



C3-Cloud

“A Federated Collaborative Care Cure Cloud Architecture for Addressing the Needs of Multi-morbidity and Managing Polypharmacy”

PRIORITY Objective H2020-PHC-25-2015 - Advanced ICT systems and services for integrated care

D9.6 Final Result of Evaluation and Modelling Large-Scale Impact of the C3-Cloud Pilot Application

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1. EXECUTIVE SUMMARY

Work Package 9 was responsible for the evaluation of the C3-Cloud components and pilot application. This was a complex undertaking due to the manifold aspects, clinical, technical, and organizational, that were considered. The main focus in this period was on carrying out the technology trial across three pilot sites in Europe (Basque Country, Region Jämtland Härjedalen and South Warwickshire), and on evaluating the acceptance, usage, usefulness and impact of the C3-Cloud solution on a user and systemic level. After planning and monitoring the technology trials, T9.3 has been concluded with the closing of the same. T9.4 has been concluded after successfully developing the training material and performing the training of all user groups in the pilot sites as well as delivering ongoing support during the technology trial. T9.5 has been concluded with submission of D9.5 and D9.6, including the final evaluation of user surveys and the impact modelling that lent insights from a budget impact analysis and a cost-benefit analysis (ASSIST) to develop scale-up scenarios for the C3Cloud system, taking a systemic perspective.

The present document presents the evaluation results of the C3-Cloud system, based on a 6-month technology trial in three European Regions.

One of the challenges that C3-Cloud tackles is the complexity of care planning for multi-morbid patients. Generally, care-planning comprises the planning of activities to reach defined health-related goals or to maintain a certain health condition. Care planning is more complex for patients with multiple chronic conditions than it is for patients with just one chronic condition. Common drawbacks include time consuming care planning when considering the multiple chronic conditions at once. Time is spent on collaboration with the multi-disciplinary team (MDT) check up on test results or with arranging follow-up consultations. Some examinations or consultations may be duplicated, or the medication plan may not be well aligned for the different conditions. Also, patients and their informal caregiver may not have the resources at hand to be easily informed about the patients' condition, the goals of their care and what activities they should follow to reach these goals. Consequently, patients' self-management of their condition is often not facilitated.

A solution to these challenges could be a widely accepted C3-Cloud that by patients and their multi-disciplinary team, that is useful for their self-management and professional care planning and that should potentially also save healthcare resources such as time or treatment costs. To determine if C3-Cloud was able to reach up to these expectations, we developed a research protocol. The main research question was if “the use of a personalised ICT tool that facilitates coordinated care planning, treatment optimisation and patient self-management is acceptable to patients with multiple long-term conditions and their team of health professionals?”.

Altogether, the technology trial was used to evaluate user acceptance, user centered design, user experience and usefulness of the C3-Cloud system. That served to enable project partners learn what aspects needed improvement and if scaling up of the C3-Cloud system could be an option when taking a systemic stakeholder perspective. For that, we defined four ‘testing and evaluation’ phases (Figure 1), involving multiple qualitative methods, and advanced impact modelling.

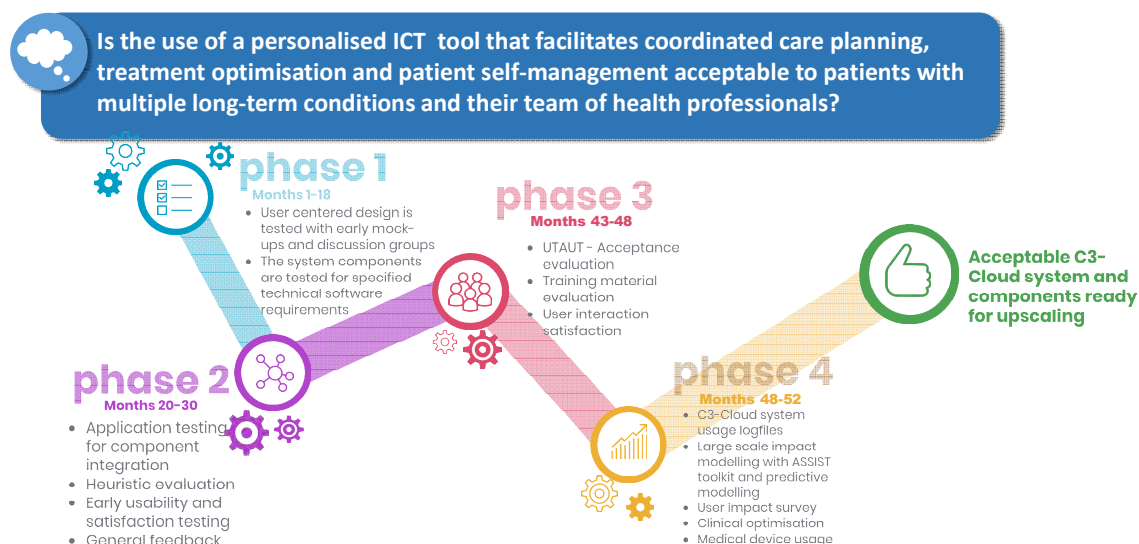


Figure 1 Research question and evaluation phases

In the first phase – early in the project- user centered design using mockups and discussion groups was tested. Also, clinical users tested if the system complied with their clinical and technical requirements. In phase two, the integration of all C3-Cloud components and the user experience was tested by means of heuristic evaluation, early usability tests and user a satisfaction survey. During these two phases we learned that users found the solution very promising already during the early development phase. They believed that the suggested care plan goals and activities were meaningful and the operation on the platforms was intuitive. Doubts were raised if the group of elderly patients that we targeted would be able to work well with the technology or if they lacked IT literacy (for detailed results, see deliverable D9.3).

After phase one and two tests, the C3-Cloud development partners worked on implementing the feedback that was received. That was followed by deploying the C3-Cloud components carrying out the technology trial from November 2019 to April 2020.

For phase three, the fully deployed solutions were tested with users in Sweden, Region Jämtland Härjedalen (RJH); United Kingdom, South Warwickshire (SWFT); and Spain, Basque Country (BC) with a total of 126 healthcare professionals (HCPs) and 230 patients. We surveyed the acceptance, evaluated user training material, and evaluated the user satisfaction with the C3-Cloud platforms. Phase 4 involved analysing C3-Cloud usage patterns with data generated during the trial as well as developing impact scenarios if C3-Cloud were used at scale. Budget impact analysis and cost-benefit analysis methods were used for the impact modelling and for sketching scale-up scenarios.

Several challenges with that technology trial were experienced:

Several months delay in finalizing the development and deploying C3-Cloud in the pilot sites: Through the early testing activities, we learned a lot about the pitfalls and potential improvements of the platform and it was crucial for all clinical partners, that the software that we deliver was safe to use. As a result, our pilot sites were convinced that a reliable and trusted C3-Cloud was seamlessly integrated in their local IT landscape after the deployment process.

Patient recruitment issues: 70% of patients were lost to recruitment from the outset. In response, we added more patients to the pool of patients that was approached for recruitment. Also, a decision was made during the project to include patients with mild and moderate conditions only for this technology trial. That limited the number of patients eligible for inclusion. Thus, the minimum inclusion age was decreased to start from 55. Finally, efforts were made to provide

simple and rich information to motivate patients to consent for participation. These information packs may not have been simple enough or patients may have overestimated the level of input that would be required from them, without seeking clarification. The very detailed information packs may have been a benefit and a down turner for patients to get involved.

COVID-19 pandemic: It struck during the trial at a time when most patients and healthcare professionals were about to benefit from the system, and after they had overcome an initial period of adaptation to the system. Starting from February 2020, usage frequency and the duration that users spent on the system went down dramatically, as clinical staff were called to provide front-line services rather than spending their resources on C3-Cloud. In consequence, C3-Cloud patients may have felt left alone and less well cared for.

Finally, the evaluation surveys that we sent out had low return rates. A general reminder was sent to all patients in the pilot sites where this was considered appropriate. However, ethics boards required us to set up the evaluation completely anonymously and that did not enable us to send targeted reminders.

Consequently, our users' experience with the C3-Cloud platforms was short and compromised. We have a limited data basis for the evaluation and the determination of significant resource use differences when comparing control patients with the C3-Cloud patients was difficult.

Despite this limited data basis, the following results are summarized for phase 3: A rich set of training material and manuals was developed during the project. Users described the core training material overall trustworthy and easy to understand. Given the volume of user training material and supporting documents, it could have been expected that some users wished it would have been more concise. This is a learning for future deployments of the C3-Cloud system –the benefit being that rich resources to lend from are available for future tests, training sessions and deployment activities.

The analysis of evaluation surveys shows further, that HCPs indicated the platforms were generally rather easy to become skilful at, that they consider them useful for their job and the platforms fit well with the way they work and the services they provide on a daily basis. In addition, the organisations they work for were supportive of the C3-Cloud technology. Our surveys also showed that patients were slightly more positive than negative on whether to use the Patient Empowerment Platform (PEP) in the future, while they indicated that it was rather not worth the effort involved in using it. This shows that patients do see the potential of the C3-Cloud system, yet they could not be fully convinced of its use just during the trial. That finding was slightly different for HCPs who wanted to use C3-Cloud in the future and believed that it was worth the effort involved in using it. These responses show the potential of the C3-Cloud system and that it can be a useful and powerful system to improve patient care.

We have also received some rather retained ratings given by our users. HCPs do rather not believe that C3-Cloud will enhance their productivity just yet and they could not put the system to full use during the trial. That can be explained by fact that some HCPs used several systems in parallel to C3-Cloud and others experienced technical issues during usage that prevented them from using it to its full potential. The impression of “decreased productivity” is detrimental to what the C3-Cloud envisaged for HCPs and it should be carefully reinvestigated in a follow-up trial whether these statements hold or if their origin lies in the shortened trial period and the COVID-19 situation with a high workload and burden on professional staff. The latter may have turned HCP perceptions to negative opinions on the professional C3-Cloud platform.

In phase 4, a discrete event simulation (DES) model was used to represent mathematically the natural history of C3-Cloud patients' health conditions. This allowed performing a budget impact analysis to generate economic healthcare resource consumption models (costs per patient and month) for the following 7 years. The significantly different cost categories determined included primary care consultations with general practitioners (GPs) and nurses; telephone contacts between patients and nurses; nurse home visits; and accident and emergency (A&E) unit visits.

The ASSIST cost-benefit method was the last evaluation method that was applied in phase 4. The aim was sketch economic scale-up scenarios for the pilot sites, using a cost-benefit analysis and merging this with the DES results.

For that, we first identified stakeholders who are involved or affected by C3-Cloud implementation, comprising patients and their informal caregivers, GPs, nurses, call center staff, hospital staff, the healthcare payer and software developers. We identified relevant positive and negative impact indicators along the categories “financial impacts”, “resource use impacts” and “intangible impacts”. Costs included for instance C3-Cloud development costs; forgone income from fewer GP consultations; time spent on training or inconvenience using the new system. Benefits included for instance Time saved during GP consultations; less reimbursement due to fewer GP consultations; or improved satisfaction at work. “Fewer GP consultations” is both a cost and a benefit. This is based on the way we set up the analysis and illustrates a typical benefit shift. Fewer GP consultations may be a cost to the primary care organization, but a benefit to the institution that reimburses such consultations.

After performing the full impact modelling, we found that the three regions vary regarding their overall cumulative socio-economic return (SER) figures for the stakeholder groups and their systemic socio-economic return. Interestingly, the general direction has shown similarity in all three pilot sites (Figure 2).


















				
Sweden, Region Jämtland Härjedalen	 6 %	 9 %	 -79 %	 1103 %
United Kingdom, South Warwickshire	 -1 %	 -23 %	 -29 %	 347 %
Spain, Basque Country	 -10 %	 10 %	 -66 %	 1067 %

Figure 2 Overall socio-economic return for the whole service system (systemic SER), for patients, for primary care and for the payer

Patients and their informal caregivers have an intermediate perception of the system and their costs and benefits are rather equalling out. The Healthcare professionals have a rather large negative SER; however, this translates only into marginal costs in absolute terms (i.e. a couple of ten thousands €). Healthcare organizations are the losers in terms of SER. This is explained largely as in the current models they pay for HCPs training time on C3-Cloud, medical sensor devices (i.e. weight scales and blood pressure meters, and they have forgone income for instance from avoided GP and nurse consultations. It can be debated if this is indeed a loss in income, as it is largely dependent on the reimbursement schemes given in the pilot regions. Also, a reduction in GP and nurse consultations will in effect liberate their time which they could spend to provide better quality care. As a secondary effect, we could then see increased HCPs work satisfaction and patients may feel better cared for. Thus, if fewer consultations would not go along with reduced reimbursement for the health care providers, their SER could be more positive.

The great winner in the model, under given assumptions, will be the payers that cover costs for general healthcare provision. Be that the Ministry of Health, a health insurance, or the NHS. The Payers save large amounts of money with a highly positive SER, ranging from 347% in South Warwickshire to 1103% in Region Jämtland Härjedalen.

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3. INTRODUCTION

Work Package 9 had 7 objectives:

Objective 1: Define a 4-phased approach that can evaluate the complex technical and organisational nature of the C3-Cloud components and technology trial

We achieved that by developing an extensive, 4 phased research protocol delivered in D9.2 and submitted for publication. The research protocol included specifications on the recruitment, technology tests, user surveys and impact modelling with different sets of users.

Objective 2: Defining an approach that can predict and model the impact of the application when implemented at scale.

An adaptation to the ASSIST modelling tool was done to merge the patient-level, DES unit cost data results with the stakeholder and service-system perspective of the ASSIST tool.

Objective 3: Assuring the quality and correctness of C3-Cloud components by continuous testing activities before and during the technology trial

Various software component tests were defined in D9.1 before starting the first tests. Results were reported in D9.3.

Objective 4: Organising user training workshops prior to and at the beginning of pilot application validation

Extensive user training material and supporting documentation was developed in T9.4 and reported in D9.4. User training workshops were prepared and carried out for and with all three pilots in 3 languages.

Objective 5: Testing and evaluating the C3-Cloud pilot application by professionals, patients, and informal carers for 15 months

The C3-Cloud pilot application was tested in all three pilot sites and with all three user groups. The technology trial had a decreased duration of 6 months due to limitations raised in chapter 5. It included feedback from all user groups, though with limited survey return numbers, despite repeated efforts to motivate feedback.

Objective 6: Modelling the impact of the C3-Cloud integrated care pilot application compared to as-is situation

The impact of the C3-Cloud system was modelled using the ASSIST method, enriched with information from the DES modelling (chapter 7).

Objective 7: Informing WP2 with appropriate measures especially on innovation and business aspects

Veto players and potential supporters of the C3-Cloud system have been identified and are reported in this deliverable (chapter 8).

3.1. Purpose of the Document

The deliverable at hand reports on the results of the acceptance evaluation of the C3-Cloud system as well as the large scale (i.e. systemic) cost-benefit impact modelling and resource use modelling if C3-Cloud were deployed in the three pilot regions at larger scale. We also discuss what the limitations are towards the interpretation of our results and what efforts project partners took to mitigate issues leading to the limitations.

3.2. Background

In the previous deliverable “D9.5 Interim Evaluation Results for the C3-Cloud Pilot Application”, we reported about the interim tests, the enrolment of users into the technology trial and described the approach to the large-scale impact modelling tool. D9.5 built on the updated research protocol and both form the basis in presenting the evaluation results of all WP9 tasks in this present deliverable “D9.6 Final Result of Evaluation and Modelling Large-Scale Impact of the C3-Cloud Pilot Application”. For the technology trial, we followed the approach described in the updated research protocol, while we tried to develop contingency plans for issues encountered regarding the recruitment of patients. A technology trial that was reduced in length due to development and deployment delays and the European-wide COVID-19 situation.

The final evaluation results and the modelling of the large-scale impact of the C3-Cloud application is embedded in a technology trial planned far ahead. The evaluation and modelling depended to a large extent on the successful development, deployment, and operation of the C3-Cloud platform to the three pilot sites and its usage by MDT members and their patients. All C3-Cloud partners have worked to develop a system that is safe in recruiting a user cohort while adhering to the inclusion criteria; A system that offers thorough training for system usage and the means to evaluation C3-Cloud user acceptance, usefulness and impact.

To this end, pilot sites identified and described the pilot application user requirements together with patients, primary care practitioners and nurses and mapped them to the C3-Cloud high-level components. Starting from there, the formal requirement specification of the C3-Cloud components architecture was documented.

In preparation for the study technical partners worked together to compile a detailed deployment plan for the seven C3-Cloud high-level components to ensure smooth delivery of the C3-Cloud solution.

Based on component deployment requirements, technical partners worked with each pilot site to refine the C3-Cloud pilot application design in deliverable D8.2, producing specific pilot application architecture for each site, considering the idiosyncrasies in infrastructure and specific requirements each site had for data integration. All pilot sites implemented this specification and provided both a staging and production environment to provide a seamless acceptance testing environment and allow for continuous integration of improvements and fixes into live environments. Details of testing and enhancements made to the C3-Cloud components during this period are documented in Deliverable 9.5. Each pilot site then made available to the pilot environment the local IT services for patient data integration, such as the CDA service at Osakidetza, or the Cambio Open Services at RJH. Osakidetza additionally set up a private docker registry for C3-Cloud components and made this available to other sites, which provided a centralized location for the latest stable versions of the C3-Cloud components for deployment. Bi-weekly meetings were scheduled to allow all partners to quickly evaluate progress and solve critical issues.

A Clinical Reference Group (CRG) involving health professionals from the pilot sites was key to solve issues related to clinical content or processes. The CRG helped to refine the pilot requirements and recommendations for the software developers and to discuss and review the Standard Operating Procedure (SOP).

Alongside usability testing by project staff at pilot sites, training was also arranged for healthcare professionals recruited to use the system, with site-specific training materials developed to minimise any onboarding issues.

Just before the intervention, training was provided to all stakeholder groups, including end users of the system, those that will support the end users and those that will support the system. Training plans were developed in each site. Training materials were developed for the C3-Cloud intervention, tailoring the target audience to reinforce in-person ICT training. During the intervention, the three sites provided a Help Desk to deal with any questions and issues raised. As the C3-Cloud system aimed to be used in real clinical practice (i.e. live

settings) the acceptance by local clinicians and IT managers required multiple testing iterations, to a larger degree than planned, until compliance with the pilot site needs was achieved. To this end, testing was carried out in a structured way, test scripts were developed between pilot sites and component owners. Issues identified by the pilot sites, and suggestions for improvement, were reported and managed using the GitLab tool. Each time a fix or change was applied, the relevant test scripts were followed by the pilot sites.

Given the extended testing and improvement period, an extension to the study period was proposed. To help support WP9 activities during this period, regular meetings were adapted to include more detailed reporting on study recruitment numbers, training performed and statuses of surveys for evaluation.

The recruitment of patients to the trial has shown more difficult than expected and despite efforts from the pilot sites the expected number of patients could not be recruited. An early identification of potential participants by automated EHR search at an early stage could potentially have increased the number of participants.

During the technology trial, the world faced pandemic “COVID-19”, reducing engagement with clinical staff needing to prioritise COVID-19 response. However, due to the robust testing no critical issues of the C3-Cloud solution that potentially could block the use of the system remained at this stage.

Near the close of the study period, a closure plan was drafted to allow smooth discontinuation of C3-Cloud services at the end of the project. This included standardized processes for each site to extract the necessary data for evaluation based on Data Management Plans in D1.7 and the WP9, internal Task 9.6, Monitoring tool.

3.3. Structure of the Document

This document first presents the executive summary (chapter 1) which is followed by the table of contents (chapter 2). In chapter 3, the purpose of this document and the background of the evaluation work discussed, to identify the technical and organizational C3-Cloud accomplishments towards the technology trial and its evaluation. Chapter 4 reports on the technology trial user enrolment and the barriers that the three pilot sites have experienced with user recruitment. Chapter 5 describes in detail the limitations that the evaluation findings have, mainly based on the recruitment issues, C3-Cloud component development delays and the COVID-19 pandemic that hit in February 2020.

Chapter 6 includes the analysis results for the first and the second C3-Cloud technology trial user surveys. Subsequently, chapter 7 reports on the discrete event simulation results and analyses the ASSIST impact modelling results. Finally, chapter 8 discusses and interprets the analysis findings from the previous chapters, embedding them in the accomplishments of the technology trials under consideration of the evaluation limitations.

In chapter 9 the tables are listed, chapter 10 lists the figures and is followed by the Annexes.

3.4. Glossary

Acronym	Definition
AIC	Akaike Information Criteria
AIP	Acute intermittent porphyria
ASSIST	The method and toolkit applied for a cost-benefit impact evaluation
BIA	Budget Impact Analysis
CDS	Clinical Decision Support
CRG	Clinical Reference Group
DES	Discrete Event Simulation
DOA	Description of Action
EAP	Equipo de Atención Primaria
EGFR	Estimated Glomerular Filtration Rate
EHR	Electronic Health Record
EMIS	Egton Medical Information Systems
FHIR	Fast Healthcare Interoperability Resources
GBP	Great Britain Pound
GDPR	General Data Protection Regulation
GFR	Glomerular Filtration Rate
HCP	Health Care Professional
HTA	Health Technology Assessment
ICT	Information and Communication Technology
MDT	Multi-Disciplinary Team
NMSE	normalized mean square error
NYHA	New York Heart Association Functional Classification
PCT	Primary Care Team
PDCA	Plan-Do-Act-Check
PEP	Patient Empowerment Platform
PGA	Polyglandular Syndrome
QUIS	Questionnaire on User Interaction Satisfaction
RJH	Region Jämtland Härjedalen
ROI	Return on Investment
SD	Standard Deviation
SEK	Swedish krona
SER	Socio-Economic-Return
SIM	Subscriber Identity Module

Acronym	Definition
SOP	Standard Operating Protocol
SRDC	Software Research & Development Consultancy
STD	Stand
SWFT	South Warwickshire Foundation Trust
UTAUT	Unified Theory of Acceptance and Use of Technology

4. ENROLMENT REPORT

An essential part of the C3-Cloud technology study is to trial the C3-Cloud system with an agreed number of patients and healthcare professionals. The following tables show the final recruitment numbers overall and per pilot site. In addition, an interpretation why the recruitment of patients fell beyond our expected numbers is given.

Table 1 shows that a total of 230 patients across all three pilot sites was consented by November 2019, when the technology trial started which is only 19.4% of all 1183 approached patients.

All Pilot Sites		
Intervention patients	Planned	Actual
Approached	610	1183
Recruited	526	293
Consented by Nov 2019	420	230
Gender distribution (female/male)	210/210	100/130
MDT members	Planned	Actual
Consented	62	125, of which 20 were active during the Covid-19 pandemic

Table 1 Number of trial participants across all three pilot sites

SWFT had the lowest response rate of our three pilot sites with only 7.4% of the approached patients consenting to participate in the trial (**Table 2**).

South Warwickshire Pilot Site		
Intervention patients	Planned	Actual
Approached	70+18+14 = 102	241
Recruited	88	25
Consented by Nov 2019	70	18 (+ two patients who withdrew consents early)
Gender distribution (female/male)	35/35	6/12
MDT members	Planned	Actual
Consented	16	16
Comments	<p>3 GPs, 2 practice nurses, 4 dieticians, 2 diabetes specialists, 5 district nurses, 1 heart failure nurse.</p> <p>SWFT MDT members needed to stop their active involvement in C3-Cloud activities as they were all called to front-line services in response to the COVID-19 outbreak.</p>	

Table 2 Number of trial participants at SWFT

The Basque pilot site was able to consent 14% of the patient they approached (**Table 3**)

Basque Country Pilot Site		
Intervention patients	Planned	Actual
Approached	175+44+35 = 254	250
Recruited	219	35
Consented by Nov 2019	175	35
Gender distribution (female/male)	50/50	12/23
Comments		
MDT members	Planned	Actual
Consented	16	92
Comments	48 GPs and 44 primary care nurses were recruited. 33 HCPs actively used the systems. When COVID-19 pandemic struck Spain, only 3 HCPs were able to maintain usage.	

Table 3 Number of trial participants at BC

The RJH pilot site, which had overall the largest patient cohort, was able to consent 25.6% of the patients they contacted (Table 4).

Region Jämtland Härjedalen Pilot Site		
Intervention patients	Planned	Actual
Approached	175+44+35 = 254	692
Recruited	219	223
Consented by Nov 2019	175	177
Gender distribution (female/male)	88/87	82/95
Comments	3 of the consented patients deceased during study trial delay. 12 patients withdrew their consent before trial start. 3 patients moved to other areas, 1 patient moved to special housing, 1 patient no longer fulfils the inclusion criteria.	
MDT members	Planned	Actual
Consented	30	17
Comments	-	

Table 4 Number of trial participants at RJH

Discussions with the pilot sites over the last year have shown several reasons for the low conversion rates:

Ethical approval:

- Recruitment of patients was initially delayed as it was time consuming to convince the regional ethics committees that the C3-Cloud pilot status as a technology trial rather than a clinical trial. The pilot site managers had to go through several iterations of ethics committee decisions to obtain the final approvals of our research protocol.
- In addition, the ethics committees made clear that the project teams were not permitted to put pressure on patients to participate, to offer inducements or to sell the potential benefits of the study to any great extent.

- When the consortium presented an addendum to extend the intervention by three months, several months passed before confirmation was obtained. This uncertainty till the addendum was officially approved by the EC did not facilitate recruitment.

Recruitment:

- Possible inaccuracies in the way that diagnoses are coded in EMIS (The primary care EHR system) at SWFT: the EMIS search was not able to reliably identify all relevant patients or some patients may have been identified as suitable but prove not to be suitable following case note review. There are no other sources available in the practice to identify suitable patients, e.g. multi-morbidity diseases registers.
- The primary issue, which is out of the control of the practice or project team, is that most patients contacted did not respond at all even after a reminder letter was sent. Thus, approximately 70% of the patients were lost to recruitment from the outset. A few declined participation or could not be considered further for recruitment as they were later found to be ineligible, e.g. patient had been identified as suitable in error, conditions had resolved, their health had deteriorated, they had moved into a nursing home etc.
- A small number of patients declined as they specifically said they do not like IT and prefer face to face interaction.
- Numbers were estimated prior to the start of the study and a formal case note review was not carried out before the numbers were agreed in the DOA. This is an important learning point from the research.
- Detailed inclusion and exclusion criteria were defined after the original numbers were agreed in the DOA which had an impact on the number of suitable patients available. In particular, the severity levels of the four conditions were reduced, e.g. inclusion of mild to moderate Renal Failure, Heart Failure and depression and the exclusion of Type 1 diabetes. The pilot sites original estimation of numbers was predicated based on the inclusion of all disease severity levels. Other issues that influenced the numbers were the exclusion of patients living in a nursing/residential home and patients with other conditions that affect their ability to provide informed consent or to use the system for instance. This may have been offset to a small extent by reducing the lower age limit from 65 to 55+ that was done when we recognised that uptake rates would be much lower than expected.
- Although efforts were made to ensure that the information provided to patients about the study in the recruitment pack was simple, it may not have been simple enough. On the other hand, patients may have overestimated the level of input that would be required or the complexity of the study without seeking clarification. There was a requirement to balance the volume and complexity of information provided with not overloading the patients or discouraging them from reading it.

Budget limitations:

- At the time when it was recognised that uptake rates are as low as 7.4% (SWFT) it was not possible to involve additional practices to the C3-Cloud project, and SWFT for instance would not have had the budget available to pay more than one practice for their involvement.

Response rates:

- We understood from the outset that older people are likely to be less comfortable with IT. That said, it was hoped that this would be less of a problem in the area targeted for instance by SWFT, as the GP practice is in an affluent area with a well-educated patient base with higher than average IT literacy & technology usage. Furthermore, patients who stated that they were not comfortable with IT were generally not encouraged by the option to enlist the help of a friend, family member or carer, and some patients said that they did not have anyone to call on.
- Some patients may have been put off using the term ‘multi-morbidity’. One patient stated they felt that the term had negative and worrisome overtones.

- The use of innovative IT is not very well developed especially not among patients aged 70+. This may have caused patients to decline participation.

Clinician workload and COVID-19:

- The recruitment process followed in the Basque Country, where Primary Care healthcare professionals approached and recruited patients, has not favoured the recruitment process. Primary Care has been and is very overloaded, which was a problem already before the COVID-19 outbreak. In 2019 there were several strikes among Primary Care professionals. This overload of work to which professionals are subjected every day together with the short piloting time expected influenced negatively in the recruiting process as many of them did not consider that the effort was worthwhile.
- Once the extension of the Project was approved early 2020 and thus the piloting time extended, the first cases of the COVID-19 outbreak in February 2020 disrupted Primary care work and did not enable further recruitment either. Back then, some professionals were in the process of recruiting and starting the intervention with patients for instance in the Basque Country pilot site.

Prediction of relevant MDT members for inclusion in the technology trial was difficult:

- Improved MDT collaboration for care planning was key for this project and similarly one of its pitfalls: It was difficult for the pilot sites to reliably predict which healthcare professionals the patients would see during the technology trial. Healthcare professionals are not all working in a few care centres but randomly spread across care centres and the regions. As a result, it was rarely the case that the complete MDT of one patient was involved in the C3-Cloud technology trial. That compromised MDT collaboration during the trial.

5. LIMITATIONS OF THE EVALUATION

There are several limitations to the validity of our evaluation findings. To set the framing for an interpretation of the findings, these limiting factors are presented here before analysing the surveys and the cost-benefit based impact models. While many of these limiting factors were beyond control of the evaluation team, they represent valuable lessons learned for future evaluation research protocols.

- Technical partners needed to ensure the flawless development, testing and deployment of the C3-Cloud components and MDT and patient platforms in the pilot sites. This development process experienced several months delay which reduced the technology trial duration from the original 15 months to six months. In consequence, this reduced the degree of experience that users were able to have with the system. The impact modelling however was set to identify changes in healthcare system usage (e.g. care centre consultations, hospitalizations, etc.). With the small number of participants and the short trial duration it was difficult to find significantly different resource usage statistics for the intervention and the control patients. The same is thought to be the case for potentially avoided clashes of medical guidelines or polypharmacy – the main clinical outcomes of C3-Cloud of our research protocol.
- The difficulty to find significant differences in resource use was amplified by the fact that the inclusion criteria defined patients as mild or moderately ill (not severely ill). During recruitment, the inclusion age range was also reduced to start from 55 years, thus including younger patients with rather mild conditions yet more IT literate than older patients. For these younger patients, the number of consultations and other healthcare resource use will be considerably lower even without C3-Cloud than it would be for older patients.
- Not having recruited the full user numbers for the C3-Cloud components implies that we needed to base our C3-Cloud evaluation on the input from less patients and MDT users from the outset. Although that reduced number of patients was well informed about the effort expected for our evaluation, we experienced very low survey returns for the qualitative evaluation of C3-Cloud acceptance, usability, usefulness, and satisfaction (see Table 6), despite general reminders being sent out to the whole batch of patients. This was even more difficult as the regional ethics committees in the pilot sites requested that we were not allowed to track the survey responses individually (using token links). Thus, we could not identify who responded already and who had yet to respond. This could have helped to send targeted reminders to individuals. In consequence, the interpretation of the survey results has limited validity and representativeness.
- The ASSIST tool uses several data sets and sources as input, among which is the eCCIS and the eCUI questionnaire to obtain a measure for C3-Cloud user satisfaction. Due to the small number of replies to the surveys, it was decided to pool the answers to these questionnaires from all three pilot sites. As the answers reflect an ordinal scale, the median response for each item was used to calculate the satisfaction rate for the ASSIST modelling tool.
- The scale-up model for staff numbers is based on the staff numbers in the region (i.e. BC, RJH, SWFT). It was not possible during the technology trial, especially with the short duration and the Covid-19 outbreak, to estimate the share of professionals that could ultimately get involved in the C3-Cloud services per region. For the ASSIST modelling we therefore assumed a saturation of staff numbers when ‘all’ available professionals in the pilot regions were involved in the C3-Cloud service. The argument being that when C3-Cloud is further developed, C3-Cloud can be used for many more diseases than the C3-Cloud inclusion ones (i.e. hear failure, renal failure, diabetes, and depression).
- The evaluation of C3-Cloud does not cover clinical impacts of C3-Cloud and did not pursue to identify quality improvements in care provision. Rather the resource use, time spent or saved through C3-Cloud and other intangible impacts such as user satisfaction were in the focus of the impact modelling. The results are however compromised by low survey return rates (COVID-19) and a shortened duration of the trial.
- The care plans for the RJH patients were created centrally; i.e. import of the drug regimen from the EHR, addition of suggested self-empowerment material and addition of self-

measurement tasks for patients that used medical devices. The task to adopt and set specific goals and activities was meant to be delegated to the doctors treating the individual patients. As the COVID-19 pandemic struck RJH, the MDTs did not have capacity to modify the care plans any further. However, communication between patients and their MDT using C3-Cloud messaging functions was upheld. As a result, For RJH only few goals and activities were planned in the patient's care plans.

- It was planned from the outset to obtain control patient data. As recruitment of intervention patients proved difficult, the methodology was changed, and anonymised control patient data was planned to be obtained (no parallel groups anymore in the technology trial). This took place at RJH and BC. It was not possible to obtain control patient data at SWFT due to the increased workload during the COVID-19 pandemic and all clinic personnel being called to frontline services.
- The COVID-19 pandemic may have affected the technology trial manifold. Healthcare professionals' participation in C3-Cloud is part of a research project and not routine care. During the COVID-19 pandemic in early 2020, C3-Cloud usage was not the priority in the pilot sites and C3-Cloud was not yet well-rooted in their care processes. Thus, C3-Cloud usage fell far below our expectations in all three pilot sites. Due to lack of data, there is no specific effect on the usage pattern observable among the three pilot sites. Not all recruited patients have seen their initial care plan and not all patients have had at least one follow-up consultation with their MDT to review their care plan. The reason may be that many consultations were cancelled due to the pandemic, while only urgent treatments for severely ill patients (i.e. not C3-Cloud patients) were provided. The research hypothesis was that intervention groups would use fewer resources than control groups. At this stage, it is difficult to determine the effects of COVID-19 as a confounding bias. The C3-Cloud consortium believes that if the MDTs had been better acquainted to the C3-Cloud components before the COVID-19 pandemic hit, this could have made a great difference to system usage as it is meant to ease the MDTs workload on care planning (see **Figure 53**).

In consequence, the analysis and interpretation as well as the robustness and validity of the surveys and the cost-benefit modelling based impact analysis, is limited to the survey returns and results that were possible to retrieve. The interpretation of the real C3-Cloud intervention effects most likely has been hampered by the COVID-19 outbreak.

6. SURVEY RESULTS

The first step in the evaluation of the survey results was to export the raw data and subsequently adapting them to empirica data assessment tool. From the time the “open” survey was running, all the responses, including survey tests, were recorded. The identification and removal of the “dummy/test responses” was implemented, and the adapted data were imported to empirica survey tool for analysis. In some cases, as SWFT in “C3-Cloud: Detailed Survey for Patients”, only one survey link had been sent to the users based in the UK, and the related data had to be imported in the associated sheet and then used as an input to the survey tool (for further explanations see 6.5). Each survey was composed of one or more questionnaires as listed in table Table 5.

The survey analysis is presented here soberly and without interpretation, which will be done selectively in the discussion (chapter 8).

Survey	Questionnaires included in the survey
First survey for all patients	<ul style="list-style-type: none"> • UTAUT patients (acceptability of C3-Cloud)
Second survey for all patients	<ul style="list-style-type: none"> • UTAUT patients (acceptability of C3-Cloud)
First detailed survey for 150 phase 3 patients	<ul style="list-style-type: none"> • Patient Questionnaire (usefulness of C3-Cloud for care planning and empowerment) • QUIS7 Patients (Usability questionnaire) • Patient Material Output (Evaluation of training material) (video, information leaflet, wallet card)
Second detailed survey for 150 phase 3 patients	<ul style="list-style-type: none"> • Patient Questionnaire (usefulness of C3-Cloud for care planning and empowerment) • QUIS7 Patients (Usability questionnaire) • eCCIS patient (System satisfaction questionnaire) • Patient Material Outputs (Evaluation of training material), (Leaflets and web pages as well as peer support groups)
First survey for all MDTs	<ul style="list-style-type: none"> • UTAUT MDT (acceptability of C3-Cloud) • QUIS7 MDTs (Usability questionnaire)
Second survey all for MDTs	<ul style="list-style-type: none"> • MDT Questionnaire (usefulness of C3-Cloud for care planning and empowerment) • UTAUT MDT (acceptability of C3-Cloud) • QUIS7 MDTs (Usability questionnaire) • eCUIs MDT (System satisfaction questionnaire)
First survey for all informal caregivers	<ul style="list-style-type: none"> • eCCIS informal caregivers (System satisfaction questionnaire)
Second survey for all informal caregiver	<ul style="list-style-type: none"> • eCCIS informal caregiver (System satisfaction questionnaire)
Survey about sensor device usage for patients in RJH	<ul style="list-style-type: none"> • Device usage patients (feasibility study to show usage of data from multiple sources)

Survey	Questionnaires included in the survey
Survey about sensor device usage for MDTs in RJH	<ul style="list-style-type: none"> Device usage MDTs (feasibility study to show usage of data from multiple sources)

Table 5 List of questionnaires per survey

Each of these surveys consisted of related questionnaires that are broken down for ease of presentation. In all surveys the respondents were first asked to answer three mandatory basic questions about their “age”, “sex” and the “area they lived in” (Healthcare Professionals/HCPs answered one more basic question related to their job title). These basic questions are therefore analysed with the associated charts at the beginning of each survey. Furthermore, to offer an outlook of the results, the mean ratings for each statement in the questionnaires are presented in a summary graph; the complete results of each question/statement are offered in bar and pie charts as an appendix to this file.

Additionally, the users had the opportunity to leave general comments at the end of each questionnaire. In the QUIS7 surveys, the users were also asked to provide a comment if they rated a statement 0-5. All comments are translated into English and collected in tables; comments in the original language are presented in the appendix.

Survey returns				
First survey round (January 2020)	BC	RJH	SWFT	totals
First Survey for Patients	12	28	25	65 surveys returned of which 45 were complete
First Detailed Survey for Patients	5	7	2	14 surveys returned of which 9 were complete
First Survey for Informal Caregivers	1	6	2	9 surveys returned of which 6 were complete
First Survey for Healthcare Professionals	21	2	3	26 surveys returned of which 19 were complete
Second surveys round (April – May 2020)	BC	RJH	SWFT	totals
Second Survey for Patients	2	19	5	26 surveys returned of which 24 were complete
Second Detailed Survey for Patients	4	8	0	12 surveys returned of which 7 were complete
Second Survey for Informal Caregivers	3	0	0	3 surveys returned of which 2 were complete
Second Survey for Healthcare Professionals	16	0	2	18 surveys returned of which 12 were complete
Survey on Patient’s Device Usage in RJH		2		2 surveys returned of which 1 was complete
Survey on HCP’s Device Usage in RJH		0		0 surveys returned

Table 6 List of survey return numbers

6.1. C3-Cloud: First Survey for Healthcare Professionals

6.1.1. Basic Questions

According to the three basic questions that are asked at the beginning of the HCP survey, 19 respondents (N=19) in three pilot sites submitted their responses. Most of the respondents were between 45-49 and 55-59 years of age, and the rest between ages 30-44, 50-54 and 60-64 (see **Figure 3**).

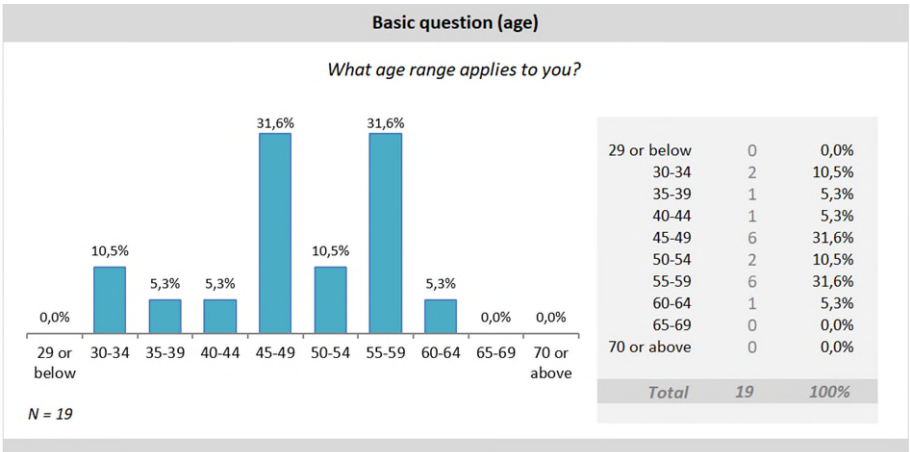


Figure 3 1st survey for HCP, basic question (age)

The second basic questions asked the respondents about their sex and which area they lived in. The results show that the respondents were predominantly female (almost 80%), and mostly submitted their responses from the Basque Country in Spain (see **Figure 4** and **Figure 5**).

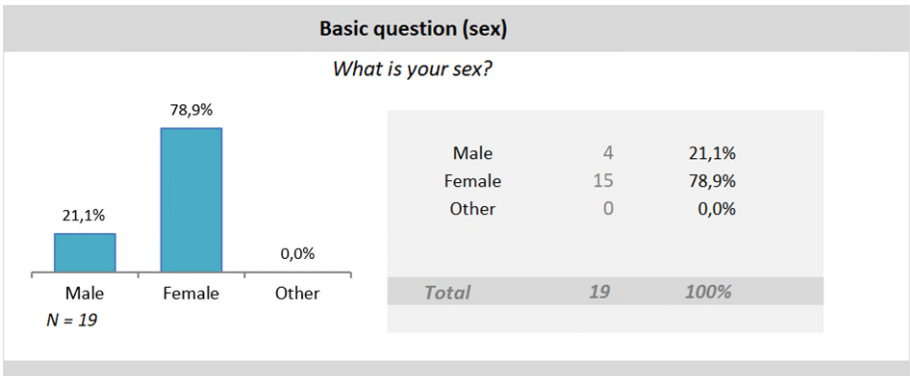


Figure 4 1st survey for HCP, basic question (sex)

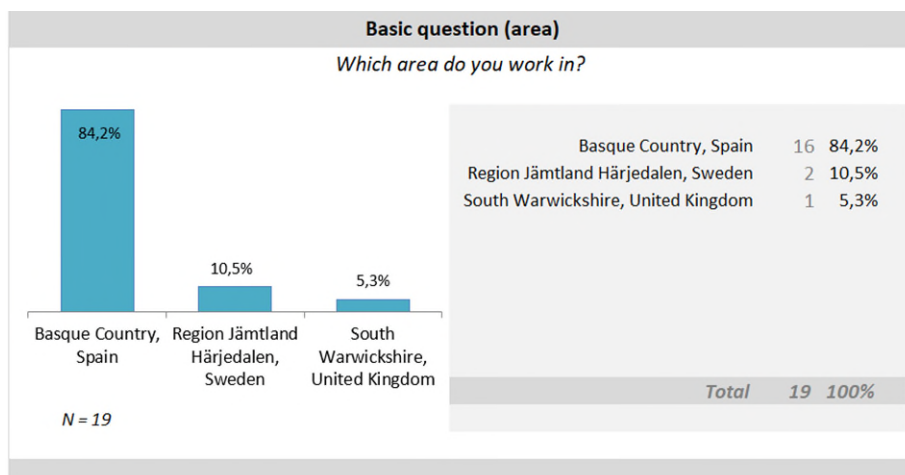


Figure 5 1st survey for HCP, basic question (area)

Apart from these three basic questions that were common among all surveys, HCPs were also asked to submit their job titles. The table below demonstrates what job titles the respondents held when responding to the survey (for the job titles in original language refer to Appendix 10.3).

HCP job titles			
1)	District nurse	2)	District doctor
3)	Community nurse	4)	Nurse × 6
5)	Doctor × 2	6)	Optional holder (unclear what this is meant to be)
7)	Family doctor × 5	8)	Primary care physician
9)	DUE (unclear what this is meant to be)		

Table 7 1st survey for HCP, job titles, English translation

6.1.2. HCP Unified Theory of Acceptance and Use of Technology (UTAUT)

To evaluate the acceptance and use of the C3-Cloud system by HCPs, another general question was asked at the beginning of this survey and within the frame of the UTAUT questionnaire. Thus, respondents were asked if they have had the opportunity to use the C3-Cloud system since the beginning of the trial, to which almost 80% said “Yes” and a 20% said “No” (see **Figure 6**).

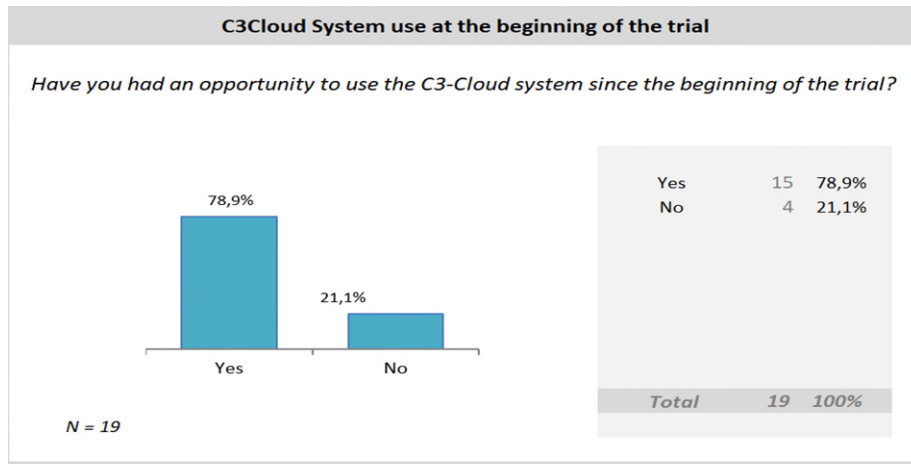


Figure 6 Have you had an opportunity to use the C3-Cloud system since the beginning of the trial

The following summary figure presents the mean rating for each statement. For a better presentation of the results, the statements are divided into two groups. In addition, figures such as **Figure 7** illustrate for each question: the mean, the standard deviation (SD), the distribution of ratings on a bar chart and a pie chart. As previously, the presentation of “non-responses” were ignored in the bar charts, and the average and SD are respectively calculated without these responses, while non-response rates are included in the pie charts. The bar charts and pie charts are colour coded dark red, red, and light red/pink for values from 0-3, grey for neutral, and light green, green, and dark green for values from 5-7.

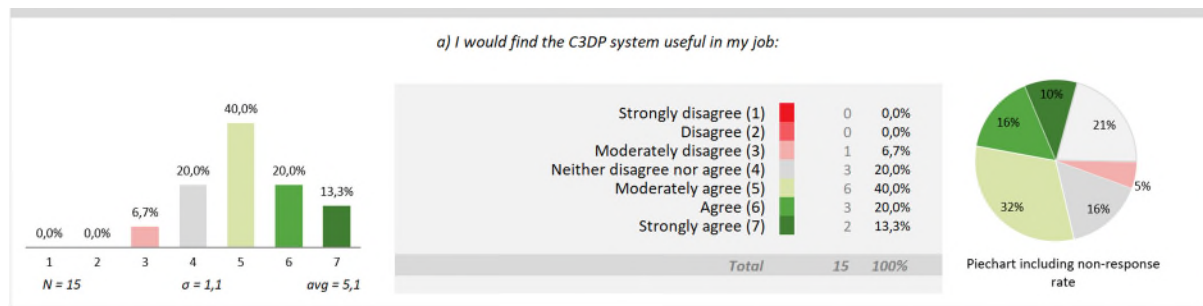


Figure 7 Sample bar and pie chart presentation of the results

The next group of questions at this stage asked the HCPs to rate the system’s overall usefulness, ease of use, if the system were a mental challenge and if the patients would be willing to keep working with the new technology. **Figure 8** displays the mean ratings of 19 users to the statements (a-i) on a scale from “Strongly disagree” to “Strongly agree”. Compared to the patients, the HCPs were more assertive in their system ratings. The users tended to agree more with the statements that asked about their attitude towards the new technology (a, f, h and i), but when it came to the active usage of the system, there were sudden dents in the graph (statement g), and the disagreement went as low as 3.53 (statement b). As for statement (b), the users disagreed that using the C3DP would enable them to complete the related tasks more quickly, which could be explained with insufficient training, unfamiliarity with the system, or a weakness in system design, which needs to be considered for the system improvement. Concerning whether the system increased the user productivity, quality of work and whether it fitted well with the way they worked (statements c-e), the users tended to rate the system neutrally, leaving room for delving into these ratings and improving the system.

Like statement (b), statement (g), which assessed if the system facilitated the users’ daily job, thereby making work quicker and easier, received a low average rating. Taken together with

statement (b), this demonstrates that this aspect of the system needs to be seriously reviewed and possibly improved.

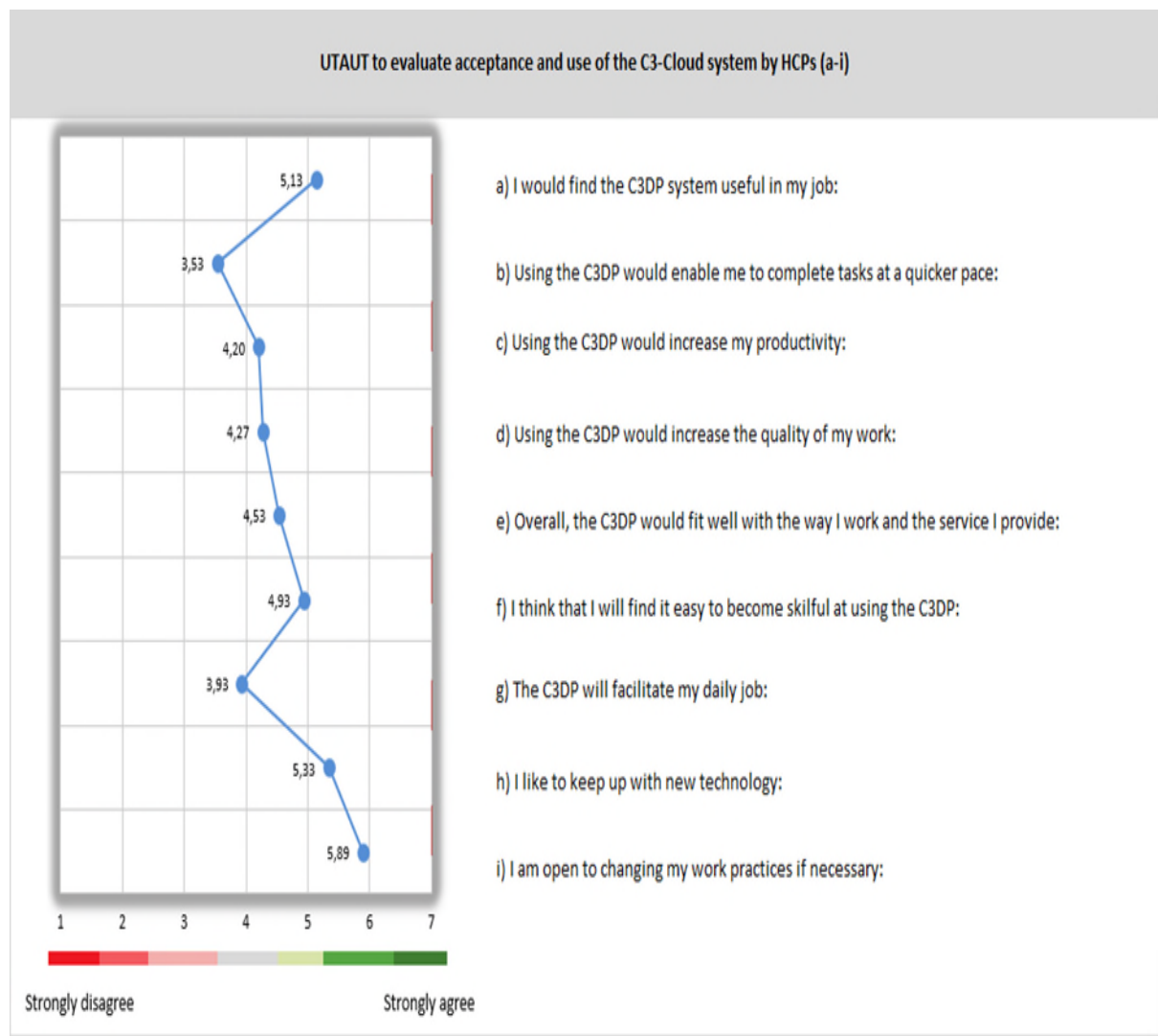


Figure 8 1st survey for HCP, UTAUT (a-i)

The statements then assessed if the HCPs were anxious, whether they had time to learn and received the needed training, and finally their future intentions on how they would put the system to full use. **Figure 9** shows the mean ratings of 19 users to the statements (j-r) on a scale from “Strongly disagree” to “Strongly agree”.

The statements concerning the HCPs system usage intention received a “Moderately agree” to “Agree” response (o, p, and r). The statement (q) was an exception as the users showed hesitance when it came to the promotion of the system to their colleagues. Regarding whether the users were open to accepting the change if enough time and sufficient resources were offered (statement j), the respondents quite agreed.

Notably, it is worthwhile to study the low ratings for statement (k-n), which could have affected the ratings of statements related to ease of use and speed of doing tasks through the system (b and g). Since the users showed some level of anxiety when using technology (more than 20%), the users should have been given more training and enough time to get used to the system environment. However, by rating statements (l, m and n) close to 4, the users were unsure if they had adequate time to get trained using the system, if they received sufficient information or training, and if they had enough time to get used to the system environment. As these three

statements are basic (meaning they could have affected the overall rating of the system), careful attention should be paid to them for future research.

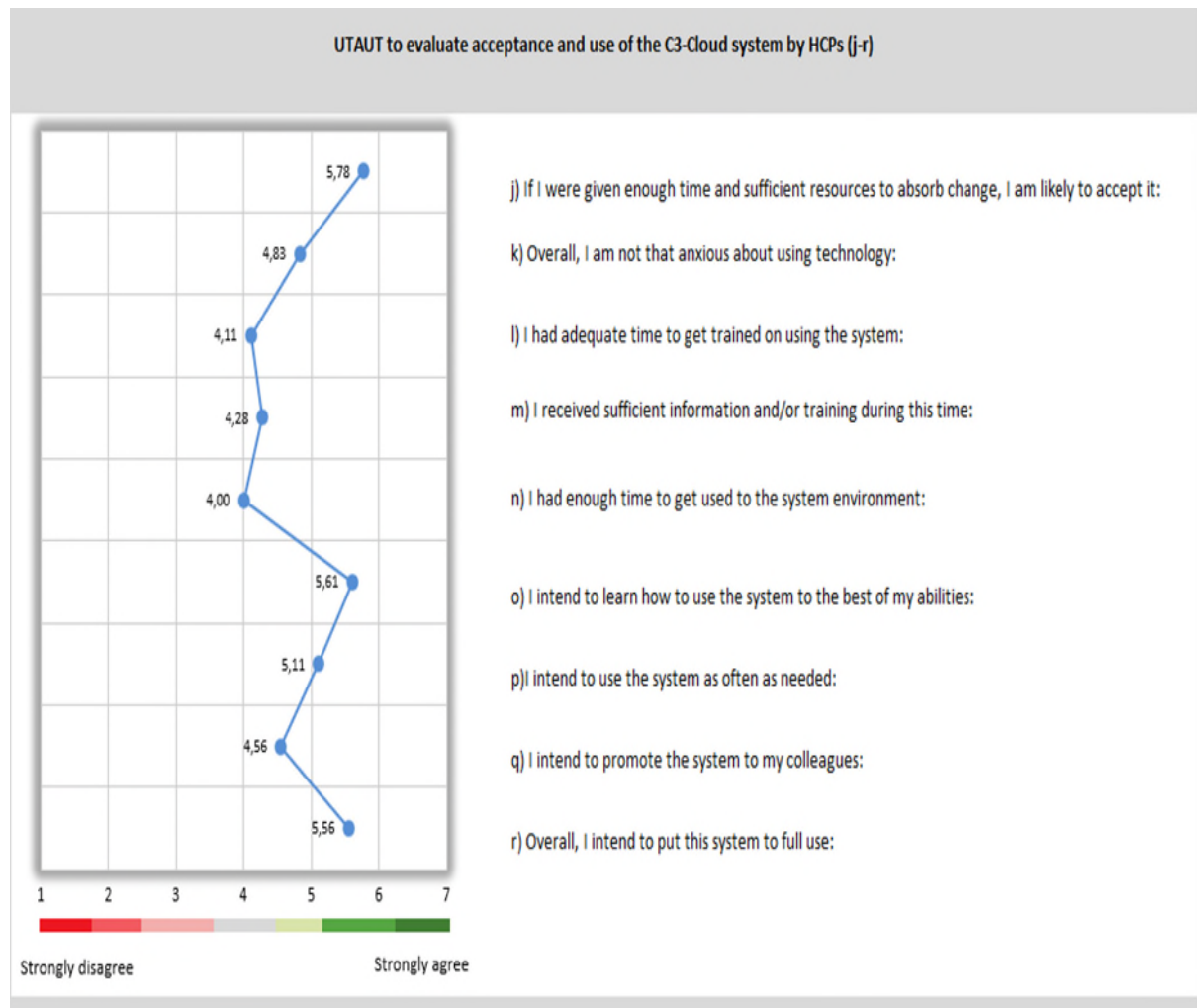


Figure 9 1st survey for HCP, UTAUT (j-r)

Finally, the respondents were asked if they had any other comments and suggestions for the improvement of the system. The comments are collected in the table below (for these comments in original language refer to Appendix 10.3).

UTAUT, HCP general comments (English translation)	
1)	In the visualization of the information that the patient sends us, it would be very interesting to see the hours in which the patient takes his glycemias.
2)	I think the handwriting can be improved; it is too fine. I wish there were a way we could be warned that the patient had contributed new information without having to enter the program.
3)	Ideas for improvement 1- That the patients' messages appear directly in the doctor's mail without the need to access the platform. 2- Some system that confirms the reception and/or reading of messages, activities, educational material... 3-More intuitive interface.

	4- That in this survey we are not asked: "select the options that best reflect your impression of your health status" as this is not related to the survey.
4)	I have had trouble getting my messages to the patients. I end up doing the phone consultation to make sure they receive the information.
5)	Now I do not see a greater utility than the programs we have so far with OSABIDE.
6)	It has become complicated because I have not achieved continuity in the relationship with the patient through the platform due to technical difficulties.
7)	Now we have had communication problems with the system, which should be resolved as soon as possible.
8)	I am not attracted to technology: because of age.

Table 8 1st survey for HCP, UTAUT general comments, English translation

6.1.3. HCP Questionnaire for User Interaction Satisfaction 7 (QUIS7)

The QUIS7 included a set of statements that asked the users opinions about their interaction with the system. For a better presentation of the results, the statements are divided into two groups. For each group, a summary figure presents the mean rating per statement (see **Figure 11**). Furthermore, figures such as the one presented below, display for each question: the mean, the standard deviation (SD) and the distribution of ratings on a bar chart and a pie chart. The bar chart shows only responses that were obtained on the respective item, while the pie chart includes all user responses and the percentage of non-responders per item. It should also be noted that, for the sake of simplification, the presentation of “non-responses” were ignored in the bar charts, and the average and SD are respectively calculated without these responses as they are not vital when it comes to the evaluation of the C3-Cloud. However, and as mentioned above, the percentage of non-response rates are presented in the pie charts. (see **Figure 10** for an example and Appendix **10.3** for the rest of the results). The bar charts and pie charts are colour coded on a continuum of dark red (0) to light red/pink (3), and light green (4-5), to dark green (9). If respondents rated a statement 5 or below, which demonstrated that users were quite unsatisfied, they were requested to leave a comment and explain why they submitted such ratings. The English translation of the comments is provided in Table 9. The comments in original language (Swedish, English and Castilian) are referred to in Appendix **10.3**. Furthermore, a field was provided for the users to offer their general opinions, and the English translation of these general comments are collected in Table 10 (the comments in original language are included in Appendix **10.3**). The total number of multidisciplinary team (MDT) member responses considered for these set of questions is N=19.

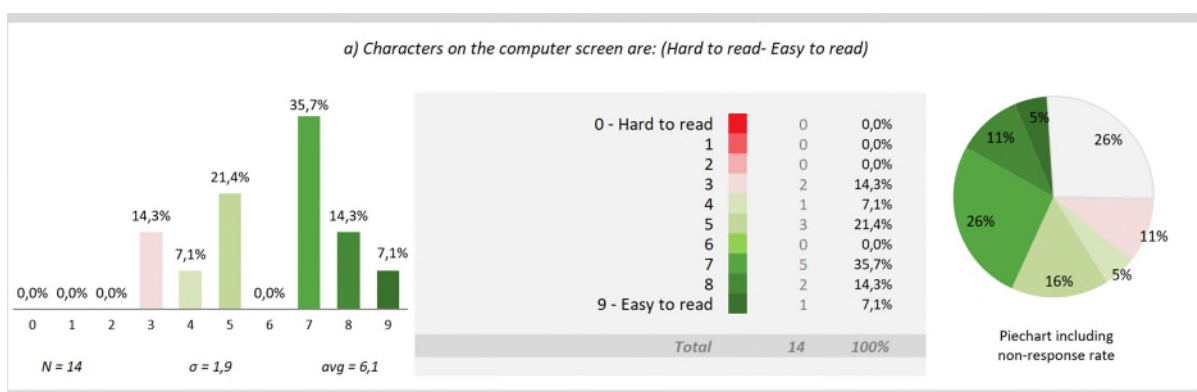


Figure 10 Sample bar and pie chart presentation of the results

HCP Technology trial participants were asked for their reactions to the system by rating each statement on a scale from 0-9. The figure below depicts the mean ratings of 19 users' impressions to the first group of statements (a-k). Except for a couple of small dents and spikes, the graph is quite even, with most of the statements rated an average of 6.0-6.5, showing that users had a quite positive view about different system features. However, statements (h) and (i) were rated slightly below average, implying that the sequence of screens was sometimes confusing and unpredictable, which should be considered and improved.

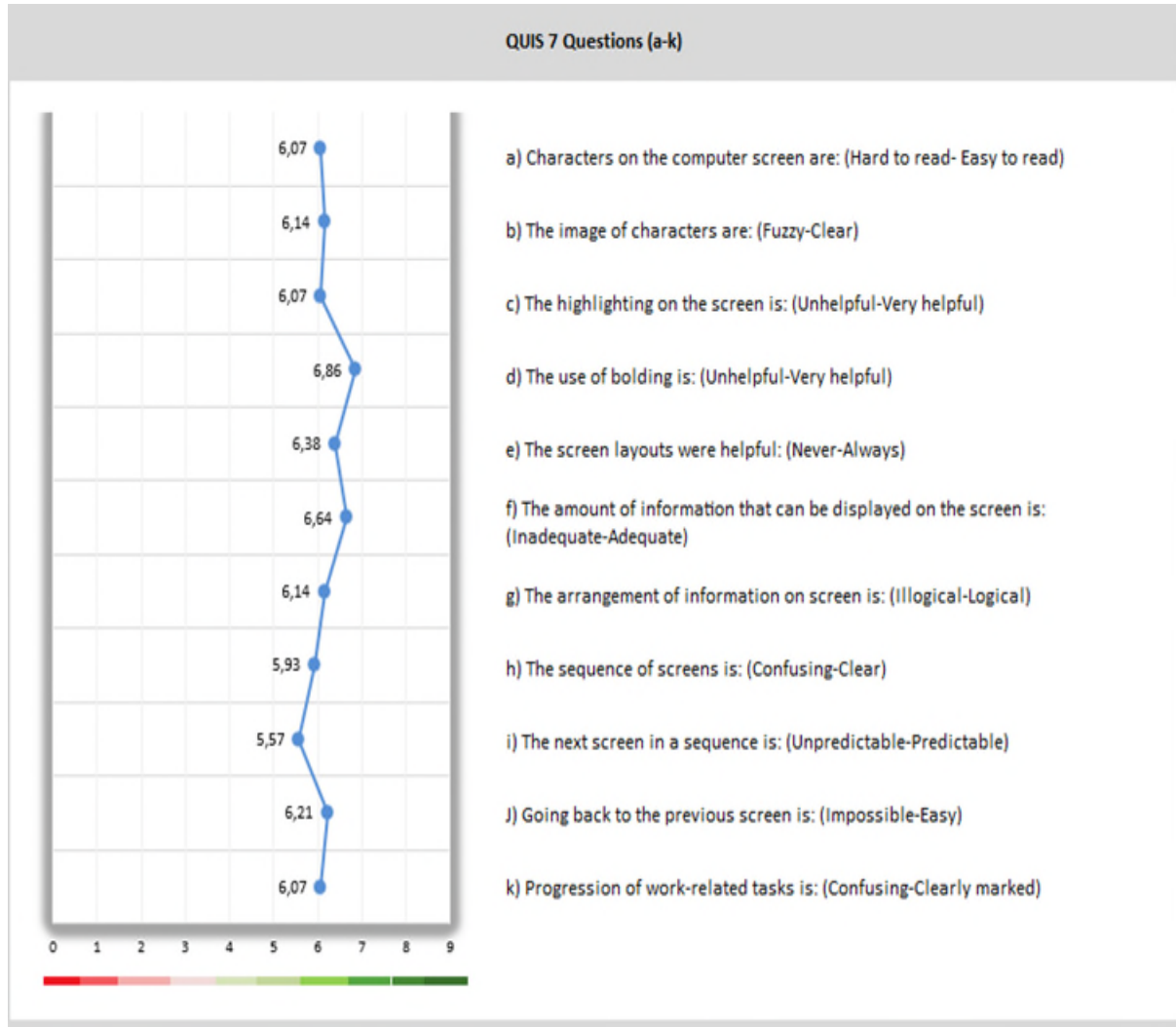


Figure 11 1st survey for HCP, QUIS7 (a-k)

Figure 12 displays the mean ratings of 19 users' impressions to the second group of statements (l-r). Compared to the previous one, this graph is even more even (except for statement r), and almost resembles a straight line. Thus, almost all statements were rated between 5.5 and 6.0, showing that the users had a moderately positive view about the second group of statements.

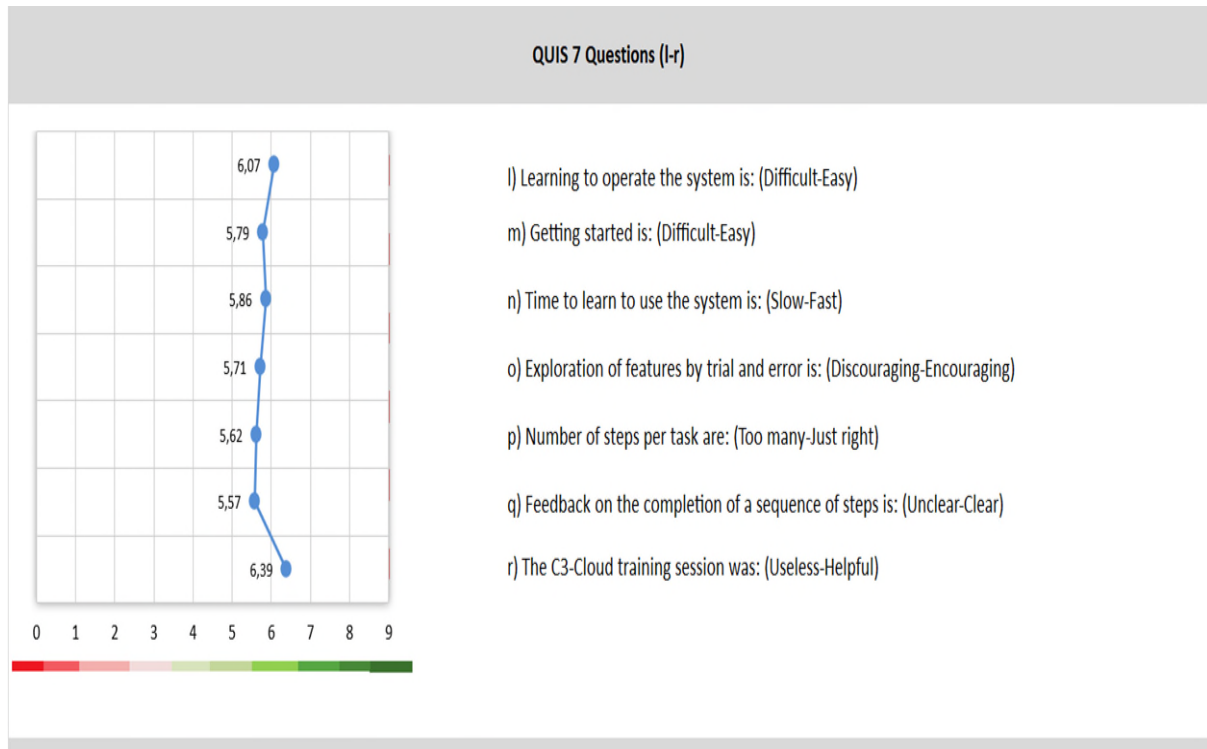


Figure 12 1st survey for HCP, QUIS7 (l-r)

As previously mentioned, users were asked for their further comments if they rated a statement 0-5. The table below includes the English translation of these comments (for the comments in original language refer to Appendix 10.3).

Comments related to statements (English translation)	
1)	The use of bolding is: [Unhelpful Very helpful] <ul style="list-style-type: none"> The truth is that I did not realize that some words are in bold and others are not.
2)	The screen layouts were helpful: [Never Always] <ul style="list-style-type: none"> The care plan tab should be more visual. By the same theme as the screen characters. I do not know how to explain it well, it is like monotone... does not make the content binding.
3)	The arrangement of information on screen is: [Illogical Logical] <ul style="list-style-type: none"> a lot of information but badly ordered, it is easier to search for diabetes or atherosclerosis than for glucose or BP management.
4)	The sequence of screen is: [Confusing Clear] <ul style="list-style-type: none"> I find it hard to tear myself away from the pages.
5)	The next screen in a sequence is: [Unpredictable Predictable] <ul style="list-style-type: none"> I do not know.
6)	Progression of work-related tasks is: [Confusing Clearly marked] <ul style="list-style-type: none"> I do not control the system.

7)	Time to learn to use the system is: [Slow Fast] <ul style="list-style-type: none"> The course where the usage was explained to us was too fast.
8)	Number of steps per task are: [Too many Just right] <ul style="list-style-type: none"> "There's too much information in every box. I have a memory that it was a bit cumbersome to create tasks, activities."
9)	Feedback on the completion of a sequence of steps is: [Unclear Clear] <ul style="list-style-type: none"> I do not understand the question.

Table 9 1st survey for HCP, comments related to statements rated 0-5, English translation

Additionally, the following table shows general comments in English about users' interaction with the system and their level of satisfaction (for the comments in original language refer to Appendix 10.3).

General comments (English translation)	
1)	We have started using the C3-Cloud system at a time of considerable work overload and patients have had difficulty enrolling. When using the system, I cannot make any progress.

Table 10 1st survey for HCP, QUIS7 general comments, English translation

6.2. C3-Cloud: Second Survey for Healthcare Professionals

6.2.1. Basic Questions

As in the previous surveys, the second survey for HCPs asked three basic questions to which 17 HCPs (N=17) from two pilot sites responded. Most were between 45-49 and 55-59 years of age (23,5% each), followed by those aged between 50-54 and 30-34. The rest of the respondents belonged to the age groups 29 or below, 35-39, 40-44 and 70 or above.

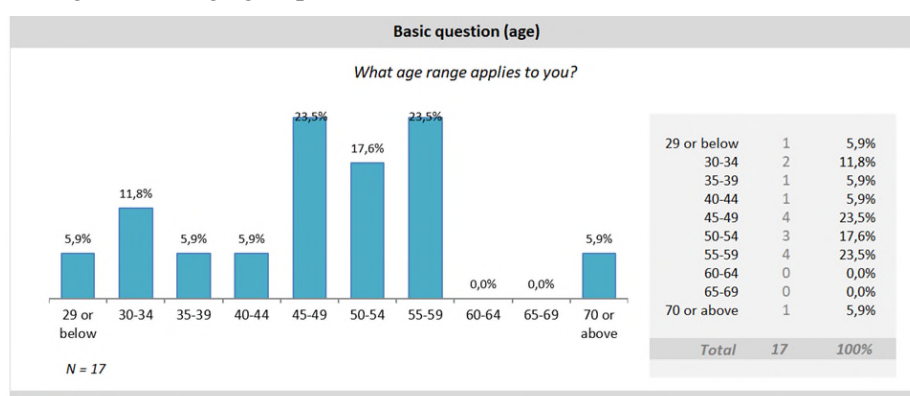


Figure 13 2nd survey for HCP, basic question (age)

Regarding the second basic question about respondents' sex, the vast majority was female (70,6%), four HCPs (23,5%) were male and one person identified with "Other" (see **Figure 14**). The HCPs worked predominantly in the Spanish Basque Country (88,2%), while two respondents (11,8%) were located in South Warwickshire, UK (see **Figure 15**).

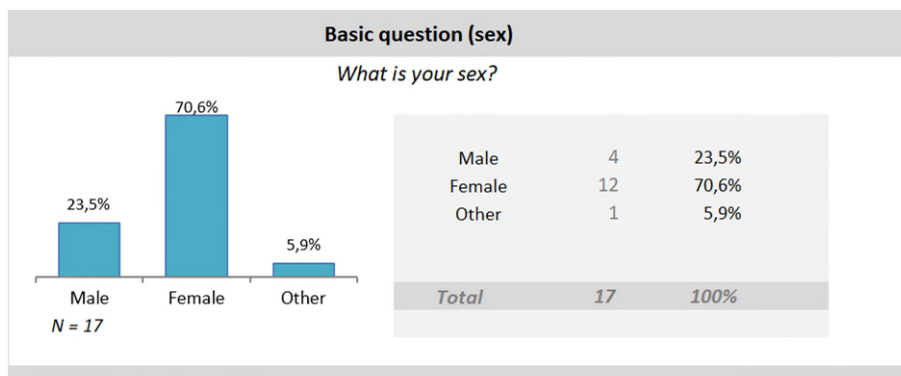


Figure 14 2nd survey for HCP, basic question (sex)

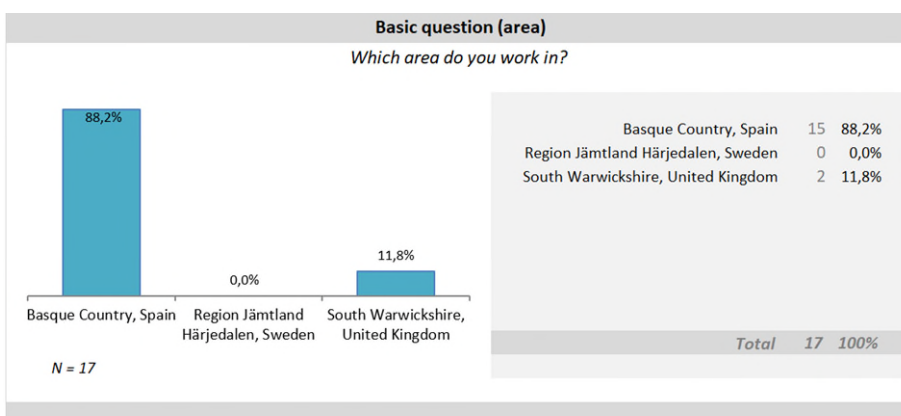


Figure 15 2nd survey for HCP, basic question (area)

In addition to these basic questions, HCPs were asked to provide their job titles, which 16 respondents (N=16) submitted. The table below displays the job titles respondents held with the corresponding English translations (for the job titles in original language refer to Appendix **10.6**).

HCP job titles			
1)	Project manager	2)	Nurse × 3
3)	Doctor × 3	4)	Primary care physician × 3
5)	Family doctor × 4	6)	Primary care nurse
7)	Doctor-head of medical care unit	8)	

Table 11 2nd survey for HCP, job titles, English translation

6.2.2. MDT Questionnaire

The MDT Questionnaire assessed how HCPs perceived the usefulness of the C3-Cloud for care planning and empowerment. The first C3DP-specific questions were statements that users were asked to rate on a scale from “Strongly disagree” to “Strongly agree”. For ease of presentation, the statements are divided into three groups, and summary figures for each group are presented. The first statements (a-j) assessed whether C3DP supported HCPs with handling conflicting clinical guidelines and treatment alternatives, with notifications on patient’s health deterioration, requesting care activities from MDT members, treatment goal-setting, informed decision-making, and whether conflicting care pathways were likely to occur when using C3DP together with existing tools. Statements (a-h) were rated by 13, statements (i) and (j) by 12 MDT members.

Figure 16 represents an example of the mean, the SD, and the distribution of ratings to each statement in a bar and pie chart. Corresponding bar and pie charts to each statement are provided in Appendix 10.6. Notably, the option “not relevant to me” and non-responses are not included in the bar charts, the mean rating and SD, but both are considered in the pie charts. Bar and pie charts are colour coded dark red, red, and light red for values from 0-3, grey for neutral, and light green, green, and dark green for values from 5-7.

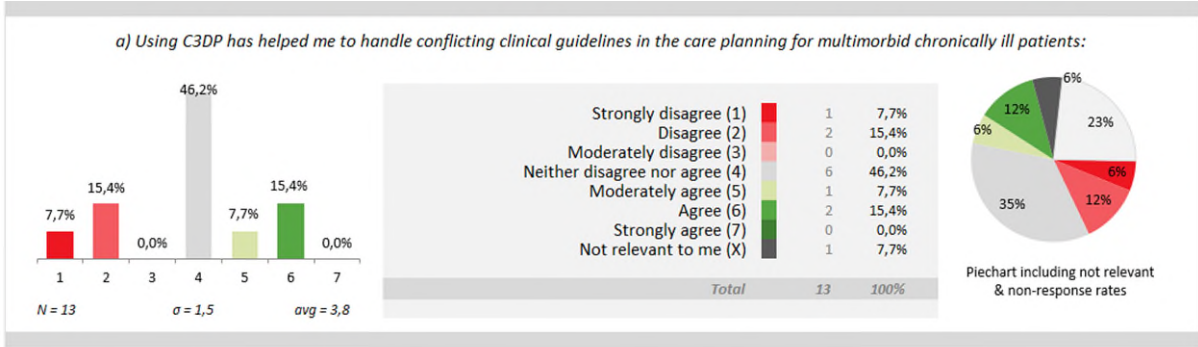


Figure 16 Sample bar and pie chart presentation of the results

Figure 17 provides a summary of the mean ratings to statements (a-h) (13 respondents), (i) and (h) (12 respondents). With an average rating of 3, statement (d) received the lowest rating, indicating that communication about MDT members’ care activities in the C3DP should be improved. In contrast, statement (h) received the highest rating of 5.54, demonstrating that defining treatment goals in C3DP was valuable for health outcomes, also facilitated through rather flexible goal setting (statement f). Respondents were neutral towards the remaining statements, suggesting room for improvement regarding notifications on health deteriorations, easier goal-setting and suggested care pathways. Moreover, HCPs neither disagreed nor agreed that C3DP was helpful in case of conflicting clinical guidelines and treatment alternatives when developing care plans for multimorbid patients (statements a and b).

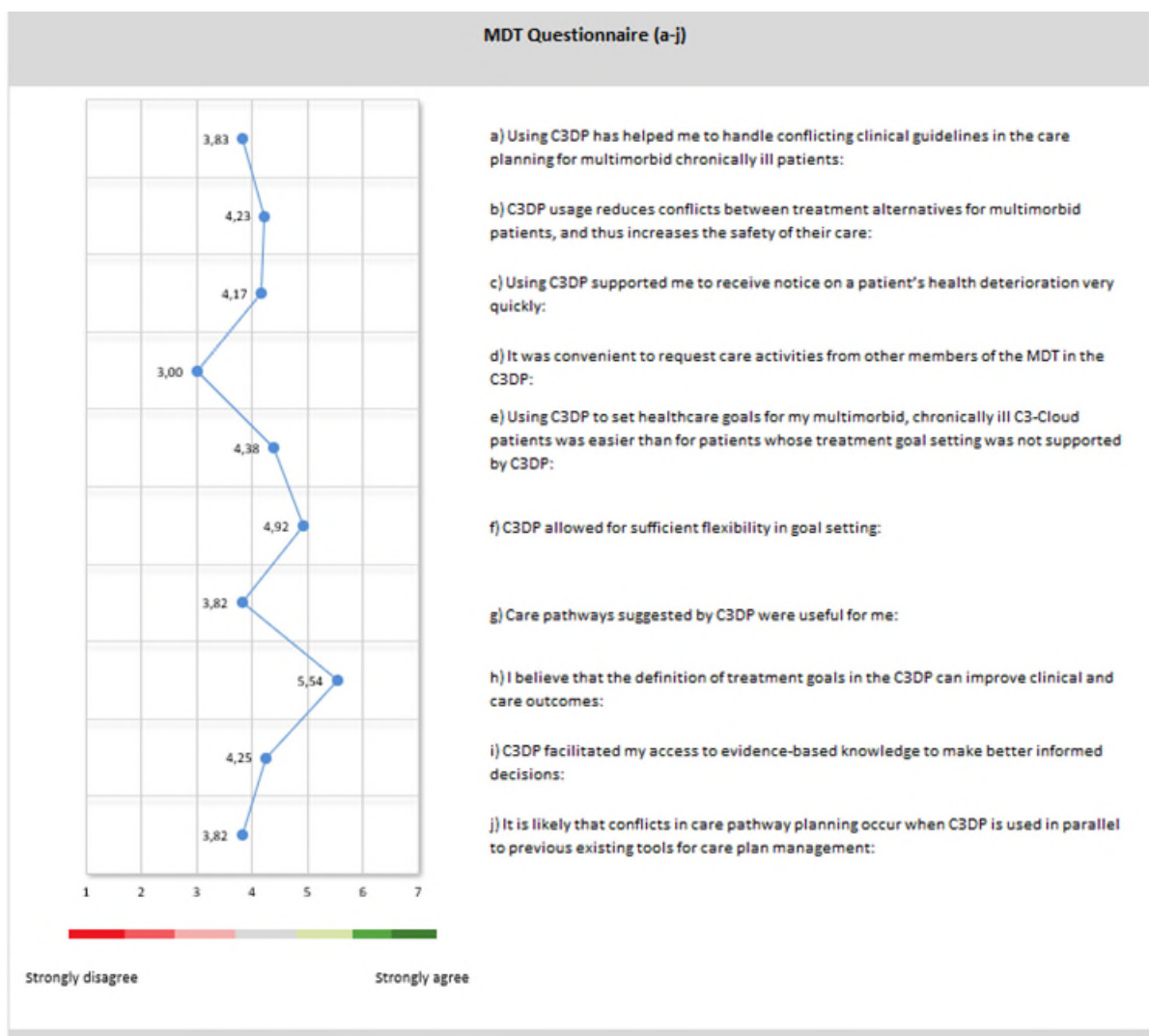


Figure 17 MDT questionnaire (a-j)

Twelve respondents submitted ratings to statements (k-t), which focused on the use of other care plan tools, C3DP's support for conflicting care plans, decision-making, care plan creation, its convenience and time spent compared to other tools, as well as collaboration among MDTs. **Figure 18** presents the mean ratings on a scale from "Strongly disagree" to "Strongly agree". Statements (k), (m) and (p) were rated higher than 4, proposing C3DP's potential to facilitate better care planning and care pathway creation for multimorbid patients through tailored information-provision and advice, although some HCPs have used existing care planning and management tools in parallel to C3DP (statement k). Respondents moderately disagreed that C3DP was supportive in detecting conflicting clinical guidelines and making rational treatment decisions and was more convenient and timesaving in comparison to software alternatives (statements l, n, o, and q). However, statement (r) suggests a slight discrepancy between time slots allocated for patients not involved in C3-Cloud and those involved, implying that C3-Cloud potentially reduced the time that HCPs spent for care provision. Considerably low ratings were submitted for statements (s) and (t) (2.8 and 3.0, respectively), emphasizing that C3DP did not improve the collaboration and coordination among MDT members, which might be related to a difficult communication among involved HCPs. The short piloting time and the low to moderate severity of the patients recruited did not make it necessary to have referrals or encounters with specialist consultants, so this output probably may not be reliable.

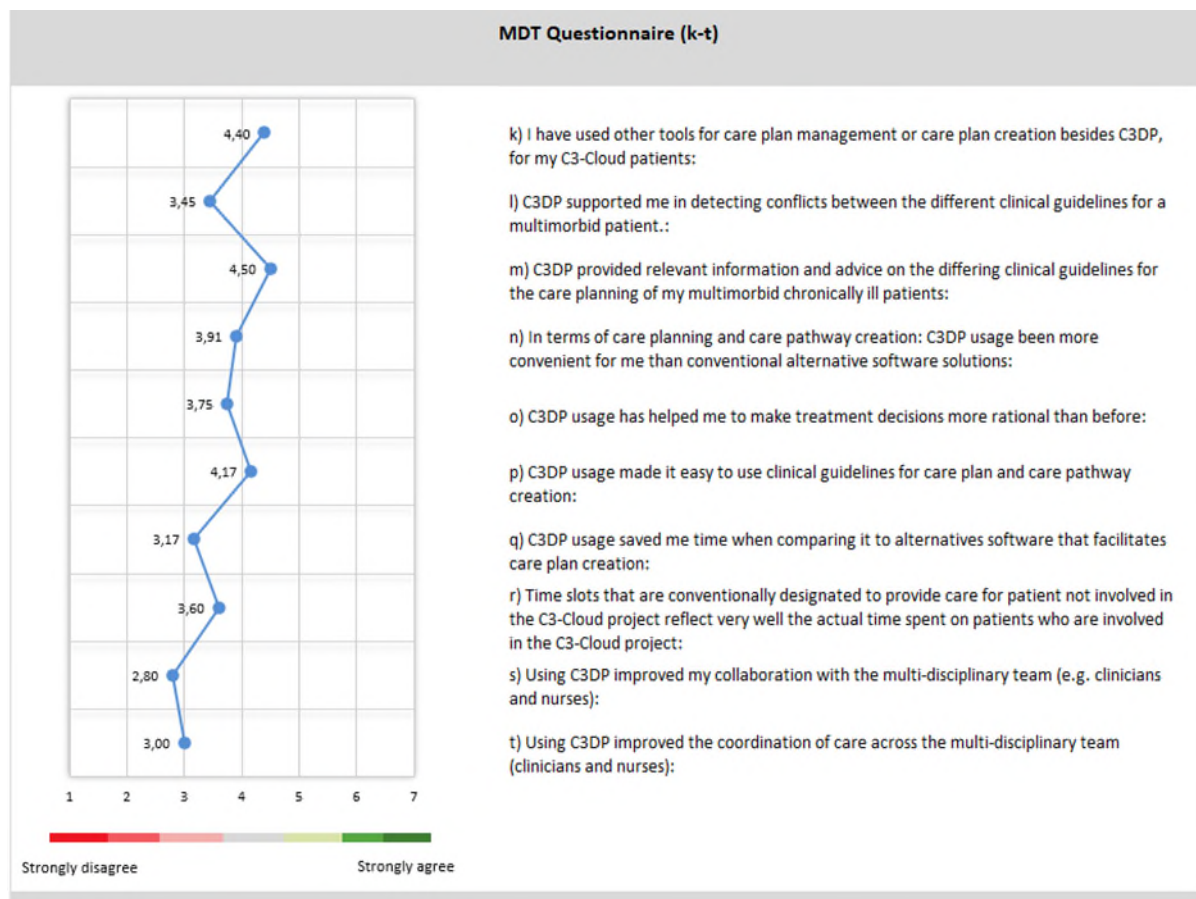


Figure 18 MDT questionnaire (k-t)

The third set of statements (u-ae) was rated by 12 respondents, except for statement (u), to which 11 users responded. **Figure 19** provides the mean ratings on a scale from “Strongly disagree” to “Strongly agree”. The statements assessed the benefits of the C3DP messaging function, the presentation and usefulness of patients’ home-based self-measurement data, the suitability of suggested clinical patient questionnaires, and whether reviewing the results of these questionnaires was easy and useful. While respondents rated most statements between 4.0-4.9, indicating a neutral opinion, statements (u) and (ac) received a lower rating (3.2 and 3.88, respectively). Thus, HCPs did not significantly benefit from the C3DP messaging function to better collaborate in the MDT, which again demonstrates that better communication among MDT members requires attention (statement u). According to responses obtained for statement (ac), the selection of clinical patient questionnaires suggested by C3DP was less adequate for patients suffering from depression than for diabetes, heart and renal failure patients, indicating that the suitability of the CDS rules for depression may perhaps be lower. Nevertheless, respondents tended to be moderately positive towards the presentation of self-measurement data and the usefulness of these data for care planning.

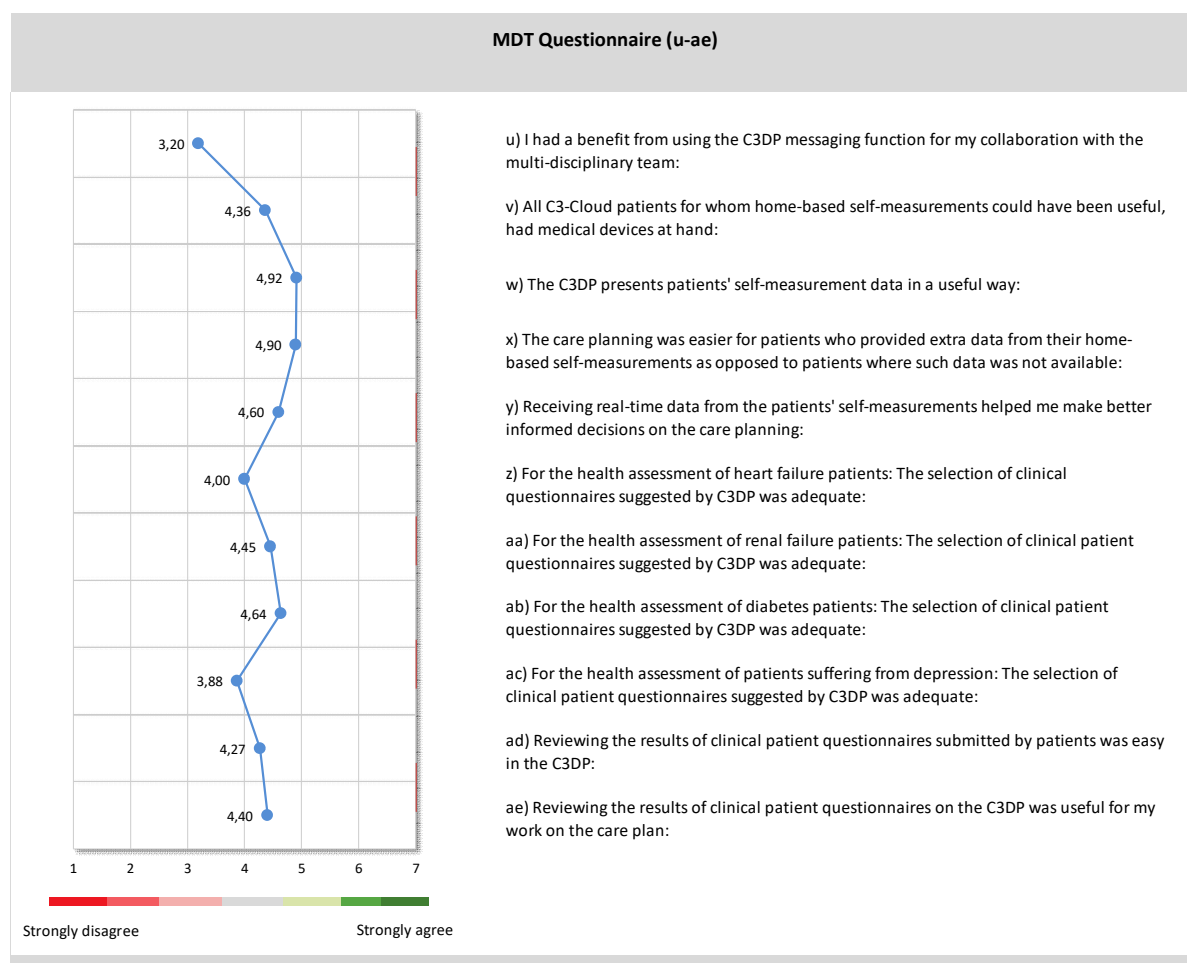


Figure 19 MDT questionnaire (u-ae)

Following these statements, three questions were asked about the average time that HCPs spent on care plan creation for patients and how often they experienced conflicting clinical guidelines when treating patients not involved in C3-Cloud. The responses are presented in separate bar and pie charts for each question. As noted previously, the bar charts with the corresponding average and SD do not include non-response rates, which are, however, represented in the pie charts.

To indicate the average time spent on care plan creation, respondents were asked to choose between options ranging from “Less than 5 minutes” (dark red) to “More than 30 minutes” (dark green), and “Not relevant to me” (dark grey). Thirteen (N=13) HCPs submitted responses to the first two questions about time use. Regarding the first question, 30.8% of respondents spent more than 30 minutes creating a care plan for patients not involved in C3-Cloud, followed by 23.1% requiring 20-30 minutes. In contrast, 23.1% reported to spent on average 5-10 minutes on care plan creation for non-involved patients (see **Figure 20**).

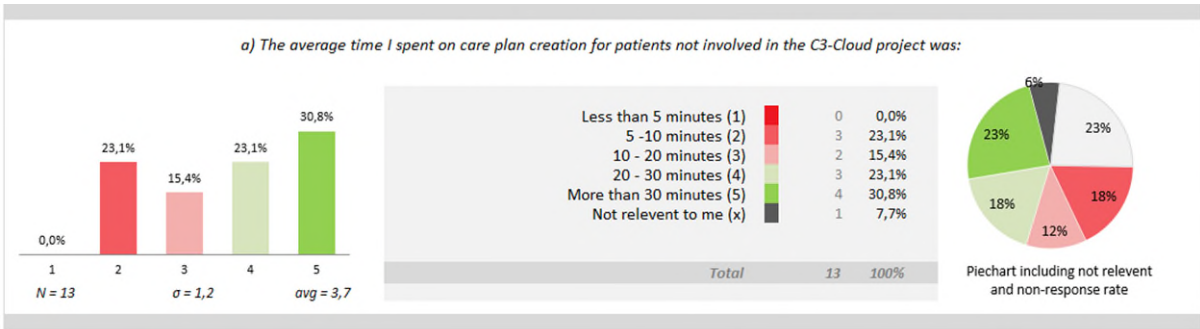


Figure 20 The average time I spent on care plan creation for patients not involved

Comparing **Figure 20** with **Figure 21** highlights that HCPs spent on average slightly less time on care plan creation per patient involved in C3-Cloud. Like the first question, 23.1% spent 20-30, and 15.4% spent 10-20 on care plan creation for involved patients, while comparatively less required more than 30 minutes (15.4%). However, fewer HCPs than in the first question spent only 5-10 minutes, overall indicating that C3DP might not save significant time in care plan creation. Notably, 30.8% of respondents regarded this question inapplicable.

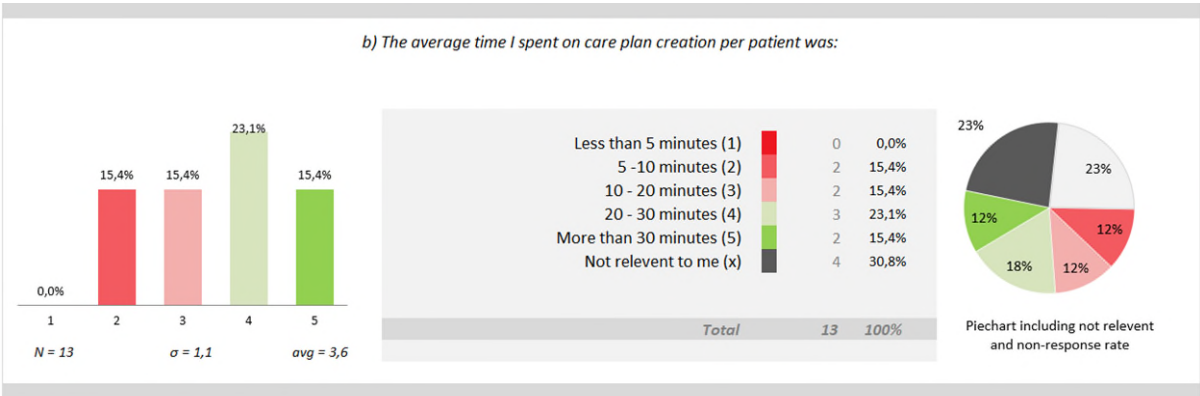


Figure 21 The average time I spent on care plan creation per patient

The third question, to which 12 HCPs responded, assessed how often they experienced conflicting clinical guidelines in the treatment of the average patient not involved in C3-Cloud (see **Figure 22**). Respondents were asked to choose between different options ranging from “Not at all” (dark green) to “More than 3 times” (dark red) and “Not relevant to me” (dark grey). While 41.7% considered this question not relevant, others mostly experienced conflicting clinical guidelines for the average non-involved patient “One or two times” (33.3%).

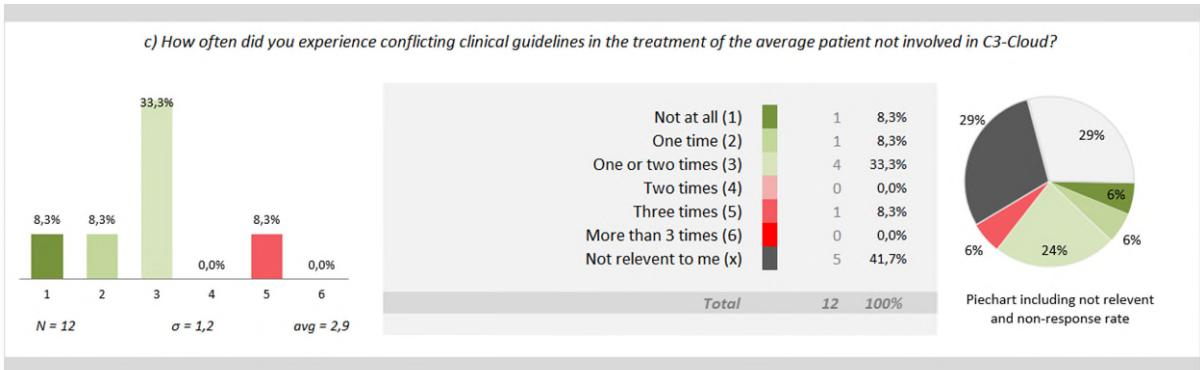


Figure 22 How often did you experience conflicting clinical guidelines in the treatment of the average patient not involved

In addition, the MDT questionnaire asked five open-ended questions about whether and how C3DP helped MDT members to access and compile patient information, to react to patients' health evolution and set up care plans, how HCPs were affected if patients had other health conditions, and whether they perceived any lacking functionalities. All HCPs answering these questions were Spanish. The following table presents the comments to these questions in the English translation (for comments in the original language refer to Appendix 10.6).

Comments to open questions (English translation)	
1)	<p>How does the C3DP system help you in the access to and compilation of the needed clinical information for patients?</p> <ul style="list-style-type: none"> • The platform offers me initially a summary of the patient's clinical history (mainly pathology and treatment) which is very important to have an overview of the patient. • Briefly and quite clearly. • Can be useful in very specific patients with technological skills and with a specific care plan. • Improves contact with the patient. I think it would be good to focus on access for patients with a wide geographical spread who find it difficult to come to a consultation or who do not make an appointment, this tool would facilitate their follow-up. • I find it a clear and simple platform to work on. • I have asked for closer communication with the patient. • Among others, through C3C you can interact with patients and help improve their clinical situation through treatment orders, delivery of information material, self-care tips... They can also include doubts and parameters (such as blood glucose levels) to be able to assess them and take them into account in the consultation or when requesting tests, for example, in a clear and easy to find way for both patients and health professionals involved. • Helps me keep up to date on basic patient information, allows me to integrate. • As far as collecting clinical information is concerned, it is adequate, although somewhat complicated. • Helps to target and focus on important pathologies by creating a care plan. • Very little. • Practical, because an overview is displayed on one screen. • It helps me organize the pathologies so that I can make a care plan.
2)	<p>How does it affect your work if patients have other health conditions that are not within the scope of C3-Cloud (i.e. besides Diabetes Type II, renal failure, heart failure or depression)?</p> <ul style="list-style-type: none"> • It is important that these health conditions are included in the initial summary, even if they are not within the scope of C3-Cloud, as they may condition future treatment. • Not much. But the reports that can be downloaded from the platform also help for other pathologies in general (healthy diet...). • Well our work is like that, our evaluation must be integral in all spheres, horizontal development of attention. • Does not give an overall view of the patient. • The additional reports are very useful for all types of pathology since many of them include general information. • I do not quite understand the question.

	<ul style="list-style-type: none"> • To phrase it positively, it seemed to me that the individual care plans help to collect goals in a general way and under consideration of considering all prevalent pathologies. • It helps in making routine or non-urgent clinical decisions, in most cases. • Allows me to integrate health in a global aspect. • It is not included so it should be considered separately. • They must be considered through the clinical history. • It affects me a lot, for example in case of dementia. • It does not affect. • I must remember; it should be included somehow.
3)	<p>Has C3-Cloud helped you to react on patients' health evolution? If yes: How? If no: Why not?</p> <ul style="list-style-type: none"> • Yes. I saw a patient who had high blood pressure at home, which led me to up the dose of an antihypertensive he was taking. • No. Our patient has not been handling the program very well. • It has not helped me; it is true that it was a patient with a lot of comorbidity and with difficult margin of improvement. • Yes, e.g.: there is continuous information on constants such as weight, and it facilitates the achievement of the objective: to lose weight, reinforcing this change and motivating people to continue. • Our case has not been very useful, as the patient has not been handled very well with the tool. • With my patients, no, because there has been stability in their health condition. • No, because patients are not in the habit of using online tools. • messages through the platform. They have preferred to make an appointment by phone with their Primary Care Team (PCT), despite having sent messages to help or encourage them to use it. I have even made phone calls to them to help or ask if there was a problem and they have come in person to resolve any doubts with the platform and its access, or when they have come for another reason to the health center (HC). • Experience has been short; I have no criteria to evaluate this question. • Has helped me to interact with the patient because of technical difficulties. • In the beginning the platform allowed interaction and it was easy, there came a time when the patient could not be contacted. • Not especially. It does not allow for quick reactions. • Yes, because when you enter clinical data (blood pressure, blood glucose) it is possible to make treatment changes if you see them as appropriate. • Yes, it is a suitable tool to interact.

4)	<p>Did C3DP usage support you to be better informed when setting up a care plan for the patient?</p> <ul style="list-style-type: none"> • Yes. C3-Cloud helps structure the patient care plan. • Not much. • It has not helped me either. • Yes, since I used it • It does help make a care plan. • You can more easily monitor their records and change treatments, if necessary. • No, how little we have been able to use it because of the global pandemic situation. We have had more misinformation with patients than benefit. • Yes, despite the little data uploaded by the patients. • Yes. • It forces you to review and focus on their problems and think about how to interact. • Yes. • Yes. • Yes. • Yeah, since you are organizing it.
5)	<p>Does C3DP lack any functionality, so that you were inclined to use other tools instead or in parallel? If yes: What were the functionalities that you missed?</p> <ul style="list-style-type: none"> • I have not missed any other features. • IT support. • I see that it has functionality for a certain person profile, unfortunately the people from our quota that we have offered to participate have declined to participate, and we have only had one participant so it is not valuable. I do see that it is a very useful tool in a certain type of patient, and in the future, it will cover many patients. • It has been hard to get in sometimes. I have missed that it is more dynamic and faster. • As I have already mentioned, our patient has not taken away the usefulness that we see he could take away if he had used the platform properly. • No. • A direct notification in the daily professional agenda, for example. • It does not lack functionality, in fact I think it is a good platform, but I think there is still a lot for the society of this municipality to "get" this kind of health tools. This is a beginning. As I said, they have preferred to use other channels to interact with the health center. • No. • There have been technical difficulties to the patient communication platform that have not been solved. • We have had to resort to the usual ways since we have not been able to solve the communication due to technical problems. • An evolutionary one. • No. • The problem has been the tool itself, technical problems.

Table 12 MDT questionnaire, comments to open questions, English translation

6.2.3. HCP Unified Theory of Acceptance and Use of Technology (UTAUT)

As in the first survey for HCPs, the UTAUT questionnaire evaluated the acceptability and use of C3-Cloud by HCPs through a series of statements. For a better presentation of the results, the statements are divided into two groups. A summary figure presenting the mean rating for each statement is provided for both groups (see **Figure 24**). In addition, figures such as **Figure 23** show for each statement the mean, the standard deviation and the distribution of ratings on a bar and pie chart. As mentioned previously, non-response rates are disregarded in bar charts, but reflected in the pie charts. The charts are colour coded dark red, red, and light red/pink for values from 0-3, grey for neutral and light green, green and dark green for values from 5-7.

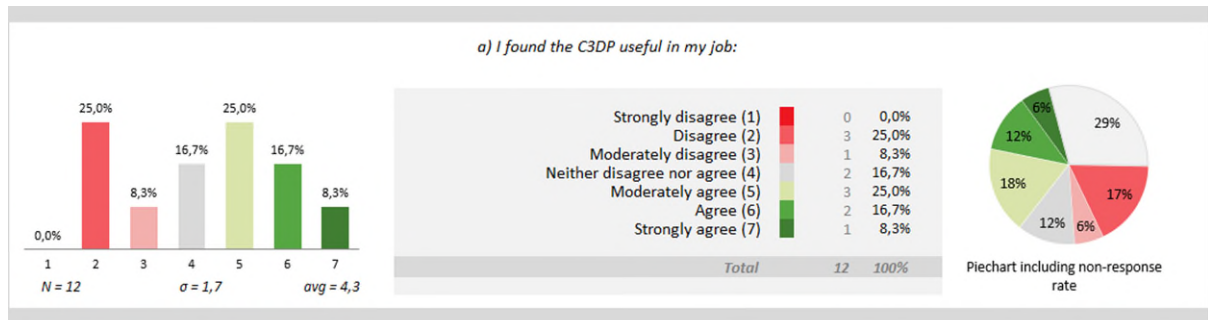


Figure 23 Sample bar and pie chart presentation of the results

The first group of statements assessed the perception of HCPs on C3DP's usefulness, ease of use, its impact on their work and the acceptance of other people in their organization. **Figure 24** shows the mean ratings of 12 users ($N=12$) to statements (a-l) on a scale from "Strongly disagree" to "Strongly agree".

While HCPs in the first survey were more positive towards the usefulness of C3DP in their job, respondents in the second survey had a neutral opinion (statement a). They were rather negative regarding the ease of use and impact of C3DP on their work compared to the perceived overall usefulness, which presents a similar pattern as in the first survey. However, especially statement (c) about whether C3DP increased productivity received a considerably lower rating in the second compared to the first survey (3.0 vs. 4.2, respectively), and therefore requires attention. Further, respondents moderately disagreed that C3DP would enable them to complete tasks more quickly and increase the quality of their work (statements b and d), represented in the lower average rating to these statements than in the first round. Similar to the first survey, respondents were still neutral that the system would fit well with their work and that becoming skillful at using C3DP was easy (statements e and f), while they moderately disagreed that C3DP facilitated their job (statement g). These results highlight the need to improve the system, its design and related training for HCPs to facilitate a faster and more efficient work. Statements (h-l) focused on the intention towards applying C3DP. Accordingly, patients benefitting from C3DP did not inspire HCPs usage (statement i). Although respondents moderately disagreed with statements h and j, indicating a slightly negative attitude and low intentions of HCPs organizations towards C3DP usage, the comparatively high rating for statement (k) (5.25) suggests that organizations were nevertheless supportive towards the system. This provides room to make C3DP more valuable for successful adoption and use by organizations. Since respondents had a neutral to slightly positive opinion that their countries used technological advances in a good way (statement l), there might be an interest in upscaling a refined and improved system in the future.

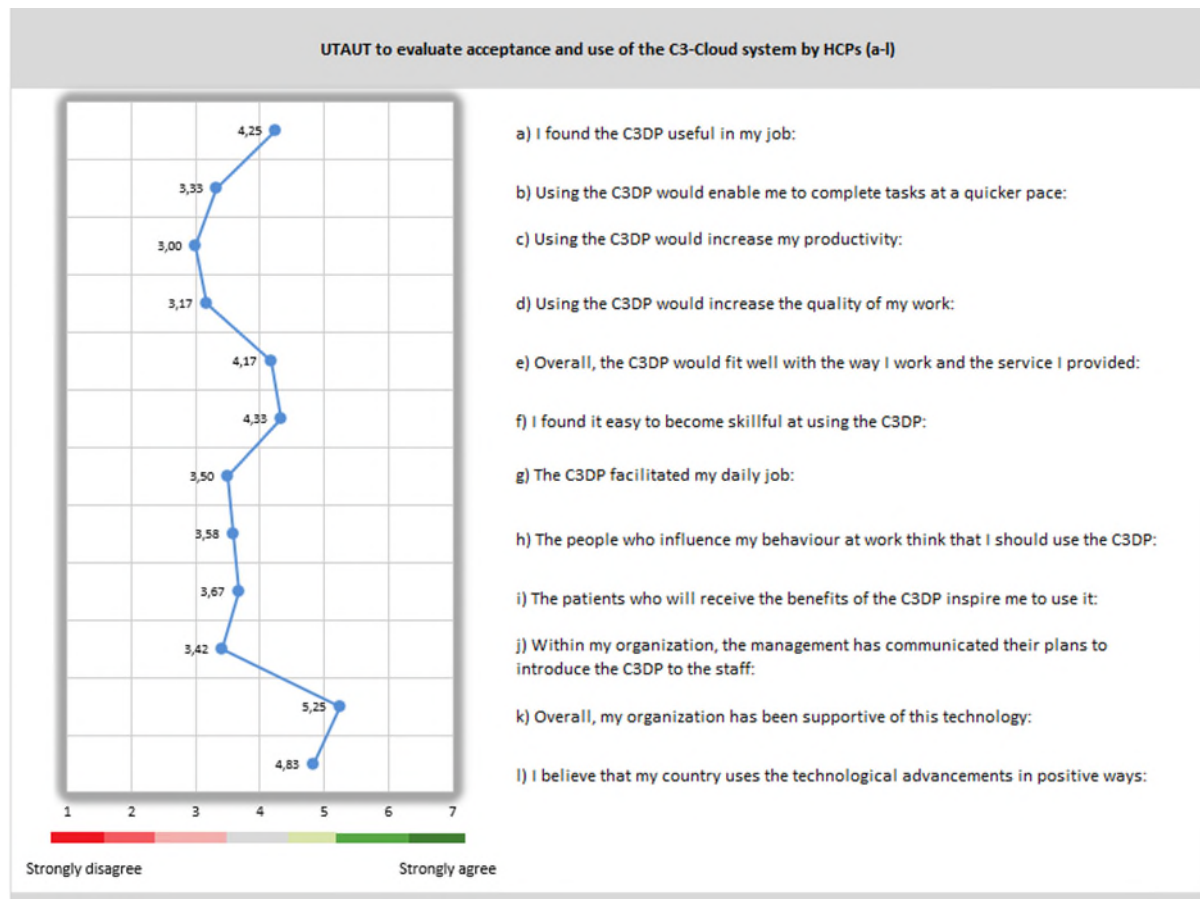


Figure 24 2nd survey for HCP, UTAUT (a-l)

The second group of statements (m-x) assessed how HCPs perceived their local community's attitude towards healthcare technologies, whether they found C3DP relevant for their community's needs, how they perceived the training on the system, their overall usage and intentions to promote the system. **Figure 25** presents the mean ratings to statements (m-x) on a scale from "Strongly disagree" to "Strongly agree". Twelve HCPs submitted responses to statements (m-o), while the remaining statements were rated by 11 users.

The statements that referred to the local community level (m, n, o) received a neutral opinion with a slightly positive tendency. Hence, HCPs perceived that their local communities might appreciate and be open to using healthcare innovations such as C3-Cloud, while overall neither disagreeing nor agreeing that C3DP was very relevant to their community's needs.

Similar to the results in the first survey, the statements that related to the HCPs perception of the needed training and time to use the system were on average rated neutrally, indicating that HCPs were unsure (statements p, q, r, t, u). Compared to the first survey, a slightly higher rating was submitted for the statement that HCPs received sufficient training (statement q), suggesting a marginal improvement in information-provision, but highlighting that more guidance and time is needed. As respondents were unsure whether they would have enough time to get into the habit of using the system if it became available (statement t), the issue of adequate time for successful adoption by HCPs requires attention. These aspects are likely to have influenced HCPs perception of C3DP's overall usefulness to their job (see **Figure 24**), which is reflected in the neutral opinion towards whether HCPs would be able to improve the quality of their work immediately with C3-Cloud remaining on the market (statement s). Nevertheless, respondents rated statement (u) comparatively higher (4.55), indicating a neutral but slightly positive stance regarding whether HCPs learned to use the system to the best of their abilities.

Respondents moderately disagreed with the last three statements. Statement (x) concerning whether respondents put the system to full use was rated the lowest (3.55), proposing that complete adoption of C3DP was unsuccessful. This is likely to be the result of the perceived lack of training, time, and functionalities. Consequently, HCPs did not use the system as often as needed and were slightly reserved towards promoting the system to their colleagues (statements v and w).

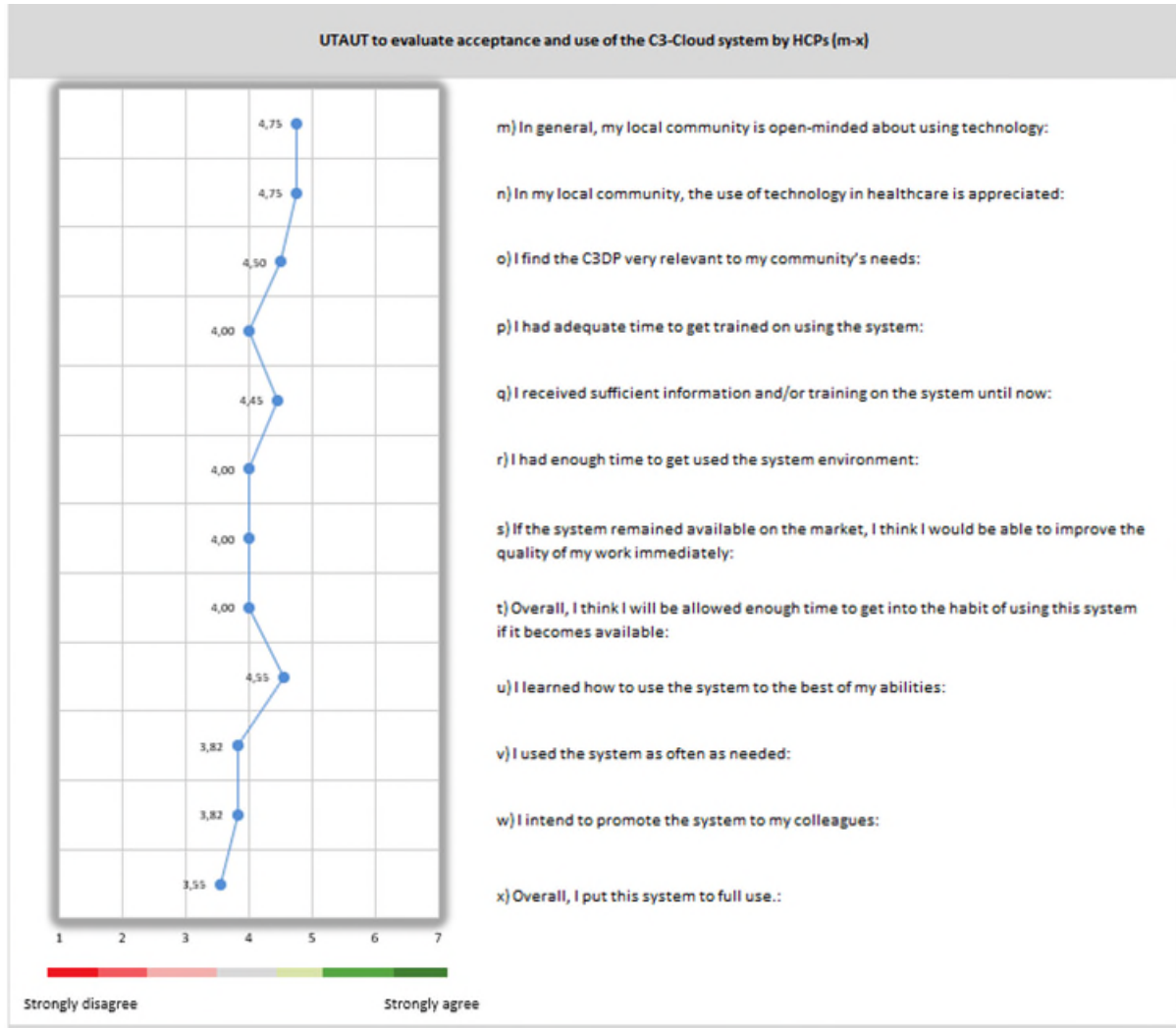


Figure 25 2nd survey for HCP, UTAUT (m-x)

Finally, HCPs were asked to leave a general comment about the C3-Cloud system and suggestions for improvement. The comments are collected in the table below (for these comments in the original language refer to Appendix 10.6). The comments highlight in summary a lack of time, limited patient numbers and the COVID-19 situation.

UTAUT, HCP general comments (English translation)	
1)	I believe that the C3-Cloud system is a good basis for creating a platform for the control and treatment of multimorbid patients.
2)	I find the tool useful. The time I have had to work with it has been scarce and unregularly for me (COVID-19 pandemic). I have been able to select few patients and some have had difficulty in handling computers. I believe that it is a good way to support people with chronic pathologies without making them spend a lot of time, avoiding them to feel sick, making them more active in the decision-making

	process. With this means we could be following many multimorbid patients without them having to run the risk of contagion with a better quality of care that is more active, participative, and continuous.
3)	My experience with the platform has been limited because unfortunately we could only test it on one patient. I think it is a platform that will help a lot with patient self-care soon.
4)	In my case I have not used the program as I would have liked, as the patient has not been well managed. But despite this, I do find it a useful tool for our work and for the autonomy of the patient.
5)	Before writing a constructive criticism, I would like to point out that we have not been able to make a full assessment of the tool because of the covid-19 pandemic. I found the tool a bit cumbersome, with a lot of information at first glance when entering the system. It would be good to have a somewhat more schematic and orderly view according to the relevance of information from the clinical history.
6)	It was a pity that I did not have enough time to use the platform and get to know it well, but it was not easy or quick. I think this kind of platform will be useful but maybe we should start with other age groups.
7)	I think that access to the platform should be made easier for patients and their families, since they have had problems accessing it by subject of passwords, links, etc. In addition, they have commented to us that they take a long time to access the different screens, to upload clinical data (e.g.: glycemia...) and their system is slow.

Table 13 2nd survey for HCP, UTAUT general comments, English translation

6.2.3.1. UTAUT HCP Response Comparison

The patients' responses before using the C3-cloud and after using it is then juxtaposed for the readers to grasp any possible changes more readily in the users' opinions.

When the healthcare professionals were asked if they think they would find the C3DP useful in their job, 5.13 was the average rating that was given to the statement before using the system. However, this figure turned into 4.25 once the healthcare professionals experienced working with the system. A figure that clearly shows that the users' opinions has deteriorated.

The statement that received almost the same rating both before and after the healthcare experience the system, was if using the C3DP enabled them to complete the tasks faster, to which 3.53 was the average before using the system and 3.33 the average after using it. This demonstrate that the healthcare professionals' opinion of this statement was low to begin with and even slightly worsened after they experience the system.

Before using the system, the healthcare professionals were quite neutral if the C3DP increased their productivity by rating the statement an average of 4-20. This rating however, dived to hover a 3 when they used the system, demonstrating that the users moderately disagreed if the C3DP increased their productivity.

When asked if using the C3DP increased the quality of their work, the healthcare professionals' average rating was 4.27 before using the system; however, and after they experienced working with the system, their opinion plunged into a 3.17, showing that they moderately disagree if the system increased the quality of their work.

For the statement if C3DP fit well with the way their work and the service they provide, the pre and post C3DP use ratings are quite close. Before using the system, the healthcare professionals rated this statement a 4.53, which turned into a 4.17 after they experienced working with the system, demonstrating that their opinion tended to be more neutral once they used the system.

When asked if they found it easy to become skillful at using the C3DP, the average rating before using the C3DP was 4.93 which turned into 4.33 once the healthcare professionals used the system demonstrating that the moderately positive opinion of the users before they experience working with the system, turned into a neutral opinion once they experienced the C3DP.

Interestingly, from the beginning healthcare professionals had a low opinion of the system when it came to the facilitation of their daily job by rating this statement an average of 3.91 even before working with it. This poor rating slightly worsened and turned into 3.5 once the users experienced the system. This poor rating demonstrates that not only did the C3DP not facilitate the users' daily job, but also it might have made it a bit harder than usual.

Finally, when asked if the healthcare professionals would promote the system to their colleagues, a 4.56 pre-C3DP system use rating of the statement turned into a 3.82 after they experienced using the system, demonstrating that the healthcare professional are quite neutral if not hesitant about promoting the system to their colleagues.

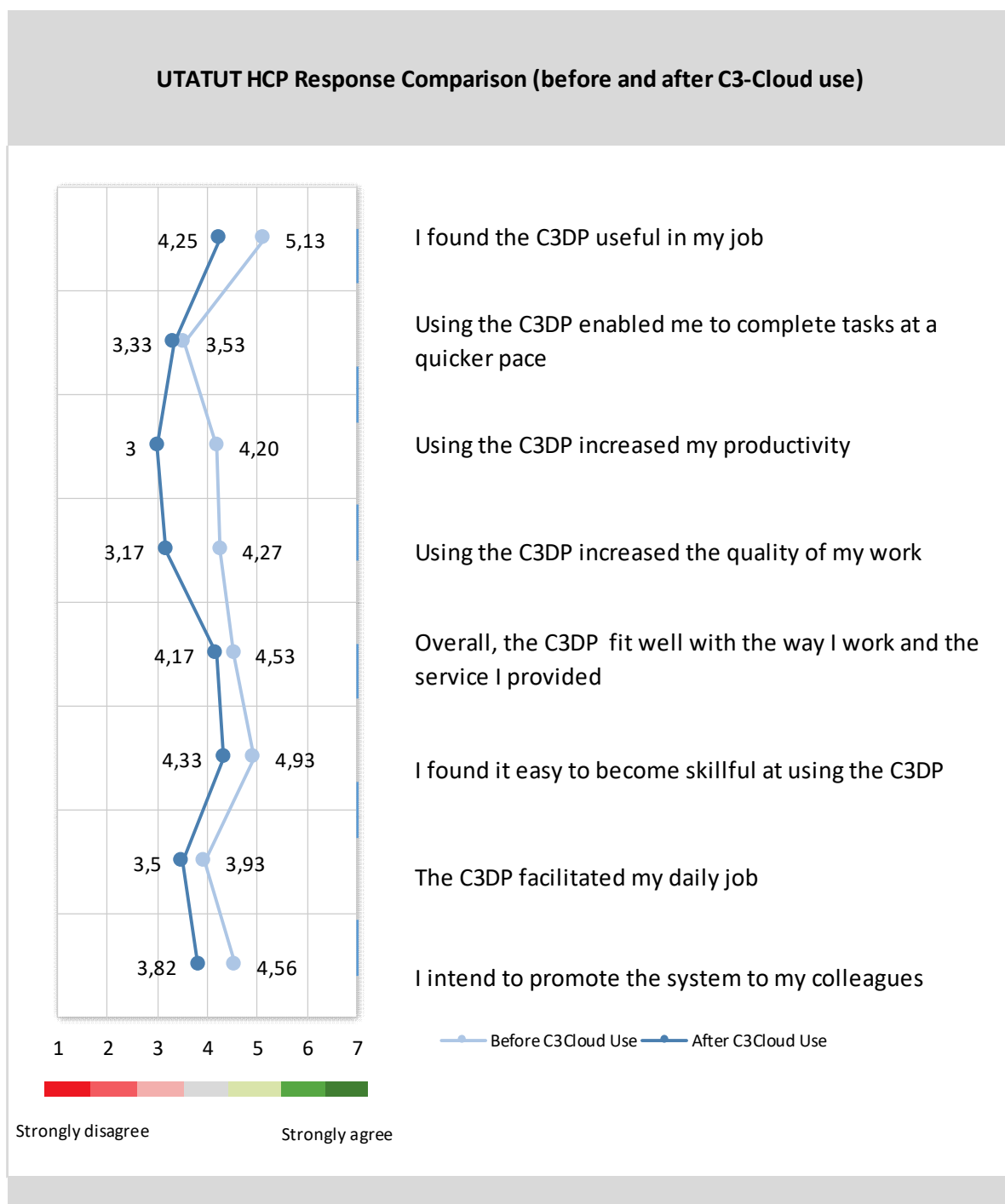


Figure 26 UTAUT HCP Response Comparison

6.2.4. HCP Questionnaire for User Interaction Satisfaction 7 (QUIS7)

The QUIS7 assessed the usability, usefulness, and ease of use of C3-Cloud for HCPs through statements about their satisfaction when interacting with the system. For ease of presentation, the statements are divided into six groups. For each group, a summary figure displaying the mean rating per statement is presented (see **Figure 28**). Furthermore, figures such as **Figure 27** show for each statement the mean, the standard deviation and the distribution of ratings on a bar and pie chart. As noted previously, non-response rates for each item are included only in the pie charts. Averages and standard deviations thus exclude non-responses. Bar and pie charts are color coded

on a 9-point scale from dark red, light red/pink and light green to dark green. In addition, respondents were asked to write a comment if they rated a statement 5 or below. **Table 14** depicts these comments in their English translation (for comments in the original language refer to Appendix 10.6). As in the first survey for HCPs, Technology trial participants had the opportunity to provide further general comments, but no general comment was submitted.

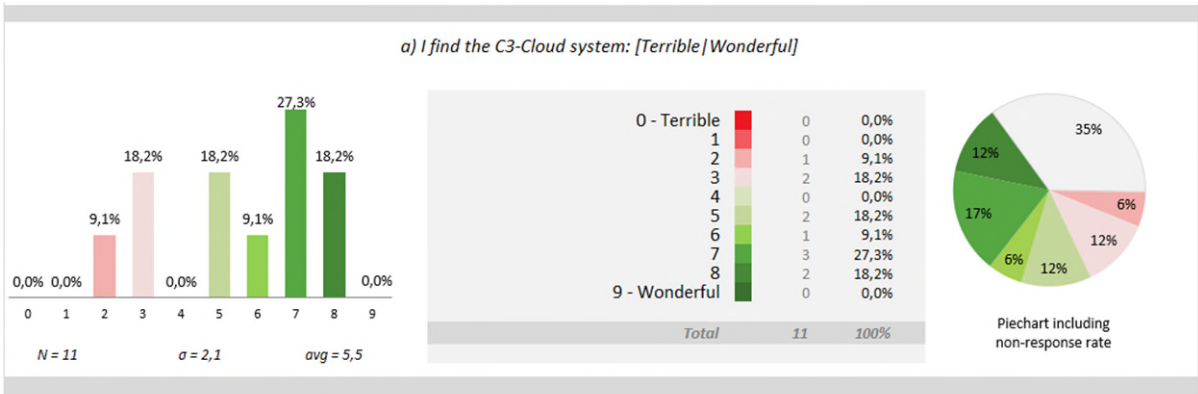


Figure 27 Sample bar and pie chart presentation of the results

Eleven Technology trial participants rated the first group of statements (a-k) on a scale from 0-9. The summary figure below shows the mean ratings for statements (a-k). All statements received overall positive ratings, making the graph quite even except for the spikes for (d-f). Statements (a-d) and (f), assessing respondents' perception of the C3-Cloud system, were on average rated between 5.18-5.91, suggesting that users were rather satisfied. However, the ease of use and flexibility of the system were rated the lowest, thus leaving much room for improvement (statements d and f). Statement (e) received the highest rating of 7.0, showing that respondents found that the system had enough power. Statements (g-k) related to the system's terminology, which was overall regarded quite consistent and appropriate.

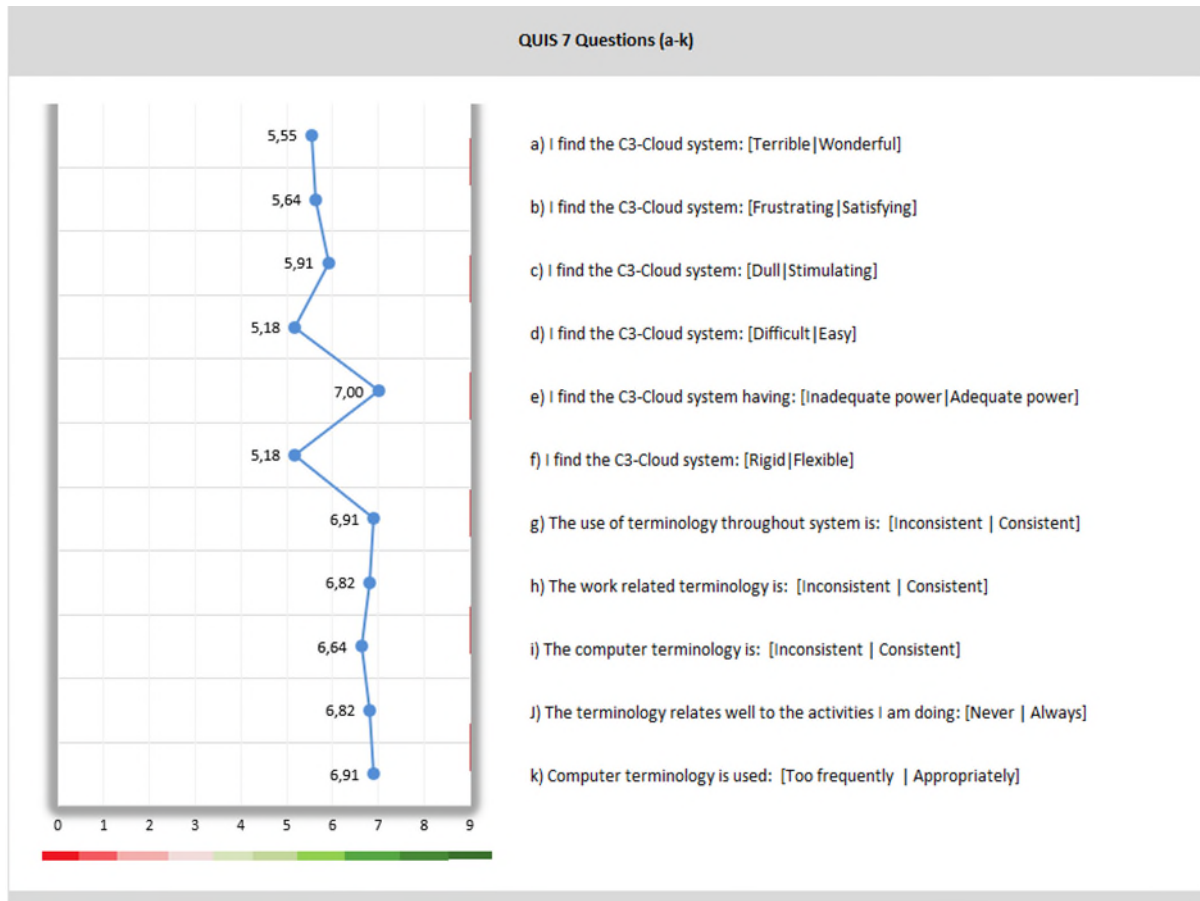


Figure 28 2nd survey for HCP, QUIS7 (a-k)

Figure 29 illustrates the mean ratings of 11 respondents to statements (l-v). Compared to the first graph, this one is less even. Statements (l), (o), (p), and (t-v) received average ratings between 6.0-6.64, indicating that respondents found the terminology on the screen quite precise, appearing messages and instructions rather clear, results of operations moderately predictable, controlling feedback rather easy and the length of delays between operations quite acceptable. However, these aspects could still be refined for ease of use. Statements (n), (q) and (r) were on average rated between 5.55-5.91, suggesting that the position of instructions on the screen could be more consistent, instructions for correcting errors clearer and users could be better kept informed about what the system was doing. While statement (m) about consistent appearance of messages on the screen received the highest rating, statement (s) about whether animated cursors kept users informed received the lowest. Therefore, this system component should receive attention.

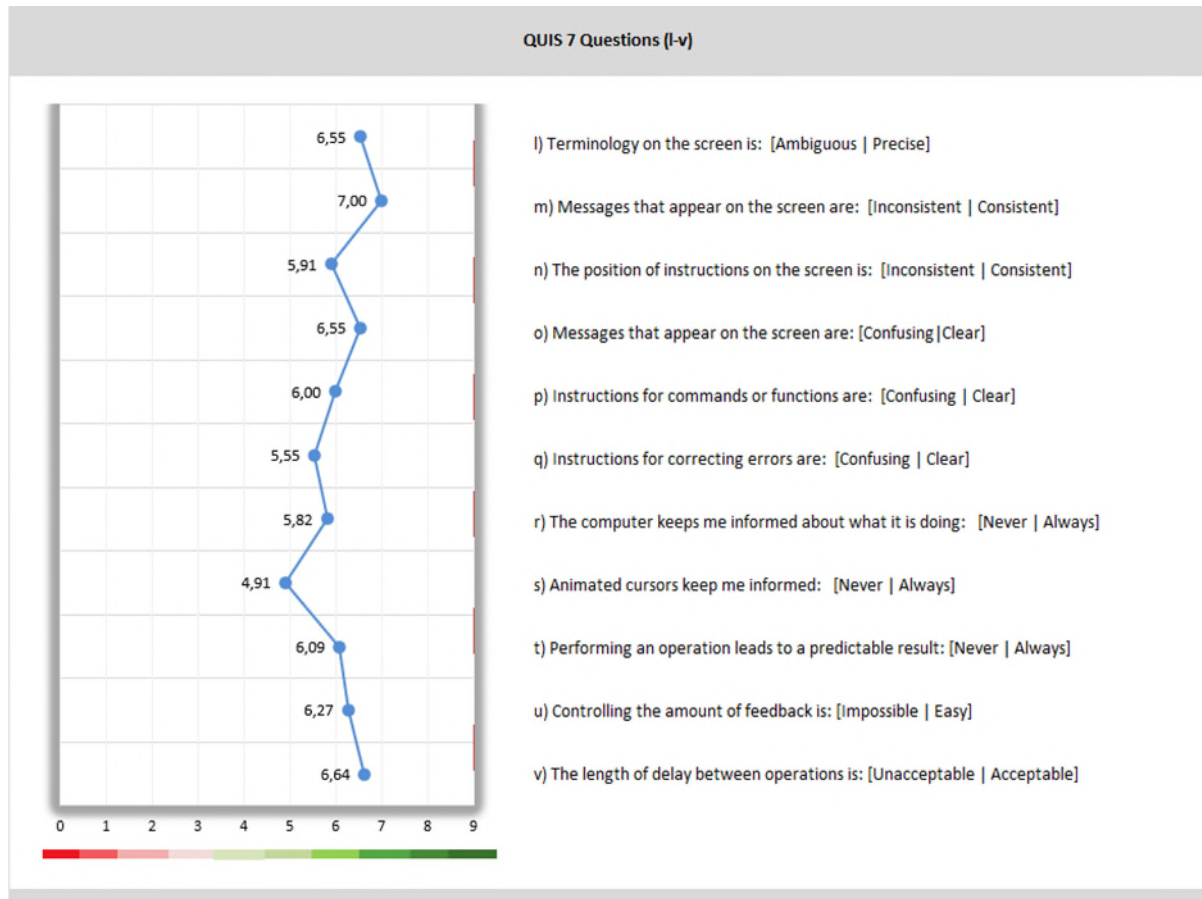


Figure 29 2nd survey for HCP, QUIS7 (I-v)

Figure 30 illustrates the mean ratings to statements (w-ag). Eleven HCPs submitted responses to these statements, except for statement z which was rated by 10 users. The first three statements related to error messages in the system. While users found these overall quite helpful (statement w), they indicated that they should clarify the encountered problems better (statement x) and be phrased more pleasantly (statement y). Moderate average ratings of 5.4 and 5.27 to statements (z) and (aa), respectively, suggest that some users faced difficulties in learning advanced features and did not learn to use the system quickly, which highlights the need for more guidance. Since the time required to learn to use the system was perceived more slowly compared to the first survey (5.27 vs. 5.86), this aspect is particularly important. This is also reflected in the 5.91 rating for statement (ac), implying that users did not find remembering rules about entering commands easy, which in turn can slow down the use. Moreover, moderately positive ratings for statements (ab), (ad), (af) and (ag) propose that the exploration of features, the performance and completion of tasks, as well as the feedback on the completion of sequential steps could be enhanced, although the latter point received a slightly higher rating in the second compared to the first survey (5.82 vs. 5.57). Statement (ae) received the lowest rating, which is considerably lower than in the first survey, emphasising that the number of steps taken per task need to be reduced.

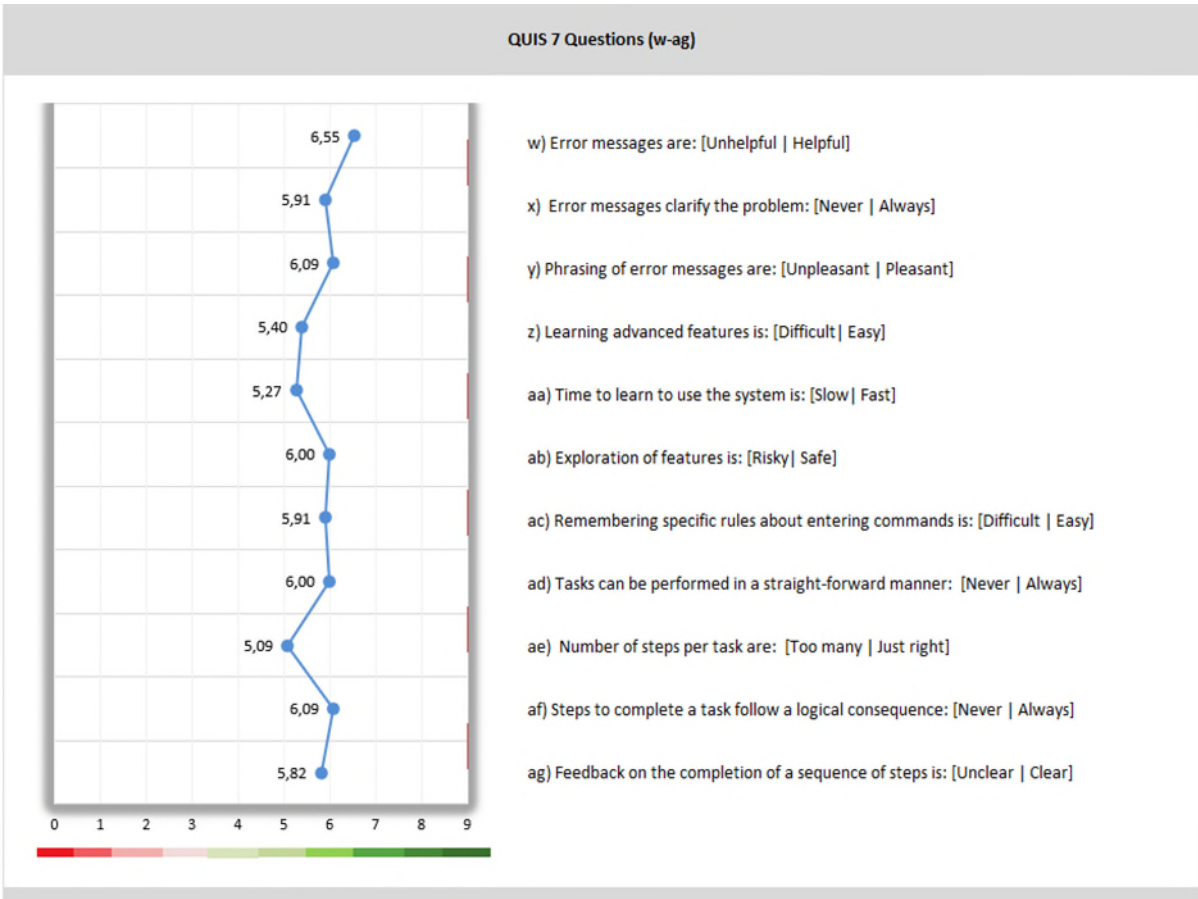


Figure 30 2nd survey for HCP, QUIS7 (w-ag)

Figure 31 provides a summary for the mean ratings to statements (ah-ar). Ten MDT members submitted their rating to statement (ak) and 9 members to statement (ap), while the remaining statements were rated by 11 respondents. Statements (ak) and (aq) received the highest ratings, showing that respondents perceived operations to be dependable and that the ease of doing these operations related to users' experience. Hence, unfamiliar users could experience difficulties and require more training. The lowest average ratings of 5.73 each were given for statements (an) and (ao), whereby users indicated that correcting mistakes and typos could be easier. The remaining statements received average ratings between 6.09-6.91, proposing that respondents were rather positive about the response time and the system's reliability, while system speed, the frequency of warning messages and system failures, as well as the ease of undoing operations and accomplishing tasks with few commands might need enhancement.

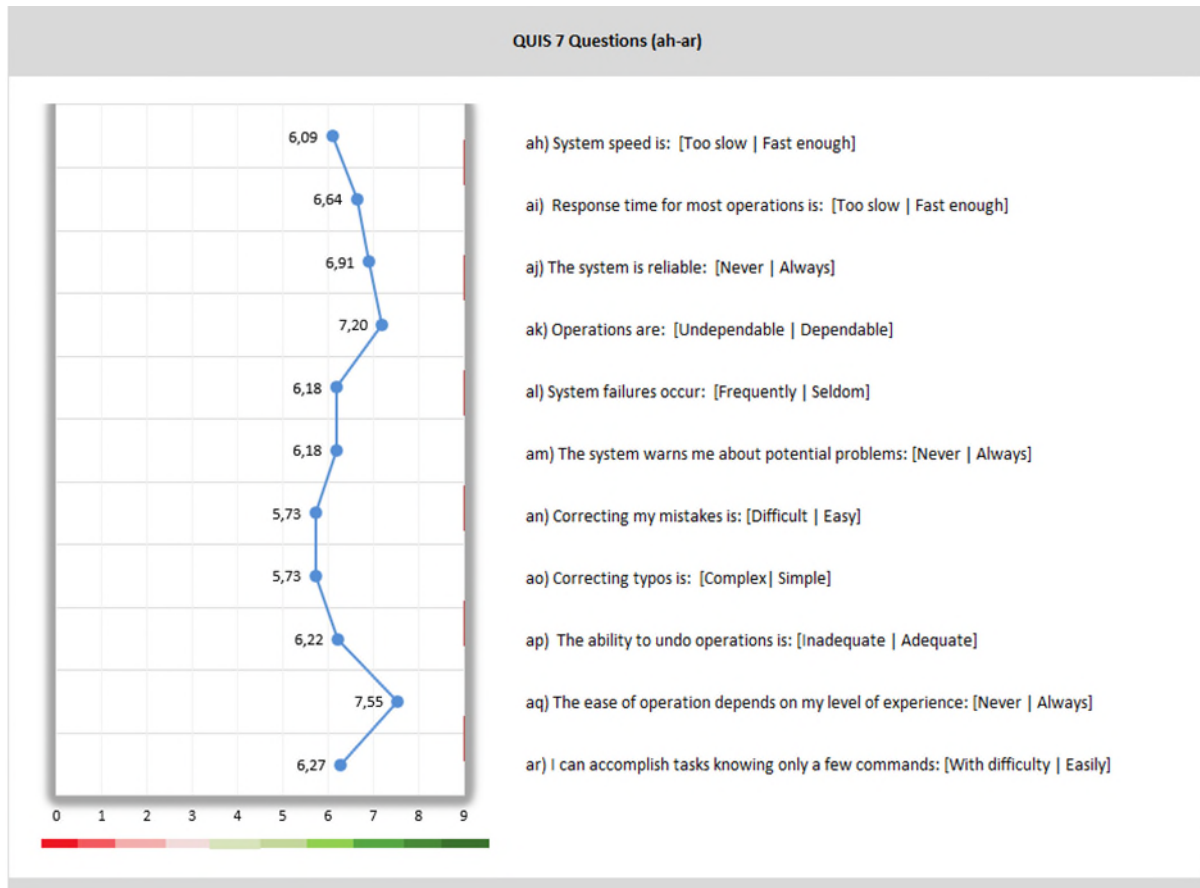


Figure 31 2nd survey for HCP, QUIS 7 (ah-ar)

The mean ratings to statements (as-bc) are more consistent compared to the previous graph, resulting in a straighter line (see **Figure 32**). Statement (au) was rated by 9 respondents, statements (av), (ay), (az) and (ba) by 10 respondents, statements (bb) and (bc) by 8 respondents, and the remaining statements by 11 respondents. The first three statements related to the terminology and information in manuals. Users found the terminology relatively clear, the information provided often easy to understand, and finding a solution to a problem using the manual not very difficult, although the manual could probably be improved. Statements (av-ax) focused on the amount and placement of, as well as the access to help messages, which received moderately positive ratings between 6.10-6.36. Statements (ay-bc) focused on the quality and brightness of pictures and movies. Respondents indicated to be more satisfied with the quality and brightness of movies than with the quality, clarity and brightness of pictures or photos, proposing that especially the latter should be better.

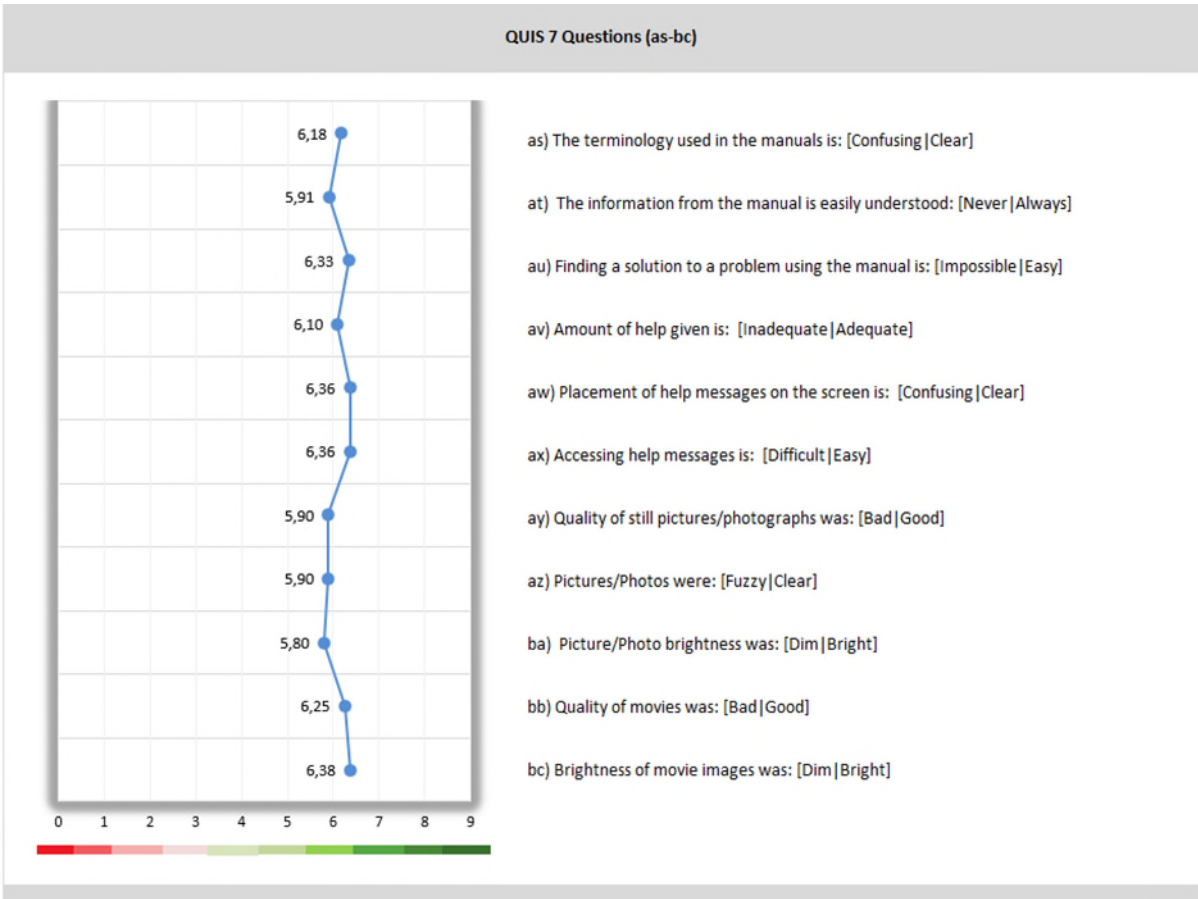


Figure 32 2nd survey for HCP, QUIS7 (as-bc)

Figure 33 depicts the mean ratings to statements (bd-bk). Ratings to statement (bd) were submitted by 7 respondents, those to statements (be-bh) by 8 respondents, statement (bi) by 10 respondents, (bj) and (bk) by 9 respondents. The summary graph is less even with ratings ranging from 5.33 to 6.5. Technology trial participants were quite satisfied with the colours used in the system, and comparatively positive towards the size of the movie window, as well as the speed of setting up the software. They were slightly less positive about how often they got informed of the installation progress (statement bj). Furthermore, the moderate ratings of 5.38 for statements (be) and (bf) propose that the sound output should be enhanced, and the installation progress could give more meaningful explanations in case of failures (statement bk).

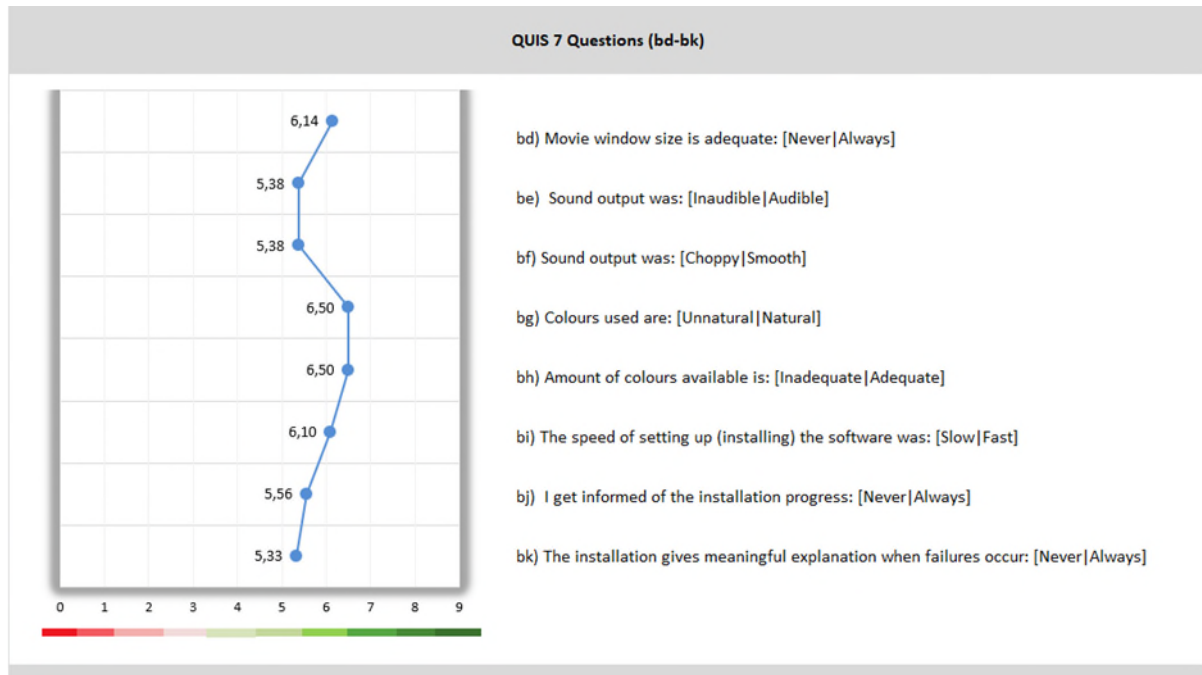


Figure 33 2nd survey for HCP, QUIS7 (bd-bk)

As mentioned previously, in cases the users rated the statement 0-5, Technology trial participants were asked to provide additional comments. The table below depicts the English translation of these comments (for the comments in original language refer to Appendix 10.6).

Comments related to statements (English translation)	
1)	I find the C3-Cloud system: [Terrible Wonderful] <ul style="list-style-type: none"> Improved access and more training to use it. I think that the use of the platform should be explained to the patient more simply and with more time. It is very cumbersome. It needs direct integration into the programs we use.
2)	I find the C3-Cloud system: [Frustrating Satisfying] <ul style="list-style-type: none"> I feel it works slow.
3)	I find the C3-Cloud system: [Dull Stimulating] <ul style="list-style-type: none"> A tool that, if improved, could be used in a useful or practical way.
4)	I find the C3-Cloud system: [Difficult Easy] <ul style="list-style-type: none"> Explaining better to patients. There have been technical problems that have not been solved.
5)	I find the C3-Cloud system: [Rigid Flexible] <ul style="list-style-type: none"> In the time in which I have participated it has been difficult for me to access the surveys, I could not see the content of them to be able to choose them, the items in many options were difficult to understand.
6)	The use of terminology throughout the system is: [Inconsistent Consistent] <ul style="list-style-type: none"> Can it be a problem of translation and linguistic coherence of the different participating countries?

7)	<p>The position of instructions on the screen is: [Inconsistent Consistent]</p> <ul style="list-style-type: none"> I think I have made several mistakes using the program because I was not always able to put the tasks in their proper place...I have lacked time to evaluate it better for sure.
8)	<p>Instructions for commands or functions are: [Confusing Clear]</p> <ul style="list-style-type: none"> Complicated.
9)	<p>Instructions for correcting errors are: [Confusing Clear]</p> <ul style="list-style-type: none"> I have had no mistakes, so I did not need any instructions.
10)	<p>Animated cursors keep me informed: [Never Always]</p> <ul style="list-style-type: none"> I do not know what you mean by animated cursors. I am not aware of having seen any. As of today, we must actively follow up with the professional to see if we have any notification. I do not know what you mean by “animated cursors”.
11)	<p>The length of delay between operations is: [Unacceptable Acceptable]</p> <ul style="list-style-type: none"> Technical problem on the platform.
12)	<p>Error messages clarify the problem: [Never Always]</p> <ul style="list-style-type: none"> I have had no mistakes, except for waiting for the system to process tasks. These times have been helpful in finding out what is going on. So, for the fact that I had no error messages at all, I give 9 out of 9 credits.
13)	<p>Time to learn to use the system is: [Slow Fast]</p> <ul style="list-style-type: none"> I think more time is needed.
14)	<p>Number of steps per task are: [Too many Just right]</p> <ul style="list-style-type: none"> Sometimes you must perform too many steps per task.
15)	<p>System speed is: [Too slow Fast enough]</p> <ul style="list-style-type: none"> I would be better off if I were a little faster. On several occasions it has been stuck and has required waiting several minutes to continue. In some cases, I have had to leave the system and go back in. However, I did not lose any data.
16)	<p>System failures occur: [Frequently Seldom]</p> <ul style="list-style-type: none"> Technical failures, which were not solved. We could not contact the patient; he was referred to the post office for technical problems and it was never solved.
17)	<p>Quality of still pictures/photographs was: [Bad Good]</p> <ul style="list-style-type: none"> There have been no pictures or photographs.
18)	<p>Pictures/photos were: [Fuzzy Clear]</p> <ul style="list-style-type: none"> There have been no pictures or photographs.
19)	<p>Picture/photo brightness was: [Dim Bright]</p> <ul style="list-style-type: none"> There have been no pictures or photographs.
20)	<p>Sound output was: [Inaudible Audible]</p> <ul style="list-style-type: none"> It did not have volume. The only video I could see was the one explaining how to use the platform, to explain to the patients, and it did not have volume.

21)	Sound output was: [Choppy Smooth] <ul style="list-style-type: none"> It did not have volume. The only video I could see was the one explaining how to use the platform, to explain to the patients, and it did not have volume.
22)	The installation gives meaningful explanation when failures occur: [Never Always] <ul style="list-style-type: none"> I have not had any failures in the installation.

Table 14 2nd survey for HCP, comments related to statements rated 0-5, English translation

6.2.5. MDT eCare User Impact Survey (eCUIIS)

The eCUIIS evaluated the utility that C3-Cloud brings to MDT members. Before asking three concluding questions, eCUIIS included 17 questions (a-q) about time use in relation to the platform, the patient, and MDTs, as well as the system's impact on HCPs work. Depending on the question, respondents could choose between 3-5 different answers, or indicate that the question was not relevant to them. Figures such as **Figure 34** present the corresponding responses in bar and pie charts. As noted previously, bar charts, averages and standard deviations do not include non-response rates. However, these are represented in pie charts. Bar and pie charts are color coded from dark green to dark red. Except for questions (b) and (d), to which 7 users responded, the questions, including the three final evaluations, were answered by 11 HCPs. In addition, Technology trial participants had the opportunity to provide further general comments about their satisfaction with C3DP (see **Table 15**).

The first question asked HCPs how often they needed to support patients involved in C3-Cloud filling in home-based self-measurements. Most HCPs (63.6%) reported to provide support less than once per week, and 27.3% indicated that they never had to help their patients with filling in home-based self-measurement data.

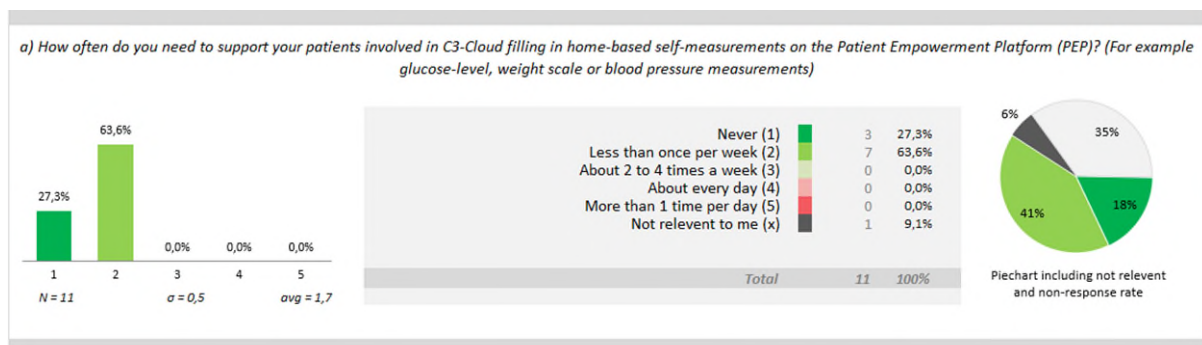


Figure 34 How often do you need to support your patients involved in C3-Cloud filling in home-based self-measurements

Secondly, HCPs were asked how much time they usually spent supporting their patients with home-based self-measurements readings per session. The 7 HCPs responding to this question had different experiences but spent rather little time on average. Less than half (42.9%) reported to spend less than 10 minutes per session supporting their patients with readings, while 28.6% needed between 10-30 minutes and 14.3% took more than half an hour per session.

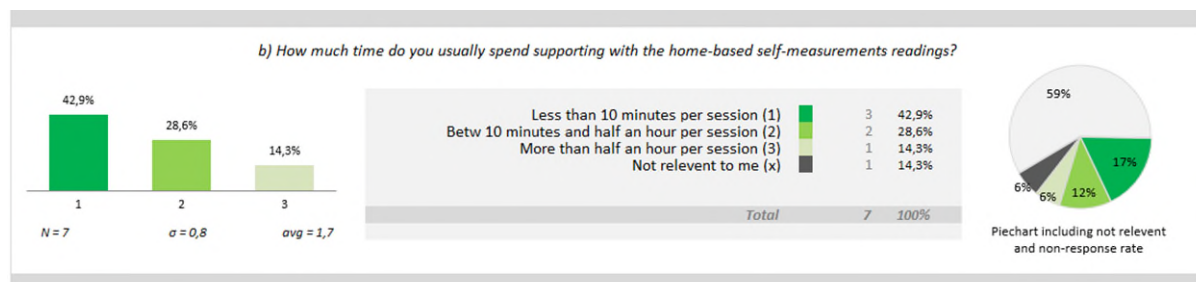


Figure 35 How much time do you usually spend supporting with the home-based self-measurements readings

The third question assessed how often HCPs usually helped their patients using the PEP. On average, respondents usually helped their patients less than once per week, an answer that was chosen by almost half of the users (45.5%). 18.2% indicated to never helped their patients using the PEP, while another 18.2% reported “About 1 to 4 times a week”.

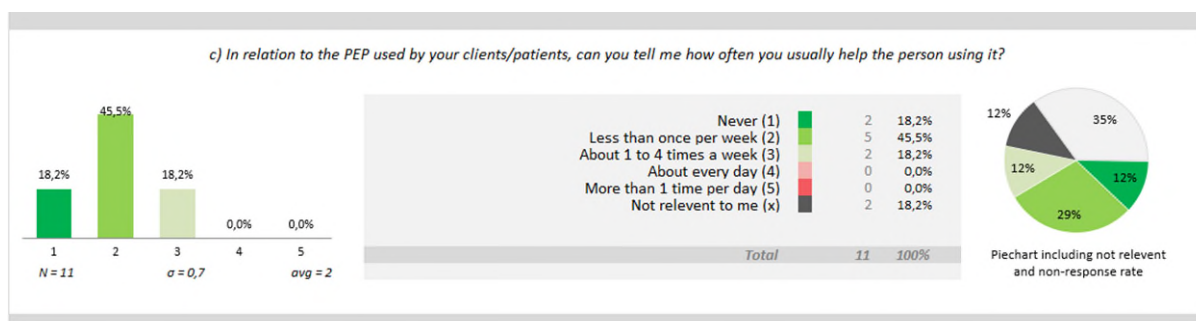


Figure 36 In relation to the PEP used by your clients, can you tell me how often you usually help the person using it

Further, 4 out of 7 respondents (57.1%) reported spending less than 10 minutes per session helping with the PEP, and two (28.6%) indicated to spend between 10-30 minutes. Although 14.3% spent more than half an hour per session, this suggests, taken together with the previous questions, that patients mostly used the PEP without HCPs support. Thus, helping patients with the PEP did not consume much of HCPs working time.

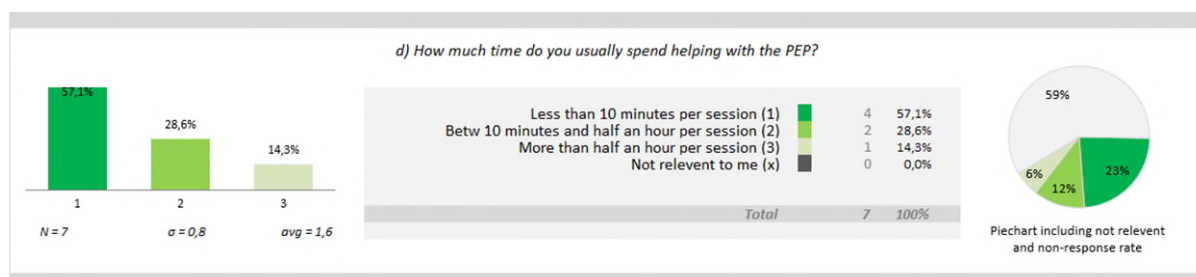


Figure 37 How much time do you usually spend helping with the PEP

Additionally, when asked how much time one patient consultation took, including preparation and follow-up, most HCPs (45.4%) required between 15-30 minutes. 36.4% reported that it took less than 15 minutes. Accordingly, no user spent more than half an hour per patient consultation.

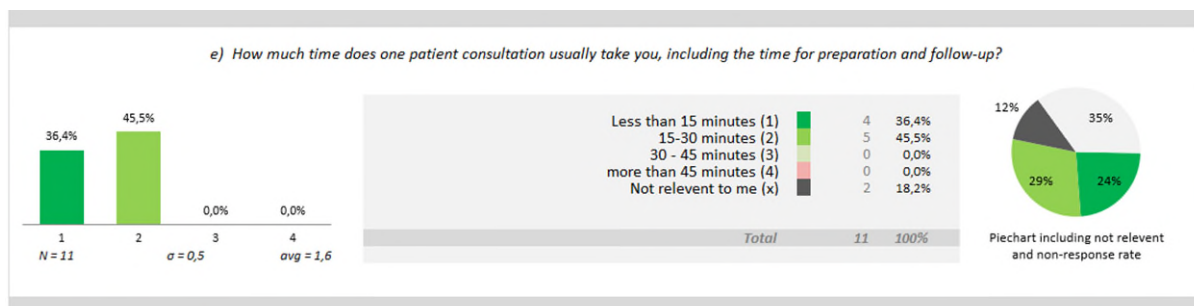


Figure 38 How much time does one patient consultation take you

The following four questions (f-i) relate to MDT care planning meetings for C3-Cloud patients. More than half of the HCPs (54.5%) indicated to attend those meetings in relation to one patient every 1-3 months and 27.3% did so more than once a month.

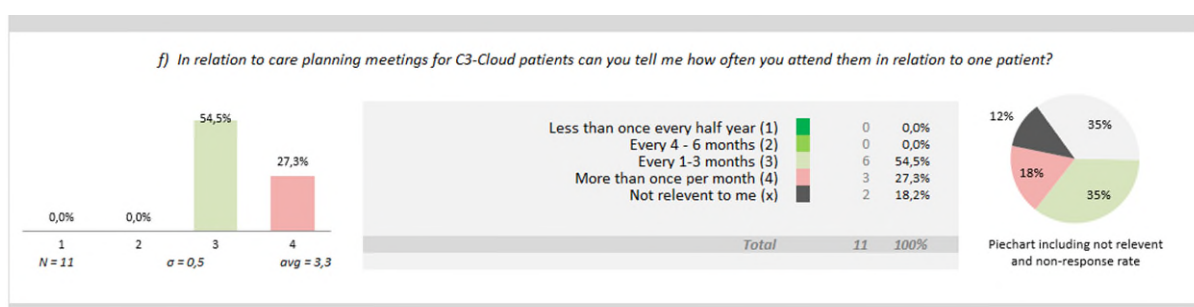


Figure 39 In relation to care planning meetings for C3-Cloud patients, how often do you attend them

More than one third of respondents (36.4%) usually needed less than 30 minutes to go to one meeting with their care team, including travel time. 18.2% of HCPs took between 30-60 minutes, while 9.1% needed between 1-2 hours. The remaining respondents regarded this question not relevant.

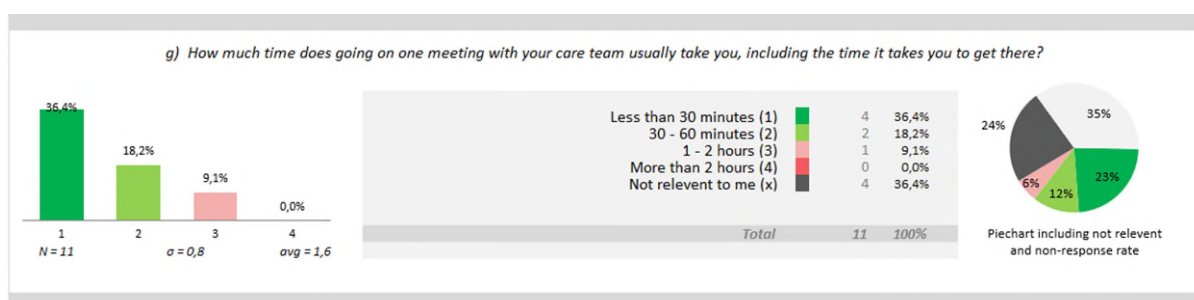


Figure 40 How much time does go on one meeting with your care team usually take you

Regarding virtual care planning meetings for C3-Cloud patients, most HCPs (54.5%) indicated that it was not relevant to them and thus presumably did not make use of them. However, 27.3% attended virtual care planning meetings in relation to one C3-Cloud patient every 1-3 months, and 9.1% did so less than every 6 months. In contrast, 9.1% attended virtual care planning meetings more than once per month.

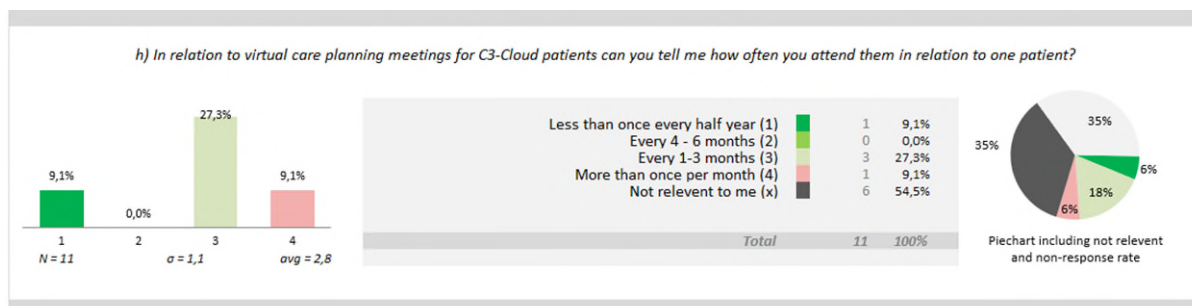


Figure 41 In relation to virtual care planning meetings for C3-Cloud patients, can you tell me how often you attend them

When asked how much time going on one meeting usually took them, those HCPs regarding the question applicable mostly required less than 30 minutes (27.3%), followed by 18.2% who needed 30-60 minutes, and 9.1% who spent 1-2 hours.

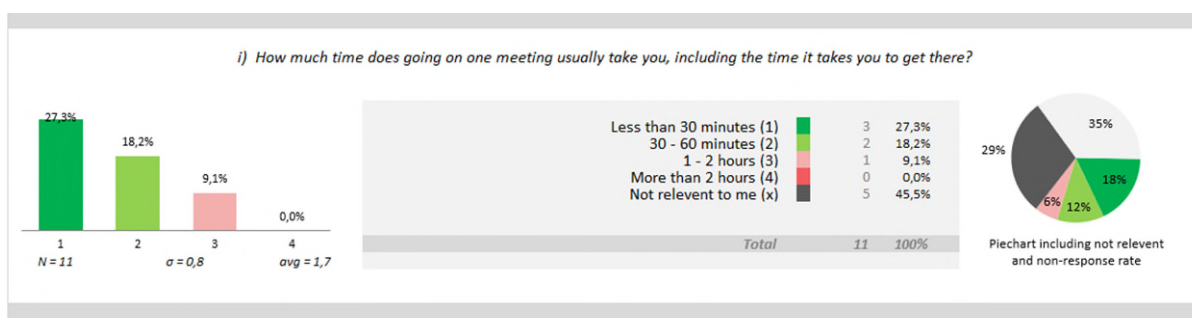


Figure 42 How much time does going on one meeting usually take you

Concerning how often they usually accessed C3DP in relation to one C3-Cloud patient, most HCPs (63.6%) said “Less than once per week”, while 18.2% agreed with “About 1-4 times a week”.

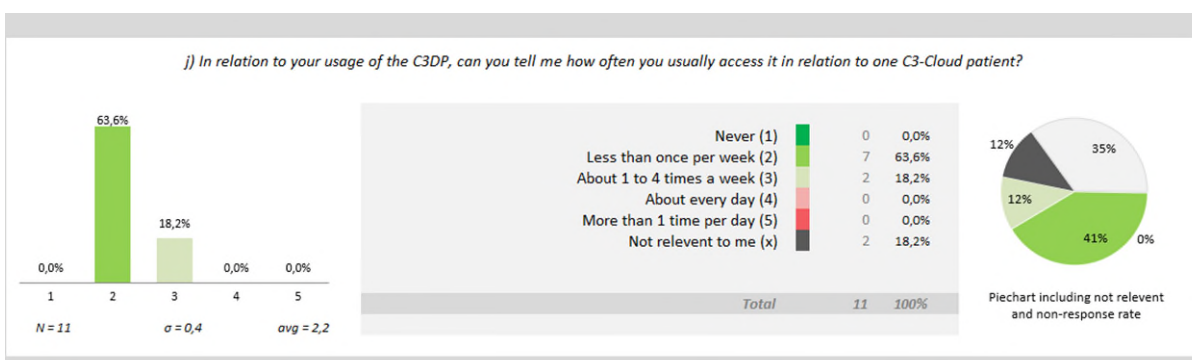


Figure 43 In relation to your usage of the C3DP, can you tell me how often you usually access it

When accessing the C3DP, more than one third of HCPs (36.4%) spent less than 10 minutes using C3DP per patient, 27.3% spent 10-20 minutes and 18.2% between 20-30 minutes. One participant (9.1%) reported needing more than half an hour. This underlines that C3DP usage did not consume very much working time per patient, although some might still consider it time-consuming, which could possibly be reduced with improved usability.

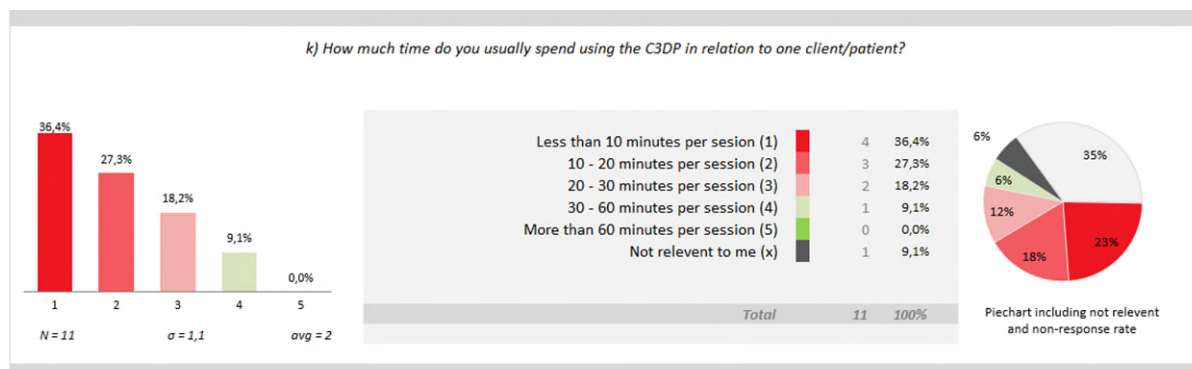


Figure 44 How much time do you usually spend using the C3DP in relation to one patient

Questions (l-q) related to the impact of C3DP on HCPs work, their mental well-being and relationship with patients. Concerning the system's impact on their ability to manage workloads, more than half of HCPs (54.5%) believed it did not affect their ability. However, 18.2% of respondents found that it had a slightly positive impact, while 9.1% believed that it slightly decreased their ability. Nevertheless, this proposes that C3DP mostly had no negative impact on HCPs workload, although it should be investigated how its positive effect could be enhanced.

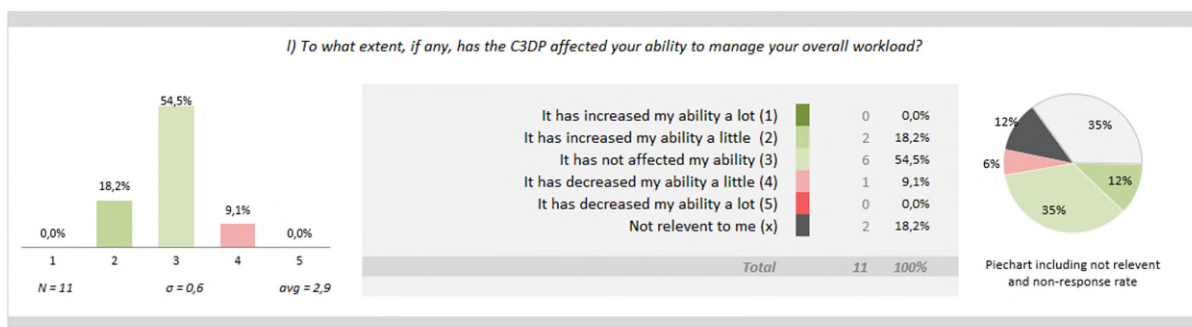


Figure 45 To what extent has C3DP affected your ability to manage your overall workload

Furthermore, almost half of the respondents (45.5%) believed that C3DP did not affect their ability to provide care to individual patients. While one MDT member (9.1%) perceived that it decreased the ability, 27.3%, however, believed it positively impacted their ability to provide care, resulting in a neutral to slightly positive perception on average.

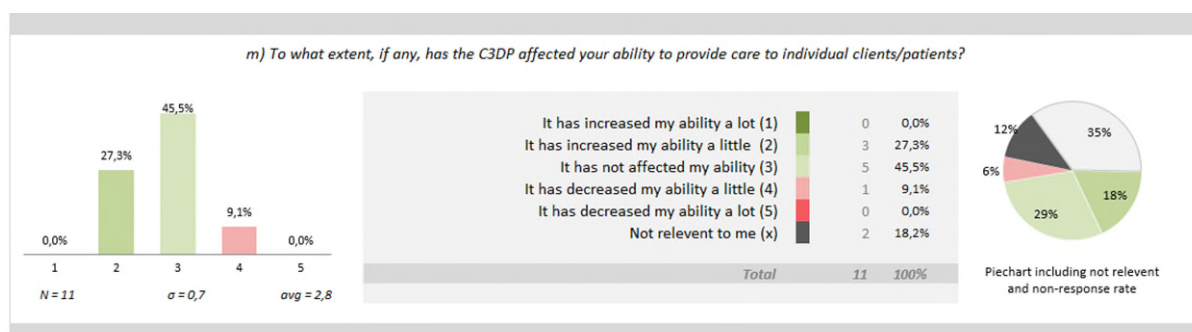


Figure 46 To what extent has C3DP affected your ability to provide care to individual patients

Concerning MDT members' efficiency at work, 36.4% of respondents proposed that C3DP did not change their efficiency. 27.3% were positive that it slightly increased their efficiency, but

18.2% in total believed that it had a negative impact, which might be related to deficient functionalities.

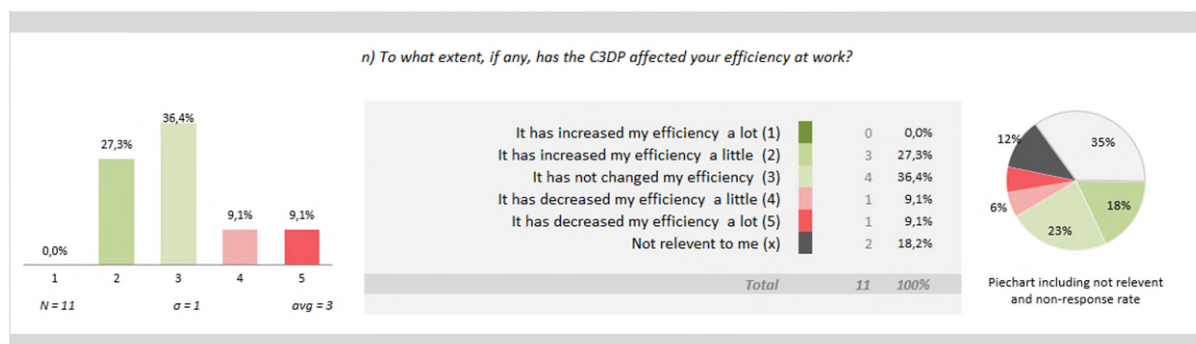


Figure 47 To what extent has C3DP affected your efficiency at work

When asked about C3DP's impact on their relationship with patients, most HCPs (54.5%) found that the system slightly improved the relationship, which could be associated with good communication and information-sharing. Although 27.3% believed that the system had no impact and 9.1% stated that it slightly worsened the relationship with patients, this overall indicates a positive effect.

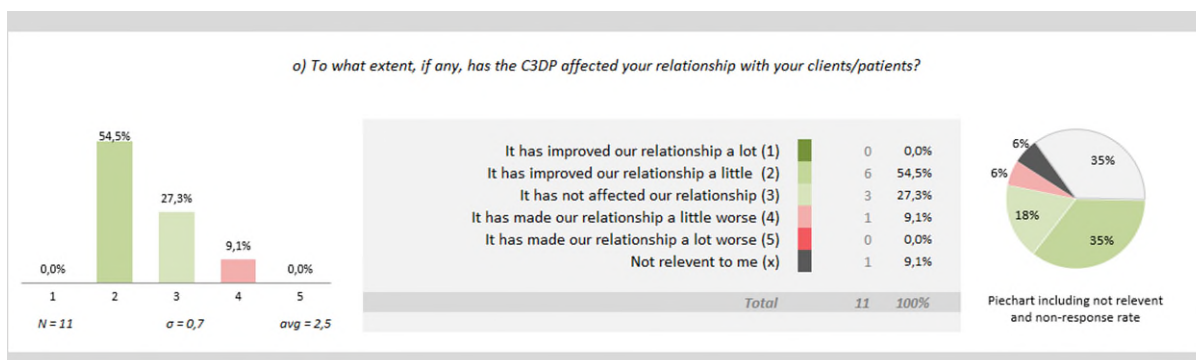


Figure 48 To what extent has C3DP affected your relationship with your patients

Additionally, most respondents (72.2%) found that C3DP had no effect on their level of work-related stress. However, one respondent (9.1%) experienced that it somewhat increased work-related stress, which follows the results of question (1) about the system's impact on respondents' ability to manage workloads.

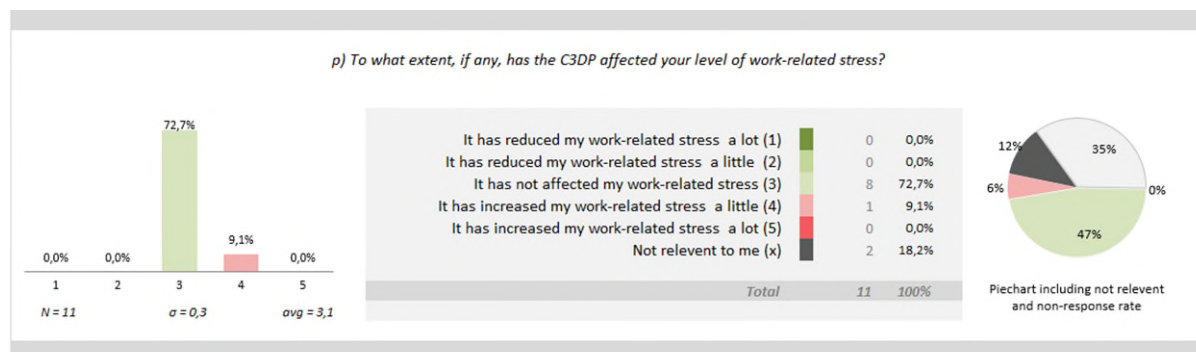


Figure 49 To what extent has C3DP affected your level of work-related stress

The above responses are reflected in the users' opinion on C3DP's impact on their work satisfaction. Almost half of the respondents (45.5%) agreed that the system did not change their satisfaction, followed by 27.3% who believed that it slightly increased their satisfaction. Despite one negative response (9.1%), this overall suggests that C3DP has the potential to have a positive effect on HCPs work.

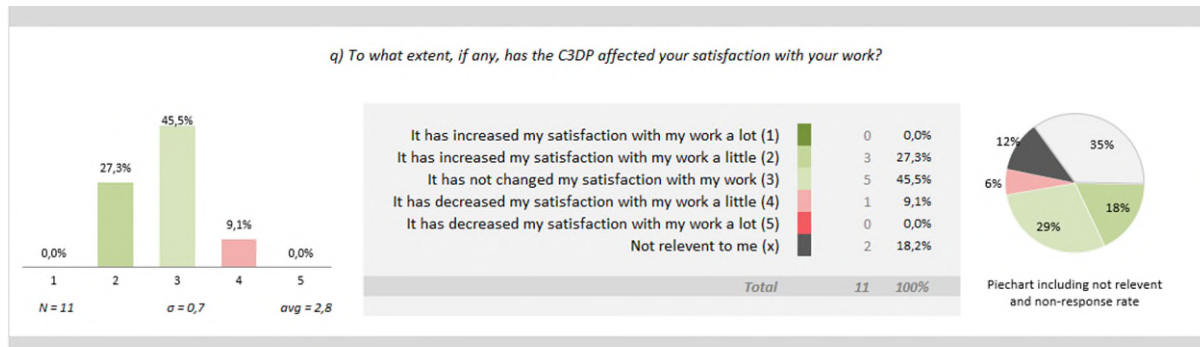


Figure 50 To what extent has C3DP affected your satisfaction with your work

The eCUIIS concluded with three questions evaluating HCPs overall satisfaction with the system, their future intentions to work with it, and whether they considered using C3DP was worth the effort involved. Taking everything into account, more than one third of respondents was “Fairly satisfied” with C3DP, almost half was neutral (45.5%), and 18.2% was “Fairly dissatisfied”, leading to a neutral to slightly positive tendency on average.

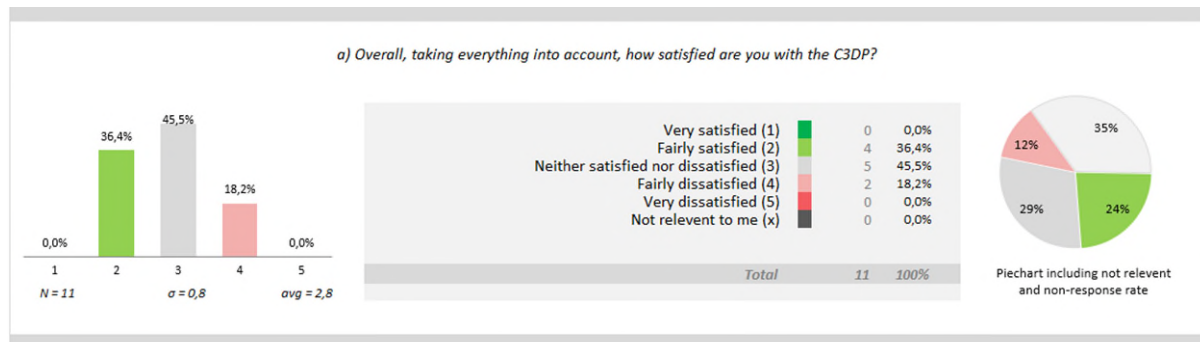


Figure 51 Overall, how satisfied are you with the C3DP

Although no HCP was “Very satisfied” with the C3DP and most were neutral, respondents were less reserved and more positive towards whether using C3DP was worth the effort. Thus, 36.4% agreed that the platform was mostly worth the effort, and 18.2% believed it was very much worth the effort. 27.3% had a neutral opinion and 18.2% stated that it was mostly not worth the effort. This nevertheless proposes that most Technology trial participants saw the utility of using the platform despite experienced difficulties.

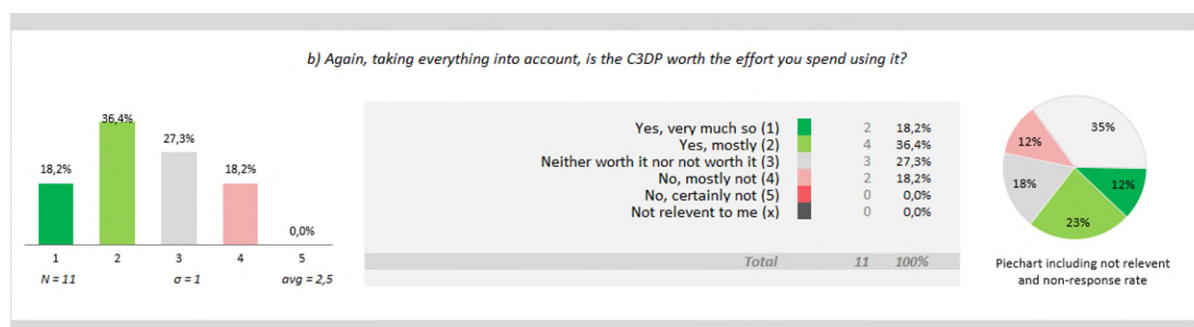


Figure 52 Is the C3DP worth the effort you spend using it

Following the previous results, more than one third of HCPs (36.4%) indicated that they would probably want to continue working with C3DP in the future if the decision was solely up to them. While 9.1% stated that they would want to continue using the platform, another 9.1% would “Certainly not”. The remaining participants were indecisive (27.3%) or would “Probably not” continue using C3DP (18.2%). This resulted in an overall slightly positive intention towards future application, implying MDT members’ general interest.

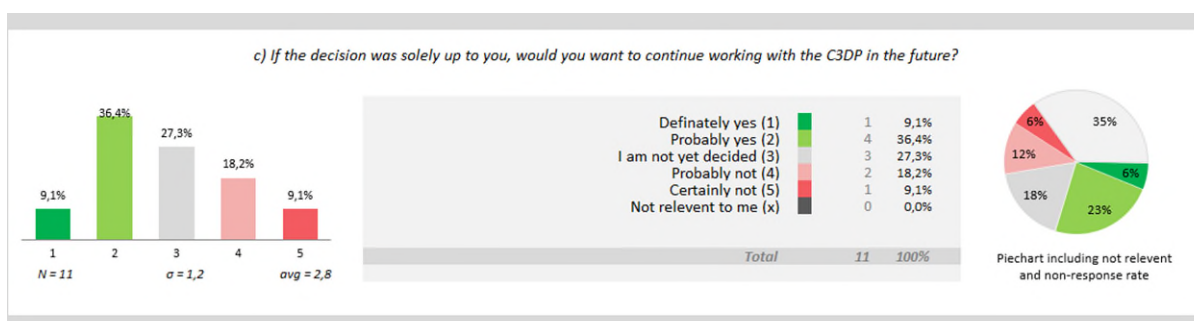


Figure 53 If the decision was solely up to you, would you want to continue working with the C3DP in the future

Additionally, four Spanish MDT members provided further comments on their overall satisfaction and experience with C3-Cloud. The following table displays these comments in English (for comments in the original language see Appendix 10.6).

eCUIIS, MDT further comments (English translation)	
1)	It has given me a complicated and slow learning tool, which needs time to be exploited. A time that we do not have today in our day to day. If we had the necessary time, I could consider it.
2)	My patients who were in the study have not been very active or helpful, so we have not been able to "get the juice" (i.e. fully grasp the potential) out of the platform. However, I did find it interesting and the data "uploaded" by them have supported decisions in consultation but have not been decisive. Speaking with colleagues of the health center, yes, they have been more prolific.
3)	I think in a rural area where there is dispersion it can be a good option. With one patient, I cannot really have an opinion on the project. I see that it can be useful to be more easily in touch, but nowadays, it carries more workload. I find it useful to send a message when some new information is added to the story, without having to go in to see if there is something new introduced by the patient. Also, there have been no internists to whom I can ask questions.
4)	I would like to work with the C3-Cloud working properly, without problems on the platform, and if they were to be solved in time, not like in my case, which have not been able to solve.

Table 15 2nd survey for HCP, eCUIIS further comments, English translation

6.3. Patient Medical Device Usage

Medical sensor device usage and connected device usage was tested with 15 patients at the RJH pilot site. Patients were individually selected from the group of patients at the discretion of local clinicians and based on their diagnosis. The testing served to evaluate the technical feasibility of including sensor and connected devices as an integral part of the patient care and planning.

11 weight scales, 16 blood pressure devices and 16 Motorola G7 Play Smartphones were purchased through Warwick, tagged and shipped to RJH. RJH purchased UK to EU converters for the USB charger plugs. The RJH IT team installed a data SIM card, the Medixine hub android application and established the Bluetooth pairing between the sensor devices and the Smartphones. Consequently, the hubs were registered in the Medixine Suite and the sensor kits were assigned to specific patients once identified. Patients were advised through their caregiver on how to use the sensor devices and performed home-based weight and blood pressure measurements during the technology trial.

The device kit, with a direct link to the C3-Cloud PEP platform, was used in RJH only. However, the functionality to add self-measurements manually was available in all pilot sites. The latter came handy in terms of interoperability and data fusion which has shown to be especially pronounced when it comes to blood pressure measurement. In BC 372% of prescriptions translated into (automatically and manually entered) self-measurements and in SWFT 63% of prescriptions did. In addition, the tool has proven useful for weight measurements executed by patients in RJH. The measurement activities of patients also relate to the question of compliance with prescribed measurements. Since there is no data available for heart rate measurement, it is hard to interpret how well the tool would be accepted for this purpose. However, blood pressure and weight measurements were observed at all three pilots in different rates (see chapter 7.1), which speaks of an acceptable level of conformance.

6.3.1. Basic Questions

Two respondents (N=2) living in the Region Jämtland Härjedalen, Sweden, returned the survey relating to the patient device usage in the second round, of which one survey was complete. As in previous surveys, basic questions concerning respondents' sex and age range were asked. Both respondents were male, one was 60-64 years of age, while the other one was 70-74 years old (see **Figure 54** and **Figure 55**).

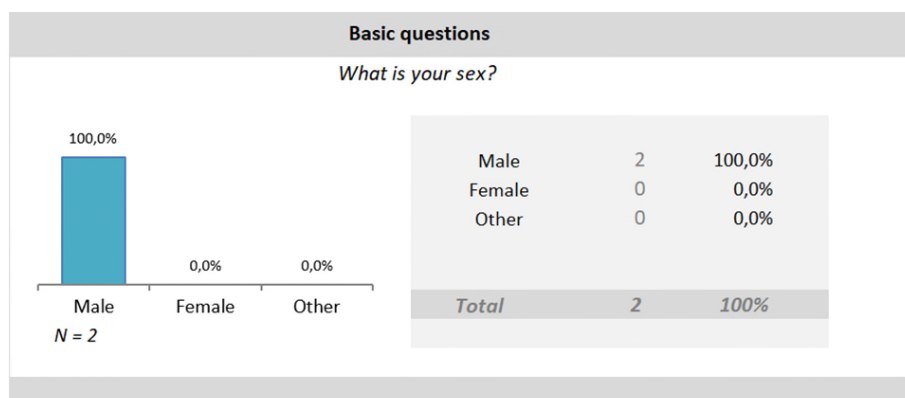


Figure 54 RJH patient device usage, basic question (sex)

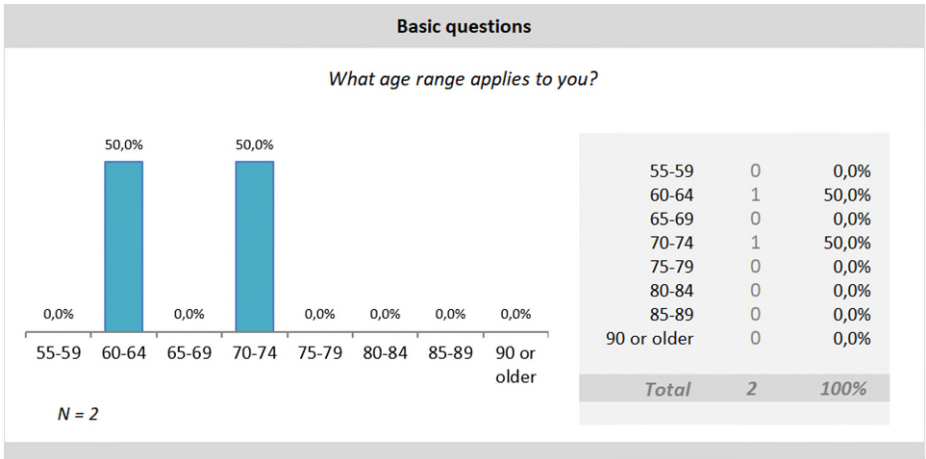


Figure 55 RJH patient device usage, basic question (age)

6.3.2. Patient Device Usage

The two participants answered two binary choice questions (Yes/No) regarding the use of devices connected to the C3-Cloud application for home-based self-measurements. Accordingly, both respondents used a blood pressure meter and a weight scale connected to the C3-Cloud over the past months (see **Figure 56** and **Figure 57**).

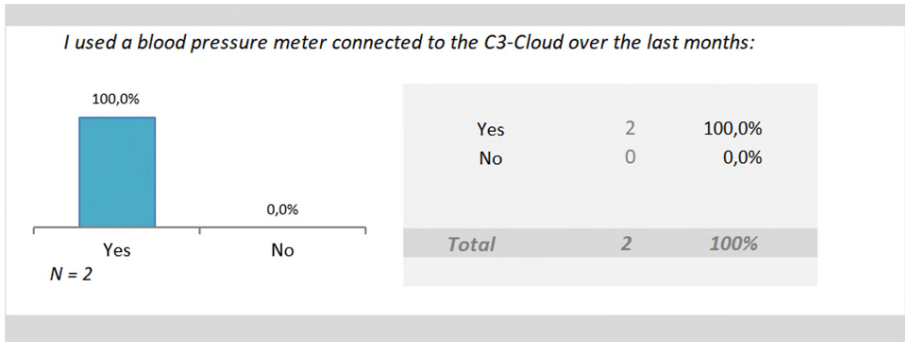


Figure 56 RJH patient device usage (blood pressure meter)

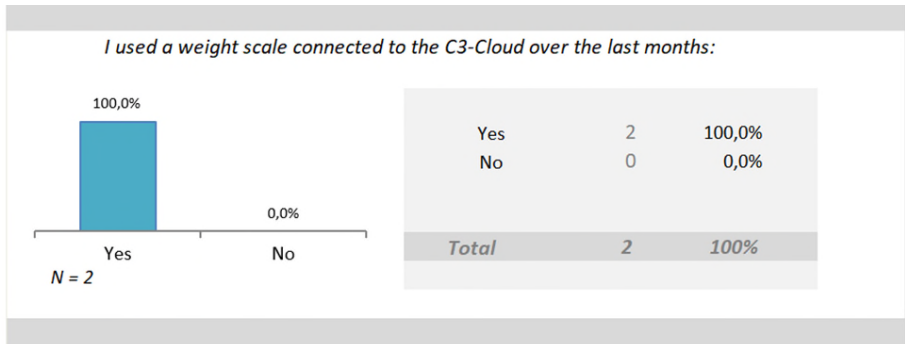


Figure 57 RJH patient device usage (weight scale)

These questions were followed by five statements (a-e) which were rated on a scale from dark red (“Strongly disagree”) to dark green (“Strongly agree”) and completed by one respondent (N=1).

Figure 58 gives a summary of the respondent's rating to each statement. Separate figures for each statement are provided in Appendix 10.9. Concerning statement (a), the patient disagreed to not having experienced any problems when connecting a medical device to the C3-Cloud, suggesting the need for more support and interoperability between medical devices and the system. A neutral response was provided to statement (b), asking whether the patient felt better cared for knowing that data from home-based self-measurements appeared directly in the system of the care team. Nevertheless, the respondent strongly agreed to statements (c-e), indicating patient empowerment and better self-management of health conditions through home-based self-measurements, making it worth the effort to perform these despite the experienced problems.

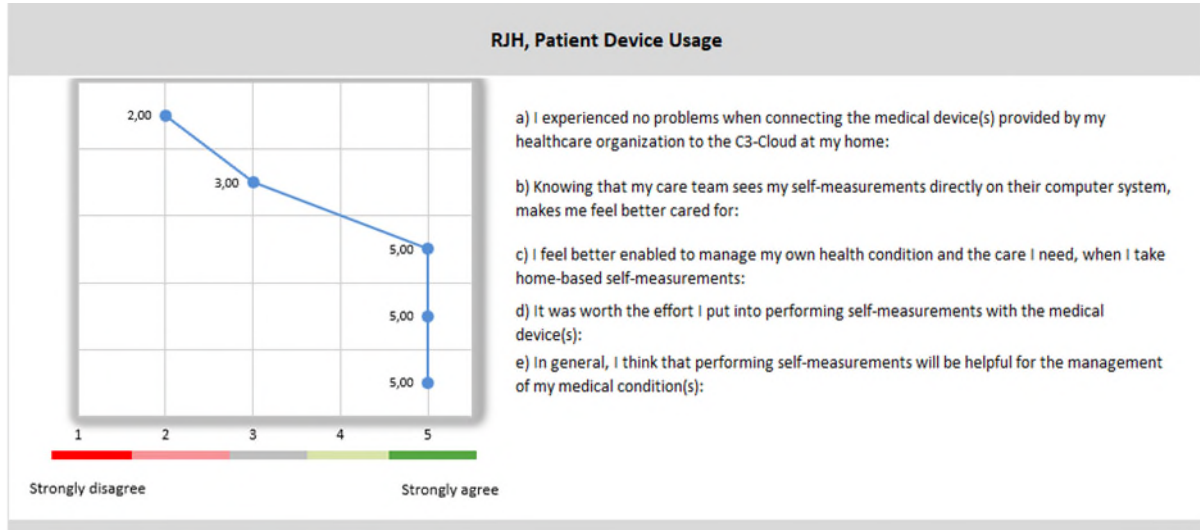


Figure 58 RJH patient device usage (a-e)

6.4. C3-Cloud: First Survey for Patients

6.4.1. Basic Questions

Forty respondents (N=40) in three pilot sites submitted their answers to the three basic questions asked at the beginning of the survey. According to the first basic question, most of the respondents were between 65 and 79 years of age (see **Figure 59**).

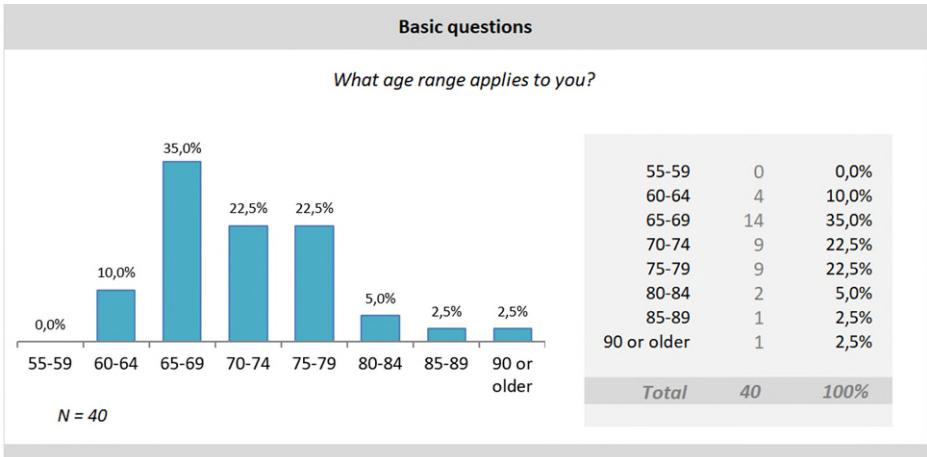


Figure 59 1st survey for patients, basic question (age)

The second and third basic questions asked the respondents about their sex and the area they lived in. The results showed that most of the respondents were male and belonged to the Region Jämtland Härjedalen pilot site (see **Figure 60** and **Figure 61**).

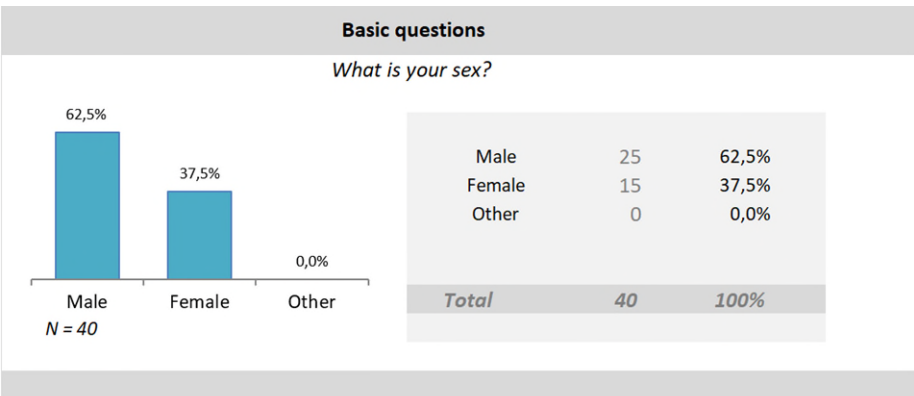


Figure 60 1st survey for patients, basic question (sex)

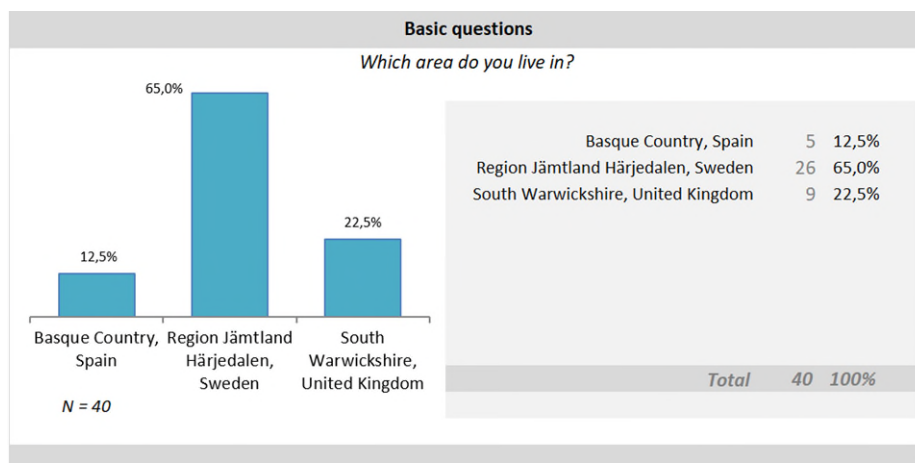


Figure 61 1st survey for patients, basic question (area)

6.4.2. Unified Theory of Acceptance and Use of Technology (UTAUT)

To evaluate the patients' acceptance and use of the C3-Cloud system, another general question within the frame of the UTAUT questionnaire was asked at the beginning of this survey. The question was if the respondents have any experience of self-managing their health via ICT, to which almost half of them gave a negative and the other half a positive answer. **Figure 62** depicts the exact percentage of responses to the ICT self-managing experience.

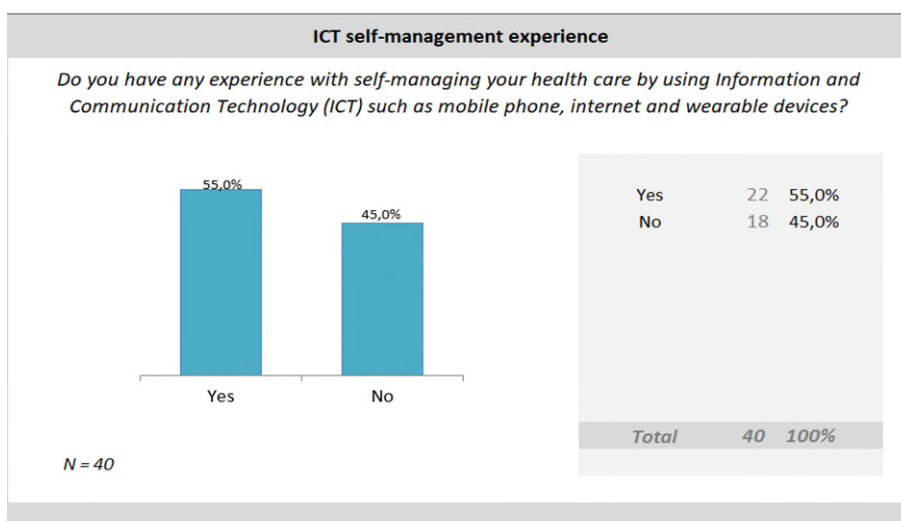


Figure 62 ICT self-management experience

To present the UTAUT results, a summary figure displays the mean rating for each question (see **Figure 64**). For a better presentation of the results, the statements are divided into two groups, each with a summary figure of the mean rating per statement. In addition, figures such as **Figure 63** show for each statement: the mean, the standard deviation (SD), the distribution of ratings on a bar chart and a pie chart. The bar chart shows responses without the non-response rate, while the pie chart shows all user responses, including the percentage of non-responders per item (see Appendix 10.1 for the rest of the results). The bar charts and pie charts are colour coded dark red, red, and light red/pink for values from 1-3, grey for neutral and light green, green, and dark green for values from 5-7.

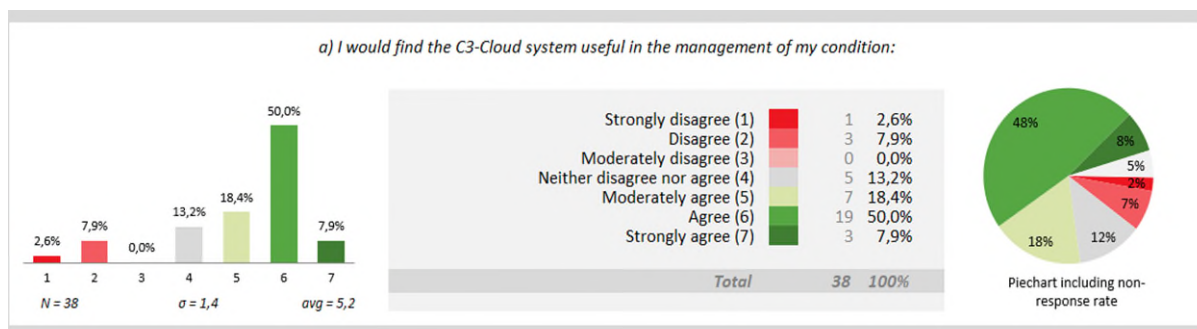


Figure 63 Sample bar and pie chart presentation of the results

In the first group of statements, patients were asked to rate the system's overall usefulness, ease of use, if the system were a mental challenge and if the patients would be willing to keep working with the new technology. **Figure 64** shows the mean ratings of 40 users to the statements (a-h) on a scale from "Strongly disagree" to "Strongly agree".

Most of the statements (a-e and h) were rated with an average of 5, which shows that, in general, the users moderately agreed with the statements. As for statements (d) and (h), the rating is comparatively slightly higher, which shows that the respondents found it easy to become skilful in using the system and they liked working with new technology. It should also be noted that the users quite disagreed with statement (f), which proposes that using the C3-Cloud system did not mentally exhaust them. Statement (g), which was also rated below average, suggests that the users felt that not enough support and preparation had been offered to them.

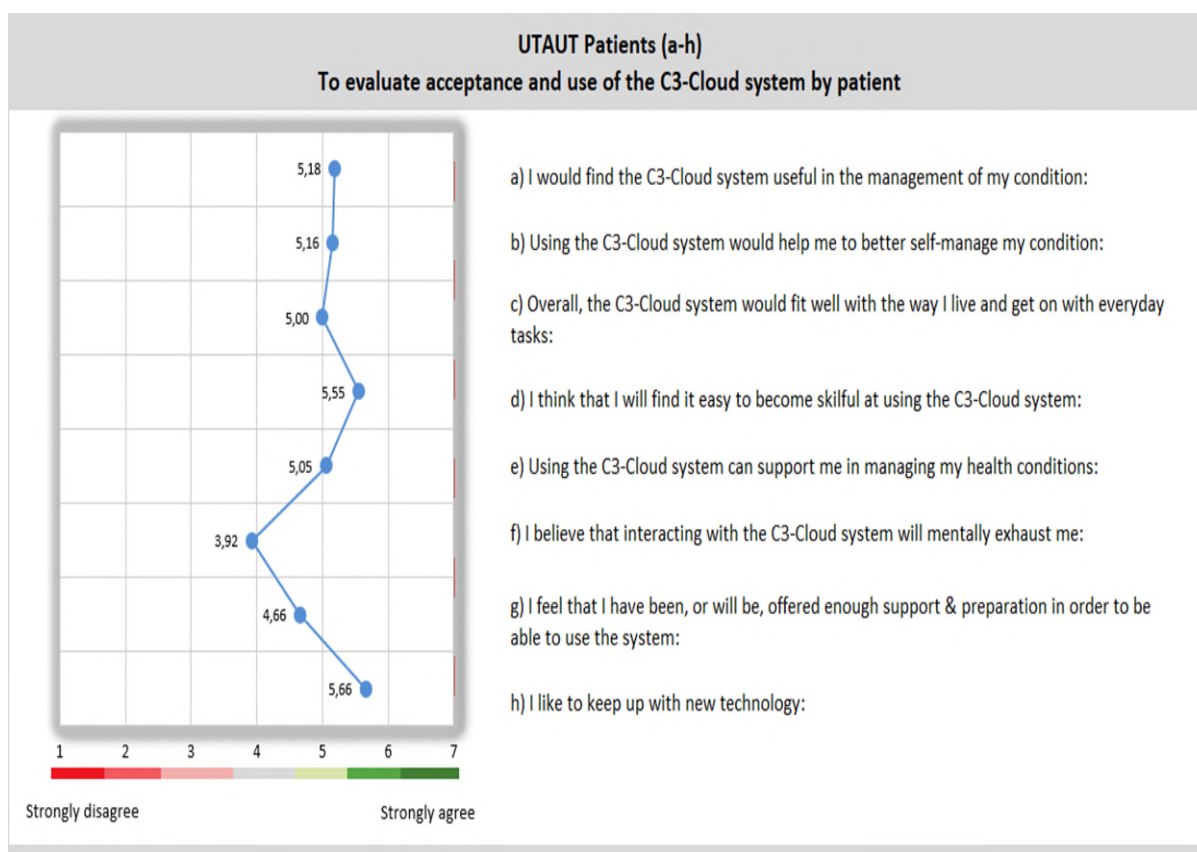


Figure 64 1st survey for patients, UTAUT (a-h)

The second group of statements assessed whether the patients were willing to start selfcare, whether they were anxious, had time to learn and received the required training, and finally their

future intentions on how they will put the system to full use. **Figure 65** shows the mean ratings of 40 users to the statements (i-p) on a scale from “Strongly disagree” to “Strongly agree”.

Compared to the previous graph, this graph is more uneven. As the users quite agreed with changing the way they usually take care of themselves (statement i), a rating of 4.85 demonstrates that they did not feel very relaxed using technology (statement j). Statements (k), (l) and (m) demonstrate that the users had quite a neutral opinion about the training they received for using the system. Coupled with a rather neutral response to statement (g), this demonstrates that attention should be paid to the training offered to the users. Statements (n-p), were all rated quite favourably, meaning that the users had the determination to use the system as much and as often as they could.

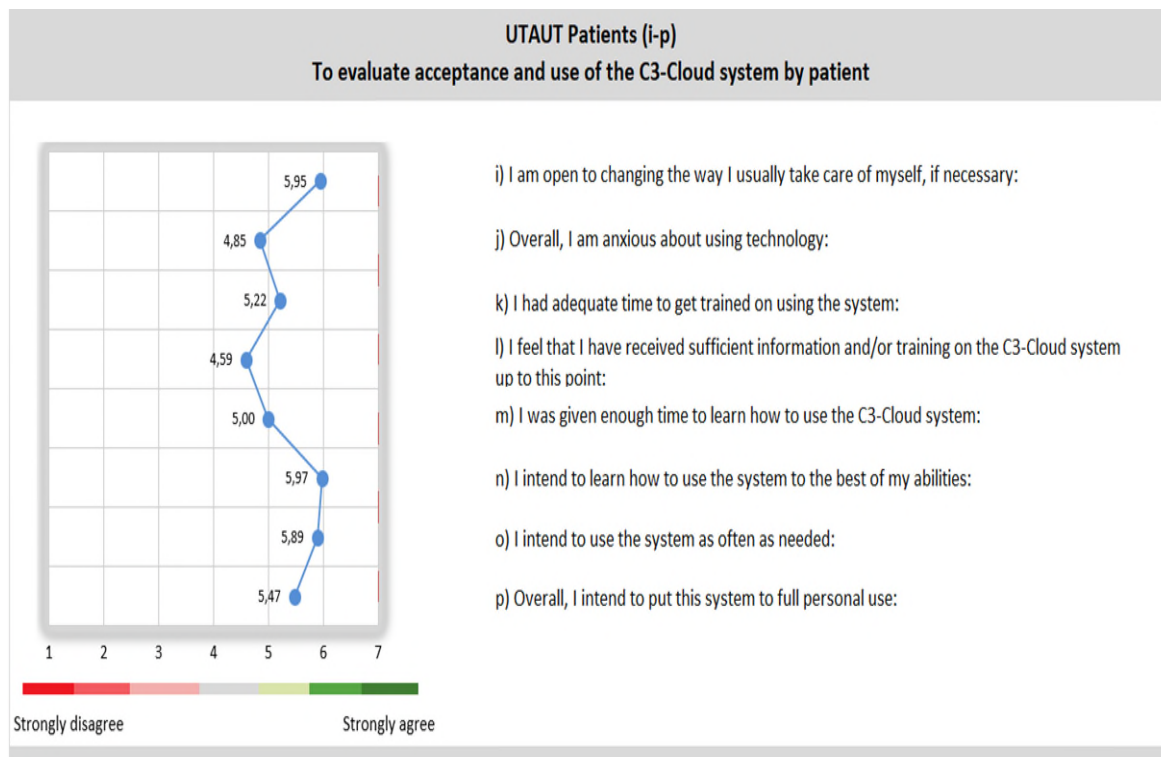


Figure 65 1st survey for patients, UTAUT (i-p)

Finally, the respondents were asked if they had any other opinions about the system and recommendations for improvement. The English translations of these comments are collected in **Table 16** (for these comments in the original language see Appendix **10.1**.) Comments number 1-16 are from the patients in RJH, 17-22 from SWFT and 23-25 from BC¹.

UTAUT, patients' general comments (English translation)	
1)	Exciting systems hope that it will work.
2)	I think this system works very well. That it will be easier for the healthcare staff and a security for me.

¹ Comments in this and similar tables are colour coded to make it easy to trace the comments to the related region: Swedish light blue, English light/phosphorous green and Castilian dark grey.

3)	PGA, illness in the family I have not been able or had time to be so active as I wanted yet. But I hope it will change soon. I have several diseases that everyone can interact with, so different medications degrade my health.
4)	I do not know what I learned about using the system!
5)	It does not feel like it is getting started yet. Has been a very long process.
6)	There were no complete instructions on how to configure the system for connection. Later received good support saying that the system was already configured and would work without action, but that was not the case. Also missing information on how the supplied mobile phone can / cannot or cannot be used.
7)	Am open to learn, but have trouble trusting myself, afraid to make mistakes. Would wish for another human information encounter, the former feels so remote so that you have forgotten certain things.
8)	The Information session was scheduled to be held in the municipality, but no one showed up to inform, so everything became a large question mark...
9)	Nothing has happened to my participation in this project other than a lot of announcements that it will soon be ready to use.
10)	Very strange that the project can be so delayed! The credibility of the project has long since expired. This must work in an incredible uphill or it is the wrong manager for the project. Just by e-mailing multiple emails at a time makes you thoughtful.
11)	I do not think I got any real clarity in when the project really started and how it should be used. At the same time, maybe that information may have been provided but where I did not understand it!
12)	Have no experience with the C3 Cloud system. Have a lot to learn. Did not understand who is my healthcare team? Guess my diabetes nurse is there, but what a doctor, I do not know. Is it the doctor at the health center who is connected to the residential area?
13)	We will log in periodically to keep us updated.
14)	My health plan contains only one non-up-to-date medication list, which I have always had access to. Thus: this is not a care plan that is of any use!
15)	It has been difficult to get a grip on when it would start and how to get started.
16)	So far, my experience is very small. What I understand is that the system has just started, the last time I visited the site it had been corrupted so it had not started
17)	Easy to use. Graph showing blood sugar test results particularly useful.
18)	We have had no feedback from anyone. We tend to do it once a week. You need more than an online tutorial to be able to use the system initially.
19)	The scheme started extremely late and as such I feel that I have not had the time to derive much benefit from it! I also understand that it is due to finish at the end of the month.
20)	I do not really want to save my log-in details but do find it a bit fiddly to get in each time. Inputting data becomes a bit repetitive and boring when not much changes.
21)	seems to have a lack of feedback capability from patient. - I have had an appointment with a cardiology consultant and a severe cold recently. - reporting such things may be useful.
22)	The ability to send messages is somewhat restricted, and I completed my tasks quite soon after receiving them, other than the ongoing diet recommendation, so there was little point in logging in, and when I received an email to advise of these two messages the system was down, and I have just got around to checking the site again to find two messages. I would not repeatedly log in to the system unless I had some action to report and would like to receive an email to trigger such action.

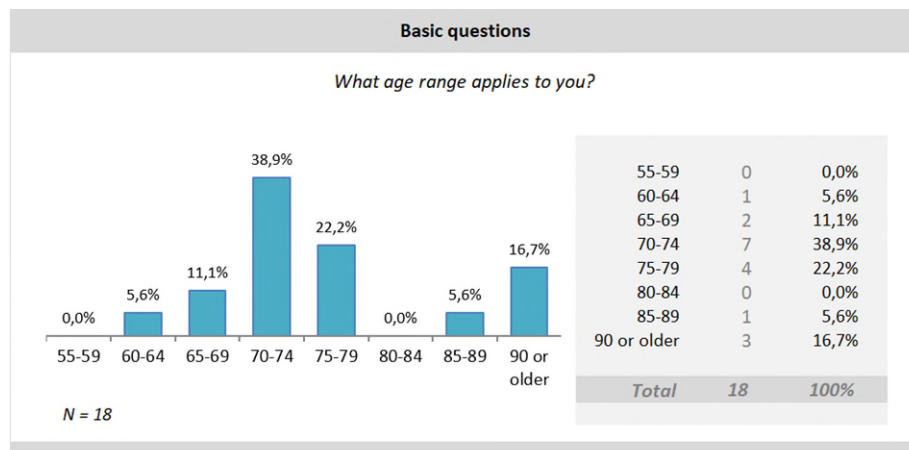
	Otherwise I think the advantages of such a system for Doctor or medical liaison could save a lot of surgery time.
23)	I find the system quite useful and interesting, giving fluidity to the communication with the team, setting the necessary guidelines for the welfare of the patient in due course.
24)	I find the C3-Cloud system an interesting program. Because it allows you to be in contact with the doctor 24 hours a day and to be able to exchange ideas based on the existing disease.
25)	The system keeps you away from the doctor's presence.

Table 16 1st survey for patients, UTAUT general comments, English translation

6.5. C3-Cloud: First Detailed Survey for Patients

6.5.1. Basic Questions

According to the three basic questions at the beginning of the survey, 18 users (N=18) in three pilot sites submitted their responses. Most of the respondents were between 70-79 years of age. It should also be notified that about 17% of the respondents were 90 years of age or older (see **Figure 66**).

Figure 66 1st detailed survey for patients, basic question (age)

The second and third basic questions asked the respondents about their sex and which of the three pilot sites they belonged to. The results show that most of the respondents were male. Half of them lived in the South Warwickshire pilot site, while the other half was almost equally shared between Basque Country and Region Jämtland Härjedalen (see **Figure 67** and **Figure 68**).

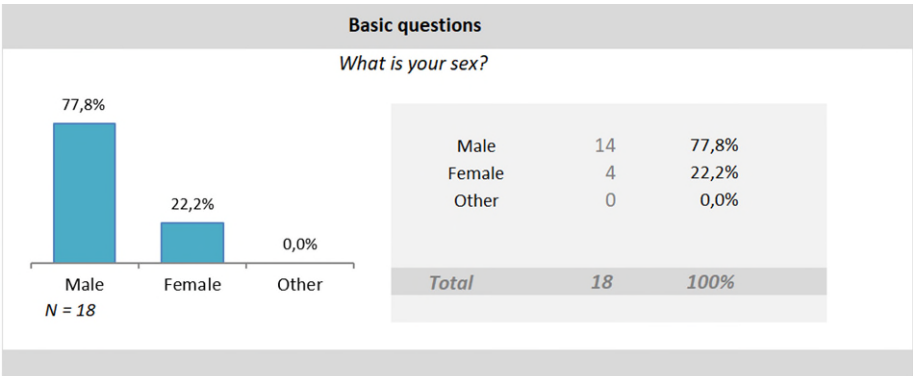


Figure 67 1st detailed survey for patients, basic question (sex)

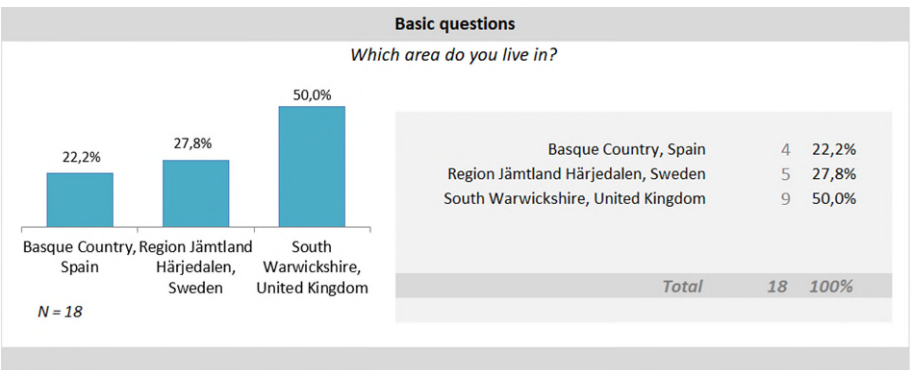


Figure 68 1st detailed survey for patients, basic question (area)

6.5.2. Patient Questionnaire

The first set of questions in this survey was a group of four statements that assessed the users’ opinions on their involvement in planning their healthcare, the communication with their care team, and whether they had been informed about the goals and procedures of the medications they take.

Figure 70 presents the mean rating for each statement. In addition, figures such as **Figure 69** show for each question: the mean, the standard deviation (SD), the distribution of ratings on a bar chart and a pie chart. It should be noted that the answer “Not relevant to me” and non-responses were ignored in the bar charts for simplification, and the average and SD are respectively calculated without these two responses as they are not vital when it comes to the evaluation of the C3-Cloud. However, the percentage of both are presented in the pie charts. The bar charts and pie charts are color coded dark red, red, and light red/pink for values from 0-3, grey for neutral and light green, green, and dark green for values from 5-7.

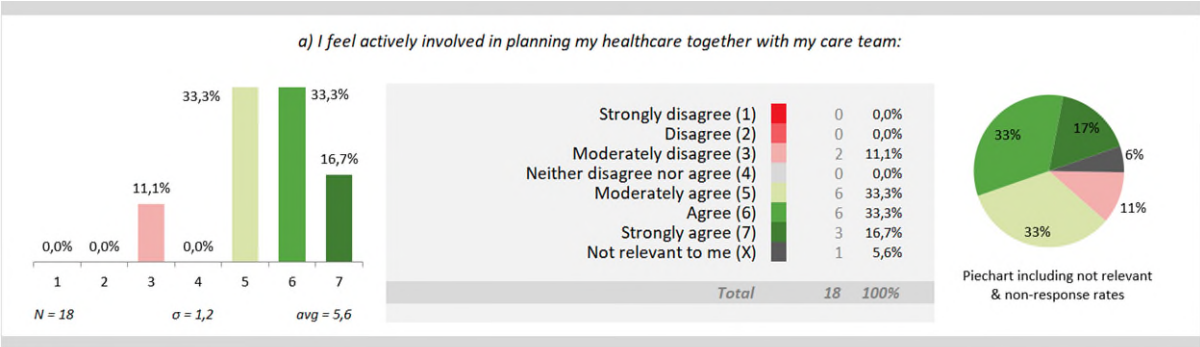


Figure 69 Sample bar and pie chart presentation of the results

The figure below illustrates the mean ratings of 18 users to the statements (a-d) on a scale from “Strongly disagree” to “Strongly agree”. The mean rating close to 6 for statements (a), (c) and (d) demonstrates that the users were involved in planning their healthcare, felt informed about the goals and procedures of their medicaments and the goal that they had set. However, regarding statement (b), the graph shows a dent, which indicates that the patients’ communication with their care team about treatment decisions was not easy and hence needs to be improved.

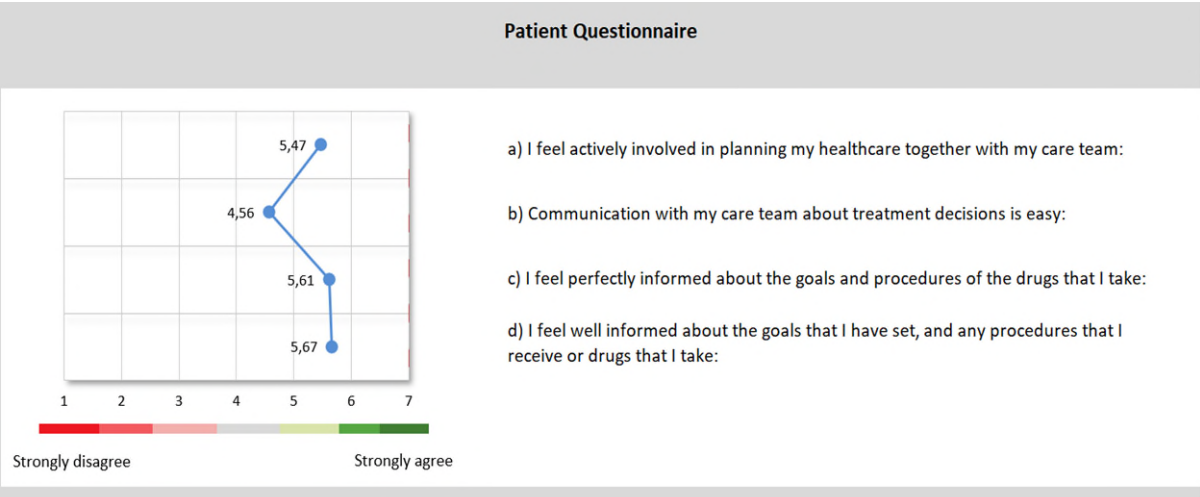


Figure 70 1st detailed survey for patients, patient questionnaire

6.5.3. Questionnaire for User Interaction Satisfaction 7 (QUIS7)

The QUIS7 questionnaire in this survey included a set of statements regarding the users’ opinions about their interaction with the system. For a better presentation of the results, the statements are divided into two groups. In each group, a summary figure presents the mean rating for each statement (see **Figure 72**). Furthermore, figures such as **Figure 71** show for each question: the mean, the standard deviation (SD), the distribution of ratings on a bar chart and a pie chart. The bar chart shows only responses that were obtained on the respective item, while the pie chart includes all user responses and the percentage of non-responders per item (see Appendix 10.2 for the rest of the results). The bar charts and pie charts are color coded on a continuum from dark red (0) to light red/pink (3), and light green (4 and 5) to dark green (9). If respondents rated a statement 5 or below, demonstrating that the users were quite dissatisfied with the related system feature, they were requested to provide a comment and explain why they gave such a rating. The English translation of these comments is presented along with the related bar and pie charts. The original comments (in Swedish, English, and Castilian) are displayed in Appendix 10.2. Additionally, users could leave their general opinions, which were translated into English in

Table 18; for the original comments (in Swedish, English, and Castilian) refer to Appendix 10.2. The total number of responses to these set of questions is N=18.

As noted previously, for the sake of simplification, the presentation of “non-responses” were ignored in the bar charts, and the average and SD are respectively calculated without these responses as they are not vital when it comes to the evaluation of the C3-Cloud; However, the percentage of non-response rates are presented in the pie charts.

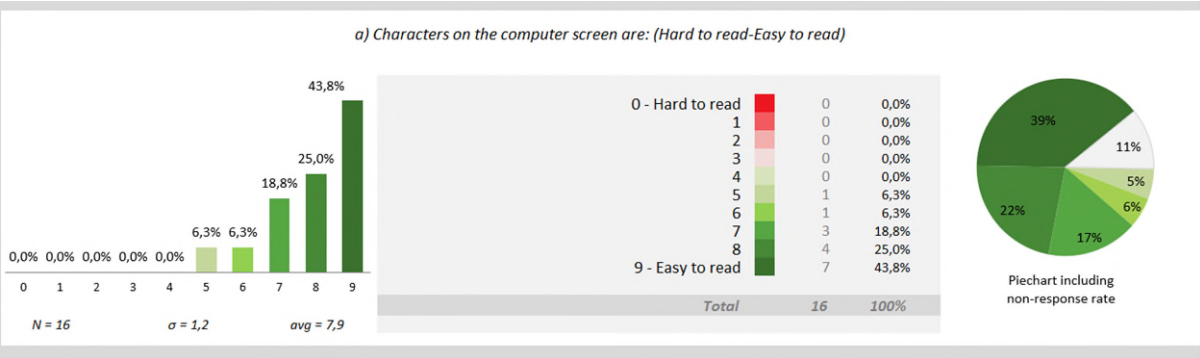


Figure 71 Sample bar and pie chart presentation of the results

Technology trial participants were asked for their reactions to the system by rating each statement on a scale from 0-9. **Figure 72** shows the mean ratings of 18 users' impressions to the first group of statements (a-k). By rating statement (a) around 8, the users almost unanimously agreed that it was easy to read characters on the computer screen. The same average rating was provided for statement (b), demonstrating that the image of characters on the system was also clear enough. Further, the users believed that the highlighting on the screen and the use of bolding were quite helpful by rating statements (c) and (d) an average of 7 and 7.33. Statements (e), (f) and (g) were also rated slightly above 7, which shows that the screen layout was most of the time helpful, the amount of information that can be displayed on the screen was almost adequate, and the arrangement of this information appeared to be logical to the users. The sequence of screens also appeared to be quite clear and predictable. Apart from all the previous statements that were rated positively, the last two statements (j and k) were comparatively rated less favorably. Thus, statement (j) was on average rated 6.53, indicating that some users might have experienced difficulties going back to the previous screen. Statement (k) was rated 6.71, which shows that the progression of work-related tasks was quite clearly marked. However, this rating is comparatively lower and needs to be considered for possible improvement.

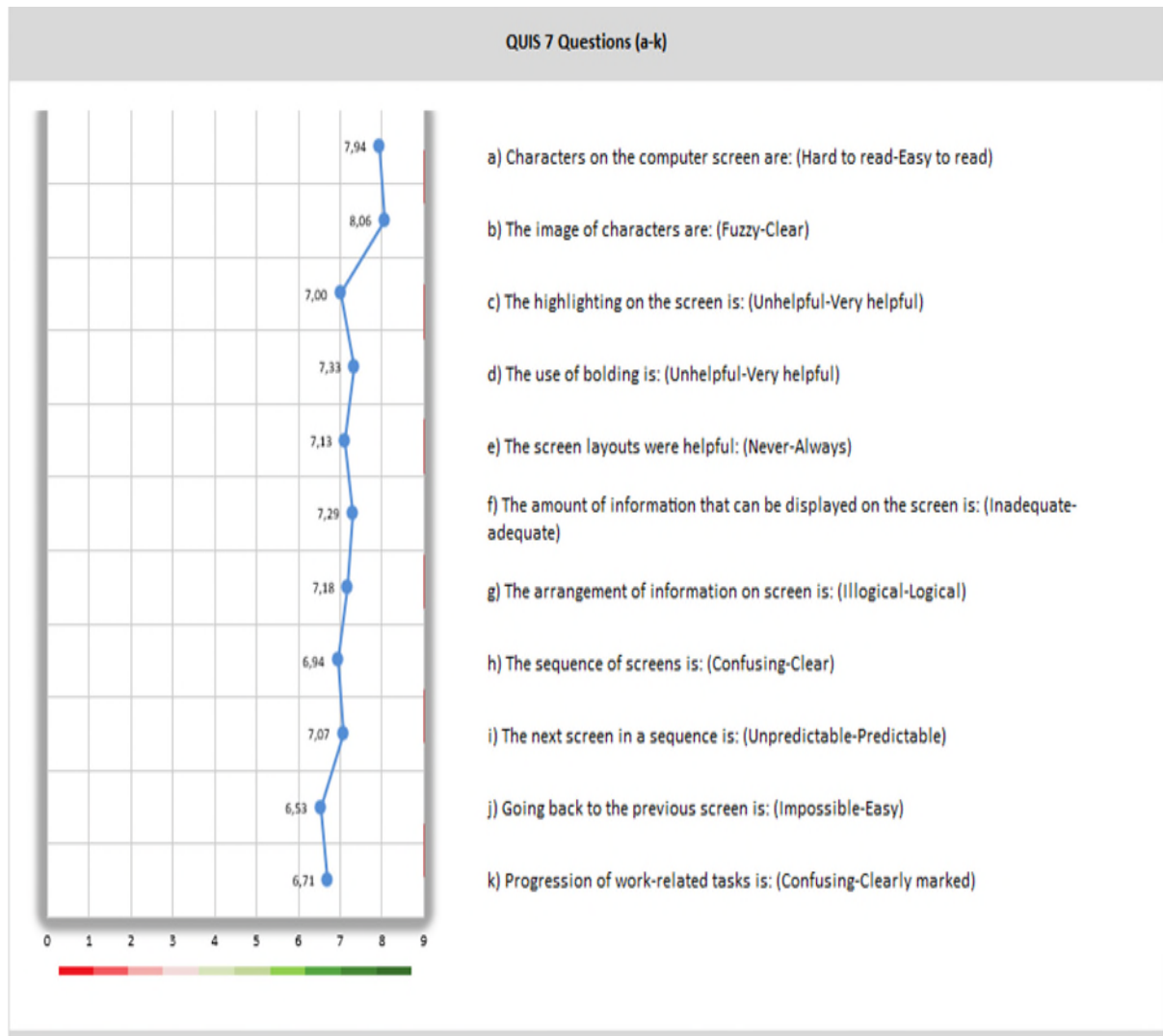


Figure 72 1st detailed survey for patients, QUIS7 (a-k)

Technology trial participants were asked for their reactions to the system by rating each statement on a scale from 0-9. **Figure 73** shows the mean ratings of 18 users to the second group of statements (l-r). This second group of statements was comparatively rated lower than the first group (a-k). Apart from statement (o), which was rated almost 7, suggesting that it was encouraging to explore different features by trial and error, the remaining statements were rated around 6.5 and 6. Statements (l) and (m) were rated 6.69 and 6.50, demonstrating that both, learning to operate the system and getting started, was quite easy. The users also believed that they could learn to use the system rather quickly by rating statement (n) 6.38 on average. The number of steps per task also seemed to be appropriate as statement (p) was rated 6.67. As in the first group of statements, the last two statements in the second group were rated comparatively lower than average. The rating for statement (q) proposes that the users were somewhat hesitant when it came to the clarity of the feedback they received after completing a sequence of steps, and hence there is still some room for improvement. The users also believed that the C3-Cloud training session was quite helpful, but a rating of 6.14 implies that the training session can still improve.

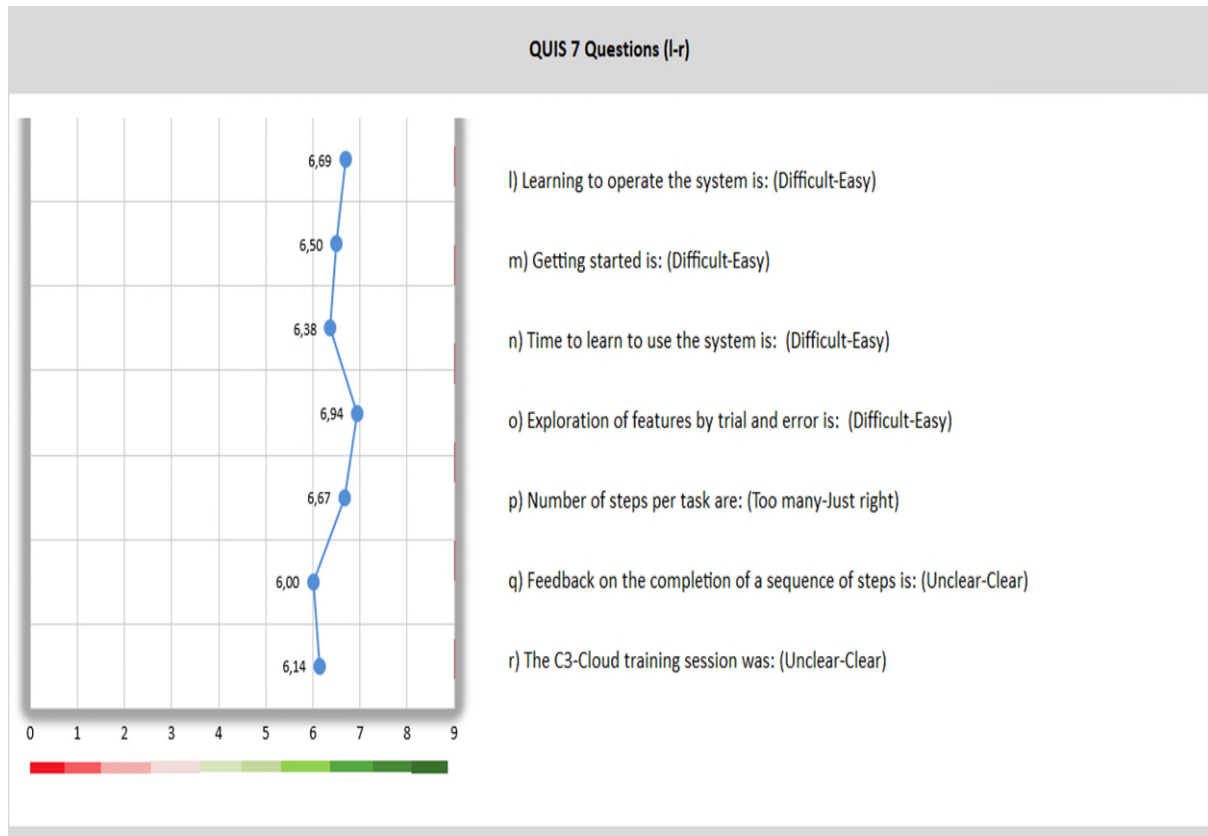


Figure 73 1st detailed survey for patients, QUIS7 (l-r)

As mentioned previously, if the users rated a statement 0-5, they were asked for further comments; the table below presents the English translation of the comments (for these comments in original language refer to Appendix 10.2).

Comments related to statements (English translation)	
1)	The use of bolding is: [Unhelpful Very helpful] <ul style="list-style-type: none"> Do not understand what the "bold" question has to do with the project?
2)	The screen layouts were helpful: [Never Always] <ul style="list-style-type: none"> My criterion is that the information they collect is insufficient for the medical professional to draw any real conclusions about the measurements the patient sends. Those measurements are subject to changes according to other parameters that you are not aware of and that should be collected on the data capture screen. I collect data for the Endocrine and for Nephro, in which I provide more information than that provided by this study.
3)	The amount of information that can be displayed on the screen is: [Inadequate Adequate] <ul style="list-style-type: none"> The answer is in the previous question.
4)	The arrangement of information on screen is: [Illogical Logical] <ul style="list-style-type: none"> The answer is in the previous question.
5)	The sequence of screen is: [Confusing Clear] <ul style="list-style-type: none"> The answer is in the previous question.

6)	<p>The next screen in a sequence is: [Unpredictable Predictable]</p> <ul style="list-style-type: none"> • The answer is in the previous question.
7)	<p>Going back to previous screen is: [Impossible Easy]</p> <ul style="list-style-type: none"> • When I reverse backwards, I must start over. • The answer is in the previous question. • Have not had to go back to a previous screen.
8)	<p>Progression of work-related tasks is: [Confusing Clearly marked]</p> <ul style="list-style-type: none"> • Since this is the first message, I get from C3 and when I must google on progression, I experience it as confusing! • The answer is in the previous question.
9)	<p>Learning to operate the system is: [Difficult Easy]</p> <ul style="list-style-type: none"> • I do not know what I learned about the system, I think it has dragged out over time and I do not know if I have been given any "exercise" to learn the system. • As I wrote earlier, the first message I was able to open from C 3 is therefore difficult to rate the system already. • Once you start using it is easy, but you could use more instruction when you first start using it.
10)	<p>Getting started is: [Difficult Easy]</p> <ul style="list-style-type: none"> • I do not know how to get started! • See previous answer!! • Email links did not work - I had to key in the link to get started.
11)	<p>Time to learn to use the system is: [Difficult Easy]</p> <ul style="list-style-type: none"> • Do not know... • Again, see previous answer, but it is possible I may have missed some information earlier. • The need to make a small diagram of utilization sequences.
12)	<p>Exploration of features by trial and error is: [Difficult Easy]</p> <ul style="list-style-type: none"> • Do not know how I discover the features. • What do you mean, cannot remember much use of trial and error?
13)	<p>Number of steps per task are: [Too many Just right]</p> <ul style="list-style-type: none"> • Do not know what commands are. • A record could be made to collect all information on glucose, blood pressure and weight. In addition, it would be interesting that when information is entered the first time in the day, it can be retrieved in edit mode throughout the day to enter more data during the same day. Anyway, this is subject to a test that I am going to do and know if in a day that I have entered information in the morning I can edit the same day the next day and provide more information. So far, I see that you can recover a day in which you did not enter anything and enter the delayed information. • This is a median answer as time to learn and then use the system seems to be very limited.

14)	Feedback on the completion of a sequence of steps is: [Unclear Clear] <ul style="list-style-type: none"> • How is the feedback? • I have received no feed-back after completion of a sequence. • I was not aware there was any!
15)	The C3-Cloud training session was: [Unclear Clear] <ul style="list-style-type: none"> • Is this the education? • With reference to previous answers! • You need more than an online tutorial. • Felt it was too rushed and too late in the trial.

Table 17 1st detailed survey for patients, comments related to statements rated 0-5, English translation

Additionally, the table below depicts the users' general comments about their interaction with the system and their satisfaction with it in English (for these comments in original language refer to Appendix 10.2).

General Comments (English translation): Swedish/RJH (1-3), English/SWFT (4-8)	
1)	So far, I have only received some test messages and some other messages.
2)	Wondering if I am the right person to attend. Meets diabetes nurse once a year / year and doctor once a year for age diabetes. Once a year for KLM. I think it "works" well and hope to continue that way!
3)	Because of illness in the family I have not been able to be as active as I wanted.
4)	Feedback would be great.
5)	I am not conscious of much in the way of feedback - possibly because not much is happening to me health-wise at present, i.e. I am stable, and it would need blood tests to point to potential problems. Obviously, they are outside the scope of the scheme.
6)	As I was a commercial computer systems developer, I feel that some of my responses may be at variance with your "target" users. (mine I had to assume were idiots!!)
7)	I am reasonably experienced in using remote learning
8)	No.

Table 18 1st detailed survey for patients, general comments, English translation

6.5.4. Patient Training Material

The patient training material questionnaire included statements assessing the users' feedback on the C3-Cloud training material (guidebook, wallet card, information leaflet, etc). For a better presentation of the results, the statements are divided into two groups. In each group, a summary figure presents the mean rating for each statement (see **Figure 75**). In addition, figures such as

Figure 74 show for each statement: the mean, the standard deviation (SD), the distribution of ratings on a bar chart and a pie chart. The bar chart shows only responses that were obtained on the respective item, while the pie chart shows all user responses, including the percentage of non-responders per item (see Appendix 10.2 for the rest of the results). The bar charts and pie charts are colour coded dark red, red, and light red/pink for values from 0-3, grey for neutral, and light green, green, and dark green for values from 5-7.

It should also be noted that, for the sake of simplification, the presentation of “non-responses” were ignored in the bar charts, and the average and SD are respectively calculated without these responses as they are not vital when it comes to the evaluation of the C3-Cloud. The percentage of non-response rates could still be referred to in the pie charts.

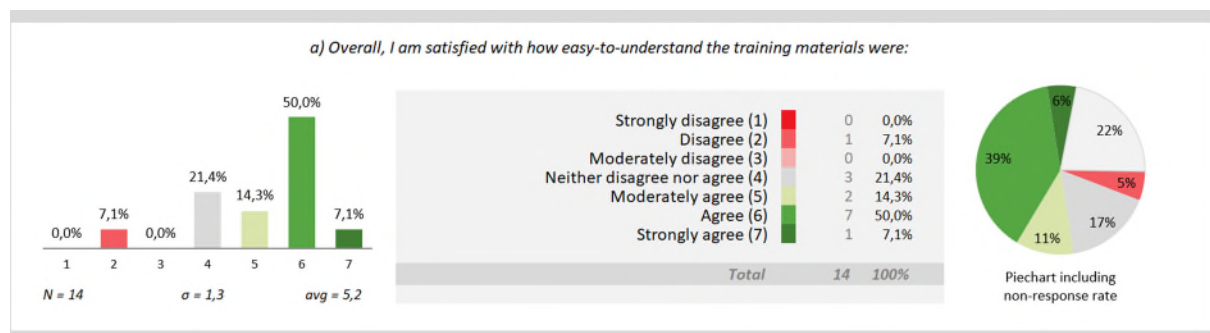


Figure 74 Sample bar and pie chart presentation of the results

Technology trial participants were asked for their reactions to the training material by rating each statement on a scale from 1-7. The figure below shows the mean ratings of 14 users' impressions to the first group of statements (a-h). The average rating hovers between 4.50 and 5.50, which implies that the users moderately agreed with the statements. As for statements (a), (b) and (c), the users moderately agreed that the training materials were easy to understand, comfortable to use and improved the users' capability and confidence when caring for their health conditions. Statement (d) is the peak rating and shows that the users could trust the information presented to them. The last four statements (e, f, g, and h), however, show clearly that the training material presented to patients needs improvement. A neutral rating for statement (e) suggest that the way C3-Cloud directed users to the training material was not as intuitive and natural as it should be. A 4.46 rating for statement (f) also proposes that the users were neutral about whether the training material encouraged them to take positive steps to improve the management of their condition. The average rating of 5 for statement (g) demonstrates that the users did not find the information in the patient training material video easy to understand. Consequently, statement (h), which assessed if the video was capable enough to support the patient in using the C3-Cloud system, was rated quite neutrally. This illustrates that the training material video needs to be reviewed and its content possibly revised and improved.

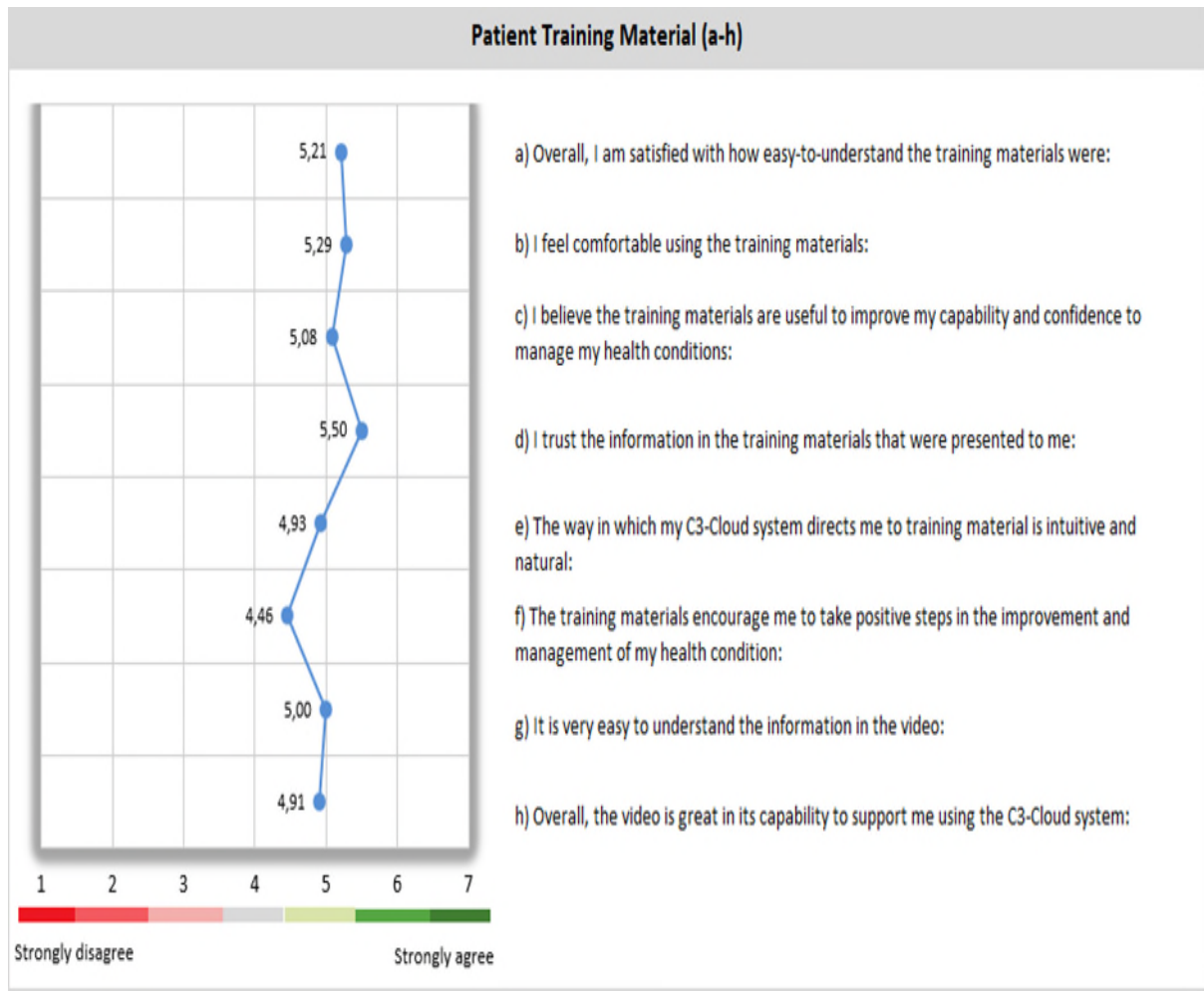


Figure 75 Patient training material (a-h)

The following figure presents the mean ratings of 14 users' impressions to the second group of patient training material statements (i-p). The graph is archlike as the first and last statements were rated quite positively, while the statements in the middle were rated rather neutrally. As for statements (i) and (j), the users moderately agreed that it was easy to use the information in the project guidebook and the manual was moderately supportive when using the C3-Cloud system. A quite neutral rating for statements (k), (l) and (m), shows that the training material and the way it was offered to the users certainly needs to be reconsidered and improved. Statements (n) and (o) demonstrate that the training material neither improved the users' self-care knowledge, nor encouraged the users to adopt a higher degree of self-management. Against this background, the last statement shows that the users believed that the provision of training material could make it easier for them to use the system.

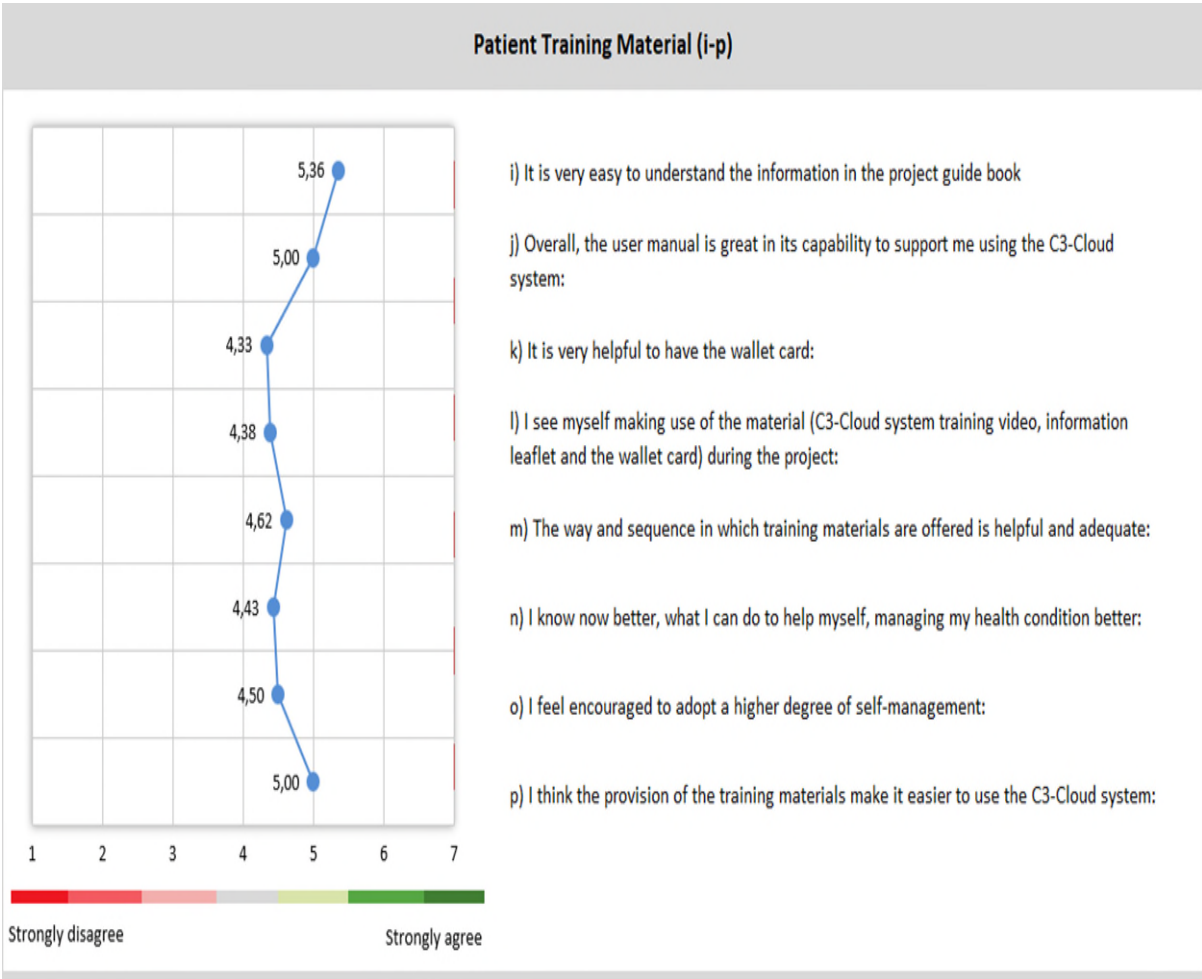


Figure 76 Patient training material (i-p)

6.6. C3-Cloud: Second Survey for Patients

6.6.1. Basic Questions

According to the three basic questions asked at the beginning of the survey, 26 respondents (N=26) in three polit sites submitted their responses to these questions. Most of them were between 65 and 79 years of age (see **Figure 77**).

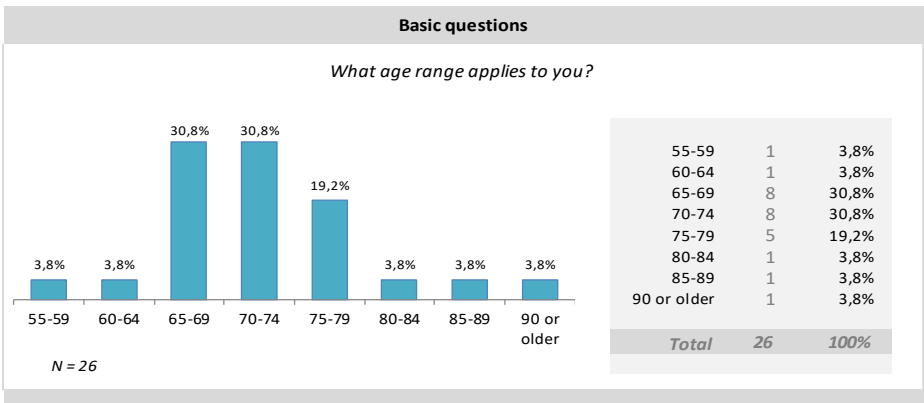


Figure 77 2nd survey for patients, basic question (age)

The second and third basic questions asked the respondents about their sex and the area they lived in. The results showed that most of the respondents were male and belonged to the Region Jämtland Härjedalen pilot site (see **Figure 78** and **Figure 79**).

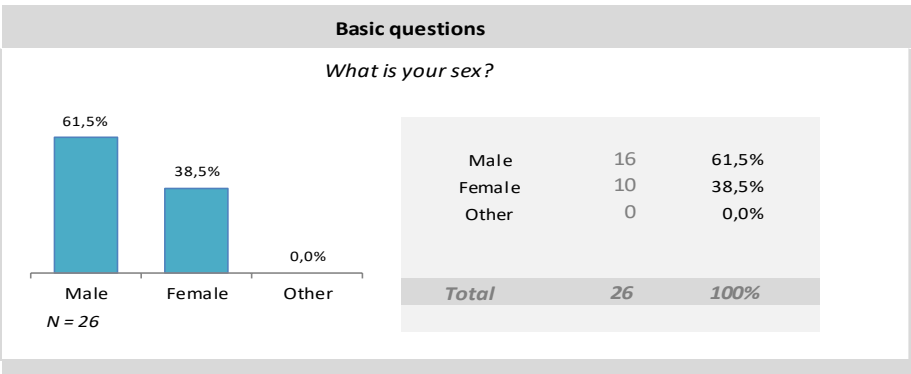


Figure 78 2nd survey for patients, basic question (sex)

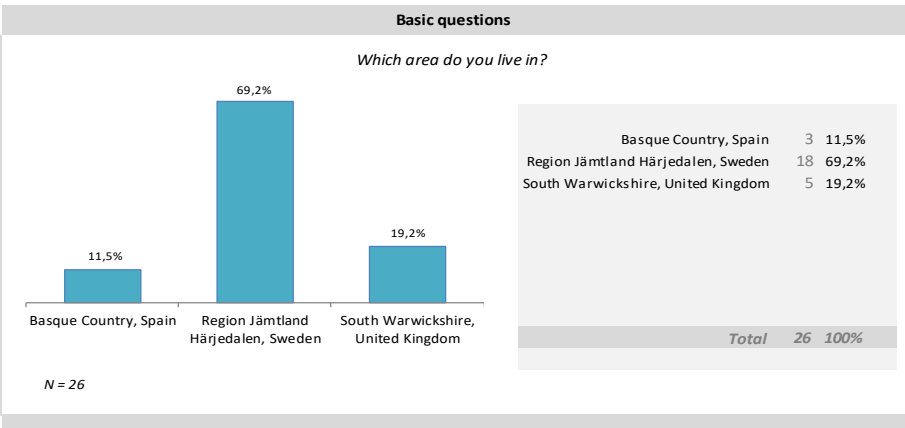


Figure 79 2nd survey for patients, basic question (area)

6.6.2. Unified Theory of Acceptance and Use of Technology (UTAUT)

To present the UTAUT results, a summary figure displays the mean rating for each statement (see **Figure 81**). For a better presentation of the results, the statements are divided into two groups with one summary figure each. In addition, figures such as **Figure 80** show for each question: the mean, the standard deviation (SD), the distribution of ratings on a bar chart and a pie chart. The bar chart shows responses without non-response rate, while the pie chart includes all user responses and the percentage of non-responders per item (Appendix **10.4** presents the rest of the results). The bar charts and pie charts are colour coded dark red, red, and light red/pink for values from 1-3, grey for neutral, and light green, green and dark green for values from 5-7.

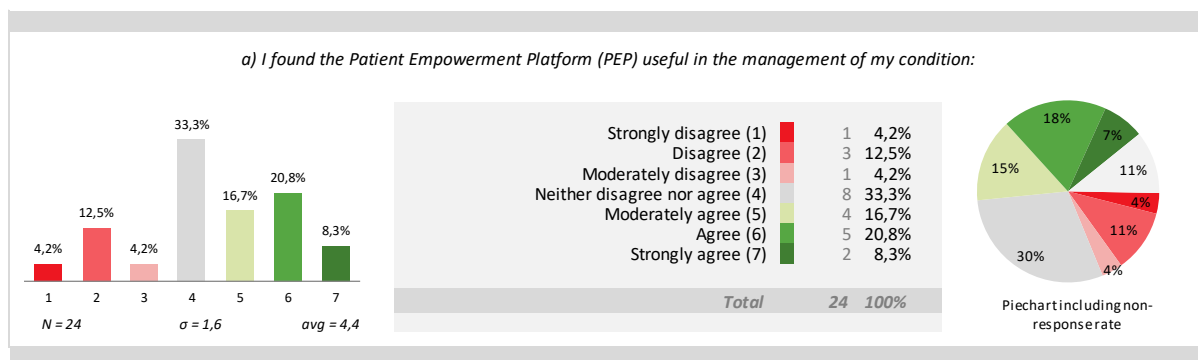


Figure 80 Sample bar and pie chart presentation of the results

The next group of questions at this stage asked the patients to rate the system's overall usefulness, ease of use, if the system was a mental challenge and if the patients were willing to keep working with the new technology. **Figure 81** shows the mean ratings of 26 users to the statements (a-j) on a scale from "Strongly disagree" to "Strongly agree".

Most of the statements, (a-e and g), were rated an average of 4-4.50, which shows that, in general, the users had a neutral opinion about the statements. As for statements (h), (i) and (j), the rating is comparatively lower, indicating that the users moderately disagreed to be inspired by fellow patients who use PEP, if their care team communicated their plans or if their care team was supportive. It should also be noted that the users moderately agreed with statements (f), which proposes that using the PEP did not mentally exhaust them.

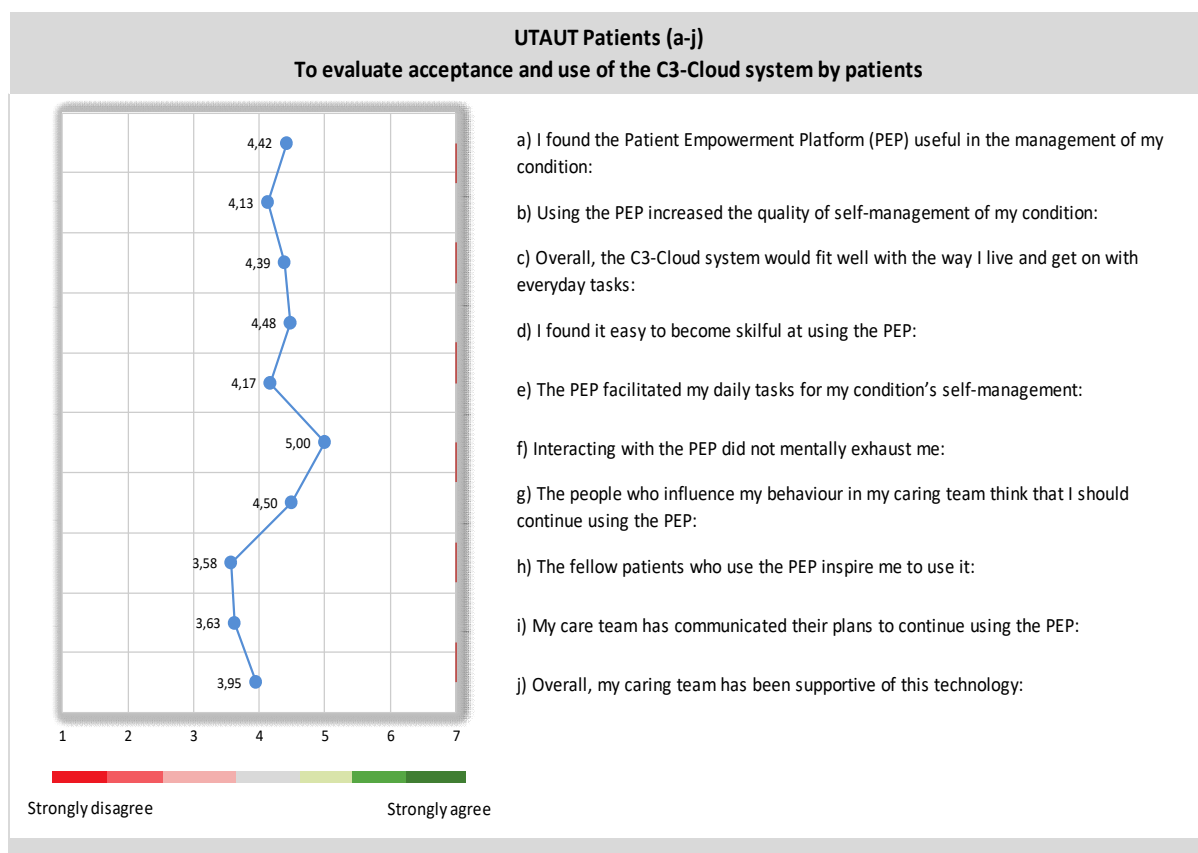


Figure 81 2nd survey for patients, UTAUT (a-j)

The next group of statements assessed whether the use of technology was generally accepted in the user's local community, if the user had adequate time to get trained about using the system, if they thought that the system would improve the quality of their condition's management immediately, and what intentions the users had regarding the system's promotion and its full personal use. **Figure 82** shows the mean ratings of 26 users to the statements (k-t) on a scale from "Strongly disagree" to "Strongly agree".

Almost all the statements were rated an average of 4-4.79, which shows that the users generally had a neutral opinion about the statements, but slightly leaning towards "Moderately agree". As for statements (n) and (q), the ratings are comparatively slightly higher, which demonstrates that the users had adequate time to get trained on using the system and used the system to the best of their abilities.

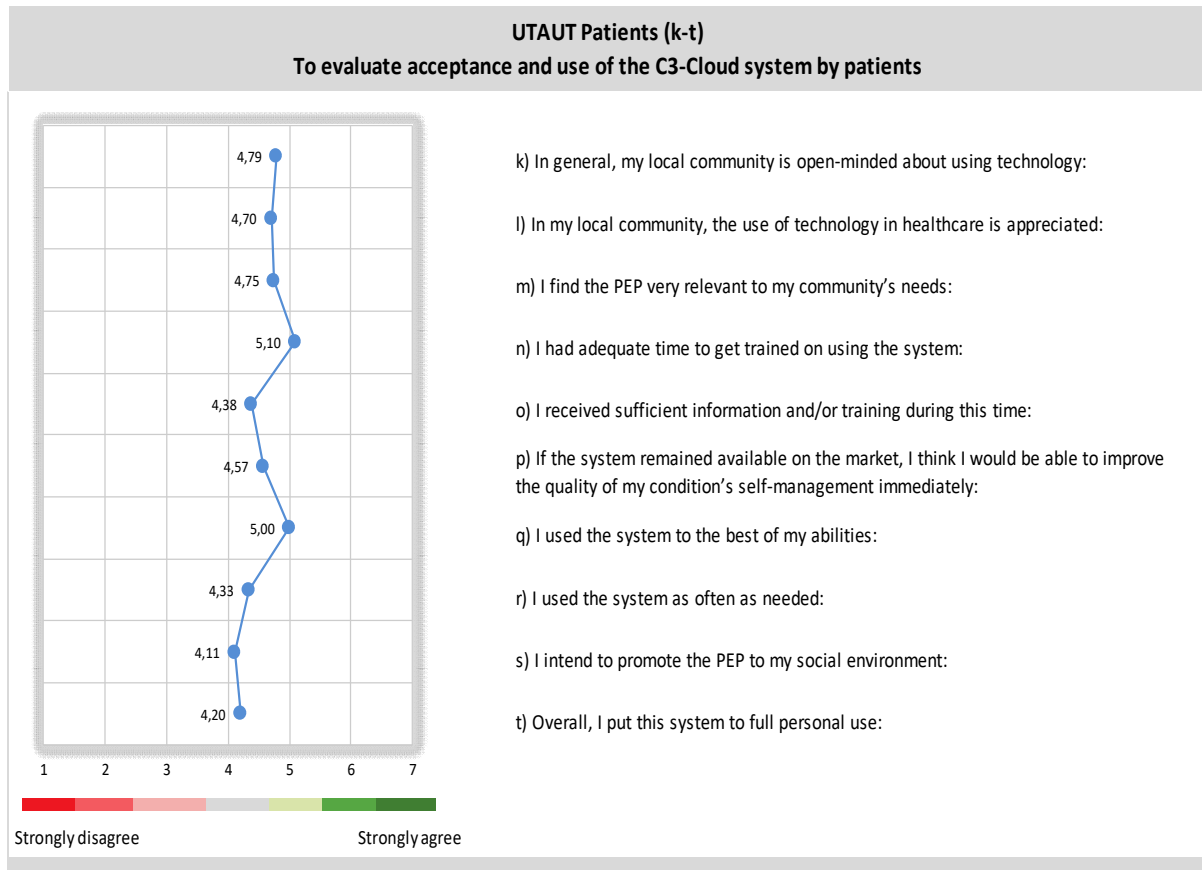


Figure 82 2nd survey for patients, UTAUT (k-t)

Finally, the respondents were asked if they had any other opinions about and for the improvement of the system. The English translation of these comments are collected in

UTAUT, patients' general comments (English translation)	
1)	The system worked, but patient does not experience any major commitment / feedback from the system owner.
2)	I do not know what you are talking about, I have not received anything with more than 2 test messages. As far as I can think, no one has trained me in what C3-Cloud is. Why did I join here?
3)	So, I do not understand the meaning of this survey because I have not had any access at all to anything that would be within the system. No care plan, no contact at all other than this and previous survey. As I have experienced it, it is just a lot talk about new technology, but nothing that really seems to

	have to do with reality. How did it happen like this? Would like an explanation. I am very disappointed as I was prepared to participate in this study fully.
4)	I do not think I have learned to use the system. With my healthcare contacts, neither I nor anyone in healthcare has talked about C3-Cloud.
5)	I have a hard time understanding what is going to happen. I asked my doctor if she was in and working with the system. She was not.
6)	When I asked my carer about C3-Cloud, she was puzzled.
7)	Either I do not understand the program, or it has not started properly. No communication with healthcare professionals and no advice.
8)	Well worth doing, I particularly found the graph produced using blood sugar levels informative in showing trends. Not possibly as interactive as intended. Because of other people's priorities with the current virus epidemic.
9)	System unavailability at times was annoying.
10)	The tasks were completed early during the timescale so the need to log in decreased. the lack of ability to send messages to doctors meant that there was no inter communication so no ongoing benefit other than following the diet plan. The communication checks were probably of value to the organisers in assessing the ability of the patients, but to this 91-year-old were somewhat frustrating in that with an ability to communicate I could have new targets and a wider link and benefit from medical staff. For example, I would possibly benefit from monitoring my blood sugar level but cannot download this currently from my practice website although I have a six-monthly blood test and diabetic check. I have always found available report graphs invaluable in motivating and monitoring action.
11)	As I recall, the system was very late coming online and left little time before it closed. The aim of the trial was to establish if C3-Cloud could help me manage my pre-existing conditions, which I have had for many years. Treatment has remained constant, with minor 'tweaks' from time to time and hence, I have become very used to managing my conditions quite well. As such, I feel that I did not fully benefit from this study. I have not had the opportunity of discussing this with my GP, who I see infrequently and usually for reviews of medication.
12)	I would like to be informed by whomever it may concern whether I am using the system properly or not <ul style="list-style-type: none"> • Comments on the results • Tips?

Table 19 below (for these comments in original language see appendix 10.4)². From the open comments we find that patients highlight the disconnect between the clinical team use of the C3DP and the patients' use of the PEP. Patients need to be reassured in daily practice, that their MDT uses the C3-Cloud system and that they can interact with their MDT. Otherwise they are disconnected and discouraged to use the PEP.

UTAUT, patients' general comments (English translation)	
13)	The system worked, but patient does not experience any major commitment / feedback from the system owner.
14)	I do not know what you are talking about, I have not received anything with more than 2 test messages. As far as I can think, no one has trained me in what C3-Cloud is. Why did I join here?

² Comments in this and similar tables are colour coded to make it easy to trace the comments to the related region: Swedish light blue, English light/phosphorous green and Castilian dark grey.

15)	So, I do not understand the meaning of this survey because I have not had any access at all to anything that would be within the system. No care plan, no contact at all other than this and previous survey. As I have experienced it, it is just a lot talk about new technology, but nothing that really seems to have to do with reality. How did it happen like this? Would like an explanation. I am very disappointed as I was prepared to participate in this study fully.
16)	I do not think I have learned to use the system. With my healthcare contacts, neither I nor anyone in healthcare has talked about C3-Cloud.
17)	I have a hard time understanding what is going to happen. I asked my doctor if she was in and working with the system. She was not.
18)	When I asked my carer about C3-Cloud, she was puzzled.
19)	Either I do not understand the program, or it has not started properly. No communication with healthcare professionals and no advice.
20)	Well worth doing, I particularly found the graph produced using blood sugar levels informative in showing trends. Not possibly as interactive as intended. Because of other people's priorities with the current virus epidemic.
21)	System unavailability at times was annoying.
22)	The tasks were completed early during the timescale so the need to log in decreased. the lack of ability to send messages to doctors meant that there was no inter communication so no ongoing benefit other than following the diet plan. The communication checks were probably of value to the organisers in assessing the ability of the patients, but to this 91-year-old were somewhat frustrating in that with an ability to communicate I could have new targets and a wider link and benefit from medical staff. For example, I would possibly benefit from monitoring my blood sugar level but cannot download this currently from my practice website although I have a six-monthly blood test and diabetic check. I have always found available report graphs invaluable in motivating and monitoring action.
23)	As I recall, the system was very late coming online and left little time before it closed. The aim of the trial was to establish if C3-Cloud could help me manage my pre-existing conditions, which I have had for many years. Treatment has remained constant, with minor 'tweaks' from time to time and hence, I have become very used to managing my conditions quite well. As such, I feel that I did not fully benefit from this study. I have not had the opportunity of discussing this with my GP, who I see infrequently and usually for reviews of medication.
24)	I would like to be informed by whomever it may concern whether I am using the system properly or not <ul style="list-style-type: none"> • Comments on the results • Tips?

Table 19 2nd survey for patients, UTAUT general comments, English translation

6.7. C3-Cloud: Second Detailed Survey for 50 Patients

6.7.1. Basic Questions

Since the questions targeting the users in South Warwickshire, UK, were only sent through one link, meaning the “C3-Cloud Second Survey for Patients” and “C3-Cloud Detailed Survey for 50 Patients (part 2)” questionnaires were combined for the SWFT patients, and since one data analysis tool was already created based on the SWFT data analysis needs, the first step for the analysis was to extract the data related to the “C3-Cloud Detailed Survey for 50 Patients (part 2)” Basque Country and Region Jämtland Härjedalen, and add it to the data sheet collected from South Warwickshire. For this reason and because the collected data was analyzed in one single

data analysis tool to save time and meet the deadline (unlike first surveys in which two separate tools were created for the two surveys), the basic questions' results are exactly repeated here as they were reported in 6.6.1. The rest of the result analysis, however, is implemented in the same manner and is presented below.

6.7.2. Patient Questionnaire

The first set of questions in this survey were a group of 14 statements that assessed the users' opinions on their involvement in planning their healthcare and communication with the care team, if they had been informed about the goals and procedures of the medications they took, if it was easy to adhere to the suggested treatment activities and whether they felt motivated to actively follow their treatment plans.

Figure 84 presents the mean rating for each statement. In addition, figures such as **Figure 83** show for each question: the mean, the standard deviation (SD), the distribution of ratings on a bar chart and a pie chart (Appendix 10.5 presents the detailed results of each statement). It should also be noted that, for the sake of simplification, the presentation of “non-responses” were ignored in the bar charts, and the average and SD are respectively calculated without non-responses as they are not vital to evaluate the C3-Cloud system. However, the percentage of non-responses are presented in the pie charts. The bar charts and pie charts are color coded dark red, red, and light red/pink for values from 1-3, grey for neutral (4), and light green, green and dark green for values from 5-7.

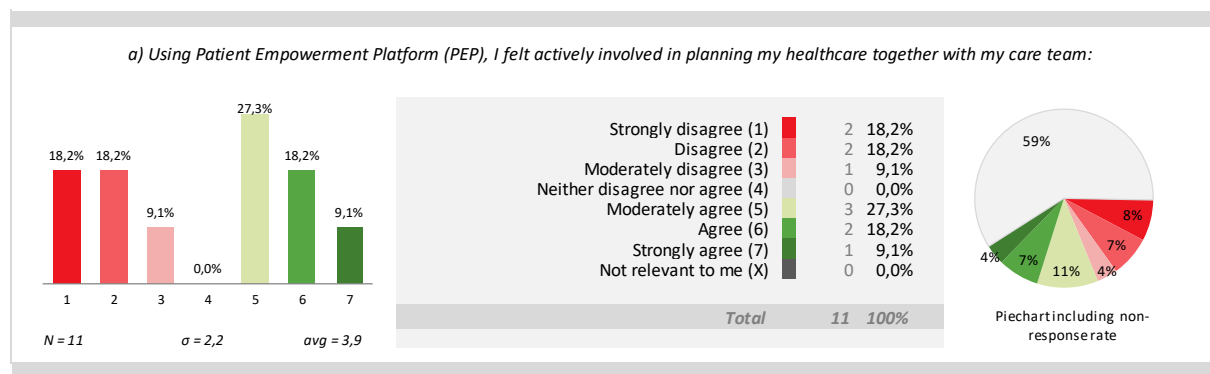


Figure 83 Sample bar and pie chart presentation of the results

The figure below shows the mean ratings of 11 users to the statements (a-n) on a scale from “Strongly disagree” to “Strongly agree”. With regard to statements (a-g) a mean rating between 3.27 and 4.18 (with an average of 3.72) demonstrates that the users moderately disagreed with, or had a neutral opinion about their healthcare planning through PEP, the satisfaction of their personal preferences and needs when it came to using PEP, and if the PEP made communication with the care team easier, made the patients better informed, or made them feel more confident in adhering to their care plan. Statement (h) shows a sudden dent (3.09), which demonstrates that the patients moderately disagreed that they always received appropriate automated or personal feedback when sharing personal data or messages with their care team via PEP, which certainly opens the floor for further discussion on this statement.

Statements (i-k) demonstrate that the patients quite moderately agreed with feeling informed about their health conditions, goals and procedures of the drugs they took, and that they found it easy to adhere to treatment activities suggested by care team members. Statement (m) shows a spike (5) in the graph, indicating that the patients moderately agreed with having a high personal motivation to actively follow the treatment plan and independently carry out treatment activities. Finally, for statement (n), which is if the PEP feedback function was useful for effective communication with regard to the care plan issues, the patients moderately disagreed, which may

be caused by putting the phrasing of this question wrongly. Rather than relating to “the feedback function” we intended to ask for “Using the PEP messaging functions”.



Figure 84 2nd detailed survey for patients, patient questionnaire

6.7.2.1. Patient Questionnaire Response Comparison

The patients' responses before using the C3-cloud and after using it is then juxtaposed for the readers to grasp any possible changes more readily in the users' opinions.

When asked if they felt actively involved in planning their healthcare with their care team, the patients rated the statements an average of 5.61 before using the C3-Cloud. However, when they were asked to respond to the same question, the average hovered on 3.91, showing that the users' opinion deteriorated and tends to be neutral.

When asked if communication with their care team about treatment decisions via PEP was easy, the patients opinion tend to be positive before using C3-Cloud. The average response for a pre-C3-Cloud use was 4.94 while the post-C3-Cloud use average response rated showed 3.27.

The average rating that the patients gave to the statement “if they feel perfectly informed about the goals and procedures of the drugs they took” before using the system was 5.61 which retreated to 4.73 after using PEP.

Quite similarly, the patients feeling of being informed about their health condition was also on retreat after using the system. The patients’ average opinion about this statement before using the system was 5.67 which regressed to a 4.64 once the patients had the experience of using the system.

Taken all the four below statements into account, the pattern of the pre and post C3-Cloud use graphs demonstrate that the opinions of the patients generally worsened once they used the system.

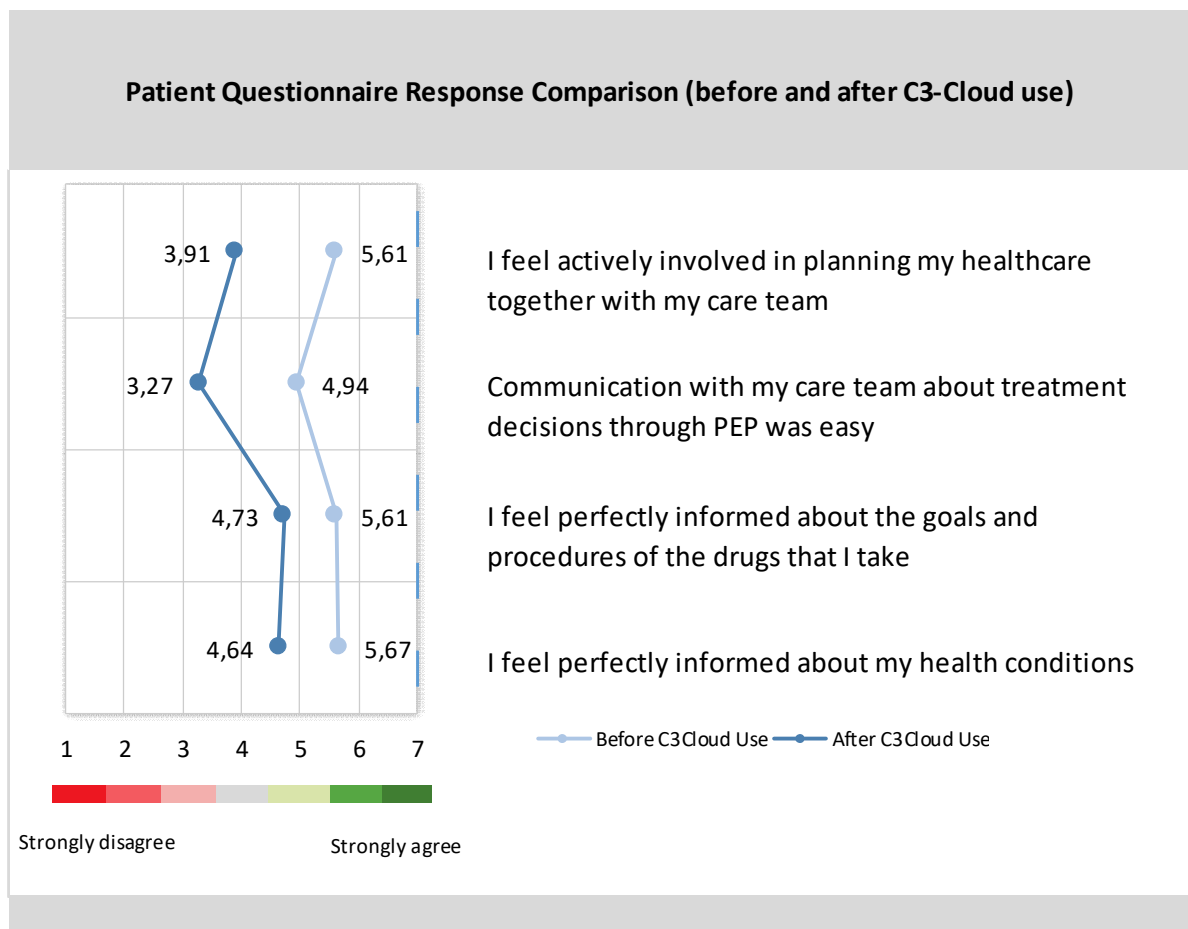


Figure 85 Patient Questionnaire Response Comparison

6.7.3. Questionnaire for User Interaction Satisfaction 7 (QUIS7)

The QUIS7 questions in this survey were a set of statements that asked the users opinions about their interaction with the system. For a better presentation of the results, the statements are divided into four groups. In each group, a summary figure presents the mean rating for each statement (**Figure 87**). Furthermore, figures such as **Figure 86** show for each question: the mean, the standard deviation (SD), the distribution of ratings on a bar chart and a pie chart. The bar chart

shows only responses that were obtained on the respective item, while the pie chart shows all user responses, including the percentage of non-responders per item (see Appendix 10.5) for the rest of the results). The bar charts and pie charts are colour coded on a continuum from dark red (0), light red/pink (3), and light green (4-5) to dark green (9). In case the respondents rated the statement 5 or below, which demonstrated that the users were quite unsatisfied with the related feature of the system, they were requested to leave their comments and explain why they gave such ratings. The English translation of these comments is provided along with the related bar and pie charts. The original comments (in Swedish, English, and Castilian) could be referred to in Appendix 10.5. Additionally, a field was provided for the users to offer their general opinions, and the English translation of the comments are collected in Table 20; the original comments (in Swedish, English, and Castilian) could be referred to in Appendix 10.5. The total number of responses considered for these set of questions is N=11.

It should also be noted that, for the sake of simplification, the presentation of “non-responses” were ignored in the bar charts, and the average and SD are respectively calculated without these responses as they are not vital to evaluate the C3-Cloud. However, the percentage of non-response rates are presented in the pie charts.

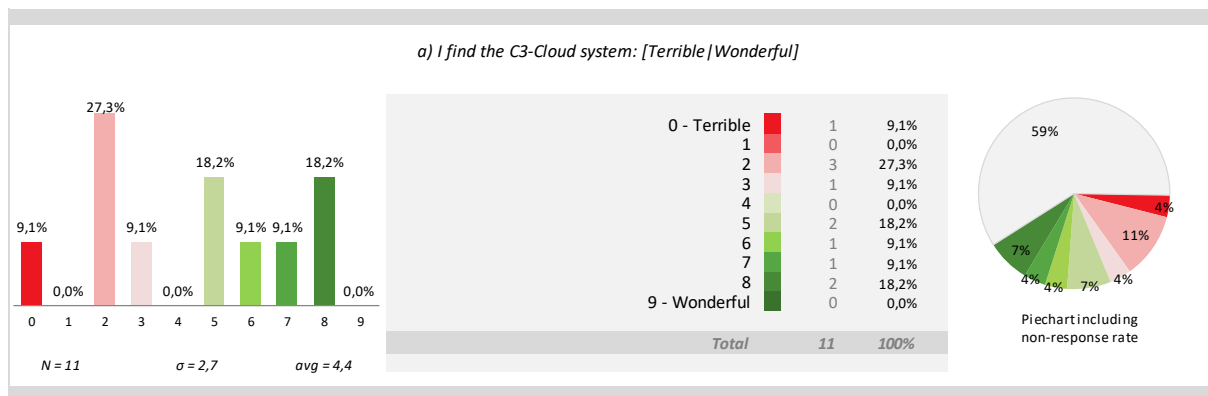


Figure 86 Sample bar and pie chart presentation of the results

Technology trial participants were asked for their reactions to the system by rating each statement on a scale from 0-9. **Figure 87** shows the mean ratings of 11 users' impressions to the first group of statements (a-o). By rating statements (a-c) an average of 4.36, 4.18 and 4.91, the users demonstrated that they had quite a neutral opinion towards finding the C3-Cloud system terrible or wonderful, frustrating, or satisfying, and dull or stimulating. The same rating was repeated for statements (e and f), demonstrating that the users had a neutral opinion if the C3-Cloud system was rigid or flexible and if the system had inadequate or adequate power. Statements (d) and (g-i) were comparatively rated higher, indicating that the users found the C3-Cloud system quite easy to use, and found the use of terminology throughout the system, the work-related terminology and computer terminology quite consistent. Statement (j) was rated below 5, which indicates that the users believed that the terminology “sometimes” related well with the activities that they were doing. Finally, statements (k-o) were rated between 5 and 6, indicating that the users thought that computer terminology was used quite appropriately, the terminology on the screen was more or less precise, the messages appearing and the position of instructions on the screen were quite consistent, and messages appearing on the screen were quite clear.

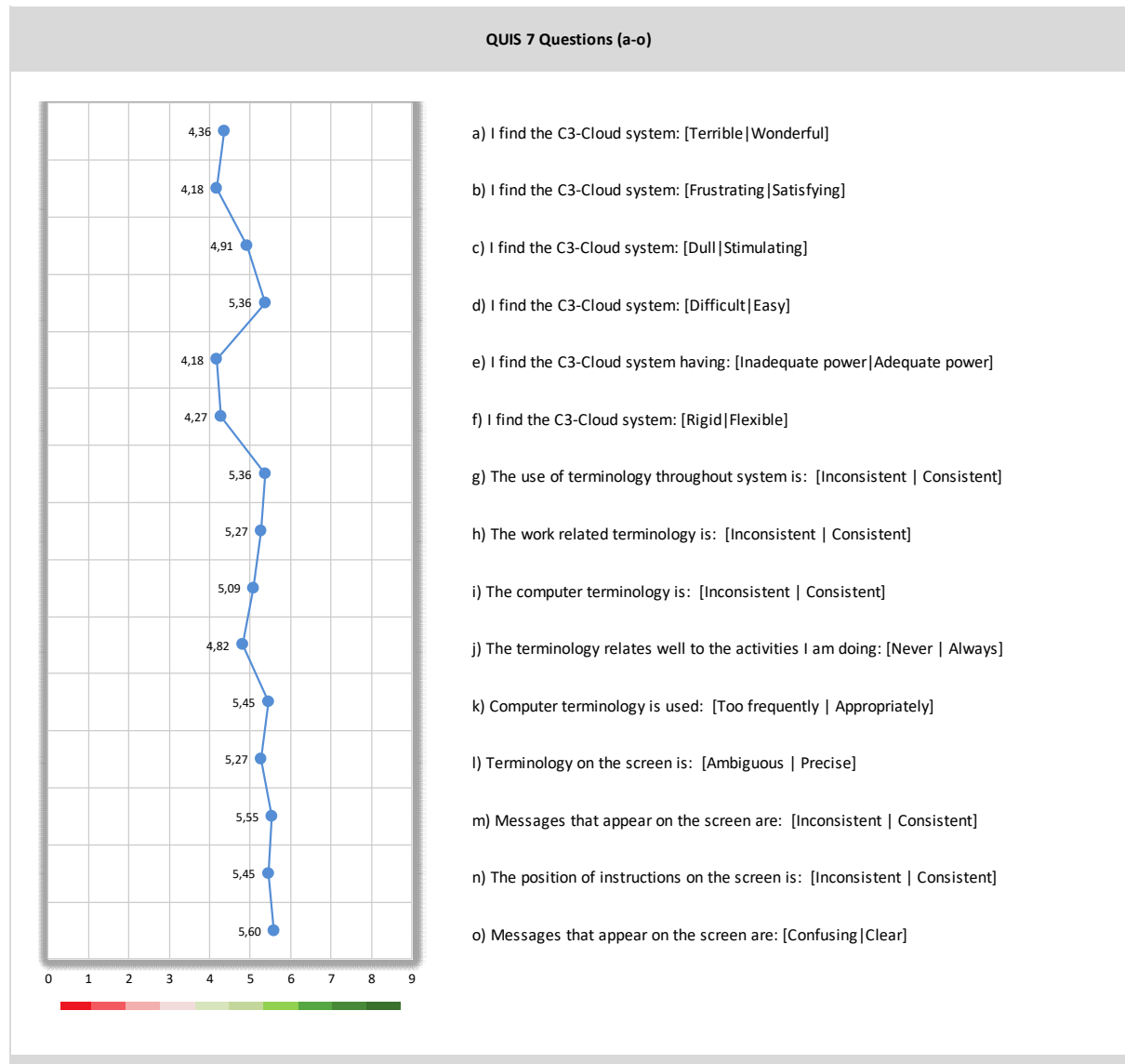


Figure 87 2nd detailed survey for patients, QUIS7 (a-o)

Technology trial participants were asked for their reactions to the system by rating each statement on a scale from 0-9. **Figure 88** shows the mean ratings of 11 users' impressions to the second group of statements (p-ad). Statement (p) was rated above 5, implying that the users believed that instructions for commands or functions were somewhat clear. However, by rating statement (q) on average 4.40, the users showed a neutral opinion about whether the instructions for correcting errors were confusing or clear. Statement (r) was also rated quite neutrally, demonstrating that the users were neutral about whether the computer kept them informed about what it was doing. What certainly needs more reflection upon is statement (s), which was rated lowest in this group, thereby creating a dent in the graph. Accordingly, the users believed that the animated cursors kept them informed only a few times. Statement (t) shows that performing operation sometimes led to predictable results, and statement (u) shows that controlling the amount of feedback was not so easy. By rating statement (v) less than 5, the users proposed that the length of delay between operations was more or less unacceptable, and they also believed that error messages were more or less unhelpful and only sometimes clarified the problem, opening the floor for further discussion on statement (x). Statements (y-aa) were also rated below 5, implying that phrasing of error messages was neither unpleasant nor pleasant, learning advance features was neither difficult nor easy, and the time to learn to use the system was hovering between slow and fast. By

rating statement (ab) 5.20, the users demonstrated that the exploration of features was quite safe. Finally, the users showed that they were neutral about whether remembering specific rules about entering commands was difficult or easy, and if tasks could be performed in a straightforward manner.

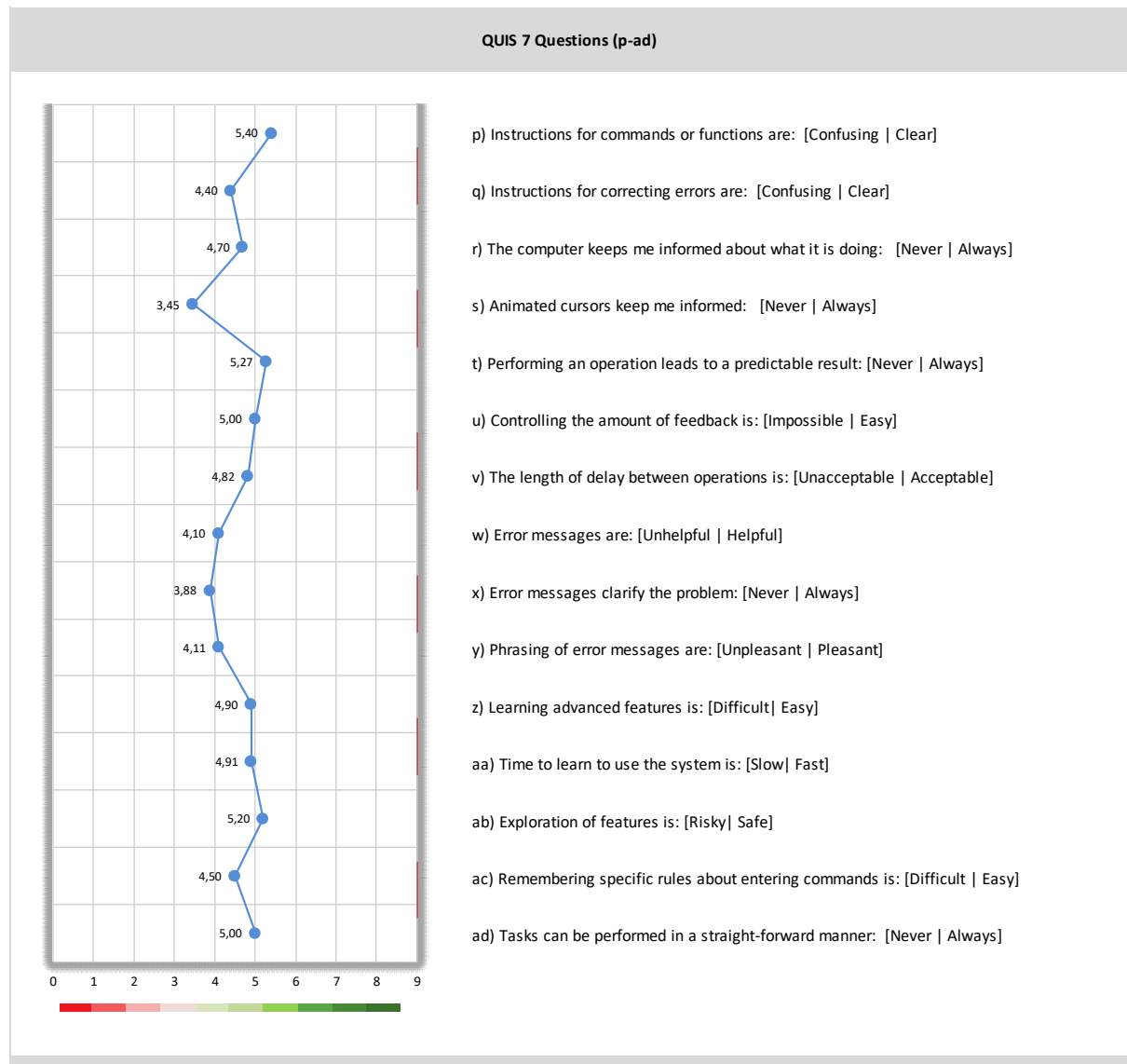


Figure 88 2nd detailed survey for patients, QUIS7 (p-ad)

Technology trial participants were asked for their reactions to the system by rating each statement on a scale from 0-9. **Figure 89** shows the mean ratings of 11 users' impressions to the third group of statements (ae-as). By rating statements (ae-ag) an average of 4.67, 5.09 and 4.90, the users demonstrated that they had quite a neutral opinion towards whether the number of steps per task was too many or just right, if the steps to complete a task always or never followed a logical consequence, and if the feedback on the completion of a sequence of steps was unclear or clear. By rating statements (ah) and (ai) more positively, the users indicated that the system speed and the response time for most operations were quite fast enough. Responses to statement (ak) show that the users thought that operations were quite dependable. However, by rating statements (aj), (al) and (am) less than 5, the users demonstrated that they had a neutral opinion that the system was reliable, that system failures occurred seldom or frequently, and that the system warned them about potential problems. Statement (an-as) were all rated an average above 5 (most of them tilting towards 6) which demonstrates that the users had quite a positive opinion.

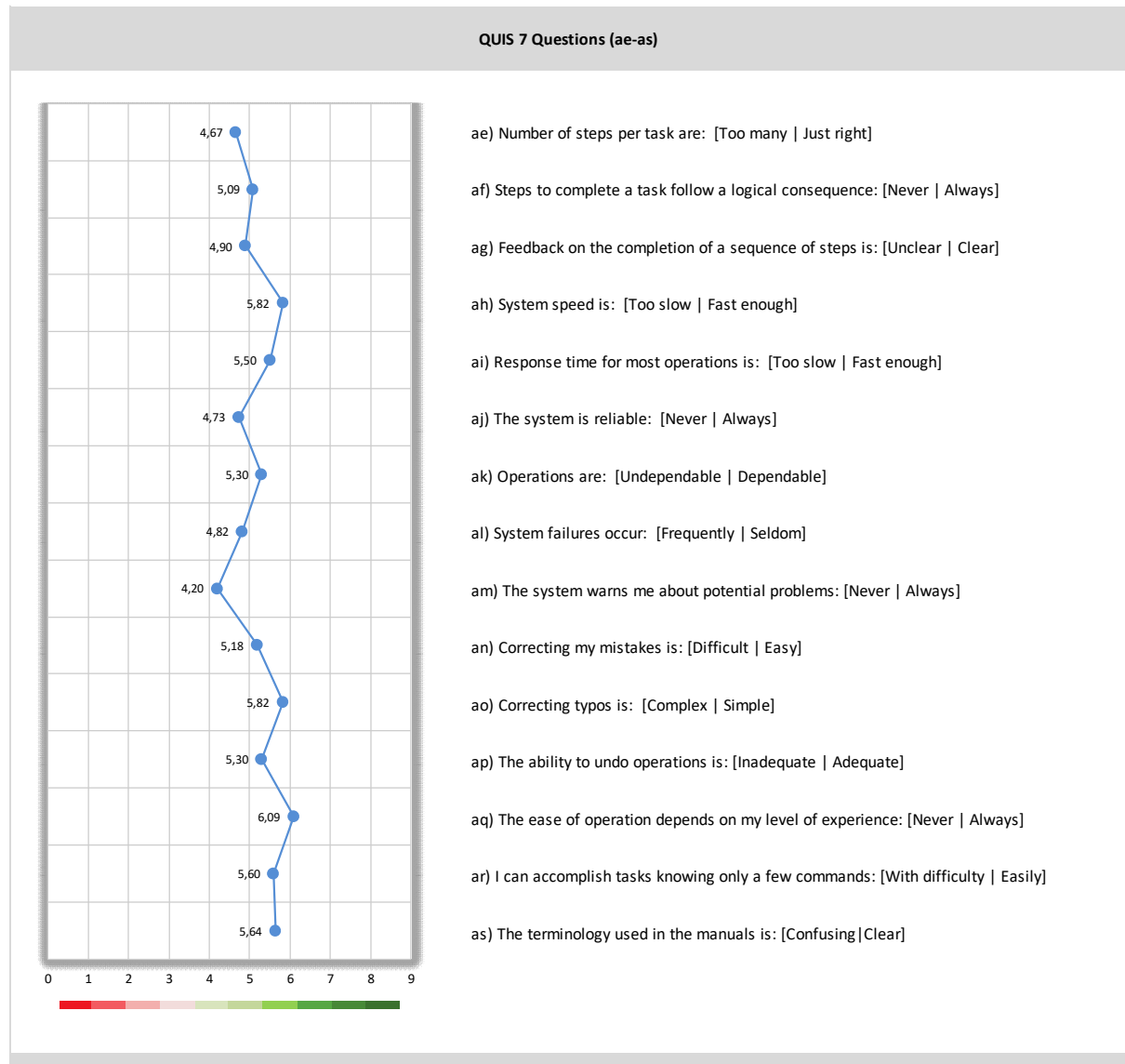


Figure 89 2nd detailed survey for patients, QUIS7 (ae-as)

Technology trial participants were asked for their reactions to the system by rating each statement on a scale from 0-9. **Figure 90** shows the mean ratings of 11 users' impressions to the third group of statements (at-bk). The average rating of 6.70 for statement (at) suggests that the information from the manual was almost always easily understood. By rating statements (au-bb) an average between 5.30 and 5.90, the users showed that they had quite a positive opinion about these statements. The almost straight line resulting from the ratings of statements (av-bb) is interrupted with statement (bc) being rated 4.50, thereby creating a dent in the graph. This indicates that the users were quite neutral about the brightness of movie images. However, this most certainly relates to training material proposed by the MDT which are eternal to the PEP. Statements (bd-bj) were all rated between 5 and 5.75, showing that the users had quite a positive opinion about these statements. However, the last statement in this group was rated 4.57, which suggests that the users were quite neutral towards whether the installation gave meaningful explanation when failures occurred.

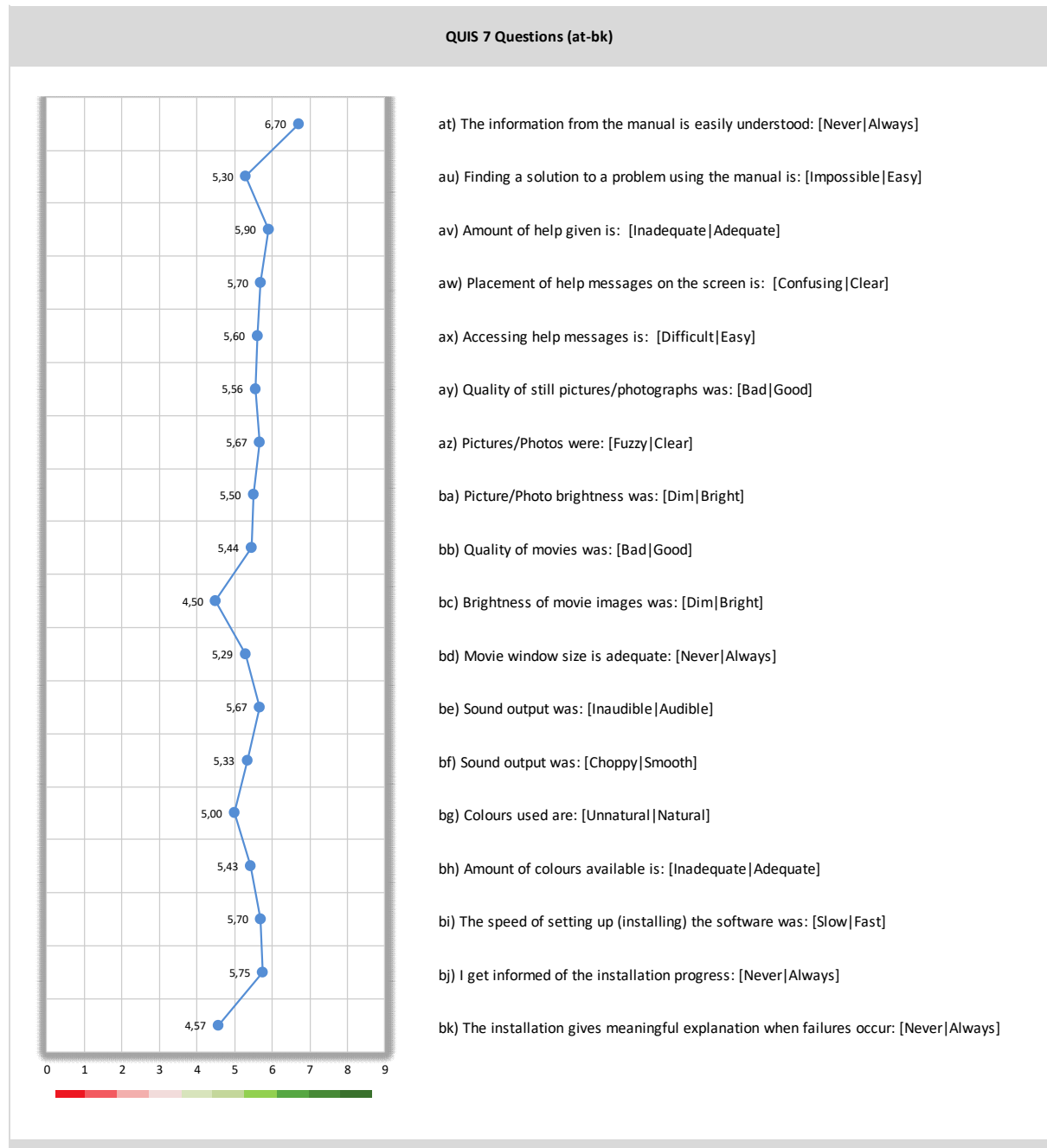


Figure 90 2nd detailed survey for patients, QUIS7 (at-bk)

As mentioned previously, users were asked for further comments if they rated a statement 0-5. The table below displays the English translation of the comments (for the comments in original language refer to Appendix 10.5).

Comments related to statements (English translation)	
1)	<p>I find the C3-Cloud system: [Terrible Wonderful]</p> <ul style="list-style-type: none"> I have no idea about this! It is a bit difficult to understand because the first thing to enter the coordinates is a bit complicated, and the rest is a bit confusing.

	<ul style="list-style-type: none"> • Difficulties at times inputting data. I feel at times that my care team is understandingly giving priority to the virus pandemic (i.e. COVID-19) over my conditions. • The system is too restricted in scope, needs better feedback • Did not derive the benefits I expected. Having said that, I did not require regular help in managing my conditions.
2)	<p>I find the C3-Cloud system: [Frustrating Satisfying]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Lack of further tasks following initial targets. Possibly I have missed something as I understood that I could not request additional tasks as there was not to my knowledge any system to do so other than commenting and providing survey answers. I do try to avoid using busy doctors time with appointments, but strongly feel that the internet could help immensely if we could use it. I fully realize that diagnosis often relies on personal contact because patient views of need are often not accurate, but an initial email or system contact could help. For example, I think my age and conditions make me at serious risk if I get the Covid virus, and a 7 day wait and 111 would possibly be too late. I do not know of any alternative recommendation so would probably dial 111 or the Practice by day 2 or 3. Meanwhile I stay home. Email for personal guidance would avoid concern. • Did not provide the help I expected.
3)	<p>I find the C3-Cloud system: [Dull Stimulating]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Certainly not stimulating but then I suppose I did not find the need to use it regularly.
4)	<p>I find the C3-Cloud system: [Difficult Easy]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
5)	<p>I find the C3-Cloud system having: [Inadequate power Adequate power]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • More feedback, with any corrective action I need to take. • Limited ongoing tasks. I completed mine in a few weeks so have since only completed surveys, although I am awaiting a phone call from my practice on C3 today. • Perhaps more use by me may have changed this.
6)	<p>I find the C3-Cloud system: [Rigid Flexible]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Only outward communication on a few simple tasks without ability to request follow ups. • Not in a position to comment on this.
7)	<p>The use of terminology throughout system is: [Inconsistent Consistent]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
8)	<p>The work-related terminology is: [Inconsistent Consistent]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
9)	<p>The computer terminology is: [Inconsistent Consistent]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.

10)	<p>The terminology relates well to the activities I am doing: [Never Always]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for. Not in a position to comment.
11)	<p>Computer terminology is used: [Too frequently Appropriately]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
12)	<p>Terminology on the screen is: [Ambiguous Precise]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
13)	<p>Messages that appear on the screen are: [Inconsistent Consistent]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
14)	<p>The position of instructions on the screen is: [Inconsistent Consistent]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
15)	<p>Messages that appear on the screen are: [Confusing Clear]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
16)	<p>Instructions for commands or functions are: [Confusing Clear]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
17)	<p>Instructions for correcting errors are: [Confusing Clear]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for. There were none so I cannot comment. Should be "Not applicable" response available
18)	<p>The computer keeps me informed about what it is doing: [Never Always]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for. No comment.
19)	<p>Animated cursors keep me informed: [Never Always]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for. never noticed any. Cannot remember any but initial communication memory may have forgotten them. No comment.
20)	<p>Performing an operation leads to a predictable result: [Never Always]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for. No comment.
21)	<p>Controlling the amount of feedback is: [Impossible Easy]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for. what feedback?
22)	<p>The length of delay between operations is: [Unacceptable Acceptable]</p> <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for. If by operations, you mean follow up medical tasks there were not any. Additionally, as the site seemed to block me out recently and there were no further tasks, there was no point in logging in frequently, so I expected an email to trigger for example a response to this questionnaire.

23)	Error messages are: [Unhelpful Helpful] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • None, cannot comment. • No comment.
24)	Error messages clarify the problem: [Never Always] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • None, cannot comment. • No comment.
25)	Phrasing of error messages are: [Unpleasant Pleasant] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • None, cannot comment. • No comment.
26)	Learning advanced features is: [Difficult Easy] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Unable to comment.
27)	Time to learn to use the system is: [Slow Fast] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Unable to comment.
28)	Exploration of features is: [Risky Safe] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Unable to comment.
29)	Remembering specific rules about entering commands is: [Difficult Easy] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Unable to comment.
30)	Tasks can be performed in a straight-forward manner: [Never Always] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Unable to comment.
31)	Number of steps per task are: [Too many Just right] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Unable to comment.
32)	Steps to complete a task follow a logical consequence: [Never Always] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Unable to comment.
33)	Feedback on the completion of a sequence of steps is: [Unclear Clear] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Unable to comment.
34)	System speed is: [Too slow Fast enough] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
35)	Response time for most operations is: [Too slow Fast enough] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.

36)	<p>The system is reliable: [Never Always]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • it was unavailable several times. • Did not find this to be the case when first started and completed survey had to be repeated.
37)	<p>Operations are: [Undependable Dependable]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • As above.
38)	<p>System failures occur: [Frequently Seldom]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
39)	<p>The system warns me about potential problems: [Never Always]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Unable to comment.
40)	<p>Correcting my mistakes is: [Difficult Easy]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
41)	<p>Correcting typos is: [Complex Simple]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
42)	<p>The ability to undo operations is: [Inadequate Adequate]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
43)	<p>The ease of operation depends on my level of experience: [Never Always]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
44)	<p>I can accomplish tasks knowing only a few commands: [With difficulty Easily]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
45)	<p>The terminology used in the manuals is: [Confusing Clear]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
46)	<p>Finding a solution to a problem using the manual is: [Impossible Easy]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Not required.
47)	<p>Amount of help given is: [Inadequate Adequate]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
48)	<p>Placement of help messages on the screen is: [Confusing Clear]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
49)	<p>Accessing help messages is: [Difficult Easy]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
50)	<p>Quality of still pictures/photographs was: [Bad Good]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.
51)	<p>Pictures/Photos were: [Fuzzy Clear]</p> <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for.

52)	Picture/Photo brightness was: [Dim Bright] <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
53)	Quality of movies was: [Bad Good] <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
54)	Brightness of movie images was: [Dim Bright] <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
55)	Movie window size is adequate: [Never Always] <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
56)	Sound output was: [Inaudible Audible] <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
57)	Sound output was: [Choppy Smooth] <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
58)	Colors used are: [Unnatural Natural] <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
59)	Amount of colors available is: [Inadequate Adequate] <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for.
60)	The speed of setting up (installing) the software was: [Slow Fast] <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for. the link given did not work - I had to key in to load it Unable to comment.
61)	I get informed of the installation progress: [Never Always] <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for. Unable to comment.
62)	The installation gives meaningful explanation when failures occur: [Never Always] <ul style="list-style-type: none"> No or bad explanation for what I use C3-Cloud for. Cannot remember any. You really do need a N/A button sometimes. Unable to comment.

Table 20 2nd detailed survey for patients, comments related to statements rated 0-5, English translation

The following table below additionally presents the users' general comments (in English) about their interaction with the system and their level of satisfaction with it (for these comments in original language refer to Appendix 10.5).

General Comments (English translation): Swedish/RJH (1), English/SWFT (2 and 3), Spanish/BC (4)	
1)	No or bad explanation for what I use C3-Cloud for.
2)	No please read those made.
3)	No

4) It is complicated in general

Table 21 2nd detailed survey for patients, general comments, English translation

6.7.4. Patients eCare Client Impact Survey (eCCIS)

In the eCCIS, the patients were asked to respond to four questions inquiring how often they did home-based self-measurements, how much time they spent doing home-based self-measurement etc. As the options for each question varied, it is not possible to offer a summary graph for the mean ratings. Instead, each question and the related bar and pie charts are illustrated and described separately. It should also be noted that the non-response rates are considerably high in all questions, hence it is just mentioned once here and not individually for every question.

As indicated previously, for the sake of simplification, the presentation of “Not relevant to me” and non-responses were ignored in the bar charts, and the average and SD are respectively calculated without these two response types as they are not vital when it comes to the evaluation of the system. However, the percentage of both are presented in the pie charts.

When the patients were asked how often they usually did their home-based self-measurements, 40% responded about 2 to 4 times a week, 30% chose “Less than once per week” and 10% said they did it more than once per day. 20% of the respondents also claimed that this question was not relevant to them.

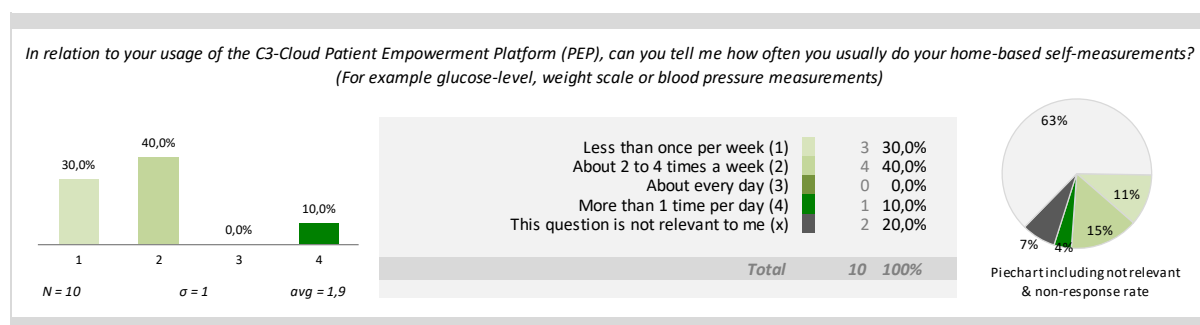


Figure 91 How often do you usually do your home-based self-measurements

When asked how much time they usually spent doing their home-based self-measurement readings, half of the respondents said “Less than 10 minutes per session”, 30% said between 10 minutes and half an hour per session, and 20% chose that it was not relevant to them.

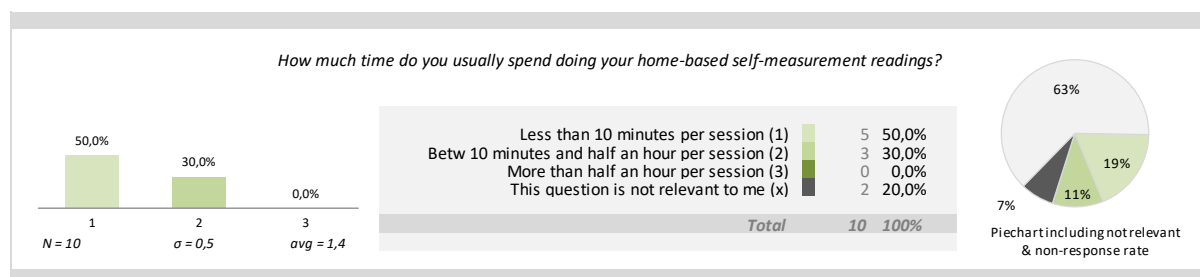


Figure 92 How much time do you usually spend doing your home-based self-measurement readings

When asked how often they used the C3-Cloud PEP, 70% said less than once per week, 10% chose about 2 to 4 times per week, 10% said about every day and 10% said that it was not relevant to them.

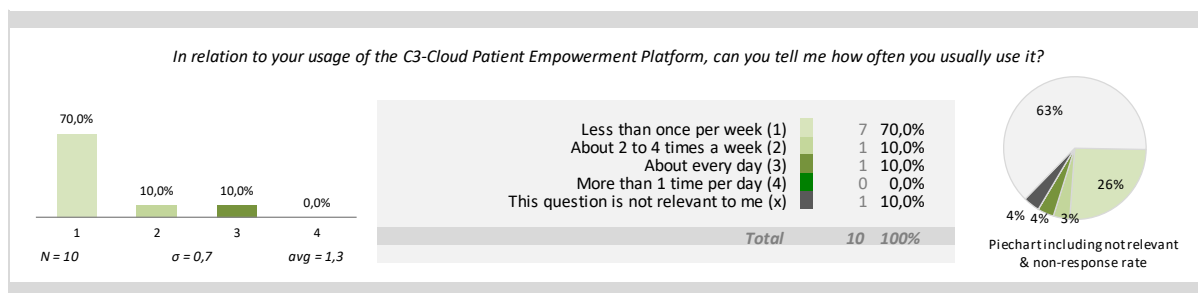


Figure 93 In relation to your usage of the C3-Cloud Patient Empowerment Platform, can you tell me how often you usually use it

To the question how much time they usually spent on using the C3-Cloud PEP, 30% of the users replied less than 10 minutes per session, half of the respondents said between 10 minutes and half an hour per session, 10% said more than half an hour per session and 10% said that it was not relevant to them.

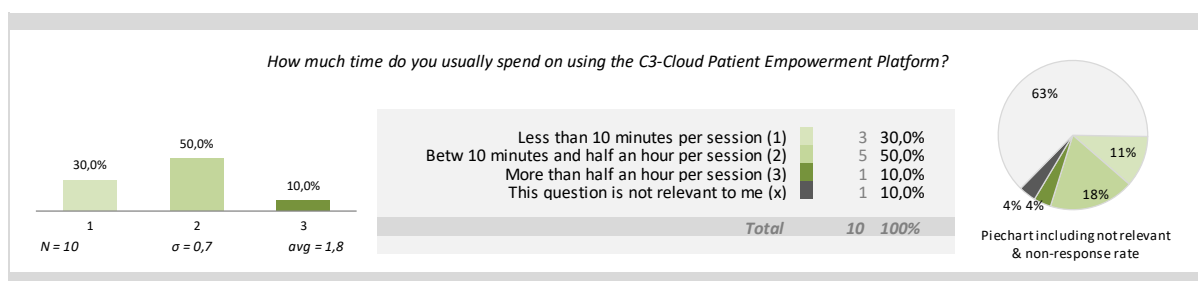


Figure 94 How much time do you usually spend on using the C3-Cloud Patient Empowerment Platform

When asked how much time a visit to a GP takes them, half of the users responded with “Less than an hour”, 40% said between one and two hours and 10% said it was not relevant to them.

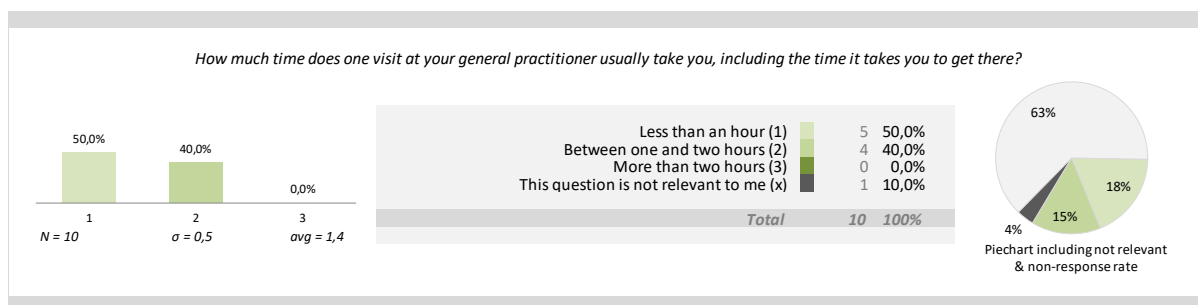


Figure 95 How much time does one visit at your general practitioner usually take you, including the time it takes you to get there

When asked how much time a visit to their health consultant took them, 30% of the users responded with “Less than an hour”, 40% said between one and two hours and 30% said more than three hours.

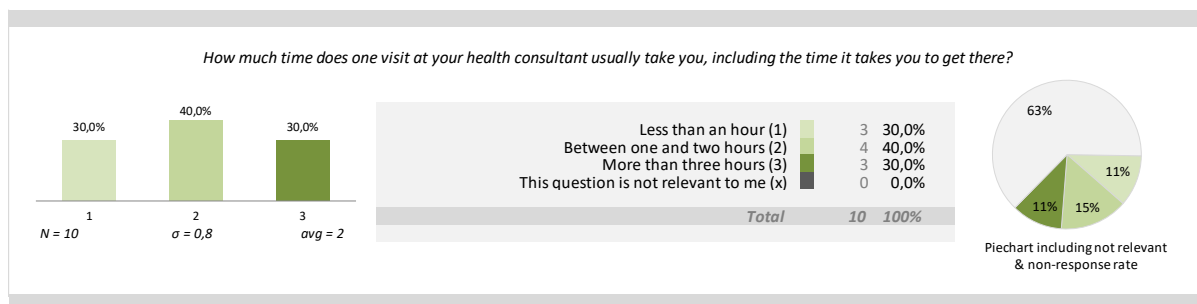


Figure 96 How much time does one visit at your health consultant usually take you, including the time it takes you to get there

When asked to what extent C3-Cloud participation affected their motivation to perform daily physical activities, 50% of the respondents said it had not affected their motivation, 40% said it had increased their motivation a little and 10% chose it was not relevant to them.

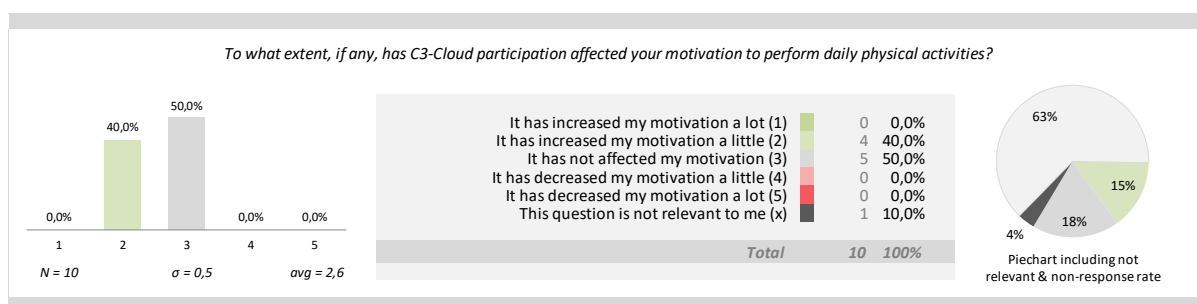


Figure 97 To what extent has C3-Cloud participation affected your motivation to perform daily physical activities

When asked to what extent C3-Cloud participation affected their ability to perform daily physical activities, 70% of the respondents said it had not affected their ability, 20% said it had increased their ability a little and 10% chose it was not relevant to them.

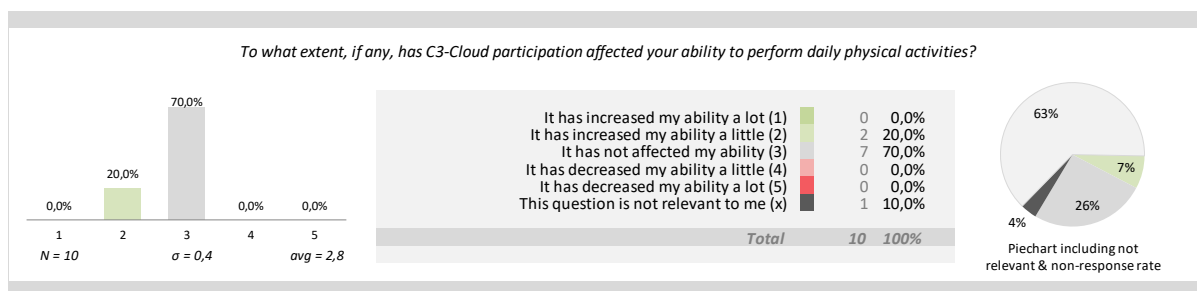


Figure 98 To what extent has C3-Cloud participation affected your ability to perform daily physical activities

When asked to what extent C3-Cloud participation affected their emotional wellbeing, 70% of the respondents said it had not affected their emotional wellbeing, 20% said it had increased their emotional wellbeing a little and 10% chose it was not relevant to them.

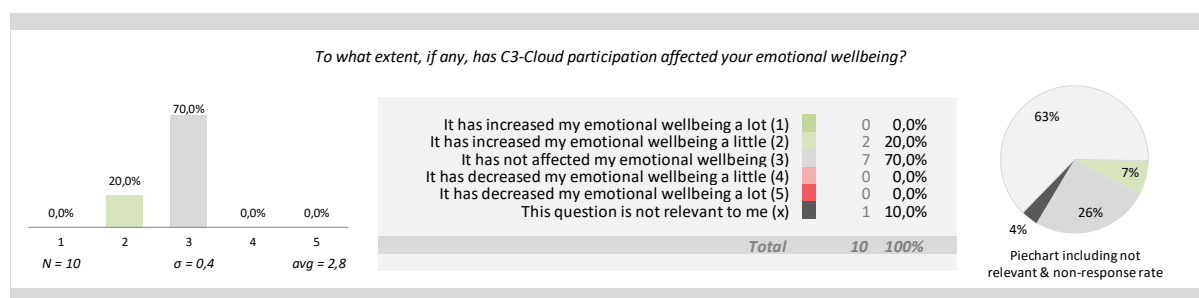


Figure 99 To what extent has C3-Cloud participation affected your emotional wellbeing

When asked to what extent C3-Cloud participation affected their ability to get along with their health condition in day-to-day life, 70% of the respondents said it had not affected their ability, 20% said it had increased their ability a little and 10% chose it was not relevant to them.

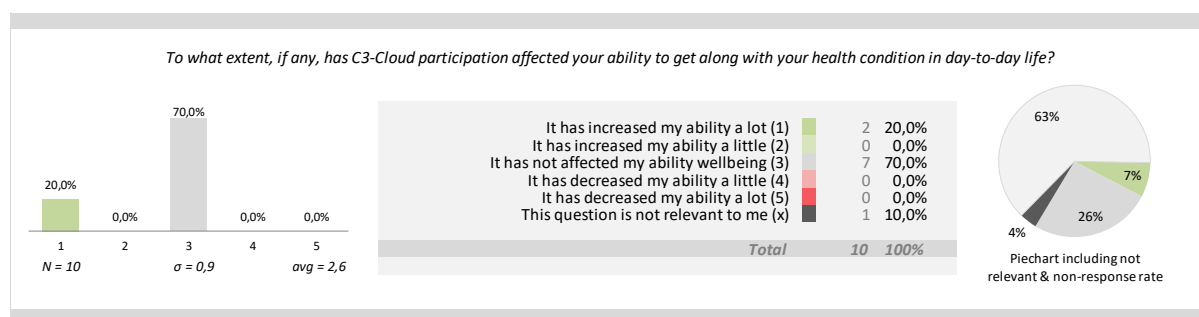


Figure 100 To what extent has C3-Cloud participation affected your ability to get along with your health condition in day-to-day life

When asked to what extent C3-Cloud participation affected their anxiety about their health condition, 70% of the respondents said it had not affected their anxiety about their health condition, 10% said it had increased their anxiety about their health condition a little, and 10% of the respondents claimed it had increased their anxiety about their health condition a little; 10% also chose it was not relevant to them.

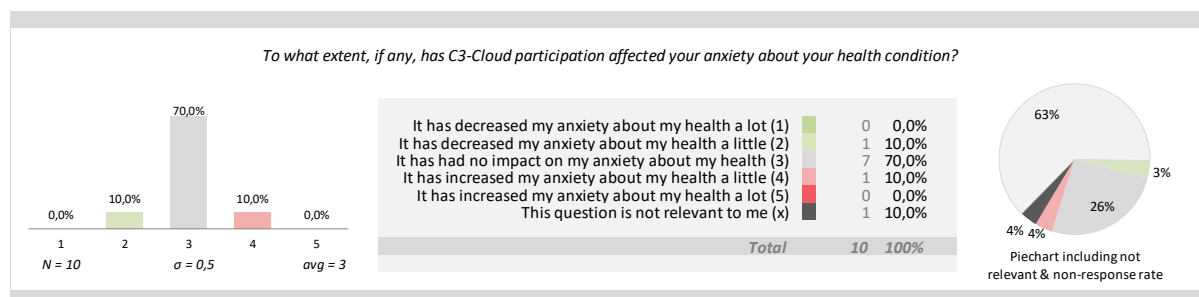


Figure 101 To what extent has C3-Cloud participation affected your anxiety about your health condition

When asked to what extent C3-Cloud participation affected how lonely they felt, 80% of the respondents said it had not affected how lonely they felt, and 20% chose it was not relevant to them.

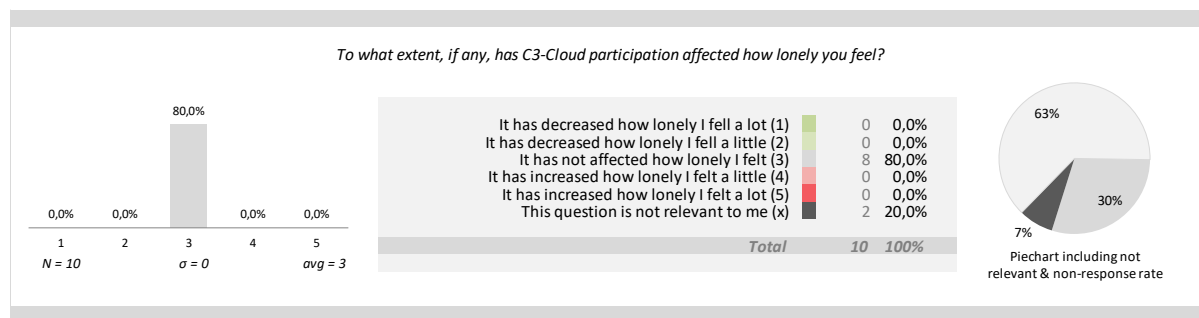


Figure 102 To what extent has C3-Cloud participation affected how lonely you feel

When asked to what extent C3-Cloud participation affected their relationship with their family carer, 44.4% of the respondents said it had not affected their relationship with their family carer, 22.2% said it had improved their relationship a little and 33.3% chose it was not relevant to them.

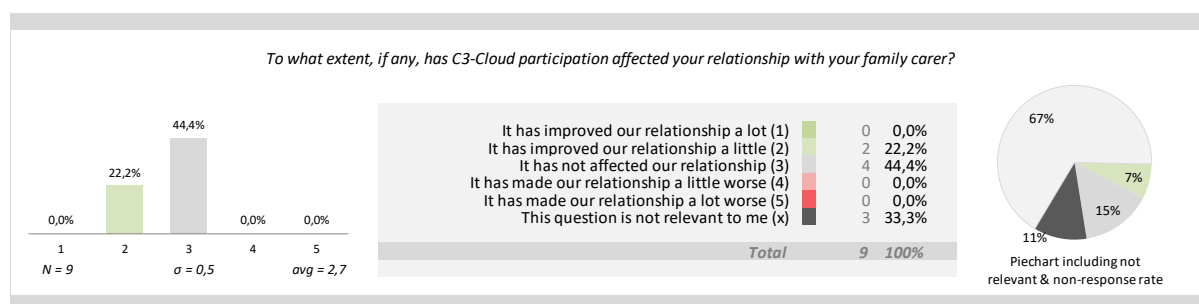


Figure 103 To what extent has C3-Cloud participation affected your relationship with your family carer

When asked to what extent C3-Cloud participation affected their relationship with the professional carers looking after them, 70% of the respondents said it had not affected their relationship, 10% said it had improved their relationship a little and 20% chose that it was not relevant to them.

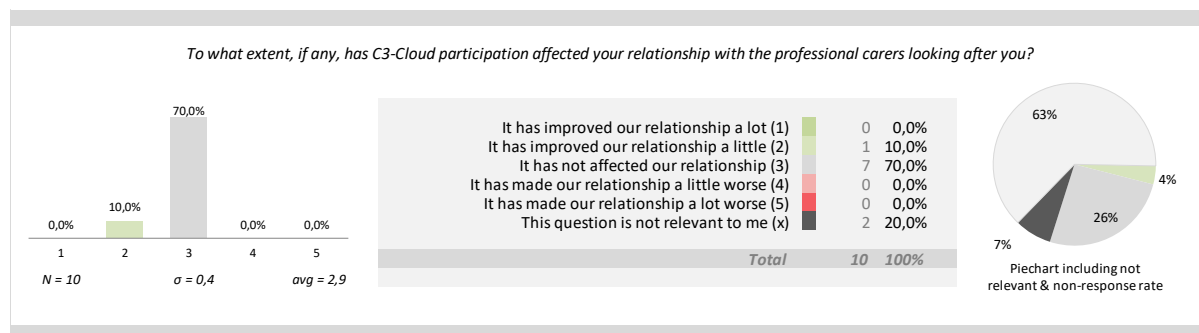


Figure 104 To what extent has C3-Cloud participation affected your relationship with the professional carers looking after you

When asked if they had to repeat their health information a lot when talking to different people treating and caring for them, 30% said that they usually had to give such information only once, 20% said that they sometimes needed to repeat this information, and 20% said that they had to repeat such information quite frequently. 30% chose it was not relevant to them.

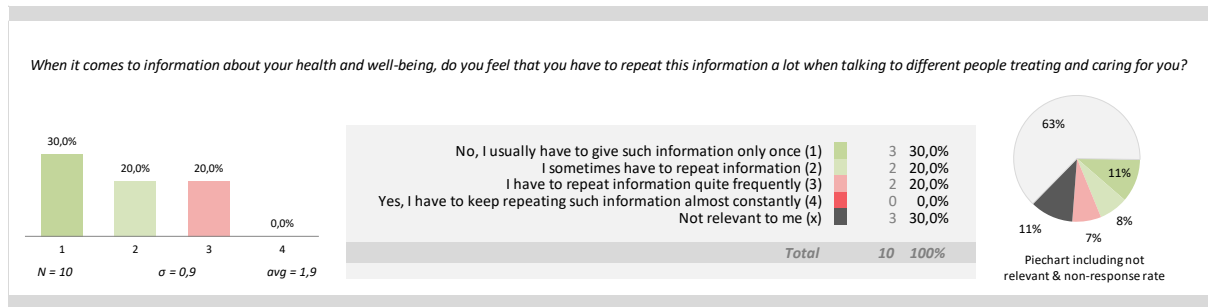


Figure 105 When it comes to information about your health and well-being, do you feel that you have to repeat this information a lot when talking to different people treating and caring for you

When asked if patients had a feeling that different people treating and caring for them worked well together, 60% said all of them worked well together, 10% said most of them worked well together and 20% chose that some of them worked well together. 10% of the respondents decided that this question is not relevant to them.

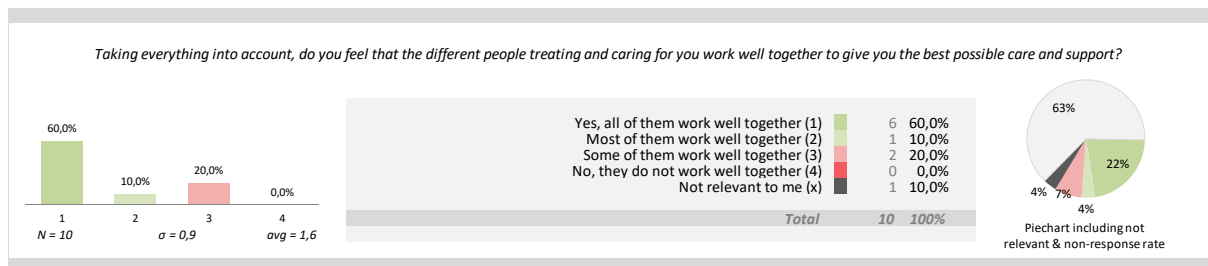


Figure 106 Taking everything into account, do you feel that the different people treating and caring for you work well together to give you the best possible care and support

When asked how satisfied the users were with the C3-Cloud application, 9.1% said that they were very satisfied, 27.3% said that they were fairly satisfied, another 27.3% said that they were neither satisfied nor dissatisfied, 9.1% chose fairly satisfied and 18.2% were very dissatisfied with the application. 9.1% of the respondents decided that it is not relevant to them.

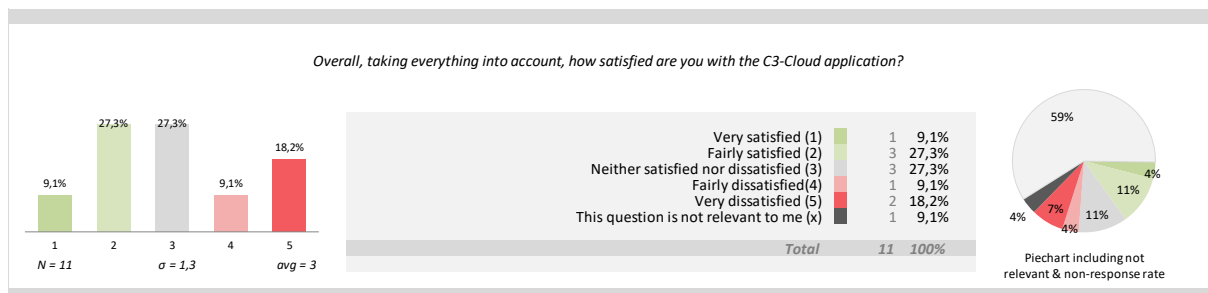


Figure 107 Overall, how satisfied are you with the C3-Cloud application

When asked if the C3-Cloud application was worth the effort involved in using it, 9.1% said “Yes, very much”, 36.4% said “Yes, mostly”, 9.1% had a neutral opinion, 27.3% said “No, mostly not” and 18.2% said “No, certainly not”.

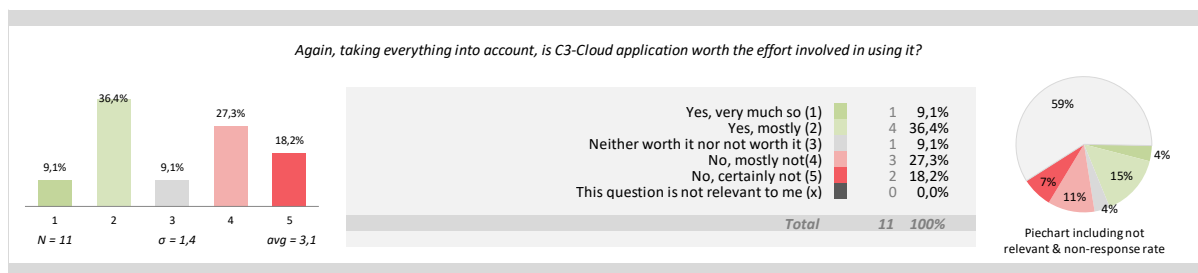


Figure 108 Is C3-Cloud application worth the effort involved in using it

Finally, regarding the question if they wanted to continue using the C3-Cloud application in the future, a peak of 36.4% replied with “Definitely yes”, 18.2% would probably continue using the application, 9.1% were of a neutral opinion, 27.3% would probably not want to use the application and 9.1% said that they will certainly not continue using the C3-Cloud application.

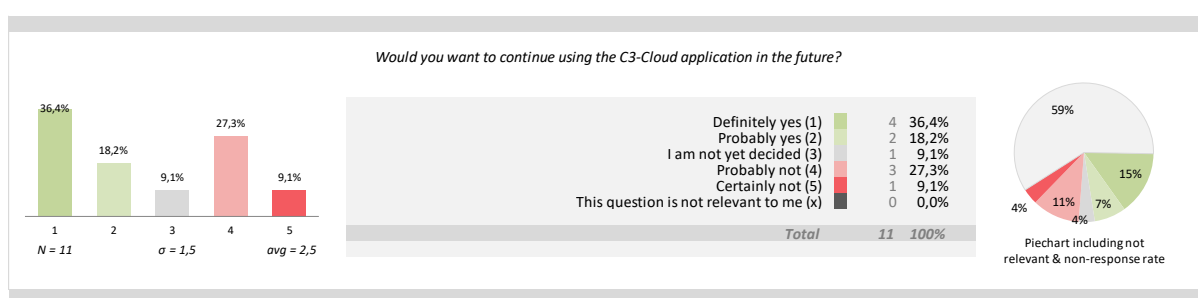


Figure 109 Would you want to continue using the n C3-Cloud application in the future

Each group of eCCIS questions also separately asked the respondents if they wanted to add further details to add to the questions asked, the translations of which are gathered in the table below. (for the original language of the comments see Appendix 10.5).

eCCIS, patients' general comments (English translation)	
1)	I think a C3 system with ongoing intercommunication and patient response/request system is an essential in this digital age and could have been invaluable in the present Covid crisis. The phone is not the best contact, as there is much material the Practice could provide with authority, which we now seek directly from the internet.
2)	If I get a better explanation of what the program does for me, it may be something for me.
3)	Everything depends on whether it is regular or temporary staff who work. Some of my diseases are unusual and in combination they can be a little special, to treat. Many new members of the workforce are interested in what, for example, AIP is and what happens in the event of an attack and what may have caused them. Which I find good.
4)	For reasons as stated throughout this survey. With well managed conditions, there was little or no need to refer to this on a regular basis.
5)	No or bad explanation for what I use C3-Cloud for.
6)	No thank you.
7)	No or bad explanation for what I use C3-Cloud for.

Table 22 2nd eCCIS general comments, English translation

6.7.5. Patient Training Material

The feedback for C3-Cloud's patient training material was asked through a range of open-ended questions. The below table provides the English translation of the result (for these comments in original language refer to Appendix 10.5).

Answers given to patient training material questions (English translation)	
1)	<p>What did you like most about the offered training material?</p> <ul style="list-style-type: none"> • Nothing, where is the material? • Informative and good when talking to others when you have good facts. • It has helped me to know better my pathologies. • Good for reference. • Clarity, although it is possibly more extensive than necessary and could do with condensing for general use. • Understandable.
2)	<p>Please describe in your own words the main problems you have faced (if any) with the use of the training material?</p> <ul style="list-style-type: none"> • Have none. • I still think the application is difficult to input the data is very slow. • None, except time to digest. • None.
3)	<p>Please describe in a few words if and how the training material affected your capability to manage your health?</p> <ul style="list-style-type: none"> • Various tips on what to think about to make it easier to cope with your illness. • Same as before. • No effect. • Little if any. • It did not.
4)	<p>Is the way and sequence in which training material is offered to you helpful and appropriate?</p> <ul style="list-style-type: none"> • Not very useful. • Yes, although long since used. • No comment.
5)	<p>What additional material or information do you think would be helpful to you?</p> <ul style="list-style-type: none"> • Well, I do not know, simpler language. • Ability to communicate with Practice or Medical responder. • None.
6)	<p>Do you think the provided material helps you to learn from other patients with multi-morbidity?</p> <ul style="list-style-type: none"> • Hesitant. • No. • Have not found any such material. Have I missed it, if so how? • Not at all.

7)	<p>What are your thoughts about supporting and getting support from other patients by engaging with them in support groups?</p> <ul style="list-style-type: none"> • Do not know. • I have not had that in this app. • Good. • Not applicable.
8)	<p>What are your recommendations for future enhancements to the training material?</p> <ul style="list-style-type: none"> • Simplify and condense. • None.

Table 23 Patient training material, English translation

The last question was put in the form of an array question that asked the users for rating a statement, which is presented below:

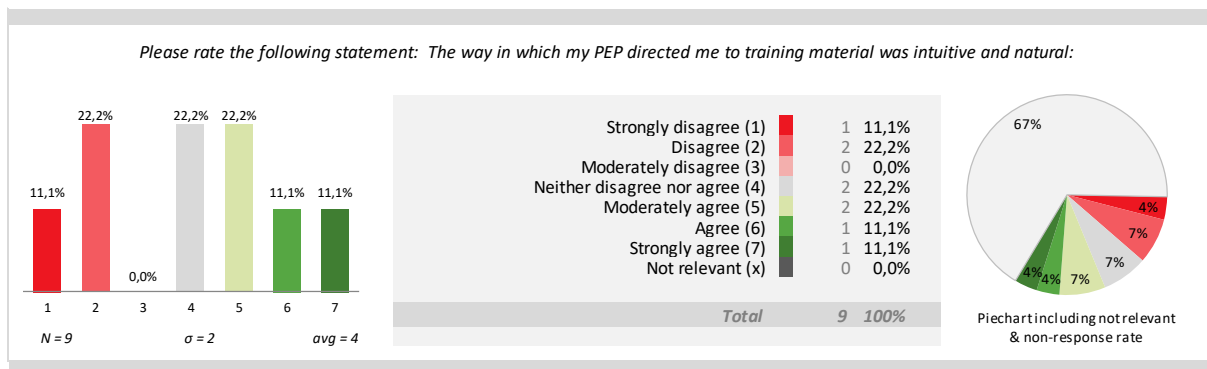


Figure 110 The way in which my PEP directed me to training material was intuitive and natural

6.8. C3-Cloud: First Survey for Informal Caregivers

6.8.1. Basic Questions

Like the previous surveys, the survey sent to the informal caregivers included three basic questions prior to C3-Cloud-specific questions. Three respondents (N=3) in three polit sites submitted their responses to these basic questions. Of those respondents, one was between 50-54, one was between 60-64, and one was between 70-74 years of age (see **Figure 111**).

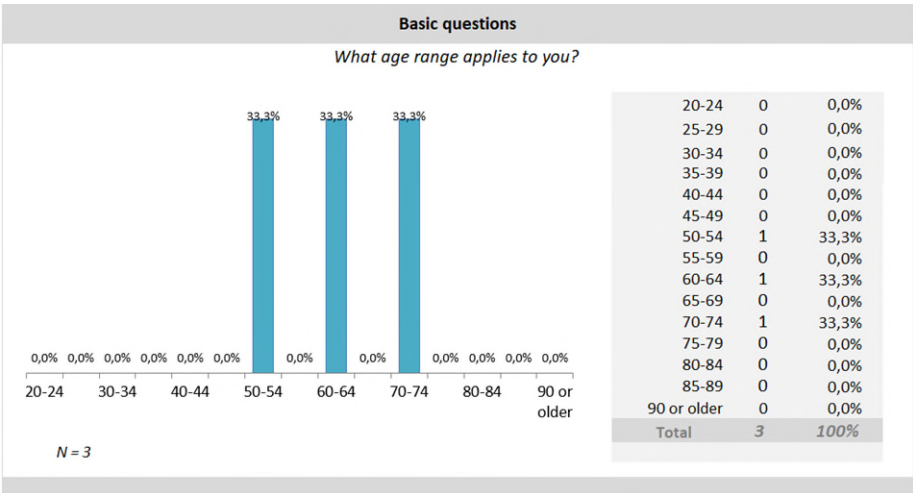


Figure 111 1st survey informal caregivers, basic question (age)

The second and third basic questions asked the respondents about their sex and which area they lived in. The results showed that all three respondents were female and lived in Region Jämtland Härjedalen (see **Figure 112** and **Figure 113**).

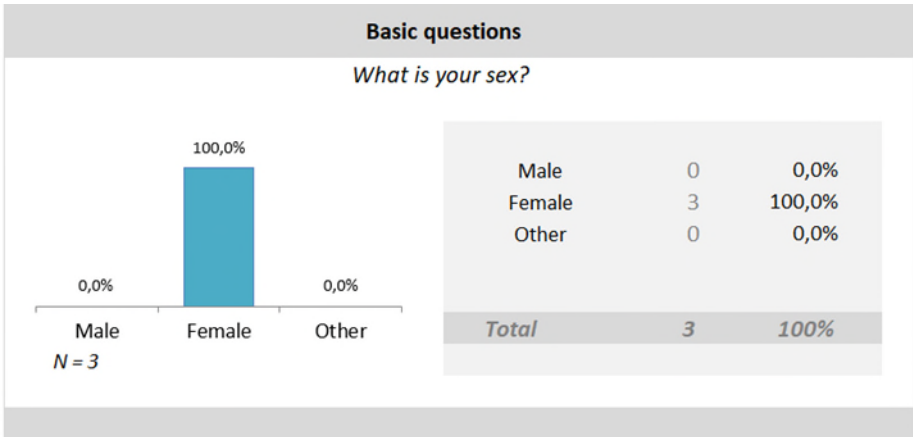


Figure 112 1st survey informal caregivers, basic question (sex)

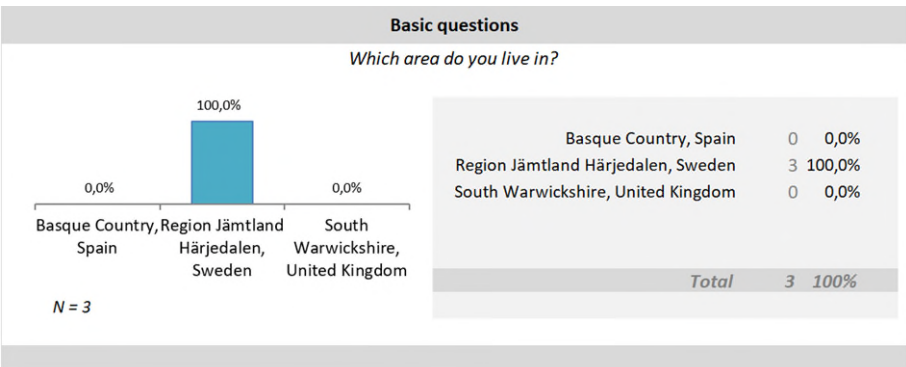


Figure 113 1st survey informal caregivers, basic question (area)

6.8.2. The eCare Client Impact Survey (eCCIS)

In the eCCIS, the informal caregivers were asked to respond to four questions inquiring how often they helped the person with home-based self-measurements, how much time they spent with helping, and how long it took them to visit a general practitioner or health consultant. As the options for each question varied (except for the last two), it is not possible to offer a graph for the mean ratings. Instead, each question and the related bar and pie charts are illustrated and described separately.

As indicated previously, for the sake of simplification, the presentation of “Not relevant to me” and non-responses were ignored in the bar charts, and the average and SD are respectively calculated without these two response types as they are not vital when it comes to the evaluation of the C3-Cloud. However, the percentage of both are presented in the pie charts.

When informal caregivers were asked how often they usually helped the person doing his/her home-based self-measurements, 67% responded that it was not relevant to them and 33% chose “About every day”.

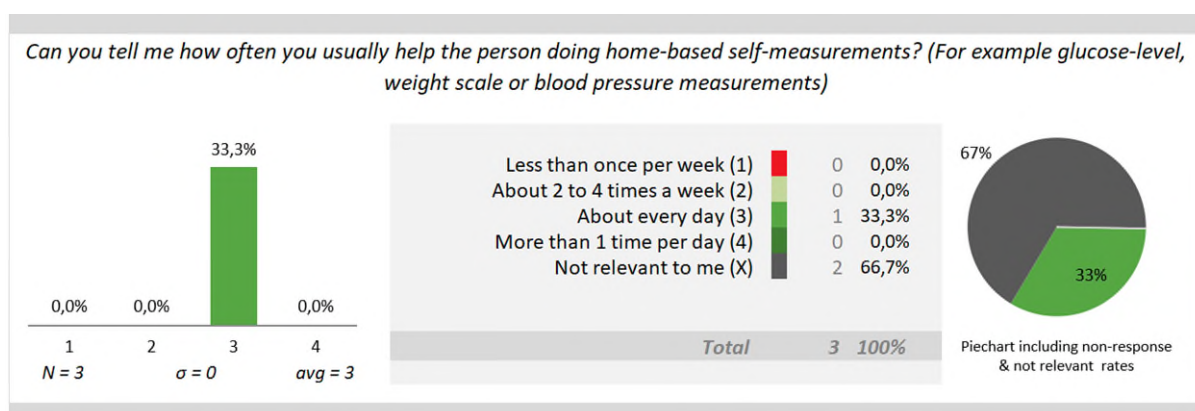


Figure 114 How often do you usually help the person doing home-based self-measurements

When asked how much time they spent with home-based self-measurement readings, 67% of the respondents said that it was not relevant to them and 33% confirmed that they spent less than 10 minutes per session with self-measurement readings.

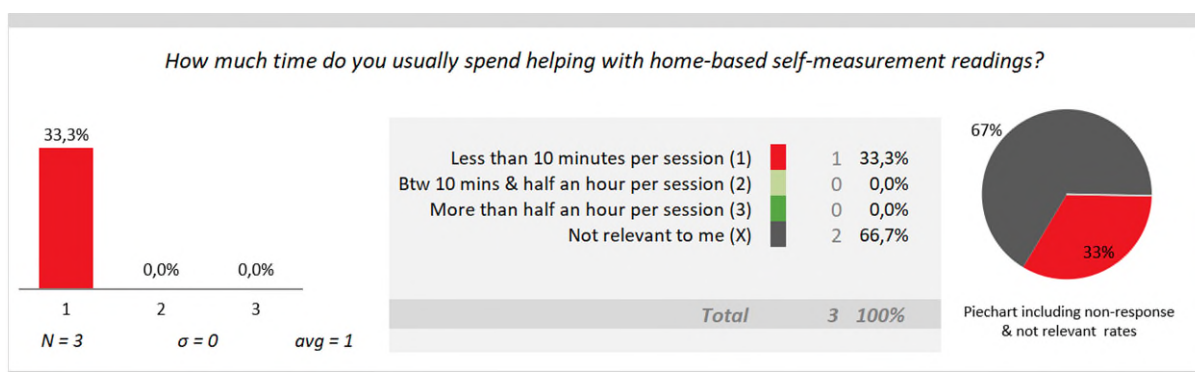


Figure 115 How much time do you usually spend helping with home-based self-measurement readings

To the question how much time they spent going to the general practitioner, including the time it took them to get to the physician’s office, 67% responded with “Less than an hour” and 33% said it was not relevant to them.

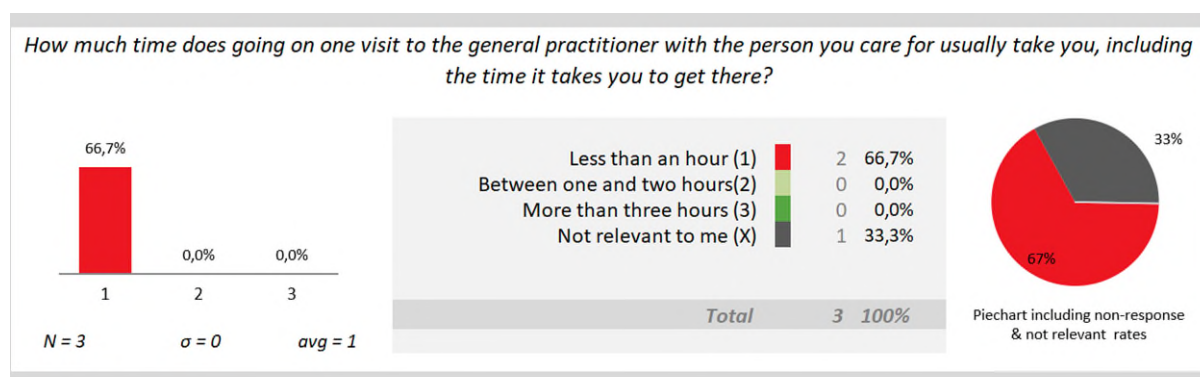


Figure 116 How much time does going on one visit to the general practitioner with the person you care for usually take you

Finally, regarding the time they usually spent going to a health consultant, including the travel time, 33% responded with “Less than an hour”, 33% responded with “Between one and two hours”, and another 33% responded that it was not relevant to them.

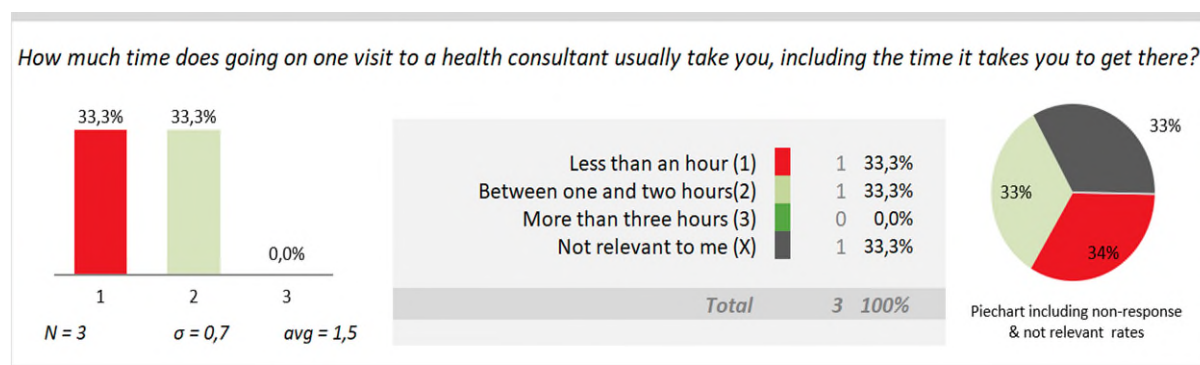


Figure 117 How much time does going on one visit to a health consultant usually take you

6.9. C3-Cloud: Second Survey for Informal Caregivers

6.9.1. Basic Questions

The second survey for informal caregivers was completed by only two respondents (N=2). The share of informal caregivers per patient varies between 5-15% across the pilot sites. In this perspective, we addressed approximately 11-33 informal caregivers and thus had a return rate of 7-20%.

As in the first survey, respondents answered three basic questions prior to questions specific to C3-Cloud. Firstly, concerning the age range of the two respondents, one was between 45-49 and one was between 65-69 years of age.

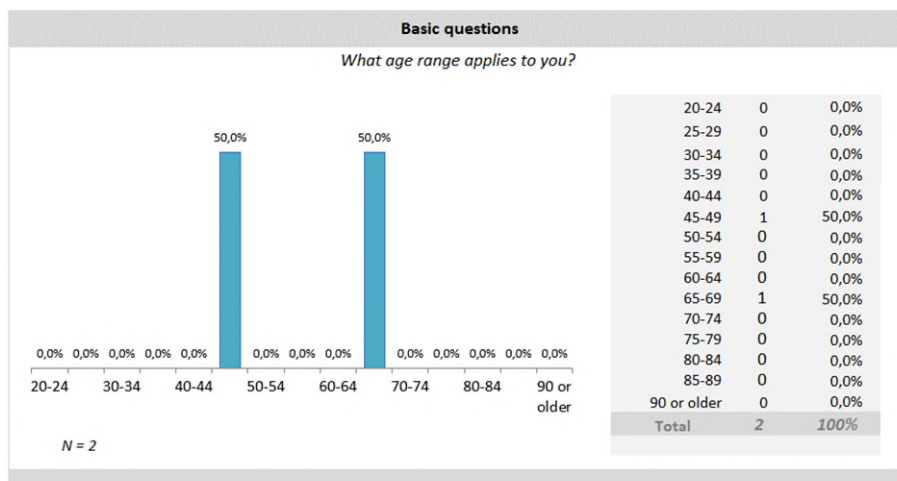


Figure 118 2nd survey informal caregivers, basic question (age)

Secondly, regarding the basic question about the users' sex, one respondent was male and one was female (see **Figure 119**). Thirdly, asking about the area they live in, both informal caregivers reported living in the Spanish Basque Country (see **Figure 120**).

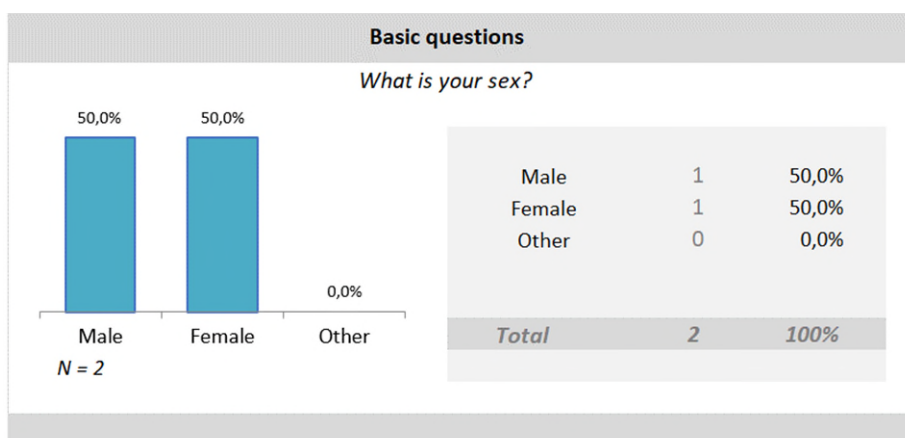


Figure 119 2nd survey informal caregivers, basic question (sex)

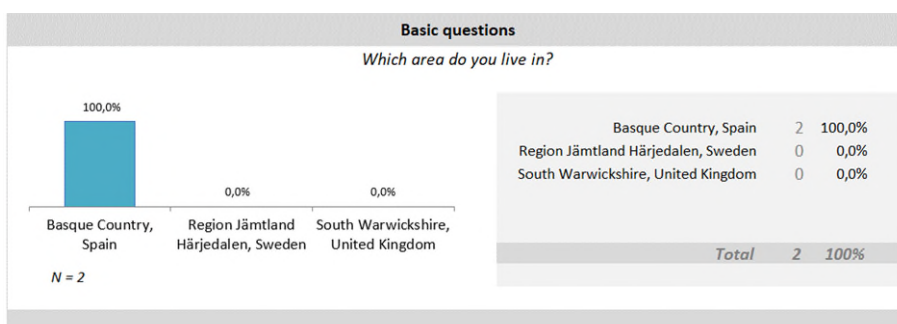


Figure 120 2nd survey informal caregivers, basic question (area)

6.9.2. The eCare Client Impact Survey (eCCIS)

Like the first round of the eCCIS, which evaluates the perceived service utility of the C3-Cloud application to Technology trial participants, informal caregivers were asked four questions about

the time spent using C3-Cloud. Each question is illustrated separately through related bar and pie charts. As noted, the option “Not relevant to me” and non-response were disregarded in the bar charts but represented in the pie charts.

When asked how often they usually helped the person with home-based self-measurements in relation to the PEP, both respondents reported to provide self-measurement support 2-4 times per week.

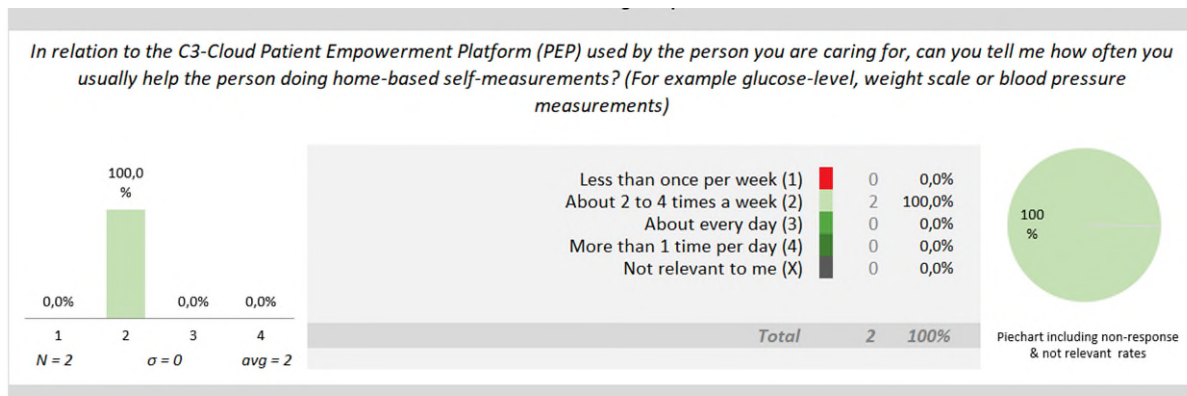


Figure 121 How often do you usually help the person doing home-based self-measurements

When asked how much time informal caregivers usually spent with home-based self-measurement readings, the two respondents noted between 10 minutes and half an hour per session.

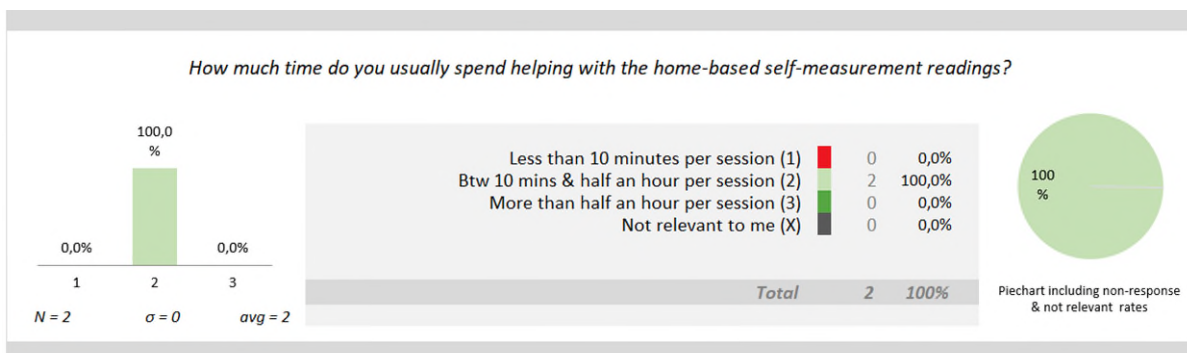


Figure 122 How much time do you usually spend helping with home-based self-measurement readings

Regarding the time needed for one visit to the general practitioner, including the travel time to get there, both informal caregivers chose the option “Between one and two hours”, which is longer compared to the first survey for informal caregivers.

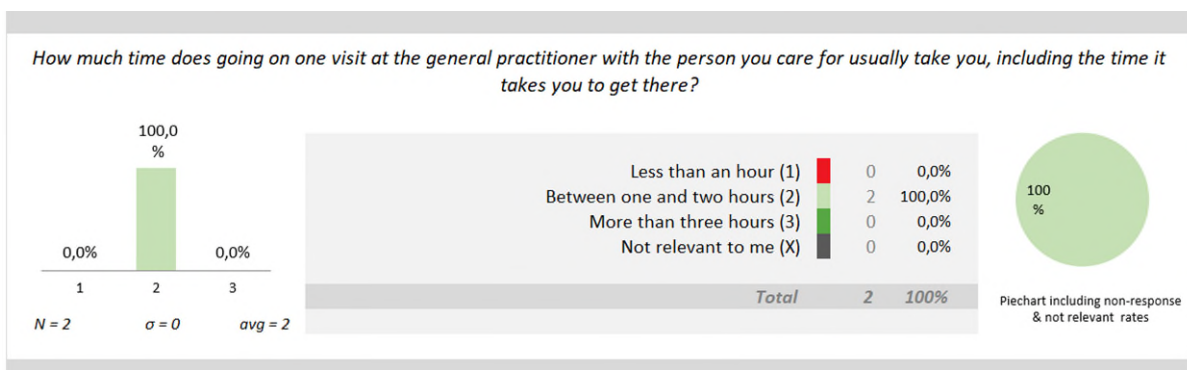


Figure 123 How much time does going on one visit at the general practitioner with the person you care for usually take you

However, looking at the time spent going on one visit to a health consultant, responses were like the first survey. Thus, one caregiver replied it took less than one hour, while the other needed between one and two hours.

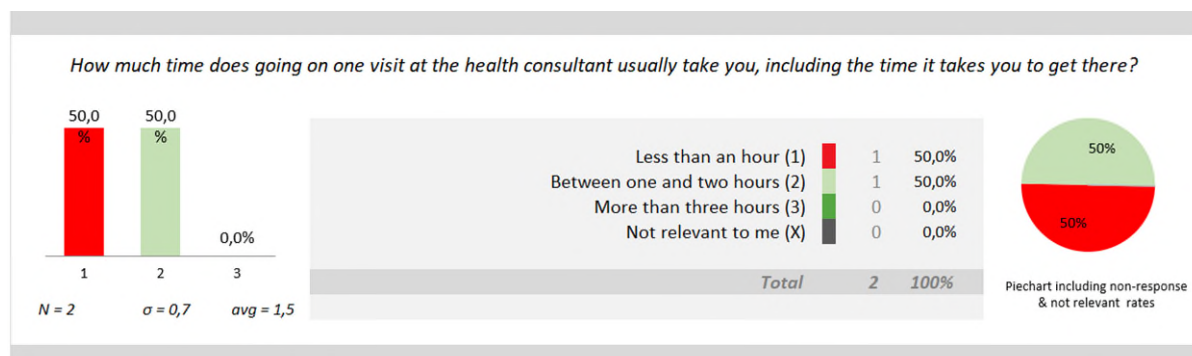


Figure 124 How much time does going on one visit at the health consultant usually take you

In addition, the eCCIS asked informal caregivers five questions relating to different areas of perceived impacts of C3-Cloud participation on their role. For each question, respondents could choose between six statements, ranging from dark green (e.g. “It has increased my ability a lot”) to dark red (e.g. “It has decreased my ability a lot”), while dark grey signified “Not relevant to me”. The two informal caregivers completing the survey chose a neutral statement to all five questions, suggesting that they perceived neither a positive nor negative impact of C3-Cloud on their role. Thus, both reported that C3-Cloud participation has not affected their ability to manage care activities.

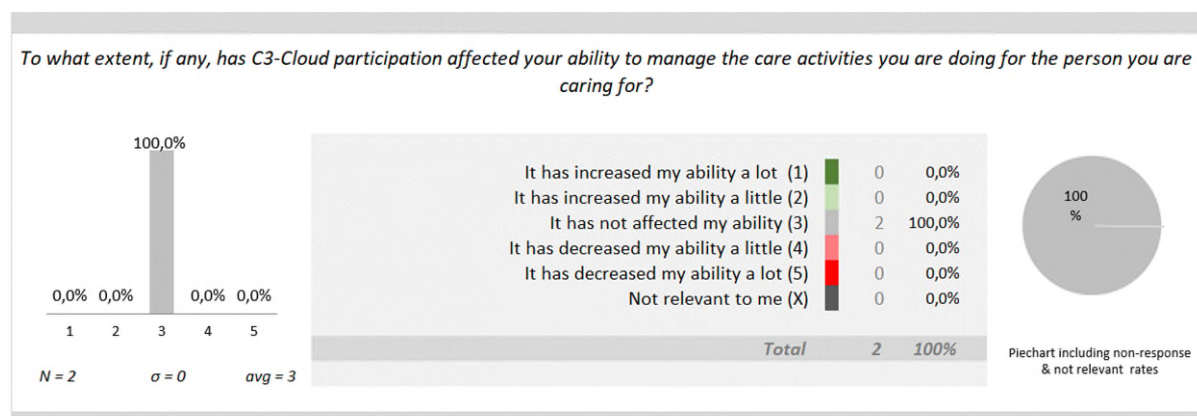


Figure 125 To what extent has C3-Cloud participation affected your ability to manage the care activities

Moreover, the two respondents agreed that C3-Cloud participation did neither improve nor worsen their relationship with the person they cared for.

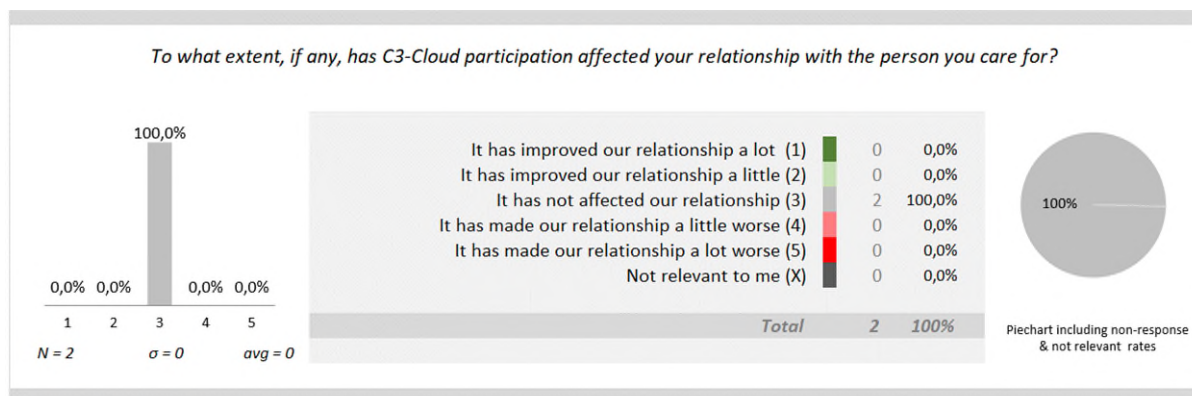


Figure 126 To what extent has C3-Cloud participation affected your relationship with the person you care for

Further, both respondents noted that C3-Cloud participation had no negative or positive impact on their level of anxiety about the health and well-being of the person they cared for (see **Figure 127**). Similarly, C3-Cloud did not affect the respondents' emotional well-being (see **Figure 128**).

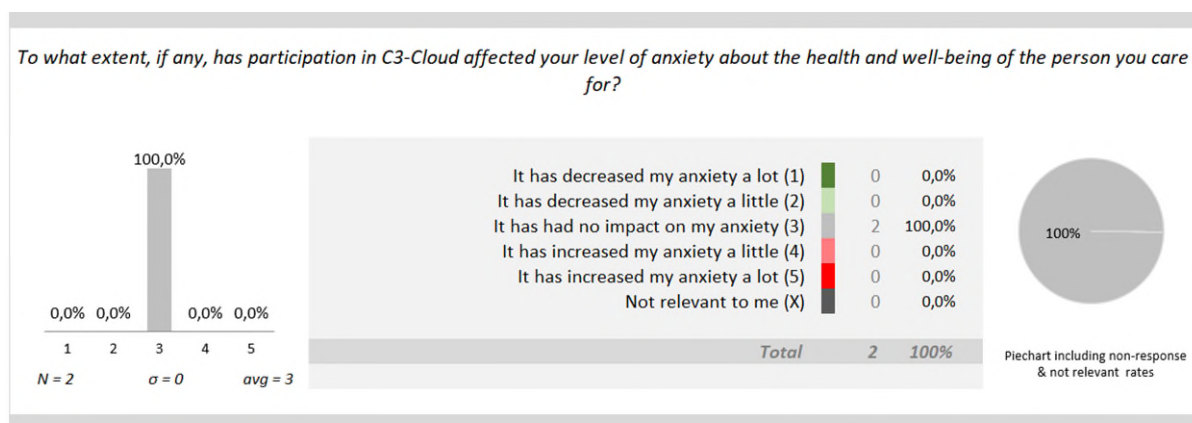


Figure 127 To what extent has C3-Cloud participation affected your level of anxiety

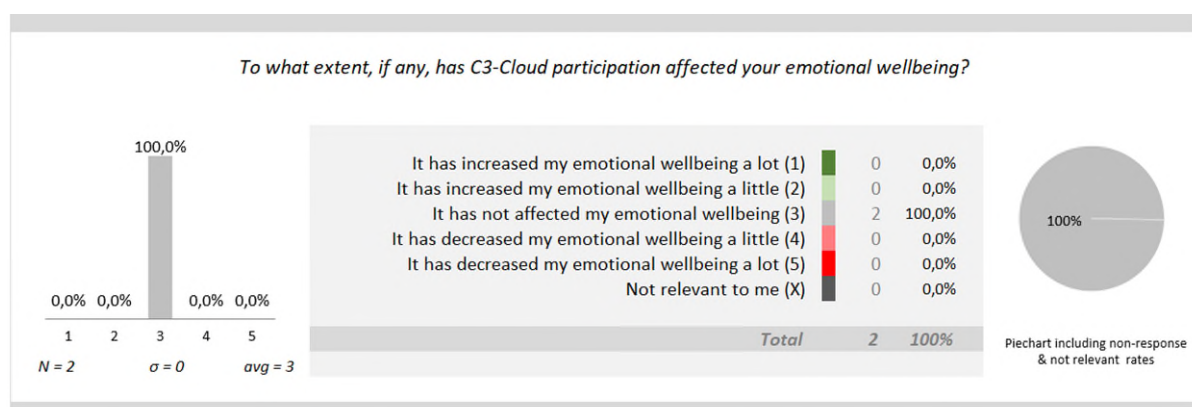


Figure 128 To what extent has C3-Cloud participation affected your emotional wellbeing

Lastly, the respondents indicated that C3-Cloud participation neither made them feel more nor less supported in their role as an informal caregiver by choosing the statement "It has not affected my emotional well-being".

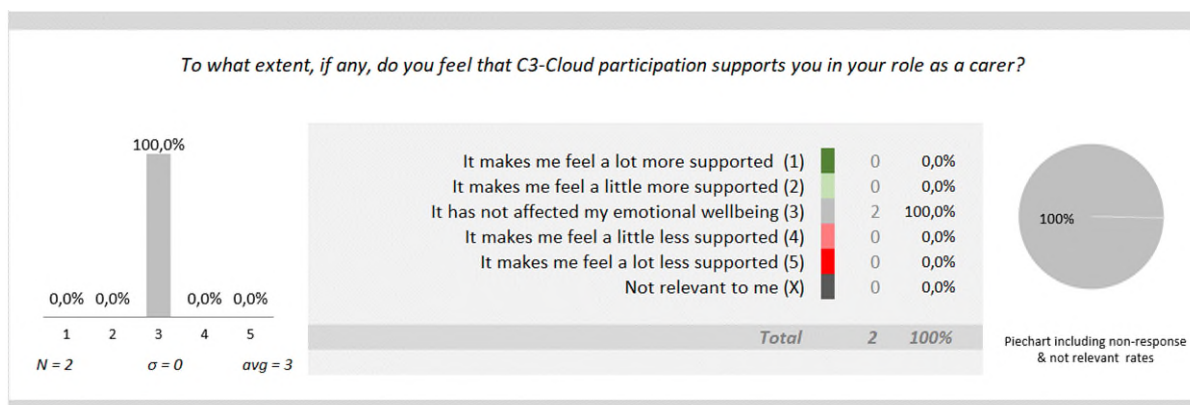


Figure 129 To what extent do you feel that C3-Cloud participation supports you in your role as a carer

Furthermore, the eCCIS for informal caregivers included two questions relating to their perceived coordination among HCPs. Responding to the question of how often they had to repeat information about the health and well-being of the person they cared for when communicating with different HCPs, one respondent indicated having to repeat information occasionally, while the other respondent had to repeat information quite frequently. This suggests that information-sharing among HCPs treating or caring for the patient might need to be improved.

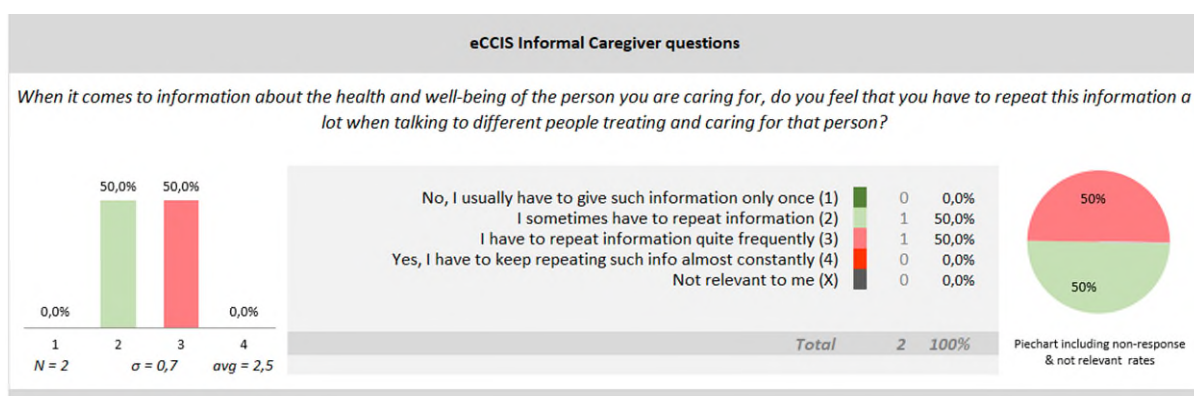


Figure 130 Do you feel you have to repeat information about the health and well-being of the person you are caring for when talking to different HCPs

Considering the second question about whether informal caregivers experienced a good collaboration between different HCPs for the person they cared for, the two respondents had different perceptions. While one agreed that the involved healthcare personnel worked well together, the other respondent noted “Some of them work well together”. Hence, informal caregivers perceived that overall coordination and collaboration between the involved HCPs might need to be enhanced to provide the best high-quality care.

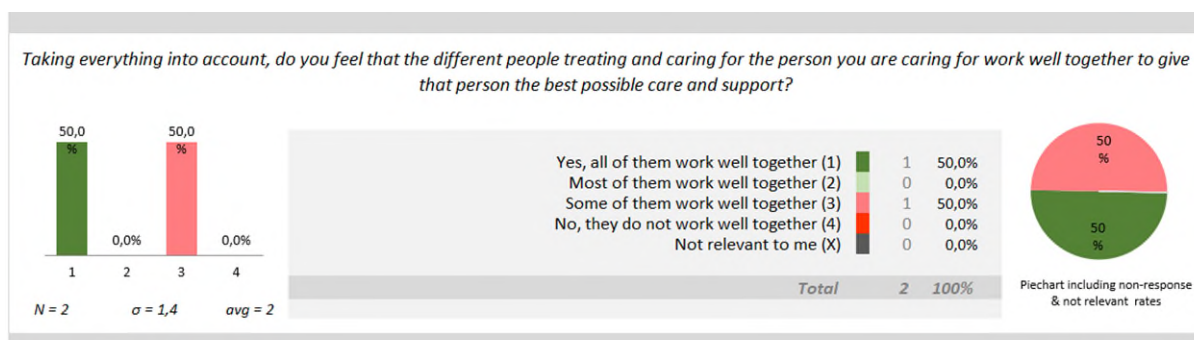


Figure 131 Do you feel that the different people treating and caring for the person you care for work well together

Lastly, the eCCIS provided a summary evaluation through three questions, each with six answer options ranging from dark green (e.g. “Very satisfied”) to dark red (e.g. “Very dissatisfied”), in addition to dark grey demonstrating “Not relevant to me”. When being asked about their overall satisfaction with the C3-Cloud application, one respondent was “Very satisfied”, while the other respondent was “Neither satisfied nor dissatisfied”.

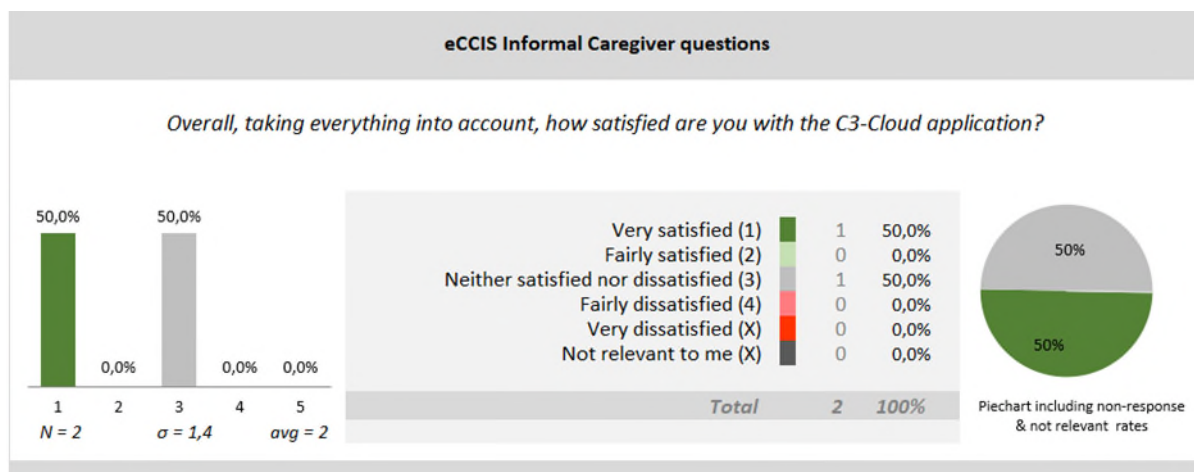


Figure 132 Overall, how satisfied are you with the C3-Cloud

Regarding the question of whether using the C3-Cloud application for their care activities was worth the effort involved, the two respondents had different opinions. While one believed that it was worth the effort considering its benefits and dis-benefits, the other respondent was neutral.

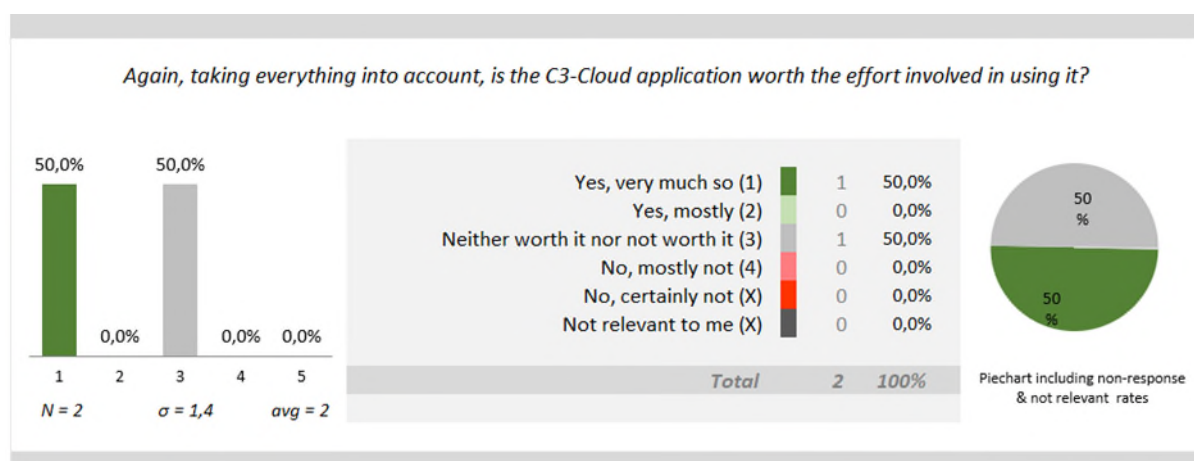


Figure 133 Taking everything into account, is C3-Cloud worth the effort involved in using it

When asked whether they would like to continue using the C3-Cloud application for their role as an informal caregiver in the future, both respondents strongly agreed. This suggests that the two informal caregivers were positive regarding the service’s sustainability and their overall experience with C3-Cloud.

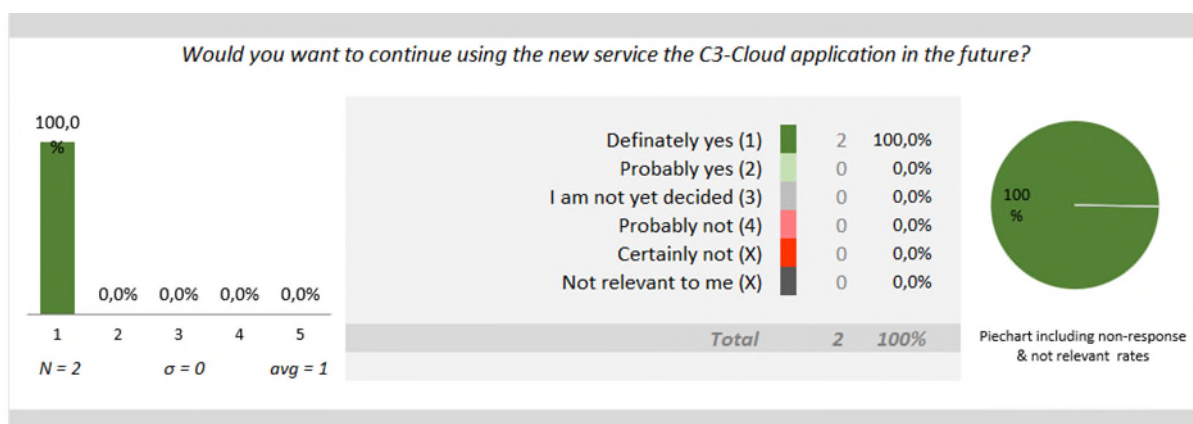


Figure 134 Would you want to continue using C3-Cloud in the future

7. IMPACT MODELLING RESULTS

The impact modelling aims to model scale-up scenarios based on ‘discrete event unit cost simulation’ and a cost-benefit modelling. In the following sub-chapters, we describe first the approach and results of the discrete event simulation (DES). This is followed by an explanation how we merged the output from the DES with the ASSIST cost-benefit model. Finally, we will show the cost-benefit impact models for selected stakeholders in the three pilot sites. The data analysis is presented here soberly and without interpretation, which will be done selectively in the discussion (chapter 8).

7.1. FHIR extract and Analysis

During the technology trial, the platform usage (C3DP and PEP) was monitored anonymously across the three pilot sites. C3-Cloud usage data that was monitored includes:

- User sessions per month
- Goals per patient and customized goals
- Activities per patient and customized activities
- Number of self-measurements per month and patient for weight, blood glucose, blood pressure and heart rate
- Dropout rates
- Messages exchanges between patients and their MDT
- CDS detected drug-drug and drug-disease conflicts

After the technology trial, the pre-defined usage report was generated from the FHIR repository, checked for de-identification by the pilot sites and shared with Empirica for analysis. The data is analysed in the following sections.

7.1.1. User sessions per month

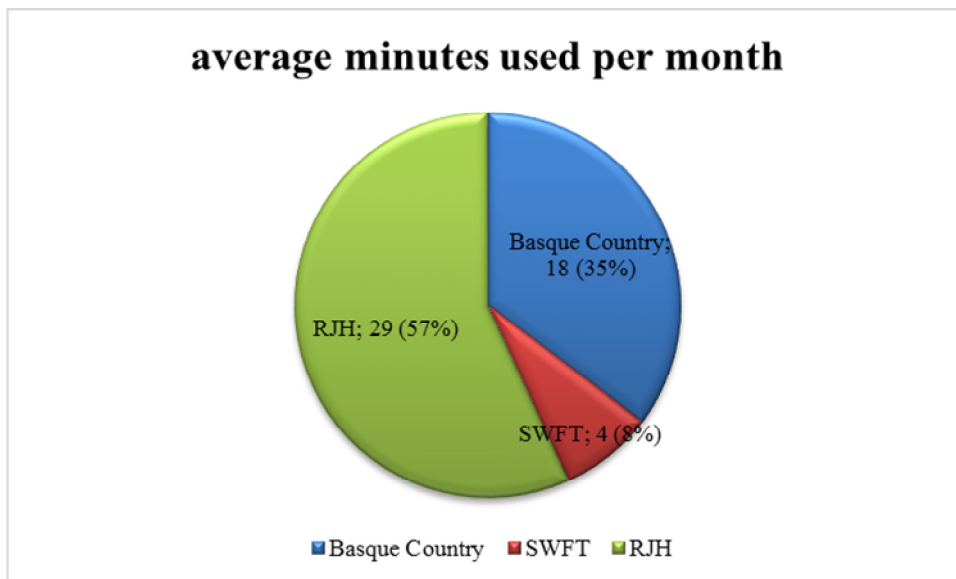


Figure 135 Average minutes the tool has been used in the three pilot sites. Data spans from October 2019 - April 2020. Total number of observations: 171. Based on FHIR Export, 2020

The average HCP used the tool for 17,6 minutes per month over the 7-month-period from October 2019 until April 2020. There is a notable difference between the user session time disaggregated by region: Whereas the HCPs' sessions in RJH took on average 29 minutes, users in SWFT spent only 4 minutes per month on average. In BC, the average use spent 18 minutes on the tool (Figure 135).

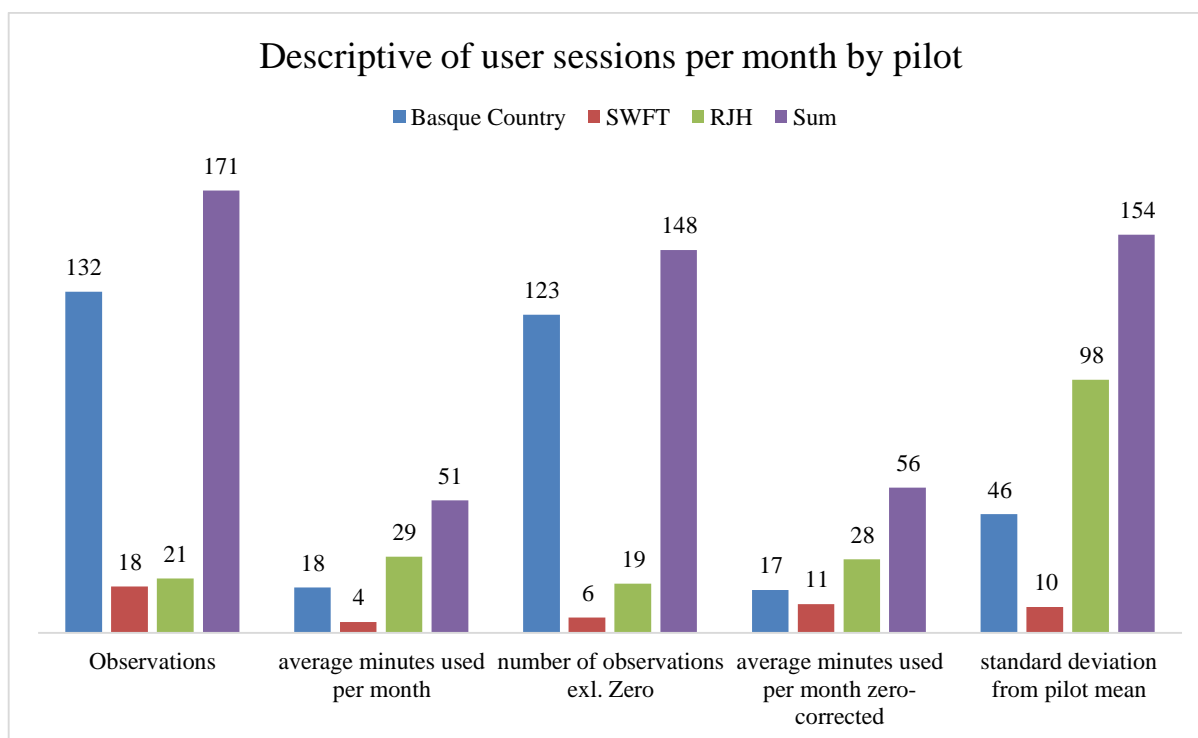


Figure 136. Distributional information of user sessions per month over the three pilot sides, relative to the total sum. Total number of observations: 171. Based on FHIR export.

The variation and relatively large deviations from pilot means make it imperative to further assess the data. As Figure 136 visualizes, RJH does not only exhibit the longest user sessions, but also substantial standard deviation with relation to the pilot mean. BC, being the most reliable data source with 132 observations, reveals proximity to the mean user value of 15 minutes. Thus, the BC pilot serves as a good proxy for the overall usage time.

New ways of delivering healthcare with new ICT tools need some stress tests as well. Covid-19 was a good stress test here, although C3-Cloud was still embedded in a research activity and not yet in routine care. According to data from the Johns Hopkins University, Spain reached its overall high in increases of new cases (51.536) during the 29. March –3. April³. For Sweden, the most severe week with 7.234 new cases was observed from 14th to 20th of June. Opposed to that, in the UK, the week with the highest infections was from April 12th to 18th with 32.582 new cases.

³ <https://coronavirus.jhu.edu/region/spain>

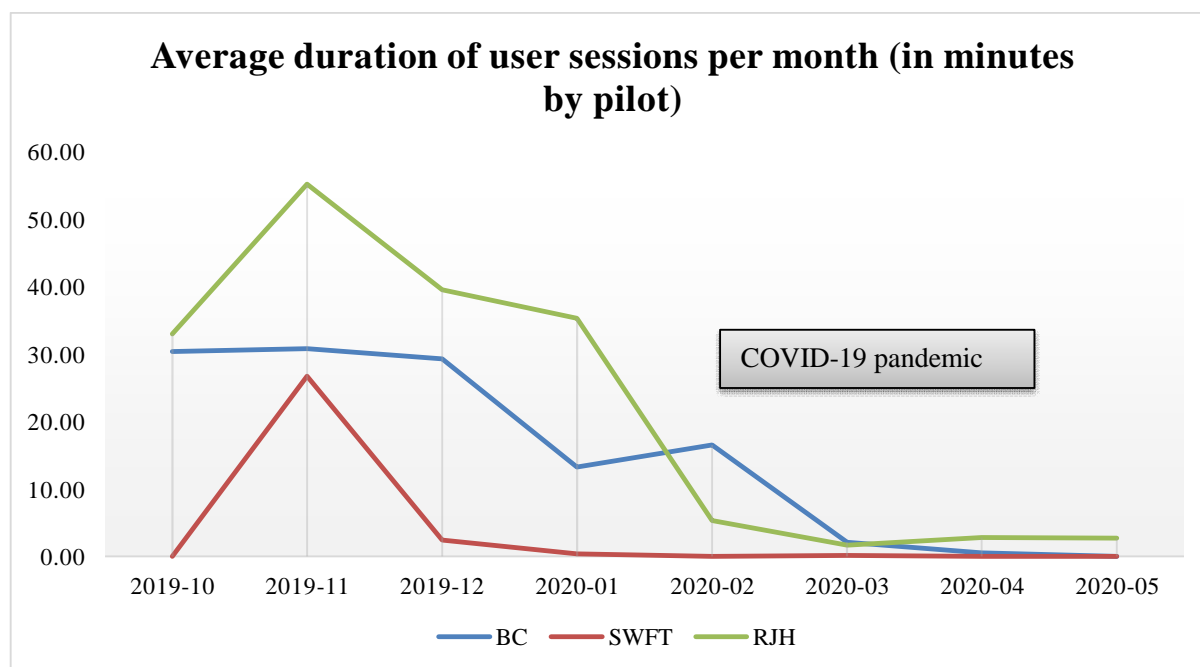


Figure 137. Average duration of user sessions (in minutes) over time, starting in October 2019 to May 2020. Timelines per pilot site. Based on FHIR Export data, 2020.

The time series in Figure 137 plunges consistently in all three pilot sites from February on, which coincides with critical Covid-19 responses. According to the timeline of EU action responding to the pandemic, the first repatriations of Europeans were undertaken in the very beginning of February⁴.

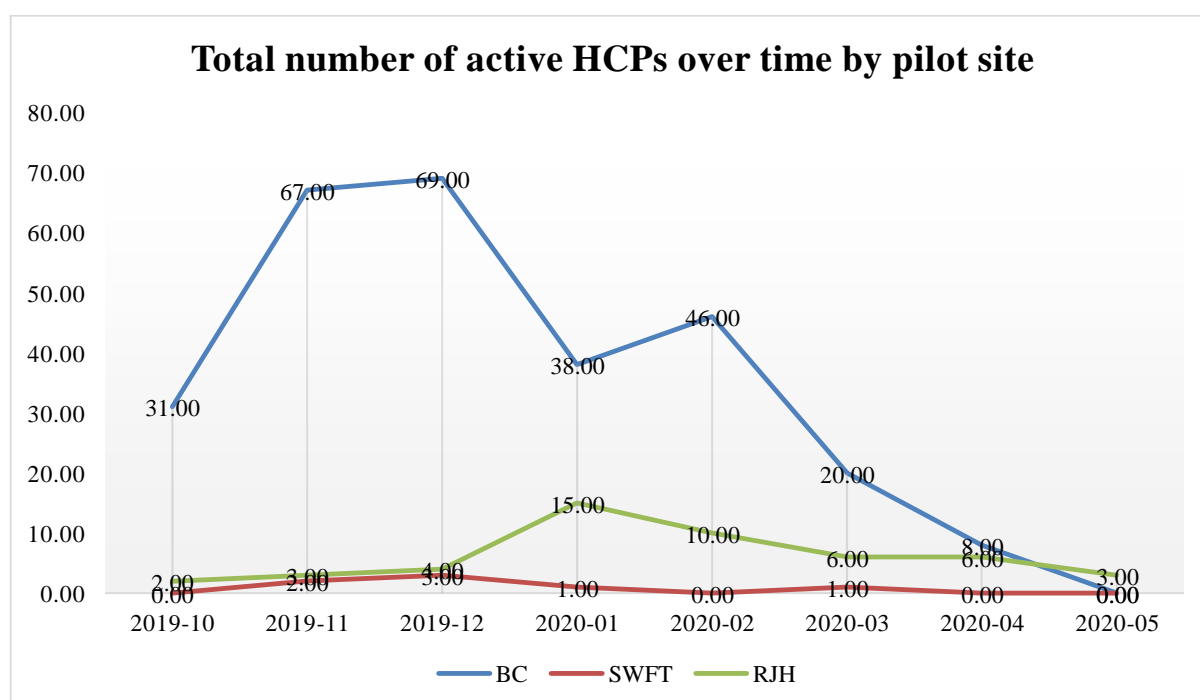


Figure 138. Total number of Health care practitioners (HCPs) using the tool in each month; disaggregated by pilot site. Based on FHIR Export data, 2020.

⁴ https://ec.europa.eu/info/live-work-travel-eu/health/coronavirus-response/timeline-eu-action_en

Figure 138 confirms the downward trend that started off in February 2020. The number of HCPs that use the tool at each site also decreases steadily or stagnates at a low level. In addition, we observe the response to the tool in general. In SWFT the number of individuals using the tool is close to zero for the whole period.

7.1.2. Goals per patient

The data on goals set for/with patients, shows that on average over all pilots, there are five goals in progress per the patients which participated in the goal setting. The 'translation rate', which refers to 'planned' minus 'goals in progress' was 2,27 on average – only including data for BC. In other words, among all goals planned, the average patient started progress on less than the number of goals that was agreed upon in their care plan. However, in the BC pilot there were confounding issues with the labels of goals, leading to some data bias. This problem renders a granular analysis of the labels in this pilot challenging. The average number of goals per patient as a total over all the labelled ('planned', 'in progress', etc.) was 6,4. BC performs over-average with an assignment of 8,3 goals per patient. Opposed to that, British patients in SWFT only dealt with a total of 1,5 goals per patient. In between the two values lies the overall average in RJH, which amounts 6,3 goals per patient.

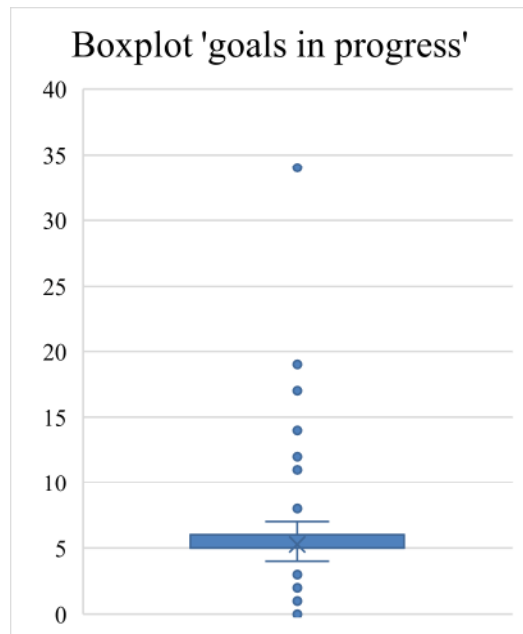


Figure 139. Boxplot of goals in progress, including 267 observations of all three pilots. Based on FHIR Export, 2020.

The Boxplot in Figure 139 visualizes, that there are many outliers in the data for the variable 'goals in progress'. The 25th and 75th percentiles are closely together and assemble 50% of the observed values at 6 goals per patient. We count 10 outliers, which represents 3,7% of all observations.

7.1.3. Goals from taxonomy and custom goals

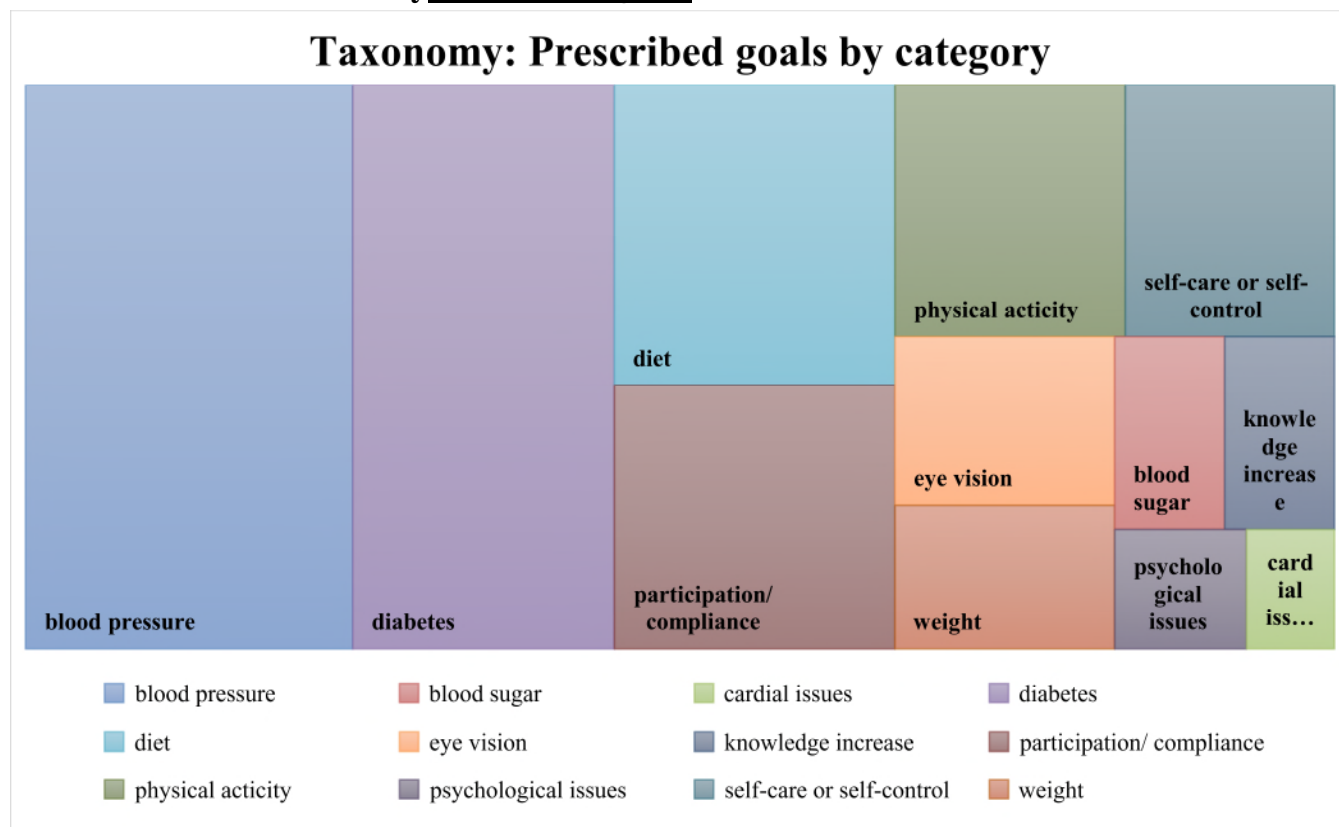


Figure 140. Cluster map of prescribed goals derived from goals from taxonomy. Data covers BC and SWFT. Total number of observations: 44; derived from FHIR Export.

Summing up the goals from taxonomy highlights the importance of blood pressure and diabetes related diseases among the patients in SWFT and BC. There is no data available for RJH so far.

First, goal assignments exhibit common features in the two pilots. The cluster map (Figure 140) visualizes, that the major share of assignments can be categorized among blood pressure, diabetes, and dietary goals. The single explicit goal that accumulates the most prescriptions (26 assignments representing 18%) is ‘maintain arterial pressure under control’, followed by ‘maintain HbA1c level below agreed target’, which relates to a diabetes context and accumulates 19 prescriptions or 13%.

Several individual goals can be clustered under the category ‘weight loss behaviour’, combining the categories ‘diet’, ‘weight’ and ‘physical activity’. If we sum up all the goal assignments under these three, we yield a count of 31 prescriptions, which represents 21,8 % of all assignment’s goals. Some goals are explicitly aimed at self-care or self-control and thus interact with other medical categories.

The high number of compliance goals are remarkable and link to the level of conformance. Goals within this category explicitly aim at ‘health seeking behaviour’, or ‘complying conduct: comply with prescribed medication’, both counted once respectively in BC. All goals in the category ‘participation/ compliance’ stem from BC data. The goal ‘acceptance of the health status’ was arguably also assigned to be compliance category but could as well be understood as psychological issue.

Customised goals data is retrieved from BC only and custom goals are often repetitive. Especially goals that relate to blood pressure levels or weight loss activities could have already been covered through the goals from taxonomy. However, they add two new categories, that did not appear among the goals from taxonomy: vaccination and evaluation of goals. More precisely, one could consider adding the goal ‘evaluate effects of medication’, which was chosen once in BC, as a

taxonomic goal. Two individual goals regard cardiac insufficiency and could possibly be grouped up within the taxonomy as well.

7.1.4. Activities from taxonomy and custom activities

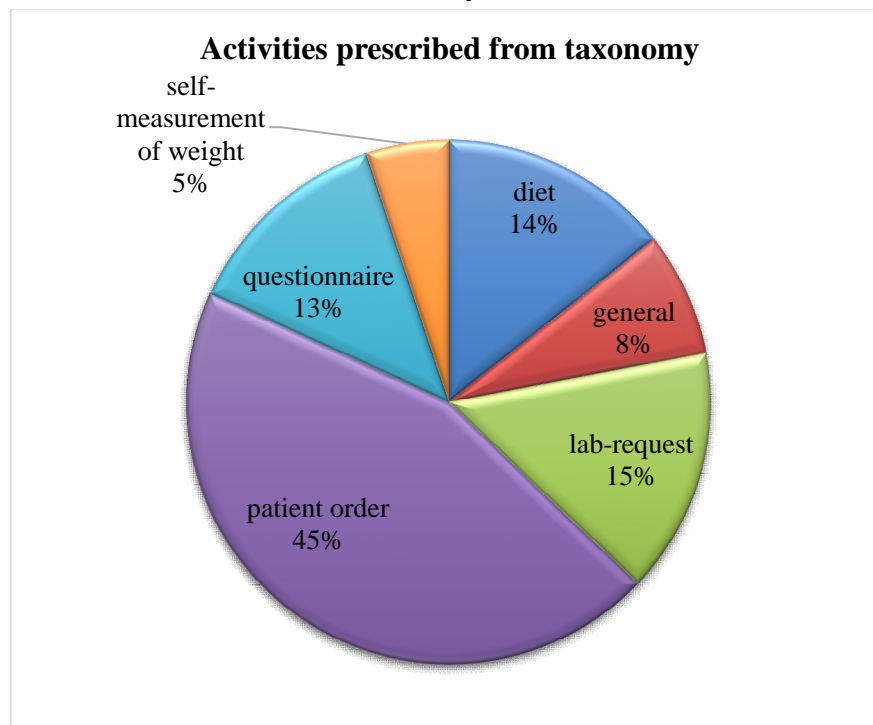


Figure 141. Activities prescribed from taxonomy by category among all three pilot sites. Number of observations: 76. Based on FHIR Export, 2020.

Among the prescribed activities from the taxonomy, the category of patient-order was the major activity with 49%, followed by lab requests (15%) and dietary related activities (14%). Figure 141 visualizes all the categories available within the taxonomy combined with respective frequencies.

Of all the activities 171 can be categorized as self-measurement, more precisely, 94 times the care plan foresees self-measurement of blood pressure (82 times in BC and 12 times in SWFT), which represents 20% of the total activities. Self-measurement of glucose has been prescribed 53 times and weight-measurement 24 times. The analysis of self-measurement prescriptions is especially revealing to study the level of conformance, since this is a task that fully depends on the patients' confidence of using the new technologies, without a care professional's interaction.

The activity to submit a photo of the diet was prescribed two times among Swedish patients, which is a novelty of the new tool. 31 times activities aim at an increase in physical activity. These are identified as categories 'patient-order' or 'general'.

Surprisingly, despite the option to prescribe physical activities within the taxonomy, exercise-related activities are found among the customized ones. Other **custom activities** related to diabetic foot problems, suggesting that HCPs should consider including a podiatric/diabetic category.

7.1.5. Patient-MDT Communications

Data on the communication through the device covers the whole multi-disciplinary team (MDT), thus it is not visible from the data, which part of the caretaker actively communicated. However, the data serves to assess information flows between the patient and the team of care givers in general.

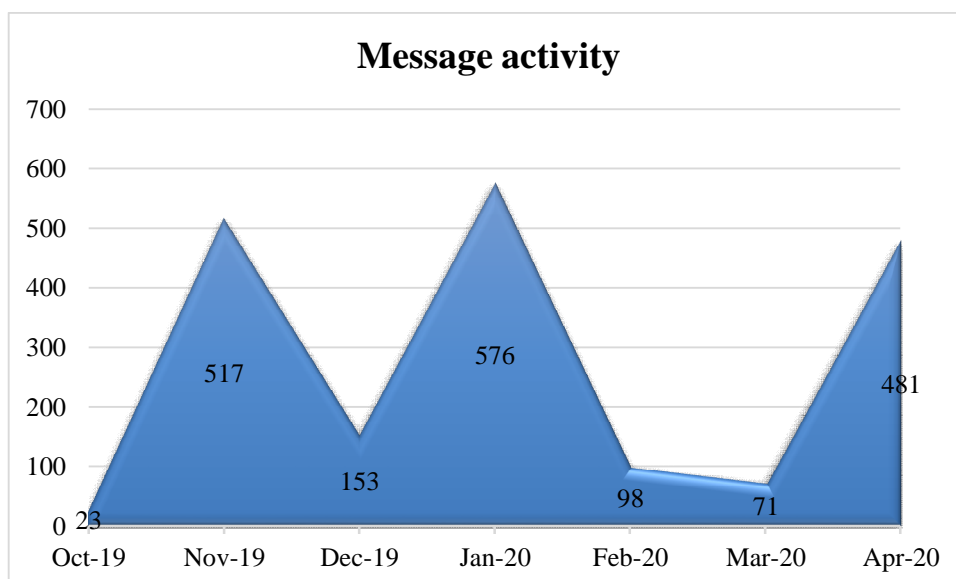


Figure 142. Average message activity (sent and received) over the three pilot sites per month. Total number of observations: 1919. Based on FHIR Export, 2020.

A total of 1919 messages has been sent and received between October 2019 and April 2020. Communication activity was most active in January 2020, where 30% of all messages have been sent and November 2019, accounting for 26,9% of total messages over time. Surprisingly, there is no apparent stable trend, as visualized in Figure 142.

Remarkably, communication was significantly one-sided over the entire period. 1829 messages – or 95% - were received by patients, while only 90 messages were sent. Thus, there is scope to increase feedback from the patient's side and make the shift towards a more dialogue-like communication.

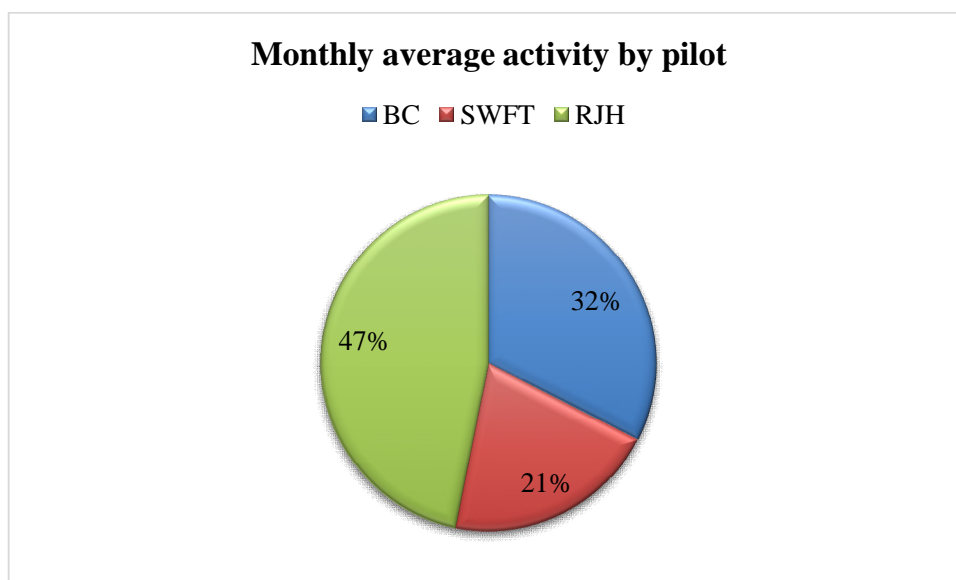


Figure 143. Monthly average message activity (sent and received) disaggregated by pilot site. Number of observations: BC: 64, SWFT: 19, RJH: 202. Based on FHIR Export, 2020.

Care personnel and patients in the RJH pilot were especially actively communicating, accounting for almost half of all the messages sent. There seem to be some obstacles to the digital communication among both, patients, and health care workers in SWFT, where 21% of message-based communication was generated through the tool. However, the concern must be raised that the invitations to the surveys were also sent via the (batch) messaging functionality on the C3DP. Having 230 patients recruited to C3-Cloud that received an invitation to the first survey and the

second survey and a subset of approx. 150 patients also receiving two more messages, we see that a total of approximately 960 messages were sent alone for the surveys.

7.1.6. Conformance measurement

Among all the 288 patients covered in the data, there were in total less than one assignment per patient (0,77 on average) of weight measurement activity. Blood pressure assignments were assigned a total of 569 times, which represents almost two assignments per patient (excl. extreme outliers). The data derived from RJH covers most observations and in this pilot the conformance of measurements fluctuates around 100%, which means that patients here seem to be very compliant. Patients in the SWFT appear in the data as the least compliant.

Analysing the way of measurement, manual versus device-based, shows some opposing trends. Of all the weight measurement activities reported, 40,6% have been conducted manually and the main share of 59,4% has been undertaken using the device. For blood pressure measurement, 87,57% of patients tend to stick to manual means and the remainder of 12,43% used the device.

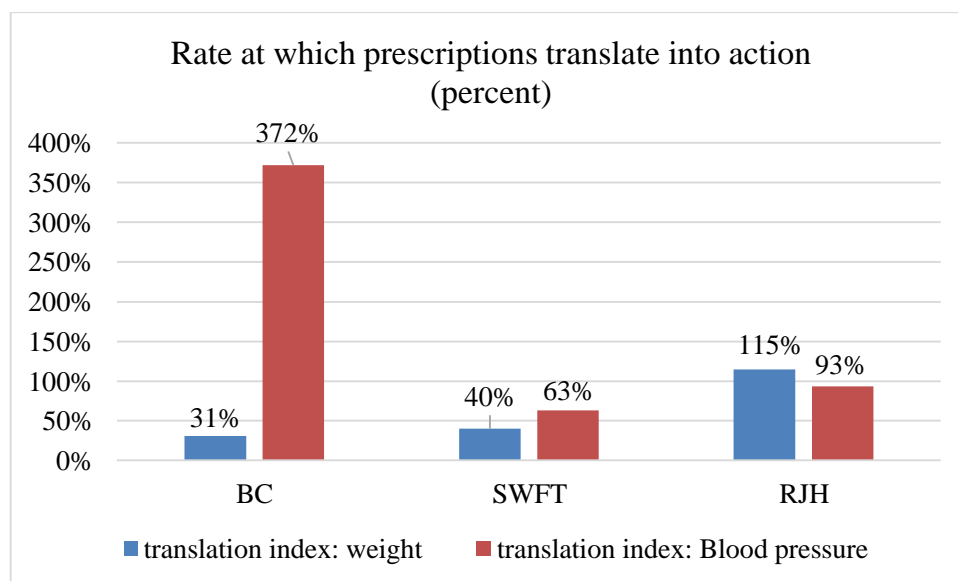


Figure 144. Share of prescribed activities that translated into either manual or device-based action; disaggregated by pilot. Number of observations: BC: 64, RJH: 202; SWFT: 22. Based on FHIR Export.

A translation rate can be calculated to determine how closely patients have adhered to their prescriptions. Translation rate refers to the percentage of prescriptions that translated into actions and can be calculated according to:

$$\text{translation rate}_{\text{weight,BP}} = \frac{(\text{manual measurement}_{\text{weight,BP}} + \text{device measurement}_{\text{weight,BP}})}{\text{total prescriptions}_{\text{weight,BP}}}$$

The percentage rate has been calculated for weight measurements and measurements of blood pressure only, because there were only zero values available for blood glucose and heart rate measurements in all three pilots. The data has been disaggregated among the three pilot sites in Figure 144. A few extreme values are alerting and were excluded from the analysis. For example, a patient in BC reported 2147483647 assigned blood pressure measurements, that translated into 35 manual measurements. There are 14 observations, where a prescription lead to several actual measurements higher than prescribed. This trend is especially pronounced in BC and drives the substantial the 'overperformance'. Of all the prescriptions of blood measurements in this pilot site, 372% converted into actual measurements, undertaken either manually or through the device.

7.1.7. Patient's information

The average patient in SWFT and RJH falls into the age group 75-79. In BC patients are 70-74 years slightly younger on average and exhibit a relatively elevated dropout rate of 27%. In RJH, 12% of patients dropped out, whereas there were no dropouts observed among the 19 patients in SWFT. The reason for almost all dropouts is specified in the category 'other', such that we can only interpret it as a variety of reasons, that is not related to either death or withdrawal. One patient died in RJH during the pilot project. The gender distribution is slightly skewed towards men, with 57,8% of the observations representing male patients.

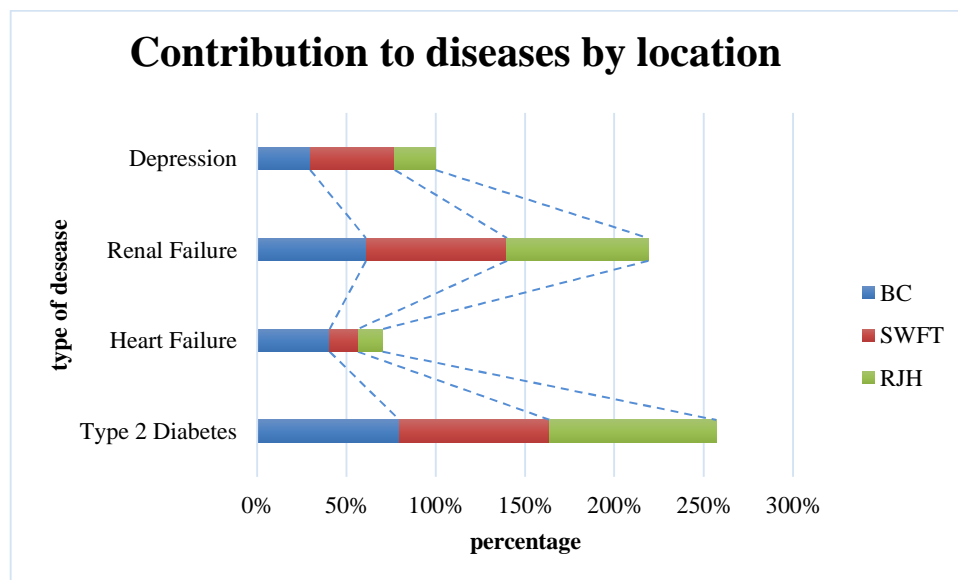


Figure 145. Contribution of the different patient shares of each location to the total occurrence of each disease (in percent). Based on FHIR Export data, 2020.

As Figure 145 shows, Type 2 Diabetes is the disease that accumulates the largest shares of patients among all three pilot sites. Heart failure is especially pronounced in BC, relative to the other sites and renal failure attributes to a similar share among all three pilot sites. In RJH, the share of participating patients with depression is significantly low compared to SWFT and BC.

Given that either being of NYHA Type 1 or 2 and possessing an EGFR value between 30-59 count as inclusion criteria for the pilot participation, values for these variables are constant and all patients comply with these features.

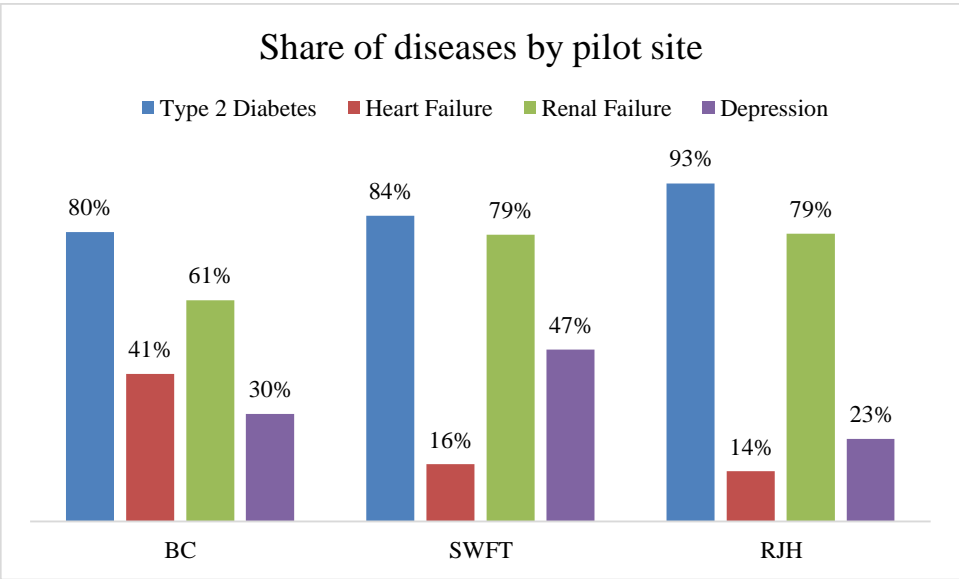


Figure 146. Share of different diseases among the total of patients for each pilot site. Based on FHIR Export data, 2020.

Most patients in RJH suffer from Type 2 Diabetes, whereas a small share of only 14% identifies as depressed. Shares of renal failure are similar among the three locations.

7.1.8. CDS Interactions & Statistics

The number of alerts for the different types (e.g. drug-drug interaction) for the total number of patients are gathered in the Clinical Decision Support statistics. Among the 64 patients in BC, 6 alerts were reported, which represents 9%. The number is significantly lower in RJH, where only 2 out 202 patients reported an alert. Data is not available for the 19 patients in SWFT.

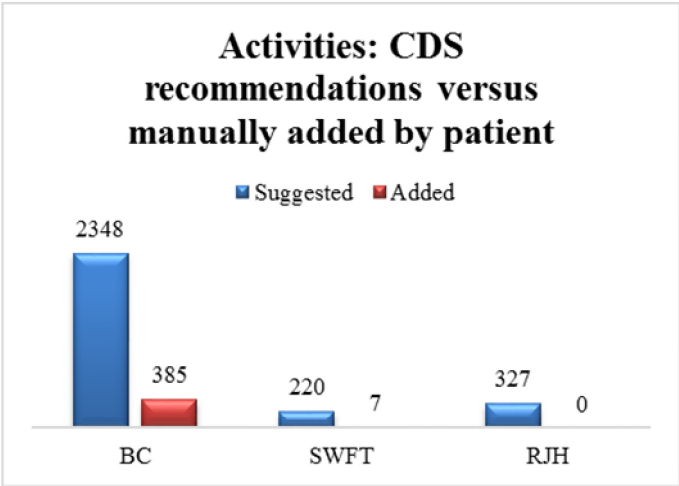


Figure 147 Care plan activities assigned by the clinical decision support (CDS) vs. manually created activities by HCPs. Based on FHIR data, 2020

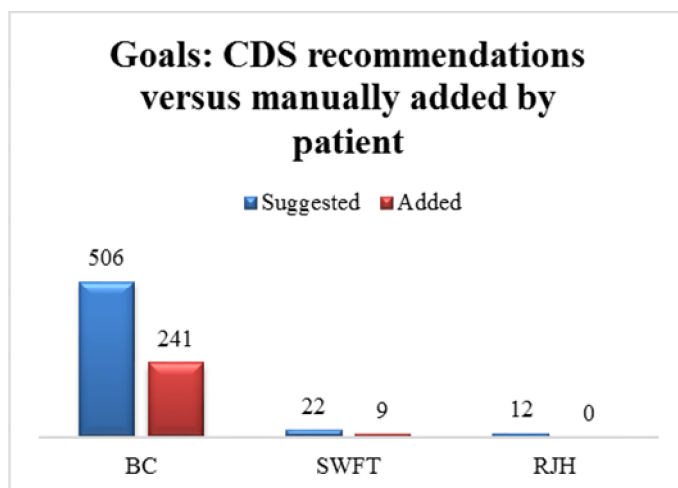


Figure 148 Care plan goals assigned by the clinical decision support (CDS) vs. manually added by goals by HCPs. Based on FHIR data, 2020

The number of prescribed goals and activities can deviate from those goals and activities that were manually created for a variety of reasons, depending on the individual medical past of the patient or being of economic nature. How the manually created goals and activities comply with the CDS activities and goals suggested can be retrieved in Figure 147 and Figure 148. Among all the activities suggested in BC, only 16,4% were indeed added, 3,2% of suggestions were added in SWFT and we do not observe any manually added activities in RJH, which represents the largest relative divergence. In absolute terms, the BC pilot outperforms among both, goals, and activities.

7.2. Discrete Event Simulation

Simulation models provides information about how something will behave without testing it, being an attempt to model and mathematically simulate a real-life situation to study and assess different scenarios. This was very appropriate to estimate the impact that an intervention centered in multimorbid patients like C3-Cloud can had. In this case, the hypothesis was that patient-centered care will control and reduce their destabilisation phases and adverse effects of polypharmacy, reducing hospital resource consumption like the use of ambulatory & emergency (A&E) services and/or hospitalisation.

Discrete event simulation (DES) models were used to represent mathematically the natural history of the disease and to provide ASSIST tool quality and robust data that could use to foresee the economic impact for each stakeholder. Thus, the main objective of the modelling was to foresee in the long term the healthcare resource consumption and costs to obtain the monthly cost per patient of different resources involved to feed ASSIST tool with reliable data.

7.2.1. Method

First, a general simulation model was properly developed and validated, which was common for all pilot sites. All the necessary data to build up the model was collected from available databases, being in this case the databases of the Basque Health Service. Once the trial was finished, intervention and historic control group resource use data was collected from the pilot sites and a statistical analysis was done to find significant differences between groups in terms of healthcare resource consumption. The differences found were incorporated into the model to differentiate the conventional scenario from the C3-Cloud scenario. The cost of the disease for the control and the intervention groups was obtained multiplying the resource consumption rate of each group by unit costs. Costs of both groups was projected in time from 2017 to 2025 using population projections and considering the effect of aging population. To run the model and obtain results for the 3 pilot sites, the unit cost used was adapted. That way, monthly cost per patient for each pilot site was obtained until 2025 to feed the ASSIST tool.

7.2.1.1. Discrete event simulation model

To build up a general simulation model that could represent the evolution and the care pathways of patients involved in C3-Cloud technology trial, a DES was used. DES is a flexible modelling method that can represent complex behaviours and interactions between different individuals, levels, and environments. The model was built using the software Arena®, a simulation tool property of Rockwell Automation, and the statistical analyses needed to obtain different parameters of the model were performed in Stata (version 13) and R (version 3.3.2).

All the relevant and necessary data was obtained from the Basque Health Service databases. The population used to develop the DES model exactly fit with the target population of the C3-Cloud project: multimorbid patients over 55 years old with at least 2 of 4 chronic diseases between diabetes (type 2), heart failure (NYHA I-II, first stages), renal failure (eGFR/GFR 30-59, no need for hemodialysis) and depression (mild/moderate). Patients with most severe diagnosis were excluded from the analysis as well as patients admitted in nursing homes.

7.2.1.2. Data collection

The data used to develop the model was extracted from the administrative and clinical databases of the Basque Health Service for the year 2017. In the Basque Health Service databases, the severity of diseases is not systematically collected. This fact made the identification of the whole target population difficult because there were people who probably met the C3-Cloud inclusion criteria but could not be identified because information about the severity of their diseases was not available. Nevertheless, as the objective of the DES model was to provide monthly cost per patient to feed ASSIST with more reliable data, only patients who exactly fit the project description were used. Table 108 shows the criteria that were considered for each disease.

Information extracted from the Basque Health Service databases also included information about patient and resource consumption data. Patient data was composed of age, sex, diseases, and death. The resource consumption collected from EHR in primary care (PC) included contacts with PC nurses and general practitioners (GP) at healthcare centre, at home or by telephone. In hospital care, contacts with cardiology, endocrinology, nephrology, psychiatry, and internal medicine were considered. Besides the contacts with outpatient services, contacts with A&E services and hospitalizations were also collected. The drugs prescribed to patients were considered too.

Regarding epidemiological data, prevalence data by gender and age group were obtained from the data set recorded in the Basque administrative databases in 2017. Incidence rates by gender and age group were obtained from the same origin comparing the target population in 2016 and 2017. As the number of patients deceased was very small in the Basque Health Service data sets because of the low severity of the target population, the mortality for the general population by gender and age was obtained from the Basque Institute of Statistics. The mortality was adjusted by the incremental death risk of multimorbid patients. In the same way, to foresee population projections between 2017 and 2025 Spanish National Statistics Institute databases were used.

The information about the unit cost of different healthcare resources for the year 2019 was obtained from the health service databases of the pilot sites. For all the pilot sites, the unit costs were retrieved in euros (EUR, €) and in their own currency, that is, euros (EUR, €) for Basque Country, Swedish krona (SEK, kr) for Jämtland Härjedalen and pound sterling (GBP, £) for South Warwickshire. The unit costs used can be seen in Table 109.

7.2.1.3. Conceptual model

The natural history of multi-morbidity is a dynamic process, characterized by frequent transitions to across different health states over time. Because of that, for this study the natural history was divided into stable and unstable states. During the stable state where patients remain at home, they were mainly cared for by primary care professionals. Contacts could be of a diverse nature as patients could be cared for by general practitioners and PC nurses either at the health-care centre, at home or by telephone. When patients decompensated and required additional attention, they were referred to hospital care⁶. In this stage, visits to specialists (endocrinology, cardiology,

nephrology, psychiatry, and internal medicine), A&E services and hospitalisation were considered. Patients that used hospital care were initially evaluated by the emergency department and were hospitalized only when the department deemed it necessary. Once the conditions of the patients were re-stabilized, they were discharged back to their residence. Of course, patients could die at any moment.

Figure 664 shows the conceptual model that includes the possible pathways and contacts that patients can have. As it is shown in the picture, all contacts with PC nurse, general practitioner, outpatient services, A&E services and hospitalisation were counted. The drug consumption was also calculated according to the time that the patients remain in the system.

7.2.1.4. Simulation model

The general simulation model presented here is a dynamic multi-cohort model. Patients who were eligible to take part on C3-Cloud technology trial were considered as prevalent cohort and they represented the initial target population. New patients who will become eligible for C3-Cloud in the future constituted the incident cohorts. The incidence was extrapolated until 2025 according to the population forecast. All these parameters are shown in Table 110.

When individuals are first entered into the model their characteristics or personal attributes (age, sex, and diseases) are assigned. To assign clinical conditions according to age and sex logistic regressions were used. As multimorbid patients were subjected to mutually dependent chronic diseases, these conditions needed to be considered in a consistent way, using logistic regression. Pharmacy costs were assigned according to age, sex, and diseases that patients have using a logarithmic function obtained from the target population data with a linear regression. The parameters of different logistic regressions used are shown in the Table 111.

The mathematical functions for the simulation model, which define the times until different events or contacts with healthcare resources occur, were obtained by developing a parametric survival analysis of the data. The DES model requires considering time in an explicit way. Patients who were alive or without an event at the end of the study period were categorized as survivors, i.e., as a censored data. In the analysis different distributions were tested as survival functions: exponential, generalized gamma, log-logistic, Weibull, Gompertz and lognormal. All functions were adjusted by independent variables (age group, sex, and diseases). The type of function that best fit with the observed data was selected using the statistical Akaike Information Criteria (AIC). After that, the mathematical functions were used to determine the time until the event occurrence for all the competing risks according to different characteristics (sex, age, and disease). Table 112 and Table 113 show the distributions used to obtain time until event functions and their parameters. For its part, Table 114 shows the multinomial logistic distribution parameters used to set the type of contact with different resources. As can be seen, Gompertz and Weibull distributions were selected to model time to event functions and, as a function of age, can be expressed with the formulas below.

$$\text{Time to event (Gompertz)} = \frac{1}{\beta} * \ln\left(1 - \frac{\beta}{HR * \alpha} * \ln(1 - u) * e^{-\beta * Age}\right)$$

$$\text{Time to event (Weibull)} = \left(-\frac{1}{HR * \alpha} \times \ln(1 - u)\right)^{\frac{1}{\beta}}$$

Where:

$$\ln(\alpha) = x_0 + x_1 * Sex + x_2 * Age\ group + x_3 * Disease$$

The equations included a uniformly distributed random factor between 0 and 1 (u) and two parameters α and β that defined the characteristics of the distribution. The hazard ratio (HR), used to incorporate the C3-Cloud intervention effect into the model, was included in the formula by multiplying it with α parameter.

That way, the time until the event occurrence for all the competing risks presented in the Figure 664 (contact with PC nurse at centre, at home or by telephone, contact with general practitioner

at centre, at home or by telephone, contact with outpatient services, contact with A&E services or death) was calculated according to these characteristics. In this sense, a list of future events that the individual will go through was generated. The event that will occur first was determined according to which was the closest in time. After that, the time to event for that event was recalculated and the event that will occur next was determined again according to which was the closest in time. This process was repeated until the patient leaves the model by death or the time horizon of the simulation reached its end.

- If the shortest time is time until death or the time horizon of the simulation reaches its end the patient left the model.
- If the shortest time is time until contact with PC nurse at centre, at home or by telephone or contact with general practitioner at centre, at home or by telephone the respective contact is counted. After the contact occurrence, the time to event for the next contact with PC nurse or general practitioner either in the health centre, at patient's home or by telephone is recalculated and assigned to patients according to their characteristics.
- If the shortest time is time until contact with outpatient services, the specialist visited is assigned according to the obtained probability distributions base on patient's characteristics and the respective contact is counted. Patients can have a contact with endocrinology, cardiology, nephrology, psychiatry, or internal medicine. After the contact occurrence, the time to event for the next contact with outpatient services is recalculated and assigned to patients according to their characteristics.
- If the shortest time is time until attendance to A&E services, patients have two ways, they can be discharged or hospitalised according to the obtained probability distributions base on patient's characteristics. If the patient is hospitalised hospitalisation duration is assigned. After the contact occurrence, the time to event for the next contact with A&E services is recalculated and assigned to patients according to their characteristics.

7.2.1.5. Validation

The validation is a set of methods used to measure the accuracy of our model. In this case, the model was validated by comparing the simulated event rates with the observed ones in 2017. For that purpose, goodness of fit tests were used with the following statistics: the correlation coefficient (R), normalized mean square error (NMSE), fractional bias (FB), fractional variance (FV) and the fraction of predictions within a factor of two (FAC2). To validate the model the correlation coefficient and the factor of two must be higher than 0.8, the normalized mean squared error must be lower than 0.5 and the fractional bias and the fractional variance must be between -0.5 and 0.5.

7.2.1.6. Obtaining outputs

Once validated, the model is ready to clone the target population to represent alternative scenarios and obtain the outputs. The model also cloned the random numbers used for each patient so that both clones will have the same settings. This means that the populations that represent the conventional scenario and the C3-Cloud scenario had the same features. To incorporate the C3-Cloud intervention effect into the model, in the C3-Cloud scenario a hazard ratio was introduced in all the resources for which significant differences were found in the statistical analysis. The hazard ratios were introduced into the time to event functions. That way, if the C3-Cloud intervention significantly improved a concrete resource use rate, the time until contact with that resource would be higher and vice versa.

The cost of the disease for the conventional and the C3-Cloud scenario was by obtained multiplying the resource consumption rate of each group by the unit costs obtained from the pilot sites of Basque Country, Jämtland Härjedalen and South Warwickshire (Table 109). Resource consumption and costs of both scenarios were projected in time from 2017 to 2025 using the population projections and considering the effect of aging population. That way, the cost of illness of multi-morbid patients was determined for each pilot site under both scenarios. This allowed to calculate the budget impact analysis (BIA) and to obtain the monthly cost per patient, which was

the main output, to feed ASSIST with reliable data. So, for each pilot site, the monthly cost per patient disaggregated by health care resource costs and pharmacy costs was obtained until 2025 in both scenarios.

7.2.2. Statistical analysis

The evaluation of the C3-Cloud technology trial effect was developed measuring the change in the resource use profile for each stakeholder. The information necessary to develop the statistical analysis relating to intervention and historic control groups was obtained in an anonymised way from the health service databases of the Basque and Swedish pilot sites. All the statistical analyses were performed in Stata (version 13) or R (version 3.6.1) with a confidence level of 95%.

7.2.2.1. Data collection

The information was collected in 2020 from the Basque Country and Jämtland Härjedalen pilot sites after the end of the trial. The implementation of the methodology for obtaining data complied with the data protection legislation of the European Union General Data Protection Regulation (EU GDPR) and additional legislation in each country on health care data and medical research. Before sharing information, database that contains patients resource consumption data were anonymized by each pilot site. To make sure that data cannot be traced, the data extracts did not include any identifiers or exact diseases codes. Nor demographic descriptors were used apart from age and sex. Moreover, instead of the exact age of the patients, an age range was used to ensure the anonymization, where each age range covered a 5-year age-span. In the same way, for each patient, all the resource utilization or contact dates were manipulated randomly within a range of ± 30 days. This way it was not possible to trace the data and to link it with the original databases.

The collected data extracts included patient and resource consumption information. Patient data was composed by sex, age range, diseases, death, and dropouts. The resource consumption information collected from primary care included contacts with PC nurses and general practitioners at healthcare centre, at home or by telephone. In hospital care, contacts with cardiology, endocrinology, nephrology, psychiatry, and internal medicine were considered for outpatient services. Contacts with A&E services and hospitalizations were also collected. The drugs prescribed to patients were considered too.

7.2.2.2. Steps of the analysis

In an initial step, univariate statistical analyses of the data were done. First, a baseline descriptive analysis of the data was performed to see if there were sociodemographic and clinical differences by group. In the descriptive statistical analysis categorical variables are presented using the frequencies and percentages (N(%)). Fisher's exact test was applied for the categorical variables of two categories and an expected value less than or equal to 5, while the chi-square (χ^2) test was used for the other cases. In the case of continuous variables with normal distribution, the comparison of means was made using the Student's t-test. Second, healthcare resource use rates were analysed to find significant differences by group in the resource consumption. As variables of health service use are counts, they are presented with means and standard deviations (SD), together with median and first and third quartile (Q1, Q3). Differences between groups were analysed using the Student's t-test or by nonparametric Wilcoxon rank-sum test when medians were displayed.

In the last step, adjusted models were used to perform the analysis. The effect of the intervention was assessed by generalized mixed models considering the clustered structure of the data. Patients were nested by two pilot sites in Spain and Sweden, so the pilot site was included as random effect. Due to the shape of health services data, usually zero-inflated counts, negative binomial regression models were used. In the case of the hospital stay, only those patients with any hospitalisation were considered, so zero adjusted negative binomial models were used. For dichotomous variables such as hospitalisation or visits to A&E services (yes/no), logistic regression models were performed. All models were adjusted by baseline differences: sex, age

range (<80 , ≥ 80) and the presence of the studied diseases (diabetes mellitus, heart failure, renal failure, and depression). The time of follow-up also was included in the models as offset.

7.2.3. Results

7.2.3.1. Statistical analysis results

The target population comprised 635 patients in the control group and 223 patients in the intervention group. The time of follow-up for most of the cases (97%) was 6 months and in the control group there were more patients with age ≥ 80 . The baseline descriptive analysis of the data showed that there were statistically significant differences in almost all the variables such as sex, age range and presence of the studied diseases (Table 115). There were not differences in the rate of deaths.

The resource consumption analysis showed some simple significant differences in the use of health services between the intervention and the historic control group (Table 116). In primary care fewer contacts with general practitioner at centre and at home and fewer contacts with PC nurse at home were observed, as well as higher contacts with PC nurse by phone. In hospital care fewer contacts with nephrology and with A&E services were found, as well as higher contacts with internal medicine. However, only some of these differences were confirmed when adjusted models were used to carry out the analysis.

Once adjusted the models (Table 117), in primary care there were not statistically significant differences in the total number of visits to the general practitioner and PC nurse. However, when the type of the visit was considered, the patients from the intervention group had less visits at the centre for both, PC doctor (p-value=0.009) and PC nurse (p-value=0.025). Control group had 1.59 and 1.35 more possibilities to have a visit, respectively. PC nurse home visits also were statistically significantly lower (p-value=0.016). However, the possibilities to have a contact with PC nurse by phone was 1.60 higher for the intervention group than for the control group (p-value=0.005). There also were differences in the number of patients with any emergency visits (p=0.023), patients from the control group had 1.76 more possibilities to visit the A&E department at least once than patients in the intervention group. There were not statistically significant differences in the contacts with the specialist when the adjusted models were considered, neither in the hospitalizations nor in the days of hospitalization. A summary of C3-Cloud intervention effect showing only the use of resources that intervention had modified is shown in Table 118. The data is presented as odds ratio and significance.

7.2.3.2. Discrete event simulation results

First, validation results were obtained to later obtain research results. In the Basque Health Service databases, a sample of 1,854 patients who exactly fit the project description were identified. Their characteristics are described in Table 119. As can be seen, the mean age was 76.8 years and the most frequent chronic condition was Diabetes Mellitus.

The model was validated using a goodness of fit test for different resources differentiated by sex. The simulated event rates were compared with the observed ones in 2017. Table 120 shows the goodness of fit tests that was carried out. As can be seen, all the statistics were within the established criteria.

Table 121, Table 122 and especially Figure 665 and Figure 666 show the BIA developed from 2017 to 2025. As it is shown, the prevalence of multimorbid patients will raise to near 2,200 in 2025. Consequently, the contacts with different health resources and the drug prescription will increase. This will generate a burden of multimorbid patients that will be near to 6.8 million of euros in 2025 for the conventional scenario. However, once applied the C3-Cloud intervention effect obtained from the statistical analysis, the simulation model showed that the total burden for a C3-Cloud scenario will be 11.38% lower than for a conventional one, i.e., 772.650 euros less.

Finally, Table 123 shows an example of monthly cost per patient outputs that DES model generated for ASSIST tool from 2017 to 2025. The outputs visible in the table are related to

Basque Country pilot site, but outputs for Jämtland Härjedalen and South Warwickshire were also generated.

7.3. Integrating ASSIST and DES

One of the goals defined in the Grant Agreement was to integrate the Budget Impact Analysis with its discrete Event Simulation and the ASSIST cost-benefit impact assessment tool. The aim was to not only model and analyse the budgetary (economic) impacts of C3-Cloud and its impact on healthcare resource use (based on unit costs). Instead this perspective should be integrated with the Assist method, which considers intangible costs and benefits in a much broader sense for its modelling, while integrating administrative, budgetary, or actual data wherever possible. By that integration, we aimed to incorporate the comprehensive (systemic) perspective applied by ASSIST and the flexible engine developed in discrete event simulation modelling to represent mathematically the monthly unit costs per patient by the natural history of their disease. This integration thus improves the validity of the ASSIST model.

For the integration of both approaches, the discrete event simulation data was performed for the Budget Impact Analysis. Unit costs were applied to calculate monthly costs and break these down on an average monthly cost or benefit on a patient level. This data was added per statistically significant unit (i.e. GP consultations; nurse consultations; home visits and telephone contacts; A&E unit admissions) as an indicator to the ASSIST tool. By that, the changes in unit costs are considered for the stakeholders whose costs and benefits are modelled in the ASSIST tool.

7.4. ASSIST analysis

The aim of this chapter is to present the analysis results of the cost-benefit impact modelling of C3-Cloud service implementation and scaling up. It models the impacts on the individual and organisational level, as well as on the service level. The monetised positive and negative effects of C3-Cloud implementation on each individual stakeholder as well as organisations are considered, and a scale-up model developed. Service-related costs and benefits are considered to approach the question of “Why would a certain stakeholder want to get involved in a service?”. In addition, the final analysis aims to establish a trend for indicators on service levels, such as the socio-economic return (SER), the point(s) in time of break-even(s) of service investments, as well as return on investments (ROI). These measures are used to give an analysis on whether C3-Cloud can reach sustainability over time on the individual, organisational and the service level.

The analysis allows the identification of indicators with a high weight that should be given most attention, in terms of both better measurements, and service optimisation for the further deployment and up-scaling of C3-Cloud services. In addition, negative results of the SER for certain stakeholders or organisations prompted us to rethink the impacts again: “Did we really consider all benefits and costs? Is it plausible that a benefit for one stakeholder is a cost to another? Whether one cost item goes along with another cost item?”.

This report addresses the service’s up-scaling potential within the three deployment regions: The Basque Country, Region Jämtland Härjedalen and South Warwickshire. The question of concern is whether C3-Cloud should/could become the new standard of doing things for a whole region and beyond, or if further development needs to be done and changes implemented to have a positive socio-economic return on a stakeholder, organisational or system level.

Limitations of the cost-benefit impact modelling in ASSIST

The explanatory power of the final analysis on the individual, organisational and service level can be limited due to several factors. Data in the ASSIST tool relies much on stakeholder estimates rather than being measured empirically or taken from the accounts. Such estimates are generally done by experts in the field, yet they remain subject to uncertainty; there may be variation in the perception of certain service indicators. Although great efforts were made to obtain accurate data, sometimes it was not possible or feasible to obtain more in-depth data.

Uncertainty is included in all measurements, though to varying degrees. This aspect is taken care of by a sensitivity analysis employing Monte Carlo Simulation. Accordingly, in several instances a socio-economic-return interval for a stakeholder or an organisation is reported that shows a likely scenario, as well as best- and worst-case scenarios.

What is especially difficult to estimate or determine is the impact on healthcare service utilisation, such as the avoidance of admissions. In during the C3-Cloud pilot trials, healthcare system resource use was monitored for C3-Cloud patients and compared with historic control patients with similar characteristics. This was followed by the discrete event simulation which modelled the six months resource utilization cost per patient for the next eight years. These costs were included in the ASSIST analysis.

What nevertheless can become clear is that with the current extra effort in service provision (e.g. time spent on training, inconvenience due to adaptation to a new way of working, efforts related to care plan creation in C3-Cloud, etc.), even optimistic estimates on avoided use of healthcare resource may not lead to a viable service. In such cases, the benefits of the service may be somewhere else, and should be seen, understood and communicated in this way.

C3-Cloud services were thoughtfully planned and carried out, yet the ASSIST tool provides information on possible veto players or losers at service level. Therefore, the service design may be optimised for the up-scaling and deployment plans based on the cost-benefit analysis.

Besides, the SER or ROI can for certain individuals or organisations be negative. This need not necessarily indicate poor performance of a certain stakeholder or organisation but can point to structural issues for which a high-level solution or work around needs to be achieved. E.g. the addition of medical sensor devices may be an excellent feature to the system, yet it may overburden primary care organisations or a call centre if they were to purchase these. Now it could be the task to minimise the loss instead of aiming for it to be profitable, as the added health information available may be worth the extra hardware cost to improve patient health in the long term.

It is therefore important to keep in mind that the cost-benefit analysis is a prospective planning tool which supports the planning of sustainable service models rather than a retrospective service evaluation. It looks ahead and tries to simulate what impact may arise.

7.4.1. SWFT

In South Warwickshire, we modelled the costs and benefits for the following organisations and their related stakeholders, based on average salaries or household income (without employer contributions and social security) as a proxy to monetise the time that individuals spend on or liberate due to C3-Cloud. The following yearly net household incomes were assumed for the ASSIST model:

- Multimorbid patients (£36,000 per year) and their informal caregivers (£45,000 per year).
- The primary care centre, including primary care physicians (£95,000 per year) and primary care nurses (£30,296 per year)
- The hospital, including hospital specialist physicians (£85,000 per year), hospital specialist nurses (£40,894 per year) and community nurses (£40,894 per year)
- The Payers (i.e. the Ministry of Health)
- IT developers (only C3-Cloud development costs were considered)

7.4.1.1. Sustainability at service level

Under the assumptions made in the evaluation, the modelling in South Warwickshire achieves an overall cumulative socio-economic return rate of -1% over the predicted period of 84 months. Based on this, the systemic service viability is only moderately positive and demands detailed interpretation and exploration, if current assumptions hold. Among the stakeholders involved, health and social care providers as well as staff exhibit negative cumulative SER ranging between

-23% to -75% respectively (Table 24Table 66). Professional staff working in the health provider organizations (primary care centers and secondary care hospitals) may thus be strong opponents or veto players to the up-scaling of the C3-Cloud systems. In contrast, the Ministry of Health has a highly positive cumulative SER of 347%, making it to potential main proponent of the C3-Cloud up-scaling. Among the individual stakeholders, positive SER values are achieved by informal carers (53%) while patients have a negative SER (-23%). The largest contribution in negative values to the overall performance derive from the hospital, followed by primary care centers. Both perform have a negative SER at the end of the modelling period (hospital: -61% and primary care centers -29%). On the positive side, the Ministry of Health which is defined as the “payer” of health services in South Warwickshire, records the largest positive impact (347% increase of SER), mainly deriving from the fact that avoided primary care consultations with nurses and physicians as well as avoided A&E admissions at the hospital are considered as benefits (i.e. avoided cost claims).

Interestingly, the overall (systemic) cumulative SER rises (Figure 149, Figure 179, Figure 174) once the majority of patients are included. The turning point is observable in April 2023, where 30,313 patients are actively included in total. This is due to the assumption, that training on the platforms follows the s-curve shaped inclusion of patients (Figure 151). Once C3-Cloud users are trained properly on the platforms, an upward SER trend is expected. The effect does not translate into a positive overall cumulative net benefit in before the end of the modelling period (Figure 150). However, the systemic Monte Carlo simulation suggests a positive (i.e. >0%) overall SER also in November 2025 in the scenario under moderate assumptions (50% percentile). In the best case scenario (95% percentile) the systemic cumulative SER would be positive from the outset, starting at 80%, following a decrease with the addition of all users over time, having its lowest point at 0% in November 2023 and levels off at around 22%. In the worst-case scenario (5% percentile) the outcome would be and stay negative from the outset, increasing to a -15% at the end of the observation period.

In conclusion, continuing the service as planned in the deployment plans can be recommended if current assumptions hold. It is crucial to involve all stakeholders in the scaling up and to communicate additional benefits to the component users. While informal caregivers have a moderate positive SER (53%), patients, healthcare professionals and the organizations employing them currently have no business case in keeping usage up but instead could be strong veto players 23% to -75% SER). Only the payer (‘Ministry of Health’) has a strong business case with a positive overall SER of 347% after 84 months. Additional benefits to the front-line workers and the organizations they are employed at should be investigated or developed. Also, the reimbursement plans need further investigation. E.g.: is forgone income from avoided primary care consultations indeed a cost to the primary care centre and a benefit only to the payer, or are there more intangible benefits (e.g. more time to deliver quality care) with the primary care centre staff?

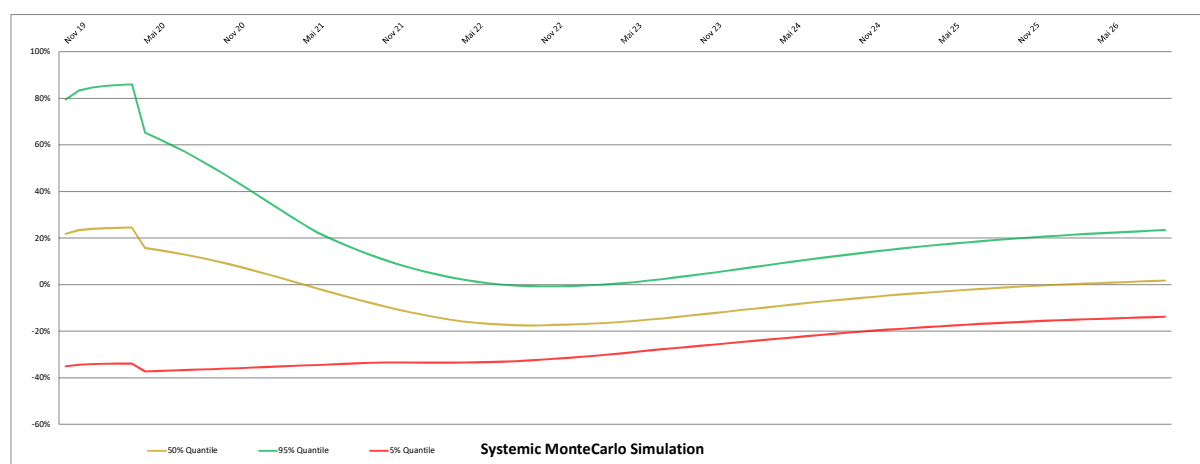


Figure 149. Monte Carlo overall cumulative socio-economic return for SWFT.

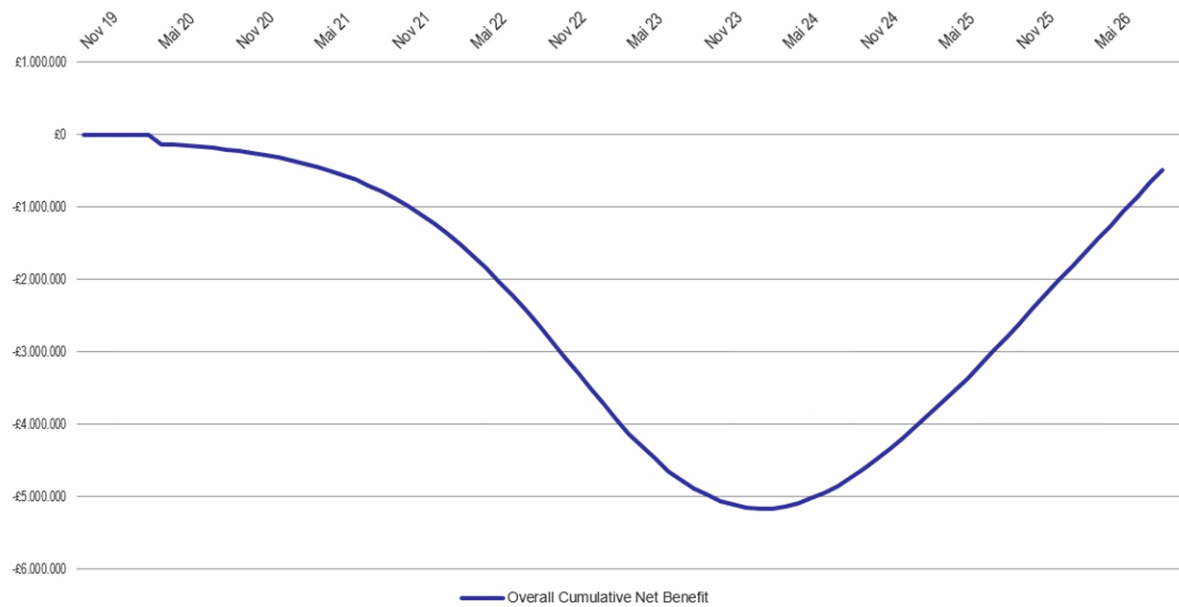


Figure 150. Overall cumulative net benefit for all stakeholders over time in SW.

Table 24. Socio Economic Return for SWFT C3-Cloud by Stakeholders.

Groups	Subgroups		Cumulative socio-economic return (SER)	Cummulative net-benefit	Time to positive SER / ROI
Overall socio economic return		➡	-1%		
Individuals					
	Multimorbid patients	⬇	-23%		—
	Informal carers	⬆	53%		0 years 6 months †
Health and social care providers & staff					
	Primary care organisations	⬇	-29%	-12.645.517	0 years 4 months
	Primary care physicians (GPs)	⬇	-75%		—
	Primary care nurses	⬇	-75%		—
	Hospital	⬇	-61%	-17.406.495	—
	Hospital physicians	⬇	-75%		—
	Community nurses	⬇	-75%		—
	Specialist / hospital nurses	⬇	-75%		—
Payers					
	Ministry of Health	⬆	347%	30.470.510	0 years 1 months
Non ICT Organisations					
ICT industry					
	IT suppliers	➡	0%	-0	— *

* Return on investment

† Multiple break-even

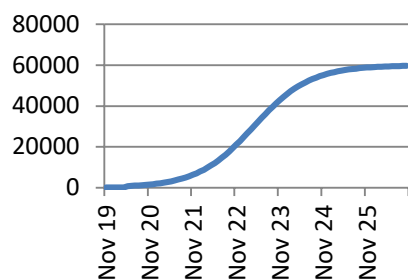


Figure 151. Cumulative S-shaped curve of patients added over time in SWFT.

Figure 151 shows the assumptions made in relation to the inclusion of (multimorbid) patients. The project period started in November 2019 over a period of 84 months, thus until October 2026. The project started with 18 patients and a gradual, S-Shaped inclusion of new patients after 6 months. The automatic inclusion of patients in South Warwickshire aims at 60,000 patients in total. While the fact that there are 5 months without any new patients (December, 2019 – April, 2020) has to be born in mind for the cost-benefit-analysis, subsequently, the inclusion surges with an additional 681 patients in May 2020 under the assumption that upscaling will kickstart with a larger number of patients following an s-curve inclusion thereafter. Over the following 77 months, the number of additional patients per month averages 767 patients.

7.4.1.2. Sustainability at individual and organisational level

7.4.1.3. Multimorbid patients

Patients with multiple diseases were chosen based on different inclusion criteria. Patients to be included in the project were chosen on having two of the four conditions: Heart failure with NYHA Type I or II; renal failure with EGFR 30-59; Diabetes Type II; mild or moderate depression.

Interactions with other stakeholders and services include:

- Reading online educational material.
- Messaging or communicating with the MDT
- Compliance with the care plan (goals and activities)
- Entering information (e.g. blood pressure and body weight) into the patient empowerment platform

The service's main cost lies in the inconveniences of adapting to the new service processes. Time spent with the tool training on new devices and service elements such as home monitoring, contact with the MDT, as well as consultations with the nurse's visits and filling in questionnaires generate resource and financial costs.

The large share of 58% of total cost lies in the inconvenience of adaption to the new tool. The training time foreseen for each patient averages 4 hours. It includes all time spent by end-users (patients) in relation to training received as part of the new service. Other than for provider organizations, time here reflects inconvenience caused by using the service, rather than a tangible cost item. The second biggest contribution to cost derives from the extra time spent as an effect of the new tool. On average it is estimated that 10% of patients need to take measurements (e.g. blood pressure, heart rate, blood glucose levels, weight). One measurement takes up 8 minutes and a total of 32 measurements was performed for each patient of that 10% subgroup, adding 42% of the total costs for patients.

The convenience of travel costs and travel time saved for avoided consultations with the patients MDT contributes largely to the benefits aggregating the positive socio-economic return for patients. This impact is followed by the positive service valuation of C3-Cloud, which covers all subjective and intangible benefits of the innovative tool, primarily in relation to user satisfaction. The idea is that, the more satisfied the patient, the more likely positive spill-over effects. The data

to assess satisfaction was retrieved from the eCCIS eCare Client Impact Survey and the eCCIS scoring tool (Table 25Table 67).

The patients Monte Carlo simulated cumulative SER results in -22% at the end of the modelling period (under moderate assumptions). Under positive assumptions, a neutral SER is reached in May 2025, increasing up to 19% in month 84, when the scaling up of patients ceased (Figure 152). The dent in November 2024 (Figure 153Figure 214) can be explained as the largest number of patients added per month has then been reached (following the s-curve inclusion, Figure 152) and less patients will need to spend time on training from then, yet more patients will benefit from avoided travels.

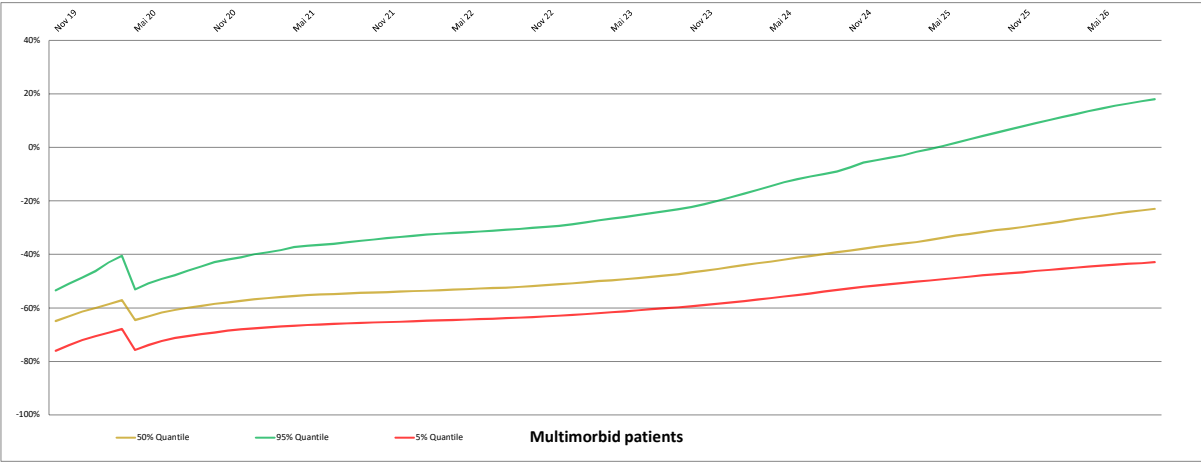


Figure 152, Monte Carlo simulation of cumulative SER for SWFT multimorbid patients

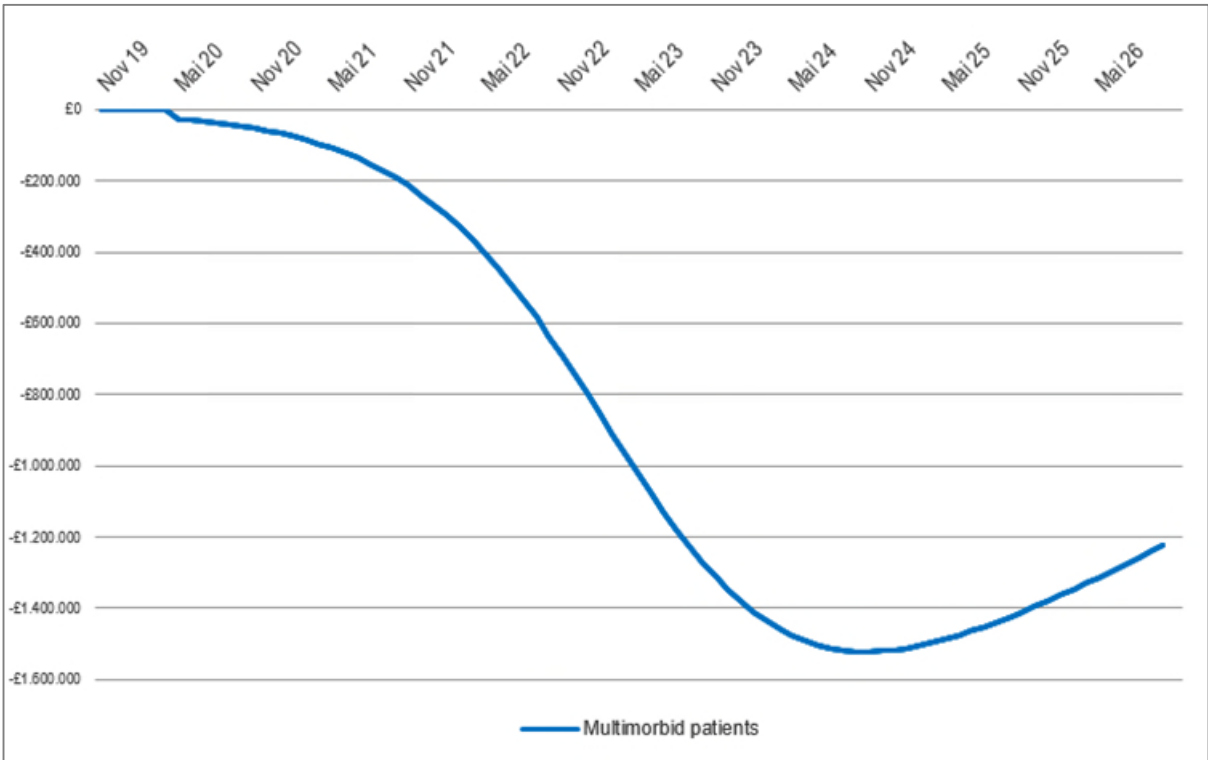


Figure 153, Cumulative net benefit for SWFT multimorbid patients

Table 25, SWFT: Key service impacts for multimorbid patients

Negative impacts	Rational	Share of total costs
Inconvenience : training time	Includes all time spent by end users in relation to training received as part of the new service. Time here reflects inconvenience caused by using the service, rather than a tangible cost item. The assumption is four hours of training per new patient using the system.	58%
Inconvenience : extra time for service use spent by Multimorbid patients	<p>Includes all time spent by end-users in relation to training received as part of the new service. Other than for provider organisations, time here reflects inconvenience caused by using the service, rather than a tangible cost item (self-measurement etc.).</p> <p>In the FHIR data, we observed that out of the 29 patients who performed self-measurements (10.2%), the mean number of measurements was 16 over six months (for blood pressure, weight, blood glucose and heart rate). We assumed 32 measurements for these patients per year. We excluded one outlier with 458+ measurements! Also, some measurements are taken at the same time (e.g. blood pressure and blood glucose may be taken and sent to PEP at the same time). The FHIR data showed that out of the 29 patients with self-measurements, 13 measured multiple measurements (e.g. they uploaded values for blood pressure and glucose levels). Where this was the case, we counted only the higher number of measurements. E.g. when blood pressure was measured 20 times and weight only 4 times, we counted only the blood pressure. Each measurement, including transmission to the PEP platform, is assumed to take 8 minutes.</p> <p>In addition, HCP interviews led to the assumption that per patient and year, 1.5 remote care sessions will be held for a duration of 15 minutes, due to the new service</p>	42%
Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits by Multimorbid patients according to eCCIS	<p>Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. Supported by the questions included in the eCCIS (eCare Client Impact Survey) and eCCIS scoring tool.</p> <p>The data was retrieved from as the median answer on the eCCIS questionnaire, pooled across all three pilot sites.</p>	43%

Convenience: travel time saved for service use spent by Multimorbid patients	Includes all time saved by end-users for travelling to receive services, as an effect of the new service. Time is accounted for different types of activities, the time spent for them and their frequency of occurrence. Other than for provider organisations, saved time reflects convenience caused by using the service, rather than a tangible benefit item.	24%
Travel cost saved for service use spent by Multimorbid patients	Patients save 1.1 consultations at the care centre per year based on the DES modelling. The assumption is 12km travel distance with a mileage refund of £0.56.	33%

In conclusion, the adaptation time to new services, the positive valuation of the service, and travel time saved are the most critical factors in terms of costs and benefits that have a high impact on the outcome. C3-Cloud implementation costs for multimorbid patients are larger than its operational costs and its operational benefits are even much larger than the latter (Table 26, Table 68). This creates a cumulative net benefit of £1,200,000 at the end of the projection period in 2026 (Figure 153, Figure 214). It should be expected that after the modelled period the net benefit may further increase and ultimately become neutral or positive.

Table 26, Sum of costs and benefits for SWFT multimorbid patients

Sum of all costs	Sum of all cost types reduced by contingency in present values	£5.306.624
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	2.157.157
Non-financial costs	Inconvenience	3.149.466
Implementation cost	Costs related to service implementation	3.149.466
Operation cost	Costs related to continuous operation of the service	2.157.157
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	£4.081.742
Financial benefits	Reducing cash outlays	1.327.774
Liberated resources	Time saved from existing activities	976.250
Non-financial benefits	Convenience	1.777.719
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	4.081.742

7.4.1.4. Informal carers

Informal carers are carers of multimorbid patients: Relatives who live with the patient, or who are responsible for them in some way and/or volunteers that regularly (e.g. several times a week) support the professional care personal to provide additional health service to the patient.

The service has the positive intangible impact of reassuring the informal carer about care provision and informing them better about the patient's care. Time and costs saved due to reduced travelling have a positive resource and financial impact.

About 5% of patients do have informal carers that accompany and assist them in their daily activities. In many cases, these are their children. For this reason, almost 100% of informal carers

are working, which puts additional pressure on them to support their family in their scarce free time. Informal carers in the RJH also learn how to use the patient empowerment platform (PEP), which is truly an investment. The estimated time spent by informal carers receiving training is expected to take 2 hours per new patient.

This is outweighed strongly by their positive perception and valuation of the service (Table 27). The Monte Carlo simulation of cumulative SER for informal carers predicts a positive SER of 150% at best, and -10% in the worst case scenario (Figure 154Figure 215).

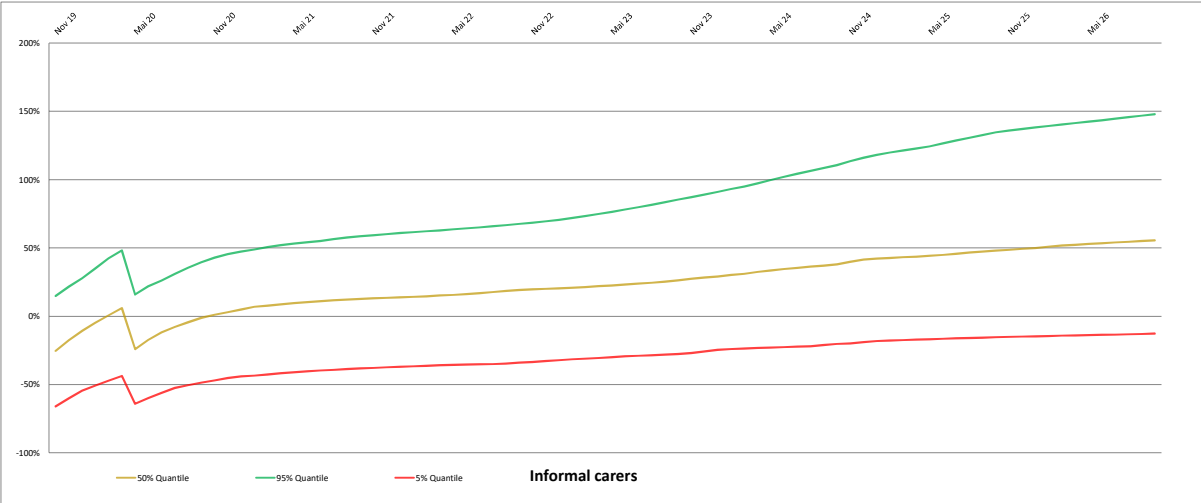


Figure 154, Monte Carlo simulation of cumulative SER for SWFT informal carers

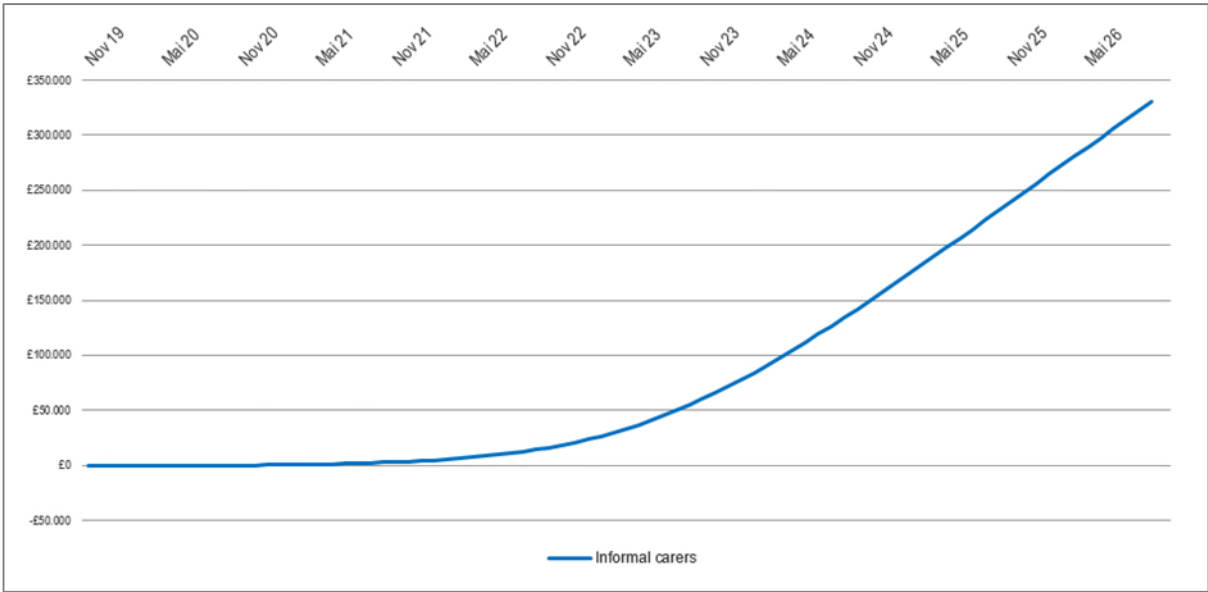


Figure 155, Cumulative net benefit for SWFT informal carers

Table 27, SWFT: Key service impacts for informal carers

Negative impacts	Rational	Share of total costs
Inconvenience: extra time for service use spent by Informal carers	Includes all time spent by end users in relation to training received as part of the new service. Other than for provider organisations, time here reflects inconvenience caused by using the service, rather than a tangible cost item (self-measurement etc.). The assumption is that informal caregivers support their 'patient' on average six times a year for 20 minutes with the PEP and with self-measurements.	78%
Inconvenience: training time	Includes all time spent by end users in relation to training received as part of the new service. Time here reflects inconvenience caused by using the service, rather than a tangible cost item. Time dedicated to learning how to use the system is estimated to be 1-2 hours.	22%
Positive impacts	Rational	Share of total benefits
Convenience: time saved for service use by Informal carers	The assumption is that informal caregivers liberate time through improved MDT collaboration (less calls and visits) and less need to plan care and help patients with their care. In addition, informal caregivers need not accompany their 'patient' for 1.1 avoided consultations per year, saving them approximately 90 minutes of their time.	57%
Valuation of intangible benefits by Informal carers according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. Supported by the questions included in the eCCIS (eCare Client Impact Survey) and eCCIS scoring tool. The data was retrieved from as the median answer on the eCCIS questionnaire, pooled across all three pilot sites. It is interpreted that their satisfaction would improve when they have seen their relatives are satisfied with the care received in C3—Cloud.	43%

In conclusion, the adaptation time to new services, the positive valuation of the service and time and travelling saved are the most critical factors in terms of costs and benefits that have a high impact on the outcome. The sum of all benefits exceeds the costs (Table 28).

Table 28 Sum of costs and benefits for SWFT informal carers

Sum of all costs	Sum of all cost types reduced by £619.839 contingency in present values	
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	478.373
Non-financial costs	Inconvenience	141.467
Implementation cost	Costs related to service implementation	141.467

Operation cost	Costs related to continuous operation of the service	478.373
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	£950.362
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	538.169
Non-financial benefits	Convenience	412.193
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	950.362

7.4.1.5. Primary care organisations

Primary care centers (community practices) employ GPs and practice nurses. Their main cost burden is forgone income from avoided consultations with the primary care practice (67% of costs) (Table 29). It can be argued that this is not indeed a cost to the primary care organisation as payment may not be based on per fee-for-service but rather on capitation payments or block contracts through South Warwickshire Health Service. However, with the ASSIST modelling a systems perspective is taken, where the ultimate saving cost with avoided consultation lies with the payer. The primary care center may instead use the time liberated for improved care quality, yet this is not under consideration with this modelling.

10% of patients may benefit from medical sensor devices that could be purchased and cycled among South Warwickshire patients (18% of costs). Extra time spent by primary care nurses on consultations with multimorbid patients, supporting them with self-measurements on the patient empowerment platform (PEP) enters as a cost factor, representing 11% of the total primary care organisation's cost. Initial care plan creation and overheads contribute to 1% and 3% to overall costs for primary care centers.

On the benefit side, 33% of positive impacts is attributable liberated GP time due to fewer consultations with C3-Cloud, 28% to additional income from more telephone consultations that may be cashed with the payer. Another major benefit is fewer phone calls needed between physicians and nurses and the wider MDT or the hospital and patients. This saves approximately 4 hours for the GPs (9% of costs) and 8 hours for nurses (1% of costs) every month (Table 29).

Applying the Monte Carlo model (Figure 156Figure 221) to the data for primary care organisations shows that it starts off with -40% SER during the trial phase, as there are many implementation costs but relatively fewer implementation benefits defined. The development is positive in the following months because no additional professionals are recruited during the technology trial, but the implementation costs decrease each month. From May 2020 onwards, additional professionals are recruited, adding new implementation costs. In parallel, primary care organisations have operational costs mainly from forgone income from reduced MDT consultations. It is debateable if this is indeed a cost to primary care organizations, as they are being paid by the Ministry of Health for such consultations. Yet the way this modelling has been set up, it is considered as a cost for the primary care organisations which translates in a benefit for the payers. Consequently, primary care organisations may have liberated time to improve care quality during remaining patient consultations. In addition, time is liberated due to reduced consultations and a new potential stream of income is generated by added telephone consultations which may be cashed with the South Warwickshire Health Service. The overall SER free-falls in May 2020 (when the scaling up starts) due to user training, and the purchasing of medical sensor devices for patients as well as the unit costs models from the Discrete Event Simulation. It can be observed, however, that the cumulative SER continuously increases from May 2020 onwards. The best scenario models the SER for primary care organizations at -20% after the observation period of 84 months; in the worst-case scenario it could be at -50%. Consequently, Figure 157 shows a minor recovery of the cumulative net benefit towards the end of the modelling period.

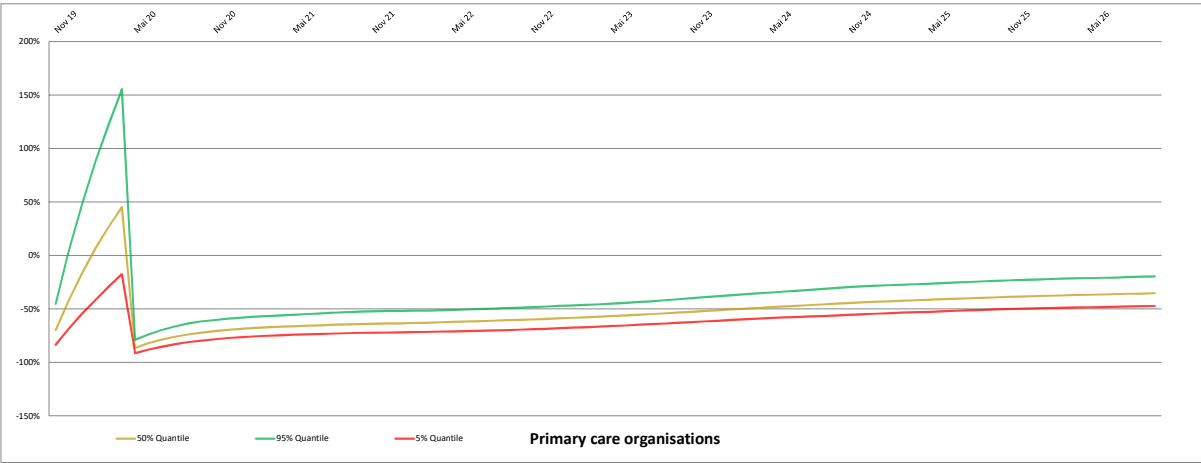


Figure 156, Monte Carlo simulation of cumulative SER for SWFT primary care organisations

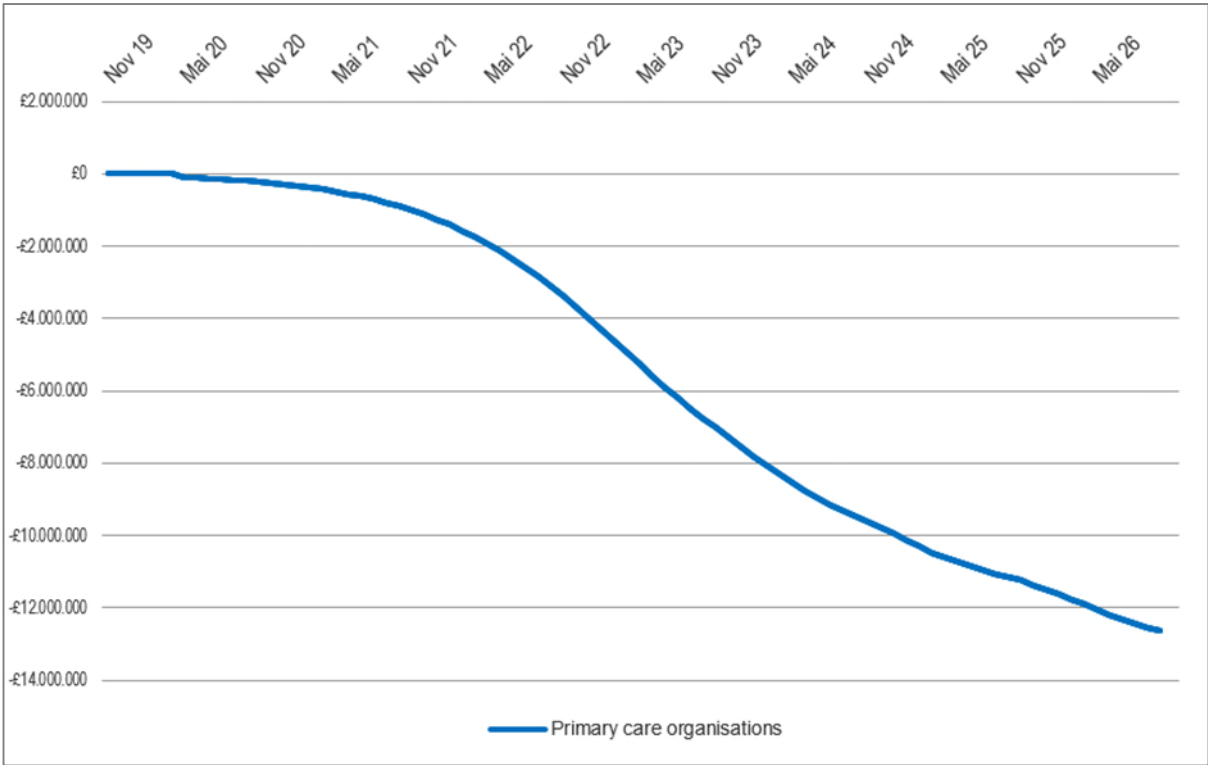


Figure 157, Cumulative net benefit for SWFT primary care organisations

Table 29, SWFT: Key service impacts for SWFT primary care organisations

Negative impacts	Rational	Share of total costs
Forgone income from reduced consultations with the MDT at the primary care organization	Based on reduced primary care physician consultations and its respective costs. The costs were modelled using discrete event simulation models, performed by the Osakidetza partners of C3-Cloud.	67%
Devices for Multimorbid patients	<p>The costs for medical devices are multiplied by patient number and by the share of patients with the respective disease.</p> <p>The share of patients from C3-Cloud having chronic conditions was significantly different from the general population in RJH. Thus, we relate here to the share of patients generally in the in RJH, who have the underlying chronic condition.</p> <p>Heart failure: 21.9%. The assumption is, that each heart failure patient could benefit from the blood pressure monitor (£45.70).</p> <p>Diabetes: The assumption is that each diabetes patient could benefit from a connected weight scale to monitor their weight (£56.62).</p> <p>The assumption further is that each multimorbid patient needs one Motorola G7 as a base to facilitate the connection between the medical device(s) and the C3-Cloud FHIR repository platform (£111).</p>	18%
Extra staff time for service provision (intervention) by Primary care nurses to Multimorbid patients - actual time	The assumption is that nurses will take 5 additional minutes for measurement per visits per patient for 3.4 visits a year (based on actual data)	11%
Overhead on costs	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on costs is calculated as a percentage mark-up on staff costs, here 25%.	3%

Extra staff time for service provision (initial care plan creation) by Primary care physicians (GPs) to Multimorbid patients - actual time	The assumption is that the MDT spends on average 34 minutes on care plan creation (derived from FHIR extracts). That is shared between physicians and nurses, both doing different activities on the system! We assume that they share tasks 50/50. In addition, a consultation with a regular (non-C3-Cloud patient) would be scheduled for 10 minutes. Thus, the extra time on care plan creation will be considered as 17minutes (C3-Cloud) - 10 minutes (non-C3-Cloud) = 7 minutes.	1%
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Positive impacts	Rational	Share of total benefits
Resource liberation (intervention) for Primary care physicians (GPs) working with Multimorbid patients - actual time	The observation is that the number of visits will be reduced by 2.2 per year per patient. One conventional visit takes the GP approx. 20 minutes (eCUI indication was 15-30 minutes). In addition, it is expected that patients will see the primary care physician every three months to review their care plan. For these consultations, C3-Cloud may save the physician time for each consultation (2 minutes per care plan review is assumed). While C3-Cloud data (DES modelling and pilot site extract) showed that C3-Cloud patients saw their primary care centre only 2.2 times a year, it is anticipated that this frequency may increase when Covid-19 restrictions have been alleviated.	33%
More income from additional consultations with the Primary care organisations	Includes added income based on additional telephone consultations between the patients and the primary care organisations. This input is based on discrete event simulation performed by our project partner Osakidetza.	28%
Resource liberation (intervention) for Primary care nurses working with Multimorbid patients - actual time	DES modelling showed that C3-Cloud saves 1 home visit per patient and year and with that nurses liberate 40 minutes of their time.	14%
Overhead on benefits	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on benefits is calculated as a percentage mark-up on staff benefits, using the same overhead rate as for costs. 25% here.	14%

Resource liberation for Primary care physicians (GPs) collaborating with patients and the MDT via the C3-Cloud platforms - actual time	The assumption is 4-5 hours/month if C3-Cloud were widely implemented.	9%
Resource liberation for Primary care nurses collaborating with patients and the MDT via the C3-Cloud platforms - actual time	In a widely implemented situation 8-10 hours/month is estimated, with less time spent in phone calls to contact other caregivers and with less time spent just waiting on the phone, communicate with the MDT and collecting needed information.	1%

Table 30, Sum of costs and benefits for SWFT primary care organisations

Sum of all costs	Sum of all cost types reduced by £43.523.184 contingency in present values	
Financial costs	The need for extra cash	38.174.044
Redeployed resources	Time taken away from other activities	5.349.140
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	8.185.953
Operation cost	Costs related to continuous operation of the service	35.337.231
Sum of all benefits	Sum of all benefit types reduced by £30.877.667 contingency in present values	
Financial benefits	Reducing cash outlays	13.190.580
Liberated resources	Time saved from existing activities	17.687.087
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	30.877.667

7.4.1.6. Primary care physicians

GPs are employed at the primary care centers, providing primary care and care planning for multimorbid patients.

Improvement in decision making due to being better informed, and improvement in quality of care provided, can have a positive intangible impact. Professional's motivation and satisfaction have a positive intangible impact (Table 31). Both result in a very moderate positive valuation of the C3DP services. However, GPs need to invest time in adapting to the new way of working. The implementation costs outweigh the perceived benefits (Table 32Table 78), resulting in a negative cumulative SER of -75% for the GPs in primary care practice (Figure 158Figure 223).

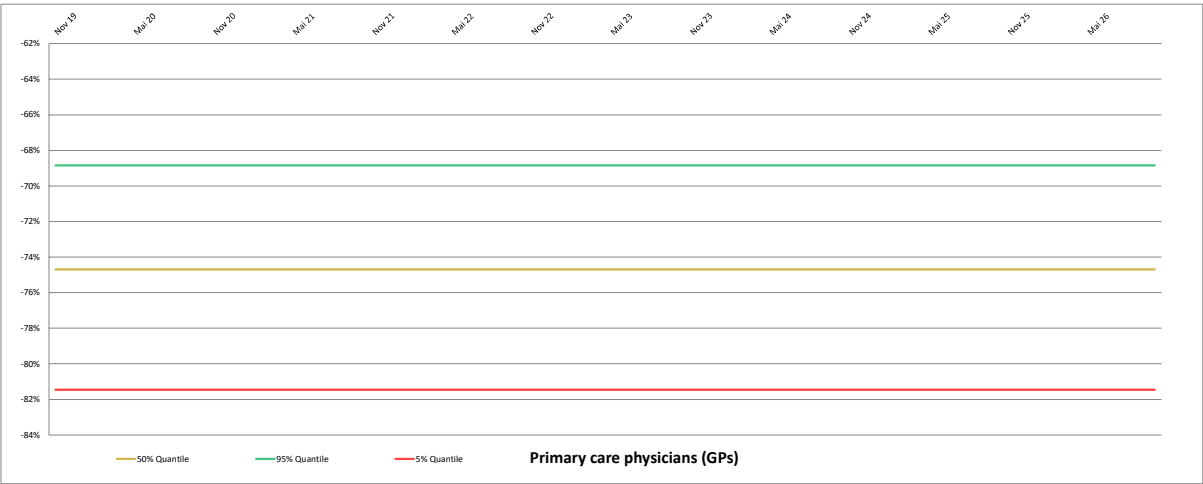


Figure 158, Monte Carlo simulation of cumulative SER for SWFT primary care physicians

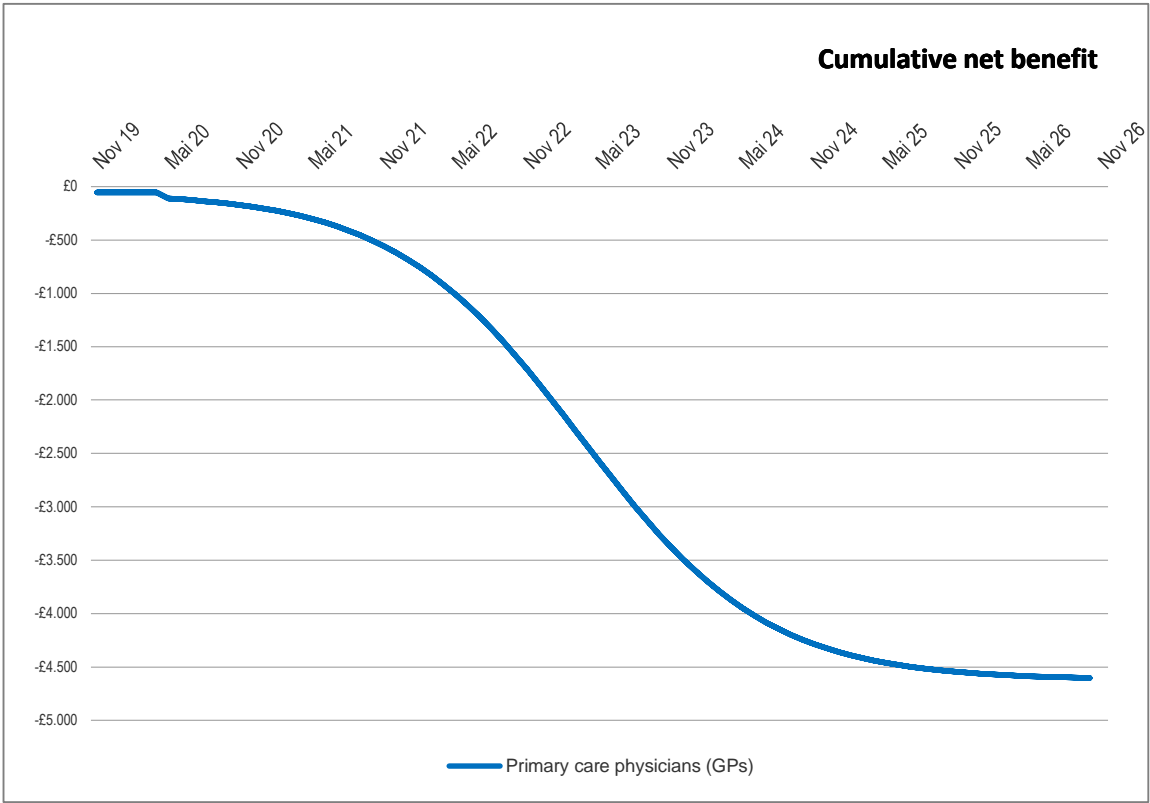


Figure 159, Cumulative net benefit for SWFT primary care physicians

Table 31, SWFT: Key service impacts for primary care physicians

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is that GPs spend 30 extra minutes during the first month due to adaptation to C3-Cloud.	100%
Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits by Primary care physicians (GPs) according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Table 32, Sum of costs and benefits for SWFT Primary care physicians

Sum of all costs	Sum of all cost types reduced by contingency in present values	£6.140
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	6.140
Implementation cost	Costs related to service implementation	6.140
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	£1.535
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	1.535
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	1.535

7.4.1.7. Primary care nurses

Primary care nurses are employed by and work in the primary care centers. They provide primary care and care planning for multimorbid patients and may support with self-measurements of vital signs such as blood pressure, heart rate or blood glucose levels.

Improvement in care planning due to being better informed, and improvement in quality of care provided through liberated time, can have a positive intangible impact. Professional’s motivation and satisfaction have very moderate positive intangible impact (Table 33). However, Primary care nurses need to invest time in adapting to the new way of working (2 hours in the first month is assumed). The implementation costs outweigh the perceived benefits (Table 34), resulting in a negative cumulative SER of -74% for nurses in primary care centers (Figure 156). This is reflected by the Monte Carlo simulation. There is a small cost (inconvenience) which cannot be outweighed by the overall satisfaction of primary care nurses with the C3-Cloud system. Thus, the Monte Carlo modelled SER varies between -69% and -81%.

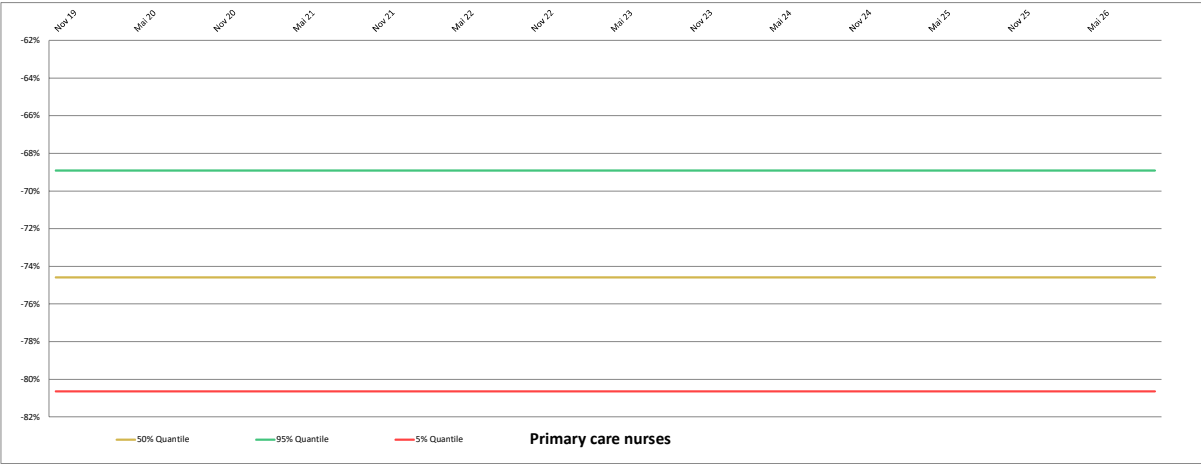


Figure 160, Monte Carlo simulation of cumulative SER for SWFT primary care nurses

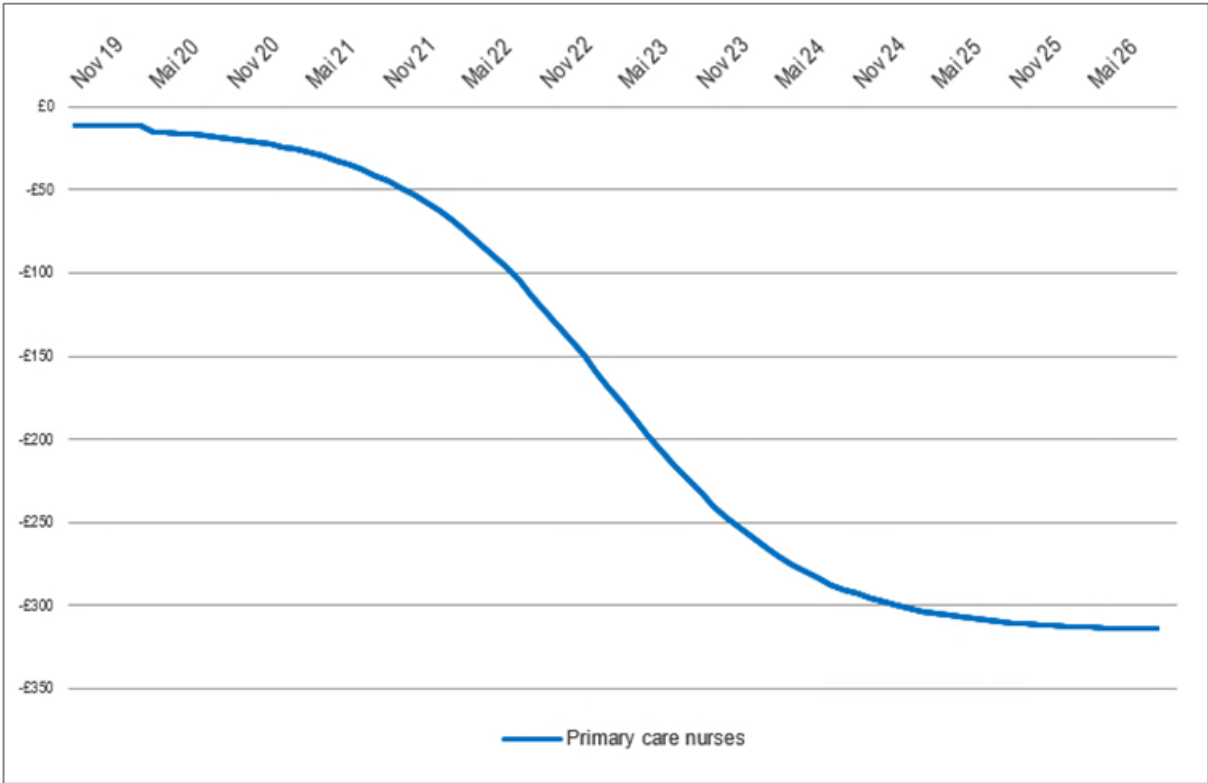


Figure 161, Cumulative net benefit for SWFT primary care nurses**Table 33: SWFT, key service impacts for primary care nurses**

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is primary care nurses need 2 hours in the first month to adapt to C3-Cloud services.	100%
Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits by Primary care nurses according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Table 34, Sum of costs and benefits for SWFT primary care nurses

Sum of all costs	Sum of all cost types reduced by contingency in present values	£419
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	419
Implementation cost	Costs related to service implementation	419
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	£105
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	105
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	105

7.4.1.8. Hospital care

Patients involved in C3-Cloud may be forwarded to hospitals to receive specialist physician care or may be submitted to the Accident and Emergency unit upon sudden health deterioration.

Hospitals are mainly affected due to forgone income from avoided A&E admissions for C3-Cloud patients (92% of all costs) (Table 35). In addition, hospital staff spends time on C3-Cloud training and on using the C3-Cloud platform, which they have not done before.

Positive impacts for the hospital include resource liberation and fewer travel expenses for community nurses who are employed at the hospital yet work in close collaboration with the primary care practices and perform home visits. Also, specialist nurses save quite several calls with the MDT and care centers due to the data being readily available on the C3-Cloud platform.

Additional benefits for the hospital may be sought in improved quality of care or shortened hospitalisation periods – indicators that were not part of this evaluation or that were found to not be significantly different for the C3-Cloud patient cohort when compared with the control patient cohort. This could be a different picture if a follow-up trial had the chance to observe a longer trial period; larger patient cohorts; patients with moderate to severe conditions and a trial not under Covid-19 impediments.

The implementation and operational costs are larger than the operational benefits over the whole time (Table 36). Consequently, the SER for hospitals maintains negative, ranging from -85% to -60% over the entire observation period (Figure 162). The cumulative net benefit starts decreasing even steeper than before from November 2022 onwards, which is caused by an increase in costs modelled from the DES (Figure 163). At the end of the observation period, the overall net benefit is as low as £-17,000,000 for hospitals.

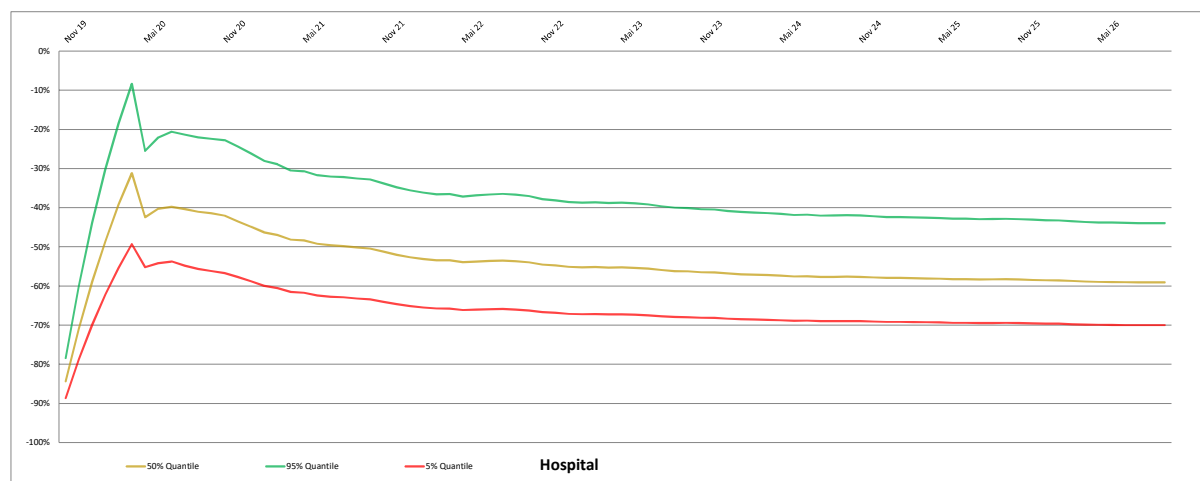


Figure 162, Monte Carlo simulation of cumulative SER for SWFT hospital care

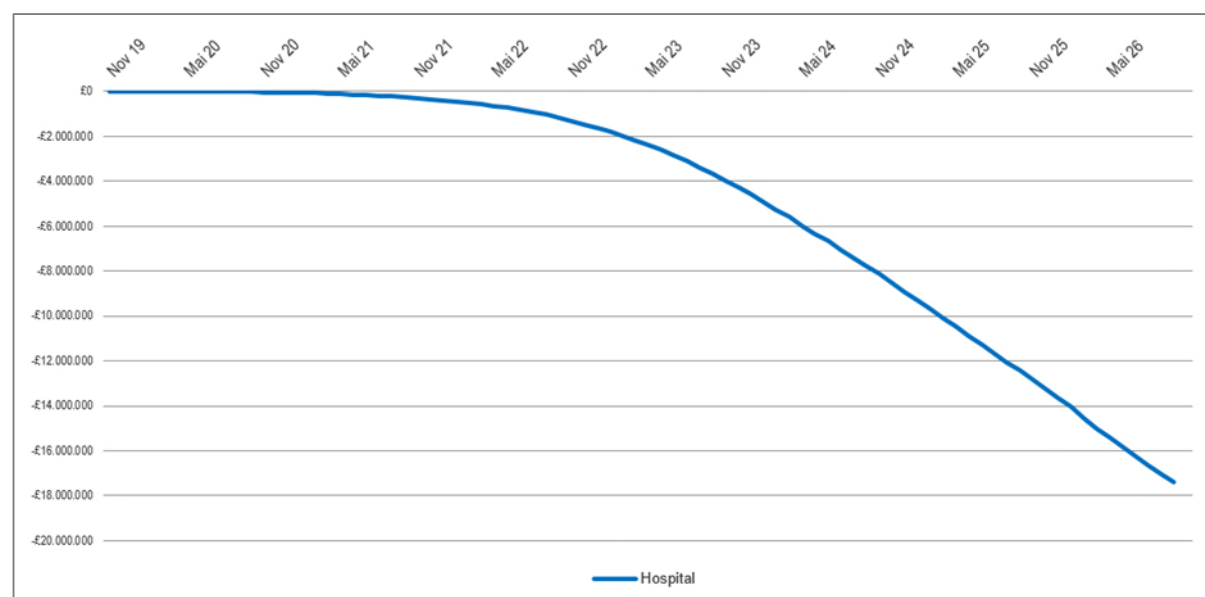


Figure 163, Cumulative net benefit for SWFT hospital care**Table 35, SWFT: Key service impacts for hospital care**

Negative impacts	Rational	Share of total costs
Forgone income from reduced home visits	The DES modelling concluded: 1.0 fewer home visits through primary care nurses over 12 months	57%
Forgone income from reduced visits or admissions to the Hospital	Forgone income based on reduced use of the A&E unit at the hospital. The data is based on DES modelling from Osakidetza. This is the delta of costs per patients and month for regular care - costs for C3-Cloud patients. It considered the average costs savings for patients that have had at least one A&E visit.	36%
Extra staff time for service provision by Hospital physicians to Multimorbid patients - actual time	Per patient per hospitalisation 15 minutes time spend on C3-Cloud care planning, dependent on the severity of the case. Excluding time spend on prescriptions.	4%
Extra staff time for service provision by Specialist / hospital nurses to Multimorbid patients - actual time	Per patient per hospitalisation 15 minutes time spend on C3-Cloud care planning, dependent on the severity of the case. Excluding time spend on prescriptions.	2%
Overhead on costs	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on costs is calculated as a percentage mark-up on staff costs; assumed to be 25%.	1%
Positive impacts	Rational	Share of total benefits
Resource liberation for Community nurses in service provision to Multimorbid patients - actual time	DES modelling showed that C3-Cloud saves one home visit per patient and year and with that community nurses liberate 40 minutes of their time.	62%
Resource liberation from avoided home visits - travel cost	1.4 home visits are saved for community nurses per year. The assumption is 8km per trip and a £0.56 mileage refund.	20%

Overhead benefits on	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on costs is calculated as a percentage mark-up on staff costs; assumed to be 25%.	16%
Resource liberation for Specialist / hospital nurses in service provision to Multimorbid patients - actual time	Specialist nurses save time for calls telephone calls: Approximately 5 calls a week (260 per year) with rheumatology, gastroenterology, chronic inflammatory arthritis, catheter patients, non-cancer chemotherapy patients) for 5 minutes each on average. In addition, they save time calling the GP practice asking to organise treatments and to answer questions on previous treatments (also approximately 260 calls per year, 5 minutes each.	2%

Table 36, Sum of costs and benefits for SWFT hospital care

Sum of all costs	Sum of all cost types reduced by contingency in present values £28.637.557	
Financial costs	The need for extra cash	27.031.482
Redeployed resources	Time taken away from other activities	1.606.074
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	94.718
Operation cost	Costs related to continuous operation of the service	28.542.839
Sum of all benefits	Sum of all benefit types reduced by contingency in present values £11.231.062	
Financial benefits	Reducing cash outlays	4.048.766
Liberated resources	Time saved from existing activities	7.182.296
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	11.231.062

7.4.1.9. Hospital/specialist nurses

Hospital specialist nurses are employed at the hospital, providing specialist secondary health care to C3-Cloud patients if these were admitted to the hospital.

Improvement in decision making due to being better informed, and improvement in quality of care provided, can have a positive intangible impact. Professional's motivation and satisfaction have a positive intangible impact. Both result in a very moderate positive valuation of the C3DP services. However, hospital specialist nurses need to invest time in adapting to the new way of working (2 hours in the first months as assumed) (Table 37). The implementation costs outweigh the perceived benefits (Table 38Table 86), resulting in a negative cumulative SER of -76% for the hospital specialist physicians working in the hospitals (Figure 164). The net benefit consequently decreases with the addition of more hospital specialist nurses and levels off when their numbers reach satisfaction. However, the absolute numbers for the net benefit are overall neglectable, being as low as £400 at the end of the observation period (Figure 165).

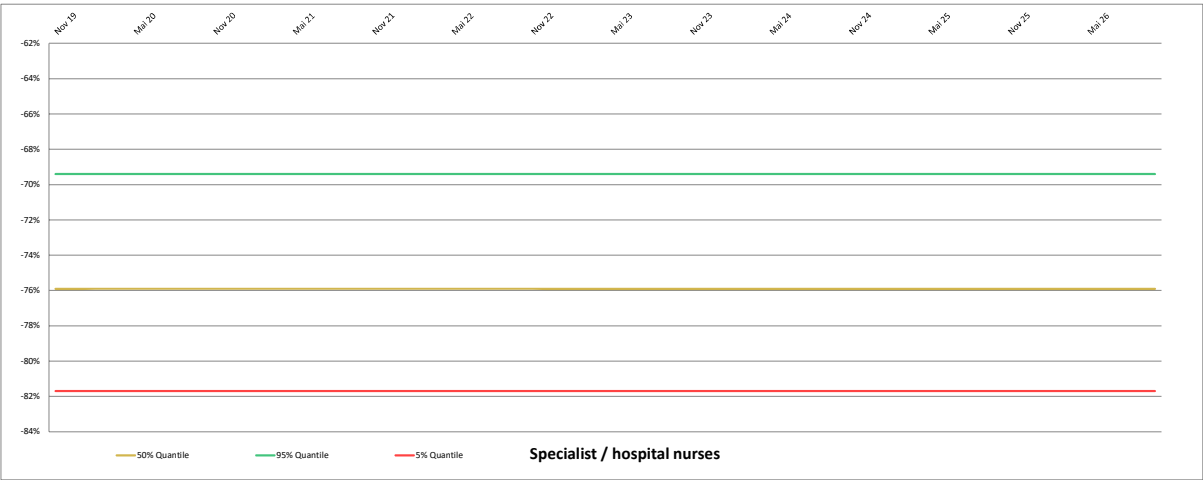


Figure 164, Monte Carlo simulation of cumulative SER for SWFT hospital nurses

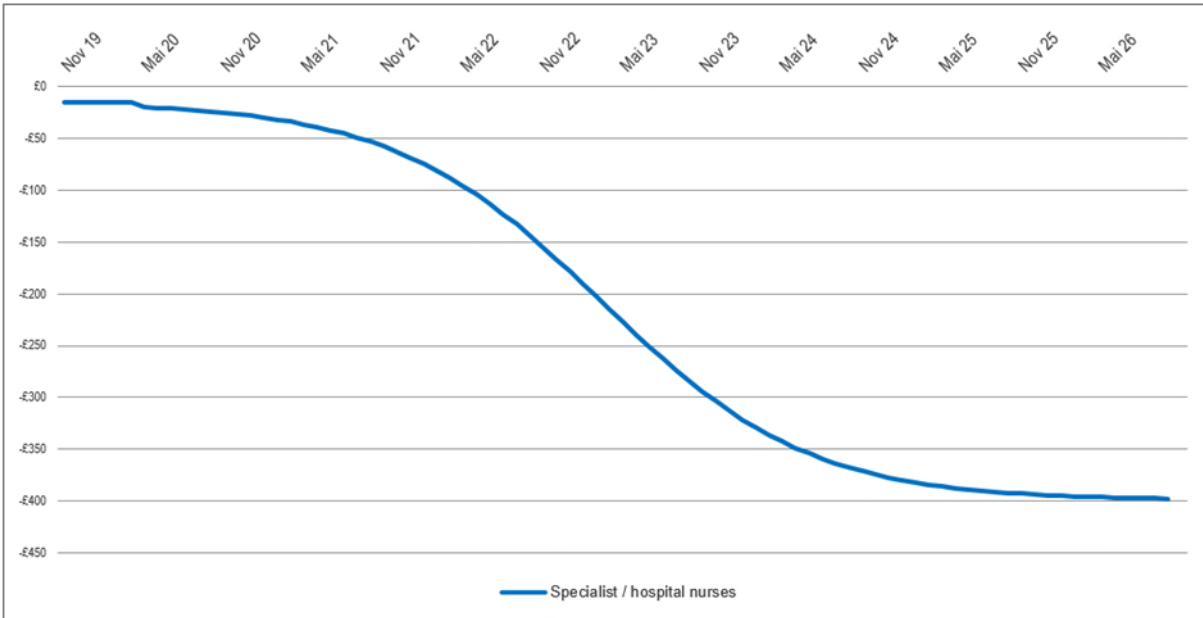


Figure 165, Cumulative net benefit for SWFT hospital nurses

Table 37, SWFT: Key service impacts for hospital nurses

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is that hospital specialists spend 30 extra minutes during the first month due to adaptation to C3-Cloud.	100%
Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits by Specialist / hospital nurses according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Table 38, Sum of costs and benefits for SWFT hospital nurses

Sum of all costs	Sum of all cost types reduced by contingency in present values	£530
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	530
Implementation cost	Costs related to service implementation	530
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	£133
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	133
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	133

7.4.1.10. Community nurses

Community nurses are employed in the hospital but work in close collaboration with the primary care centres and carry out home visitations.

Improvement in decision making due to being better informed, and improvement in quality of care provided, can have a positive intangible impact. Professional’s motivation and satisfaction have a positive intangible impact. Both result in a very moderate positive valuation of the C3DP services. However, community nurses need to invest time in adapting to the new way of working (2 hours in the first months as assumed) (Table 39). The implementation costs outweigh the perceived benefits (Table 40), resulting in a negative cumulative SER of -75% for the community nurses working in the hospitals (Figure 166). The net benefit consequently decreases with the addition of more hospital nurses and levels off when their numbers reach satisfaction. However, the absolute numbers for the net benefit are overall neglectable, being as low as £2,000 at the end of the observation period (Figure 167).

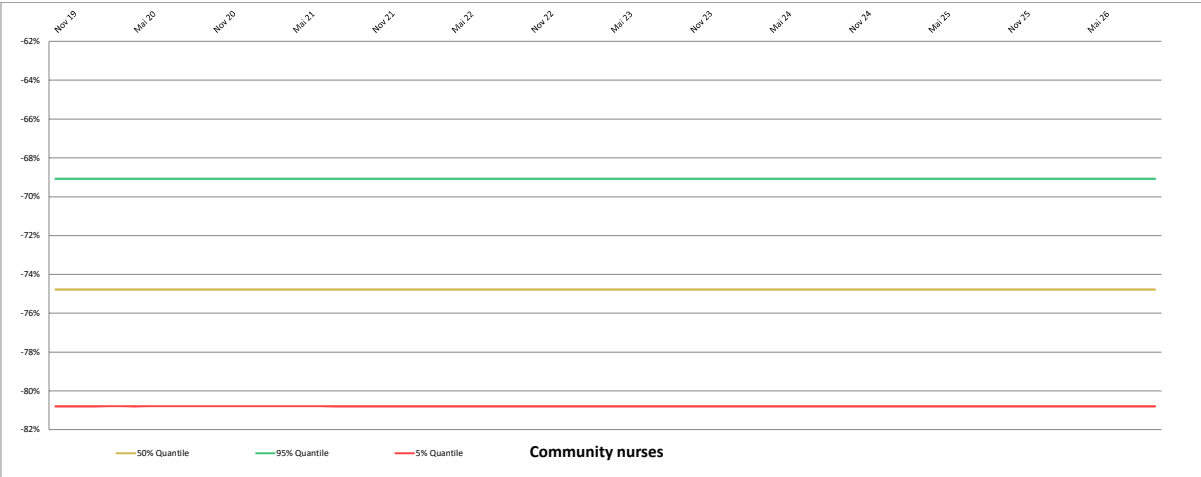


Figure 166, Monte Carlo simulation of cumulative SER for SWFT community nurses

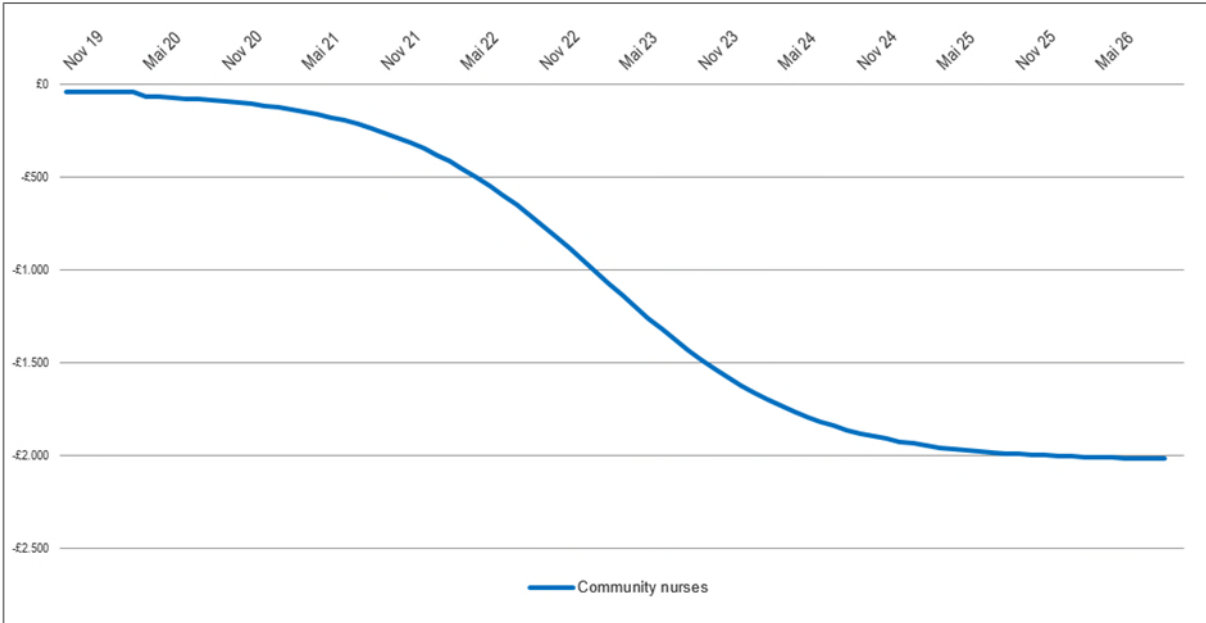


Figure 167, Cumulative net benefit for SWFT community nurses

Table 39, SWFT: Key service impacts for community nurses

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is that hospital specialists spend 30 extra minutes during the first month due to adaptation to C3-Cloud.	100%
Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits by Community nurses according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Table 40, Sum of costs and benefits for SWFT community nurses

Sum of all costs	Sum of all cost types reduced by contingency in present values	£2.689
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	2.689
Implementation cost	Costs related to service implementation	2.689
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	£672
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	672
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	672

7.4.1.11. Hospital specialist physicians

Hospital specialists are employed at the hospital, providing specialist secondary healthcare to C3-Cloud patients if these were admitted to the hospital.

Improvement in decision making due to being better informed, and improvement in quality of care provided, can have a positive intangible impact. Professional's motivation and satisfaction

have a positive intangible impact. Both result in a very moderate positive valuation of the C3DP services (Table 41). However, hospital specialist physicians need to invest time in adapting to the new way of working (2 hours in the first months as assumed). The implementation costs outweigh the perceived benefits (Table 42), resulting in a negative cumulative SER of -75% for the hospital specialist physicians (Figure 168). The net benefit consequently decreases with the addition of more hospital specialist physicians and levels off when their numbers reach satisfaction. However, the absolute numbers for the net benefit are overall neglectable, being as low as 2.800 kr at the end of the observation period (Figure 169).

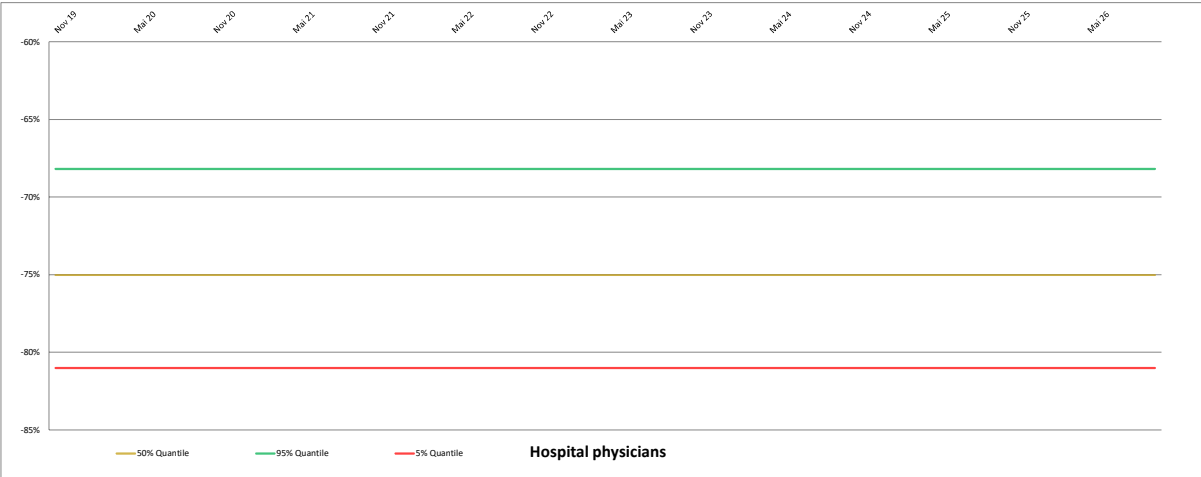


Figure 168, Monte Carlo simulation of cumulative SER for SWFT hospital physician

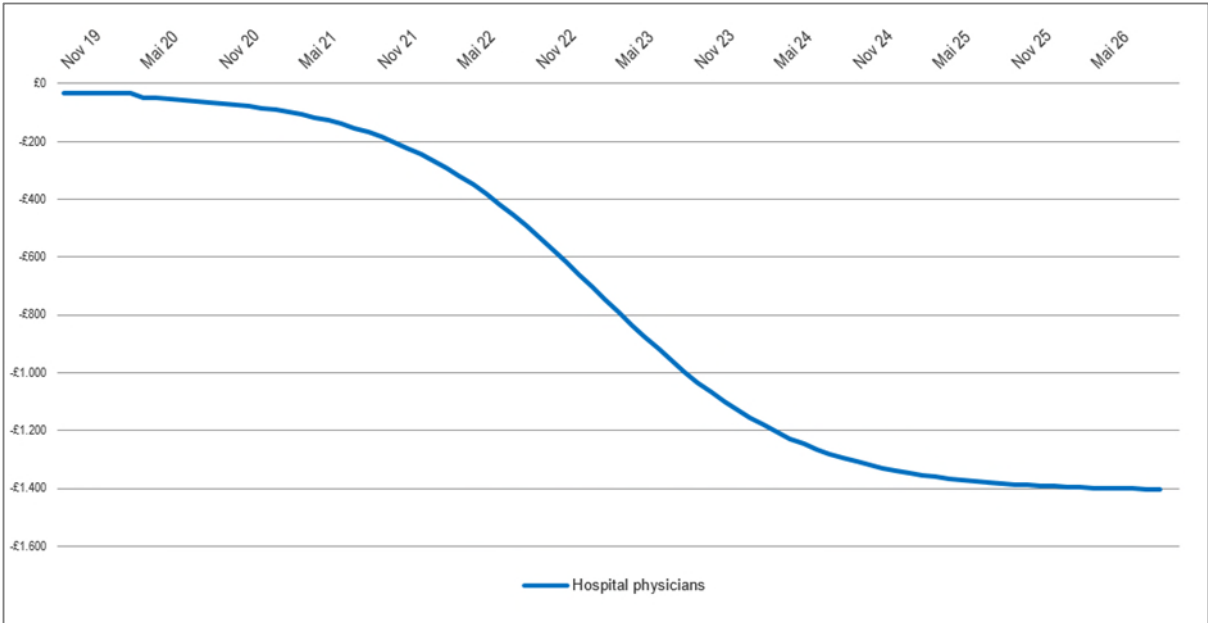


Figure 169, Cumulative net benefit for SWFT hospital physicians

Table 41, SWFT: Key service impacts for hospital physicians

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is that hospital specialists spend 30 extra minutes during the first month due to adaptation to C3-Cloud.	100%
Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits of Hospital physicians according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Table 42, Sum of costs and benefits for SWFT hospital physicians

Sum of all costs	Sum of all cost types reduced by contingency in present values	£1.870
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	1.870
Implementation cost	Costs related to service implementation	1.870
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	£468
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	468
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	468

7.4.1.12. Ministry of Health

The ministry of Health in this modelling is considered as the payer for C3-Cloud induced health care resource use changes. For this modelling, benefits or costs do not arrive at the stakeholder “Ministry of Health” as an immediate impact. They are accounted for by the affected organisation

if the budget or per capita payment is not changed. Changing a budget can be the consequence of this analysis and further deployment and usage of C3-Cloud components, but we regard this as a second order effect that is not usually modelled in ASSIST. For the time being, the following process was followed: Costs generated, and benefits liberated through C3-Cloud implementation are considered within the analysis of the organisations where the cost or benefit occurs. E.g.: Additional telephone contacts with the healthcare centre are a benefit to the primary care centre as these could generate additional income in the long term, after the budget for primary care centres is renegotiated, based on this added need for telephone calls. In consequence it is an added cost for the Ministry of Health who needs to pay for these. In contrast: fewer consultations with the healthcare centre for primary care physicians and nurses are considered a cost to the primary care centre (forgone income) and to be a benefit for the Ministry of Health (less payment needed due to fewer consultations). A similar situation is the case with the hospitals A&E unit. Less visits there imply a cost for the hospital due to forgone chances to cash such visits with the Ministry of Health. Consequently, it is a benefit for the Ministry of Health, which needs not to pay for avoided A&E visits (Table 43).

The net benefits for the Ministry of Health outweigh the costs from the first month onwards, cumulating to £30,000,000 at the end of the modelled 84 month period (Figure 171). This makes the Ministry of Health the main beneficiary of C3-Cloud deployment and scaling up under the given input and assumptions.

In the first 6 months of operation, the DES modelled relatively smaller costs for additional telephone contacts at primary care centre (amounts spanning from £0.32 - £0.94 per patient and month), which results in a relatively higher SER (1600%-900%) (Figure 170). From then this amount increases to £1.50 within one year and to £2.12 within the next 3 years and subsequently levels off – and so does the cumulative SER level off at about 350%.

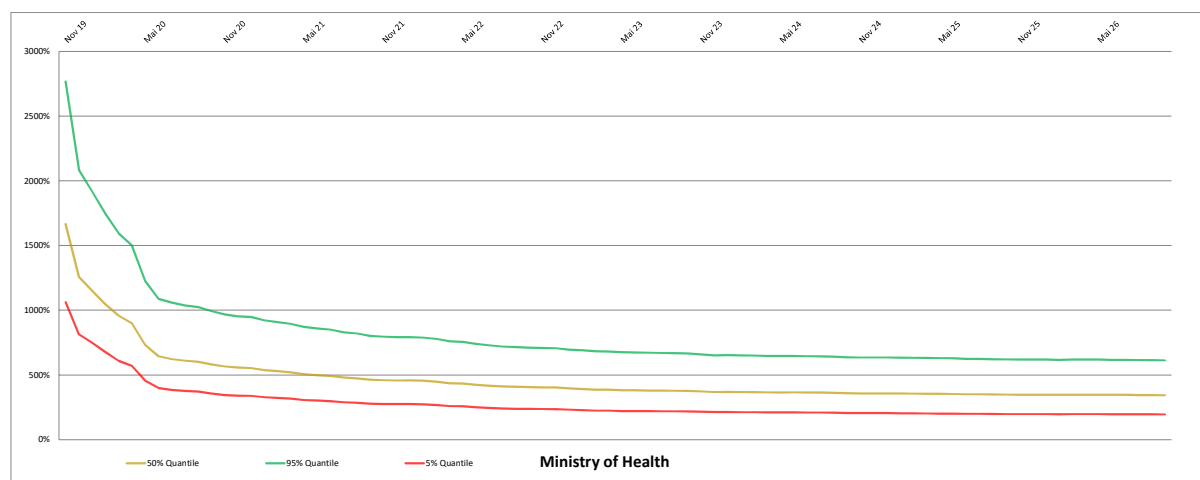


Figure 170, Monte Carlo simulation of cumulative SER for SWFT Ministry of Health

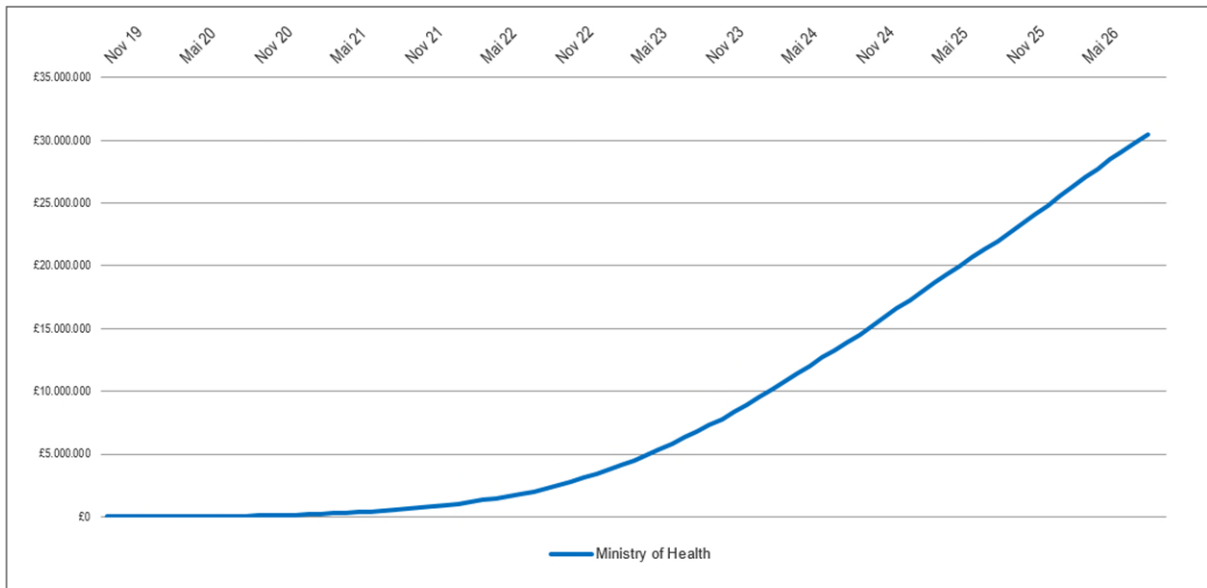


Figure 171, Cumulative net benefit for SWFT Ministry of Health

Table 43, SWFT: key service impacts for SWFT Ministry of Health

Negative impacts	Rational	Share of total costs
Extra service use: additional consultations with Primary care organisations	The DES modelling concluded: 1 additional telephone contact with primary care nurses over 12 months	100%
Positive impacts	Rational	Share of total benefits
Reduced service use: less consultations with Primary care organisations and community nurses	The DES modelling concluded: 2.2 fewer contacts with GP at primary care centres over 12 months 0.4 fewer contacts with GP for home visits over 12 months 1.0 fewer home visits through primary care nurses over 12 months	73%
Reduced service use: less admissions to and shorter stays in Hospital	The DES modelling concluded: 1.0 fewer admissions to A&E unit over 12 months. This is a benefit to the Ministry of Health who would otherwise pay for these admissions.	27%

Sum of all costs	Sum of all cost types reduced by contingency in present values	£8.768.808
Financial costs	The need for extra cash	8.768.808

Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	0
Operation cost	Costs related to continuous operation of the service	8.768.808
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	£39.239.318
Financial benefits	Reducing cash outlays	39.239.318
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	39.239.318

Table 44, Sum of costs and benefits for SWFT Ministry of Health

7.4.1.13. IT suppliers

IT suppliers are the key C3-Cloud component development organisations in the C3-Cloud project (i.e. SRDC, MEDIXINE, INSERM, Cambio and Warwick). As a business plan with specific cost indications (licensing plans) for the usage of the system was not yet available for the modelling from WP2 at the time of writing this deliverable, we assumed the EU H2020 project funding for C3-Cloud as the next best alternative proxy for the development cost. This is based on the Person Months (PM) claimed by Medixine, SRDC, INSERM, Cambio and Warwick from WPs 3, 5, 6, 7, 8 (total 302 PM) and an assumed PM rate (average across partners) of € £5,473.04. We distributed the costs across the first six months only, as this is considered the development phase and implementation of the project for the ASSIST modelling (in parallel to the piloting) (Table 45). In future evaluations it is recommended to include also cost modelling for future licensing arrangements for the C3-Cloud components or service system. That could be flat rate monthly costs per patient or patient groups (e.g. stepwise price calculations for <1000 patients; <50000 patients and >50000 patients). The specific plans for this are developed in the final WP2 deliverables and the final business planning at the end and post project.

The development costs for the three partners are neutralized by the EC H2020 project funding that was received for this project (Table 46). Consequently, the net benefit is neutral for the whole modelling period (Figure 173) and the cumulative SER for IT suppliers slightly beyond 0% due to minor discounting effects (Figure 172).

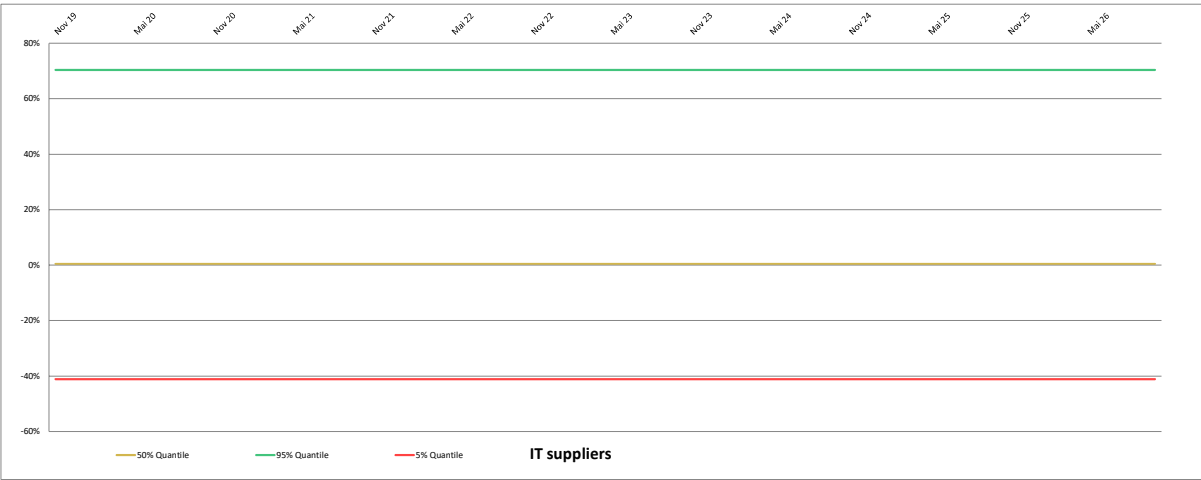


Figure 172, Monte Carlo simulation of cumulative SER for SWFT IT suppliers

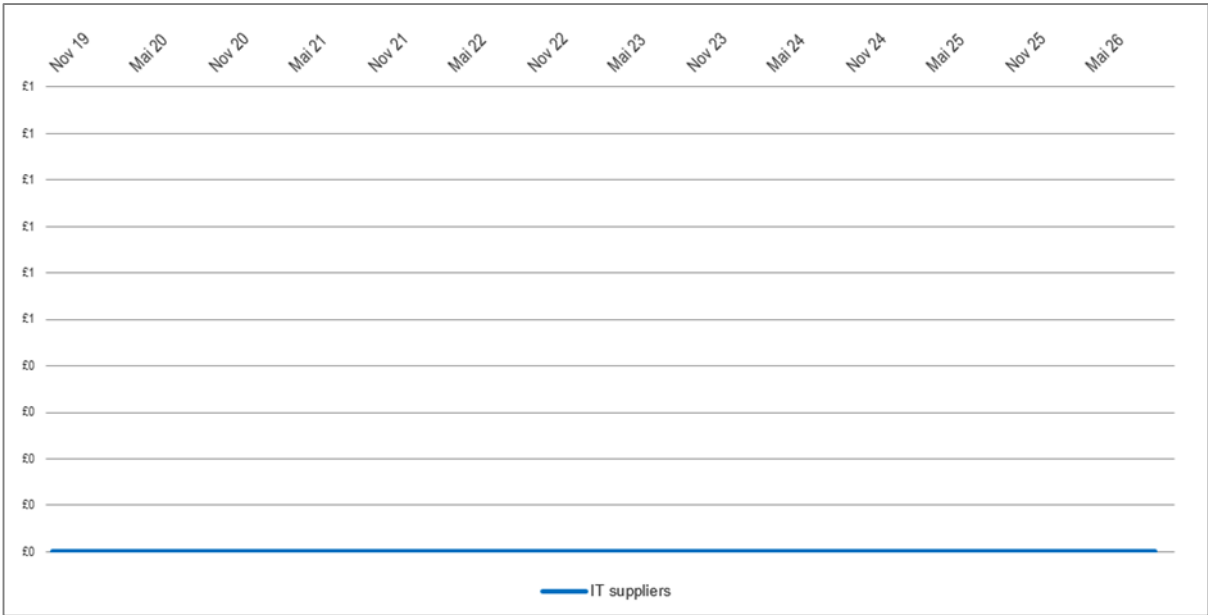


Figure 173, Cumulative net benefit for SWFT IT suppliers

Table 45, SWFT: Key service impacts for SWFT IT suppliers

Negative impacts	Rational	Share of total costs
C3-Cloud development costs for IT suppliers	<p>This is based on the Person Months (PM) claimed by SRDC, MEDIXINE, INSERM, Cambio and Warwick from WPs 3, 5, 6, 7, 8 (total 302 PM) and an assumes PM rate (average across partners) of € 6,072.72 We distributed the costs across the first 6 months only, as this will be considered the development phase of the project for the ASSIST modelling (in parallel to the piloting).</p> <p>WP3: 57 PM WP5: 40 PM WP6: 46 PM WP7: 81 PM WP8: 78 PM</p>	100%
Positive impacts	Rational	Share of total benefits
EU funding for IT suppliers	As a business plan with specific numbers for the usage of the system was not yet available for the modelling from WP2 at the time of writing this deliverable, we assumed the EU H2020 project funding for C3-Cloud as the next best alternative proxy for the development cost.	100%

Table 46, Sum of costs and benefits for SWFT IT suppliers

Sum of all costs	Sum of all cost types reduced by contingency in present values	£1.644.623
Financial costs	The need for extra cash	1.644.623
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	1.644.623
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	£1.644.623
Financial benefits	Reducing cash outlays	1.644.623
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	1.644.623
Operation benefits	Benefits related to continuous operation of the service	0

7.4.2. Basque Country

In the Basque Country, we modelled the costs and benefits for the following organisations and their related stakeholders, based on average salaries or household income (without employer contributions and social security) as a proxy to monetise the time that individuals spend on or liberate due to C3-Cloud. The following yearly net household incomes were assumed for the ASSIST model:

- Multimorbid patients (33.834€ per year) and their informal caregivers (18.045€ per year).
- The Call centre, including call centre nurses (41.353€ per year).
- The primary care centre, including primary care physicians (60.150€ per year) and primary care nurses (41.353€ per year)
- The hospital, including hospital specialist physicians (67.669€ per year) and hospital specialist nurses (41.353€ per year)
- The Payers (i.e. the Ministry of Health)
- IT developers (only C3-Cloud development costs were considered)

7.4.2.1. Sustainability at service level

Under the assumptions made in the evaluation, the modelling in the Basque Country achieves an overall cumulative socio-economic return rate of -10% over the predicted period of 84 months. Based on this, the service viability can be questioned and demands detailed interpretation and exploration, if current assumptions hold. Among the stakeholders involved, health and social care providers as well as staff exhibit negative cumulative SER ranging between -66% to -100% respectively (Table 47). Professional staff working in the health provider organisations (primary care centers and secondary care hospitals) may thus be strong opponents or veto players to the up-scaling of the C3-Cloud systems. In contrast, the Ministry of Health enters with a highly positive cumulative SER of 1067%, making it to potential main proponents of the C3-Cloud up-scaling. Among the individual stakeholders, positive SER values are achieved by the multimorbid patients and informal carers, reaching values of 10% and 30% respectively. The largest contribution in negative values to the overall performance derives from the call center and the hospital. Both perform with negative constant values of -100% over the observed 84 months' period. This is caused mainly as no benefits could be specified for these organizations for this cost-benefit modelling. On the positive side, the Ministry of Health (Osakidetza) records the largest positive impact mainly deriving from the fact that avoided primary care consultations with nurses and physicians as well as avoided A&E admissions at the hospital are considered as benefits (i.e. avoided cost claims).

Interestingly, the overall (systemic) cumulative SER rises (Figure 174) once most patients are included. The minimal turning point is observable in May 2022, where 25,607 patients are actively included in total. This is due to the assumption, that training on the platforms follows the s-curve shaped inclusion of patients. Once C3-Cloud users are trained properly on the platforms, an upward trend is expected. The effect only translates into a positive overall cumulative net benefit in November 2024 (Figure 175). The systemic MonteCarlo simulation suggests a positive (i.e. >0%) overall SER also only in November 2020 in the best-case scenario (95% percentile). When the 50% or 5% percentile is assumed as an intermediate or worst-case scenario, a positive overall SER is never achieved until the end of the modelling period. However, the overall SER is increasing and may eventually reach a positive SER.

In conclusion, continuing the service as planned in the deployment plans can be recommended if current assumptions hold. It is crucial to involve all stakeholders in the scaling up and to communicate additional benefits to the component users. While patients and their informal caregivers have a moderate positive SER (10-30%), healthcare professionals and the organisations employing them currently have no business case in keeping usage up but instead be strong veto players (-66% to -100% SER). Only the payer (Osakidetza) has a strong business case with a positive overall SER of 1067% after 84 months.

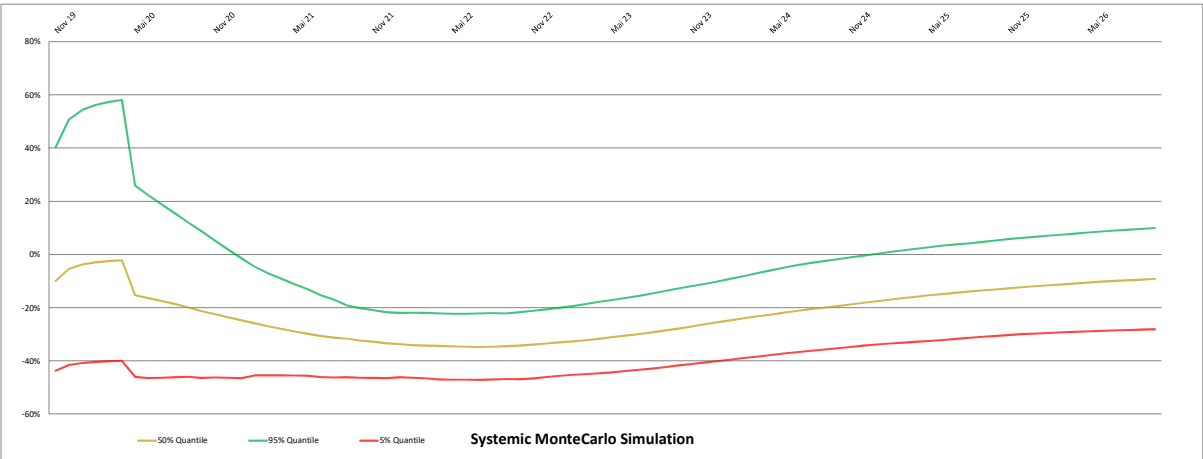


Figure 174. Monte Carlo overall cumulative socio-economic return for BC.

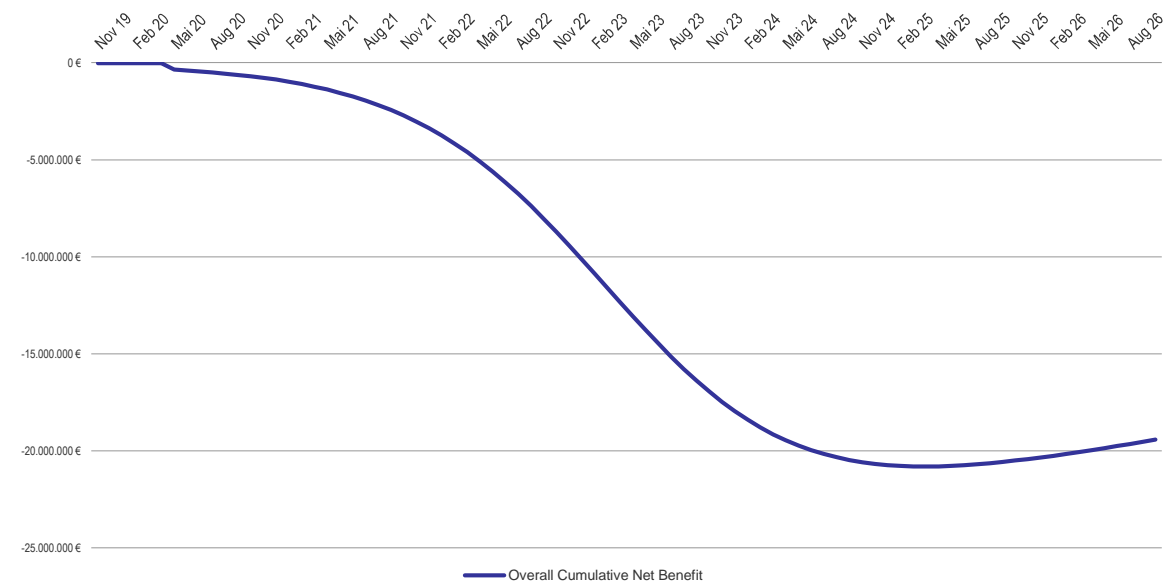


Figure 175. Overall cumulative net benefit for all stakeholders over time in BC.

Figure 134 visualiss the inverted S-shape of the overall cumulative net benefit. The all-time low is observed in November 2024 with a value of 20,778,211.66 €. After this, the trend becomes positive.

Table 47. Socio Economic Return for Basque Country C3-Cloud by Stakeholders

Groups	Subgroups		Cumulative socio-economic return (SER)	Cummulative net-benefit	Time to positive SER / ROI
Overall socio economic return		➡	-10%		
Individuals					
	Multimorbid patients	↑	10%		6 years 3 months
	Informal carers	↑	30%		2 years 3 months
Health and social care providers & staff					
	Call Centre	↓	-100%	-26.150.576	—
	Call centre nurses	↓	-75%		—
	Primary care organisations	↓	-66%	-79.166.884	—
	Primary care physicians (GPs)	↓	-75%		—
	Primary care nurses	↓	-75%		—
	Hospital	↓	-100%	-29.154.206	—
	Hospital physicians	↓	-75%		—
	Specialist / hospital nurses	↓	-75%		—
Payers					
	Ministry of Health	↑	1067%	113.865.777	0 years 1 months
Non ICT Organisations					
ICT industry					
	IT suppliers	➡	0%	-0	— *

* Return on investment
† Multiple break-even

Figure 176 shows the assumptions made in relation to the inclusion of (multimorbid) patients. The project period started in November 2019 over a period of 84 months, thus until October 2026. The project started with 35 patients and a gradual, S-Shaped inclusion of new patients after 6 months. The automatic inclusion of patients at the Basque Country pilot site aims at 128.240 patients in total. While the fact that there are 5 months without any new patients (December, 2019 – April, 2020) has to be born in mind for the cost-benefit-analysis, subsequently, the inclusion surges with an additional 1456 patients in May 2020 under the assumption that upscaling will kickstart with a larger number of patients following an s-curve inclusion thereafter. Over the following 77 months, the number of additional patients per month averages 1658 patients.

Figure 176 contrasts the distribution of patients newly added each month (in blue) and the cumulative distribution of patients (in red). The cumulative S-shaped time series exhibits a convex shape until March 23 and from then on starts the gradual decrease in new patients added, resulting in a concave shape.

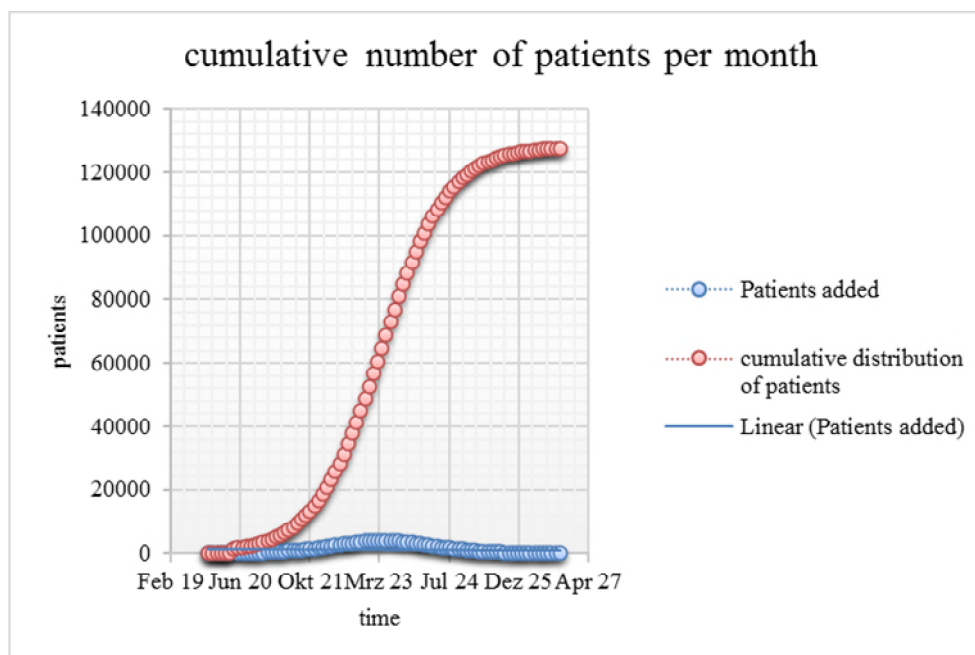


Figure 176. cumulative S-shaped curve of patients added over time.

7.4.2.2. Sustainability at individual and organisational level

7.4.2.3. Multimorbid patients

Patients with multiple diseases were chosen based on different inclusion criteria. Patients to be included in the project were chosen on having two of the four conditions: Heart failure with NYHA Type I or II; renal failure with EGFR 30-59; Diabetes Type II; mild or moderate depression.

Interactions with other stakeholders and services include:

- Reading online educational material.
- Messaging or communicating with the MDT
- Compliance with the care plan (goals and activities)
- Entering information (e.g. blood pressure and body weight) into the patient empowerment platform

The service's main cost lies in the inconveniences of adapting to the new service processes. Time spent with the tool training on new devices and service elements such as home monitoring, contact with the MDT, as well as consultations with the nurse's visits and filling in questionnaires generate resource and financial costs.

The large share of 58% of total cost lies in the inconvenience of adaption to the new tool. The training time foreseen for each patient averages 4 hours. It includes all time spent by end-users (patients) in relation to training received as part of the new service. Other than for provider organisations, time here reflects inconvenience caused by using the service, rather than a tangible cost item. The second biggest contribution to cost derives from the extra time spent as an effect of the new tool. On average it is estimated that one measurement takes up 8 minutes. Extra-sessions triggered sum up to 32 minutes.

The convenience of travel time saved for service use spent by multimorbid patients contributes to half of the socio-economic return on the side of positive impacts. This impact is followed by the calculation of intangible benefits by multimorbid patients, which covers all subjective and intangible benefits of the novel tool, primarily in relation to user satisfaction. The idea is that the

happier the patient, the more likely positive spill-over effects. The data to assess satisfaction was retrieved from the eCCIS eCare Client Impact Survey and the eCCIS scoring tool.

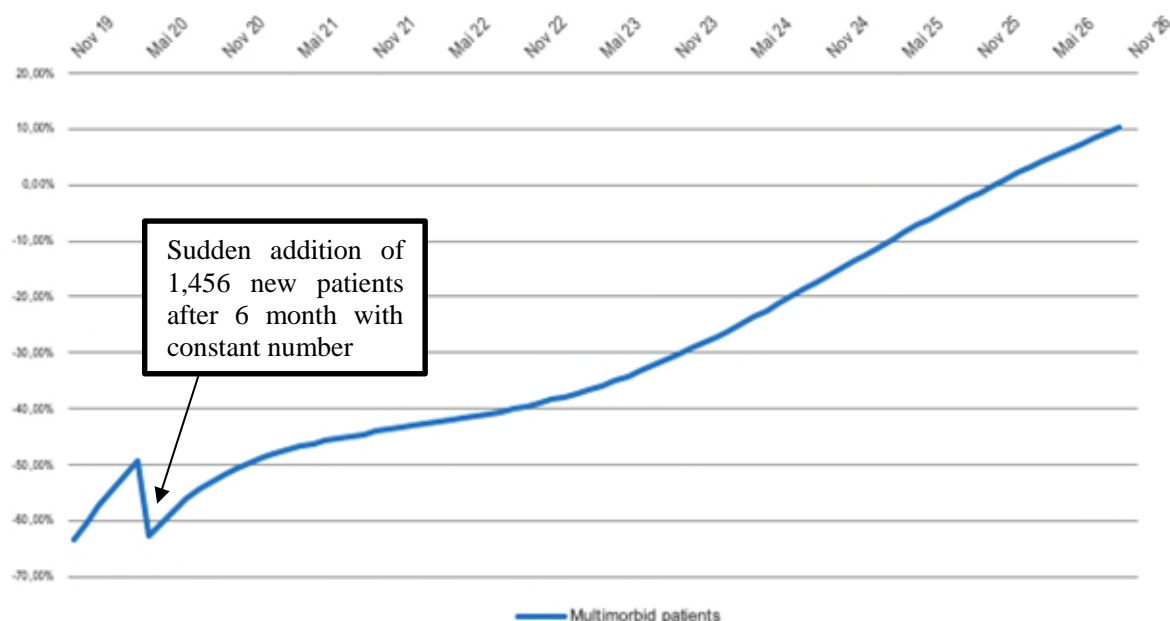


Figure 177. Cumulative socio-economic return of multimorbid patients over time.

The development of the cumulative SER for multimorbid patients (Figure 137) is best understood when held against the (subtractive) number of newly added patients each month. Since the training costs are measured per patient, the return increases instantly over the first 6 month, where we face a constant number of 35 patients. With the addition of 1456 patients in May 2020, adding a large training cost, the SER suddenly drops. However, the figure constantly increases from that point on, where patients are now gradually added. The slope of Figure 137 is explained by the S-shaped process of adding new individuals. A linear trend for the model would have a slope of +1658 patients.

In November 2025, the zero-line is crossed, resulting in a +10% overall cumulative SER at the end of the projection.

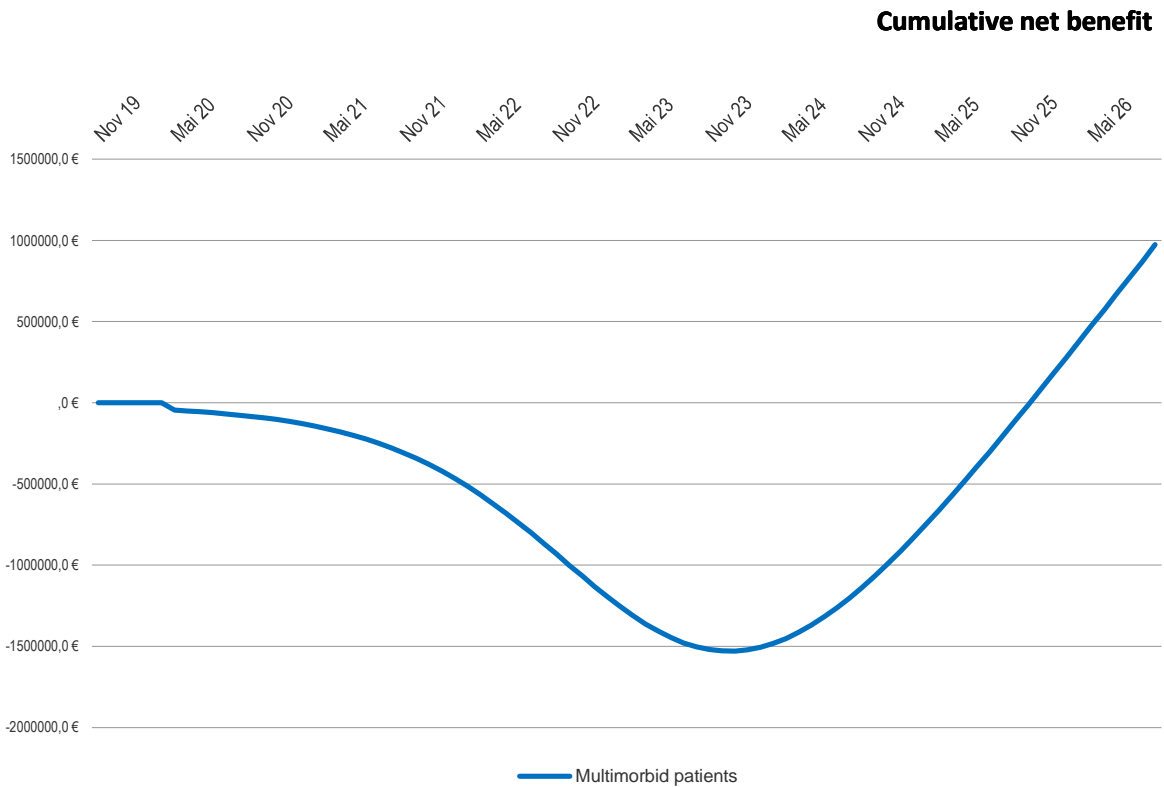


Figure 178. Cumulative net benefit of multimorbid patients over time.

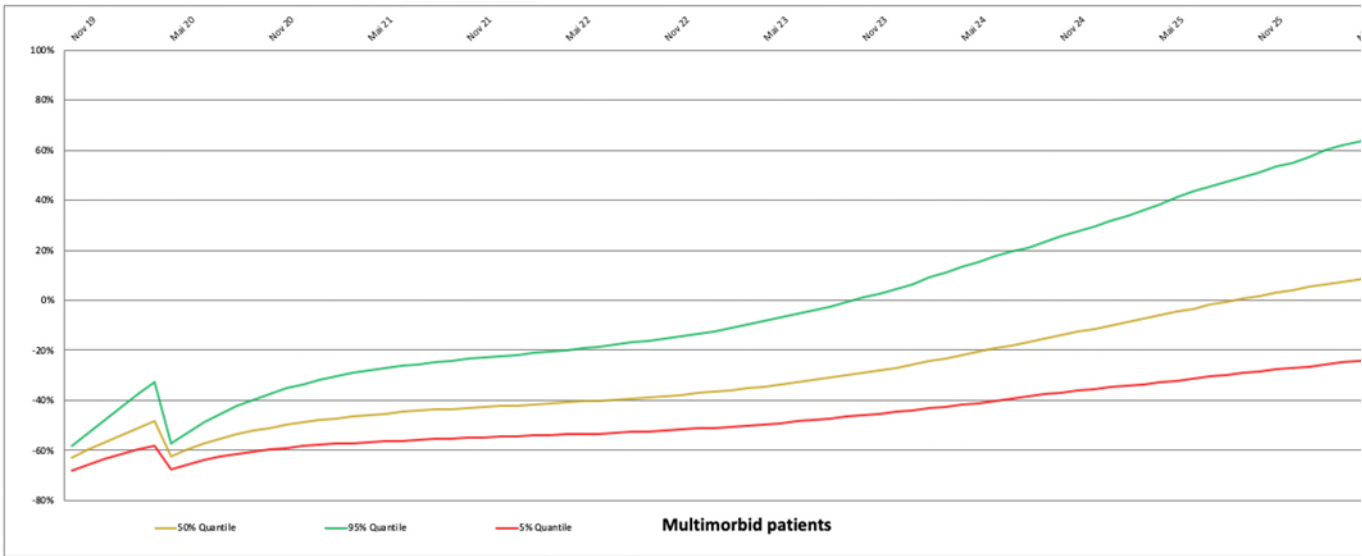


Figure 179. Monte Carlo simulation of cumulative SER for multimorbid patients.

Randomizing the predictions through a Monte Carlo simulation reveals that even in the lower confidence bound scenario, the tangible and intangible benefits, such as satisfaction, outweigh the initial costs (especially the training costs) in the long run.

In conclusion, the perceived patient valuation is a critical factor that has a high impact on the SER outcome for patients.

Table 48. Basque Country: Composition of key service impacts of multimorbid patients.

Negative impacts	Rational	Share of total costs
Inconvenience: training time	Includes all time spent by end users in relation to training received as part of the new service. Time here reflects inconvenience caused by using the service, rather than a tangible cost item. The assumption is 4 hours of training per new patient using the system.	58%
Inconvenience: extra time for service use spent by patient	Includes all time spent by end-users in relation to training received as part of the new service. Other than for provider organisations, time here reflects inconvenience caused by using the service, rather than a tangible cost item (self-measurement etc.). In the FHIR data, we observed that out of the 29 patients who performed self-measurements (10.2%), the mean number of measurements was 16 over 6 months (for blood pressure, weight, blood glucose and heart rate). We assumed 32 measurements for these patients per year. We excluded one outlier with 458+ measurements! Also, some measurements are taken at the same time (e.g. blood pressure and blood glucose may be taken and sent to PEP at the same time). The FHIR data showed that out of the 29 patients with self-measurements, 13 measured multiple measurements (e.g. they uploaded values for blood pressure and glucose levels). Where this was the case, we counted only the higher number of measurements. E.g. when blood pressure was measured 20 times and weight only 4 times, we counted only the blood pressure. Each measurement, including transmission to the PEP platform, is assumed to take 8 minutes. In addition, HCP interviews led to the assumption that per patient and year, 1.5 remote care sessions will be held for a duration of 15 minutes, due to the new service.	42%
Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits by multimorbid patients according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. Supported by the questions included in the eCCIS (eCare Client Impact Survey) and eCCIS scoring tool. The data was retrieved from as the median answer on the eCCIS questionnaire, pooled across all three pilot sites.	30%

Convenience: travel time saved for service use spent by multimorbid patients	Patients save 1.1 consultations at the care centre per year based on the DES modelling. We assumed 60 minutes travel time back and forth.	50%
Travel cost saved for service use spent by multimorbid patients	Patients save 1.1 consultations at the care centre per year based on the DES modelling. The assumption is 12km travel distance with a mileage refund of 0.40 €.	20%

In conclusion, the adaptation time to new services, the positive valuation of the service, and travel time saved are the most critical factors in terms of costs and benefits (Table 51) that have a high impact on the final outcome. The service implementation costs for patients largely exceed the operational costs, creating a cumulative net benefit of 972,285 € at the end of the projection period in 2026.

Table 49. Composition of benefits and costs of multimorbid patients in BC

Sum of all costs	Sum of all cost types reduced by 9.330.152 contingency in present values	
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	3.792.675
Non-financial costs	Inconvenience	5.537.477
Implementation cost	Costs related to service implementation	5.537.477
Operation cost	Costs related to continuous operation of the service	3.792.675
Sum of all benefits	Sum of all benefit types reduced by 10.302.437 contingency in present values	
Financial benefits	Reducing cash outlays	2.027.561
Liberated resources	Time saved from existing activities	5.149.275
Non-financial benefits	Convenience	3.125.601
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	10.302.437

7.4.2.4. Informal carers

Informal carers are carers of multimorbid patients: Relatives who live with the patient, or who are responsible for them in some way and/or volunteers that regularly (e.g. several times a week) support the professional care personal to provide additional health service to the patient.

The service has the positive intangible impact of reassuring the informal carer about care provision and informing them better about the patient's care. Time and costs saved due to reduced travelling have a positive resource and financial impact.

Between 5-15% of patients do have informal carers that accompany and assist them in their daily activities. In many cases, these are their children. For this reason, some 80% of informal carers are working, which puts additional pressure on them to support their family in their scarce free time. Informal carers in the Basque country also learn how to use the patient empowerment platform (PEP), which is truly an investment. The estimated time spent by informal carers receiving training is expected to take 2 hours per new patient.

This is outweighed strongly by their positive perception and valuation of the service (Table 50). The Monte Carlo simulation of cumulative SER for informal carers predicts a positive SER of 98% at best, and 28% in the worst case scenario (Figure 182). Accordingly, it is positive even under pessimistic assumptions.

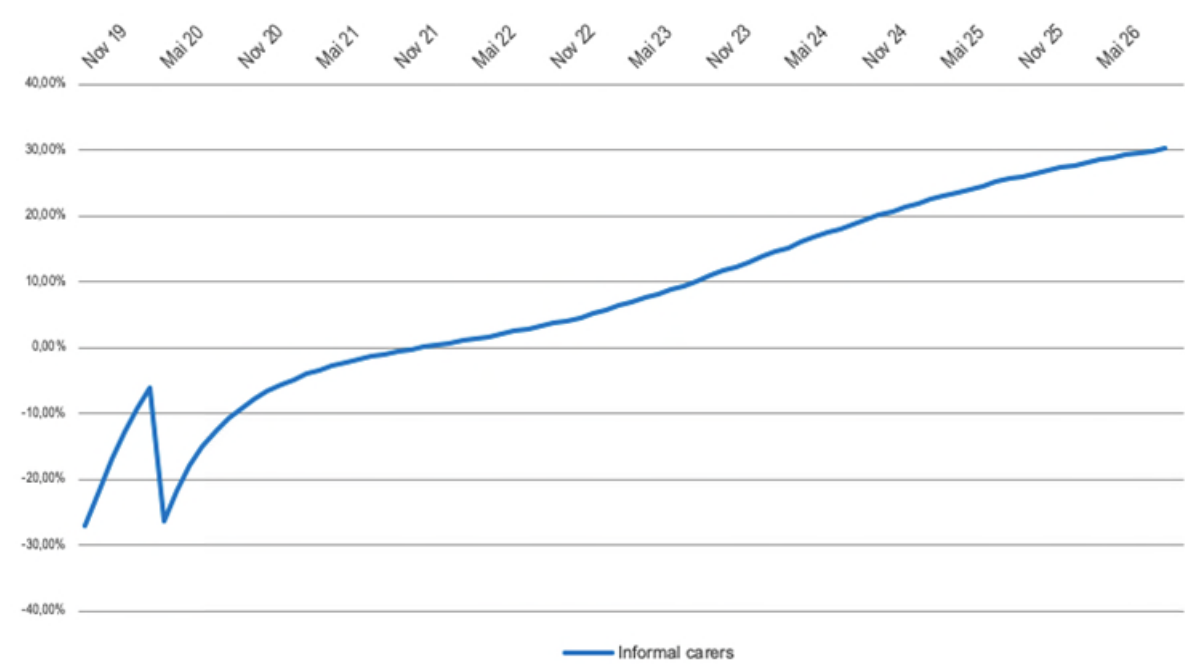


Figure 180. Cumulative socio-economic return for informal carers in BC over time.

The development of the cumulative of informal carers moves closely to the multimorbid patients’ SER and is mainly driven by the number of newly added patients as well.

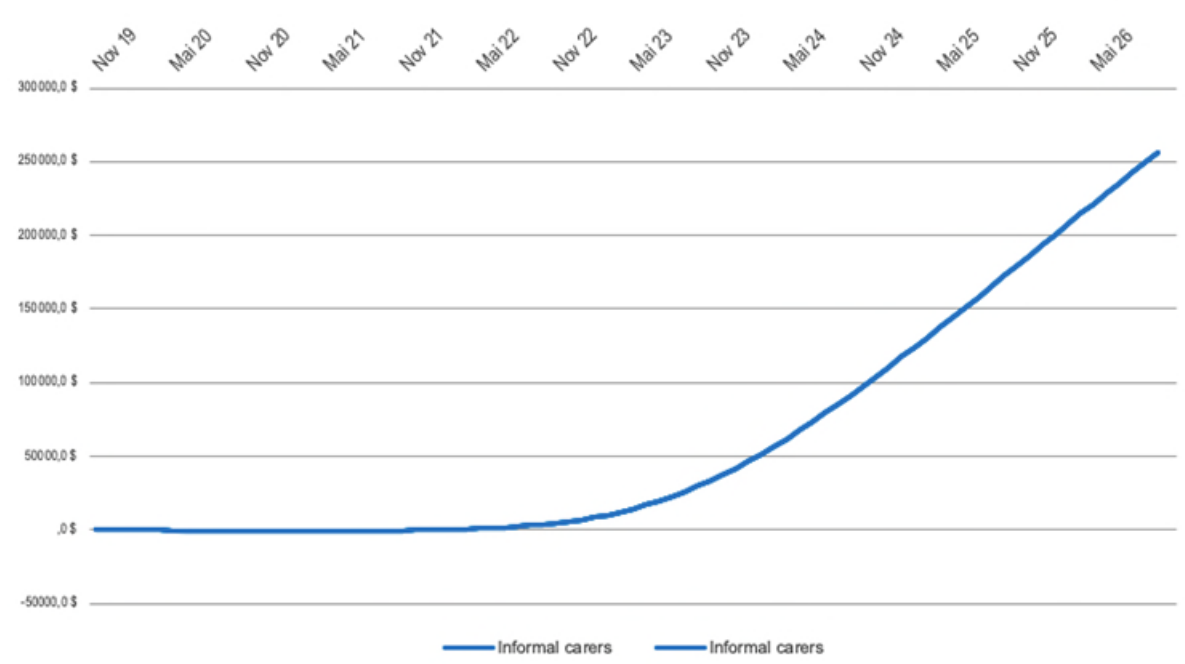


Figure 181. Cumulative net benefit of informal carers in BC over time.

The cumulative benefit of informal workers never turns negative. Negative monthly benefits, where costs exceed the revenues occur at the very beginning in November 2019 and with a monthly value of -717€ in May 2020, driven by the sudden increase in training costs based on a larger number of informal caregivers added. The returns to informal carers increase on average over time and are constantly positive from June 2020 on.

The informal carers bear potential for the success of the service, since they are assumed to be the ones mainly busy with the installation and ongoing support. Randomizing the predictions through a Monte Carlo simulation reveals that even in the lower confidence bound scenario, the benefits have a long-run positive trend. Even in the 50% Quartile scenario, from May 2021 on, the training pays off, such that it is constantly above zero.

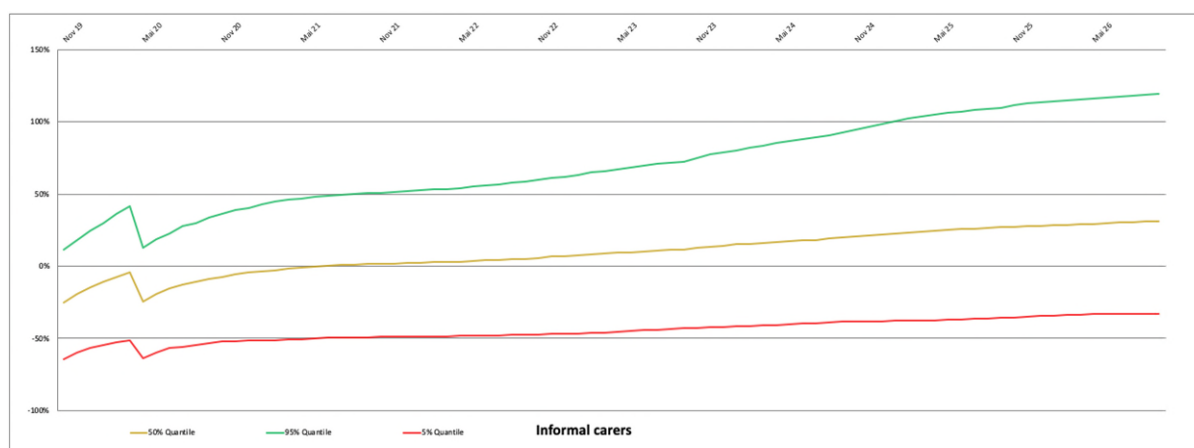


Figure 182. Monte Carlo simulation of cumulative SER for informal carers in BC over time.

Table 50 Basque country: Composition of key service impacts of informal carers

Negative impacts	Rational	Share of total costs
Inconvenience: training time	Includes all time spent by end users in relation to training received as part of the new service. Time here reflects inconvenience caused by using the service, rather than a tangible cost item. Time dedicated to learning how to use the system is estimated to be 1-2 hours.	22%
Inconvenience: extra time for service use spent by informal carers	Includes all time spent by end-users in relation to training received as part of the new service. Other than for provider organizations, time here reflects inconvenience caused by using the service, rather than a tangible cost item (self-measurement etc.). The assumption is that informal caregivers support their 'patient' on average 6 times a year for 20 minutes with the PEP and with self-measurements.	78%

Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits multimorbid patients according eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. Supported by the questions included in the eCCIS (eCare Client Impact Survey) and eCCIS scoring tool. The data was retrieved from as the median answer on the eCCIS questionnaire, pooled across all three pilot sites. It is interpreted that their satisfaction would improve when they have seen their relatives are satisfied with the care received in C3—Cloud.	51%
Convenience: travel time saved for service use spent by multimorbid patients	Includes all time saved by end-users for travelling to receive services, as an effect of the new service. Time is accounted for by different types of activities, the time spent on them, and their frequency of occurrence. Saved time reflects convenience caused by using the service, rather than a tangible benefit item. With a decrease in face-to-face interactions, time in terms of appointments with the health care professionals has been saved. Patients save 1.1 consultations at the care centre per year based on the DES modelling. For their informal caregivers, we assume 90 minutes travel time back and forth.	49%

In conclusion, the adaptation time to new services, the positive valuation of the service and travel time saved are the most critical factors in terms of costs and benefits (Table 50) that have a high impact on the final outcome. The service implementation costs for informal carers exceed the operational costs, creating a cumulative net benefit of 256,513 € at the end of the projection period in 2026.

Table 51. Composition of benefits and costs of informal carers in BC

Sum of all costs	Sum of all cost types reduced by 850.211 contingency in present values
Financial costs	The need for extra cash 0
Redeployed resources	Time taken away from other activities 656.162
Non-financial costs	Inconvenience 194.048
Implementation cost	Costs related to service implementation 194.048
Operation cost	Costs related to continuous operation of the service 656.162
Sum of all benefits	Sum of all benefit types reduced by 1.106.724 contingency in present values
Financial benefits	Reducing cash outlays 0
Liberated resources	Time saved from existing activities 541.334
Non-financial benefits	Convenience 565.390
Implementation benefits	Benefits related to service implementation 0

Operation benefits

Benefits related to continuous operation of 1.106.724 the service

7.4.2.5. Call Centre

The call center's role is to provide out-of-hours services for multimorbid patients, at night and weekends. Call center nurses work to provide remote support to patients. Organisational changes have a negative resource impact. Time and costs for increased follow up calls have a negative resource and financial impact. The results for the call center assume, that during the first month of implementation, call center nurses will require 4,20 minutes a day to adapt with the new system. 23% of the call center's cost is contributed through the extra staff time for service provision by the call center to multimorbid patients. Being specific to Basque Country, calls will be used for home monitoring patients and their potential health exacerbation. Given that this extra service institutions do not trigger any positive impacts in monetary terms, the overall socio-economic impact is -100%. The Call Centre has only some costs due the additional tasks but does not produce any monetary benefits. Consequently, the cumulative SER curve is a flat line (Figure

Since the costs are only generated in the implementation phase (see Table 52), the negative curve of the cumulative net benefit levels off over the projected time, and remains at -700,000€ once all staff have received training (Figure 184).

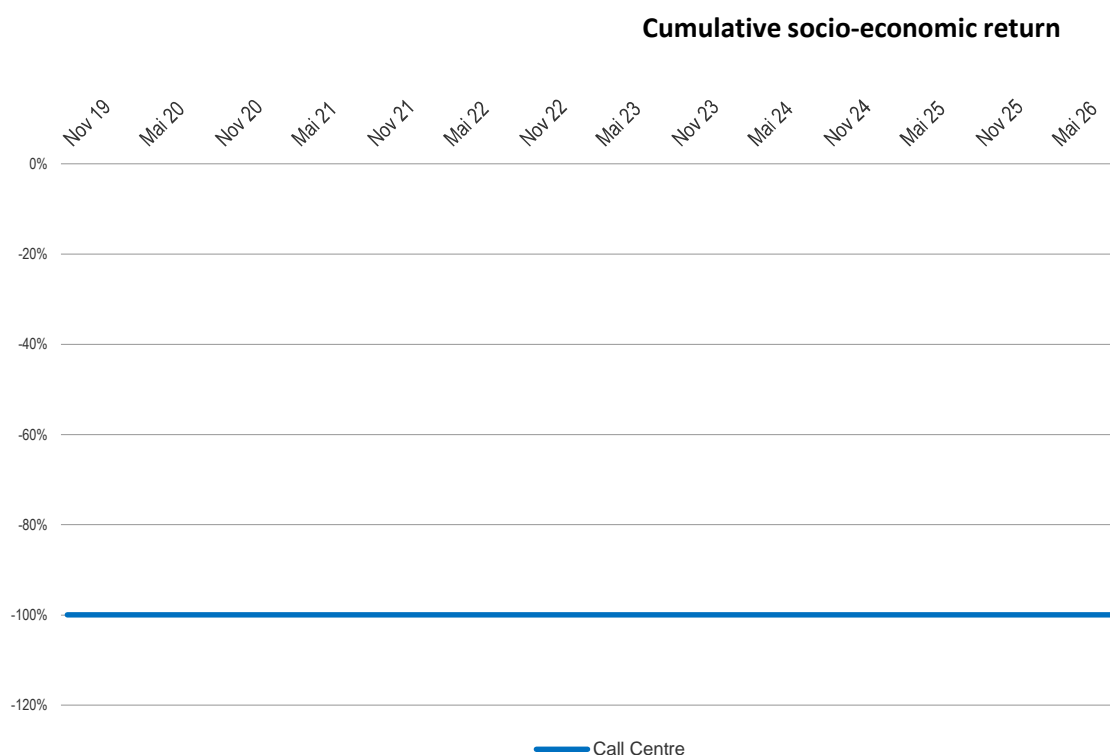


Figure 183. cumulative socio-economic return of call centre in BC over time.

In comparison, the cumulative net benefit curve is accordingly below zero over the whole period with non-linear shape, following from the addition of new call centre nurses to the service (see figure below).

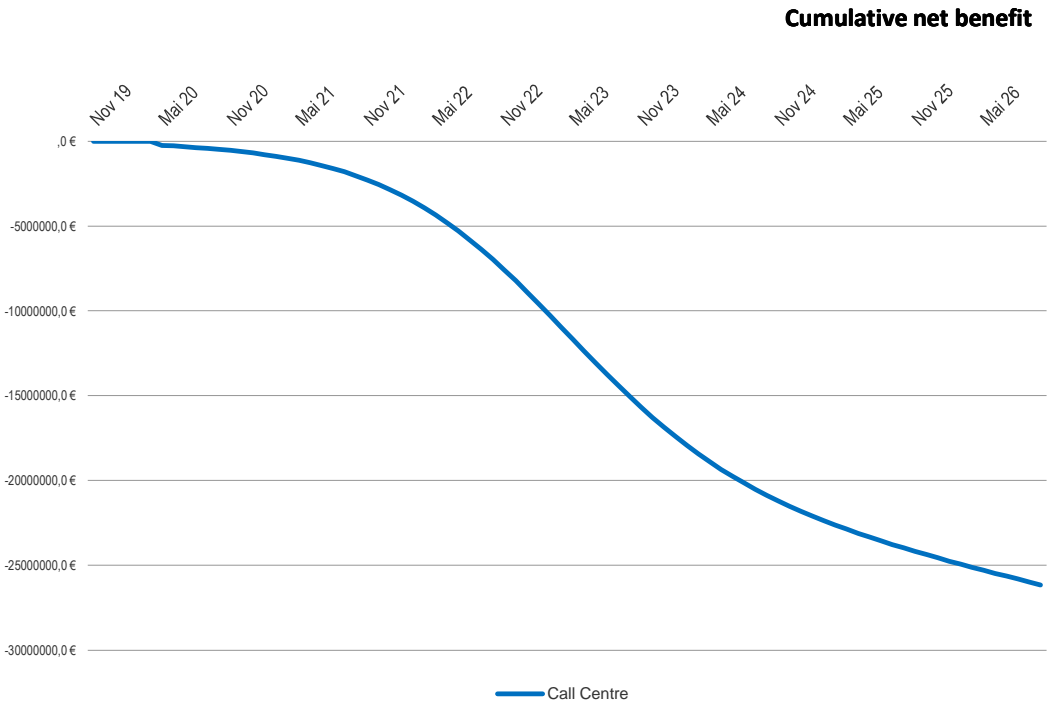


Figure 184. cumulative net benefit for call centre in BC over time.

The largest negative monthly contribution to the net benefit is reached in May 2023 with -703,038€. The total cumulative net benefit is -26,150,576€.

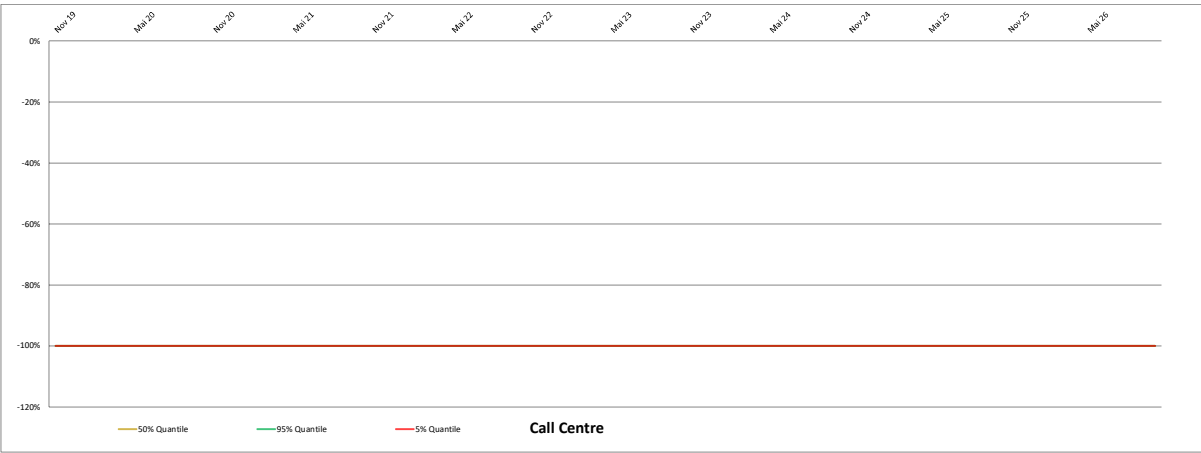


Figure 185. Monte Carlo Simulation of cumulative socio-economic return (SER) of Call Centre in BC over time.

Negative impacts	Rational	Share of total costs
Devices for multimorbid patients	The costs for medical devices are multiplied by patient number and by the share of patients with the respective disease: blood pressure monitors (50€) could potentially be used by the patients who have heart disease. Weight scales (62€) could be used by diabetes patients and a Smartphone (Motorola G7, 122€, acts as a hub connecting the mobile self-measurement devices with the PEP. The share of patients from C3-Cloud having chronic conditions was significantly different from the general population in the Basque Country. Thus, we relate here to the share of patients generally in the Basque Country, who have the underlying chronic condition.	72%
Extra staff time for service provision by Call Centre to multimorbid patients – actual time	Includes all time spent by call centre nurses on services related to multimorbid patients. It is estimated that 1-2 phone calls per year with a duration each of 15 min (conservative approach). These calls will be used for home monitoring patients and their potential health exacerbation. Consequently, less practice visits may be needed.	23%
Overhead on costs	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on costs is calculated as a percentage mark-up on staff costs.	6%

Table 52. Composition of total costs of Call Centre in BC over time (no benefits were defined).

Sum of all costs	Sum of all cost types reduced by contingency in present values	26.150.576 €
Financial costs	The need for extra cash	20.428.205 €
Redeployed resources	Time taken away from other activities	5.722.371 €
Non-financial costs	Inconvenience	0 €
Implementation cost	Costs related to service implementation	19.004.258 €
Operation cost	Costs related to continuous operation of the service	7.146.317 €
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	0
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	0

7.4.2.6. Call Centre nurses

Call centre nurses are available for C3-Cloud services. The call center's role is to provide remote out-of-hours support for multimorbid patients, at night and weekends. The costs for their ongoing work with C3-Cloud patients is a resource and financial cost to the organisation they work in. Thus, call center nurse is affected only by temporary inconveniences which carries only a very small share of to the overall systemic costs of C3-Cloud implementation and usage.

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is that call center nurses need 2 hours in the first month to adapt to C3-Cloud services.	100%
Positive Impacts	Rational	Share of total benefits
Valuation of intangible benefits by Primary care physicians (GPs) according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Figure 186. Basque Country: Composition of key service impacts of call centre nurses.

Table 53. Composition of total costs of call centre nurses in BC over time.

Sum of all costs	Sum of all cost types reduced by 336 contingency in present values	
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	336
Implementation cost	Costs related to service implementation	336
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by 84 contingency in present values	
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	84

Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of 84 the service	

The MonteCarlo simulation reflects what we see in the above tables. There is a small cost (inconvenience) which cannot be outweighed by the overall satisfaction of call center nurses with the C3-Cloud system. Thus, the SER varies between -77% and -75% (Figure 187).



Figure 187. Monte Carlo Simulation of socio-economic return (SER) for Call Centre nurses in BC over time.

7.4.2.7. Primary care organisations

Primary care organisations (i.e. community practices) employ GPs and practice nurses. These stakeholders are, however, contracted and paid by the National Health Board (Ministry of Health).

The extra time spent by primary care nurses on consultations with multimorbid patients, supporting them with self-measurements on the patient empowerment platform (PEP) enters as a cost factor, representing 12% of the total primary care organization's cost. A larger share of 83% stems for the opportunity cost, or in other words forgone income from reduced consultations with the MDT at the primary care organisation.

In terms of opportunity costs/benefits, we also attribute 35% of positive impacts to the resource liberation for primary care physicians (general practitioners GPs) working with Multimorbid patients. Potentially, fewer face-to-face appointments will be needed. Instead home monitoring can be done through a call center nurse. The observation is that the number of visits will be reduced by 2.2 per year per patient. One conventional visit takes the GP approx. 20 minutes (eCUI indication was 15-30 minutes). With C3-Cloud, primary care physicians spend the same time on C3-Cloud care plan reviews. Potentially they save time in the long run due to C3-Cloud.

According to estimation for BC, 80% of time will be saved through learning-curve-effects, referring to the desired outcome of automatisisation of improving care plans. Thus, once workers and patients are adapted to the new tool eight out of 10 minutes of face-to-face intervention with patients can be saved. This outcome represents 17% of the overall total impact.

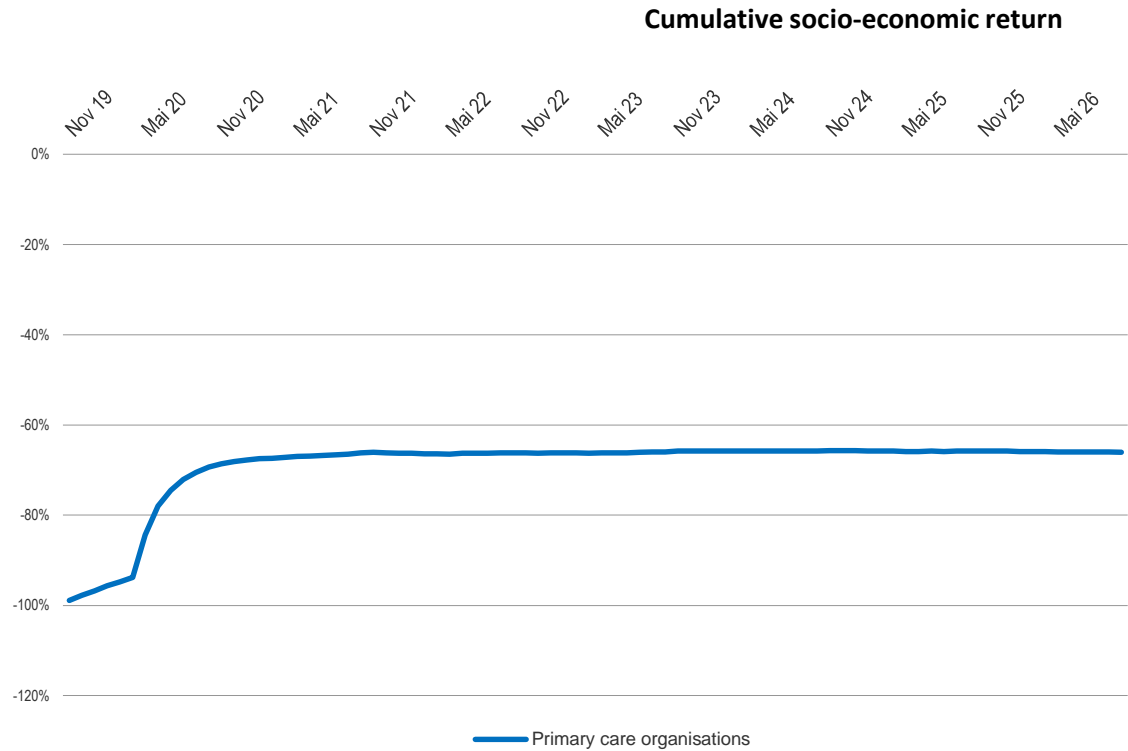


Figure 188. Cumulative socio-economic return of primary care organisations in BC over time.

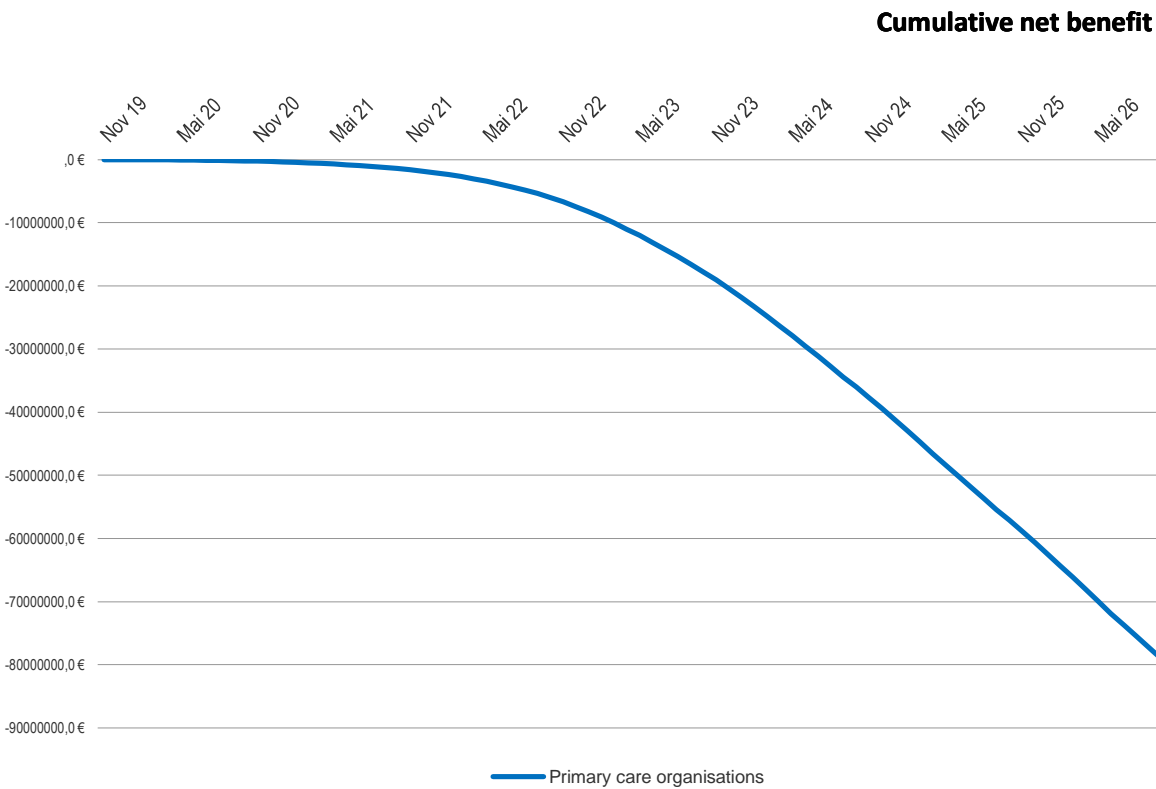


Figure 189. Cumulative net benefit of primary care organisations in BC over time.

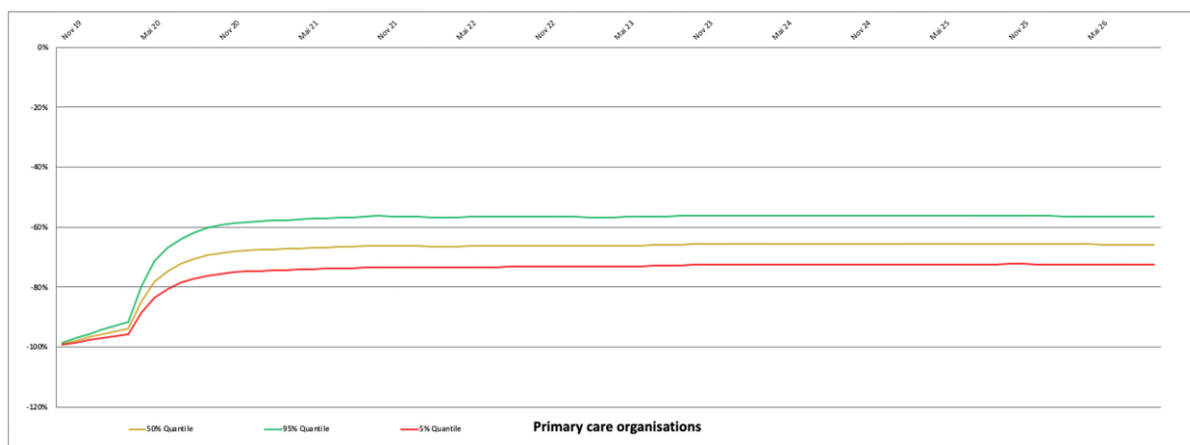


Figure 190. Monte Carlo Simulation of cumulative SER for Primary care organisations in BC over time.

Applying the MonteCarlo model to the data for primary care organisations shows that it starts off with -100% SER during the trial phase, as there are implementation costs, but no implementation benefits defined. The development is positive in the following months because no additional professional is recruited during the technology trial, but the implementation costs decrease each month. From May 2020 onwards, additional professionals are recruited, adding new implementation costs. In parallel, primary care organizations have operational costs mainly from forgone income from reduced MDT consultations. It is debateable if this is indeed a cost to primary care organisations, as they are being by the Ministry of Health for such consultations. Yet the way this modelling has been set up, it is considered as a cost for the primary care organisations which translates into a benefit for the payers. Consequently, primary care organisations may have liberated time to improve care quality during remaining patient consultations. In addition, time is liberated due to reduced consultations and a new potential stream of income is generated by added telephone consultations which may be cashed with the Ministry of Health. The overall SER has a steep increase from -93% in Mai 2020 (when the scaling up start) until approximately November 2020 due to the unit costs models from the Discrete Event Simulation. There it was modelled that the benefits (additional telephone consultations) increase by 150% in these months, while the costs (decreased consultations with GP and nurses) increase by only 105% and 96% in the same period. This levels off from November 2020 onwards, thus we see the flattening SER curve from then onwards. In the best-case model, the SER for primary care organizations will be at #58% after the observation period of 84 months; in the worst-case scenario it could be at -72%.

Table 54. Basque Country: Composition of key service impacts of primary care organisations.

Negative impacts	Rational	Share of total costs
Foregone income from reduced consultations with the MDT at the primary care organization	Based on reduced primary care physician consultations and its respective costs. The costs were modelled using discrete event simulation models, performed by the Osakidetza partners of C3-Cloud.	83%

Extra staff time for service provision (intervention) by primary care nurses to multimorbid patients	The assumption is that nurses will take 5 additional minutes for measurement per visits per patient for 3.4 visits a year (based on actual data)	12%
Overhead costs on	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on costs is calculated as a percentage mark-up on staff costs, here 25%.	3%
Staff time spent on training	In addition to the personal, non-economic cost of adaptation, professionals usually also need more time to perform their tasks during the transition period. This impact includes time spent by GP and primary care nurses, which is predicted to amount 4 hours per new staff member.	1%
Positive impacts	Rational	Share of total benefits
Resource liberation (intervention) for primary care physicians (GPs) working with multimorbid patients – actual time	<p>The observation is that the number of visits will be reduced by 2.2 per year per patient. One conventional visit takes the GP approx. 20 minutes (eCUIIS indication was 15-30 minutes).</p> <p>In addition, it is expected that patients will see the primary care physician every three months to review their care plan. For these consultations, C3-Cloud may save the physician time for each consultation (2 minutes per care plan review is assumed). While C3-Cloud data (DES modelling and pilot site extract) showed that C3-Cloud patients saw their primary care centre only 2.2 times a year, it is anticipated that this frequency may increase when Covid-19 restrictions have been alleviated.</p>	35%
More income from additional consultations with the primary care organisations	Includes added income based on additional telephone consultations between the patients and the primary care organisations. This input is based on discrete event simulation performed by our project partner Osakidetza.	26%

Resource liberation (intervention) for primary care nurses working with multimorbid patients - actual time	Our data expert interviews indicated that primary care nurses save 2 minutes per patient consultation for approx. 3.4 visits a year per patient. In addition, they save 1 home visit per patient and year and with that 30 they liberate 30 minutes of their time.	17%
Overhead on benefits	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on benefits is calculated as a percentage mark-up on staff benefits, using the same overhead rate as for costs. 25% here.	13%
Resource liberation from avoided home visits – travel cost	This includes 0.4 fewer home visits performed by physicians and 1 home visits performed by practice nurses per year (based on FHIR data), under the assumption that on trip is 10km on average and a mileage refund of 0.30€.	8%

Table 55. Composition of total costs of Primary Care Organizations in BC over time.

Sum of all costs	Sum of all cost types reduced by 119.850.995 contingency in present values	
Financial costs	The need for extra cash	103.338.461
Redeployed resources	Time taken away from other activities	16.512.533
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	1.088.053
Operation cost	Costs related to continuous operation of the service	118.762.942
Sum of all benefits	Sum of all benefit types reduced by 40.684.110 contingency in present values	
Financial benefits	Reducing cash outlays	19.257.284
Liberated resources	Time saved from existing activities	21.426.826
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	40.684.110

7.4.2.8. Primary care physicians (GPs)

GPs are directly employed by the national health authority and are the heads of primary care practices. They provide medical primary care and care planning for multimorbid patients.

Improvement in decision making due to being better informed, and improvement in quality of care provided, can have a positive intangible impact. Professional's motivation and satisfaction have a positive intangible impact. Both result in a very moderate positive valuation of the C3DP services. However, GPs need to invest time in adapting to the new way of working. The

implementation costs outweigh the perceived benefits, resulting in a negative cumulative SER of -75% for the GPs in primary care practice.

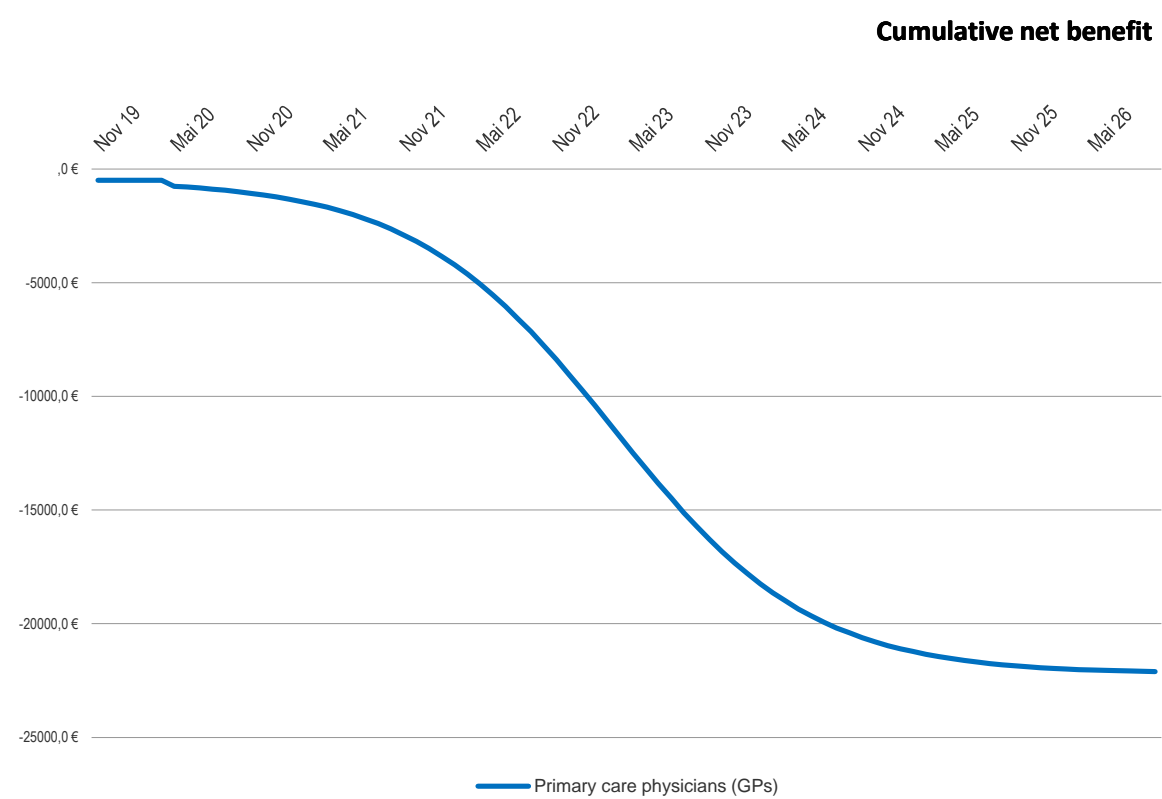


Figure 191. Cumulative net benefit of GPs in BC

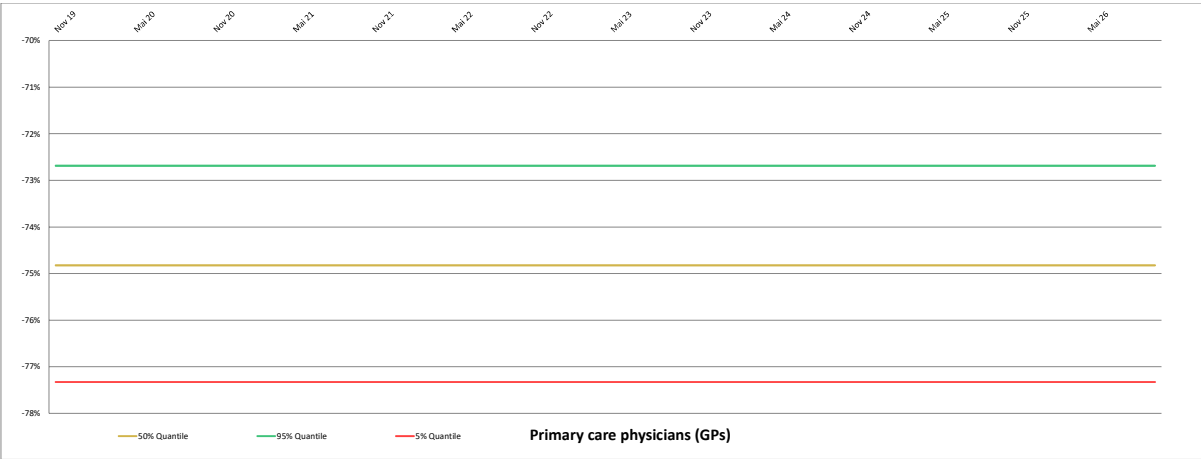


Figure 192. Monte Carlo Simulation of cumulative socio-economic return of GPs in BC

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is that GPs spend 30 extra minutes during the first month due to adaptation to C3-Cloud.	100%
Positive Impacts	Rational	Share of total benefits
Valuation of intangible benefits by Primary care physicians (GPs) according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Figure 193. Basque Country: Composition of key service impacts of GPs.

Table 56. Composition of total costs of GPs in BC over time.

Sum of all costs	Sum of all cost types reduced by 29.494 contingency in present values	
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	29.494
Implementation cost	Costs related to service implementation	29.494
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by 7.374 contingency in present values	
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	7.374
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	7.374

7.4.2.9. Primary care nurses

Primary care nurses are employed by the national health authority and work in the primary care centers. They provide primary care and care planning for multimorbid patients and may support with self-measurements of vital signs such as blood pressure, heart rate or blood glucose levels.

Improvement in care planning due to being better informed, and improvement in quality of care provided through liberated time, can have a positive intangible impact. Professional's motivation and satisfaction have very moderate positive intangible impact. However, primary care nurses need to invest time in adapting to the new way of working (2 hours in the first month is assumed). The implementation costs outweigh the perceived benefits, resulting in a negative cumulative SER of -76% for nurses in primary care centers.

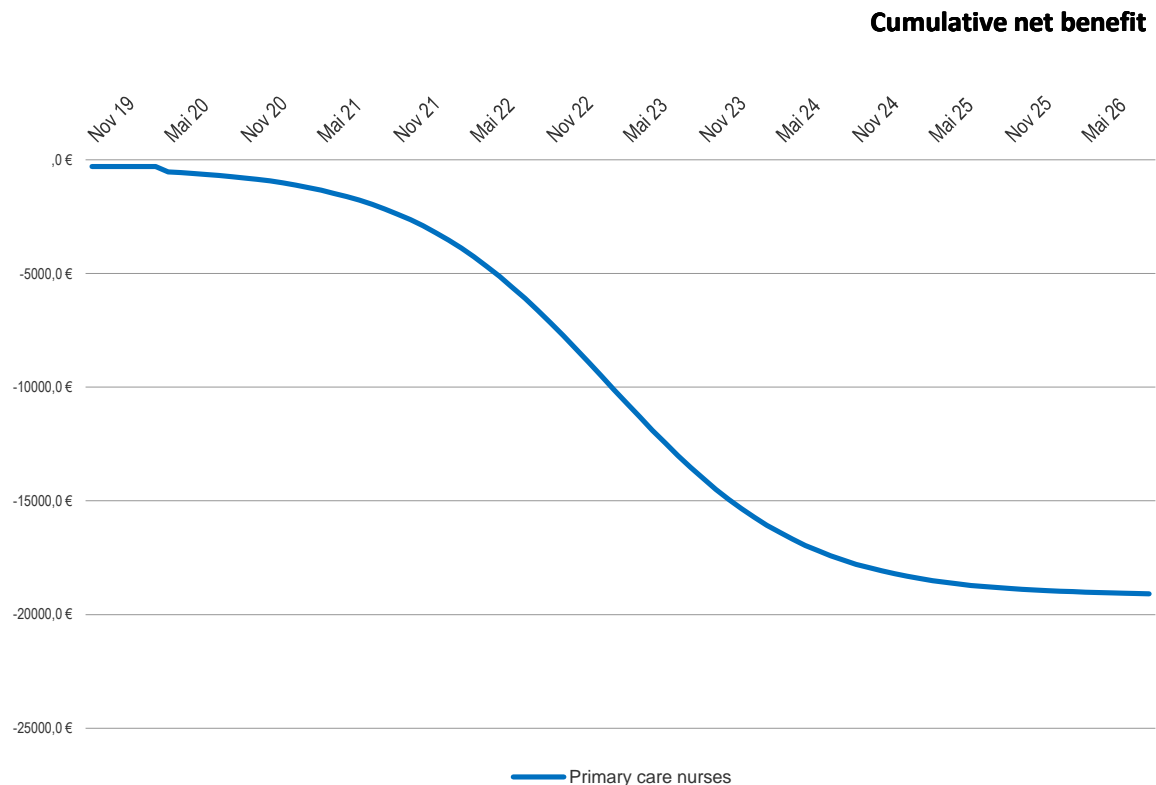


Figure 194. Cumulative net benefit of primary care nurses in BC

The MonteCarlo simulation reflects what we see in the data below (Figure 196 and Table 57). There is a small cost (inconvenience) which cannot be outweighed by the overall satisfaction of primary care nurses with the C3-Cloud system. Thus, the MonteCarlo modelled SER varies between -68% and -82% (Figure 195)

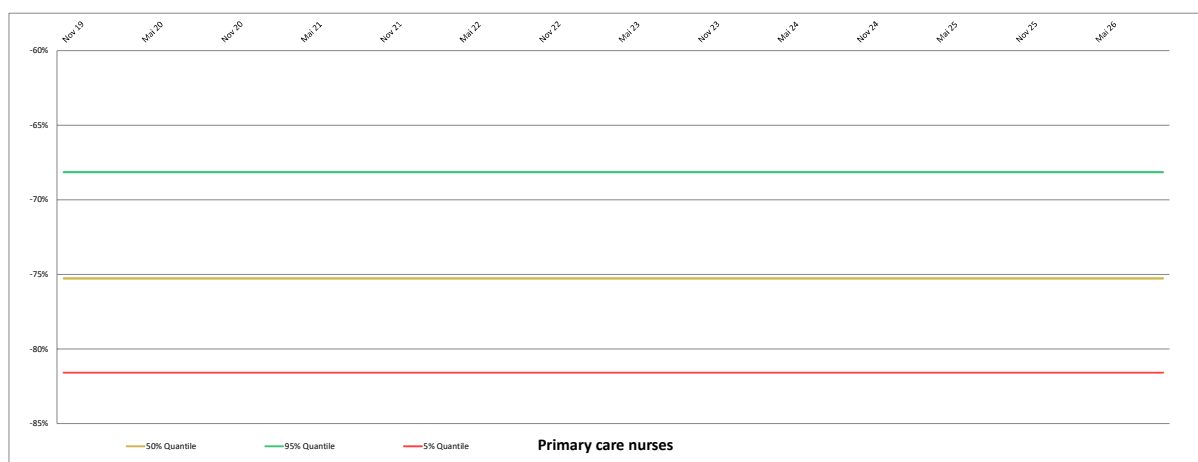


Figure 195. Monte Carlo Simulation of socio-economic return (SER) for Primary care nurses in BC over time.

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is primary care nurses need 2 hours in the first month to adapt to C3-Cloud services.	100%
Positive Impacts	Rational	Share of total benefits
Valuation of intangible benefits by Primary care physicians (GPs) according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Figure 196. Basque Country: Composition of key service impacts of primary care nurses.

Table 57. Composition of total costs of primary care nurses in BC over time.

Sum of all costs	Sum of all cost types reduced by contingency in present values	25.459
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	25.459
Implementation cost	Costs related to service implementation	25.459
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	6.365
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	6.365
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	6.365

7.4.2.10. Hospitals

Patients involved in C3-Cloud may be forwarded to hospitals to receive specialist physician care or may be submitted to the Accident and Emergency unit upon sudden health deterioration. Hospitals are mainly affected due to forgone income from avoided A&E admissions for C3-Cloud patients (86% of all costs). In addition, hospital staff spends time on C3-Cloud training and on using the C3-Cloud platform, which they have not done before (Table 58). Positive impacts have not been defined for the hospital, yet these may be sought rather in improved quality of care or shortened hospitalization periods – indicators that were not part of this evaluation or that were found to not be significantly different for the C3-Cloud patient cohort when compared with the control patient cohort. This could be a different picture if a follow-up trial had the chance to observe a longer trial period; larger patient cohorts; patients with moderate to severe conditions and a trial not under Covid-19 impediments.

Consequently, the SER for hospitals maintains at -100% for the entire observation period (Figure 197 and Figure 199). The cumulative net benefit is decreasing even steeper from November 2022 onwards, which is caused by an increase in costs modelled from the DES. At the end of the observation period, the overall net benefit is as low as -30,000,000€ for hospitals (Figure 198).

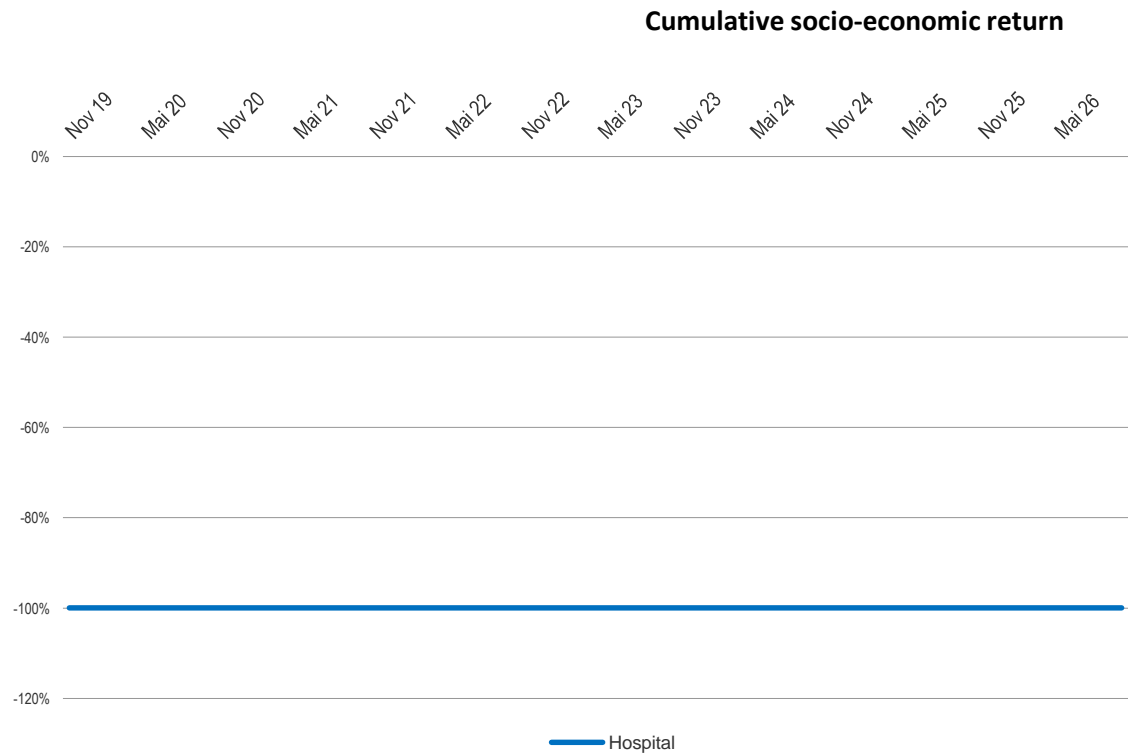


Figure 197. Cumulative socio-economic return of Hospitals in BC over time.

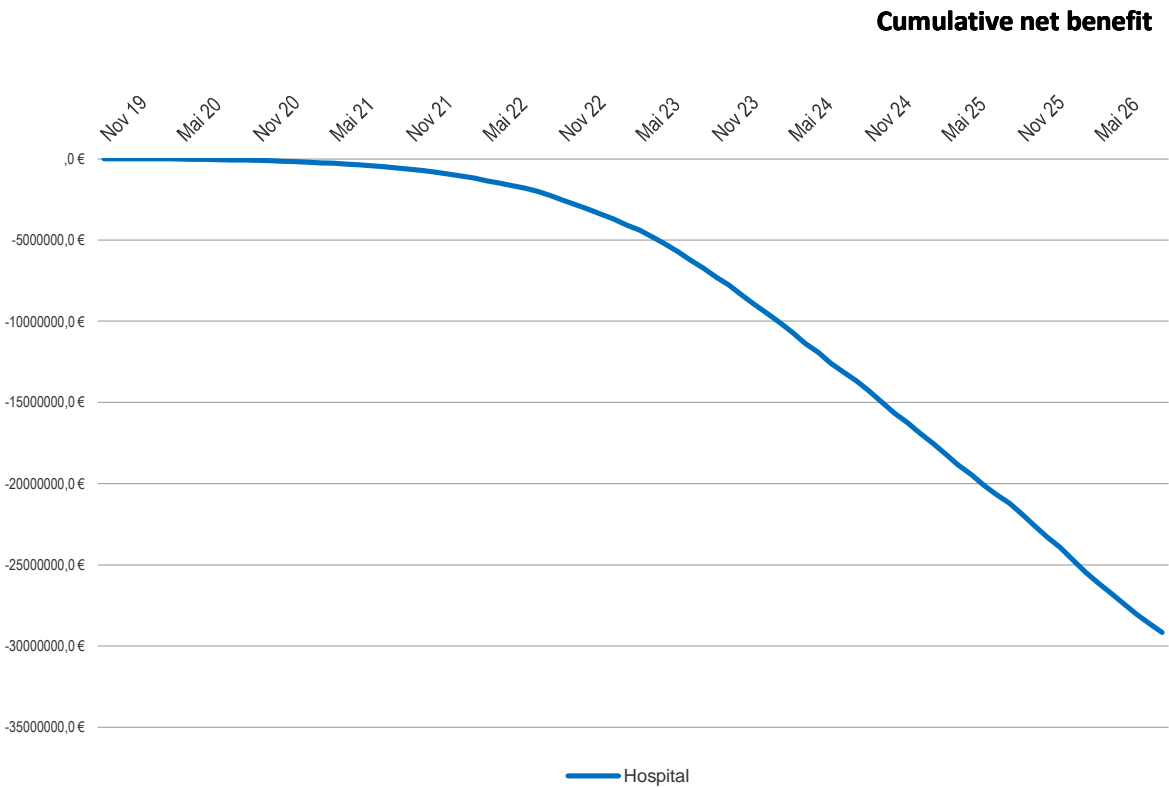


Figure 198. Cumulative net benefit of Hospitals in BC over time

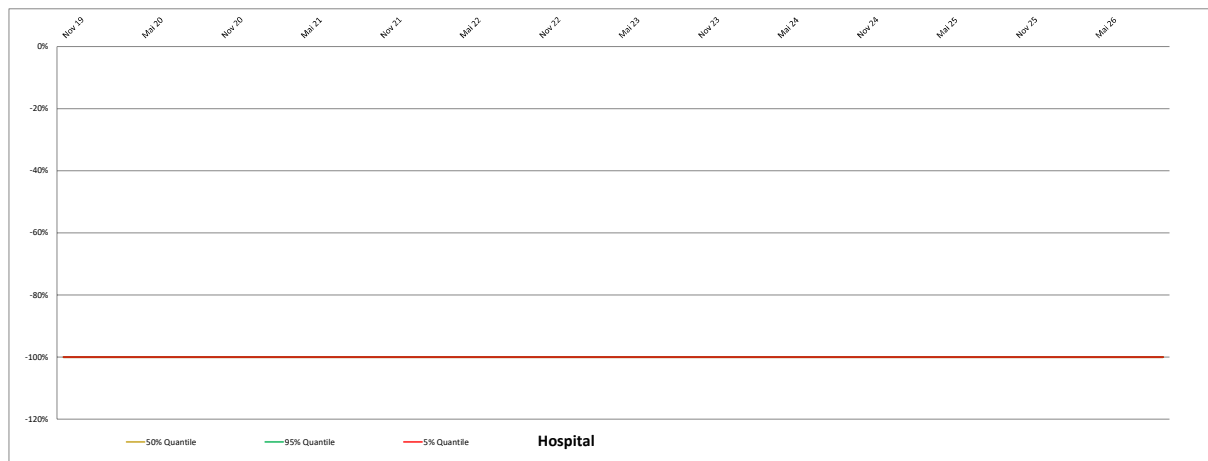


Figure 199. Monte Carlo Simulation of cumulative SER for Hospitals in BC over time.

Table 58. Basque Country: Composition of key service impacts of Hospitals.

Negative impacts	Rational	Share of total costs
Forgone income from reduced visits or admissions to the Hospital	Forgone income based on reduced use of the A&E unit at the hospital. The data is based on DES modelling from Osakidetza. This is the delta of costs per patients and month for regular care - costs for C3-Cloud patients. It considered the average costs savings for patients that have had at least one A&E visit.	86%
Extra staff time for service provision by Hospital physicians to Multimorbid patients - actual time	Per patient per hospitalisation 15 minutes time spend on C3-Cloud care planning, dependent on the severity of the case. Excluding time spend on prescriptions.	6%
Extra staff time for service provision by Specialist / hospital nurses to Multimorbid patients - actual time	Per patient per hospitalisation 15 minutes time spend on C3-Cloud care planning, dependent on the severity of the case. Excluding time spend on prescriptions.	4%
Overhead on costs	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on costs is calculated as a percentage mark-up on staff costs; assumed to be 25%.	3%
Staff time spent on training	Includes all personnel receiving training in relation to the new service.	1%

Adaptation time	In addition to the personnel, non-economic cost of adaptation, professionals usually need more time in performing their tasks during a transition period. This is a temporary reduction in productivity and includes time spent on engagement, for defining new working practices, as well as time needed for getting used to new technology and new practices. Once the services become routine, the need becomes zero. This indicator considers working time of professionals and is thus an economic cost to care organisations, at least initially.	1%
Positive impacts	Rational	Share of total benefits
No positive impacts were defined		

Table 59. Composition of total costs of Hospitals in BC over time.

Sum of all costs	Sum of all cost types reduced by 29.154.206 contingency in present values	
Financial costs	The need for extra cash	26.095.129
Redeployed resources	Time taken away from other activities	3.059.077
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	55.788
Operation cost	Costs related to continuous operation of the service	29.098.418
Sum of all benefits	Sum of all benefit types reduced by 0 contingency in present values	
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	0

7.4.2.11. Hospital specialist physicians

Hospital specialists are employed at the hospital, providing specialist secondary healthcare to C3-Cloud patients if these were admitted to the hospital.

Improvement in decision making due to being better informed, and improvement in quality of care provided, can have a positive intangible impact. Professional's motivation and satisfaction have a positive intangible impact. Both result in a very moderate positive valuation of the C3DP services. However, hospital specialist physicians need to invest time in adapting to the new way of working (2 hours in the first months as assumed)(Figure 202). The implementation costs outweigh the perceived benefits, resulting in a negative cumulative SER of -75% for the hospital

specialist physicians working in the hospitals (Figure 201). The net benefit consequently decreases with the addition of more hospital specialist physicians and levels off when their numbers reach satisfaction. However, the absolute numbers for the net benefit are overall neglectable, being as low as 1,100€ at the end of the observation period (Figure 200).

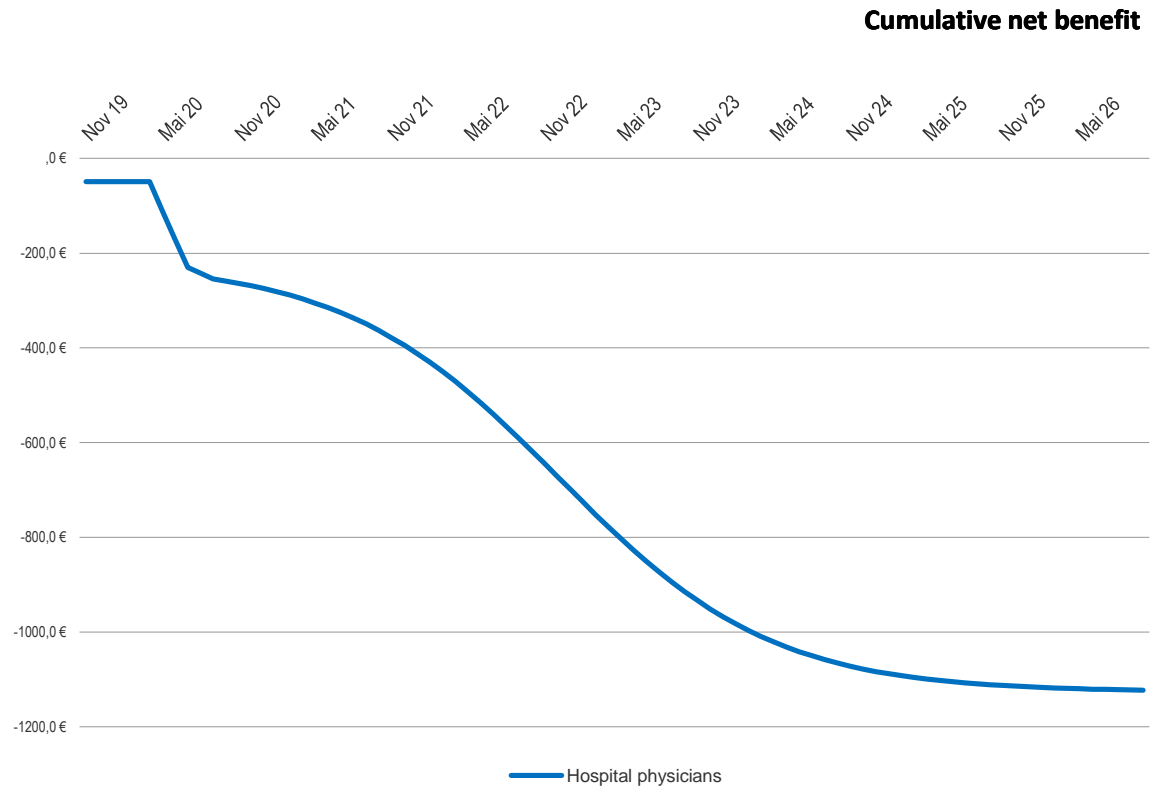


Figure 200. Cumulative net benefit of hospital specialist physicians in BC

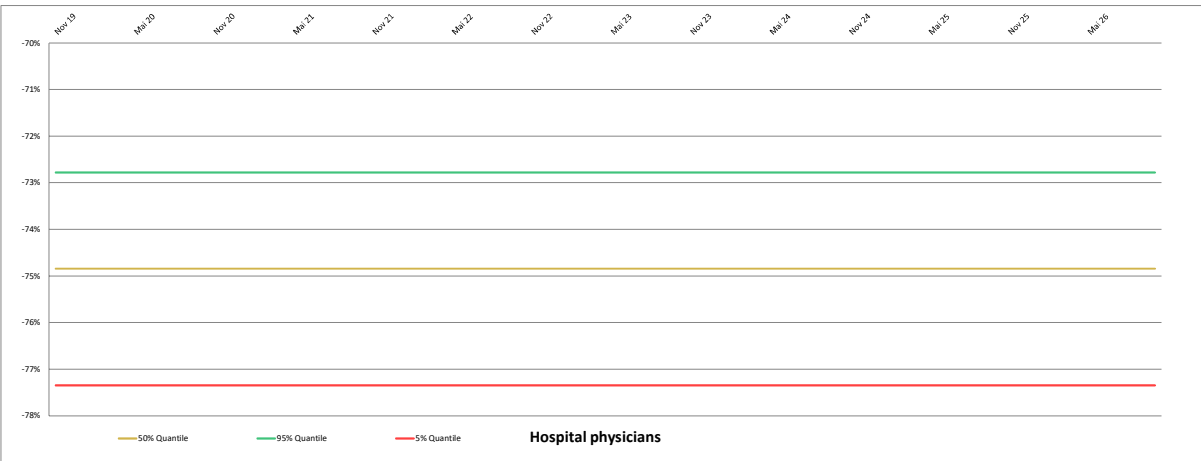


Figure 201. Monte Carlo Simulation of cumulative socio-economic return of hospital specialist physicians in BC

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is that hospital specialists spend 30 extra minutes during the first month due to adaptation to C3-Cloud.	100%
Positive Impacts	Rational	Share of total benefits
Valuation of intangible benefits by Primary care physicians (GPs) according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Figure 202. Basque Country: Composition of key service impacts of hospital specialist physicians.

Table 60. Composition of total costs of hospital specialist physicians in BC over time.

Sum of all costs	Sum of all cost types reduced by 1.497 contingency in present values	
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	1.497
Implementation cost	Costs related to service implementation	1.497
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by 374 contingency in present values	
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	374
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	374

7.4.2.12. Hospital Specialist nurses

Specialist nurses are employed at the hospitals and work in collaboration with the hospital specialist physicians. They provide secondary care and care planning for multimorbid patients.

Improvement in care planning due to being better informed, and improvement in quality of care provided through liberated time, can have a positive intangible impact. Professional's motivation and satisfaction have very moderate positive intangible impact. However, hospital nurses need to invest time in adapting to the new way of working (2 hours in the first month is assumed) (Figure 205). The implementation costs outweigh the perceived benefits, resulting in a negative cumulative SER of -75% for hospital nurses. The MonteCarlo simulation reflects this picture (Figure 204). There is a small cost (inconvenience) which cannot be outweighed by the overall satisfaction of hospital nurses with the C3-Cloud system. Thus, the MonteCarlo modelled SER varies between -72% and -78%.

The net benefit consequently decreases with the addition of more hospital nurses and levels off when their numbers reaches satisfaction. However, the absolute numbers for the net benefit are overall neglectable, being as low as 1,000€ at the end of the observation period (Figure 203).

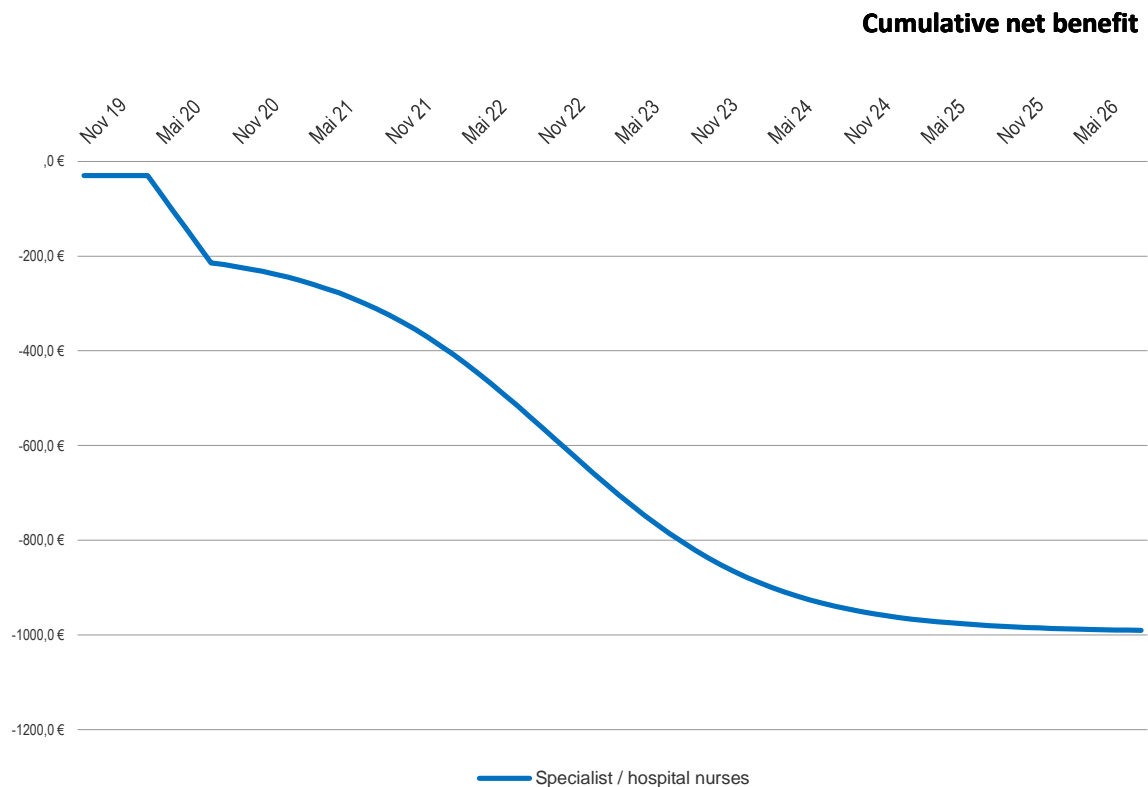


Figure 203. Cumulative net benefit of hospital specialist nurses in BC

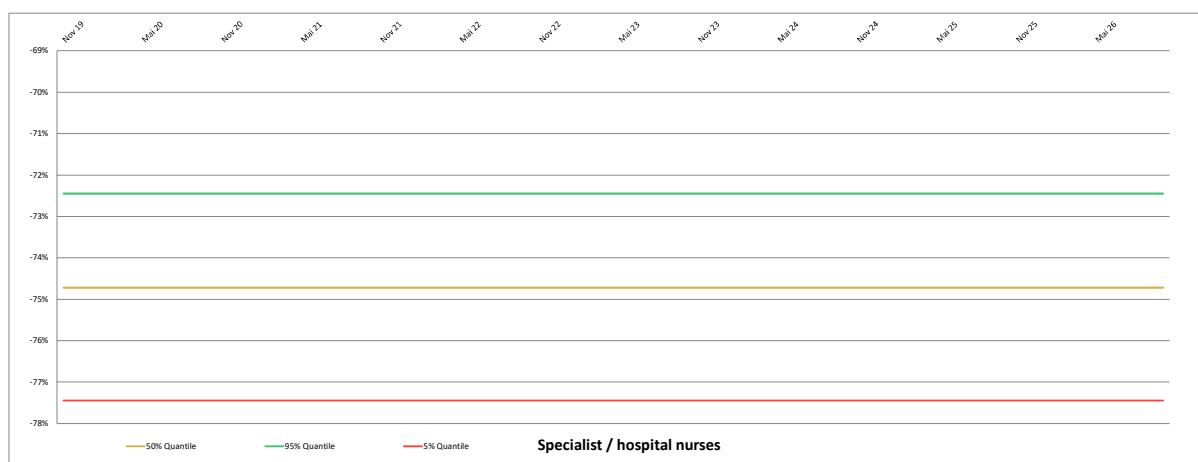


Figure 204. Monte Carlo Simulation of cumulative socio-economic return of hospital specialist nurses in BC

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is that hospital nurses spend 30 extra minutes during the first month due to adaptation to C3-Cloud.	100%
Positive Impacts	Rational	Share of total benefits
Valuation of intangible benefits by Primary care physicians (GPs) according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Figure 205. Basque Country: Composition of key service impacts of hospital specialist nurses.

Table 61. Composition of total costs of hospital specialist nurses in BC over time.

Sum of all costs	Sum of all cost types reduced by 1.321 contingency in present values	
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	1.321
Implementation cost	Costs related to service implementation	1.321
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by 330 contingency in present values	
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	330
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	330

7.4.2.13. Payer / Ministry of Health

The Basque Country Health Department oversees healthcare, health promotion and disease prevention through Osakidetza, which is the service provider. Osakidetza assumes those services corresponding to C3-Cloud. Due to the budgetary reimbursement system in the Basque Country, benefits or costs do not arrive here as an immediate impact. They are accounted for by the affected organisation if the budget or per capita payment is not changed. Changing a budget can be the consequence of this analysis and further deployment and usage of C3-Cloud components, but we regard this as a second order effect that is not usually modelled in ASSIST. For the time being, the following process was followed: Costs generated, and benefits liberated through C3-Cloud implementation are considered within the analysis of the organisations where the cost or benefit occurs. E.g.: Additional telephone contacts with the healthcare centre are a benefit to the primary care centre as these could generate additional income in the long term, after the budget for primary care centres is renegotiated, based on this added need for telephone calls. In consequence it is an added cost for Osakidetza who needs to pay for these. In contrast: fewer consultations with the healthcare centre for primary care physicians and nurses are considered a cost to the primary care centre (forgone income) and a benefit for Osakidetza (less payment needed due to fewer consultations). A similar situation is the case with the hospitals A&E unit. Less visits there imply a cost for the hospital due to forgone chances to cash such visits with Osakidetza. Consequently, it is a benefit for Osakidetza, which needs not to pay for avoided A&E visits (Table 62).

The net benefits for Osakidetza outweigh the costs from the first month onwards, cumulating to 124,000,000€ at the end of the modelled 84 month period (Figure 206 and Table 63). This makes Osakidetza the main beneficiary of C3-Cloud deployment and scaling up under the given input and assumptions.

In the first 6 months of operation, the DES modelled relatively smaller costs for additional telephone contacts at primary care centre (amounts spanning from 0.35€ - 1.04€ per patient and month), which results in a relatively higher SER (Figure 207). From then this amount increases to 1,67€ within one year and to 2.35€ within the next 3 years and subsequently levels off.

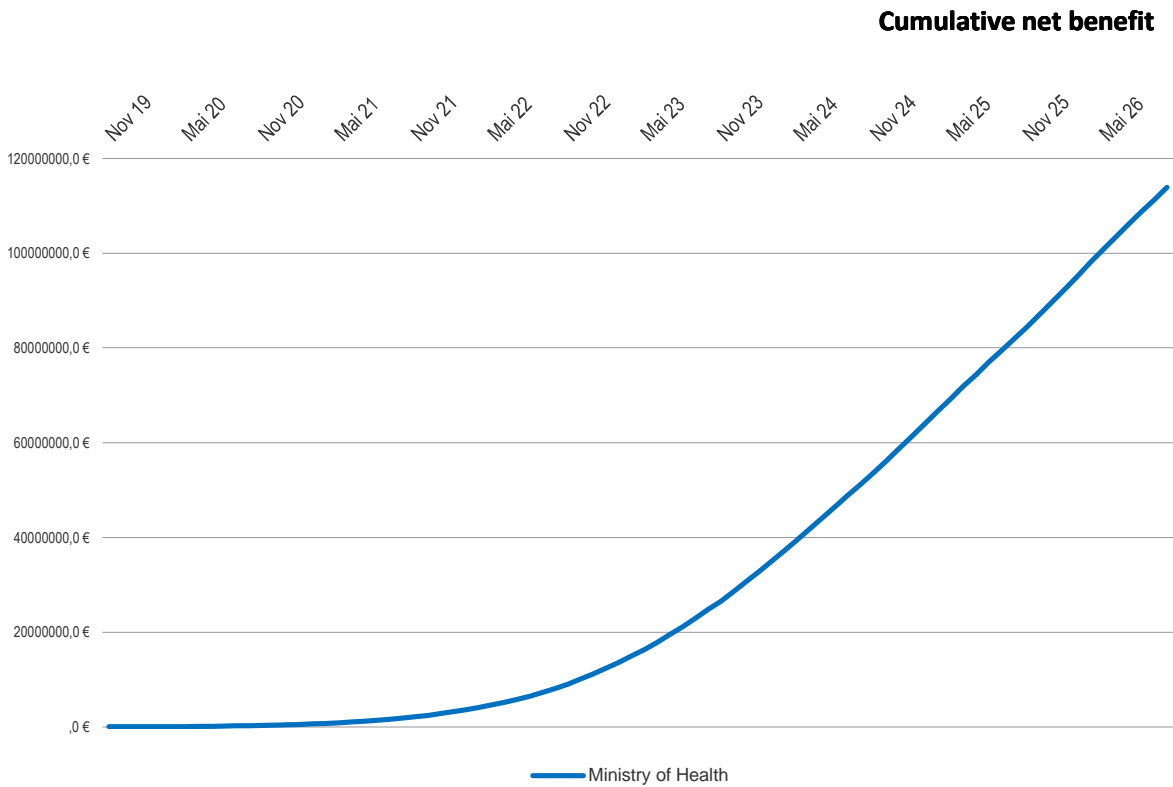


Figure 206: BC, cumulative net benefit for the Ministry of Health

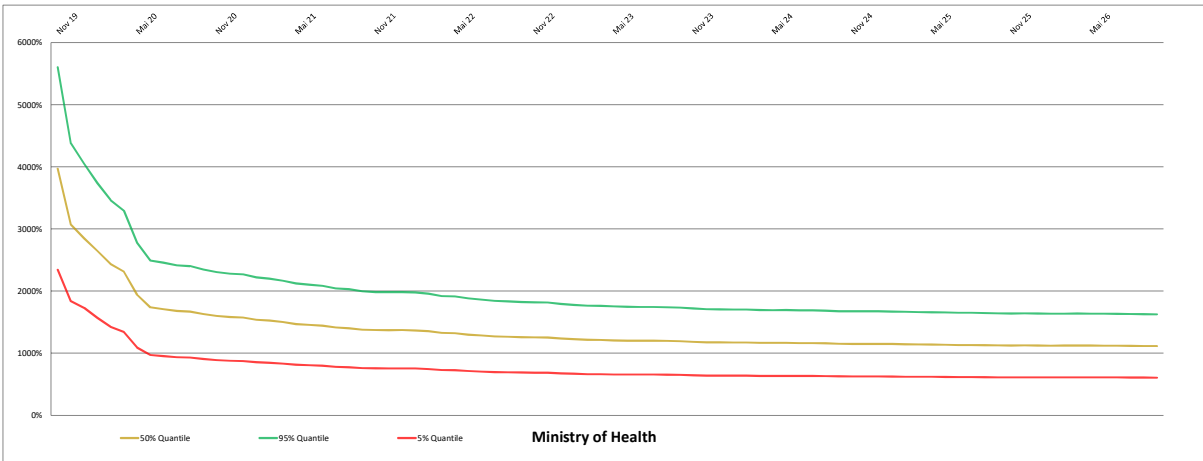


Figure 207: BC, Monte Carlo simulation of cumulative SER for Ministry of Health

Table 62: BC, key service impacts for the Ministry of Health

Negative impacts	Rational	Share of total costs
Extra service use: additional consultations with Primary care organisations	The DES modelling concluded: One additional telephone contact with primary care nurses over 12 months	100%
Positive impacts	Rational	Share of total benefits
Reduced service use: less consultations with Primary care organisations	The DES modelling concluded: 2.2 fewer contacts with GP at primary care centres over 12 months 0.4 fewer contacts with GP for home visits over 12 months 1.0 fewer home visits through primary care nurses over 12 months	80%
Reduced service use: less admissions to and shorter stays in hospital	The DES modelling concluded: 1.0 fewer admissions to A&E unit over 12 months. This is a benefit to the Ministry of Health that would otherwise pay for these admissions.	20%

Sum of all costs	Sum of all cost types reduced by 10.674.911 contingency in present values	
Financial costs	The need for extra cash	10.674.911
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	0
Operation cost	Costs related to continuous operation of the service	10.674.911
Sum of all benefits	Sum of all benefit types reduced by 124.540.688 contingency in present values	
Financial benefits	Reducing cash outlays	124.540.688
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	124.540.688

Table 63: BC, sum of costs and benefits – Ministry of Health

7.4.2.14. IT suppliers

IT suppliers are the key C3-Cloud component development organisations in the C3-Cloud project (i.e. SRDC, MEDIXINE, INSERM, Cambio and Warwick). As a business plan with specific cost indications (licensing plans) for the usage of the system was not yet available for the modelling from WP2 at the time of writing this deliverable, we assumed the EU H2020 project funding for C3-Cloud as the next best alternative proxy for the development cost. This is based on the Person Months (PM) claimed by SRDC, MEDIXINE, INSERM, Cambio and Warwick from WPs 3, 5, 6, 7, 8 (total 302 PM) and an assumed PM rate (average across partners) of € 6,072.72. We distributed the costs across the first 6 months only, as this will be considered the development phase and implementation of the project for the ASSIST modelling (in parallel to the piloting) (Table 64). In future evaluations it is recommended to include also cost modelling for future licensing arrangements for the C3-Cloud components or service system. That could be flat rate monthly costs per patient or patient groups (e.g. stepwise price calculations for <1000 patients; <50000 patients and >50000 patients). The specific plans for this are developed in the final WP2 deliverables and the final business planning at the end and post project.

The development costs for the three partners are neutralized by the EC H2020 project funding that was received for this project (Table 65). Consequently, the net benefit is neutral for the whole modelling period (Figure 209) and the cumulative SER for IT suppliers slightly beyond 0% due to minor discounting effects (Figure 208).

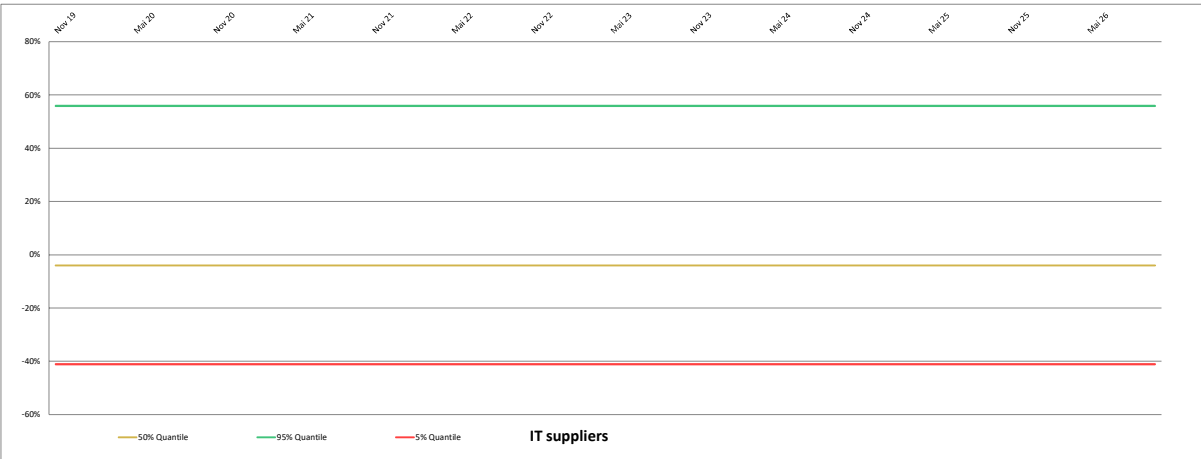


Figure 208: BC, Monte Carlo simulation of cumulative SER for IT suppliers

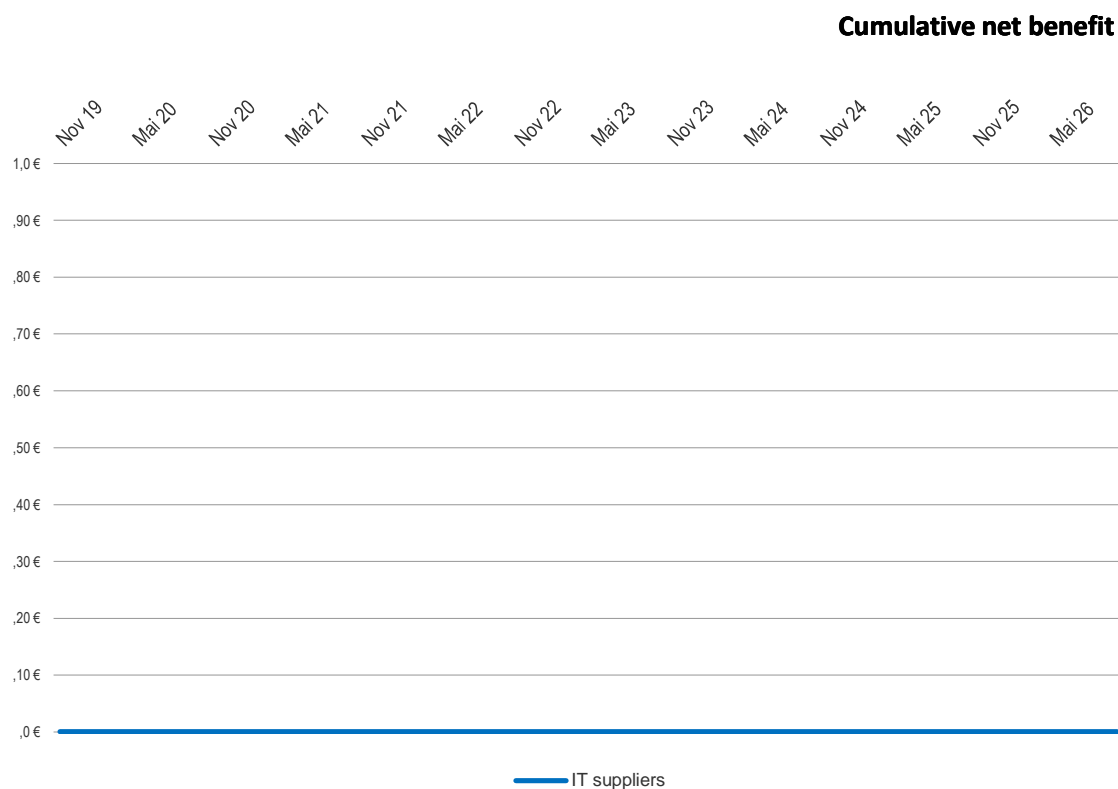


Figure 209: BC, cumulative net benefit for IT suppliers

Table 64: BC, key service impacts for IT suppliers

Negative impacts	Rational	Share of total costs
C3-Cloud development costs for IT suppliers	<p>This is based on the Person Months (PM) claimed by SRDC, MEDIXINE, INSERM, Cambio and Warwick from WPs 3, 5, 6, 7, 8 (total 302 PM) and an assumes PM rate (average across partners) of € 6,072.72 We distributed the costs across the first 6 months only, as this will be considered the development phase of the project for the ASSIST modelling (in parallel to the piloting).</p> <p>WP3: 57 PM WP5: 40 PM WP6: 46 PM WP7: 81 PM WP8: 78 PM</p>	100%

Positive impacts	Rational	Share of total benefits
EU funding for IT suppliers	As a business plan with specific numbers for the usage of the system was not yet available for the modelling from WP2 at the time of writing this deliverable, we assumed the EU H2020 project funding for C3-Cloud as the next best alternative proxy for the development cost.	100%

Table 65: BC, sum of costs and benefits for IT suppliers

Sum of all costs	Sum of all cost types reduced by contingency in present values	1.815.458
Financial costs	The need for extra cash	1.815.458
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	1.815.458
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	1.815.458
Financial benefits	Reducing cash outlays	1.815.458
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	1.815.458
Operation benefits	Benefits related to continuous operation of the service	0

7.4.3. Region Jämtland Härjedalen

In Region Jämtland Härjedalen, we modelled the costs and benefits for the following organisations and their related stakeholders, based on average salaries or household income (without employer contributions and social security) as a proxy to monetise the time that individuals spend on or liberate due to C3-Cloud. The following yearly net household incomes were assumed for the ASSIST model:

- Multimorbid patients (236.590 kr per year) and their informal caregivers (275.487 kr per year).
- The Call centre, including call centre nurses (373.655 kr per year).
- The primary care centre, including primary care physicians (976.986 kr per year) and primary care nurses (443.175 kr per year)
- The hospital, including hospital specialist physicians (869.433 kr per year) and hospital specialist nurses (373.655 kr per year)
- The Payers (i.e. the Ministry of Health)
- IT developers (only C3-Cloud development costs were considered)

7.4.3.1. Sustainability at service level

Under the assumptions made in the evaluation, the modelling in Region Jämtland Härjedalen achieves an overall cumulative socio-economic return rate of 6% over the predicted period of 84 months. Based on this, the systemic service viability is only moderately positive and needs detailed interpretation and exploration, if current assumptions hold. Among the stakeholders involved, health and social care providers as well as staff exhibit negative cumulative SER ranging between -75% to -100% respectively (Table 66). Professional staff working in the health provider organisations (primary care centers and secondary care hospitals) may thus be strong opponents or veto players to the up-scaling of the C3-Cloud systems. In contrast, the Ministry of Health enters with a highly positive cumulative SER of 1103%, making it to potential main proponent of the C3-Cloud up-scaling. Among the individual stakeholders, positive SER values are achieved by the multimorbid patients and informal carers, reaching values of 9% and 964% respectively. The largest contribution in negative values to the overall performance derives from the call center and the hospital. Both perform with negative constant values of -100% over the observed 84-month period. This is caused mainly as no benefits could be specified for these organisations for this cost-benefit modelling. On the positive side, the Ministry of Health which is defined as the “payer” of health services in RJH, records the largest positive impact mainly deriving from the fact that avoided primary care consultations with nurses and physicians as well as avoided A&E admissions at the hospital are considered as benefits (i.e. avoided cost claims).

Interestingly, the overall (systemic) cumulative SER rises (Figure 179 and Figure 174) once the majority of patients are included. The minimal turning point is observable in May 2023, where 2,757 patients are actively included in total. This is due to the assumption, that training on the platforms follows the s-curve shaped inclusion of patients (Figure 212). Once C3-Cloud users are trained properly on the platforms, an upward trend is expected. The effect only translates into a positive overall cumulative net benefit in November 2024 (Figure 211). The systemic MonteCarlo simulation suggests a positive (i.e. >0%) overall SER also in November 2020 in the scenario under moderate assumptions (50% percentile). In the best case scenario (95% percentile) the systemic cumulative SER would be positive from the outset, starting at 35%, following a decrease with the addition of all users over time, having its lowest point at 22% in November 2023 and levels off at around 32%. In the worst case scenario (5% percentile) the outcome would be and stay negative from the outset, levelling off at -20% at the end of the observation period.

In conclusion, continuing the service as planned in the deployment plans can be recommended if current assumptions hold. It is crucial to involve all stakeholders in the scaling up and to communicate additional benefits to the component users. While patients and specifically their informal caregivers have a moderate positive SER (9-964%), healthcare professionals and the organisations employing them currently have no business case in keeping usage up but instead

could be strong veto players (-75% to -100% SER). Only the payer (‘Ministry of Health’) has a strong business case with a positive overall SER of 1103% after 84 months.

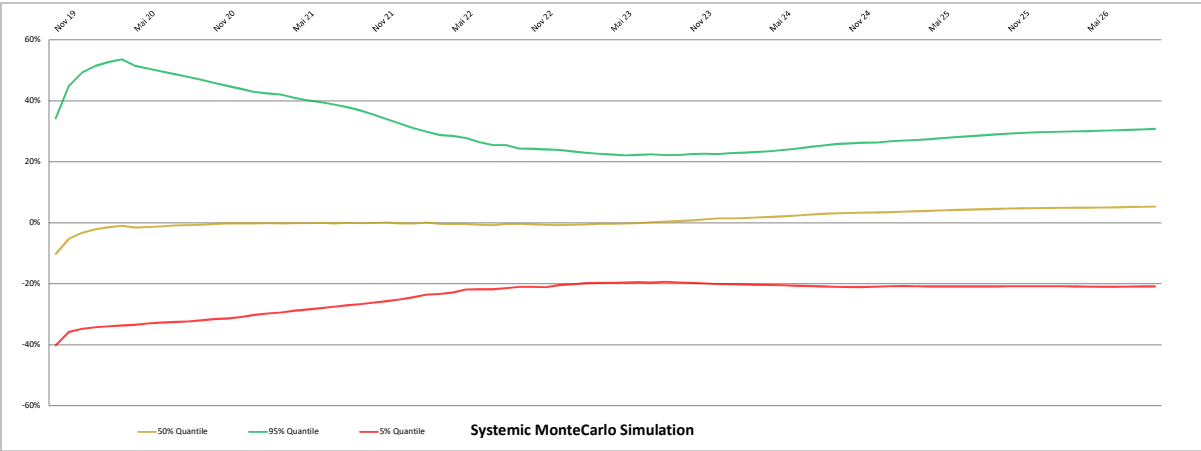


Figure 210. Monte Carlo overall cumulative socio-economic return for RJH

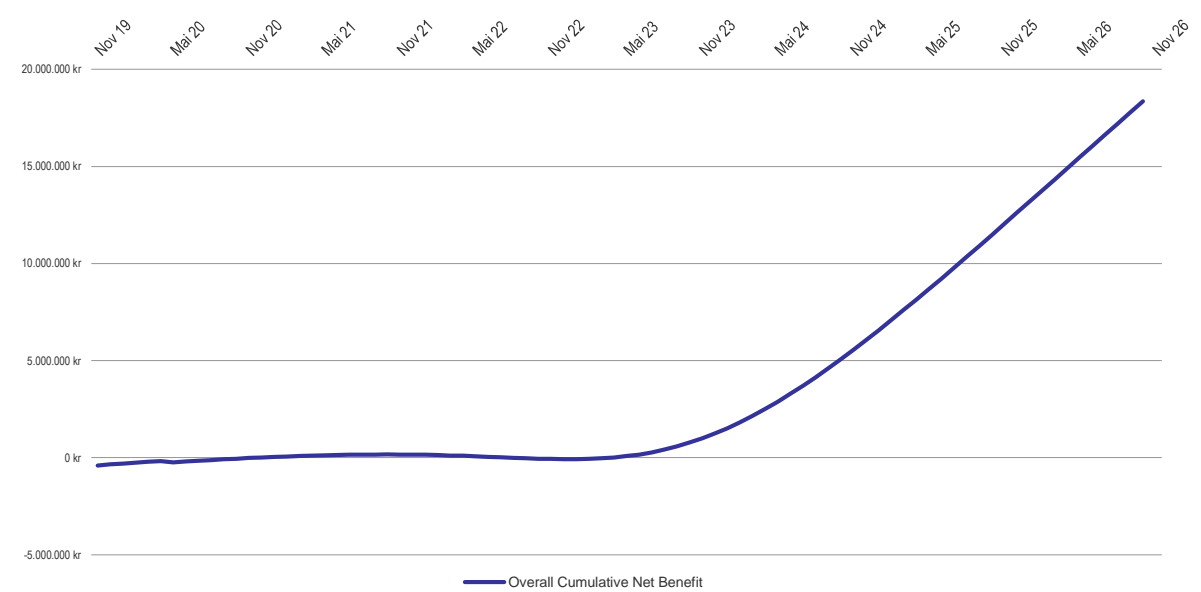


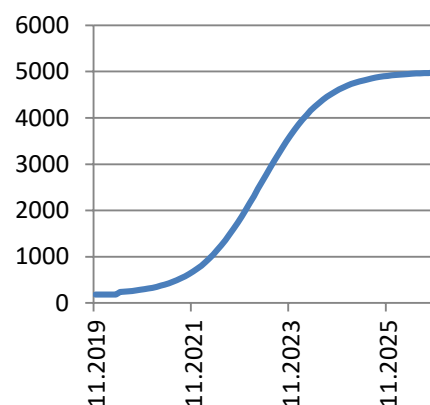
Figure 211. Overall cumulative net benefit for all stakeholders over time in RJH

Table 66. Socio Economic Return for RJH C3-Cloud by Stakeholders.

Groups	Subgroups		Cumulative socio-economic return (SER)	Cummulative net-benefit	Time to positive SER / ROI
Overall socio economic return		➡	6%		
Individuals					
	Multimorbid patients	➡	9%		6 years 3 months
	Informal carers	➡	964%		0 years 1 months
Health and social care providers & staff					
	Call Centre	➡	-100%	-10.291.701	—
	Call centre nurses	➡	-75%		—
	Primary care organisations	➡	-79%	-191.799.207	—
	Primary care physicians (GPs)	➡	-75%		—
	Primary care nurses	➡	-75%		—
	Hospital	➡	-100%	-22.927.034	—
	Hospital physicians	➡	-75%		—
	Specialist / hospital nurses	➡	-75%		—
Payers					
	Ministry of Health	➡	1103%	233.708.877	0 years 1 months
Non ICT Organisations					
ICT industry					
	IT suppliers	➡	0%	-0	— *

* Return on investment
† Multiple break-even

Figure 176 shows the assumptions made in relation to the inclusion of (multimorbid) patients. The project period started in November 2019 over a period of 84 months, thus until October 2026. The project started with 177 patients and a gradual, S-Shaped inclusion of new patients after 6 months when the upscaling could start. The automatic inclusion of patients in Region Jämtland Härjedalen aims at 4.823 patients in total. While the fact that there are 5 months without any new patients (December, 2019 – April, 2020) has to be born in mind for the cost-benefit-analysis, subsequently, the inclusion surges with an additional 55 patients in May 2020 under the assumption that upscaling will kickstart with a larger number of patients following an s-curve inclusion thereafter. Over the following 77 months, the number of additional patients per month averages 62 patients.

**Figure 212. cumulative S-shaped curve of patients added over time.**

7.4.3.2. Sustainability at individual and organisational level

7.4.3.3. Multimorbid patients

Patients with multiple diseases were chosen based on different inclusion criteria. Patients to be included in the project were chosen on having two of the four conditions: Heart failure with NYHA Type I or II; renal failure with EGFR 30-59; Diabetes Type II; mild or moderate depression.

Interactions with other stakeholders and services include:

- Reading online educational material.
- Messaging or communicating with the MDT
- Compliance with the care plan (goals and activities)
- Entering information (e.g. blood pressure and body weight) into the patient empowerment platform

The service's main cost lies in the inconveniences of adapting to the new service processes. Time spent with the tool training on new devices and service elements such as home monitoring, contact with the MDT, as well as consultations with the nurses and filling in questionnaires generate resource and financial costs.

The large share of 57% of total cost lies in the inconvenience of adaption to the new tool. The training time foreseen for each patient averages 4 hours. It includes all time spent by end users (patients) in relation to training received as part of the new service. Other than for provider organisations, time here reflects inconvenience caused by using the service, rather than a tangible cost item. The second biggest contribution to cost derives from the extra time spent as an effect of the new tool. RJH was the pilot site where the medical device usage with C3-Cloud was tested. On average it is estimated that 10% of patients need to take measurements (e.g. blood pressure, heart rate, blood glucose levels, weight). One measurement takes up eight minutes and a total of 32 measurements was performed for each patient of that 10% subgroup.

The convenience of travel costs and travel time saved for avoided consultations with the patients MDT contributes largely to the benefits aggregating the positive socio-economic return for patients. This impact is followed by the positive service valuation of C3-Cloud, which covers all subjective and intangible benefits of the innovative tool, primarily in relation to user satisfaction. The idea is that the happier the patient, the more likely positive spill-over effects. The data to assess satisfaction was retrieved from the eCCIS eCare Client Impact Survey and the eCCIS scoring tool (Table 67).

The patients Monte Carlo simulated cumulative SER results in ~10% at the end of the modelling period (under moderate assumptions). Under positive assumptions, a neutral SER is reached in May 2021, increasing up to 95% in month 84, when the scaling up of patients ceased (Figure 213). The dent in November 2023 (Figure 214) can be explained as the largest number of patients added per month has then been reached (following the s-curve inclusion) and less patients will need to spend time on training from then, yet more patients will benefit from avoided travels.

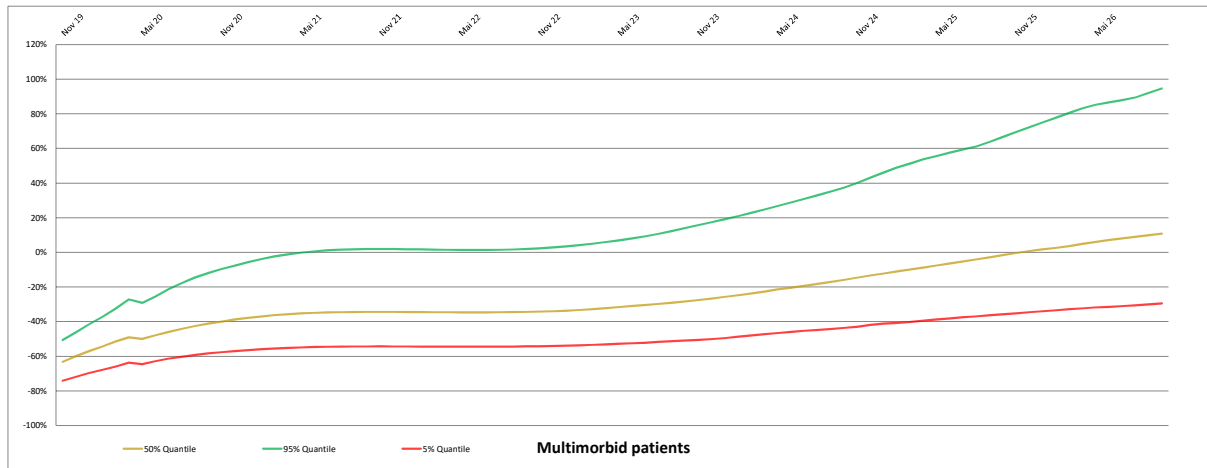


Figure 213, Monte Carlo simulation of cumulative SER for RJH multimorbid patients

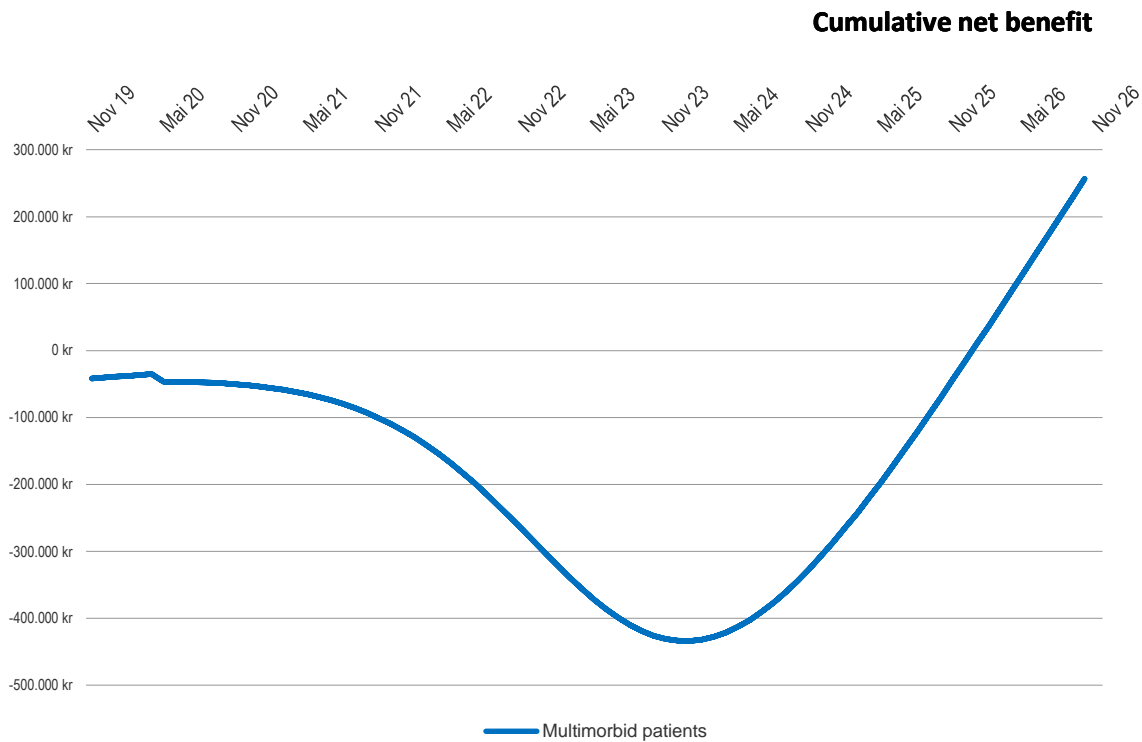


Figure 214, Cumulative net benefit for RJH multimorbid patients

Table 67, RJH: Key service impacts for multimorbid patients

Negative impacts	Rational	Share of total costs
Inconvenience: training time	Includes all time spent by end users in relation to training received as part of the new service. Time here reflects inconvenience caused by using the service, rather than a tangible cost item. The assumption is four hours of training per new patient using the system.	57%

Inconvenience: extra time for service use spent by Multimorbid patients	<p>Includes all time spent by end-users in relation to training received as part of the new service. Other than for provider organisations, time here reflects inconvenience caused by using the service, rather than a tangible cost item (self-measurement etc.).</p> <p>In the FHIR data, we observed that out of the 29 patients who performed self-measurements (10.2%), the mean number of measurements was 16 over 6 months (for blood pressure, weight, blood glucose and heart rate). We assumed 32 measurements for these patients per year. We excluded one outlier with 458+ measurements! Also, some measurements are taken at the same time (e.g. blood pressure and blood glucose may be taken and sent to PEP at the same time). The FHIR data showed that out of the 29 patients with self-measurements, 13 measured multiple measurements (e.g. they uploaded values for blood pressure and glucose levels). Where this was the case, we counted only the higher number of measurements. E.g. when blood pressure was measured 20 times and weight only 4 times, we counted only the blood pressure. Each measurement, including transmission to the PEP platform, is assumed to take 8 minutes.</p> <p>In addition, HCP interviews led to the assumption that per patient and year, 1.5 remote care sessions will be held for a duration of 15 minutes, due to the new service.</p>	43%
Positive impacts	Rational	Share of total benefits
Travel cost saved for service use spent by Multimorbid patients	Patients save 1.1 consultations at the care centre per year based on the DES modelling. The assumption is 5 km travel distance with a mileage refund of 18.5 kr.	53%
Valuation of intangible benefits by Multimorbid patients according to eCCIS	<p>Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. Supported by the questions included in the eCCIS (eCare Client Impact Survey) and eCCIS scoring tool.</p> <p>The data was retrieved from as the median answer on the eCCIS questionnaire, pooled across all three pilot sites.</p>	30%
Convenience: travel time saved for service use spent by Multimorbid patients	Patients save 1.1 consultations at the care centre per year based on the DES modelling. We assumed 20 minutes travel time back and forth.	17%

In conclusion, the adaptation time to new services, the positive valuation of the service, and travel time saved are the most critical factors in terms of costs and benefits that have a high impact on the outcome. C3-Cloud implementation costs for multimorbid patients are larger than its operational costs and its operational benefits are even much larger than the latter (Table 68). This creates a cumulative net benefit of 256.400kr at the end of the projection period in 2026 (Figure 214).

Table 68, Sum of costs and benefits for RJH multimorbid patients

Sum of all costs	Sum of all cost types reduced by 2.774.045kr contingency in present values	
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	1.149.616
Non-financial costs	Inconvenience	1.624.429
Implementation cost	Costs related to service implementation	1.624.429
Operation cost	Costs related to continuous operation of the service	1.149.616
Sum of all benefits	Sum of all benefit types reduced by kr3.030.438kr contingency in present values	
Financial benefits	Reducing cash outlays	1.580.859
Liberated resources	Time saved from existing activities	520.274
Non-financial benefits	Convenience	929.305
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	3.030.438

7.4.3.4. Informal carers

Informal carers are carers of multimorbid patients: Relatives who live with the patient, or who are responsible for them in some way and/or volunteers that regularly (e.g. several times a week) support the professional care personal to provide additional health service to the patient.

The service has the positive intangible impact of reassuring the informal carer about care provision and informing them better about the patient's care. Time and costs saved due to reduced travelling have a positive resource and financial impact.

About 15% of patients do have informal carers that accompany and assist them in their daily activities. In many cases, these are their children. For this reason, almost 100% of informal carers are working, which puts additional pressure on them to support their family in their scarce free time. Informal carers in the RJH also learn how to use the patient empowerment platform (PEP), which is truly an investment. The estimated time spent by informal carers receiving training is expected to take two hours per new patient.

This is outweighed strongly by their positive perception and valuation of the service (Table 69). The Monte Carlo simulation of cumulative SER for informal carers predicts a positive SER of 98% at best, and 28% in the worst case scenario (Figure 215). Accordingly, it is positive even under pessimistic assumptions.

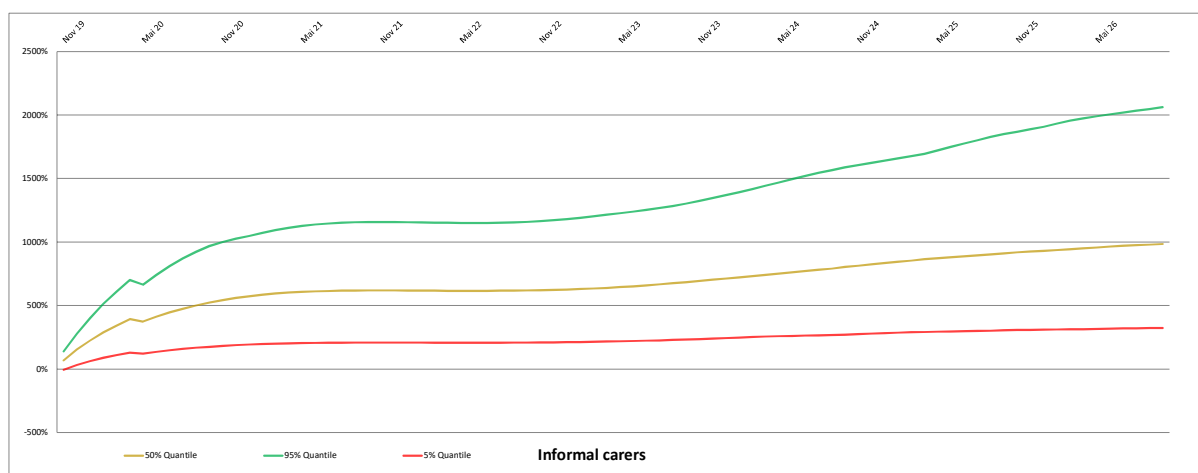


Figure 215, Monte Carlo simulation of cumulative SER for RJH informal carers

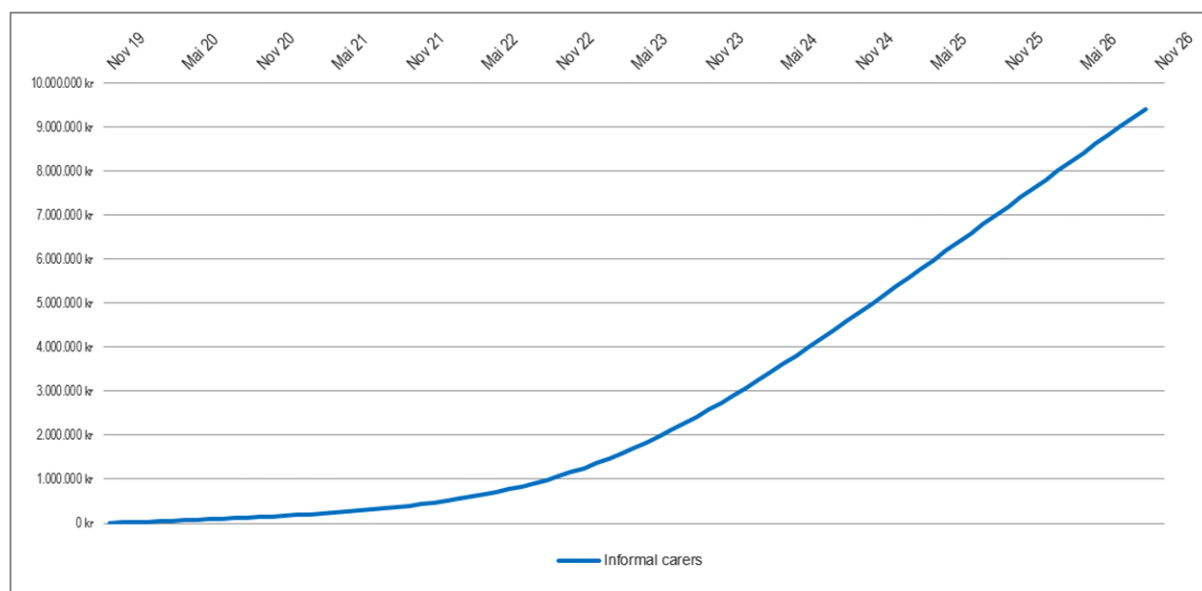


Figure 216, Cumulative net benefit for RJH informal carers

Table 69, RJH: Key service impacts for informal carers

Negative impacts	Rational	Share of total costs
Inconvenience: extra time for service use spent by Informal carers	Includes all time spent by end-users in relation to training received as part of the new service. Other than for provider organisations, time here reflects inconvenience caused by using the service, rather than a tangible cost item (self-measurement etc.). The assumption is that informal caregivers support their 'patient' on average 6 times a year for 20 minutes with the PEP and with self-measurements.	79%

Inconvenience: training time	Includes all time spent by end users in relation to training received as part of the new service. Time here reflects inconvenience caused by using the service, rather than a tangible cost item. Time dedicated to learning how to use the system is estimated to be 1-2 hours.	21%
Positive impacts	Rational	Share of total costs
Convenience: time saved for service use by Informal carers	The assumption is that informal caregivers liberate time through improved MDT collaboration (less calls and visits) and less need to plan care and help patients with their care. In addition, informal caregivers need not accompany their 'patient' for 1.1 avoided consultations per year, saving them approximately 90 minutes of their time.	94%
Valuation of intangible benefits by Informal carers according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. Supported by the questions included in the eCCIS (eCare Client Impact Survey) and eCCIS scoring tool. The data was retrieved from as the median answer on the eCCIS questionnaire, pooled across all three pilot sites. It is interpreted that their satisfaction would improve when they have seen their relatives are satisfied with the care received in C3—Cloud.	6%

In conclusion, the adaptation time to new services, the positive valuation of the service and time and travelling saved are the most critical factors in terms of costs and benefits that have a high impact on the outcome. The sum of all benefits exceeds the costs ten-fold (Table 70).

Table 70, Sum of costs and benefits for RJH informal carers

Sum of all costs	Sum of all cost types reduced by contingency in present values	977.426 kr
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	759.929
Non-financial costs	Inconvenience	217.497
Implementation cost	Costs related to service implementation	217.497
Operation cost	Costs related to continuous operation of the service	759.929
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	10.396.076 kr
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	9.746.087
Non-financial benefits	Convenience	649.988
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	10.396.076

7.4.3.5. Call centre

The call center's role is to provide out-of-hours services for multimorbid patients, at night and weekends. Call center nurses work to provide remote support to patients. Organisational changes have a negative resource impact. Time and costs for increased follow up calls have a negative resource and financial impact. The results for the call center assume, that during the first month of implementation, call center nurses will require 4,20 minutes a day to adapt with the new system. 21% of the call center's cost is contributed through the extra staff time for service provision by the call center to multimorbid patients. Calls will be used for home monitoring patients and their potential health exacerbation. Given that this extra service does not trigger any positive impacts in monetary terms, the overall socio-economic impact is -100% (Figure 217). The call centre has only some costs due the additional tasks but does not produce any monetary benefits. Consequently, the cumulative SER curve is a flat line (Figure 218).

Since the costs are only generated in the implementation phase (Table 72), the negative curve of the cumulative net benefit levels off over the projected time, and remains at -10.000.000€ once all staff have received training (Figure 218) and all remote monitoring devices have been purchased.

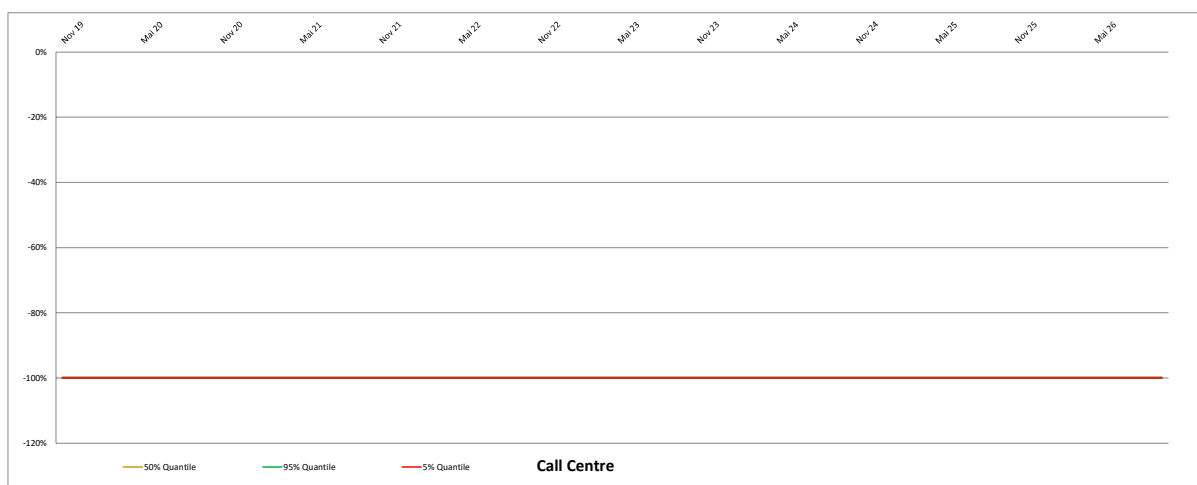


Figure 217, Monte Carlo simulation of cumulative SER for RJH call centre

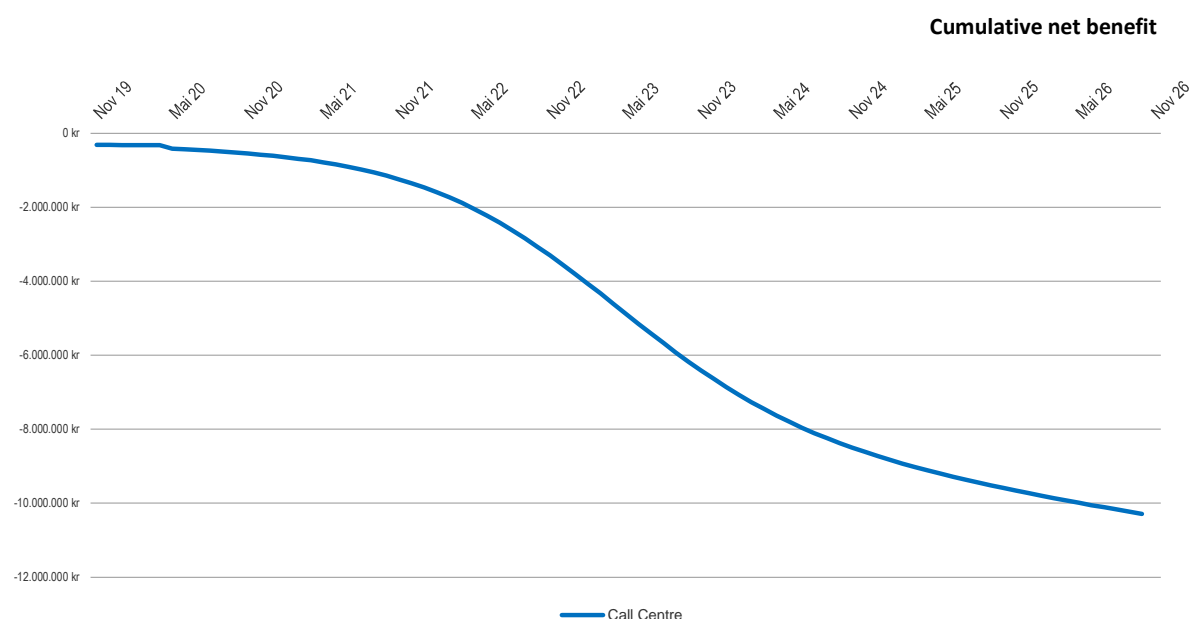


Figure 218, Cumulative net benefit for RJH call centre**Table 71, RJH: Key service impacts for call centre**

Negative impacts	Rational	Share of total costs
Devices for Multimorbid patients	<p>The costs for medical devices are multiplied by patient number and by the share of patients with the respective disease.</p> <p>The share of patients from C3-Cloud having chronic conditions was significantly different from the general population in RJH. Thus, we relate here to the share of patients generally within RJH, with the underlying chronic condition.</p> <p>Heart failure: 21.9%. The assumption is that each heart failure patient could benefit from the blood pressure monitor (514kr).</p> <p>Diabetes: The assumption is that each diabetes patient could benefit from a connected weight scale to monitor their weight (638kr).</p> <p>The assumption further is that each multimorbid patient needs one Motorola G7 as a base to facilitate the connection between the medical device(s) and the C3-Cloud FHIR repository platform (1.250kr).</p>	73%
Extra staff time for service provision by Call Centre to Multimorbid patients - actual time	Includes all time spent by call centre nurses on services related to multimorbid patients. It is estimated that 1-2 phone calls per year with a duration each of 15 min (conservative approach). These calls will be used for home monitoring patients and their potential health exacerbation. Consequently, less practice visits are probably needed.	21%
Overhead on costs	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on costs is calculated as a percentage mark-up on staff costs.	5%

Table 72, Sum of costs and benefits for RJH call centre

Sum of all costs		
	Sum of all cost types reduced by kr10.291.701 contingency in present values	
Financial costs	The need for extra cash	8.175.714
Redeployed resources	Time taken away from other activities	2.115.987
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	7.679.174
Operation cost	Costs related to continuous operation of the service	2.612.527

Sum of all benefits	Sum of all benefit types reduced by 0 contingency in present values	
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	0

7.4.3.6. Call centre nurses

Call centre nurses are available for C3-Cloud services. The call center's role is to provide remote out-of-hours support for multimorbid patients, at night and weekends. The costs for their ongoing work with C3-Cloud patients is a resource and financial cost to the organisation they work in. Thus, call center nurse are affected only by temporary inconveniences which carries only a very small share of to the overall systemic costs of C3-Cloud implementation and usage (Table 74).

The Monte Carlo simulation reflects what we see in the tables and figures. There is a small cost (inconvenience) which cannot be outweighed by the overall satisfaction of call center nurses with the C3-Cloud system (Table 73). Thus, the SER varies between -68% and -81% (Figure 219).

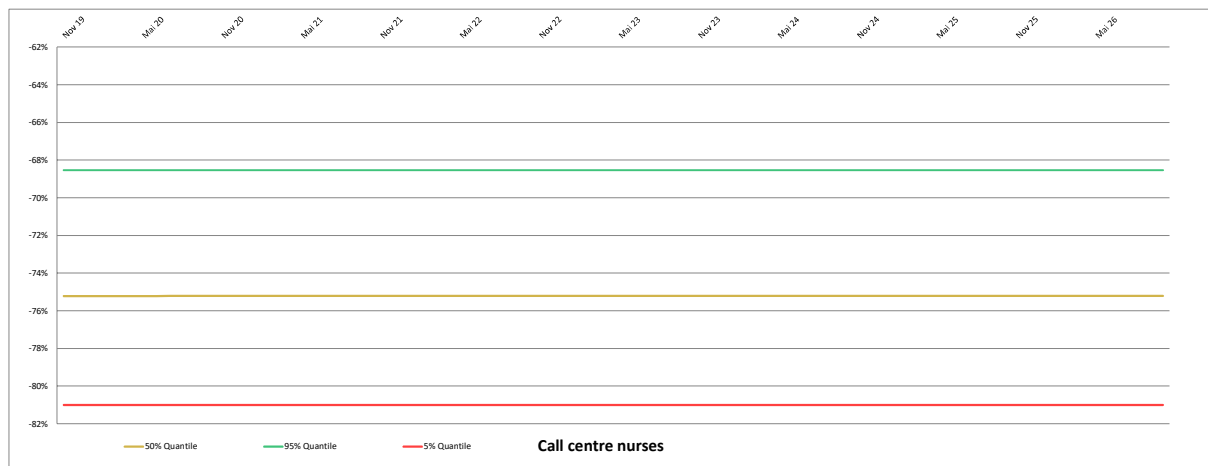


Figure 219, Monte Carlo simulation of cumulative SER for RJH call centre nurses

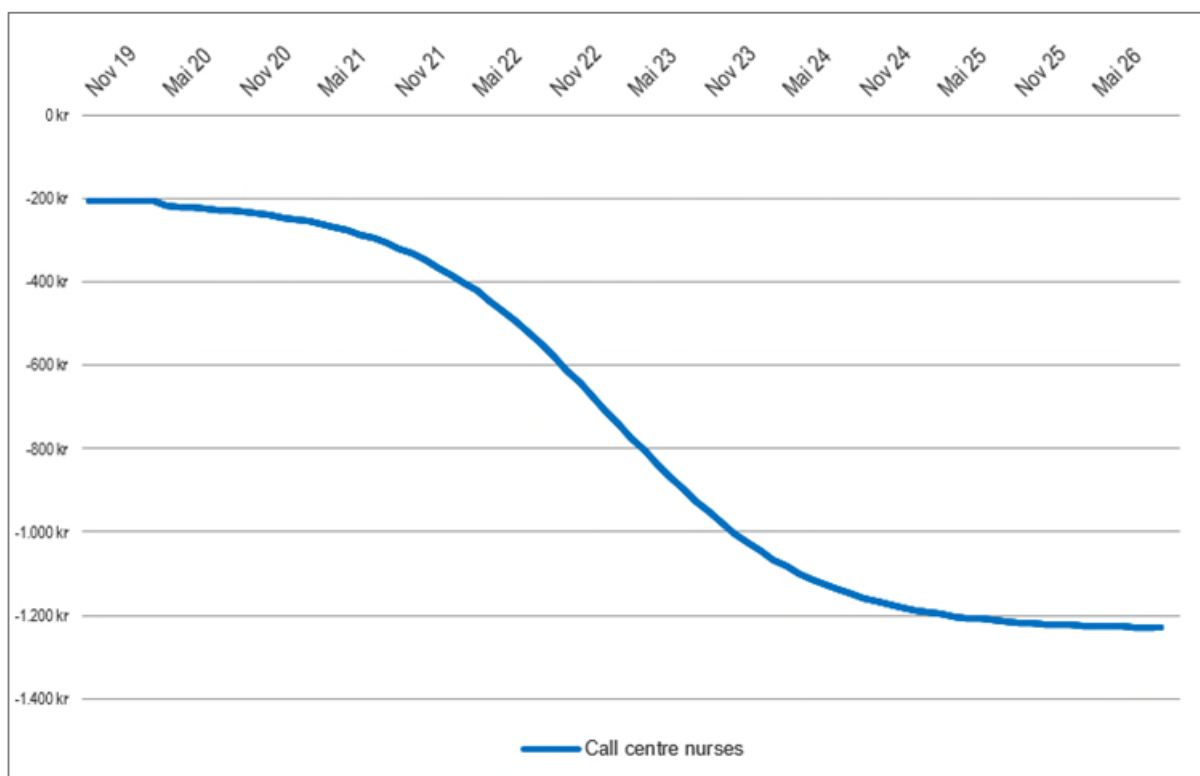


Figure 220, Cumulative net benefit for RJH call centre nurses

Table 73, RJH: Key service impacts for call centre nurses

Negative impacts	Rational	Share of total costs
Temporary inconvenience	<p>Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator.</p> <p>The assumption is that call center nurses need two hours in the first month to adapt to C3-Cloud services.</p>	100%
Positive impacts	Rational	Share of total costs
Valuation of intangible benefits by Call centre nurses according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Table 74, Sum of costs and benefits for RJH call centre nurses

Sum of all costs	Sum of all cost types reduced by kr1.639 contingency in present values	
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	1.639
Implementation cost	Costs related to service implementation	1.639
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by kr410 contingency in present values	
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	410
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	410

7.4.3.7. Primary care organisations

Primary care organisations (i.e. community practices) employ GPs and practice nurses. Their main cost burden is forgone income from avoided consultations with the primary care practice (96% of costs). It can be argued that this is not indeed a cost to the primary care organisation as payment may not be based on per fee-for-service but rather on capitation payments. However, with the ASSIST modelling a systems perspective is taken, where the ultimate saving cost with avoided consultation lies with the payer. The care center may instead use the time liberated for improved care quality, yet this is not under consideration with this modelling.

Extra time spent by primary care nurses on consultations with multimorbid patients, supporting them with self-measurements on the patient empowerment platform (PEP) enters as a cost factor, representing 3% of the total primary care organisation's cost. Several additional marginal cost indicators were defined (each less than 1% of costs): MDT time spent on care plan creation and monitoring; time spent on training; adaptation time to the new system and overhead costs.

On the benefit side, 42% of positive impacts is attributable to additional income from more telephone consultations that may be cashed with the payer. In addition, physicians liberate time due to 2.2 fewer consultations of 20 minutes per year and two minutes saved per quarterly care plan update.

Another major benefit is fewer phone calls needed between physicians and nurses and the wider MDT or the hospital and patients. This saves approximately four hours for the GPs (11% of costs) and eight hours for nurses (4% of costs) every month (Table 75).

Applying the Monte Carlo model (Figure 221) to the data for primary care organisations shows that it starts off with -40% SER during the trial phase, as there are many implementation costs but relatively fewer implementation benefits defined. The development is positive in the following months because no additional professional is recruited during the technology trial, but the implementation costs decrease each month. From May 2020 onwards, additional professionals are recruited, adding new implementation costs. In parallel, primary care organisations have operational costs mainly from forgone income from reduced MDT consultations. It is debateable if this is indeed a cost to primary care organisations, as they are being paid by the Ministry of Health for such consultations. Yet the way this modelling has been set up, it is considered as a cost for the primary care organisations which translates in a benefit for the payers. Consequently,

primary care organisations may have liberated time to improve care quality during remaining patient consultations. In addition, time is liberated due to reduced consultations and a new potential stream of income is generated by added telephone consultations which may be cashed with the Ministry of Health. The overall SER decreases from Mai 2020 (when the scaling up start) until approximately May 2023 due to the unit costs models from the Discrete Event Simulation. There it was modelled that the benefits (additional telephone consultations) increase by 150% in these months, while the costs (decreased consultations with GP and nurses) increase by only 105% and 96% in the same period. This levels off from May 2023 onwards, thus we see the flattening SER curve from then onwards. In the best-case model, the SER for primary care organisations will be at -72% after the observation period of 84 months; in the worst-case scenario it could be at -80%.

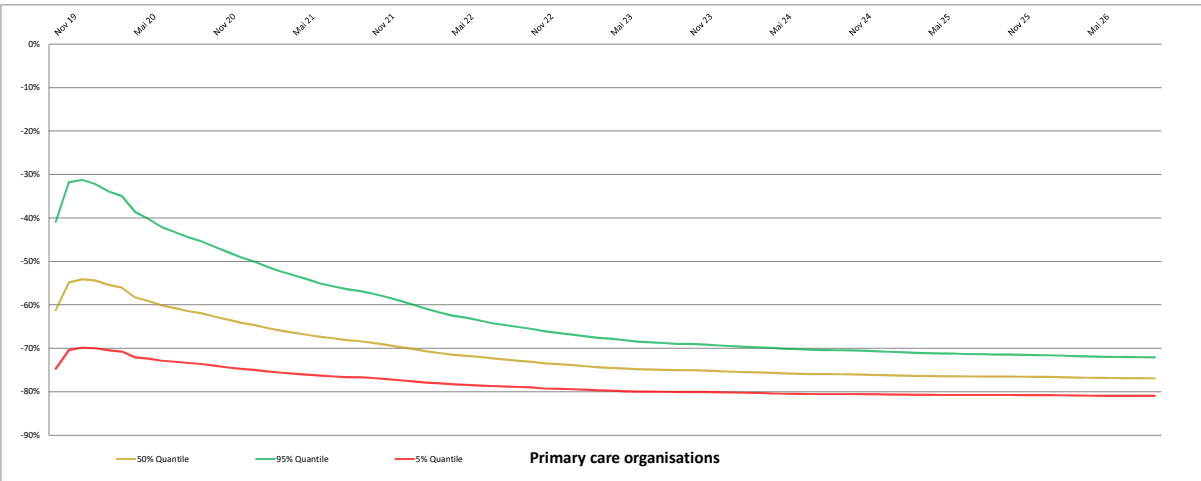


Figure 221, Monte Carlo simulation of cumulative SER for RJH primary care organisations

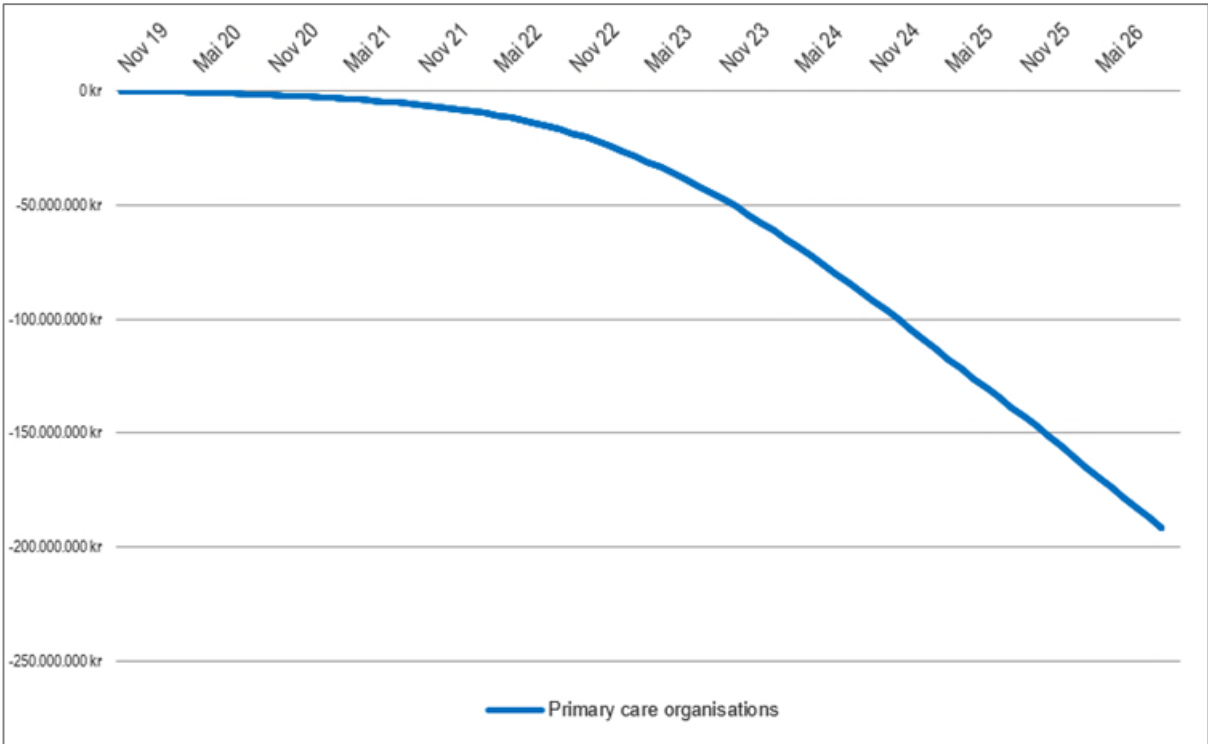


Figure 222, Cumulative net benefit for RJH primary care organisations

Table 75, RJH: Key service impacts for primary care organisations

Negative impacts	Rational	Share of total benefits
Forgone income from reduced consultations with the MDT at the primary care organisation	Based on reduced primary care physician consultations and its respective costs. The costs were modelled using discrete event simulation models, performed by the Osakidetza partners of C3-Cloud.	96%
Extra staff time for service provision (initial care plan creation) by Primary care physicians (GPs) to Multimorbid patients - actual time	The assumption is that the MDT spends on average 34 minutes on care plan creation (derived from FHIR extracts). That is shared between physicians and nurses, both doing different activities on the system! We assume that they share tasks 50/50. In addition, a consultation with a regular (non-C3-Cloud patient) would be scheduled for 10 minutes. Thus, the extra time on care plan creation will be considered as 17minutes (C3-Cloud) - 10 minutes (non-C3-Cloud) = 7 minutes.	<1%
Extra staff time for service provision (initial care planning) by Primary care nurses to Multimorbid patients - actual time	The assumption is that the MDT spends on average 34 minutes on care plan creation (derived from FHIR extracts). That is shared between physicians and nurses, both doing different activities on the system! We assume that they share tasks 50/50. In addition, a consultation with a regular (non-C3-Cloud patient) would be scheduled for 10 minutes. Thus, the extra time on care plan creation will be considered as 17minutes (C3-Cloud) - 10 minutes (non-C3-Cloud) = 7 minutes.	<1%
Extra staff time for service provision (intervention) by Primary care nurses to Multimorbid patients - actual time	The assumption is that nurses will take 5 additional minutes for measurement per visits per patient for 3.4 visits a year (based on actual data)	3%
Staff time spent on training	In addition to the personal, non-economic cost of adaptation, professionals usually also need more time to perform their tasks during the transition period. This impact includes time spent by GP and primary care nurses, which is predicted to amount 4 hours per new staff member.	<1%

Adaptation time	Primary care physicians and nurses will both spend approximately 2 additional hours over the first month on adapting to the new ways of working.	<1%
Overhead on costs	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on costs is calculated as a percentage mark-up on staff costs, here 25%.	1%
Positive impacts	Rational	Share of total benefits
More income from additional consultations with the Primary care organisations	Includes added income based on additional telephone consultations between the patients and the primary care organisations. This input is based on discrete event simulation performed by our project partner Osakidetza.	42%
Resource liberation (intervention) for Primary care physicians (GPs) working with Multimorbid patients - actual time	The observation is that the number of visits will be reduced by 2.2 per year per patient. One conventional visit takes the GP approximately 20 minutes (eCUI indication was 15-30 minutes). In addition, it is expected that patients will see the primary care physician every three months to review their care plan. For these consultations, C3-Cloud may save the physician time for each consultation (2 minutes per care plan review is assumed). While C3-Cloud data (DES modelling and pilot site extract) showed that C3-Cloud patients saw their primary care centre only 2.2 times a year, it is anticipated that this frequency may increase when Covid-19 restrictions have been alleviated.	19%
Resource liberation for Primary care physicians (GPs) collaborating with patients and the MDT via the C3-Cloud platforms - actual time	The assumption is 4-5 hours/month if C3-Cloud were widely implemented.	11%
Resource liberation for Primary care nurses collaborating with patients and the MDT via the C3-Cloud platforms - actual time	In a widely implemented situation 8-10 hours/month is estimated, with less time spent in phone calls to contact other caregivers and with less time spent just waiting on the phone, communicate with the MDT and collecting needed information.	4%

Overhead on benefits	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on benefits is calculated as a percentage mark-up on staff benefits, using the same overhead rate as for costs. 25% here.	10%
Resource liberation from avoided home visits - travel cost	1.4 home visits are saved for physicians and nurses per year. The assumption is 5 km per trip and an 18.5 kr mileage refund.	8%
Resource liberation (intervention) for Primary care nurses working with Multimorbid patients - actual time	DES modelling showed that C3-Cloud saves one home visit per patient and year and with that nurses liberate 40 minutes of their time.	6%

Table 76, Sum of costs and benefits for SWFT primary care organisations

Sum of all costs	Sum of all cost types reduced by kr242.716.258 contingency in present values	
Financial costs	The need for extra cash	235.592.840
Redeployed resources	Time taken away from other activities	7.123.418
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	288.096
Operation cost	Costs related to continuous operation of the service	242.428.161
Sum of all benefits	Sum of all benefit types reduced by kr50.917.051 contingency in present values	
Financial benefits	Reducing cash outlays	30.349.715
Liberated resources	Time saved from existing activities	20.567.336
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	50.917.051

7.4.3.8. Primary care physicians

GPs are employed at the primary care centers, providing primary care and care planning for multimorbid patients.

Improvement in decision making due to being better informed, and improvement in quality of care provided, can have a positive intangible impact. Professional's motivation and satisfaction have a positive intangible impact (Table 77). Both result in a very moderate positive valuation of the C3DP services. However, GPs need to invest time in adapting to the new way of working. The implementation costs outweigh the perceived benefits (Table 78), resulting in a negative cumulative SER of -75% for the GPs in primary care practice (Figure 223).

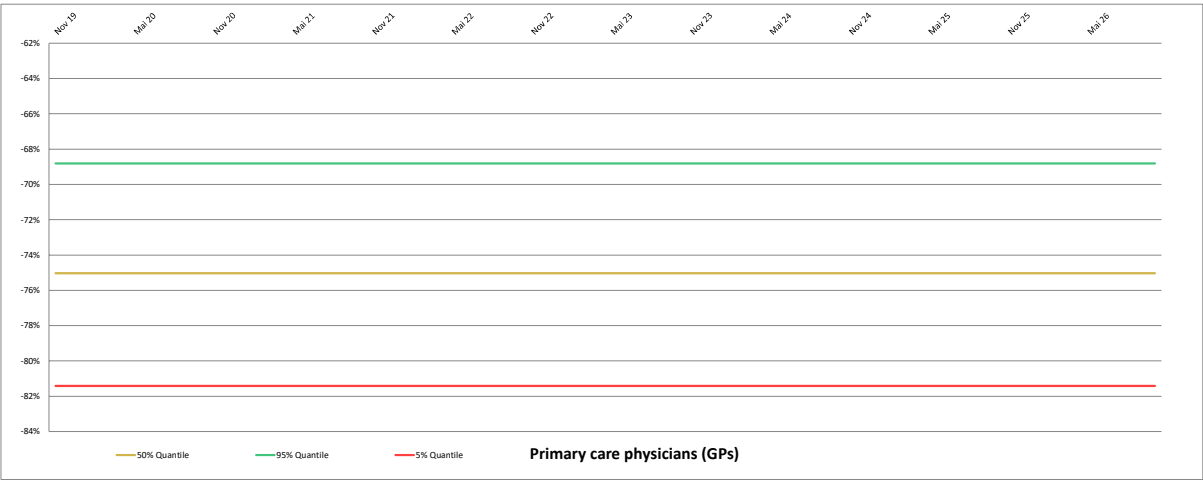


Figure 223, Monte Carlo simulation of cumulative SER for RJH primary care physicians

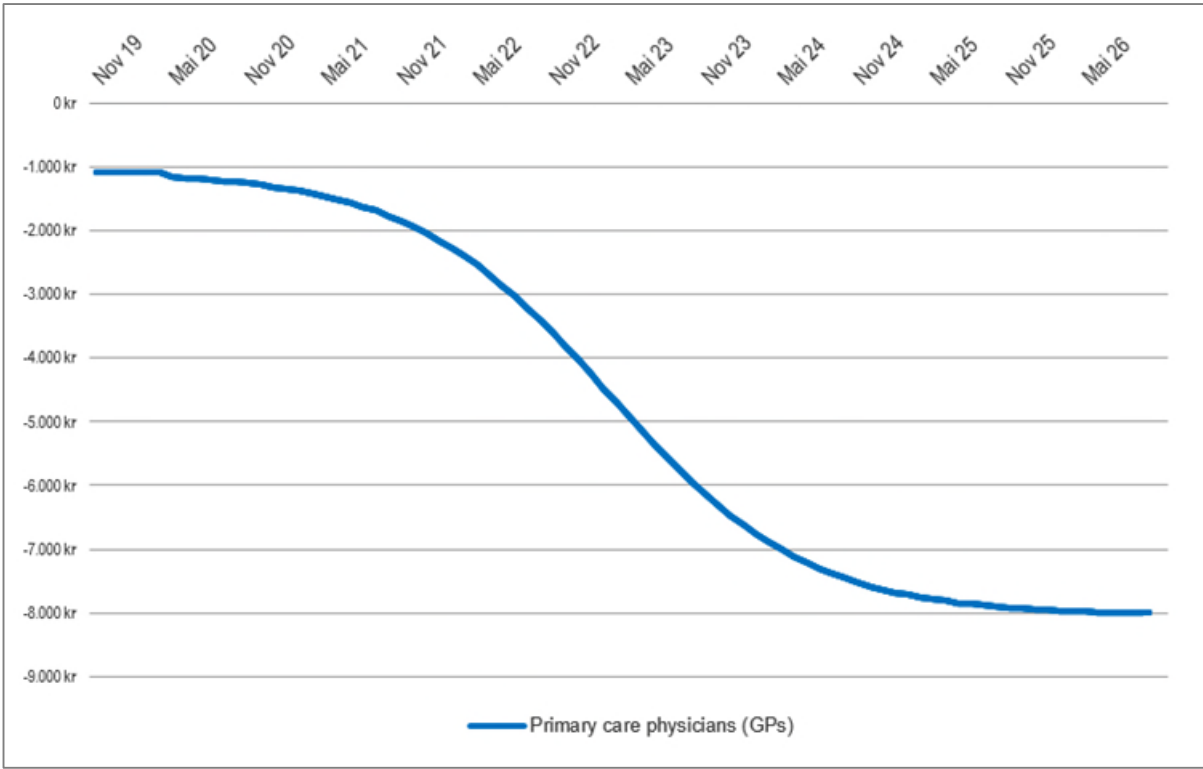


Figure 224, Cumulative net benefit for RJH primary care physicians

Table 77, RJH: Key service impacts for primary care physicians

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is that GPs spend 30 extra minutes during the first month due to adaptation to C3-Cloud.	100%
Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits by Primary care physicians (GPs) according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Table 78, Sum of costs and benefits for SWFT Primary care physicians

Sum of all costs	Sum of all cost types reduced by contingency in present values	kr10.674
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	10.674
Implementation cost	Costs related to service implementation	10.674
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	kr2.669
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	2.669
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	2.669

7.4.3.9. Primary care nurses

Primary care nurses are employed by and work in the primary care centers. They provide primary care and care planning for multimorbid patients and may support with self-measurements of vital signs such as blood pressure, heart rate or blood glucose levels.

Improvement in care planning due to being better informed, and improvement in quality of care provided through liberated time, can have a positive intangible impact. Professional’s motivation and satisfaction have very moderate positive intangible impact (Table 79). However, primary care nurses need to invest time in adapting to the new way of working (2 hours in the first month is assumed). The implementation costs outweigh the perceived benefits (Table 80), resulting in a negative cumulative SER of -74% for nurses in primary care centers (Figure 225). This is reflected by the Monte Carlo simulation. There is a small cost (inconvenience) which cannot be outweighed by the overall satisfaction of primary care nurses with the C3-Cloud system. Thus, the Monte Carlo modelled SER varies between -68% and -81%.

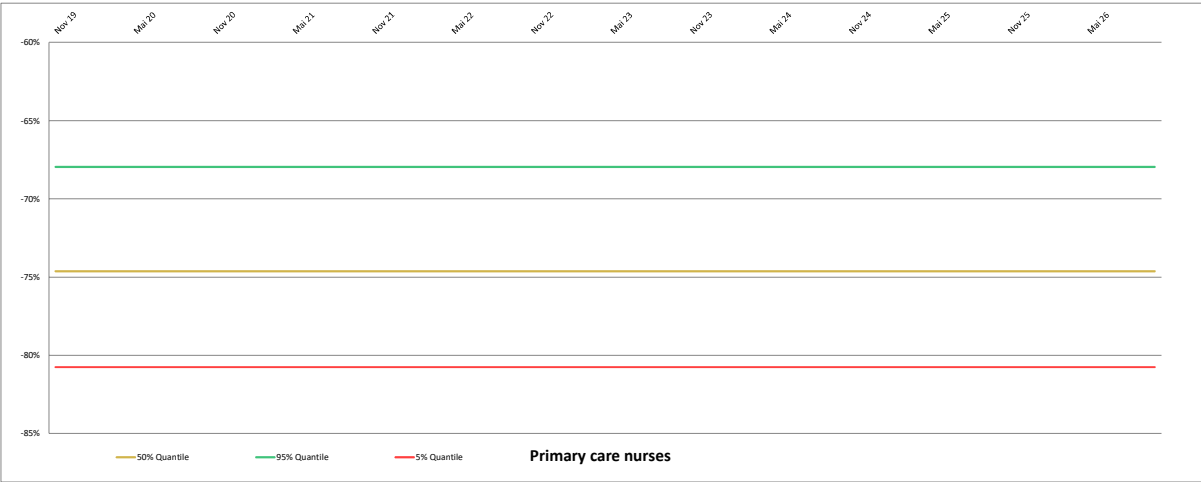


Figure 225, Monte Carlo simulation of cumulative SER for RJH primary care nurses

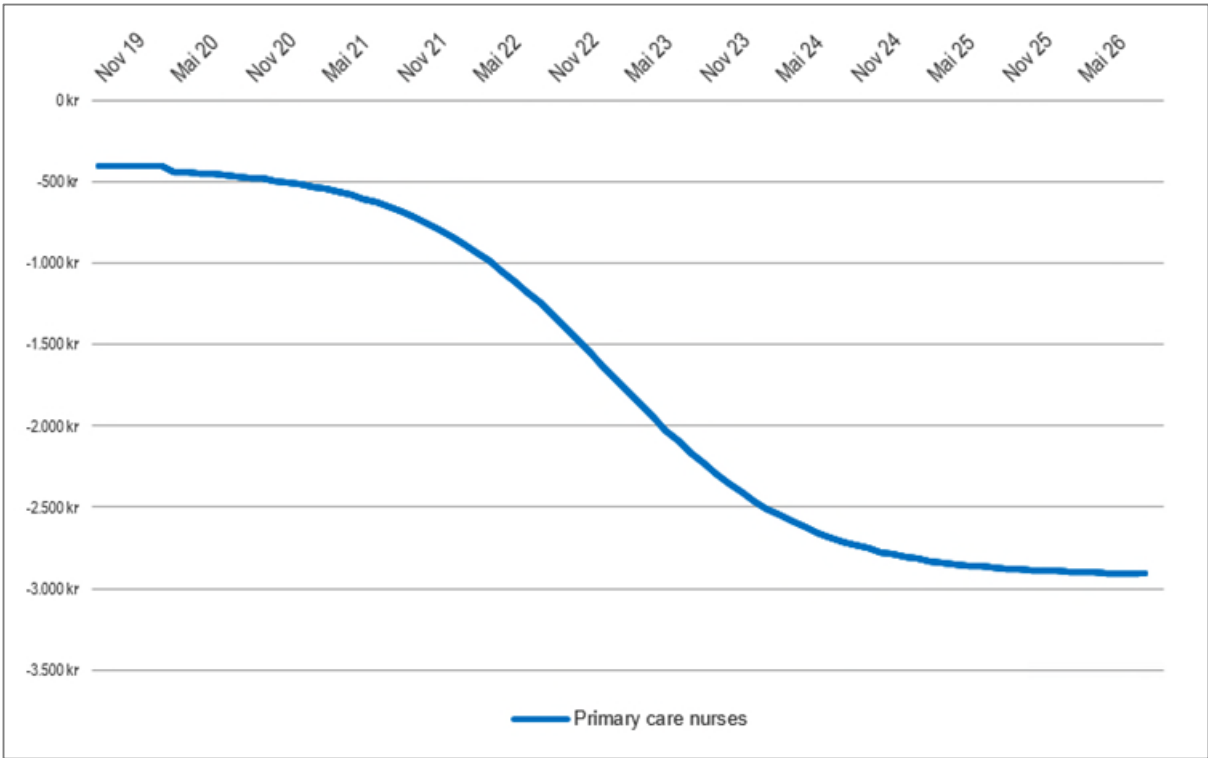


Figure 226, Cumulative net benefit for RJH primary care nurses

Table 79: RJH, key service impacts for primary care nurses

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is primary care nurses need 2 hours in the first month to adapt to C3-Cloud services.	100%
Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits by primary care nurses according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Table 80, Sum of costs and benefits for SWFT primary care nurses

Sum of all costs	Sum of all cost types reduced by contingency in present values	kr3.876
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	3.876
Implementation cost	Costs related to service implementation	3.876
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	kr969
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	969
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	969

7.4.3.10. Hospital care

Patients involved in C3-Cloud may be forwarded to hospitals to receive specialist physician care or may be submitted to the Accident and Emergency unit upon sudden health deterioration. Hospitals are mainly affected due to forgone income from avoided A&E admissions for C3-Cloud

patients (92% of all costs) (Table 81). In addition, hospital staff spends time on C3-Cloud training and on using the C3-Cloud platform, which they have not done before. Positive impacts have not been defined for the hospital (Table 82), yet these may be sought rather in improved quality of care or shortened hospitalisation periods – indicators that were not part of this evaluation or that were found to not be significantly different for the C3-Cloud patient cohort when compared with the control patient cohort. This could be a different picture if a follow-up trial had the chance to observe a longer trial period; larger patient cohorts; patients with moderate to severe conditions and a trial not under Covid-19 impediments.

Consequently, the SER for hospitals maintains at -100% for the entire observation period (Figure 227 and Figure 228). The cumulative net benefit is decreasing even steeper from November 2022 onwards, which is caused by an increase in costs modelled from the DES. At the end of the observation period, the overall net benefit is as low as -23,000,000kr for hospitals (Figure 198).

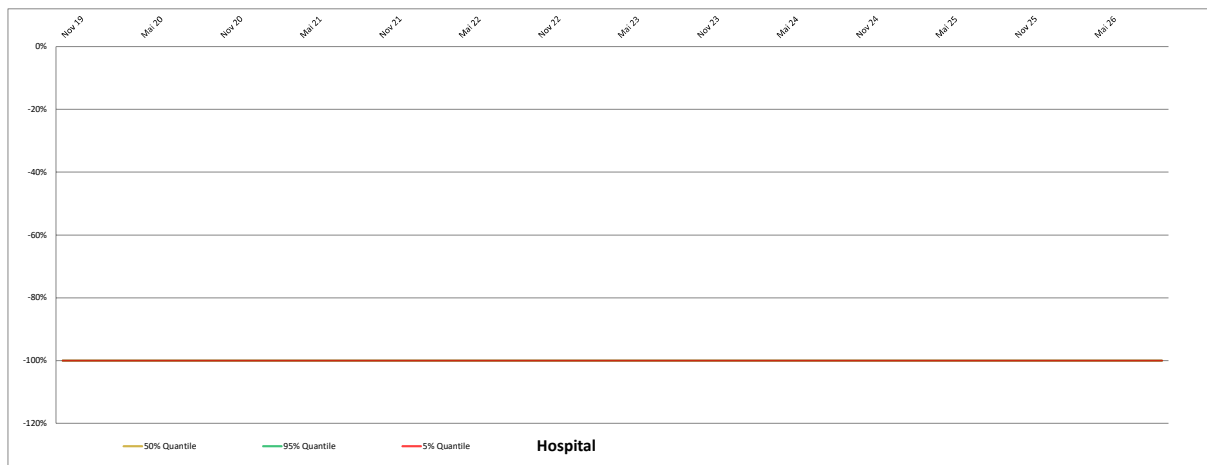


Figure 227, Monte Carlo simulation of cumulative SER for RJH hospital care

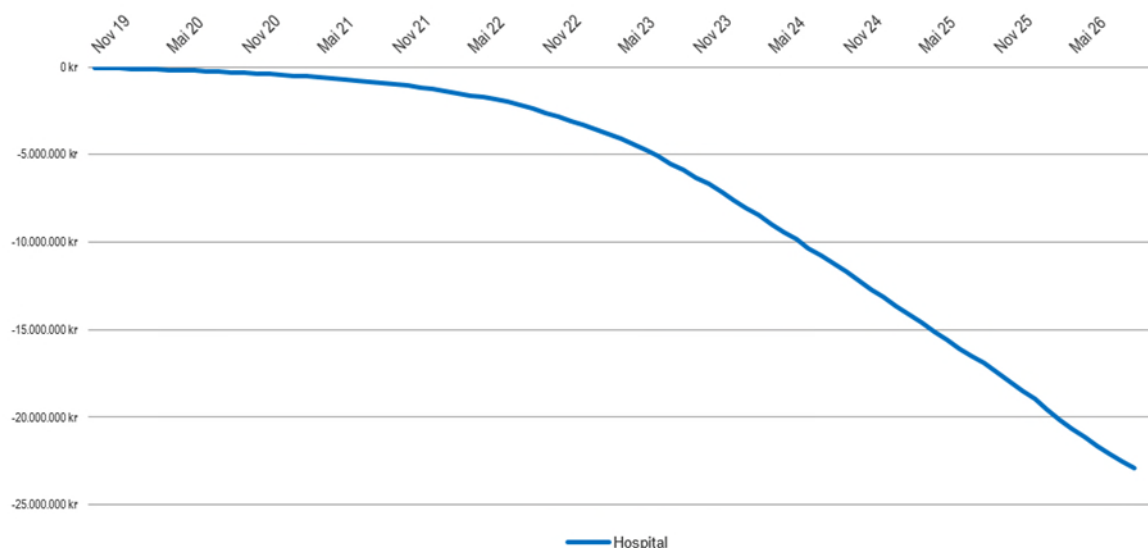


Figure 228, Cumulative net benefit for RJH hospital care

Table 81, RJH: Key service impacts for hospital care

Negative impacts	Rational	Share of total costs
Forgone income from visits or admissions to the Hospital	Forgone income based on reduced use of the A&E unit at the hospital. The data is based on DES modelling from Osakidetza. This is the delta of costs per patients and month for regular care - costs for C3-Cloud patients. It considered the average costs savings for patients that have had at least one A&E visit.	92%
Extra staff time for service provision by Hospital physicians to Multimorbid patients - actual time	Per patient per hospitalisation 15 minutes time spend on C3-Cloud care planning, dependent on the severity of the case. Excluding time spend on prescriptions.	4%
Extra staff time for service provision by Specialist / hospital nurses to Multimorbid patients - actual time	Per patient per hospitalisation 15 minutes time spend on C3-Cloud care planning, dependent on the severity of the case. Excluding time spend on prescriptions.	2%
Overhead on costs	Standard accounting overheads, including rent, organisation management, consumables, and other supporting expenditure. Overhead on costs is calculated as a percentage mark-up on staff costs; assumed to be 25%.	2%
Positive impacts	Rational	Share of total benefits
No positive impacts were defined		

Table 82, Sum of costs and benefits for RJH hospital care

Sum of all costs	Sum of all cost types reduced by kr22.927.034 contingency in present values	
Financial costs	The need for extra cash	21.450.021
Redeployed resources	Time taken away from other activities	1.477.013
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	107.978
Operation cost	Costs related to continuous operation of the service	22.819.056

Sum of all benefits	Sum of all benefit types reduced by 0kr contingency in present values	
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	0

7.4.3.11. Hospital specialist physicians

Hospital specialists are employed at the hospital, providing specialist secondary healthcare to C3-Cloud patients if these were admitted to the hospital.

Improvement in decision making due to being better informed, and improvement in quality of care provided, can have a positive intangible impact. Professional's motivation and satisfaction have a positive intangible impact. Both result in a very moderate positive valuation of the C3DP services (Table 83). However, hospital specialist physicians need to invest time in adapting to the new way of working (2 hours in the first months as assumed). The implementation costs outweigh the perceived benefits (Table 84), resulting in a negative cumulative SER of -75% for the hospital specialist physicians (Figure 229). The net benefit consequently decreases with the addition of more hospital specialist physicians and levels off when their numbers reach satisfaction. However, the absolute numbers for the net benefit are overall neglectable, being as low as 2.800 kr at the end of the observation period (Figure 230).

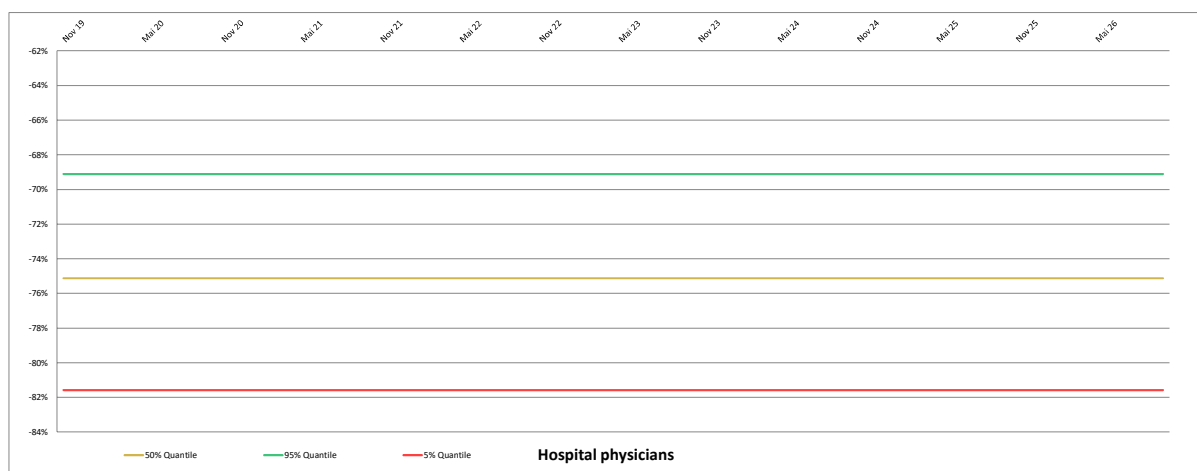


Figure 229, Monte Carlo simulation of cumulative SER for RJH hospital physician

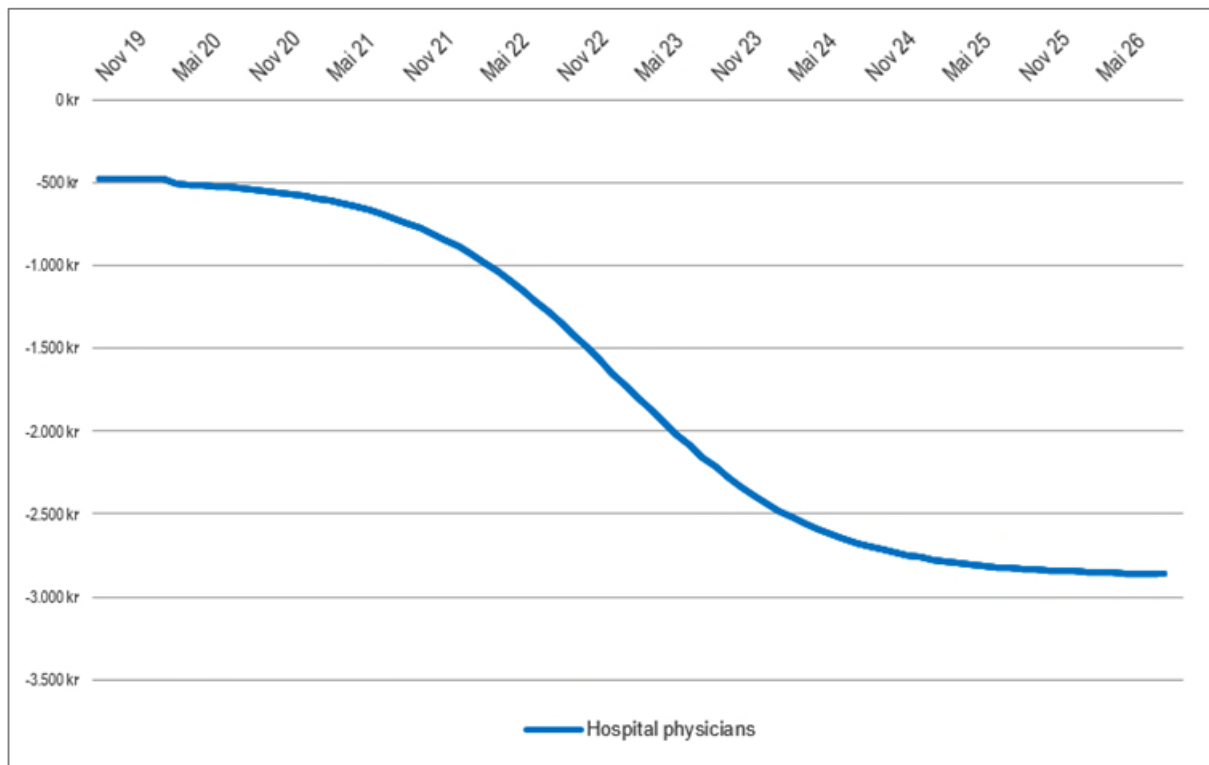


Figure 230, Cumulative net benefit for RJH hospital physicians

Table 83, RJH: Key service impacts for hospital physicians

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is that hospital specialists spend 30 extra minutes during the first month due to adaptation to C3-Cloud.	100%
Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits of Hospital physicians according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

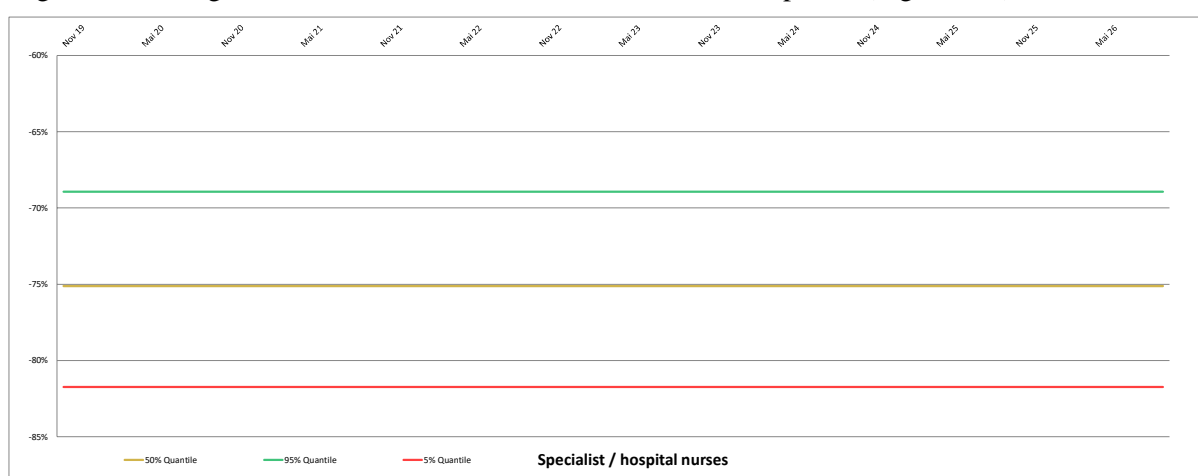
Table 84, Sum of costs and benefits for RJH hospital specialist

Sum of all costs	Sum of all cost types reduced by contingency in present values	3.814 kr
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	3.814
Implementation cost	Costs related to service implementation	3.814
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	954 kr
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	954
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	954

7.4.3.12. Hospital/specialist nurses

Hospital specialists are employed at the hospital, providing specialist secondary healthcare to C3-Cloud patients if these were admitted to the hospital.

Improvement in decision making due to being better informed, and improvement in quality of care provided, can have a positive intangible impact. Professional's motivation and satisfaction have a positive intangible impact. Both result in a very moderate positive valuation of the C3DP services. However, hospital specialist physicians need to invest time in adapting to the new way of working (2 hours in the first months as assumed) (Table 85). The implementation costs outweigh the perceived benefits (Table 86), resulting in a negative cumulative SER of -75% for the hospital specialist physicians working in the hospitals (Figure 231). The net benefit consequently decreases with the addition of more hospital nurses and levels off when their numbers reach satisfaction. However, the absolute numbers for the net benefit are overall neglectable, being as low as 1,200kr at the end of the observation period (Figure 232).

**Figure 231, Monte Carlo simulation of cumulative SER for RJH hospital nurses**

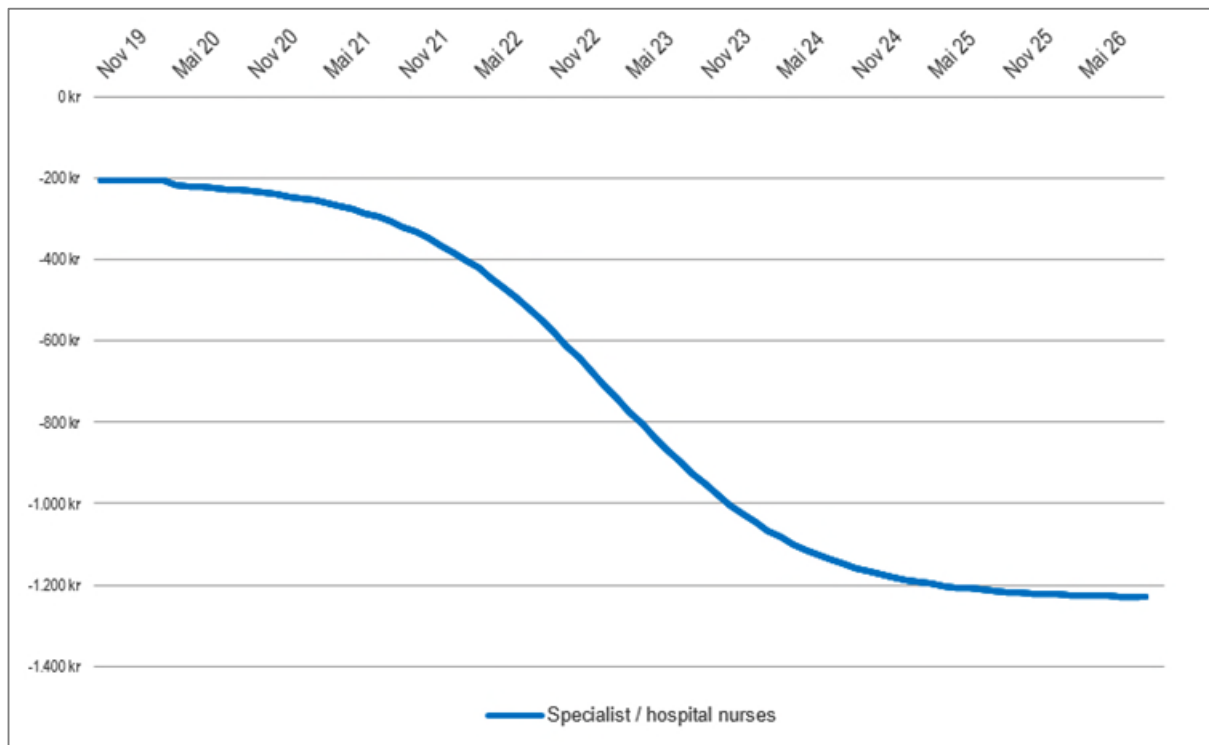


Figure 232, Cumulative net benefit for RJH hospital nurses

Table 85, RJH: Key service impacts for hospital nurses

Negative impacts	Rational	Share of total costs
Temporary inconvenience	Health and care professionals, regardless of whether they are users or become providers of telemedicine services, need to be personally involved from the very beginning. Irritation related to change in working practices, inconvenience during training and implementation, as well as possible involvement in development work represent a non-economic cost to individuals. The value of time is used as the monetary value to this intangible indicator. The assumption is that hospital specialists spend 30 extra minutes during the first month due to adaptation to C3-Cloud.	100%
Positive impacts	Rational	Share of total benefits
Valuation of intangible benefits by Specialist / hospital nurses according to eCCIS	Covers overall subjective and intangible benefits of the new service, primarily in relation to user satisfaction. The data was retrieved from as the median answer on the eCUIIS questionnaire, pooled across all three pilot sites.	100%

Table 86, Sum of costs and benefits for RJH hospital nurses

Sum of all costs	Sum of all cost types reduced by contingency in present values	kr1.639
Financial costs	The need for extra cash	0
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	1.639
Implementation cost	Costs related to service implementation	1.639
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	kr410
Financial benefits	Reducing cash outlays	0
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	410
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	410

7.4.3.13. Ministry of Health

The Ministry of Health in this modelling is considered as the payer for C3-Cloud induced health care resource use changes. For this modelling, benefits or costs do not arrive at the stakeholder “Ministry of Health” as an immediate impact. They are accounted for by the affected organisation if the budget or per capita payment is not changed. Changing a budget can be the consequence of this analysis and further deployment and usage of C3-Cloud components, but we regard this as a second order effect that is not usually modelled in ASSIST. For the time being, the following process was followed: Costs generated, and benefits liberated through C3-Cloud implementation are considered within the analysis of the organizations where the cost or benefit occurs. E.g.: Additional telephone contacts with the healthcare centre are a benefit to the primary care centre as these could generate additional income in the long term, after the budget for primary care centres is renegotiated, based on this added need for telephone calls. In consequence it is an added cost for the Ministry of Health who needs to pay for these. In contrast: Fewer consultations with the healthcare centre for primary care physicians and nurses are considered a cost to the primary care centre (forgone income) and to be a benefit for the Ministry of Health (less payment needed due to fewer consultations). A similar situation is the case with the hospitals A&E unit. Less visits there imply a cost for the hospital due to forgone chances to cash such visits with the Ministry of Health. Consequently, it is a benefit for the Ministry of Health, which needs not to pay for avoided A&E visits (Table 87).

The net benefits for the Ministry of Health outweigh the costs from the first month onwards, cumulating to 240,000,000kr at the end of the modelled 84 month period (Figure 234). This makes the Ministry of Health the main beneficiary of C3-Cloud deployment and scaling up under the given input and assumptions.

In the first six months of operation, the DES modelled relatively smaller costs for additional telephone contacts at primary care centre (amounts spanning from 3.65 - 10.78 kr per patient and month), which results in a relatively higher SER (Figure 233). From then this amount increases to 17.32 kr within one year and to 24.37 kr within the next three years and subsequently levels off.

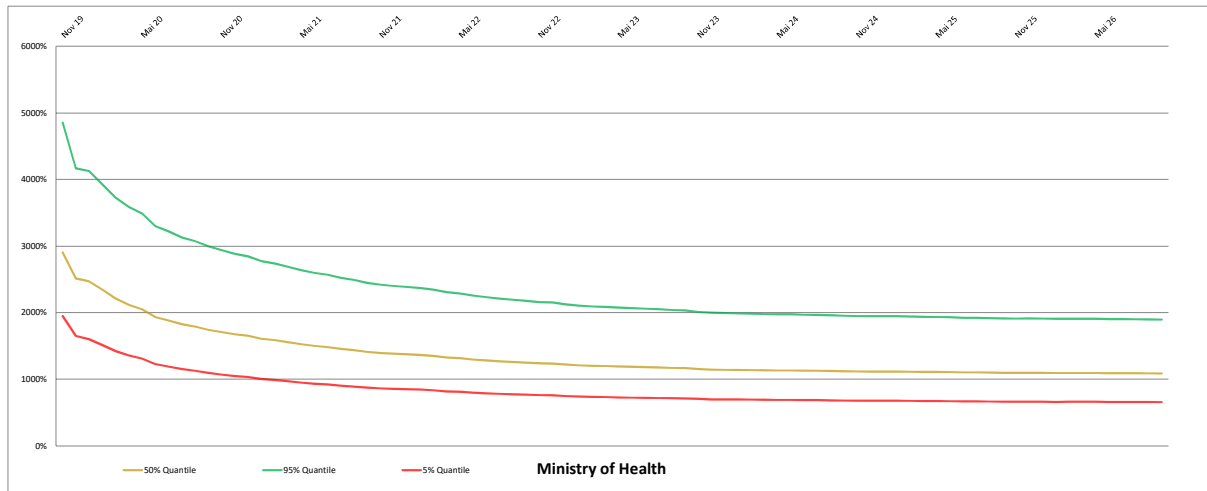


Figure 233, Monte Carlo simulation of cumulative SER for RJH Ministry of Health

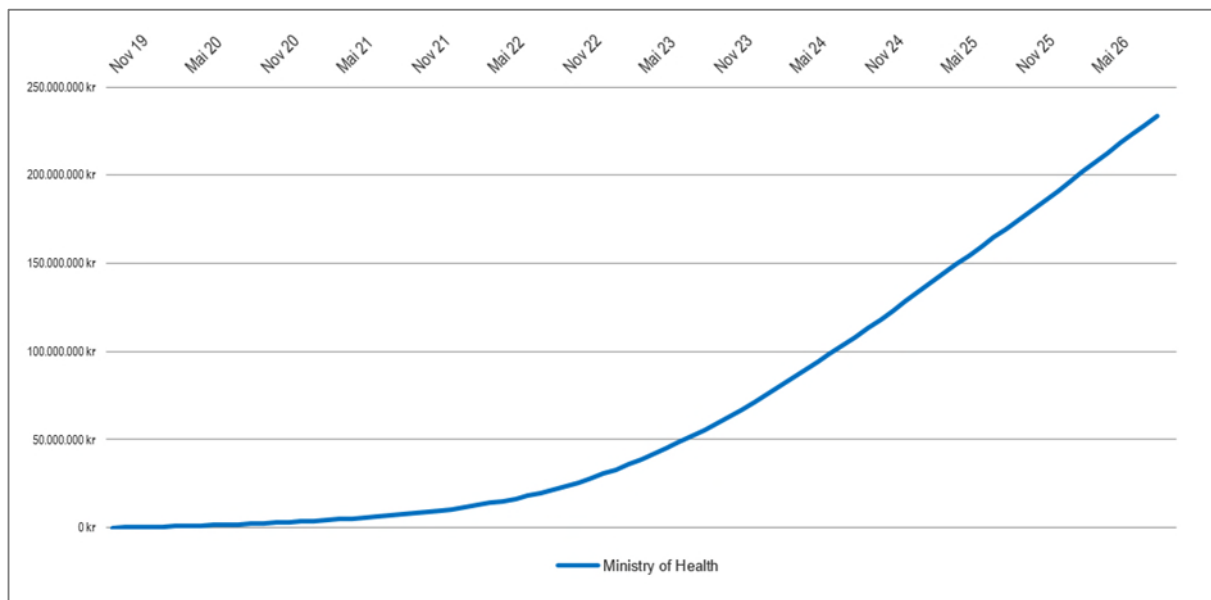


Figure 234, Cumulative net benefit for RJH Ministry of Health

Table 87, RJH: key service impacts for Ministry of Health

Negative impacts	Rational	Share of total costs
Extra service use: additional consultations with Primary care organisations	The DES modelling concluded: One additional telephone contact with primary care nurses over 12 months	100%

Positive impacts	Rational	Share of total benefits
Reduced service use: consultations with Primary care organisations	The DES modelling concluded: 2.2 fewer contacts with GP at primary care centres over 12 months 0.4 fewer contacts with GP for home visits over 12 months 1.0 fewer home visits through primary care nurses over 12 months	92%
Reduced service use: less admissions to and shorter stays in Hospital	The DES modelling concluded: 1.0 fewer admissions to A&E unit over 12 months. This is a benefit to the Ministry of Health who would otherwise pay for these admissions.	8%

Sum of all costs	Sum of all cost types reduced by contingency in present values	21.183.876 kr
Financial costs	The need for extra cash	21.183.876
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	0
Operation cost	Costs related to continuous operation of the service	21.183.876
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	254.892.753 kr
Financial benefits	Reducing cash outlays	254.892.753
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	0
Operation benefits	Benefits related to continuous operation of the service	254.892.753

Table 88, Sum of costs and benefits for RJH Ministry of Health

7.4.3.14. IT suppliers

IT suppliers are the key C3-Cloud component development organisations in the C3-Cloud project (i.e. SRDC, MEDIXINE, INSERM, Cambio and Warwick). As a business plan with specific cost indications (licensing plans) for the usage of the system was not yet available for the modelling from WP2 at the time of writing this deliverable, we assumed the EU H2020 project funding for C3-Cloud as the next best alternative proxy for the development cost. This is based on the Person Months (PM) claimed by SRDC, MEDIXINE, INSERM, Cambio and Warwick from WPs 3, 5, 6, 7, 8 (total 302 PM) and an assumed PM rate (average across partners) of € 6,072.72. We distributed the costs across the first 6 months only, as this will be considered the development phase and implementation of the project for the ASSIST modelling (in parallel to the piloting) (Table 89). In future evaluations it is recommended to include also cost modelling for future licensing arrangements for the C3-Cloud components or service system. That could be flat rate

monthly costs per patient or patient groups (e.g. stepwise price calculations for <1000 patients; <50000 patients and >50000 patients). The specific plans for this are developed in the final WP2 deliverables and the final business planning at the end and post project.

The development costs for the three partners are neutralized by the EC H2020 project funding that was received for this project (Table 90). Consequently, the net benefit is neutral for the whole modelling period (Figure 236) and the cumulative SER for IT suppliers slightly beyond 0% due to minor discounting effects (Figure 235).

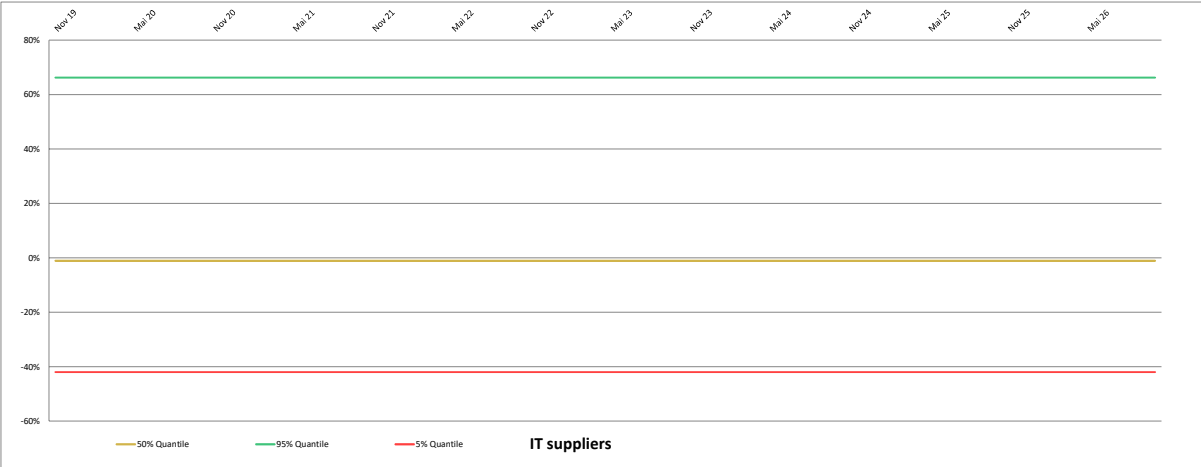


Figure 235, Monte Carlo simulation of cumulative SER for RJH IT suppliers

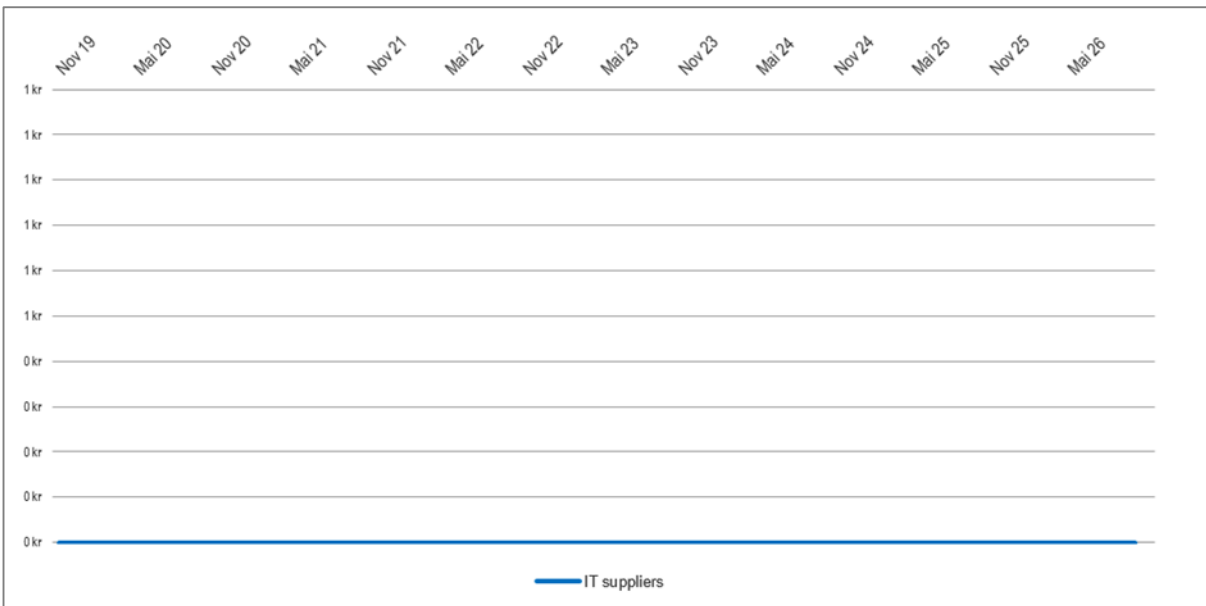


Figure 236, Cumulative net benefit for RJH IT suppliers

Table 89, SWFT: Key service impacts for SWFT IT suppliers

Negative impacts	Rational	Share of total costs
C3-Cloud development costs for IT suppliers	<p>This is based on the Person Months (PM) claimed by SRDC, MEDIXINE, INSERM, Cambio and Warwick from WPs 3, 5, 6, 7, 8 (total 302 PM) and an assumes PM rate (average across partners) of € 6,072.72 We distributed the costs across the first 6 months only, as this will be considered the development phase of the project for the ASSIST modelling (in parallel to the piloting).</p> <p>WP3: 57 PM WP5: 40 PM WP6: 46 PM WP7: 81 PM WP8: 78 PM</p>	100%
Positive impacts	Rational	Share of total benefits
EU funding for IT suppliers	<p>As a business plan with specific numbers for the usage of the system was not yet available for the modelling from WP2 at the time of writing this deliverable, we assumed the EU H2020 project funding for C3-Cloud as the next best alternative proxy for the development cost.</p>	100%

Table 90, Sum of costs and benefits for SWFT IT suppliers

Sum of all costs	Sum of all cost types reduced by contingency in present values	kr18.681.296
Financial costs	The need for extra cash	18.681.296
Redeployed resources	Time taken away from other activities	0
Non-financial costs	Inconvenience	0
Implementation cost	Costs related to service implementation	18.681.296
Operation cost	Costs related to continuous operation of the service	0
Sum of all benefits	Sum of all benefit types reduced by contingency in present values	kr18.681.296
Financial benefits	Reducing cash outlays	18.681.296
Liberated resources	Time saved from existing activities	0
Non-financial benefits	Convenience	0
Implementation benefits	Benefits related to service implementation	18.681.296
Operation benefits	Benefits related to continuous operation of the service	0

8. DISCUSSION

The focus of this deliverable D9.6 are objectives 5, 6 and 7 (see chapter 3). The intention was to present the data analysis in chapters 6 and 7 rather data-driven and soberly, i.e. disregarding its limitations (chapter 5). Key findings from that analysis are interpreted and discussed in the following sections under consideration of the limitations from chapter 5.

It is important to re-emphasise the limitations raised in chapter 5: These have had significant impact on two aspects regarding the evaluation:

- 1) The volume of the data obtained was limited to the patient numbers recruited to the technology trial. C3-Cloud user numbers were expected to be larger and the technology trial longer. This has lowered survey return rates to an unsatisfactory level (chapter 6) despite efforts to increase return rates - efforts that were mainly hampered by the COVID-19 pandemic. It has also impacted the platform usage and thus made it more difficult to determine significant differences in the C3-Cloud patients' healthcare resource use (chapter 7). The validity and reliability of the data is thus compromised.
- 2) The frequency of use was lower than expected. The COVID-19 pandemic hit out pilot sites from February 2020 onwards (see Figure 138). That led to most healthcare personnel shifting their focus of activity away from C3-Cloud to front-line work. Given that, not all C3-Cloud technology trial participants have had the chance or motivation to use the system at all or to its full capacity. In a similar fashion, we see that patients were very critical to the C3-Cloud system, which, to the opinion of some patients, did not meet their rightly high expectations. This is often directly dependent on the fact that their multi-disciplinary team was not able to deliver the C3-Cloud care they were expected to deliver. For instance, a few patients reported that have not received personalised goals or activities in their care plan or have not been in messaging exchange with their MDT. This can be explained, as for instance in RJH (the largest pilot site), where all care plans were created centrally while handing over the responsibility to define goals and activities to the healthcare professionals treating the respective patients. Yet, these professionals did not have the capacity to modify the care plans any further once COVID-19 struck.

8.1. Survey discussion

Most survey responses on C3-Cloud platforms were very heterogeneous and neutral rather than very positive or very negative. We interpret the main reason for this being the limited patient numbers, limited trial duration and limited usage opportunities due to the COVID-19 pandemic hitting during the trial and calling HCPs to front-line work rather than spending their time on C3-Cloud usage (see Figure 138). We selected a few examples for an in-depth analysis.

The **C3-Cloud training material** (chapters 6.5.4 and 6.7.5) was generally accepted with ratings ranging between 4.33-5.50 (scale from 1-7) (Figure 75). The resource that was least useful was the wallet card, yet it was assumed from the outset that this was only useful for patients if they experienced serious trouble with the system and needed a direct contact with the pilot site manager. The training material was overall understandable and well trusted; the supporting videos were appreciated, and the guidebook was easily to understand (Figure 75). The training material made the C3-Cloud system easier to use (Figure 76). All QUIS7 questionnaire statements related to learning to operate the system were rated 6 or above (Figure 73) which is also an indication that the training material was brought to good use.

Based on these ratings, some additional feedback given in writing is surprising: one patient did not find the training material at all, another did not find it useful or simpler language and more concise (condensed) training material was requested (Table 23). The latter comment can be understood when considering that extensive user-training material and training plans were developed in T9.4 and presented in D9.4. These included the development of methods, including the definition of different target groups (HCPs, patients, and informal caregivers across three pilot sites), a training plan including a detailed set of preparatory material (cover letters, information

leaflets, evaluation summaries, recruitment crib sheets, information sheets for both HCPs and patients, slides sets to introduce C3-Cloud during the training sessions, workshop invitations, workshop presentations). They also included core training material, that comprised introductory videos, wallet cards, project guide books, user manuals for all C3-Cloud components (C3DP, PEP, TIS, SIS, CDS, SPS, FHIR repository), online video tutorials, a technical webinar, an evaluation webinar and administrator guides.

For future deployments of C3-Cloud, it can be stated that there is a rich repository of training material available already, which may be re-worked to be more concise and satisfying the user needs more targeted.

The analysis of the **UTAUT questionnaires** (chapters 6.4.2; 6.6.2; 6.1.2 and 6.2.3) shows that some rather retained ratings (e.g., if the fellow patients inspire oneself to use the PEP; or if the care team has been supportive about the technology) (Figure 81), may be caused by the fact that the technology trial was shorter than planned and that the MDT used it neither to its full potential of quality nor to the intended potential in quantity. This was also supported by the free text comments that indicated that usage was not widely taken up in the pilot sites (Table 18).

HCPs indicated that the platforms were generally rather easy to become skillful at, that they consider them useful for their job and they fit well with the way they work and the service they provide. In addition, the organisations they work for were supportive of the C3-Cloud technology. These are all indicators that show the potential of the C3-Cloud system and that it can be a useful and powerful system to improve patient care (Figure 24). To the contrary, we see that HCPs do not believe that C3-Cloud will enhance their productivity and they could not put the system to full use (Figure 25). That can be explained by fact that some HCPs used several systems in parallel to C3-Cloud and others experienced technical issues during usage that prevented them from using the system to its full potential (Table 12).

Technology trial participants responded twice to several questionnaire items (at the start and at closing of the technology trial). While we found that HCPs still consider C3-Cloud useful in their job, it is also evident that they perceived a decrease in the quality and productivity of their work. This is detrimental to what the C3-Cloud system envisaged for patients and HCPs and it should be carefully reinvestigated in a follow-up trial (e.g. the H2020 funded ADLife project), whether these statements hold or if their origin lies in the shortened trial and COVID-19 situation with a high workload and burden on professional staff as well as patients. The latter may clearly have turned HPs perceptions to negative opinions on the C3DP.

The **QUIS7 questionnaires** (chapters 6.5.3, 6.7.3, 6.1.3 and 6.2.4) can be summarised along different categories, highlighting some main insights:

- The overall reaction to the C3-Cloud system was generally rated 5.55 – 7.00 (Figure 28) from HCPs and 4.18 – 5.36 (Figure 87) on a scale from 0-9. Surprisingly, HCPs rated the system having adequate power and being stimulating for their work, yet this is not reflected by usage patterns (Figure 138). This could imply that the short trial period and COVID-19 may have had an impact on usage, yet that professionals could foresee the system being useful in general and with more broad usage across HCPs and patients. Patients found the system easy to learn and stimulating.
- The terminology and system information shown was rated slightly above average from patients (4.82 – 5.45) (Figure 87) and rather good (6.55 – 6.91) from HCPs (Figure 28). It can be argued that often, HCPs will have experience with healthcare IT and understand terminology better than patients do. Following the same reasoning, patients must understand the system terminology easily as to easily access and comply with their care-plan. It could be important to revisit this for future development.
- The details shown on the screen are rated between 3.45 – 5.45 for patients (Figure 87 and Figure 88) while the average circulates round the neutral rating ‘5’ and the rather negative ratings (e.g. 3.45 on “animated cursors keep me informed” can be explained by users that

did not remember instances where that happened (Table 20). HCPs rated the same items more positive (4.91-6.64), emphasising positively the amount of adequate feedback and the acceptable system speed.

- System Capabilities comprise system speed, reliability, mistakes corrections etc. (Figure 89 and Figure 31). Again, the system is rated higher by HCPs (5.73 – 7.55) than by patients (4.20 – 6.09). Both, HCPs, and patients, appreciated system reliability, response time and that system operation gets easier with the level of experience. Patients think the system could warn better about potential problems and HCPs see improvement potential with the correction of self-made mistakes on the system.
- Multimedia (i.e. when photos, videos or audio was used) is overall rated well (5.90 – 6.39 for HCP, Figure 32 and 4.50 – 5.67 for patients, Figure 90). Other than that, no videos have been watched on through the platform, no additional feedback was given regarding the multimedia aspects (Table 20).

eCCIS and eCUIs questionnaires (chapters 6.7.4, 6.8.2, 6.9.2 and 6.2.5) allowed insight into perceived C3-Cloud platform usage. The responses were cross-checked for plausibility with data obtained from the FHIR logfile reports on platform usage. E.g. when patients indicated they used the system less than once a week (Figure 93), that indication was cross-checked with data from the FHIR export (which showed usage patterns for patients or HCPs). Subsequently, the data based on best grounds was used as input to the ASSIST cost-benefit impact modelling tool in chapter 7. The questionnaires also showed that patients were slightly more positive than negative (Figure 109) on whether to use the PEP in the future, while they indicated that it was rather not worth the effort involved in using it (Figure 108). This shows again that patients do see the potential of the C3-Cloud system, yet they could not be fully convinced of its use just during the trial. Some patients pointed out that they see the potential specifically with ongoing digital communication with their MDT and that the MDT can be easily informed about a patients multiple chronic health conditions and their implications, using the C3-Cloud system (Table 21).

This picture was slightly different for HCPs who tend to be more positive about both statements: the majority would want to continue working with the C3DP in the future (Figure 53) and also believes that that to most part the effort involved in using it is worth it (Figure 52), i.e. even despite the fact that some HCPs had only one C3-Cloud patient in their patient cohort (Table 15).

The **questionnaires on usefulness of C3-Cloud** for care planning and empowerment (chapters 6.5.2, 6.7.2 and 6.2.2) asked C3-Cloud to rate statements on scales from 1-7. Some ratings confirm previous findings and other findings contradict them. For instance:

Patients rated ‘communication with their MDT was easy (Figure 84)’ below average (3.27), which goes well along with their rating of 3.09 on ‘I received appropriate feedback when sharing personal health data or messages through the PEP’. That can be debateable, when we see that a total of 1919 messages has been shared between the MDT and their patients over the 6 months (Figure 142). Another example is that patients felt that PEP supports them in adhering to their care plans’ drug regimen (Figure 84), which is not in line with Figure 85 where they state that they feel less informed about their drugs regimen than before. Nevertheless, patients felt that PEP usage made them feel confident to adhere to their care plan, that it was easy to adhere to activities in their care plan and that they had a high personal motivation to follow their care plan (Figure 84). This indicates that they were able to use the basic system functions and to get information from it.

It is very unfortunate that patients rated several items worse after using C3-Cloud than before using it. Patients’ rating for their involvement in care planning, their communication with the care team through PEP, their level of information on goals and activities as well as their level of being informed about their health condition, was reduced after using C3-Cloud for six months (Figure 85). While these are some key functions where C3-Cloud was to support them, the C3-Cloud team

believes that this is mainly due to the COVID-19 situation and the MDT being under pressure and consequently withdrawing from C3-Cloud usage over the technology trial. That reasoning lends arguments on one hand from the patients' responses that they would generally want to use the system in the future yet, for the time being, it was not worth the effort to get involved using it (Figure 108 and Figure 109). On the other hand the argument is supported as we see that usage frequency went down over the trial (Figure 137 and Figure 138).

HCPs rated the 'C3DP supporting them in detecting medical guideline conflicts' a neutral 3.45 (Figure 18). Interestingly, HCPs still rated C3DP's capability to reduce conflicts in treatment alternatives for their patients a 4.23 (Figure 17) which contradicts the previous rating on the detection of medical guideline conflicts to some extent. Hindsight, that could be because C3-Cloud patients had rather mild or moderate and no severe health conditions. A total of six guideline clashes were detected across all three sites over the trial (chapter 7.1.8). Thus, HCPs have not experienced this as specifically supportive, yet there were no clashes to highlight.

HCPs do see large potential in care planning with C3DP and in the definition of goals to improve clinical and care outcomes. Goal setting also allowed for sufficient flexibility. This was due to the fact that it was not limited to predefined goals or activities, but the engine had an open taxonomy where personalised goals could be added (chapter 7.1.3 and 7.1.4). HCPs shared feedback that they wished C3DP allows them to request care activities from other MDT members not in their organization. This is in line with the finding that only a limited number of healthcare professionals used the system from the outset and that rarely the complete MDT of one single patient was included in the technology trial (Figure 17 and Figure 18). HCPs find the inclusion of patients' self-measurement data in the C3DP useful, and care planning was easier for those patients who reported self-measurements opposed to those who did not (Figure 19).

Generally, HCPs confirmed that the C3DP supported them in setting up a care plan for their patient by structuring the relevant data usefully and making them consider the holistic patient profile (Table 11).

8.2. DES modelling discussion

The DES modelling (chapter 7.2) is discussed as follows: Due to the short period of time that C3-Cloud intervention was in place, it is not possible to draw definitive conclusions. Nonetheless, the results of this work enabled us to analyse the trend of the intervention, showing that it began to generate changes in the resource-use-profile. In primary care, where the remote control of patients was improved thanks to C3-Cloud, the consultations in the healthcare centre decreased for both general practitioner and PC nurse, giving the control group 1.59 and 1.35 more possibilities to have a visit respectively. In the case of primary care nurses, home visits also were statistically significantly lower, where the possibilities of the control group to have a contact of this type was more than double. In comparison with the control group, only consultations by telephone with PC nurse were increased significantly, giving the possibilities of a contact 1.60 higher for the intervention group. In hospital care, the initial hypothesis was that the better control of patients would reduce or avoid their destabilisation phases, minimising at the same time the associated hospital resource consumption, like the use of A&E services and/or hospitalisation. As can be seen in the results regarding the A&E services the hypothesis was materialised. This was because patients from the control group during the trial had 1.76 more possibilities to visit the A&E department at least once more than patients in the intervention group. In all other resources there were no statistically significant differences. The lack of effect in hospitalisations and/or hospitalisation days maybe was due to the severity of patients' illnesses. As the health status of the patients was not so severe, generally very few patients were hospitalised and probably, the margin for improvement in this area was very small. Anyway, the observation was that this is a point to improve.

The BIA developed using DES showed that for the data collected from Basque Health Service database in 2017, the prevalence of multimorbid patients will rise to near 2,200 patients for the

year 2025, an increment of 38,8%. Consequently, the associated burden will also rise to 6.8 million of euros for the same period in a conventional scenario. Once the effect of the C3-Cloud intervention was incorporated in the DES model and extrapolated in time, the BIA showed that the total burden for a C3-Cloud scenario will be 11.38% lower than for a conventional scenario, generating a reduction of 772.650€. So, statistical analysis and BIA results evidenced the potential of C3-Cloud intervention to change and improve the resource use and associated costs. Going further, the integration of these procedures into a continuous improvement framework provides the basis for a systematic evaluation of complex interventions.

Nevertheless, some issues arose along the way during the project period that had to be sorted or overcome. From one hand, the low numbers achieved in the recruitment phase made difficult to obtain the results and to measure the intervention effect. Nevertheless, it is necessary to take into account that the introduction of new technologies, the multiple actors connected and the need to change the behaviours of professionals involved, made the implementation of C3-Cloud a complex intervention, with all the challenges that this entails. The implementation is strongly related to the persons involved, as well as the organisational structure they belong to. This can set up barriers that are structural, organisational, and professional, and that can generate a resistance to change. They can also delay or impede the proper adoption of the intervention. This entails challenges and barriers related to change management: HCP resistance regarding change is suggested to be the main obstacle.

On the other hand, the eruption of the COVID-19 pandemic also determined a loss of patients and difficulties to properly follow up the ones involved in the project, generating issues that affected the proper ongoing of C3-Cloud project. Because most of the healthcare systems went overloaded, the data collection process was compromised. The ideal was to collect intervention and historic control group resource-use-data from the three pilot sites and perform the statistical analysis to measure the difference between conventional and C3-Cloud scenario. Having the sample size larger it was more likely to find significant differences. Nevertheless, one pilot site could not collect and provide the resource consumption data used to develop the statistical analysis on time due to the workload generated by the COVID-19. Although different alternatives and their limitations were sought to overcome the possible lack of data, finally the data collected in the rest of the pilot sites was enough to properly carry out the task. In this sense, the hypothesis before the statistical analysis was that intervention group would use fewer resources than control group, but the healthcare resource usage could also have been affected by the COVID-19. The pandemic could have determined differences in the resource consumption rate that a patient had before and after the outbreak, introducing a bias and hampering the quantification and/or interpretation of the real C3-Cloud intervention effect. However, as the COVID-19 pandemic affected in the same way both control group and intervention group patients, the results obtained were considered valid.

Regarding the method used, the main contribution of this work was to integrate simulation models developed by Osakidetza and the cost-benefit assessment framework ASSIST developed by empirica in a unique innovative merging tool. To gain reliability and validity, DES models were used to represent mathematically the natural history of the disease. The virtues of dynamic models to represent complex systems were highlighted several times, but DES was particularly adequate because it handles time explicitly and the flexibility that it offers made the approach more generalisable, representing models with simple and complex levels of interaction. This allowed us to foresee in the long term the healthcare resource consumption and to obtain the monthly cost per patient of different resources involved. After that, these unit costs were used as inputs in ASSIST, where thanks to its comprehensive perspective, allowed us to foresee the economic impact for each stakeholder. The merging tool took advantage of predictive modelling and ASSIST tool strengths, being useful to gain reliability in the results obtained without losing the comprehensiveness or broadness that this kind of project requires. The combined application of both approaches enabled a symbiotic realisation of their complementary strengths while reducing their limitations. Decision makers were thus able to assess in advance the size of the change they could expect from the C3-Cloud intervention in terms of budget expenditure. Furthermore, the

application of this combined technique should be used for any complex intervention where determining the sustainability of the intervention is an important issue.

8.3. ASSIST discussion

The ASSIST cost-benefit impact modelling (chapter 7.4) is based on administrative and accounts data, on the DES modelling data, insights obtained from the C3C-Cloud user surveys (e.g. eCCIS and eCUIIS), and discussions and estimates from experts in the field. The systemic stakeholder view developed in this modelling considered the following groups: Patients and their informal caregivers; call centres and call centre nurses; primary care organisations with physicians and nurses; hospitals with physicians. As well as specialist nurses and community nurses, health care payers and the C3-Cloud developer organisations.

Given the assumptions made in the evaluation, it has shown the following key insights for the upscaling of C3-Cloud and its modelling over the next 84 months:

SWFT may reach a systemic cumulative socio-economic return of -1%, the BC may reach -10% and RJH may reach 6%. This is a rather neutral outcome for all three sites and the decision whether to scale up C3-Cloud needs additional investigation, as referred to in many places in this report.

In all three sites, the HCPs that would work on C3-Cloud have a negative cumulative SER varying between -75% to -100%. This is mainly due to a very neutral valuation of the C3-Cloud services, even including the efforts needed from their side to learn the new system and to adapt to new ways of working. While the -75 to -100% look bad, they translate only into marginal €-values (e.g. 30,000€ for all primary care physicians in the BC(Table 56); or as little as £419 for all primary care nurses in South Warwickshire (Table 34)). These professionals may likely tend to be rather reserved about C3-Cloud up-scaling, this is supported also by the survey results described in the earlier chapters. However, with good change management and additional supporting material pointing out additional benefits for these professional groups, it could be expected that these individual stakeholder groups would be convinced on the up-scaling of the C3-Cloud services.

The picture is more diverse for the organisations employing the individual stakeholders, i.e. the primary care centres, the call centres and the hospitals. Their cumulative SER ranges from -29% for primary care centres at SWFT, the same centres having a SER of -66% at BC and -79% at RJH. Hospitals have a negative cumulative SER of 100% at BC and RJH and being slightly better off at SWFT with -61%. The main cost for primary care organisations in all three pilot sites is forgone income from reduced consultations with the MDT at primary care organisations (including both physicians and nurses) (Table 29, Table 54 and Table 75), accounting for 76% (SWFT) to 96% (RJH) of costs. Similar costs are defined for the hospitals that could potentially cash less reimbursement for their A&E unit since they experience fewer admissions due to C3-Cloud. In addition, costs for medical devices for home based self-measurements are a large cost item for the call centre or the primary care centres (depending where this cost would occur). Staff time spent on training and adaptation to using C3-Cloud are also relevant cost categories that occur in every pilot sites' organisations that are modelled in the ASSIST tool.

On the additional income side (the benefits), we see a few added telephone consultations that nurses may have due to C3-Cloud and that could potentially be billed. Also, physicians could save time during patient consultations and for care planning and collaboration with their MDT. The same is assumed for the primary care nurses and community nurse who save time for calls among the MDT and save patient home visits, respectively. In our three pilot sites, the identification and consideration of cost indicators for service implementation was rather extensive. In contrast, the identification of benefit indicators was more difficult. This is specifically true for the individual stakeholder's satisfaction with service implementation and operation, a measurement that may have been highly biased by a short technology trial duration and limited usage of the system during the trial due to the COVID situation. In consequence, we find that the SER for individual stakeholders is negative for most individual stakeholders.

Regarding the abovementioned indicators it is crucial to consider that this is a systemic view, assuming that there is “one payer” (e.g. the Ministry of Health or the NHS) that pays money based on unit costs and resource use that is actually realised or that withholds money based on saved resource use. However, reality is that the organisations may be paid differently. At SWFT we find for instance that care centres are separate business entities with a block contract determined by the numbers of patients on their books. Forgone income from avoided primary care physician consultations must not in reality translate into reduced income for that business entity. The block contract allows care centres to cash a certain number of consultations / patients with the Foundation Trust. If that number is exceeded, the additional consultations cannot be billed. Thus, if the number of consultations and home visits is reduced due to C3-Cloud, this is not a direct financial impact in the primary care centre. Instead it liberates their resources and may translate into more time available for their patients. This could in turn improve care quality (an indicator not considered in this technology trial). However, as ASSIST takes the systemic perspective, it could be expected that saved time in primary care practices may lead to renegotiations of such block contracts and thus savings to the payer (the Foundation Trust). For that reason, the main saving in all three pilot sites is with the payers (e.g. 374% SER for SWFT; 1067% for BC and 1103% for RJH).

Certainly, it needs additional research to determine if the significantly different results for C3-Cloud user’s healthcare resource use is indeed attributable to C3-Cloud usage or if it may have been confounded for instance by the COVID-19 situation. In addition, the a longer clinical trial with moderately to severely ill patients could determine additional care and clinical impacts of C3-Cloud to evaluate the impacts in even more detail than has been done in chapter 7.

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APPENDICES

10.1. C3-Cloud: First Survey for Patients

Test user were first asked to answer three basic questions, the first basic question asked about the users' age. 80% of the respondents were between the age 65-79 years of age, with 10% between 60-64, 5 % between 80-84, and ages between 85-89 and 90 or older 2.5 % each.

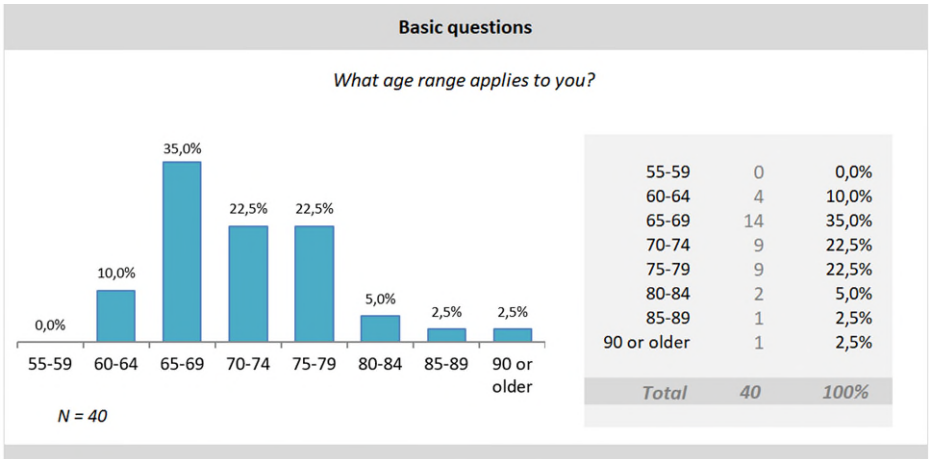


Figure 1st survey for patients, basic question (age)

The next basic question asked the Technology trial participants for their sex. Out of the 40 participants, 25 were male comprising 62.5% of the respondents, and 15 were female comprising 37.5% of the respondents.

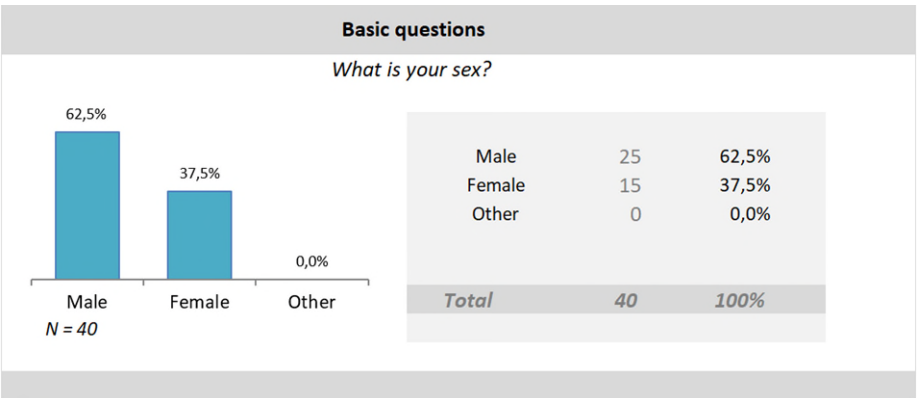


Figure 237 1st survey for patients, basic question (sex)

The third and last basic question asked the Technology trial participants about the area they lived in. Out of 40 respondents, 26 or 65% of them, were from Region Jämtland in Sweden, 9 or 22,5 % were from South Warwickshire in the UK and 5 or 12,5% were from the Basque Country in Spain.

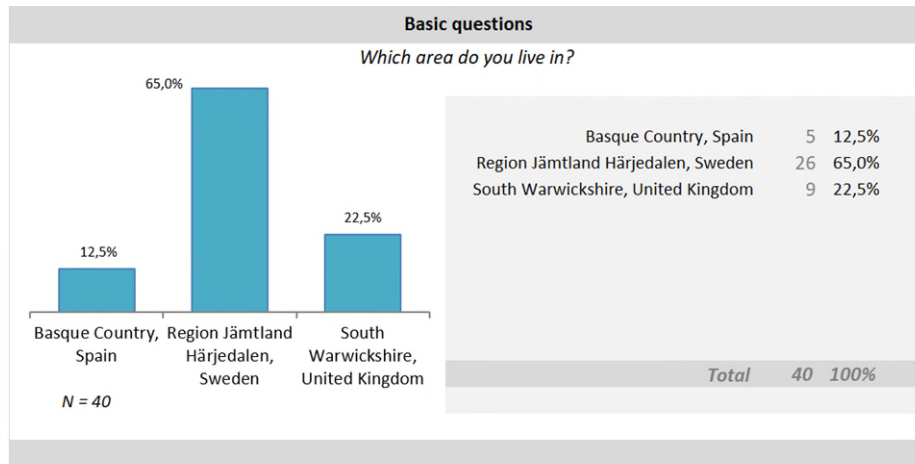


Figure 238 1st survey for patients, basic question (area)

Unified Theory of Acceptance and Use of Technology (UTAUT)

Technology trial participants were then asked whether they already had some ICT self-management experience, to which 55% replied positive and 45% negative.

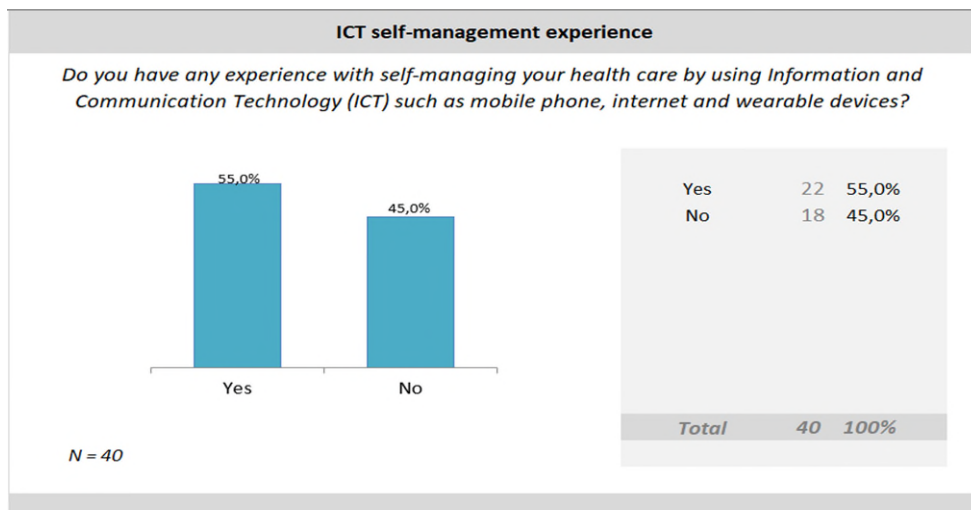


Figure 239 ICT self-management experience

Technology trial participants were then asked for their opinions about 16 statements. The users' reactions varied between colour red ("Strongly disagree") to dark green ("Strongly agree"). The below figure shows the mean ratings of almost 40 users to the statements (a-h) on a range from "Strongly disagree" to "Strongly agree".

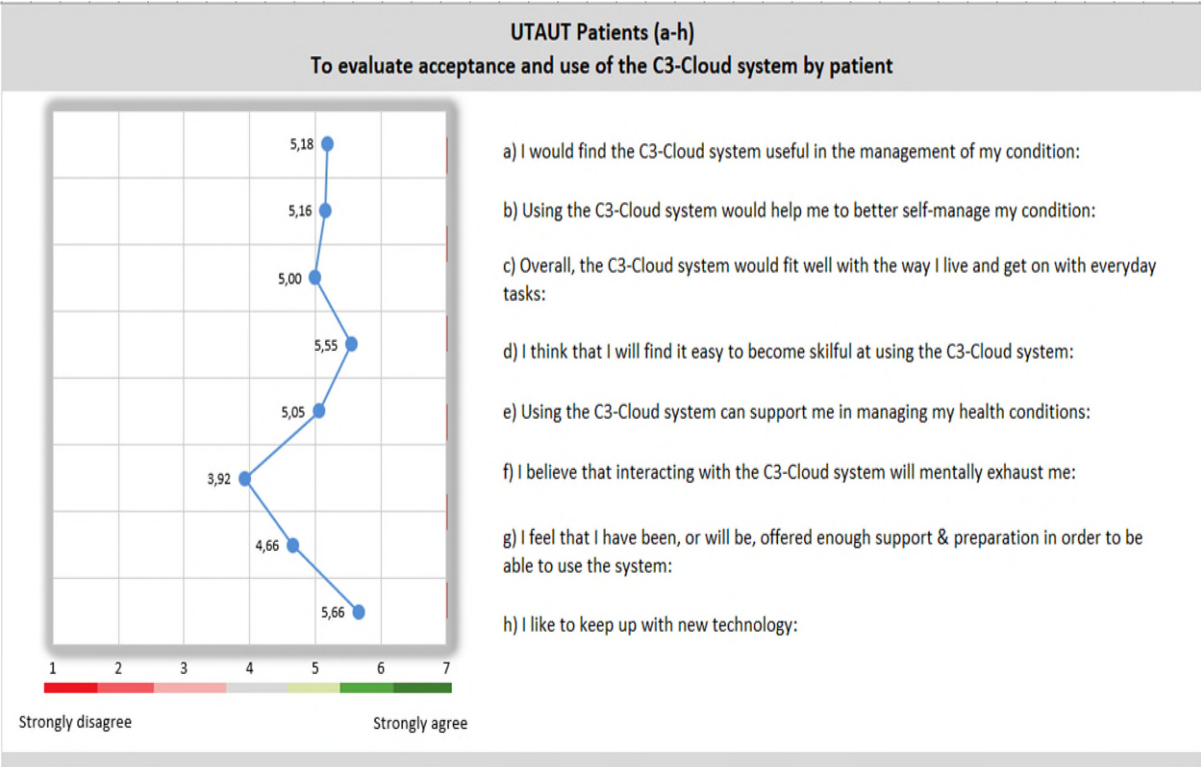


Figure 240 1st survey for patients, UTAUT (a-h)

When asked if the C3-Cloud system was found useful in the management of their condition, the system was rated an average of 5.18 with a standard deviation of 1.4 and a peak of 50% of users who agreed with the statement.

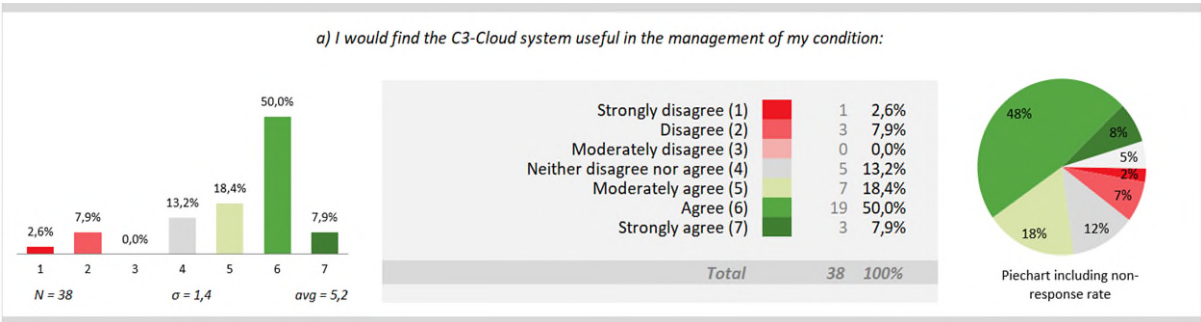


Figure 241 I would find the C3-Cloud system useful in the management of my condition

The above responses were almost repeated when the respondents were asked if the system helps them self-manage their condition better. C3-Cloud system was rated an average of 5.16, the standard deviation was 1.5 and 44.7% of the respondents agreed with the statement.

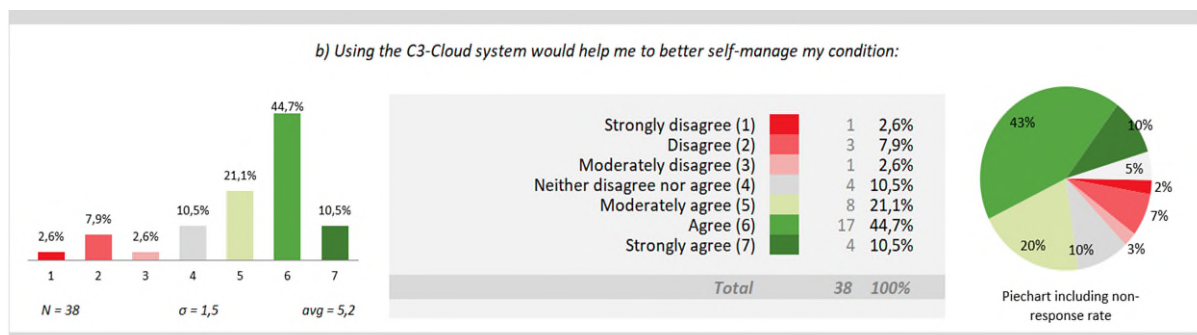


Figure 242 Using the C3-Cloud system would help me to better self-manage my condition

When asked if the C3-Cloud system fits the way the respondents live, an average of 5 showed that they almost agreed with the statement. The peak response belonged to “Agree” with 41% of the responses and the standard deviation was 1.4.

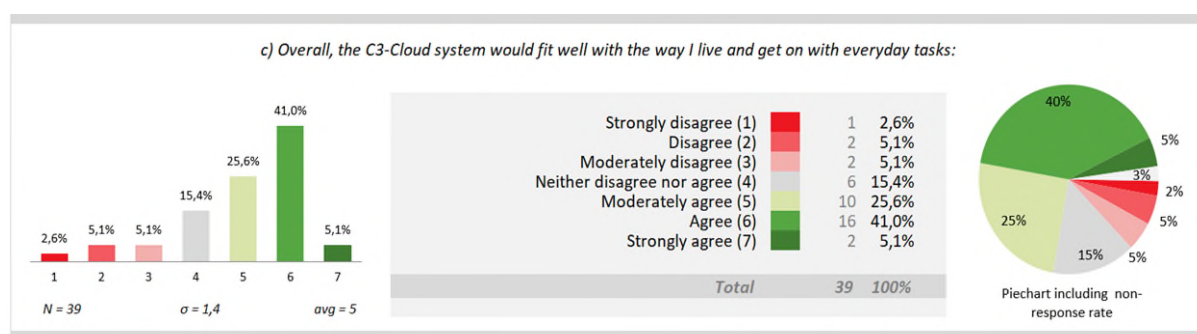


Figure 243 Overall, the C3-Cloud system would fit well with the way I live and get on with everyday tasks

An average of 5.55 for the statement (d) demonstrates that the respondents agreed with the statement. The graphs show less disagreement as the peak response belongs to “Agree” with 50%, “Moderately agree” 26.3% and “Strongly agree” with 13.2% of the responses.

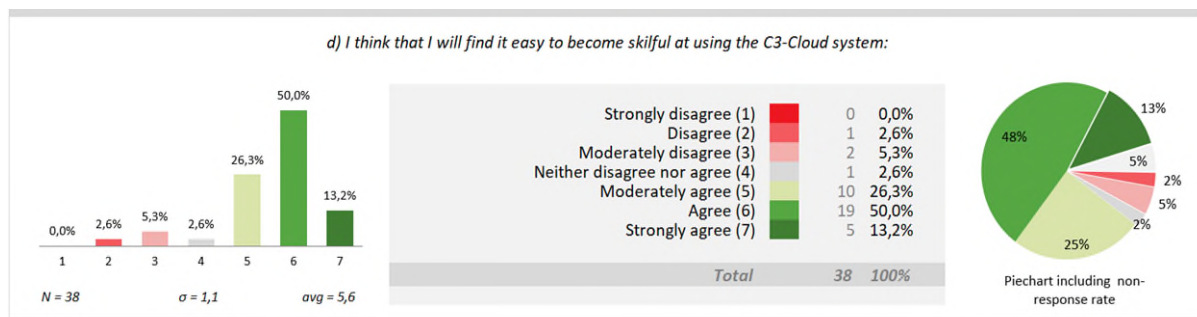


Figure 244 I think that I will find it easy to become skilful at using the C3-Cloud system

Some 10% of the respondents disagreeing with statement (e) opens the floor for a further discussion on why the standard deviation is comparatively slightly higher than the previous statements and why is it that some respondents disagreed in that the system could support them in managing their health conditions. However, with the average being 5.05 and a peak of 43.6% that belonged to “Agree”, most of the respondents showed a positive opinion on this statement.

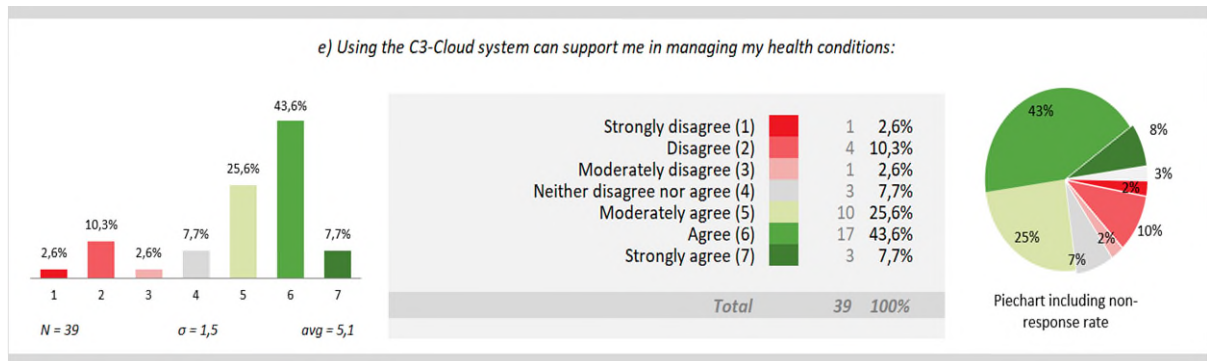


Figure 245 Using the C3-Cloud system can support me in managing my health conditions

With 5.1% “Strongly agree”, 23.1% “Agree” or “Moderately agree”, more than half of the respondents believed that the C3-Cloud system mentally exhausted them. Only 15.4% strongly disagreed and 23.15 disagreed with the statement. Knowing that most of the respondents were between 65-79 years of age, measures might need to be taken to make the system less mentally exhausting for such users.

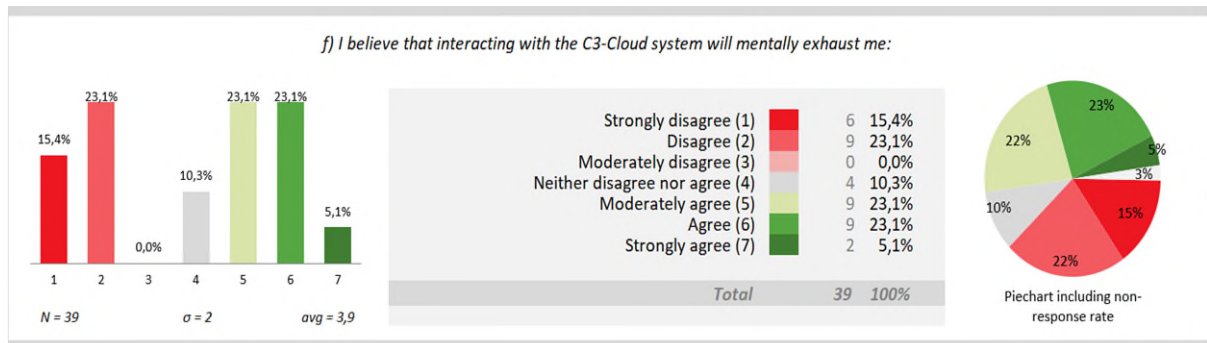


Figure 246 I believe that interacting with the C3-Cloud system will mentally exhaust me

When asked if they had been offered enough support and preparation for using the system, the standard deviation was comparatively slightly higher (1.7). Although most of the responses (36.8%) agreed with the statement, about 20% had a negative opinion of the statement, which could be interpreted as there is still more room for the support given to the respondents.

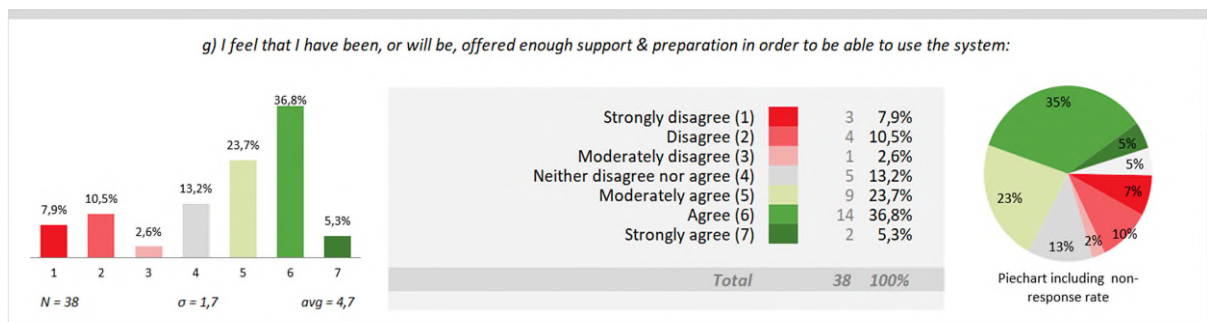


Figure 247 I feel that I have been, or will be, offered enough support & preparation in order to be able to use the system

When asked if they liked to keep up with new technology, the average was 5.66 and standard deviation 1.2 with a peak of 42.1% of the respondents agreeing with the statement, showing that most of the users had of a positive mind with regard to this statement.

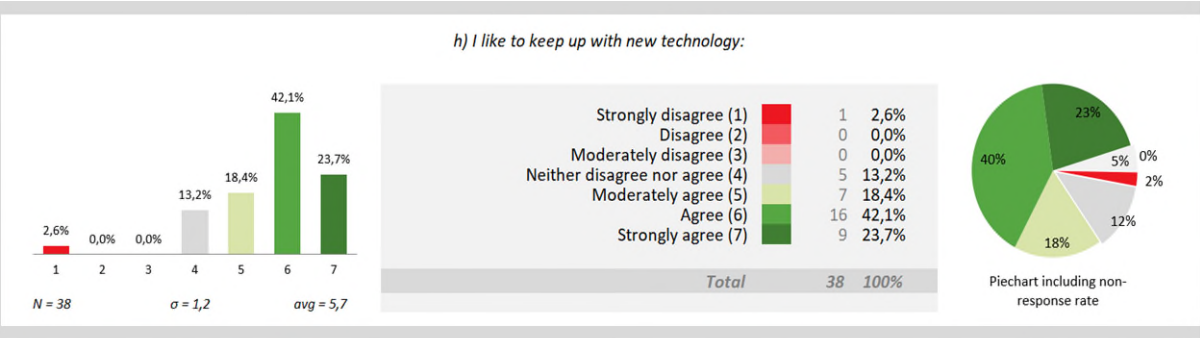


Figure 248 I like to keep up with new technology

The below figure shows the mean ratings of almost 40 users to the statements (i-p) of the same UTAUT patient questions, on a range from “Strongly disagree” to “Strongly agree”.

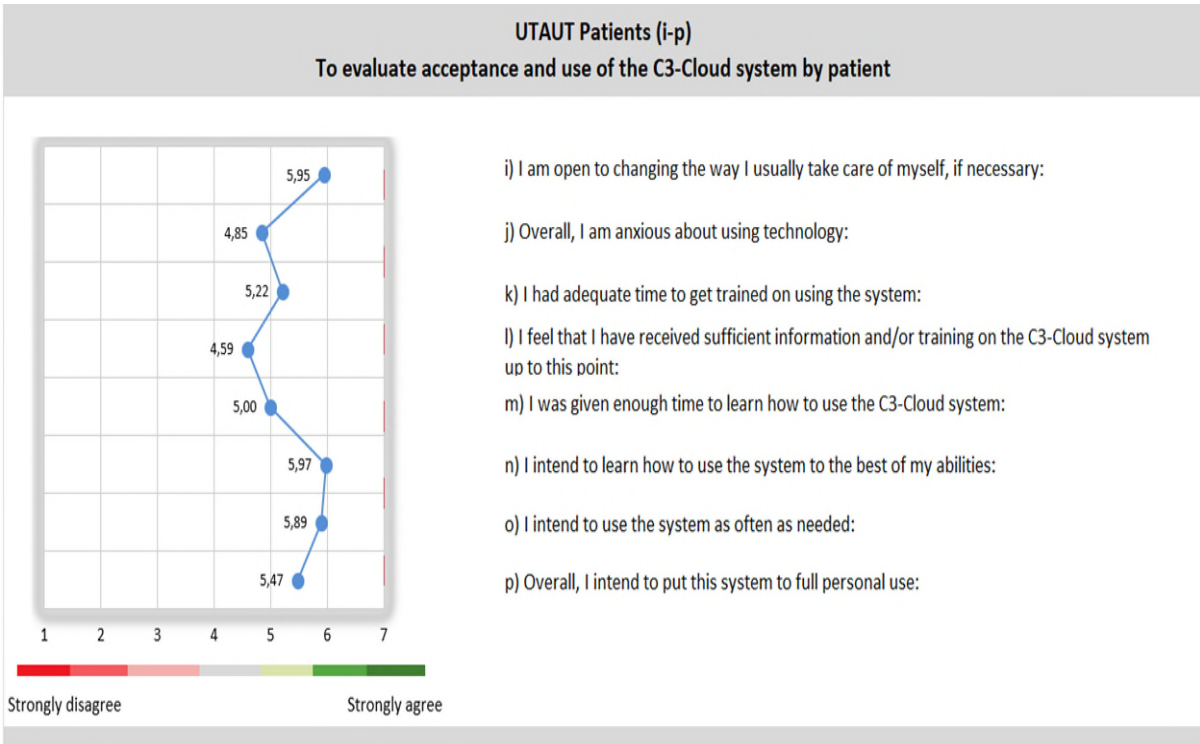


Figure 249 1st survey for patients, UTAUT (i-p)

When asked if they were open to changing the way they took care of themselves, the respondents quite unanimously agreed. With an average of 5.95 and 71.8% agreeing with the statement, most of the respondents were flexible in terms of changing their self-care ways.

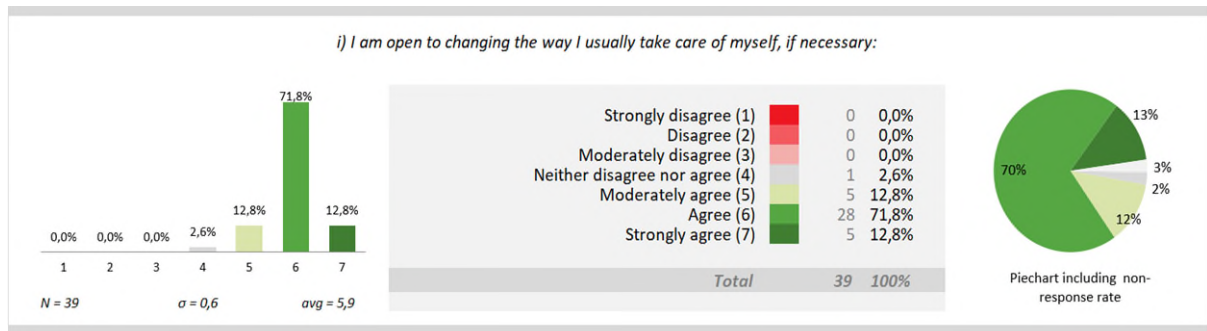


Figure 250 I am open to changing the way I usually take care of myself, if necessary

The respondents showed some level of anxiety about using technology as 48.7% of them agreed with statement (j). Although more than 20% of the respondents disagreed with the statement, an average of 4.85 demonstrates that most of the respondents felt anxious about using technology.

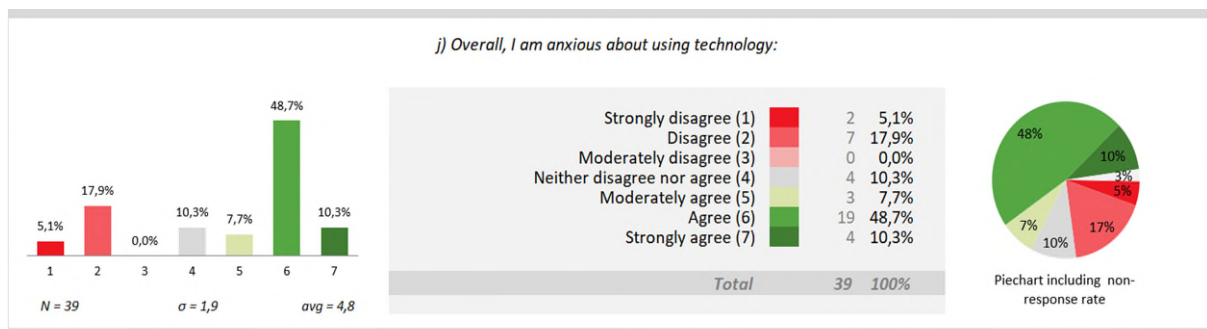


Figure 251 Overall, I am anxious about using technology

When asked if the users had enough time to get trained on how to use the system, the average of 5.22 shows that the respondents were mostly positive. The standard deviation was 1.1 and the peak of the responses was 48.6% who agreed with the statement.

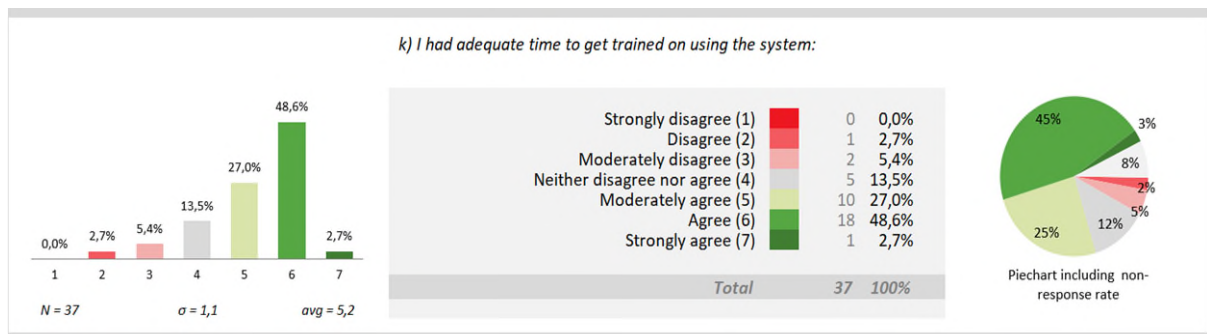


Figure 252 I had adequate time to get trained on using the system

The responses show a lean towards moderately agree to statement (l), with the average being 4.59 and a standard deviation of 1.7. However, it should not be ignored that around 25% of the responses also disagreed with the statement and 13.5% had a neutral opinion.

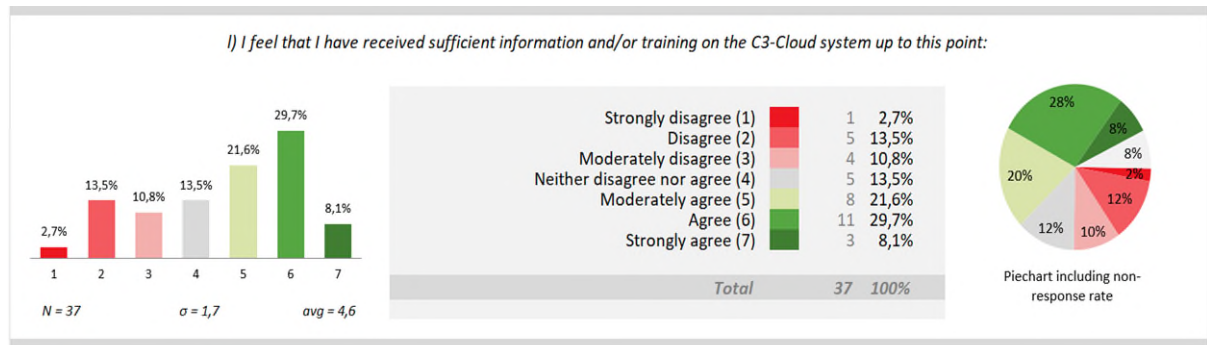


Figure 253 I feel that I have received sufficient information and/or training on the C3-Cloud system up to this point

When asked if they were given enough time to learn how to use the system, with an average of 5, the users moderately agree with the statement. Although the peak response for this statement is 37.8% agreed, the 24.3% who responded neutral should not be ignored.

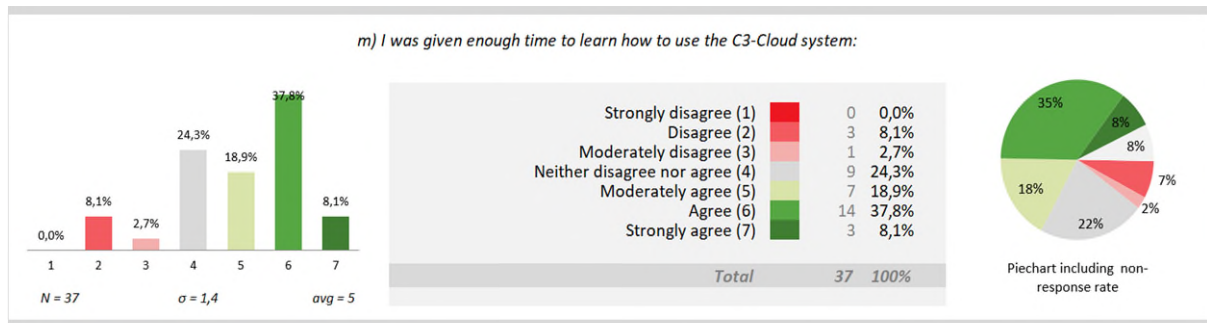


Figure 254 I was given enough time to learn how to use the C3-Cloud system

The users showed a determination in learning to use the system by 60.5% response rates agreeing to statement (n). With the standard deviation low as 0.9 and an average of 6, the respondents quite unanimously agreed with this statement.

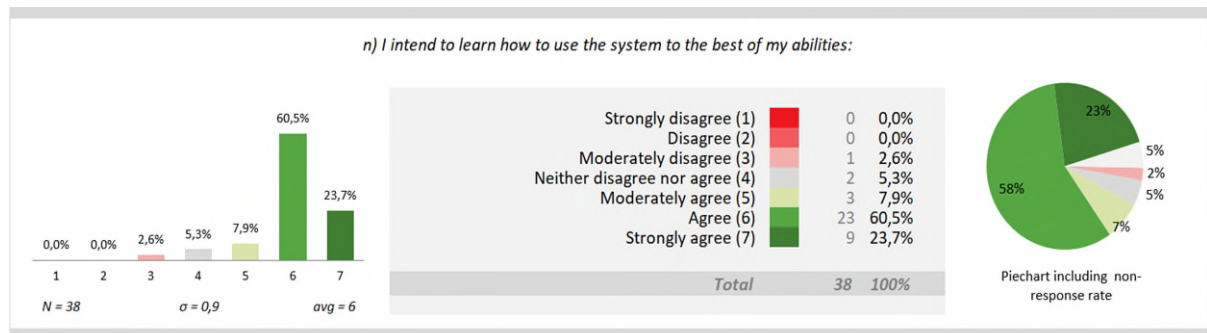


Figure 255 I intend to learn how to use the system to the best of my abilities

The same responses were almost repeated for statement (o). When asked if they intended to use the system as often as needed, and average of 5.89, a peak of 68.4% who “Agree” and 18.4% who “Strongly agree” with the statement shows that the respondents would use the system as often as needed.

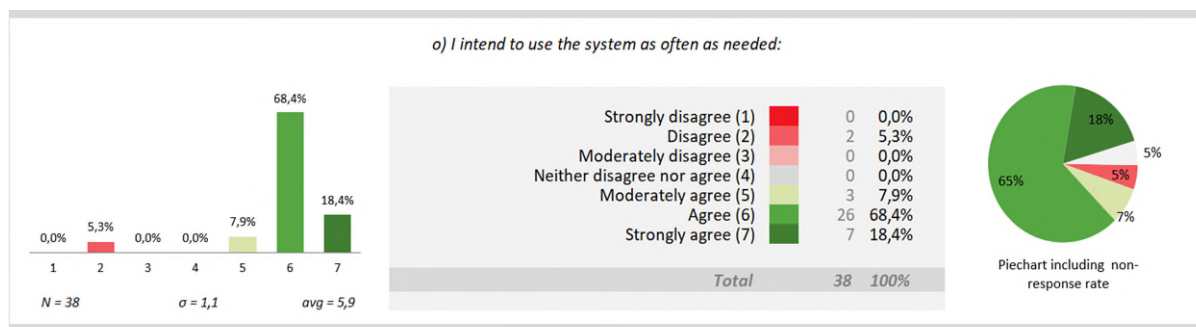


Figure 256 I intend to use the system as often as needed

The last statement was also positively rated as 47.4% of the respondents agreed with the statement and the average was 5.47, demonstrating that the respondents intended to put the C3-cloud system to full personal use.

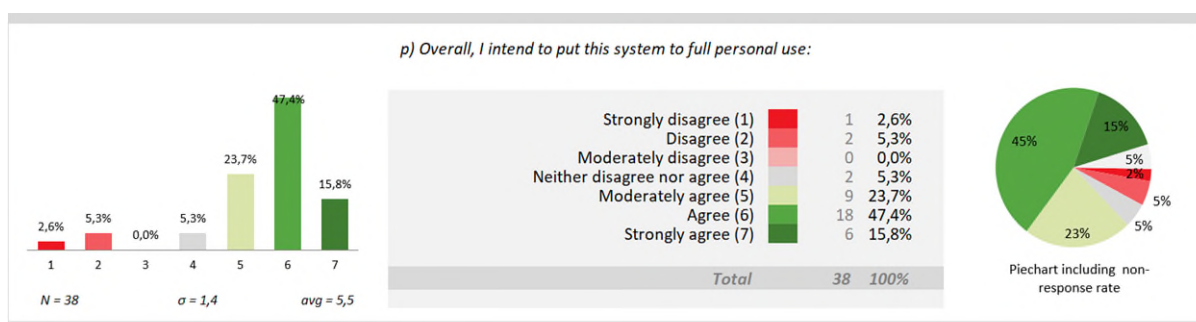


Figure 257 Overall, I intend to put this system to full personal use

Finally, and when asked if they had any further comments, the respondents gave their feedbacks which are collected in the table below, in the respondents' original language (for the English translation refer to **Table 16**; Comments number 1-16 are from the patients in RJH, therefore in Swedish language, 17-22 from SWFT and in English and comments number 23-25 from BC and in Castilian Spanish.

Comments (original language):

Swedish/RJH (1-16), English/SWFT (17-22), Castilian/BC (23-25)

- | | |
|----|---|
| 1) | PGA, sjukdom i familjen har jag inte kunnat, eller haft tid att vara så aktiv som jag velat ännu. Men jag hoppas att det ska förändras, snarast. Jag har ett flertal sjukdomar som alla kan samverka, så olika mediciner försämrar min hälsa. |
| 2) | Jag vet inte vad jag lärt mig om att använda systemet? |
| 3) | Det känns inte som det kommit igång ännu. Har varit en mycket lång process. |
| 4) | Det saknades helt instruktioner för hur jag skulle konfigurera systemet för uppkoppling. Fick senare bra support som sa att systemet redan var konfigurerat och skulle fungera utan åtgärd, men så var inte fallet. Saknar även information om hur den medlevererade mobilen kan/får eller inte får användas. |

5)	Är öppen för att lära mig, men har svårt att lita på mig själv, rädd för att göra fel. Skulle önska ytterligare en mänsklig informationsträff, den förra känns så avlägsen så man har glömt vissa saker.
6)	Spännande system hoppas att det kommer att fungera.
7)	Informationen som skulle vara i municipalitie så kom ingen och informerade,så allt blev ett stort frågetecken.
8)	Ingenting har hänt med mitt deltagande i detta projekt annat än en hel del meddelanden om att det snart är klart att användas?
9)	Mycket konstigt att projektet kan bli så försenat! Trovärdigheten till projektet har för länge sedan runnit ut. Det här måste jobba i en otrolig uppförsbacke eller så är det fel handläggare för projektet. Bara det att det sprutar ut flera mejl åt gången, gör att man blir fundersam.....
10)	Jag tycker att detta systemet verkar väldigt bra. Att det blir lättare för vårdpersonalen och en trygghet för mig.
11)	Jag tycker inte jag fått riktig klarhet i när projektet verkligen startat och hur det ska användas. Samtidigt kan kanske den informationen lämnats men där jag inte uppfattat detta.
12)	Har ingen erfarenhet av C3-Cloud-systemet. Har en hel del att lära mig. Har ej förstått vilka som är mitt vårdteam? Antar att min diabetessköterska finns med där,men vilken läkare,vet jag ej. Är det läkaren på hälsocentralen som är knuten till bostadsområde?
13)	vi kommer att logga in med jämna mellanrum för att hålla oss uppdaterade, v
14)	Det har varit svårt att få grepp om när det skulle starta och hur man kommer igång.
15)	Hittills är min erfarenhet väldigt liten. Vad jag förstår så har systemet just kommit igång, sist jag besökte sidan så hade det varit strul så det hade ej kommit igång.
16)	Min vårdplan innehåller endast en icke uppdaterad medicinlista, som jag alltid haft tillgång till. Alltså: detta är ingen vårdplan som är till någon nytta!
17)	We have had no feedback from anyone. We tend to do it once a week. You need more than an online tutorial to be able to use the system initially.
18)	The scheme started extremely late and as such I feel that I have not had the time to derive much benefit from it! I also understand that it is due to finish at the end of the month.

19)	I do not really want to save my log-in details but do find it a bit fiddly to get in each time. Inputting data becomes a bit repetitive and boring when not much changes.
20)	seems to have a lack of feedback capability from patient. - I have had an appointment with a cardiology consultant and a severe cold recently. - reporting such things may be useful.
21)	Easy to use. Graph showing blood sugar test results particularly useful.
22)	The ability to send messages is somewhat restricted, and I completed my tasks quite soon after receiving them, other than the ongoing diet recommendation, so there was little point in logging in, and when I received an email to advise of these two messages the system was down, and I have just got around to checking the site again to find two messages. I would not repeatedly log in to the system unless I had some action to report and would like to receive an email to trigger such action. Otherwise I think the advantages of such a system for Doctor or medical liaison could save a lot of surgery time.
23)	Me resulta el sistema bastante útil e interesante,dando fluidez a la comunicación con el equipo,marcando las pautas necesarias para el bienestar del paciente a su debido momento.
24)	El sistema C3-Cloud me parece que es un programa interesante. Porque te permite estar en contacto con el médico las 24 horas del día y poder intercambiar ideas en base a la enfermedad existente.
25)	El sistema te aleja de la presencia del medico.

Table 91 1st survey for patients, UTAUT general comments, original language

10.2. C3-Cloud: First Detailed Survey for Patients

Test user were first asked to answer three basic question. The first basic question asked about the users' age. 39% of the respondents were between the age 70-74 years of age, with 22.2% between 75-79, and ages between 60-64 and 85-89 5.6 % each. 16.7% of the respondents were 90 or older.

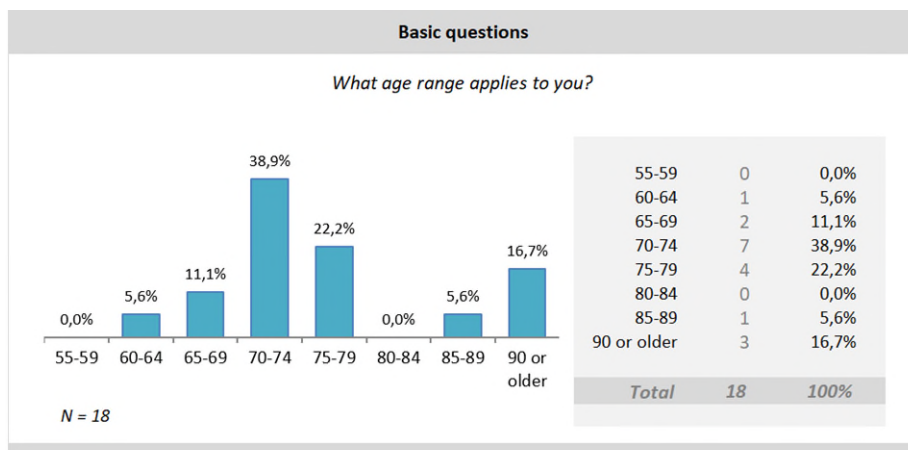


Figure 258 1st detailed survey for patients, basic question (age)

The next basic question asked the Technology trial participants for their sex. Out of the 18 participants, 14 were male comprising 77.8% of the respondents and 4 were female comprising 22.2% of the respondents.

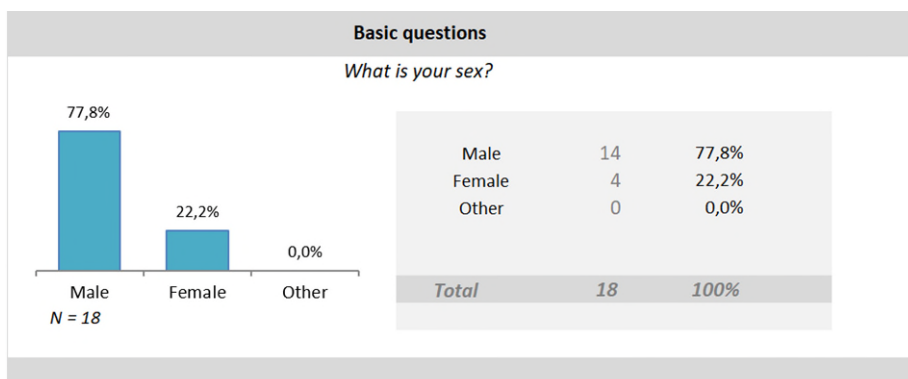


Figure 259 1st detailed survey for patients, basic question (sex)

The third and last basic question asked the Technology trial participants about the area they live in. Out of 18 respondents, 5 or 27.8% of them, were from Region Jämtland in Sweden, 9 or 50% were from South Warwickshire in the UK and 4 or 22,2% were from the Basque Country in Spain.

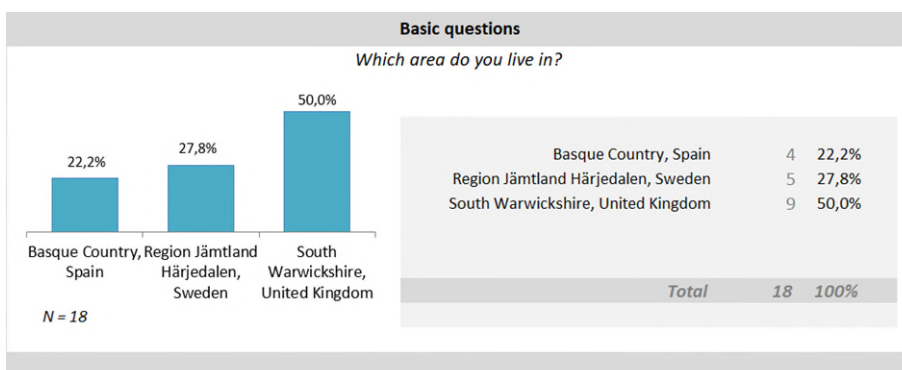


Figure 260 1st detailed survey for patients, basic question (area)

Patient Questionnaire

Technology trial participants were then asked for their opinions about four statements. The users' reactions were designed to be between colour dark red ("Strongly disagree") to dark green

(“Strongly agree”). The figure below shows the mean ratings of 18 users to the statements (a-d) on a range from “Strongly disagree” to “Strongly agree”.

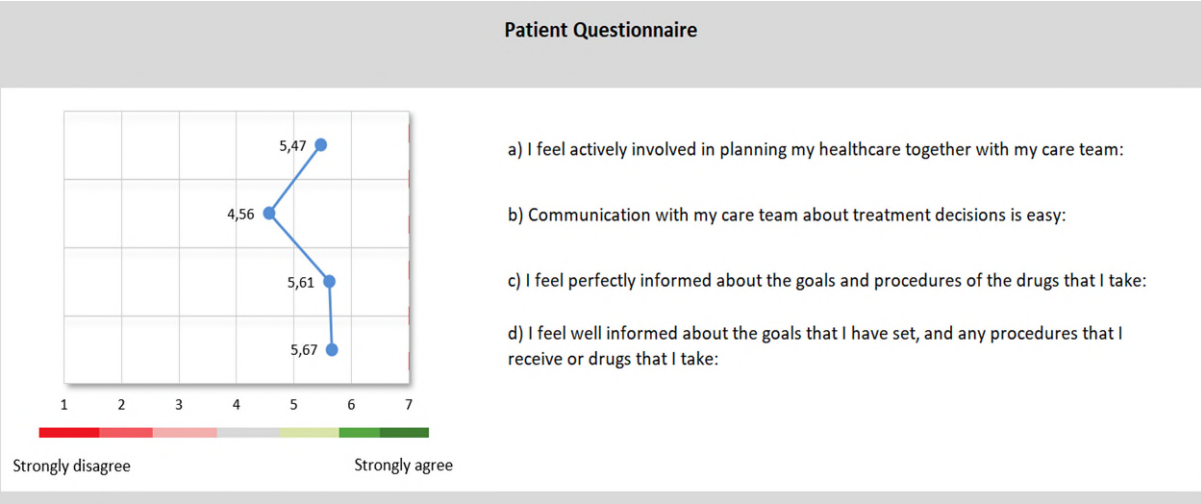


Figure 261 1st detailed survey for patients, patient questionnaire

When asked if they felt actively involved in planning their healthcare together with their health team, the users rated the statement an average of 5.47 with a standard deviation of 1.2 and peak rating belonging to “Moderately agree” and “Agree”. Although the users agreed with the statement in general, 11% of the users moderately disagreed with the statement and one user thought it was not relevant.

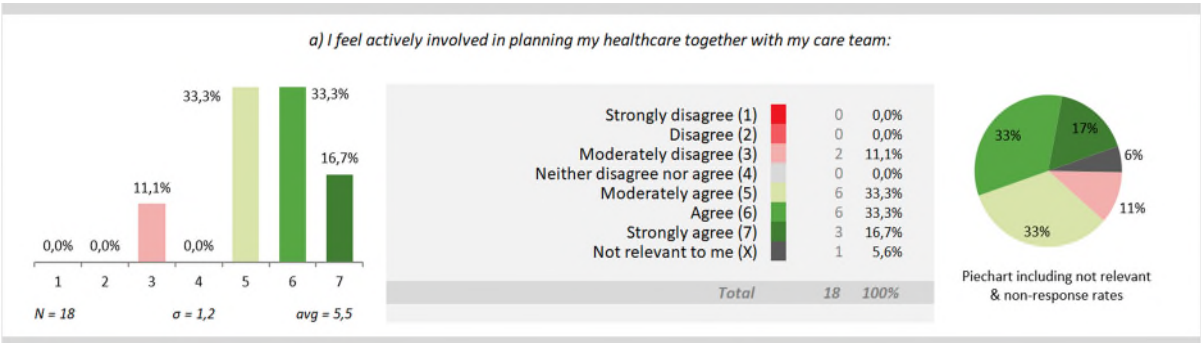


Figure 262 I feel actively involved in planning my healthcare together with my care team

When asked if the communication with their care team was easy, an average of 4.56 shows that they almost agreed with the statement, and the standard deviation was 1.4. However, the peak response belonged to “Neither disagree nor agree” with 35.3% of the responses, and 5.9% also thought that the question was not relevant to them.

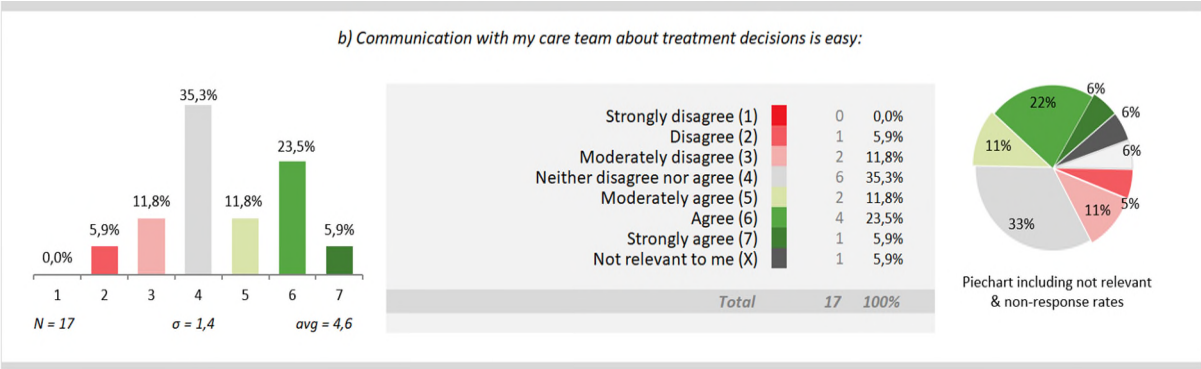


Figure 263 Communication with my care team about treatment is easy

When asked if they felt informed about the goals and procedures of the drugs they took, the users rated the statement an average of 5.61 with a standard deviation of 1.4 and peak rating belonging to “Agree” and “Strongly agree”.

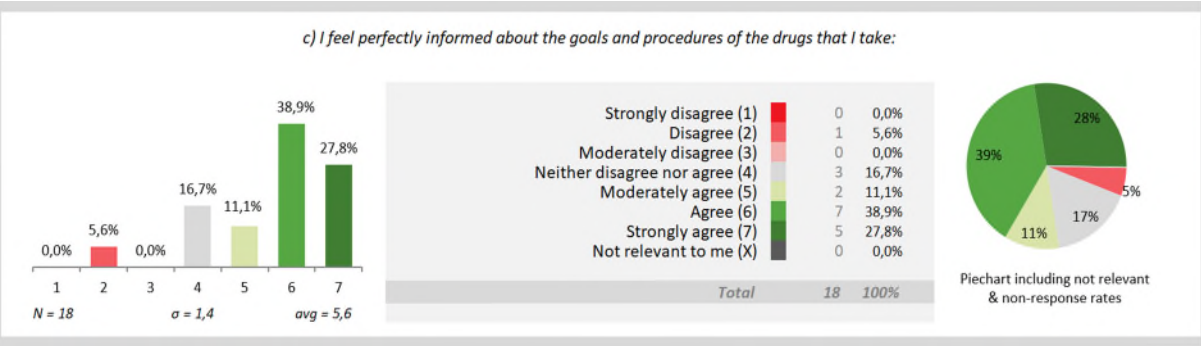


Figure 264 I feel perfectly informed about the goals and procedures of the drugs that I take

When asked if they felt informed about the goals that they set and the procedures they received of the drugs they took, the users rated the statement an average of 5.67 with a standard deviation of 1.2 and resulting graphs that leaned towards agreement.

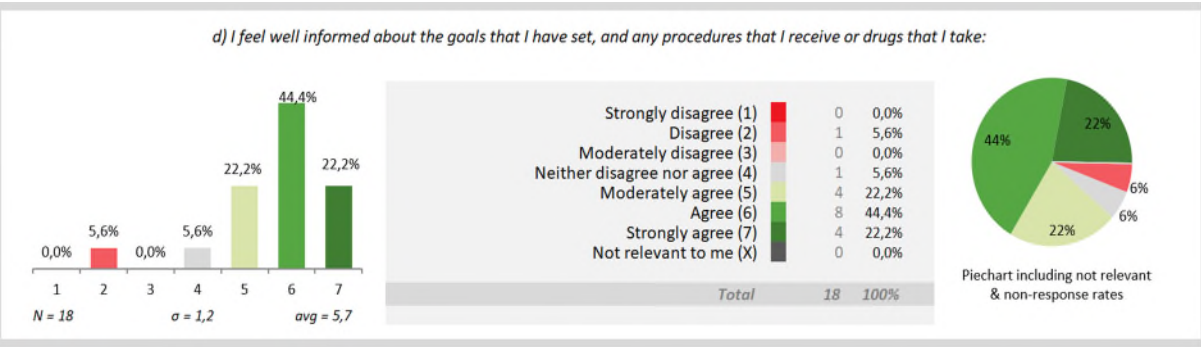


Figure 265 I feel well informed about the goals that that I have set and the procedures I received or drugs that I take

Questionnaire for User Interaction Satisfaction 7 (QUIS7)

Technology trial participants were asked to rate their satisfaction with the system on a scale from 0-9. The figure below shows the mean ratings of 18 users' impressions to the first group of statements (a-k).

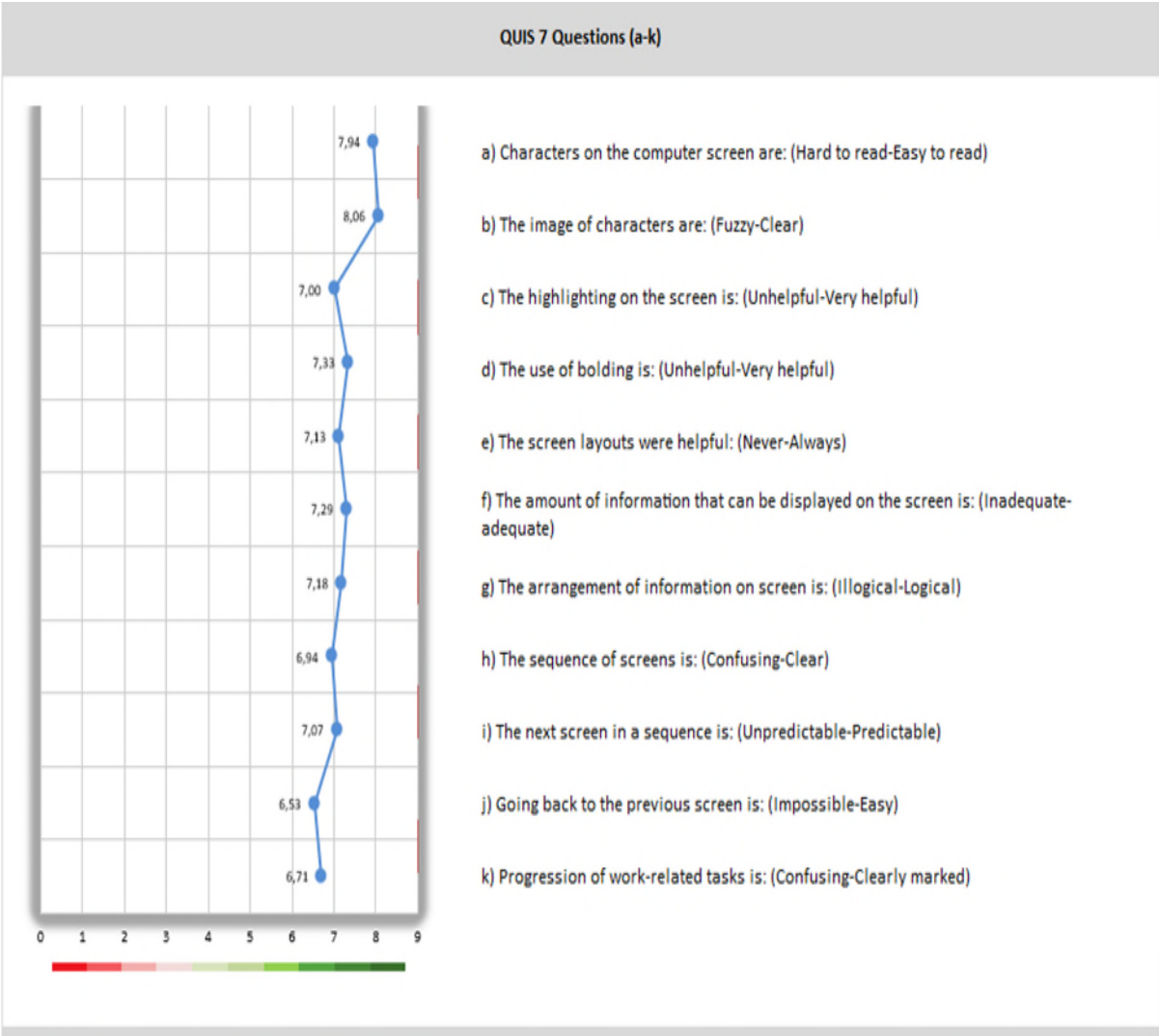


Figure 266 1st detailed survey for patients, QUIS7 (a-k)

When asked to rate the characters on the computer screen from “Hard to read” to “Easy to read”, the statement was rated an average of 7.9 with a standard deviation of 1.2. With 43.8% of the respondents thought the characters were easy to read, and the rest rating it positively, the ratings leaned toward the characters being easy to read for the users.

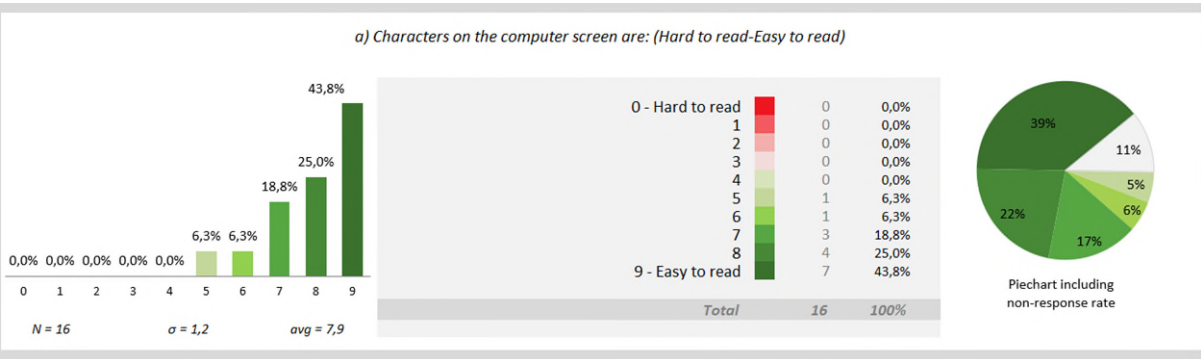


Figure 267 Characters on the computer screen are: [Hard to read|Easy to read]

The respondents also rated the image of characters as “Clear” by a peak of 50%. With no user rating the statement towards “Fuzzy”, an average of 8.1, and standard deviation of 1.2, the users quite unanimously believed that the image of characters were clear.

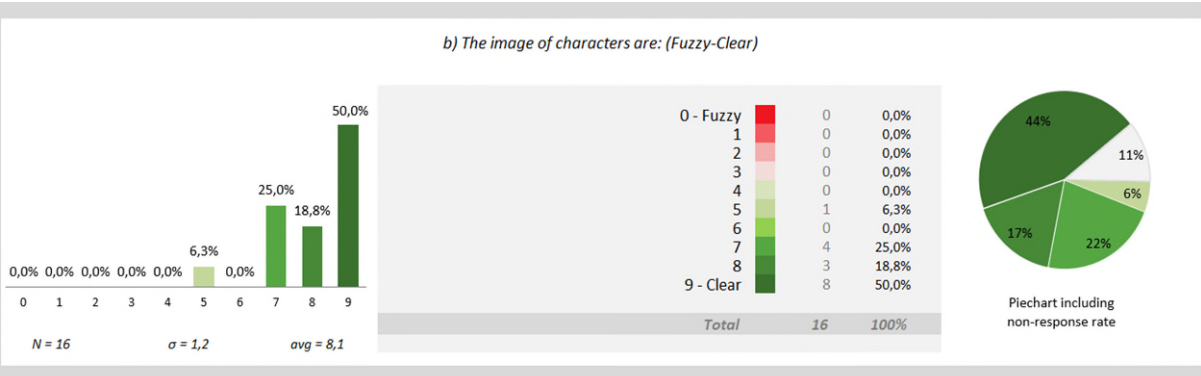


Figure 268 Image of characters are: [Fuzzy|Clear]

When asked to rate whether the highlighting on the screen was “Unhelpful” or “Very helpful”, the statement was rated an average of 7 with a standard deviation of 2.1. Although 7.1% of the respondents thought the screen highlighting was quite unhelpful, the ratings leaned toward the other direction with a peak of 42.9% rating the statement a 7 and 28.6% a 9. A comparatively higher non-response rate of 22% should also be noted in the pie chart.

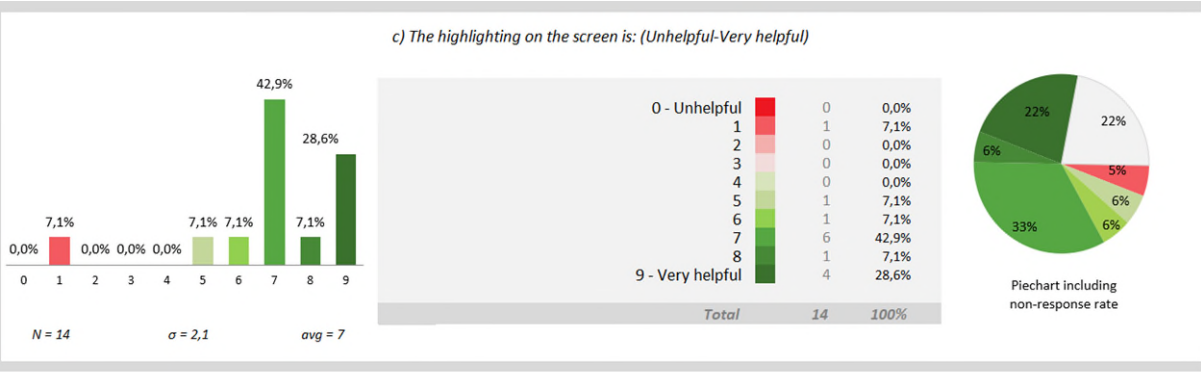


Figure 269 The highlights on the screen is: [Unhelpful|Very helpful]

As for the statement measuring the users’ level of satisfaction with the use of bolding, and a peak of 40% of the users who rated the statement as “Very helpful”, and the rest of the ratings being within the green range which lead to an average of 7.3, the chart leaned toward the green range. However, one user rated this statement as quite unhelpful and left a comment (see comment 1 in **Table 92**). A comparatively higher non-response rate of 17% should also be noted in the pie chart.

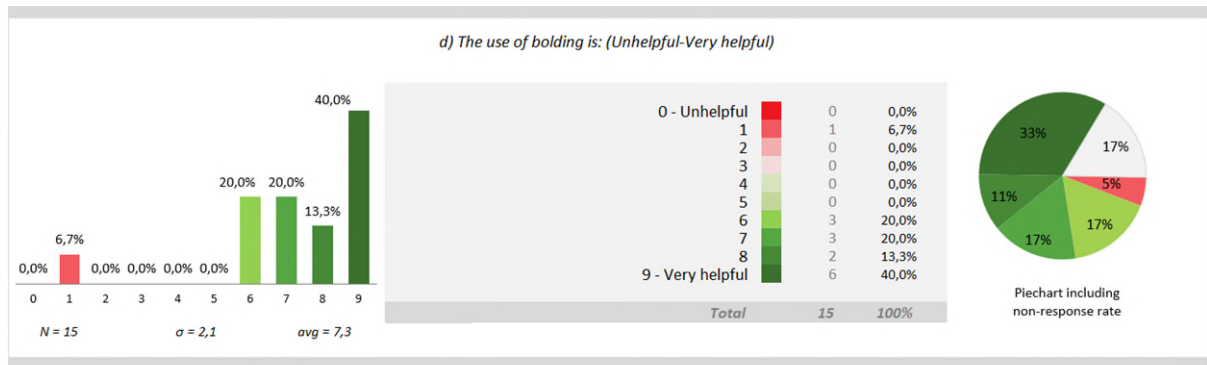


Figure 270 The use of bolding is: [Unhelpful|Very helpful]

When asked if they found the screen layouts helpful, the average was 7.1 and a standard deviation 2.2, which shows that most of the users found the screen layouts almost always helpful; However, one user rated this statement as quite unhelpful and left a comment (see comment 2 in **Table 92**).

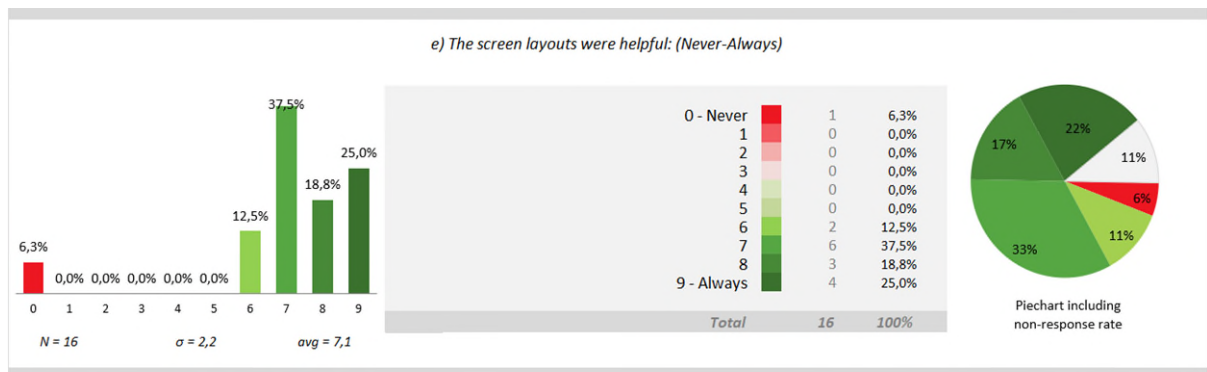


Figure 271 The screen layouts were helpful: [Never|Always]

As for the statement asking the users if they found enough information displayed on the screen, the average was 7.3 and the standard deviation 2, demonstrating that most of the users thought sufficient information was displayed on the screen. However, 5.9% of the users rated this statement as quite unhelpful and left a comment (see comment 3 in **Table 92**).

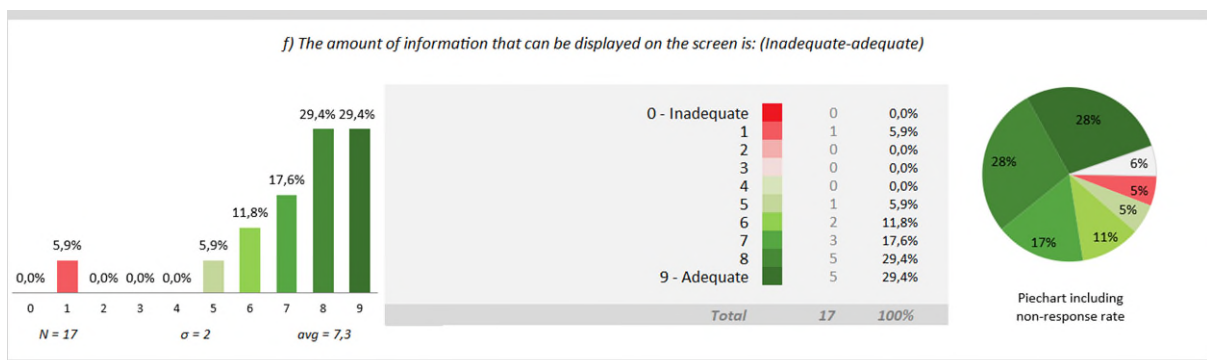


Figure 272 The amount of information that can be displayed on the screen is: [Inadeqaute|Adequate]

As for the arrangement of information on the screen, a mean of 7.2 and a standard deviation of 1.8 demonstrates that most of the users believed that the information on the screen was arranged in a logical manner. Still, 5.9% of the users believed that such an arrangement was illogical and explained it in a comment (see comment 4 in **Table 92**).

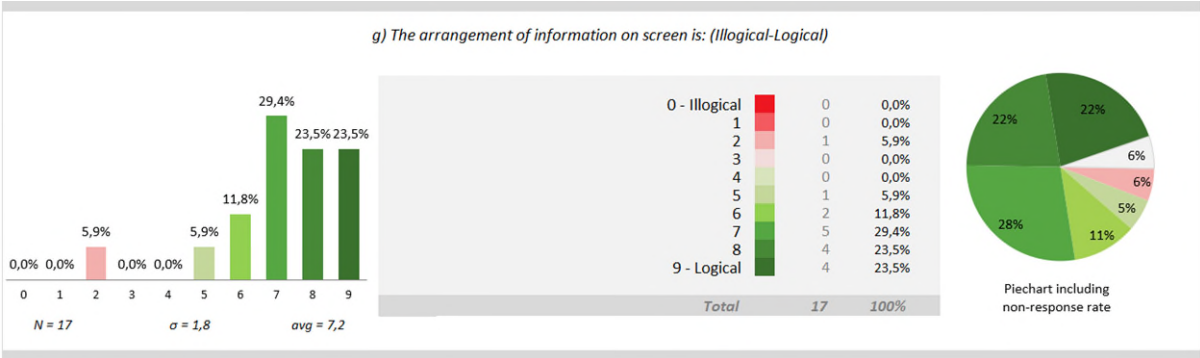


Figure 273 The arrangement of information on screen is: [Illogical|Logical]

When asked about the sequence of screens, the average was 6.9 and the standard deviation 1.9. The peak rating belonged to 7 (37.5%) and one user rated this statement as quite confusing and left a comment (see comment 5 in **Table 92**).

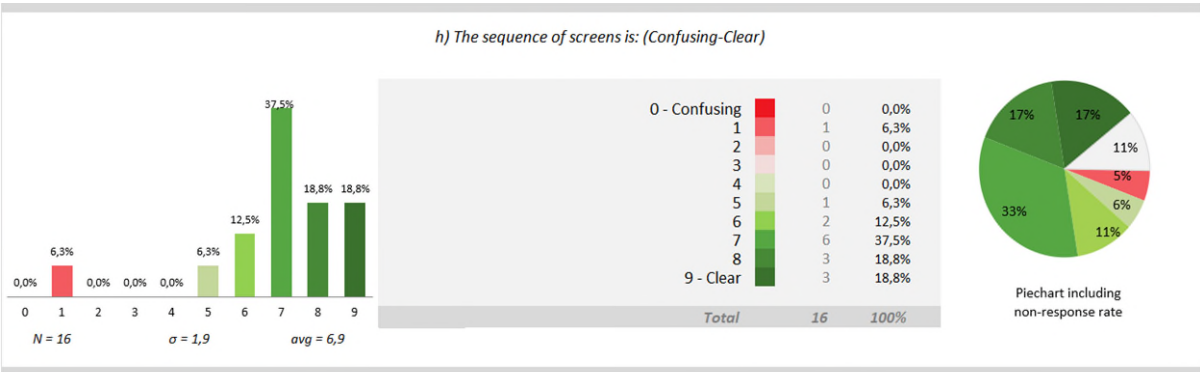


Figure 274 The sequence of screen is: [Confusing|Clear]

With an average of 7.1 and a standard deviation of 2.1, statement (i) that assessed if the next screen in a sequence is predictable or not, was leaning towards “Predictable”. Only one user thought they were quite unpredictable and left a comment (see comment 6 in **Table 92**). A comparatively higher non-response rate of 17% should also be noted in the pie chart.

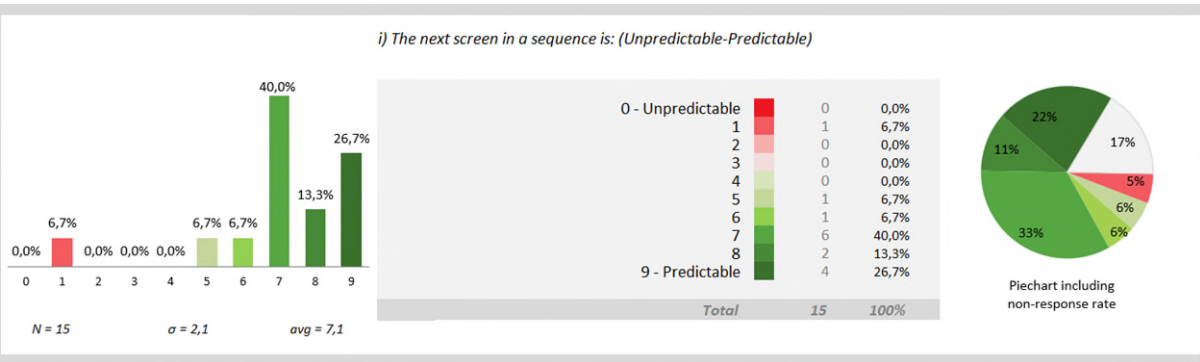


Figure 275 The next screen in a sequence is: [Unpredictable|Predictable]

Statement (j) assessed if going back to the previous screen was easy. The average showed 6.5, which means most of the users believed this action to be easy. In spite of this, some users believed that it was either impossible or difficult to go to the previous screen and left their comments (see comment 7 in **Table 92**).

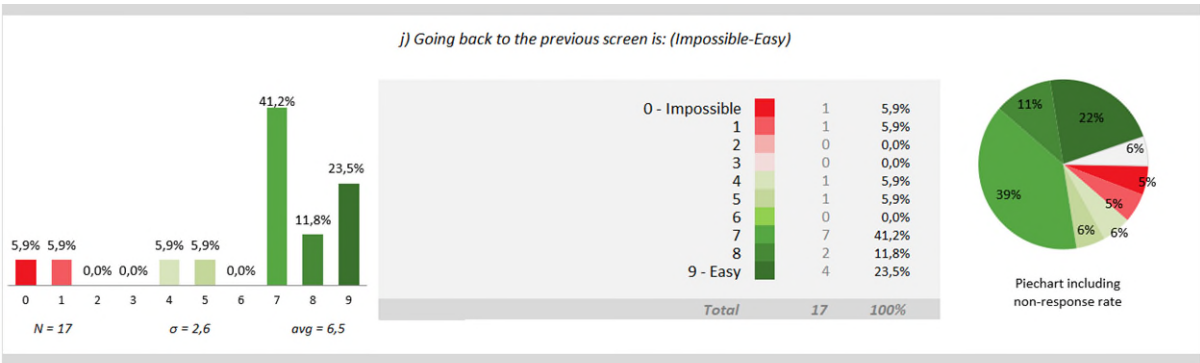


Figure 276 Going back to the previous screen is: [Impossible|Easy]

When asked to point out if they found the progression of the work-related tasks “Confusing” or “Clearly marked”, the average was 6.7 and standard deviation hovered on 2.8. 11.8% of the users believed that the work related tasks’ progression was confusing (see comment 8 in **Table 92**).

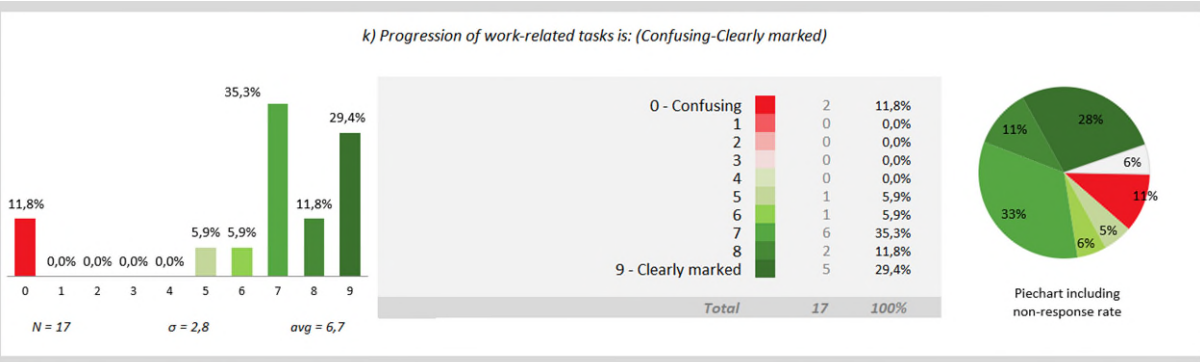


Figure 277 Progression of work-related tasks is: [Confusing|Clearly marked]

Figure below shows the mean ratings of 18 users’ impressions to the second group of statements (l-r).

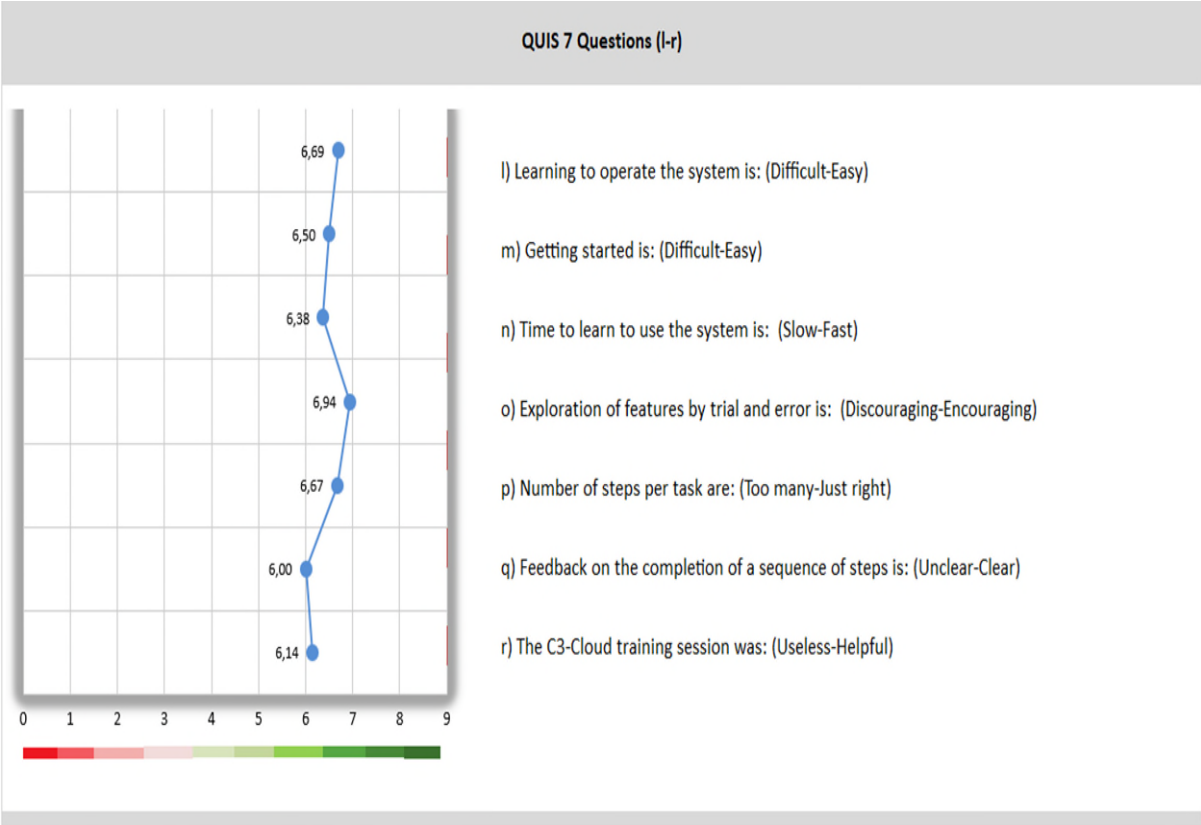


Figure 278 1st detailed survey for patients, QUIS7 (l-r)

When asked to say if they found it “Difficult/Easy” to learn to operate the system, most of the users believed that the system was easy to operate and hence the average was 6.7 and the standard deviation 2.2. Despite such ratings, there were some users who found it difficult and left their comments (see comment 9 in **Table 92**).

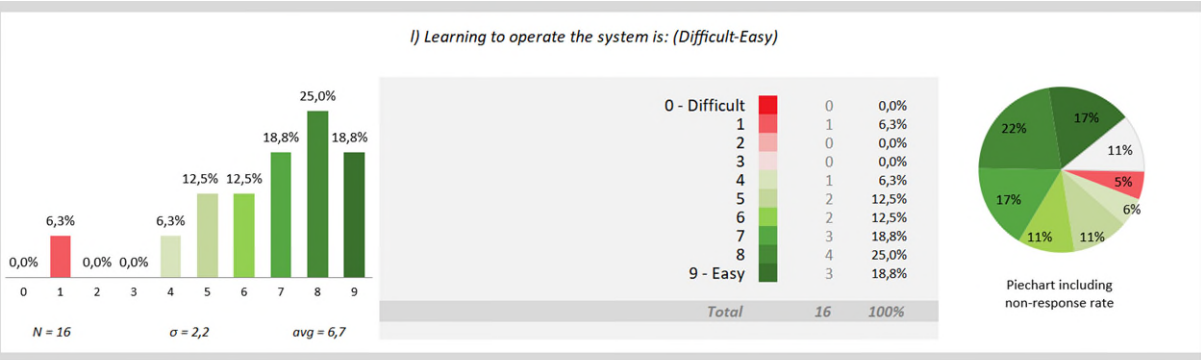


Figure 279 Learning to operate the system is: [Difficult|Easy]

An average of 6.5 and a standard deviation of 2.3 demonstrated that getting started was almost easy for the users. Some users also found it not easy and left their comments (see comment 10 in **Table 92**).

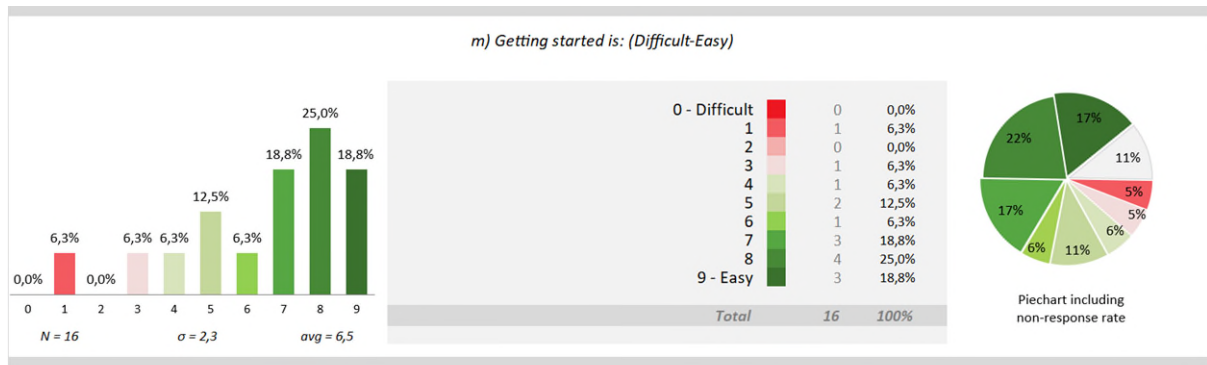


Figure 280 Getting started is: [Difficult|Easy]

When the users were asked if they could learn how to use the system fast or slow, the peak of the responses showed number 7 with 31.3% and the average was 6.38, which shows that they could learn how to use the system quite fast. In spite of this, some users thought it was not fast for them to learn the system usage and left their comments (see comment 11 in **Table 92**).

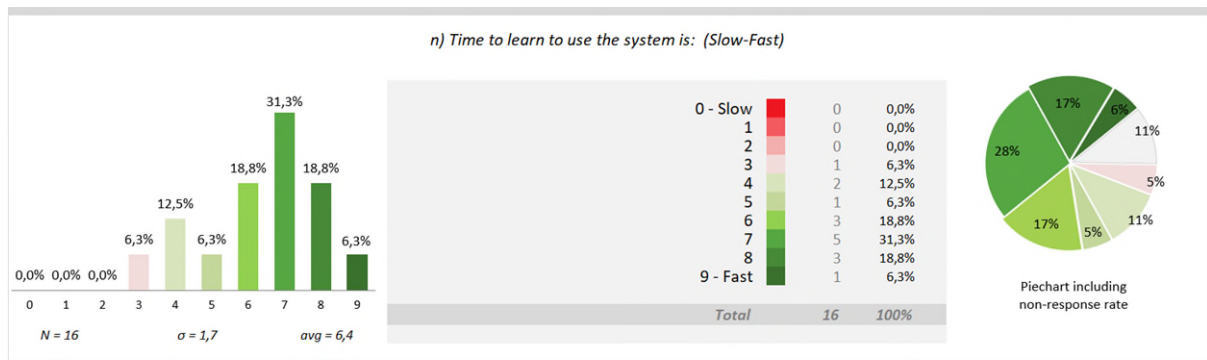


Figure 281 Time to learn to use the system is: [Slow|Fast]

Users' opinion of whether the exploration of features by trial and error was encouraging or not was predominantly positive by 50% of the users rating it an 8 and 9, and an average of 6.94. Two comments were also left (see comment 12 in **Table 92**).

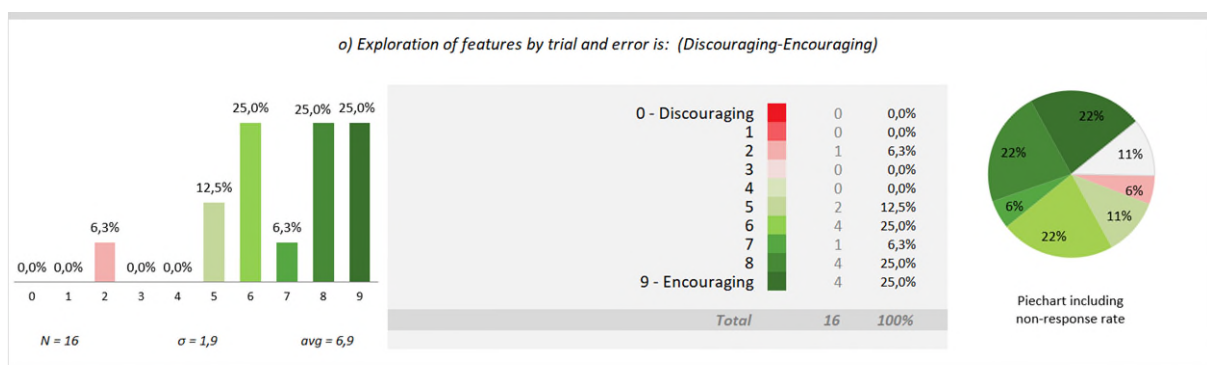


Figure 282 Exploration of features by trial and error is: [Discouraging|Encouraging]

By an average of 6.67 and more than 50% of the users rating number of steps per task 6 and above, the rating leaned towards "Just right". It should also be noted that the non-response rate for this question was 17% in the pie chart. Three comments were also left (see comment 13 in **Table 92**).

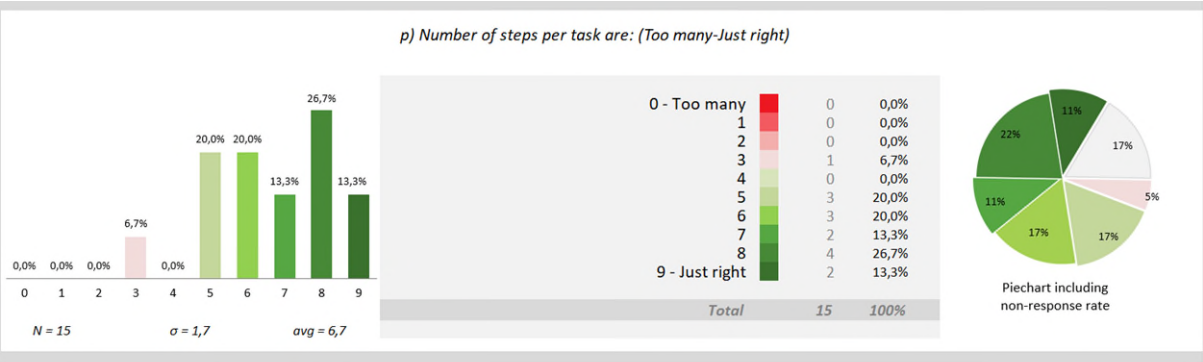


Figure 283 Number of steps per task are: [Too many|Just right]

When asked if they got clear feedback on the completion of a sequence of steps, number 7 showed a peak by 28.6% and the average was 6. Despite most of the users rating the feedbacks as quite clear, around 30% believed the opposite and some left their comments (see comment 14 in **Table 92**). A comparatively higher non-response rate of 22% should also be noted in the pie chart.

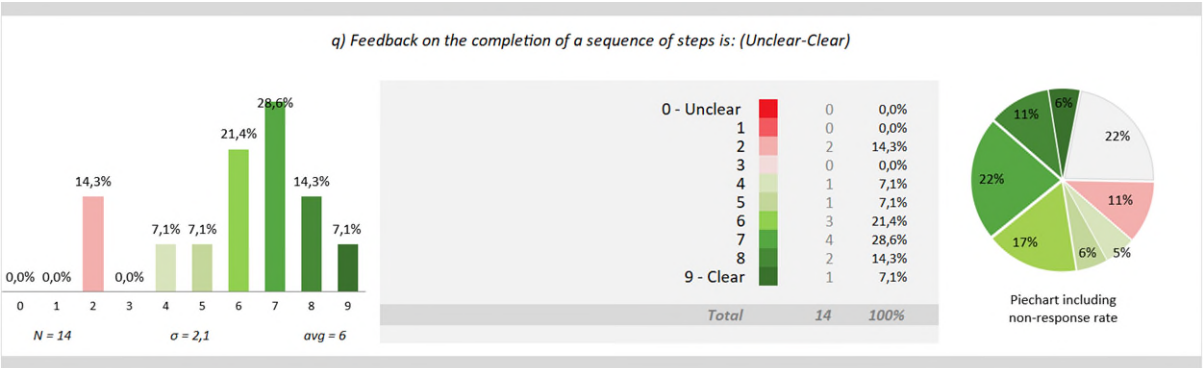


Figure 284 Feedback on the completion of a sequence is: [Unclear|Clear]

To the question if the C3-Cloud training session was useful or nor, an average of 6.14 demonstrates that the users found the training session quite useful; however, some users thought it was not useful and left four comments for the improvement of this part (see comment 15 in **Table 92**). A comparatively higher non-response rate of 22% should also be noted in the pie chart.

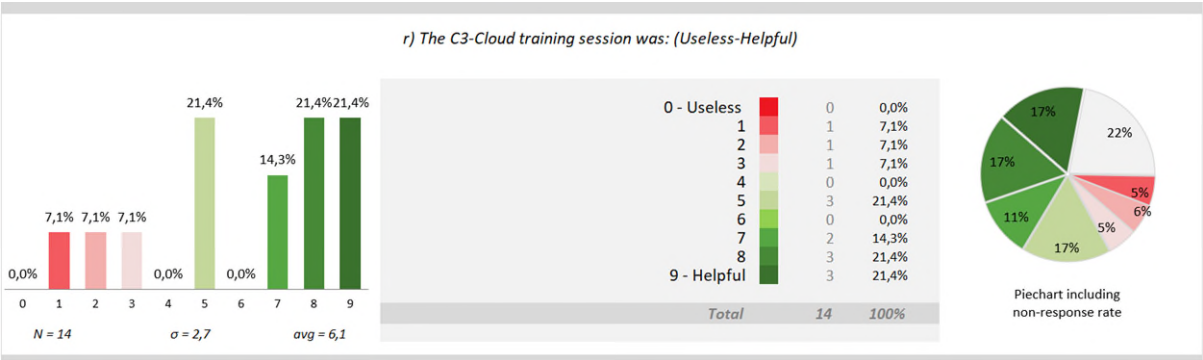


Figure 285 The C3-Cloud training session was: [Useless|Helpful]

Table below shows comments in original language (Swedish, Castilian and English), of those users who rated the question 0-5. For the English translation refer to **Table 17**.

Comments related to the statements (original language)

1)	<p>The use of bolding is: [Unhelpful Very helpful]</p> <ul style="list-style-type: none"> Förstår inte vad frågan "fetstil" har med projektet att göra?
2)	<p>The screen layouts were helpful: [Never Always]</p> <ul style="list-style-type: none"> Mi criterio es que la información que recogen es insuficiente para que el profesional médico pueda sacar conclusiones reales sobre las mediciones que el paciente envía. Dichas mediciones están sometidas a cambios en función de otros parámetros que ustedes desconocen y que se deberían recoger en la pantalla de captura de datos. Yo recojo datos para el Endocrino y para Nefro, en la que apporto mas información que la que apporto este estudio.
3)	<p>The amount of information that can be displayed on the screen is: [Inadequate Adequate]</p> <ul style="list-style-type: none"> La contestación la tienen en la pregunta anterior.
4)	<p>The arrangement of information on screen is: [Illogical Logical]</p> <ul style="list-style-type: none"> La contestación la tienen en la pregunta anterior.
5)	<p>The sequence of screen is: [Confusing Clear]</p> <ul style="list-style-type: none"> La contestación la tienen en la pregunta anterior.
6)	<p>The next screen in a sequence is: [Unpredictable Predictable]</p> <ul style="list-style-type: none"> La contestación la tienen en la pregunta anterior.
7)	<p>Going back to previous screen is: [Impossible Easy]</p> <ul style="list-style-type: none"> När jag backar med bakåtpil måste jag börja om från början La contestación la tienen en la pregunta anterior. Have not had to go back to a previous screen.
8)	<p>Progression of work-related tasks is: [Confusing Clearly marked]</p> <ul style="list-style-type: none"> Då detta är det första meddelande jag får från C3 och då jag måste googla på progression upplever jag det som förvirrande! La contestación la tienen en la pregunta anterior.
9)	<p>Learning to operate the system is: [Difficult Easy]</p> <ul style="list-style-type: none"> Jag vet inte vad jag lärt mig om systemet, jag tycker att det har dragit ut på tiden och jag vet inte om jag har fått några "övningsuppgifter" om att lära mig systemet. Som jag skrev tidigare, är det första meddelandet jag kunnat öppna från C 3 är därför svårt att redan betygsätta systemet. Once you start using it is easy, but you could use more instruction when you first start using it.
10)	<p>Getting started is: [Difficult Easy]</p> <ul style="list-style-type: none"> Jag vet inte hur jag kommer igång! Se föregående svar!! Email links did not work - I had to key in the link to get started
11)	<p>Time to learn to use the system is: [Difficult Easy]</p> <ul style="list-style-type: none"> Vet ej... Åter se föregående svar,men det är möjligt jag kan ha missat någon information tidigare. La necesidad de hacer un pequeño diagrama de secuencias de utilización.

12)	Exploration of features by trial and error is: [Difficult Easy] <ul style="list-style-type: none"> • Vet inte hur jag upptäcker funktionerna. • What do you mean, cannot remember much use of trial and error?
13)	Number of steps per task are: [Too many Just right] <ul style="list-style-type: none"> • Vet inte vad kommandon är. • Se podía hacer un registro para recoger toda la información sobre glucosa, tensión y peso. Además sería interesante de que cuando se mete información la primera vez en el día se pueda recuperar en modo edición a lo largo del mismo para introducir más datos a lo largo del mismo día. De todas formas esto lo supedito a una prueba que voy hacer y saber si en un día que he metido información por la mañana puedo editar el mismo día al día siguiente y aportar más información. Hasta ahora veo que se puede recuperar un día en él que no se metido nada e introducir la información atrasada, • This is a median answer as time to learn and then use the system seems to be very limited.
14)	Feedback on the completion of a sequence of steps is: [Unclear Clear] <ul style="list-style-type: none"> • Hur är återkopplingen? • I have received no feed-back after completion of a sequence. • I was not aware there was any!
15)	The C3-Cloud training session was: [Useless Helpful] <ul style="list-style-type: none"> • Är det här utbildningen? • Med hänvisning till tidigare svar! • You need more than an online tutorial. • Felt it was too rushed and too late in the trial.

Table 92 1st detailed survey for patients, comments related to statements rated 0-5, original language

The table below shows the users' general comments (in Swedish and English) about their interaction with the system and their level of satisfaction with it (for the English translation refer to **Table 18**).

Comments (original language):	
Swedish/RJH (1-3), English/SWFT (4-8)	
1)	Jag har hitnitills bara fått några testmeddelanden och några andra meddelanden.
2)	Undrar om jag är rätt person att delta. Träffar diabetessköterska en gång per/år och läkare en gång per/år för åldersdiabetes. Samt läkare på las. en gång per/år för KLM. Tycker det "funkar" bra och hoppas fortsätta på det sättet!
3)	Pga. sjukdom i familjen har jag inte kunnat vara så aktiv som jag önskat.
4)	Feedback would be great.

5)	I am not conscious of much in the way of feedback - possibly because not much is happening to me health-wise at present, i.e. I am stable, and it would need blood tests to point to potential problems. Obviously, they are outside the scope of the scheme.
6)	As I was a commercial computer systems developer, I feel that some of my responses may be at variance with your "target" users. (mine I had to assume were idiots!!)
7)	I am reasonably experienced in using remote learning
8)	No.

Table 93 1st detailed survey for patients, general comments, original language

Patient Training Material

Technology trial participants were then asked for the training material that had been provided to them. The users' reactions were designed to be between colour dark red ("Strongly disagree") to dark green ("Strongly agree"). The below figure shows the users' mean ratings to the statements (a-h) on a range from "Strongly disagree" to "Strongly agree".

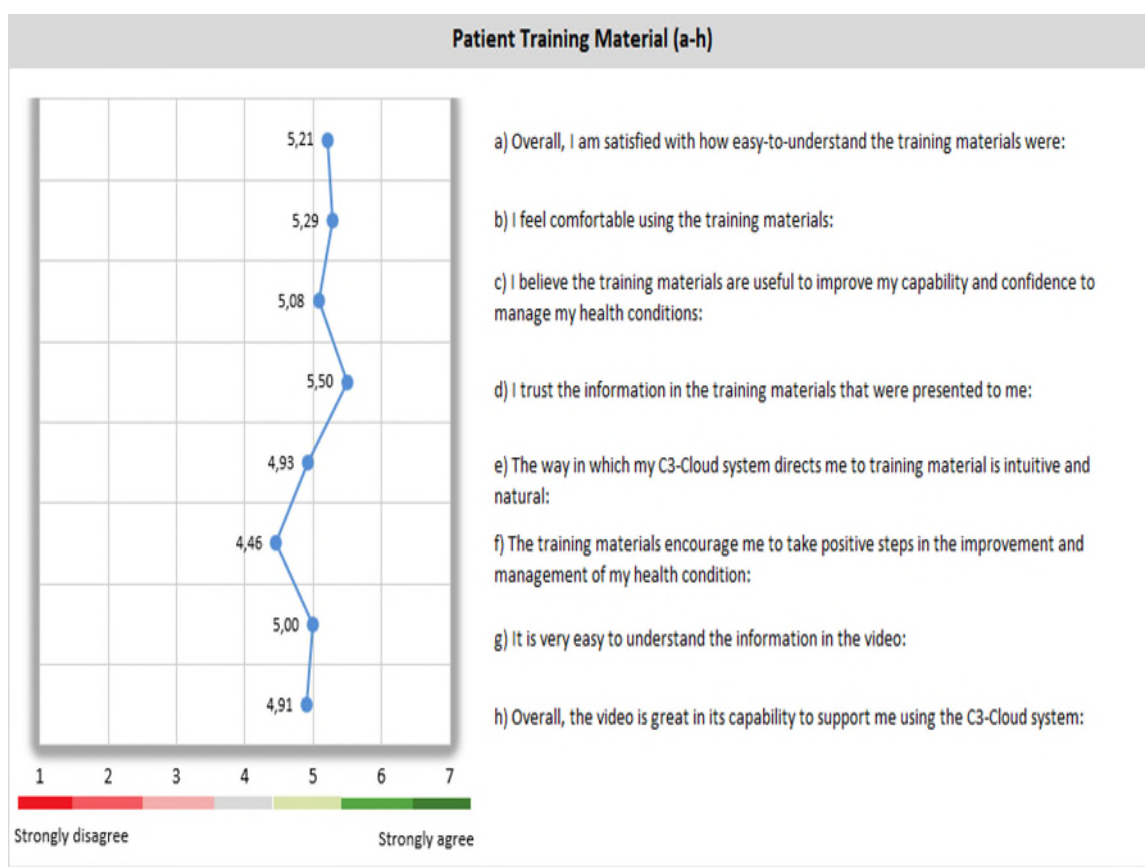


Figure 286 Patient training material (a-h)

With regard to patient training material it should be noted that, as the users are approaching the end of the survey, the percentage of non-response rates is comparatively higher; this should be

noted in every statement’s pie chart presentation and will not be referred to for every individual statement.

When asked if the users were satisfied with how easy-to-understand the training materials were, the users moderately agreed with an average of 5.21; the standard deviation for this statement was 1.3 and a peak belonged to “Agree” (6) with 50%.

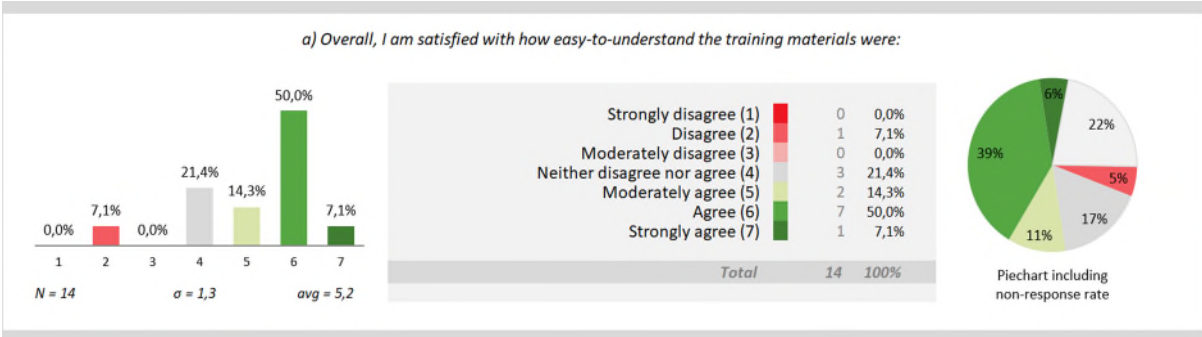


Figure 287 Overall, I am satisfied with how easy-to-understand the training materials were

The users also moderately agreed that they felt comfortable using the training material as the statement average was 5.29, with a standard deviation of 1.2; the peak responses belonged to “Agree” (6) and “Moderately agree” (5), with around 80% of the responses combined.

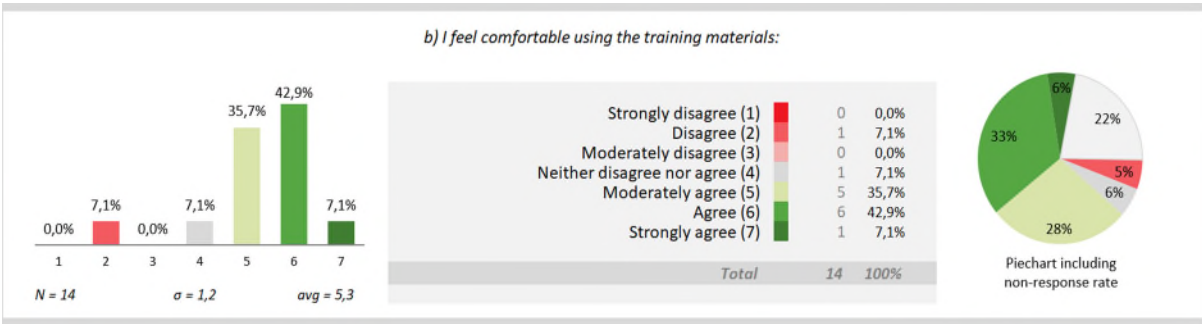


Figure 288 I feel comfortable using the training materials

When asked if the training materials were useful to improve their health conditions management capability and confidence, the users moderately agreed as the average was 5.08; the standard deviation was 1.3, with 23.1% of the users neutral opinion and 7.7% who disagreed with the statement.

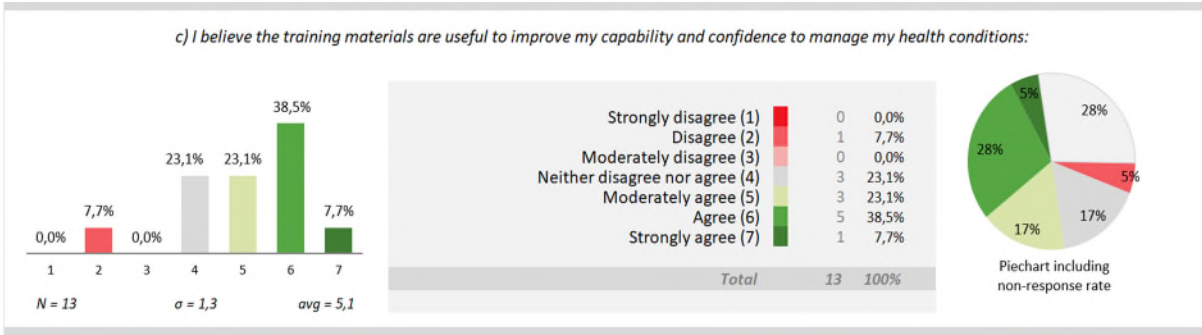


Figure 289 I believe the training materials are useful to improve my capability and confidence to manage my health conditions

With more than half of the users (57.1%) agreeing with the statement and an average of 5.5, the users' opinion about the statement was quite positive. The standard deviation was 1.4 and more than 14% also disagreed with the statement in some form.

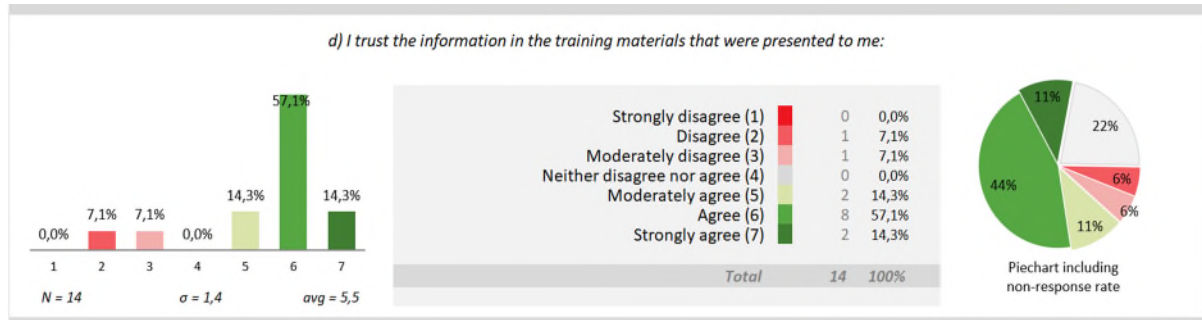


Figure 290 I trust the information in the training materials that were presented to me

When asked if the way that C3-Cloud system directed them to the training material was natural and intuitive, the peak responses belonged to “Agree” (6) and neutral (4), the average was 4.93 and standard deviation 1.3.

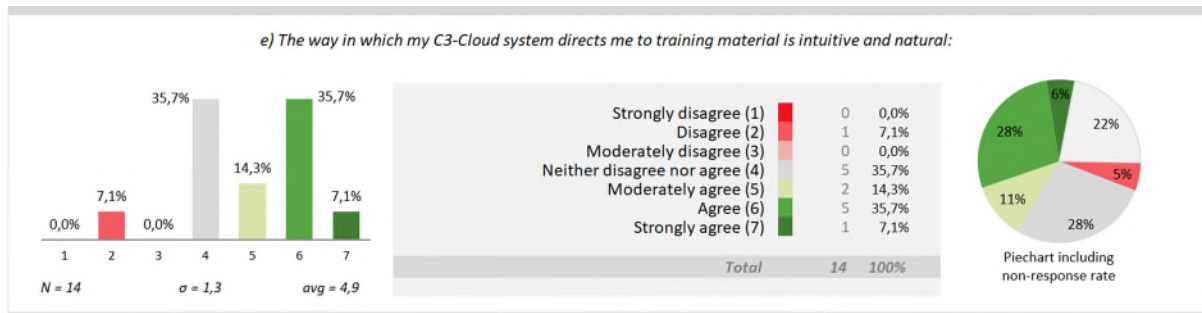


Figure 291 The way in which my C3-Cloud system directs me to training material is intuitive and natural

As mentioned before and as the users approach the end of the survey, there was a spike in non-response rates, which was the case in the next statement with 28%. The average for this statement was 4.5 and standard deviation 1.5 with over 20% disagreeing with the statement in some form.

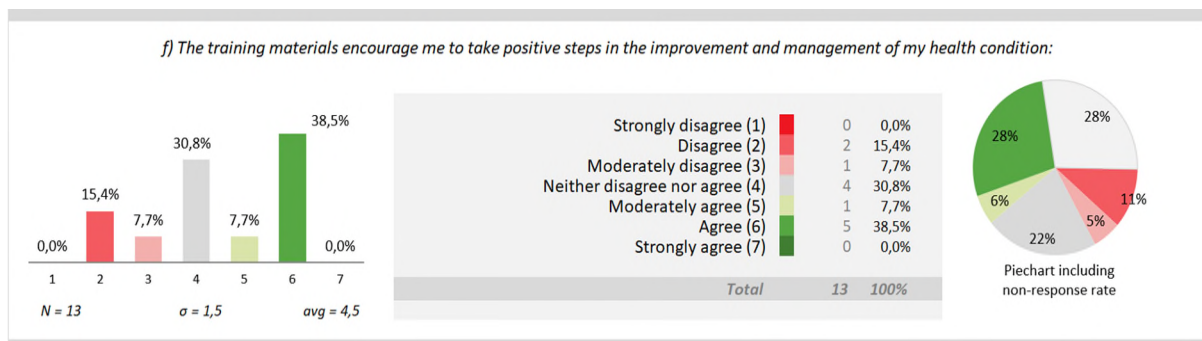


Figure 292 The training materials encourage me to take positive steps in the improvement and management of my health condition

When asked if it was easy to understand the information in the video, almost a third of the users, 33% refused to answer. But the response peak belonged to “Agree” (6) with 41.7% and the average hovered on 5. Standard deviation was 1.4 and 8.3% of the users also disagreed with the statement.

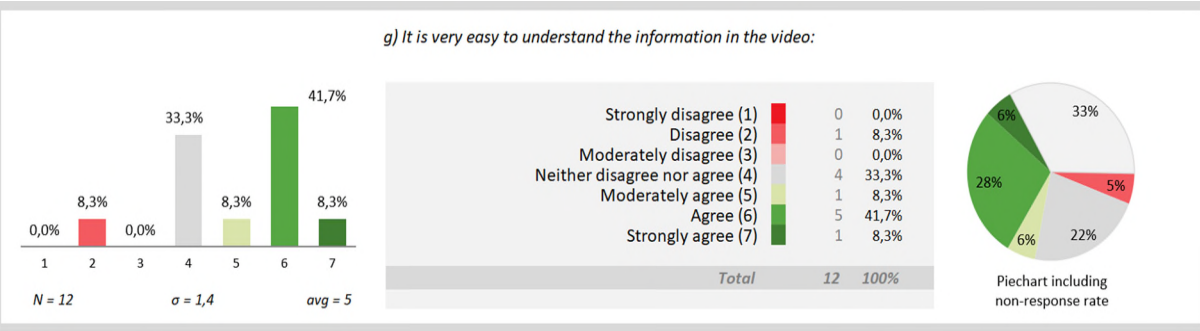


Figure 293 It is very easy to understand the information in the video

The non-response rate was again about 40% for statement (f) which assessed if the video was great in its capability to support the user when using C3-Cloud system. With most of the responses being of positive opinion about the statement, the average was 4.91 and the standard deviation 1.4.

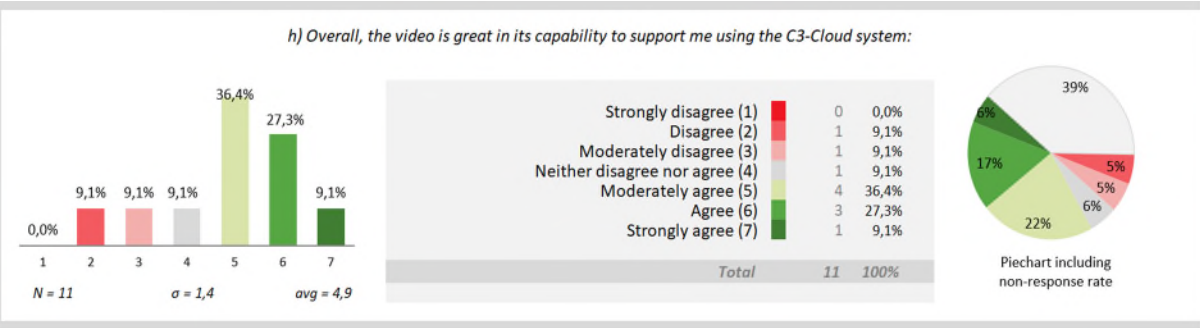


Figure 294 Overall, the video is great in its capability to support me using the C3-Cloud system

The below figure shows the users' mean ratings to the patient training material statements (i-p) on a range from "Strongly disagree" to "Strongly agree".

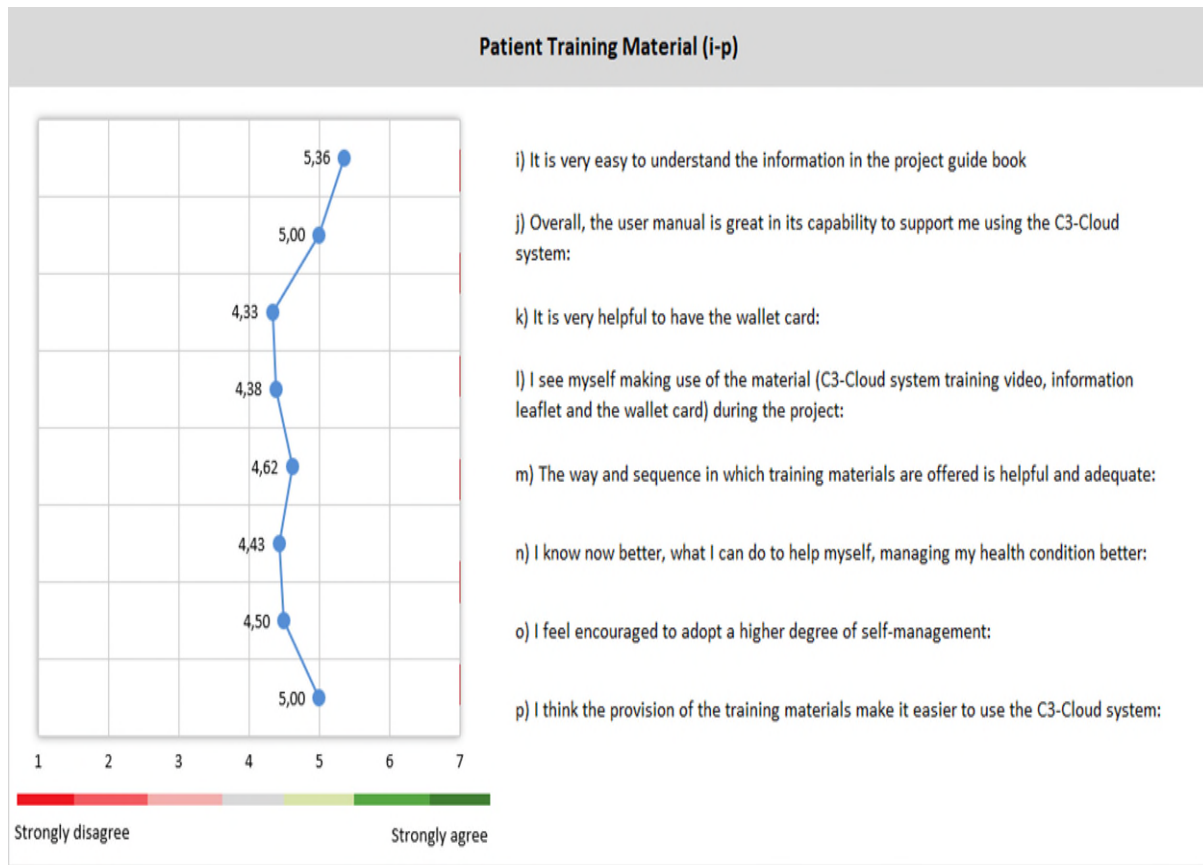


Figure 295 Patient training material (i-p)

When asked if the information in the project guidebook was easy to understand, most of the respondents (50%) agreed. The average was 5.36, standard deviation 1.1 and 14.3% rated the statement neutral.

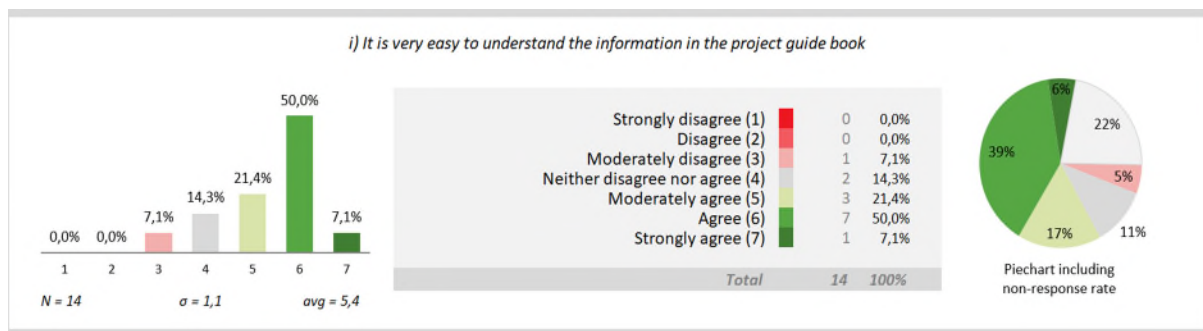


Figure 296 It is very easy to understand the information in the project guidebook

The average for statement (j) was 5 and the standard deviation 1.2 showing that the users moderately agreed with the statement; 21.4% of the users also had a neutral opinion and 7.1% disagreed with the statement.

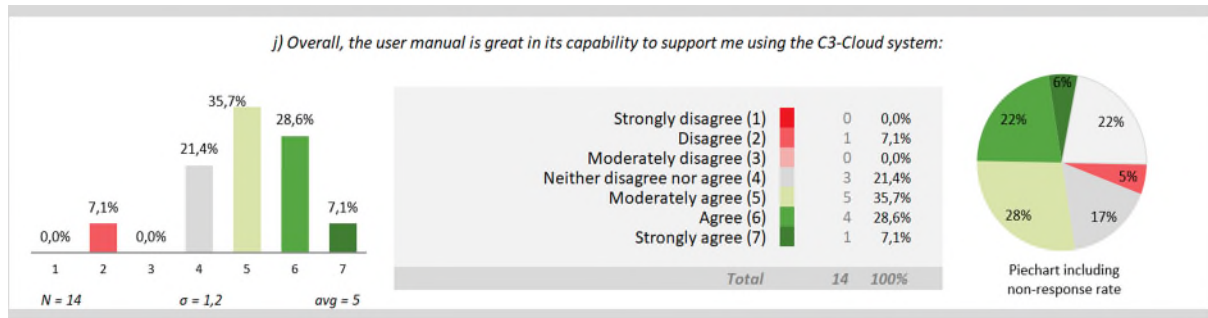


Figure 297 Overall, the user manual is great in its capability to support me using the C3-Cloud system

With the peak rates belonging to “Moderately disagree” and neutral, each 25%, the average for statement (k) was 4.33 and standard deviation 1.5; the non-response rate of 33% should also be noted.

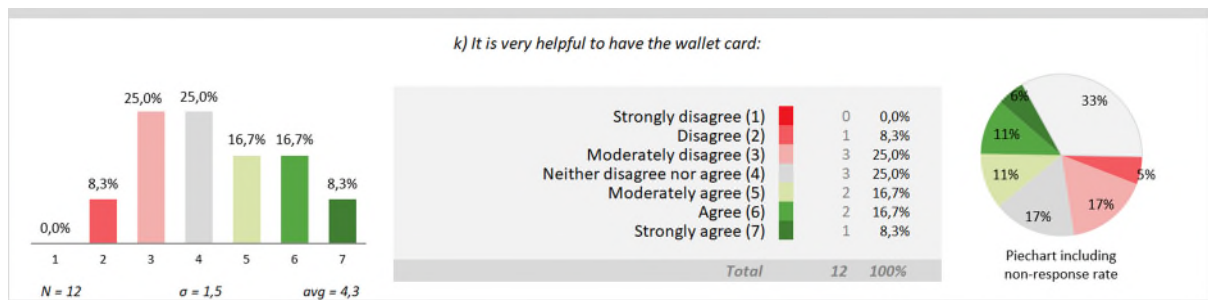


Figure 298 It is very helpful to have the wallet card

When asked if they saw themselves making use of the material during the project, the average was 4.38, and standard deviation 1.6; the peak belonged to “Agree” and neutral with 23.1% each, and the 28% non-response rate was also noticeable.



Figure 299 I see myself making use of the material (C3-Cloud system training video, information leaflet and the wallet card) during the project

When asked if the way and sequence the training materials were offered was helpful and adequate, the average was 4.62 and standard deviation 1.8; this comparatively higher standard deviation is because of a 28.5% neutral rating and 7.7% “Strongly disagree” and “Disagree” ratings. A non-response rate of 28% should also be noticed.

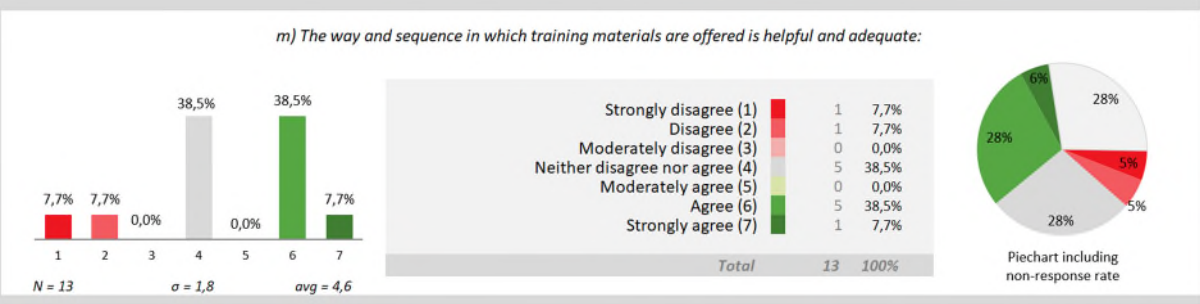


Figure 300 The way and sequence in which training materials are offered is helpful and adequate

When asked if they knew better now what they could do to help themselves managing their health condition better, the peak rating belonged to “Agree” 42.9%, the average was 4.43 and standard deviation 1.7.

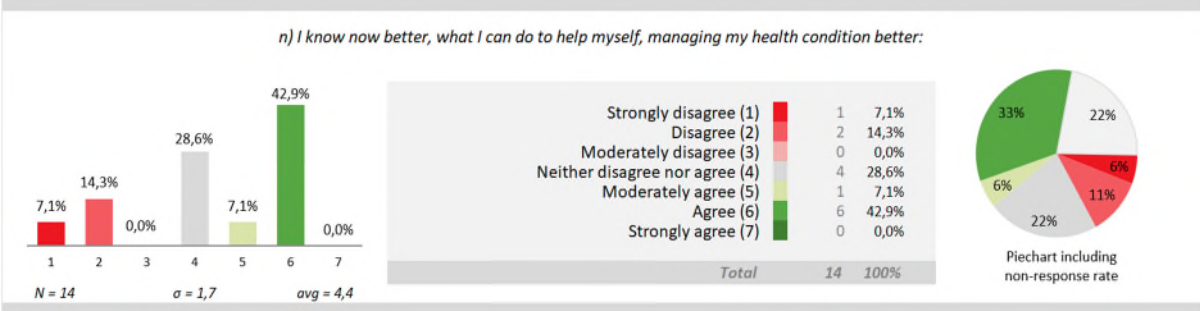


Figure 301 I know now better, what I can do to help myself, managing my health condition better

For the statement that asked the users if they felt encouraged to adopt a higher degree of self-management, an average of 4.5 demonstrates that the users moderately agreed with it; the standard deviation was 1.7, as around 21% showed a level of disagreement with the statement, and 14.3% rated the statement neutral.

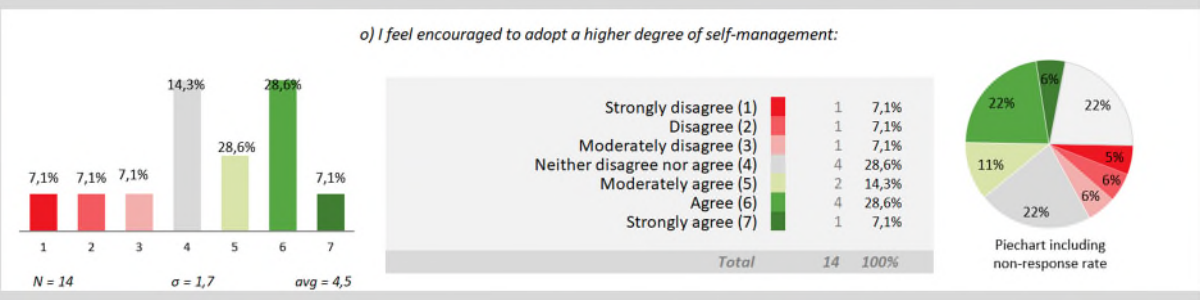


Figure 302 I feel encouraged to adopt a higher degree of self-management

Finally, when asked if the provision of the training materials eased the use of C3-Cloud system, almost half of the responses agreed with the statement, hence the average being 5; the standard deviation was 1.3, and there was also a 23.1% neutral and 28% non-response rates to the statement.

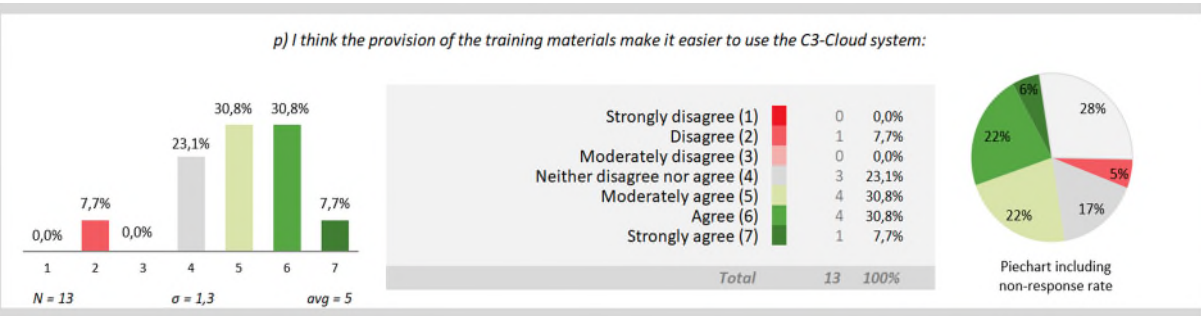


Figure 303 I think the provision of the training materials make it easier to use the C3-Cloud system

10.3. C3-Cloud: First Survey for Healthcare Professionals

Technology trial participants were first asked to answer four basic questions. The first basic question asked about the users' age. The peak age ranges belonged to the users between 45-49 (31.6%) and 55-59 years of age (31.6%); 21% of the users were between 30-34 and 50-54 (10.5% each) and 15.9% of the users were between 35-39, 40-44 and 60-65 (5.3% each).

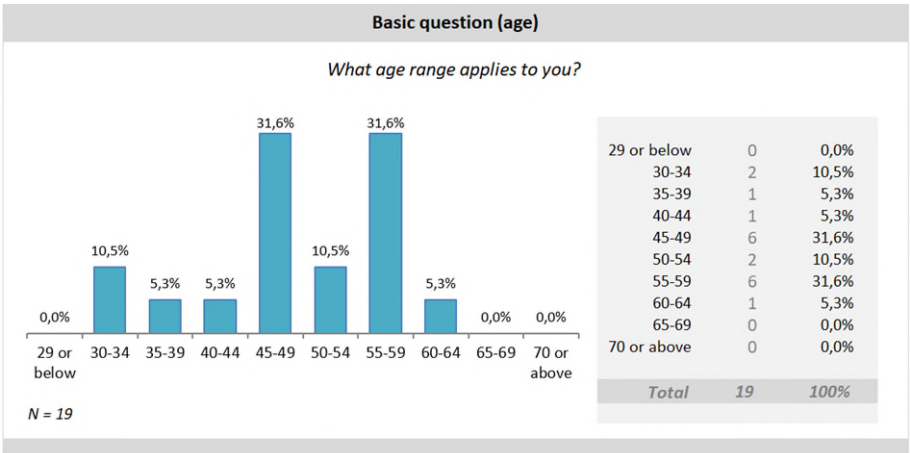


Figure 304 1st survey for HCP, basic question (age)

The next basic question asked the Technology trial participants for their sex. Out of the 19 participants, 15 were female comprising 78.9% of the respondents and 4 were male comprising 21.1% of the respondents.

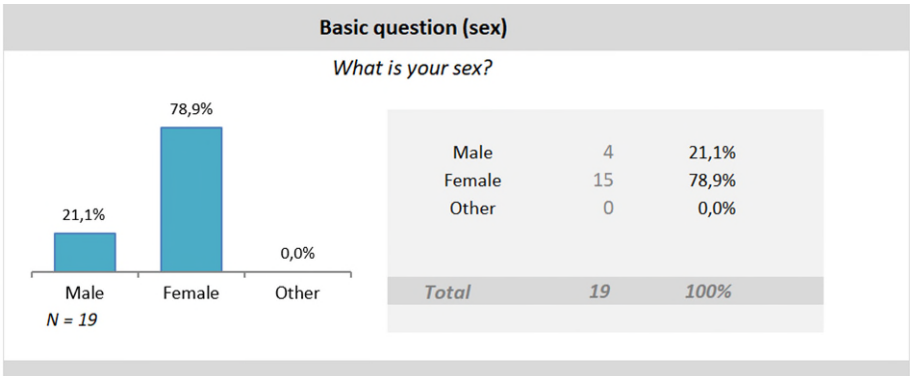


Figure 305 1st survey for HCP, basic question (sex)

The third basic question asked the Technology trial participants about the area they lived in. Out of 19 respondents, 16 or 84.2% were from Basque Country in Spain, 2 or 10.5% were from Region Jämtland in Sweden and 1 or 5.3% of the users were from South Warwickshire in the UK.

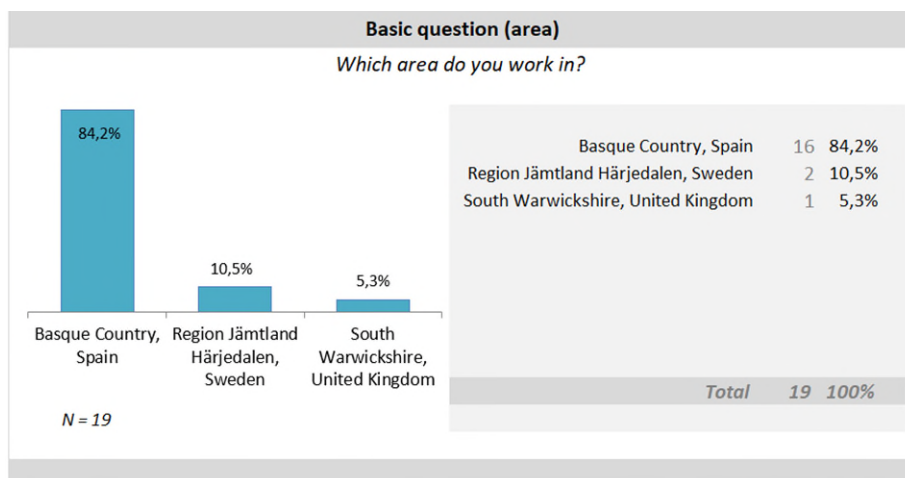


Figure 306 1st survey for HCP, basic question (area)

The last basic question for the HCPs was their job title which is collected in the original language below (for the English translation, refer to **Table 7**).

HCP job titles			
1)	Distriktssköterska	2)	Distriktsläkare
3)	Community nurse	4)	Enfermera × 6
5)	Médico × 2	6)	Optional holder
7)	Médico de familia × 5	8)	medico atencion primaria
9)	DUE		

Table 94 1st survey for HCP, job titles, original language

HCP Unified Theory of Acceptance and Use of Technology (UTAUT)

In order to evaluate acceptance and use of the system by the HCPs, the users were asked if they had the opportunity to use the C3-Cloud system since the beginning of the trial, to which 15 users (78.9%) said “Yes” and 4 users (21.1%) replied “No”.

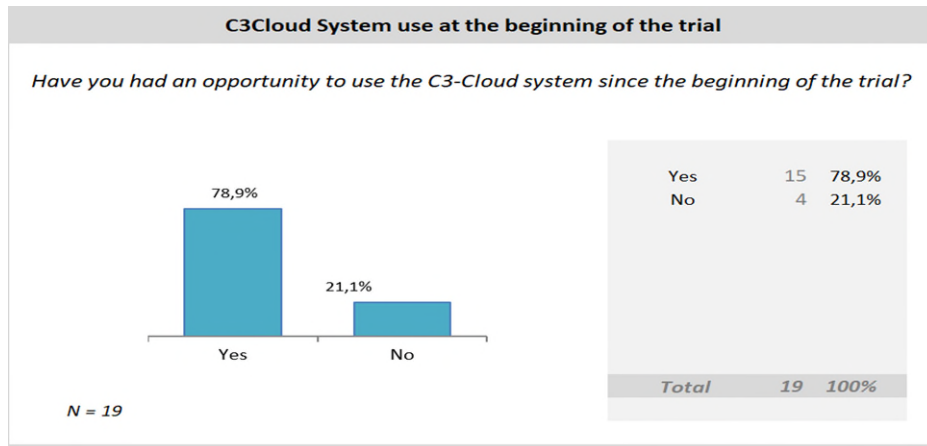


Figure 307 Have you had an opportunity to use the C3-Cloud system since the beginning of the trial

Technology trial participants were then asked for their opinions about statements (a-r). The users' reactions were designed to be between colour dark red ("Strongly disagree") to dark green ("Strongly agree"). The figure below shows the mean ratings of 19 HCP users to the statements (a-i) on a range from "Strongly disagree" to "Strongly agree".

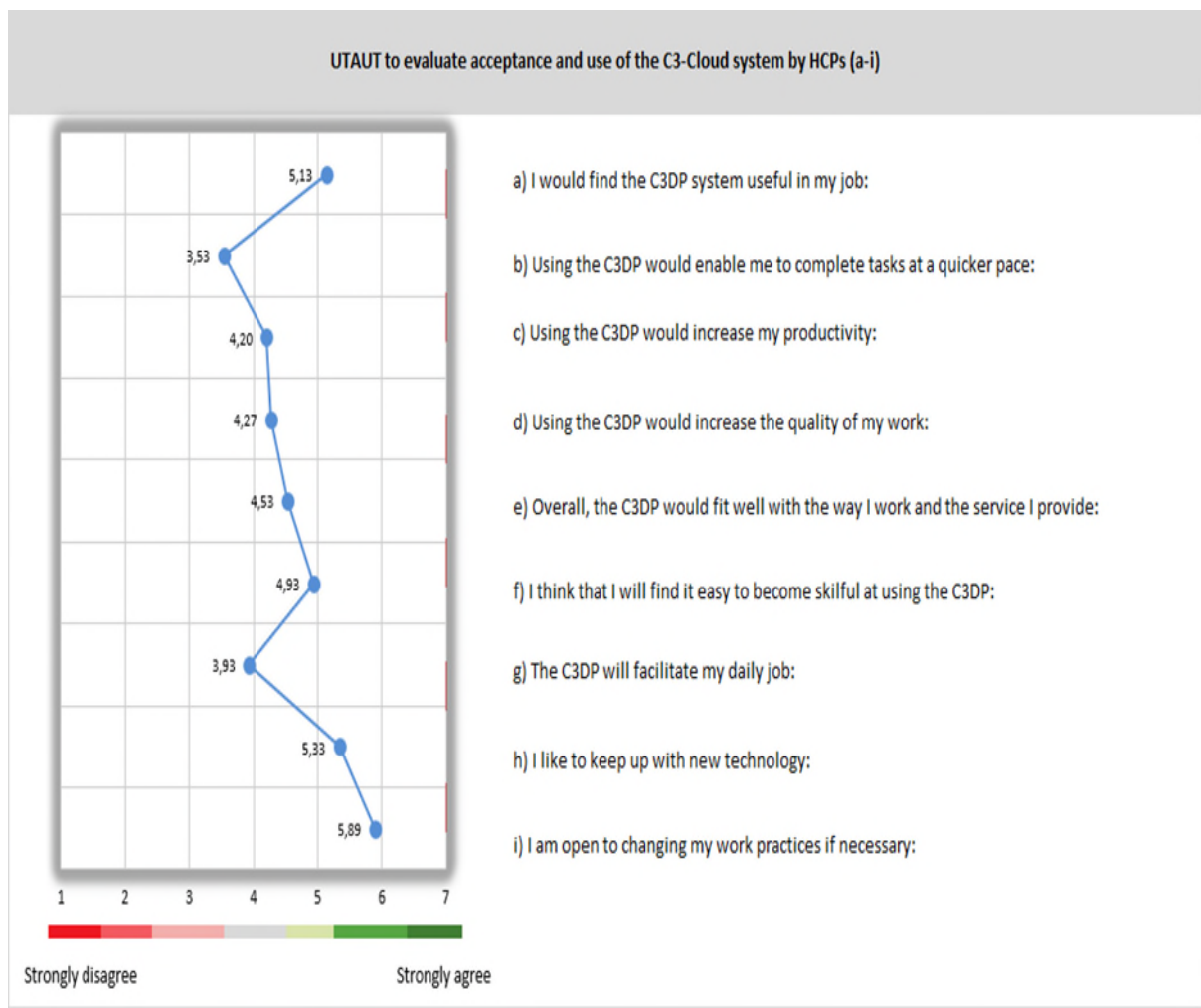


Figure 308 1st survey for HCP, UTAUT (a-i)

When asked if the HCPs found the C3DP system useful in their job, the users moderately agreed with an average of 5.13. The standard deviation for this statement was 1.1 and a peak belonged to “Moderately agree” (5) with 40%. A non-response rate of 21% should also not be ignored.

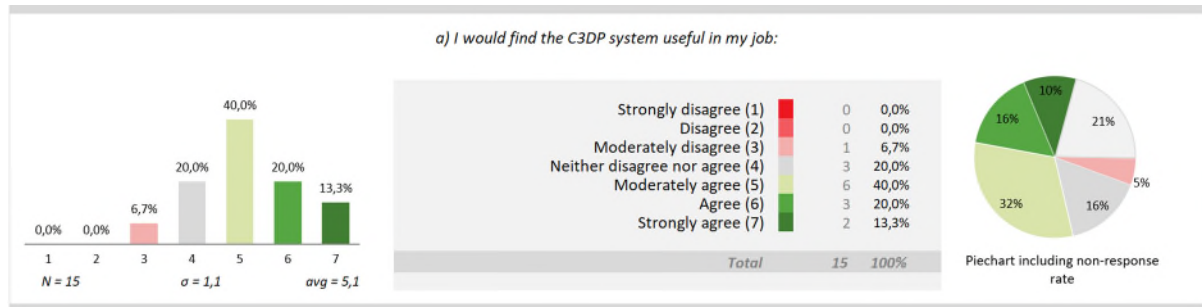


Figure 309 I would find the C3DP system useful in my job

An average of 3.5, a 1.4 standard deviation for the statement (b) and a peak rating that belonged to “Disagree” (2) with 33.3% and another 13.3% moderately disagreeing with the statement demonstrates that the respondents almost disagreed if the C3DP enabled them to complete tasks at a quicker pace. 26.7% of the users had a neutral opinion and 21% refused to respond to this statement.

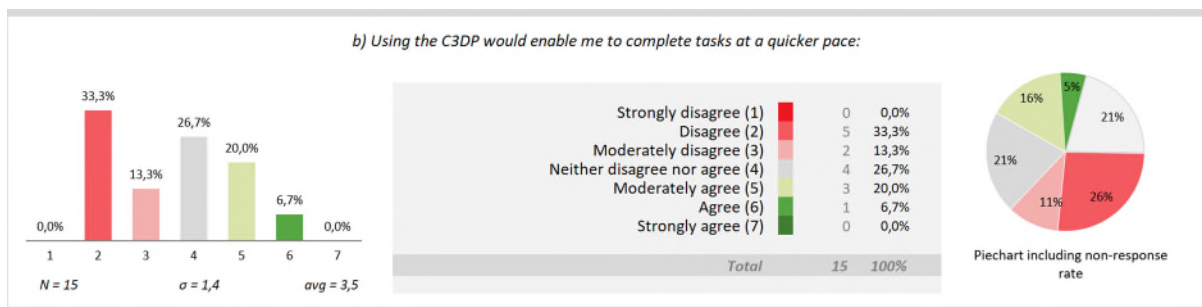


Figure 310 Using the C3DP would enable me to complete tasks at a quicker pace

When asked if using the C3DP increased their productivity, a peak of 46.7% moderately agreed with the statement, the average was 4.2 and standard deviation 1.5; However, 26.7% of the users disagreed with this statement and 21% refused to respond to it.

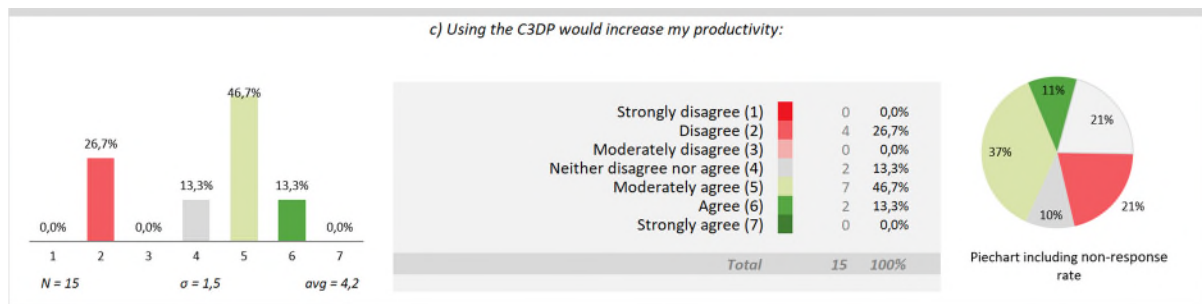


Figure 311 Using the C3DP would increase my productivity

Although 26.7% rated statement (d) neutrally and another 21% refused to answer to it, by 26.7% who moderately agreed and 20% who agreed with the statement, the average 4.3 tilts slightly towards users' agreement. Moreover, 26.6% of the users did not have a positive opinion about this statement.

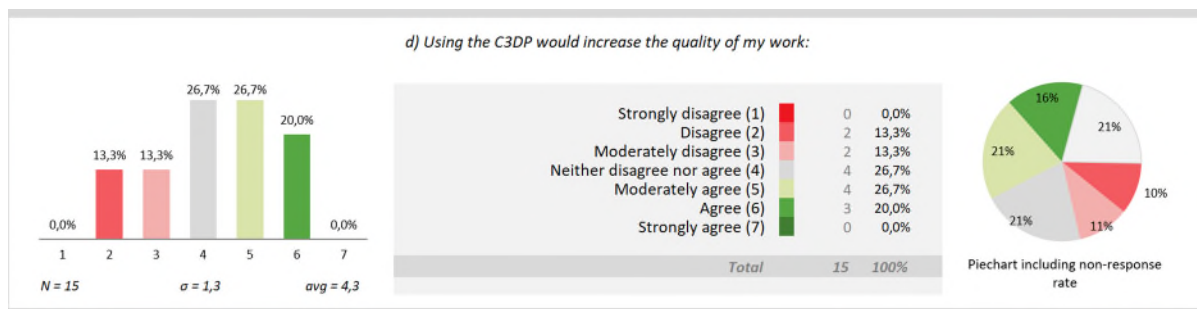


Figure 312 Using the C3DP would increase the quality of my work

When asked if using the C3DP would fit well with the way they worked, more than 65% moderately or fully agreed with the statement, and the average showed 4.53, standard deviation 1.3. However, 21% of the users also refused to respond and 26.6% of the HCP users in a way disagreed with the statement.

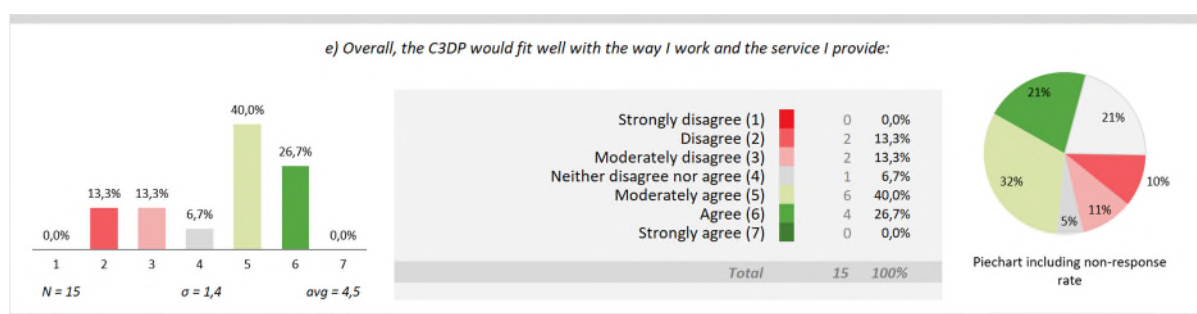


Figure 313 Overall, the C3DP would fit well with the way I work and the service I provide

When asked if they thought that it was easy to become skilful at using the C3DP, the peak belonged to “Agree” with 40 %, followed by “Moderately agree” with 33.3%, which made the graphs for this statement lean towards HCPs agreement with an average of 4.93. The standard deviation was 1.2 and 21% refused to respond.

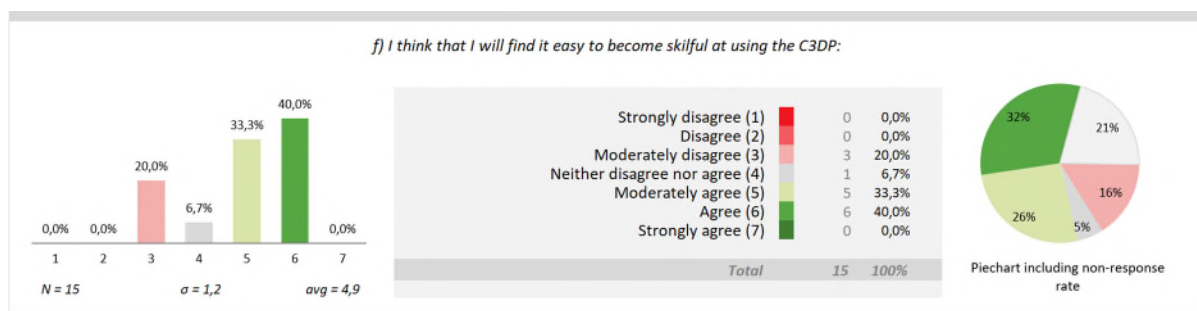


Figure 314 I think that I will find it easy to become skilful at using the C3DP

The HCP users moderately disagreed with statement (g). An average of 3.93 demonstrated that the C3DP would not facilitate their daily job. However, there was a 21% non-response rate and a 33.3% neutral response for this statement.

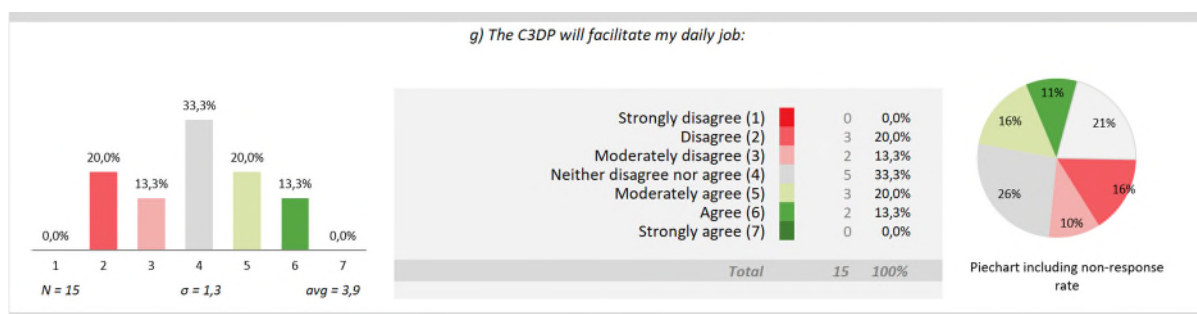


Figure 315 The C3DP will facilitate my daily job

When asked if they liked to keep up with new technology, the average showed 5.33 and standard deviation was 1.6; with a peak of 44.4% for “Agree” and 16.7% for “Strongly agree”, the HCP users were almost of a positive opinion about keeping up with new technology.

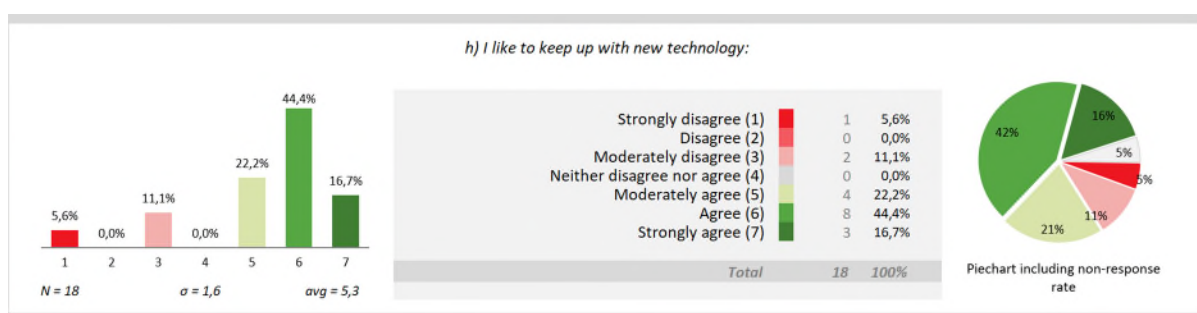


Figure 316 I like to keep up with new technology

The HCPs showed that they were almost unanimously open to changing their work practices by an average of 5.89 and a standard deviation of 0.8; the peak response belonged to “Agree” with 44.4% of the responses, and there was no neutral or disagreeing responses for this statement, making both graphs coloured only in the realm of the green colour continuum.

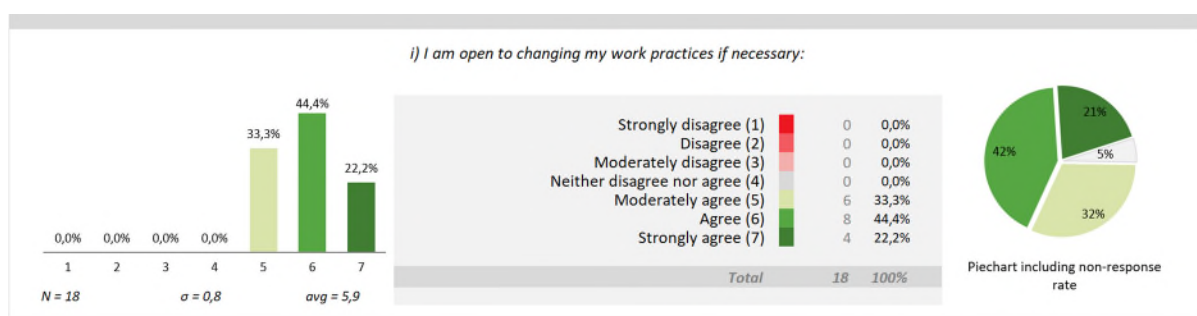


Figure 317 I am open to changing my work practices if necessary

The figure below shows the mean ratings of 19 HCP users to the statements (j-r) on a range from “Strongly disagree” to “Strongly agree”.

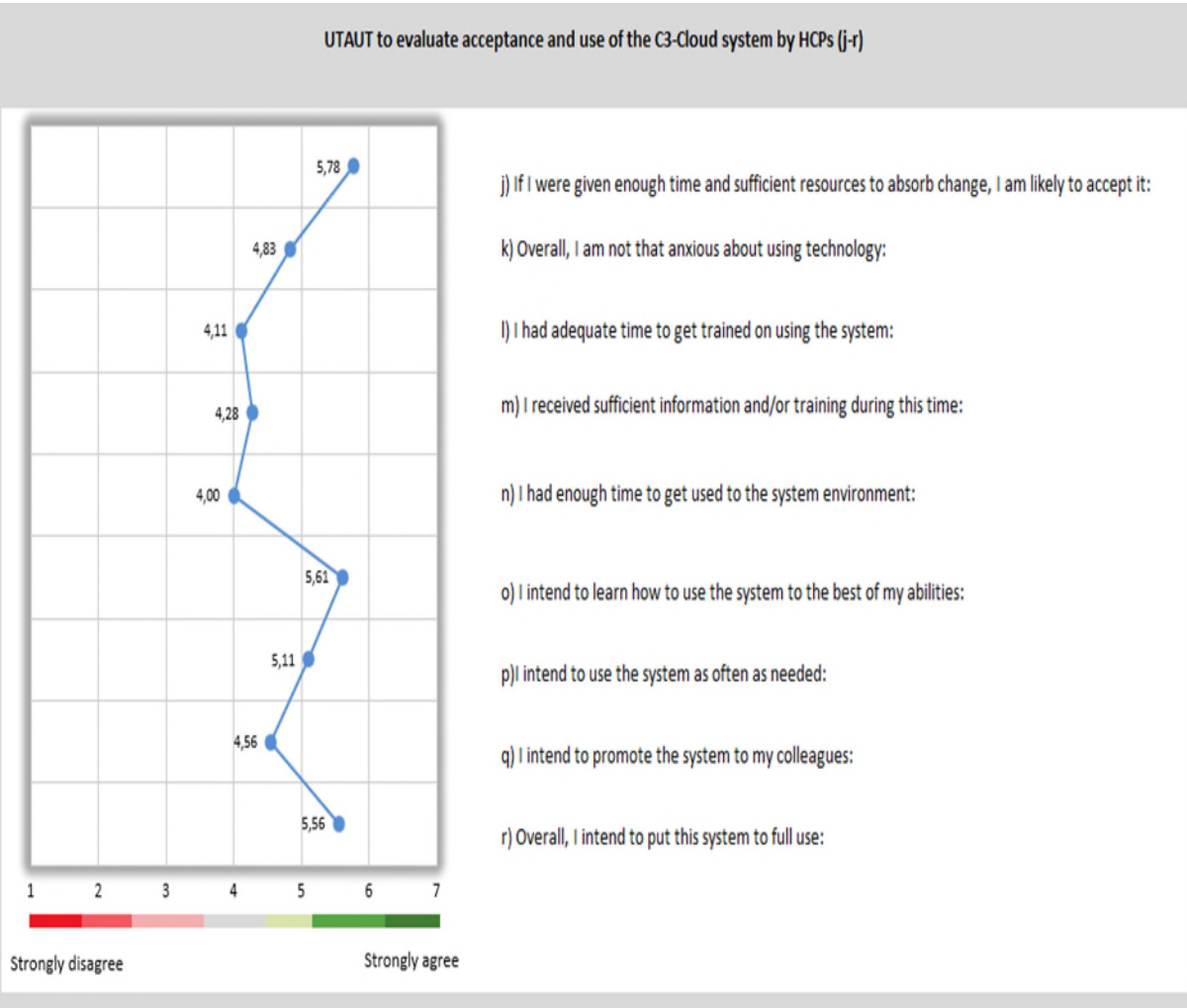


Figure 318 1st survey for HCP, UTAUT (j-r)

With 50% of the users choosing “Agree” for the statement (j), 16.7% “Strongly agree”, a standard deviation that hovered on 0.8, and no disagreement recorded for this statement, the users quite unanimously agreed that, if they were given enough time and resources to absorb change, they would accept it.

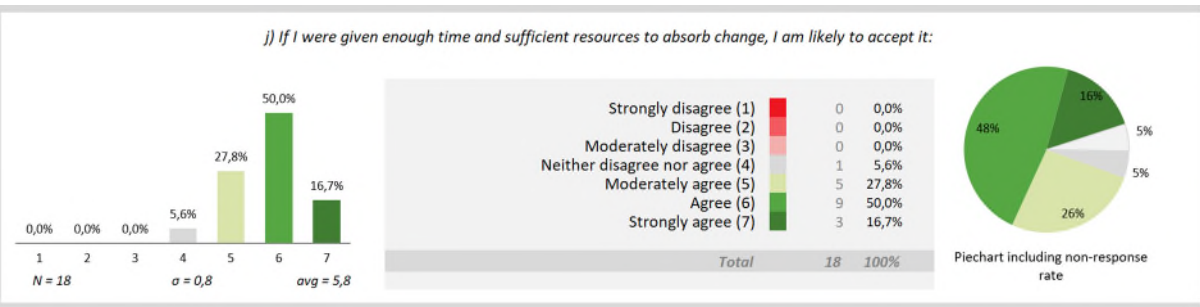


Figure 319 If I were given enough time and sufficient resources to absorb change, I am likely to accept it

For statement (k) the responses, although not equally, spread for all choices available. The peak belonged to options 6 and 5 with 33.3% and 22.2% and another 11.1% also opted for option 7; such responses made an average of 4.83 which leans towards agreement for this statement.

However, there was also more than 20% disagreement and 11.1% who responded neutrally to this statement.

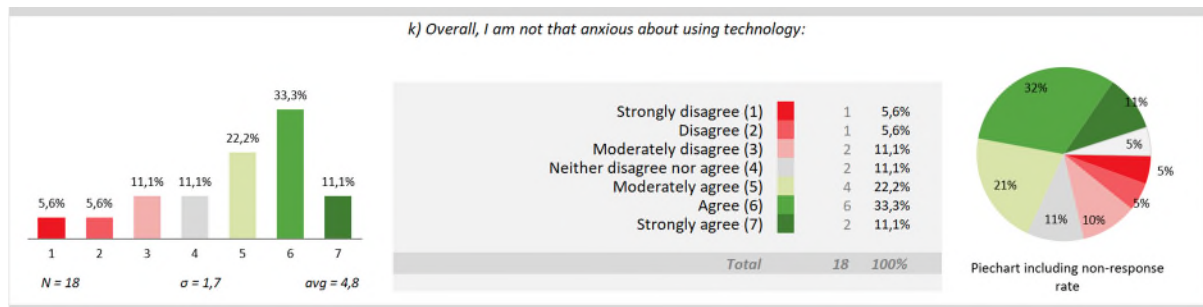


Figure 320 Overall, I am not that anxious about using technology

When asked if they had adequate time to get trained on using the system, the users rated the statement an average of 4.11 with a standard deviation of 1.6; the peak ratings belonged to 6 and 3 (27.8% each), and about 16% disagreed with the response. This is balanced off by a 22.2% moderate agreement to the statement. Overall, the users seemed to be ambivalent about statement (l).

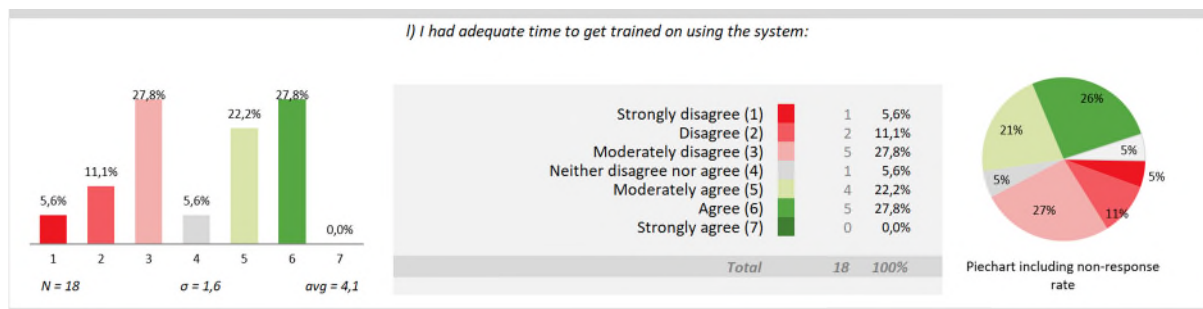


Figure 321 I had adequate time to get trained on using the system

The users moderately agreed that they had received sufficient information or/and training by giving the statement an average of 4.3 and a standard deviation of 1.6; the peak ratings belonged to options 3, 5 and 6 with 27.8% each.

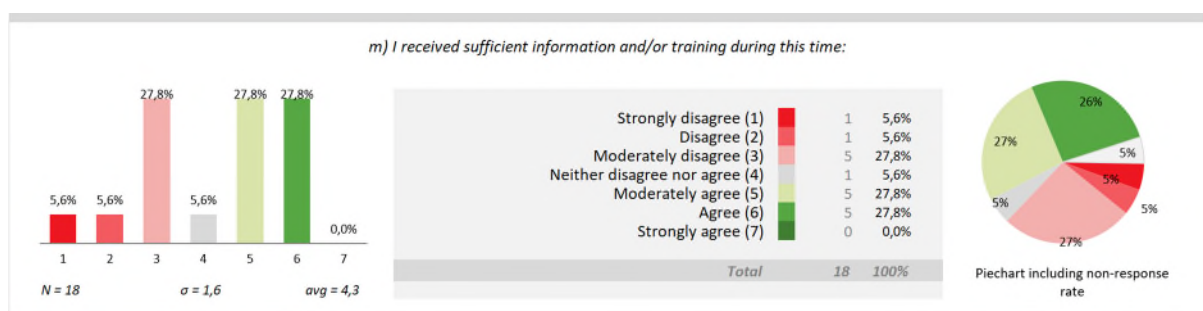


Figure 322 I received sufficient information and/or training during this time

When asked if they had enough time to get used to the system environment, and average of 4 demonstrated that the users had an ambivalent opinion. The responses that agreed and disagreed with the statement look symmetric on the charts and 11.1% of the respondents had a neutral opinion about this statement.

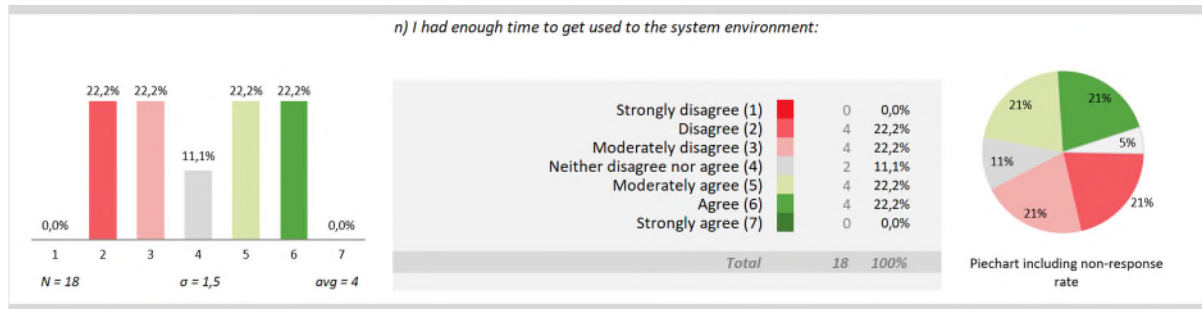


Figure 323 I had enough time to get used to the system environment

When asked if they intended to learn how to use the system to the best of their abilities, the users rated the statement an average of 5.61 with a standard deviation of 0.8, a peak response that belonged to “Agree” and resulting graphs that leaned towards agreement.

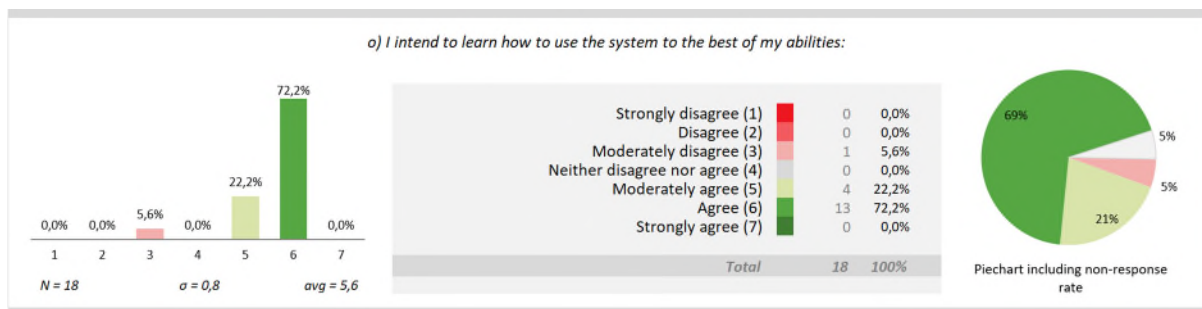


Figure 324 I intend to learn how to use the system to the best of my abilities

When asked if they intended to use the system as often as needed, the peak belonged to “Agree” by 44.4% and then “Moderately agree” by 27.8%; 22.2% of the users also had a neutral opinion about the statement and the standard deviation was 1.

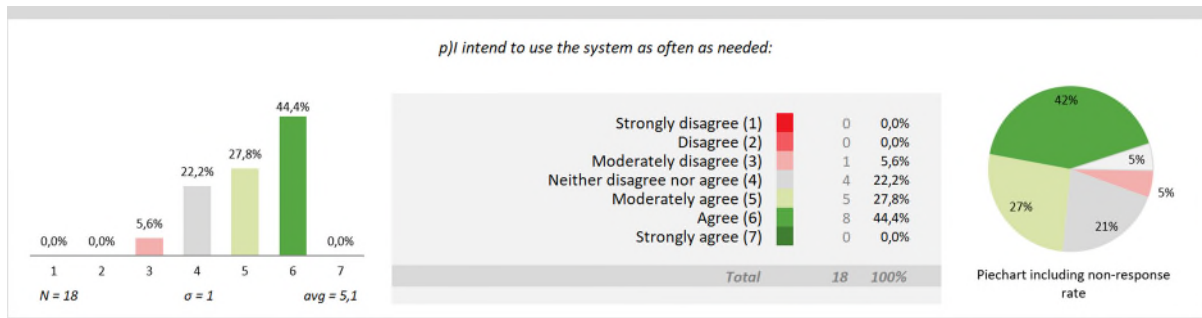


Figure 325 I intend to use the system as often as needed

An average of 4.56 and a standard deviation of 1.3 for the statement (q) demonstrates that the respondents moderately agreed with the statement. The charts show less disagreement as the peak response belonged to “Agree” with 27.8%, and “Moderately agree” with 27.8%. 27.8% of the respondents also had a neutral opinion about this statement and about 20% disagreed with it.

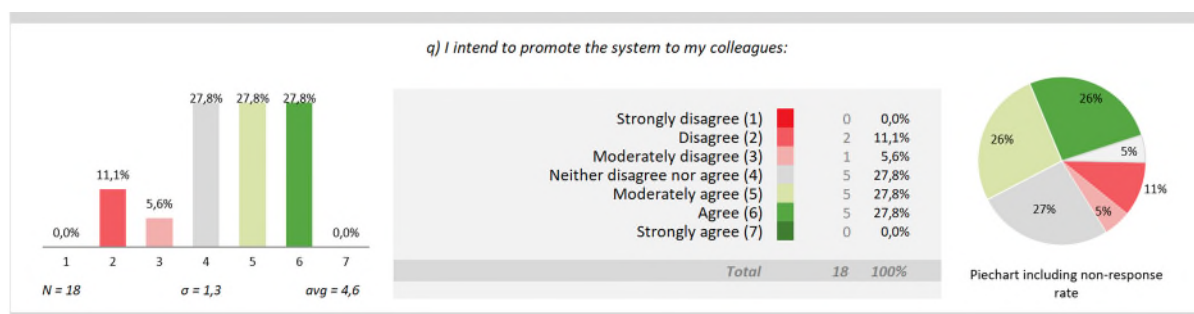


Figure 326 I intend to promote the system to my colleagues

Finally, when asked if they intended to put the system to full use, the peak predominantly belonged to “Agree” with 66.7%, the average was 5.56 and standard deviation was 1.

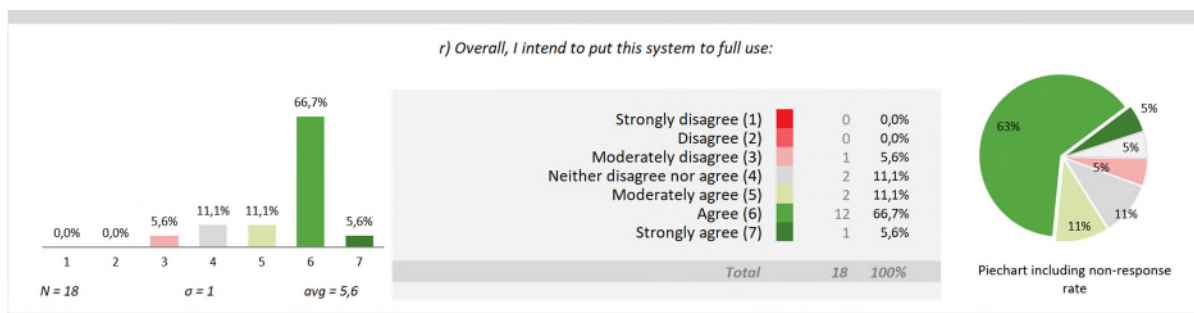


Figure 327 Overall, I intend to put this system to full use

The table below shows the users’ general comments (in Castilian, Spanish) about their interaction with the system (for the English translation refer to **Table 8**).

UTAUT, HCP general comments	
1)	<p>Ideas de mejora</p> <p>1- Que los mensajes de los pacientes aparezcan directamente en el correo del médico sin necesidad de acceder a la plataforma.</p> <p>2- Algún sistema que confirme la recepción y/o lectura de mensajes, actividades, material educativo...</p> <p>3-Interfaz más intuitiva.</p> <p>4- Que en esta encuesta no nos pregunten: "seleccione las opciones que mejor reflejen su impresión acerca de su estado de salud" ya que no tiene relación con la encuesta.</p>
2)	<p>He tenido problemas para que lños pacientes reciban mis mensajes. Acabo haciemndo la consulta telefónica para cerciorarme de que reciben la información</p>
3)	<p>CrEo que la letra se puede mejorar, es demasiado fina. Me gustaría que hubiera una manera de que se nos avisase de que el pacienre a aportado información nueva sin tener que entrar en el programa</p>

4)	De momento no veo una utilidad mayor que los programas que disponemos hasta ahora con OSABIDE
5)	Se me ha hecho complicado porque no he conseguido una continuidad en la relación con el paciente a través de la plataforma por dificultades técnicas
6)	De momento hemos tenido problemas de comunicacion y tenemos actualmente con el sistema.Deberia de ser mas agil y resolverse cuanto antes.
7)	En la visualización de la información que el paciente nos envía sería muy interesante que aparecieran las horas en las que el paciente se hace las Glucemias.
8)	No me atrae la tecnología: por edad ?, conocimiento?...No despierta mi interés.

Table 95 1st survey for HCP, UTAUT general comments, original language

HCP Questionnaire for User Interaction Satisfaction 7 (QUIS7)

Technology trial participants were asked to rate their satisfaction with the system on a scale from 0-9. The figure below shows the mean ratings of 18 users' impressions to the first group of statements (a-k).

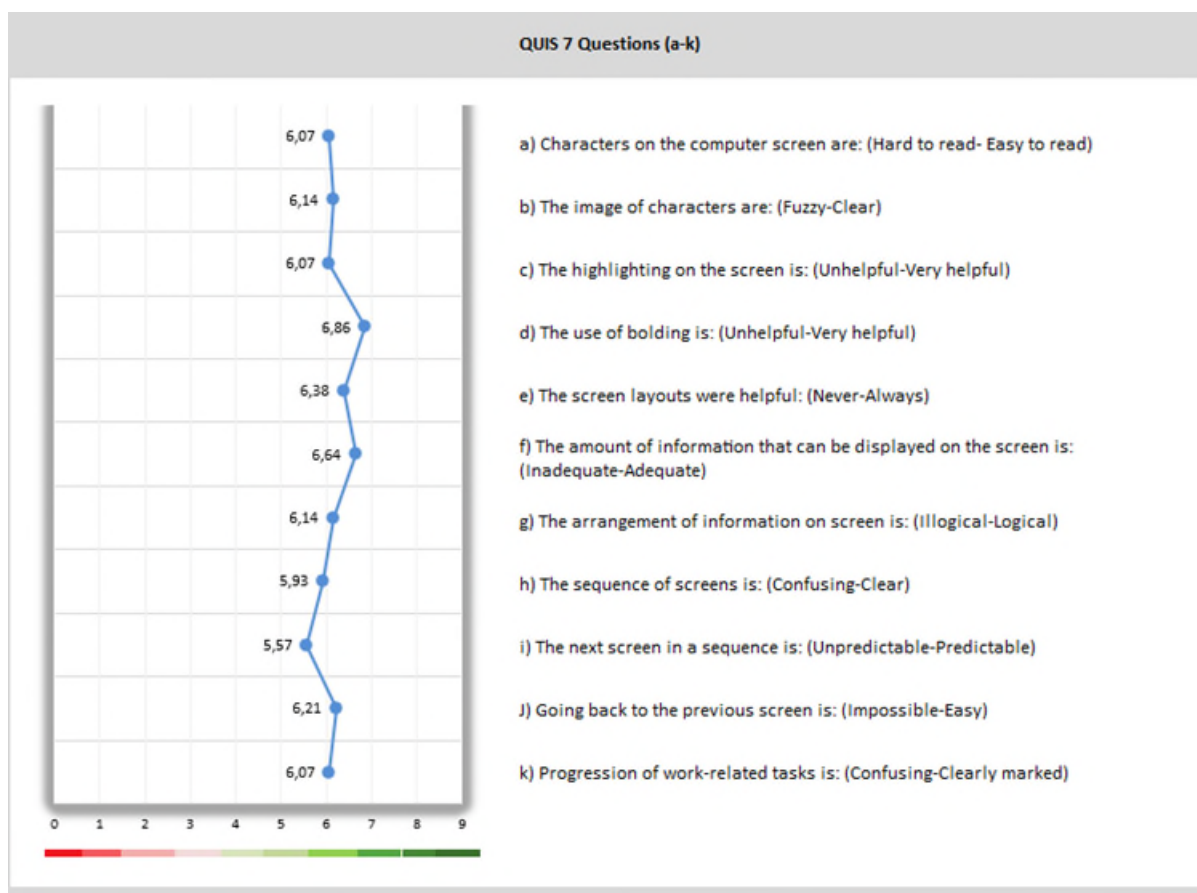


Figure 328 1st survey for HCP, QUIS7 (a-k)

When asked to rate the characters on the computer screen from “Hard to read” to “Easy to read”, the statement was rated an average of 6.07 with a standard deviation of 1.9; with more than 35% of the respondents thinking the characters were quite easy to read, and the rest rating it rather positively, the ratings lean toward the characters being easy to read to the users. A non-response rate of 26% should also not be ignored.

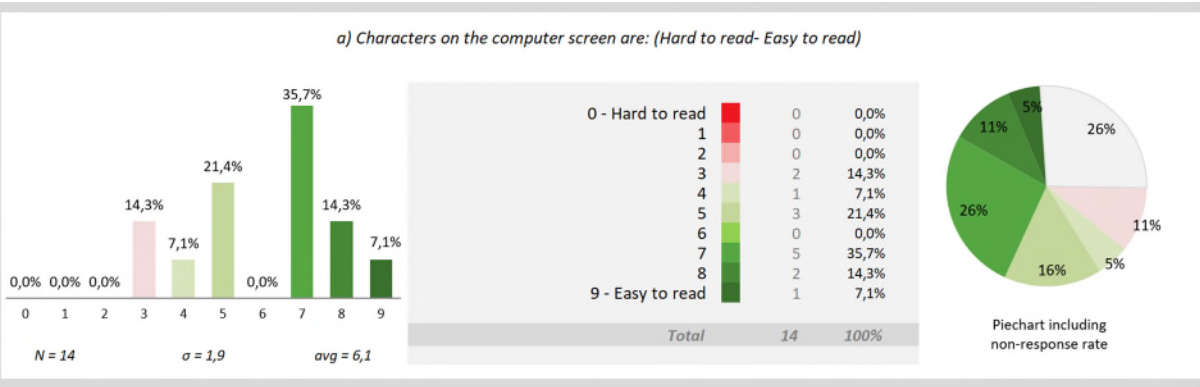


Figure 329 Characters on the computer screen are: [Hard to read|Easy to read]

The respondents also rated the image of characters as almost “Clear” by an average of 6.14; the three peak ratings belonged to 6,7 and 8, 21.4% each, standard deviation was 2.1 and 26% of the users refused to respond to this statement.

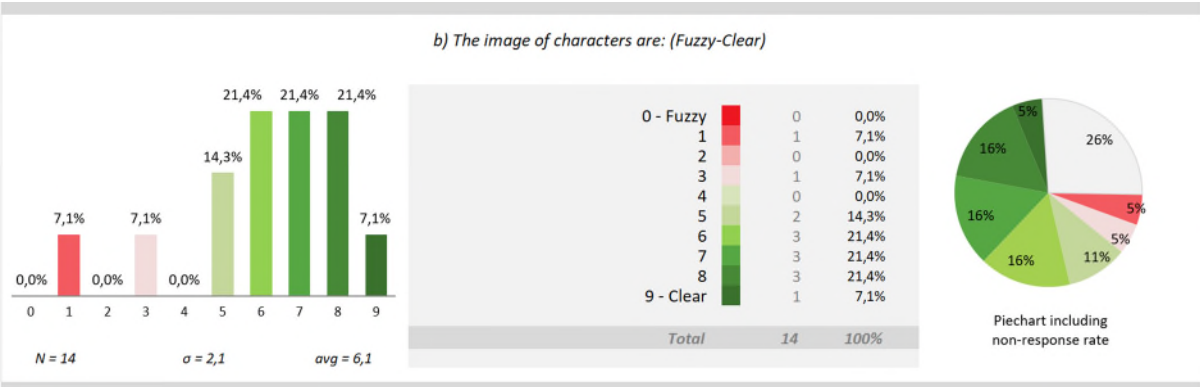


Figure 330 The image of characters are: [Fuzzy|Clear]

When asked to rate whether the highlighting on the screen was “Unhelpful” or “Very helpful”, the statement was given an average of 6.07 with a standard deviation of 2.1. Although 7.1% of the respondents thought the screen highlighting was unhelpful, the ratings lean toward the other direction with a peak of 35.7% rating the statement a 7 and a combined 14.2% rating it an 8 and a 9. A non-response rate of 26% should also be noted.

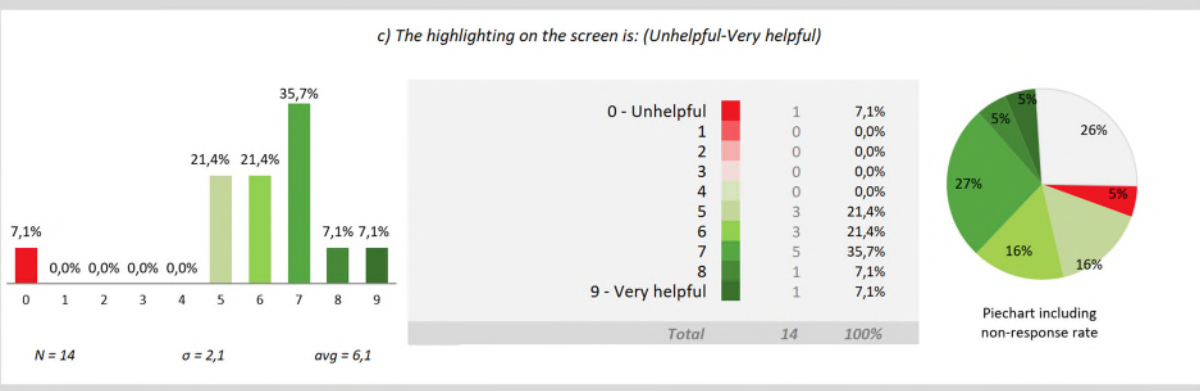


Figure 331 The highlighting on the screen is: [Unhelpful|Very helpful]

When asked for their level of satisfaction with the use of bolding, the user quite unanimously rated the statement positively with an average of 6.86, thereby leaning toward the green range. However, like the previous statements, the non-response rate was as high as 26%, and one user rated this statement as quite unhelpful and left a comment (see comment 1 in Table 96).

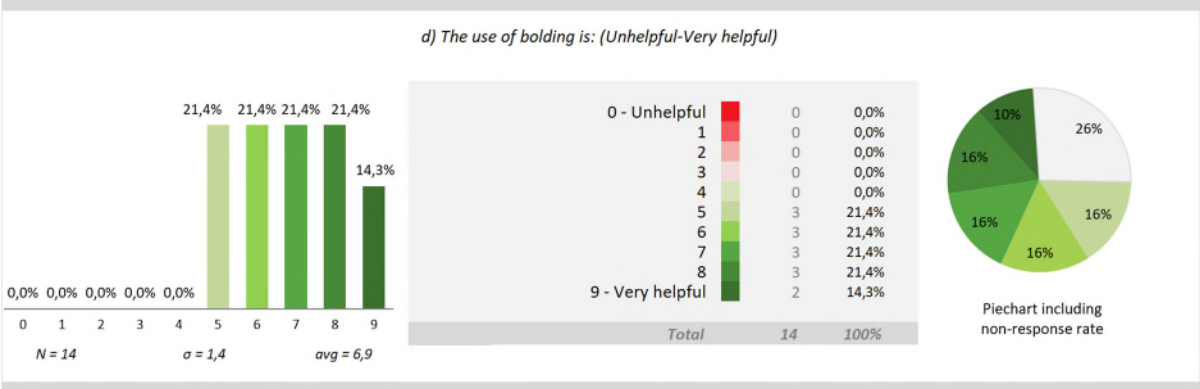


Figure 332 The use of bolding is: [Unhelpful|Very helpful]

When asked if they found the screen layouts helpful, the average was 6.38 and standard deviation 1.8, which showed that most of the users found the screen layouts helpful most of the time. However, a comparatively higher rate of users (32%) refused to respond to this statement and three users left their comments (see comment 2 in Table 96).

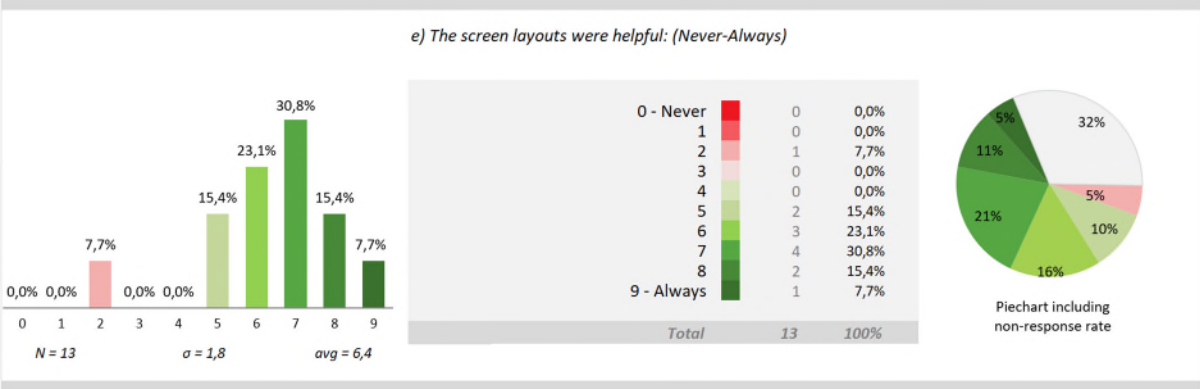


Figure 333 The screen layouts were helpful: [Never|Always]

As for the statement assessing whether the users found enough information displayed on the screen, the average was 6.64 and the standard deviation 1.2. The peak of 42.9% that belonged to 6 and the rest of the response in the green colour continuum demonstrated that most of the users thought adequate information was displayed on the screen; 26% non-user response should also not be ignored.

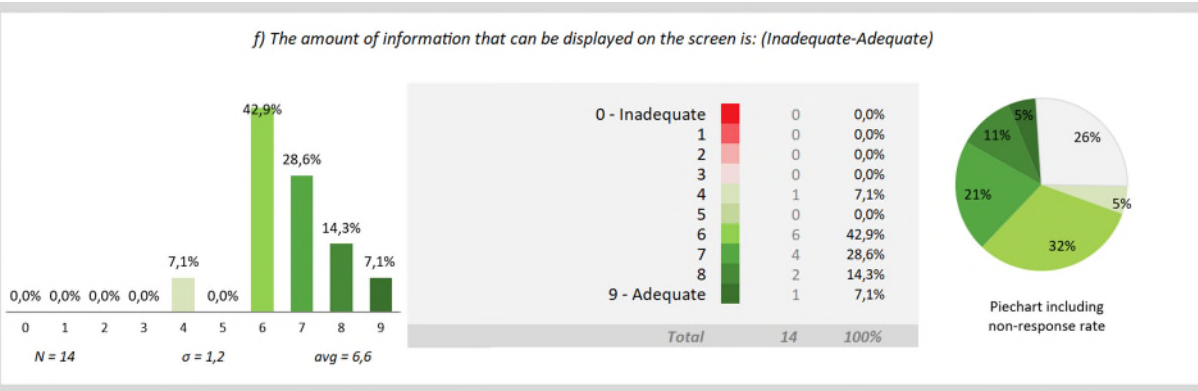


Figure 334 The amount of information that can be displayed on the screen is: [Inadequate|Adequate]

As for the arrangement of information on the screen, an average of 6.14 and a standard deviation of 2.3 demonstrates that most of the users believed that information on the screen was arranged in quite a logical manner. Still, 14.2% of the users believed that such an arrangement was illogical and left their comments (see comment 3 in Table 96). 26% of the users refused to rate this statement.

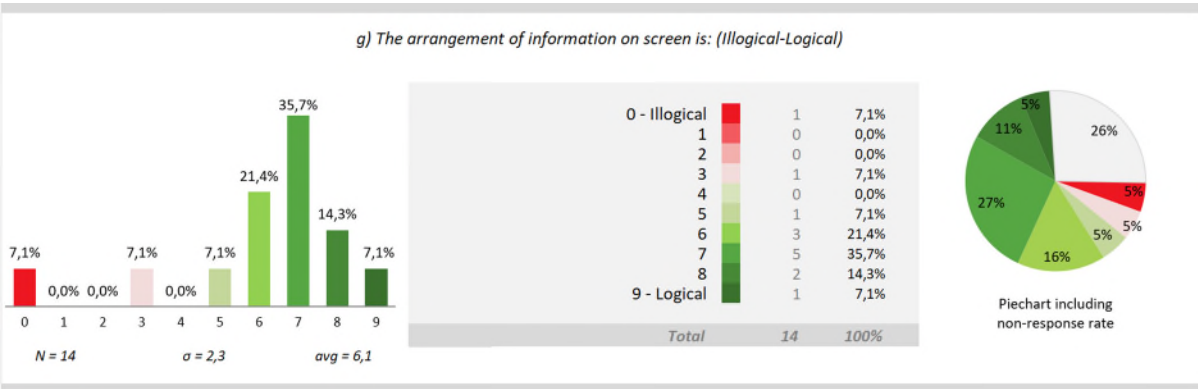


Figure 335 The arrangement of information on screen is: [Illogical|Logical]

When asked about the sequence of screens, the average was 5.93 and standard deviation showed 2.4. More than 50% of the users had a positive opinion about this statement although 21.4% did not and left their comments (see comment 4 in Table 96).

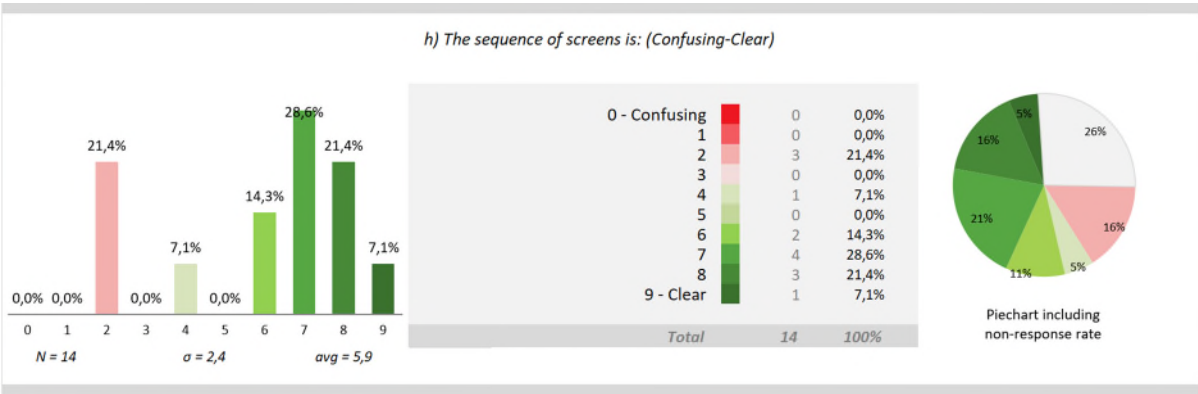


Figure 336 The sequence of screen is: [Confusing|Clear]

With an average of 5.57 and a standard deviation of 2.5, statement (i), which assessed if the next screen in a sequence was predictable or not, leaned towards “Predictable”. Despite this, around 30% rated the statement negative and left their comments (see comment 5 in **Table 96**). A non-response rate of 26% should also be noted.

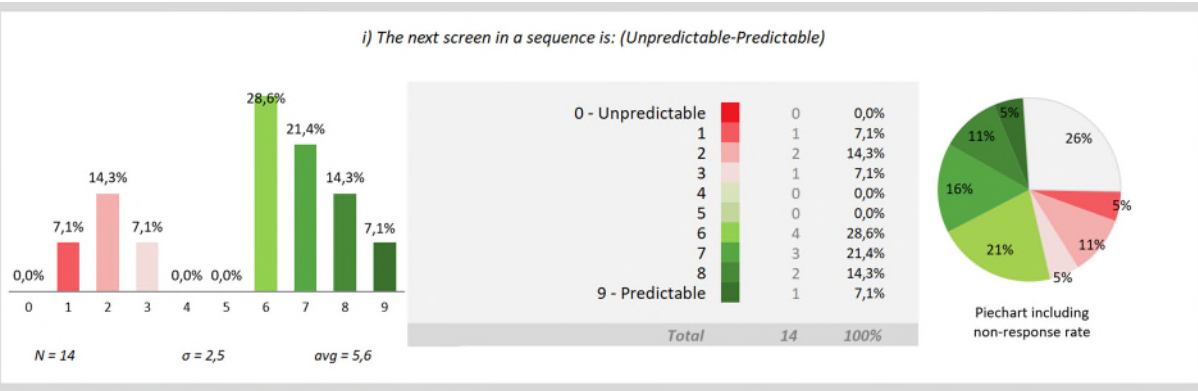


Figure 337 The next screen in a sequence is: [Unpredictable|Predictable]

Statement (j) assessed if going back to the previous screen was easy. The average showed 6.21 which means most of the users believed it was easy to do. Despite this, some users believed that it was either impossible or difficult to go to the previous screen and, as in previous statements, a 26% non-response rate should be noticed.

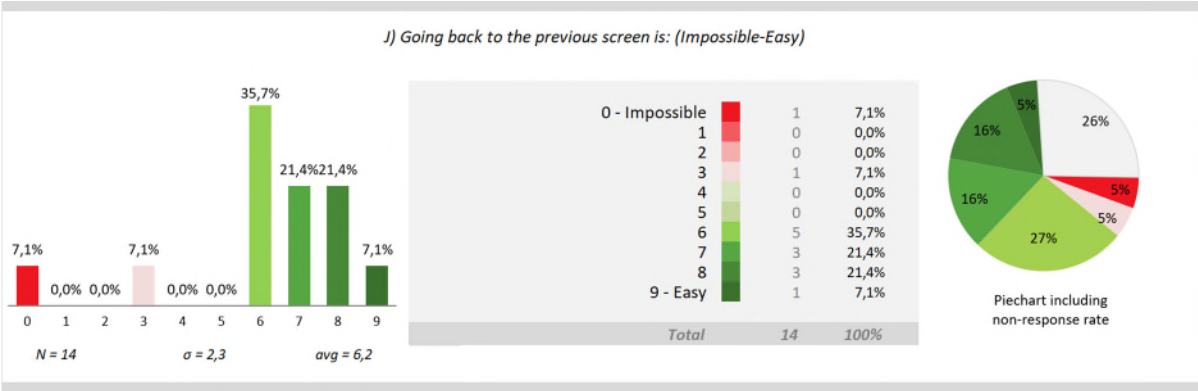


Figure 338 Going back to the previous screen is: [Impossible|Easy]

When asked to point out if they found the progression of the work-related tasks “Confusing” or “Clearly marked”, the average was 6.07 and standard deviation 1.8. 14.3% of the users believed that the work-related tasks’ progression was somewhat confusing and left their comments (see comments 6 in **Table 96**). 26% of the users refused to respond to this statement.

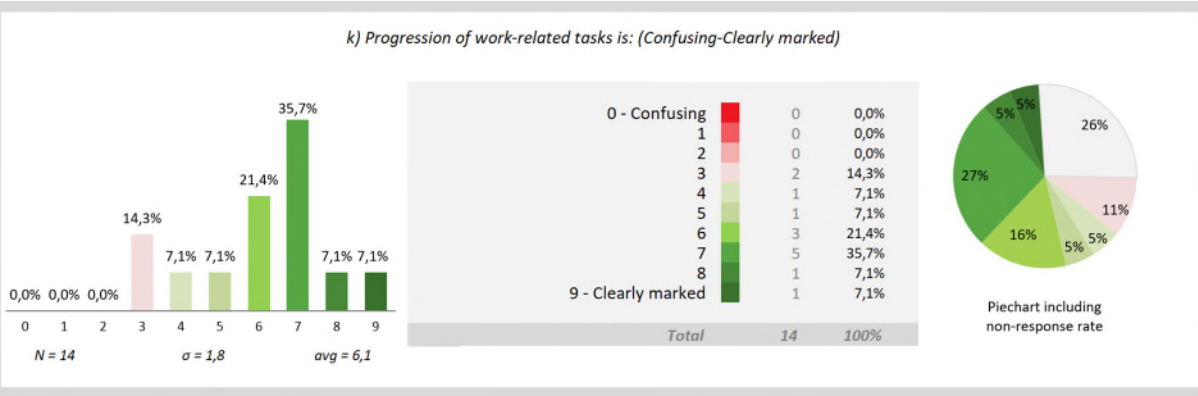


Figure 339 Progression of work-related tasks is: [Confusing|Clearly marked]

The figure below shows the mean ratings of 19 users’ impressions to the second group of statements (l-r).

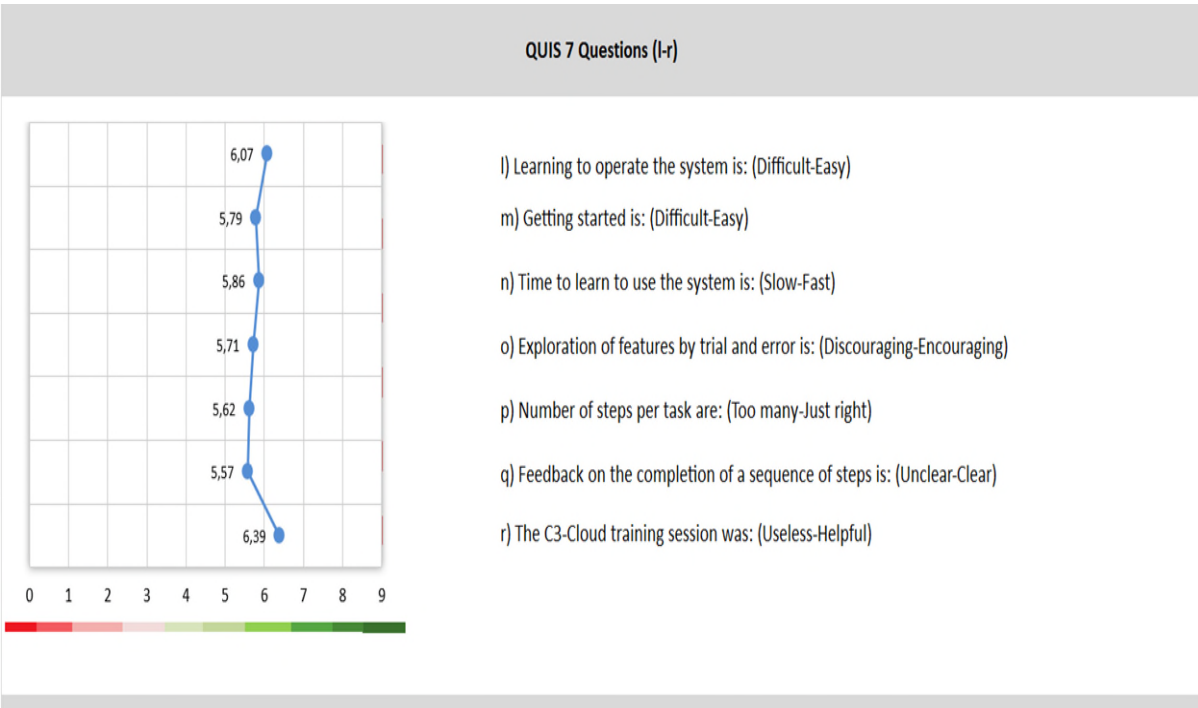


Figure 340 1st survey for HCP, QUIS7 (l-r)

When asked if they found it difficult or easy to learn to operate the system, most of the users believed that the system was easy to operate. Hence, the average was 6.07, the standard deviation 1.5. and there was a 26% non-response rate.

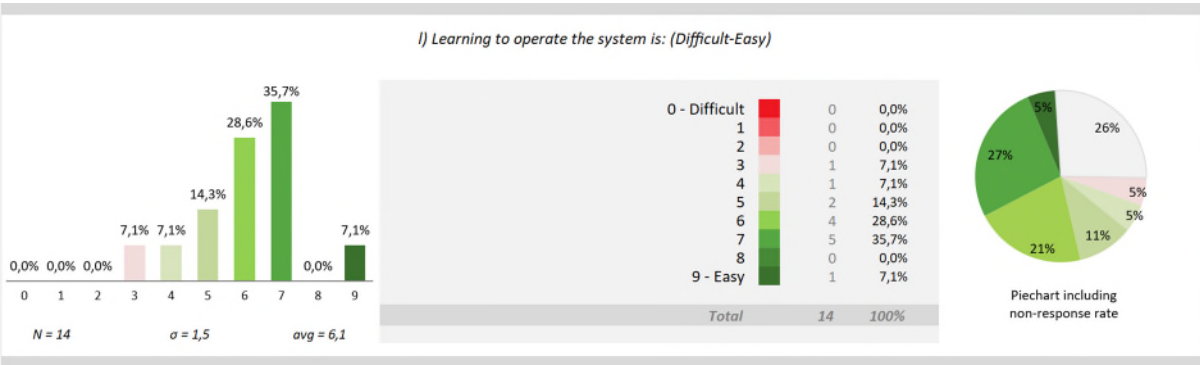


Figure 341 Learning to operate the system is: [Difficult|Easy]

For statement (m) the average was 5.79, standard deviation 1.6 and the peak rating belonged to 6 (42.9%) which demonstrated that getting started was almost easy for the users. However, like the previous statements, there was a 26% non-response rate.

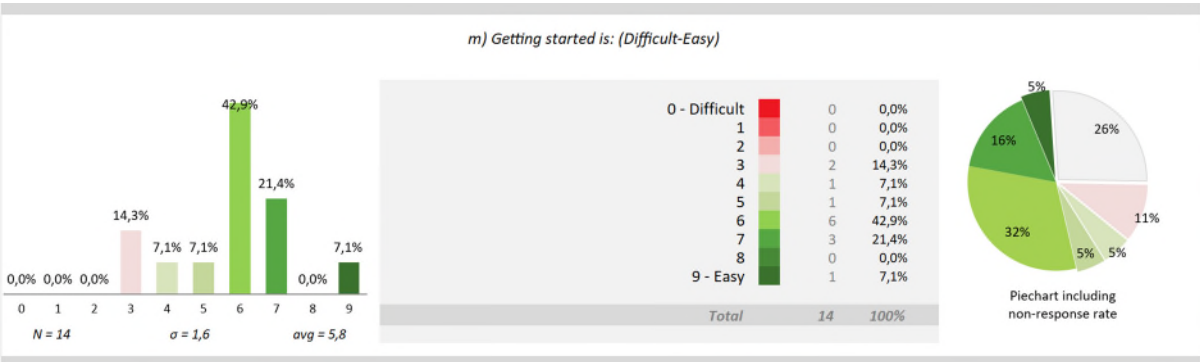


Figure 342 Getting started is: [Difficult|Easy]

When the users were asked if they could learn how to use the system with a fast or slow pace, the peak of the responses belonged to 7 points with 42.9% and the average was 5.86, which showed that they could learn how to use the system a little faster than average. In spite of this, some users thought it was not fast for them to learn the system usage and one of them left a comment (see comment 7 in **Table 96**).

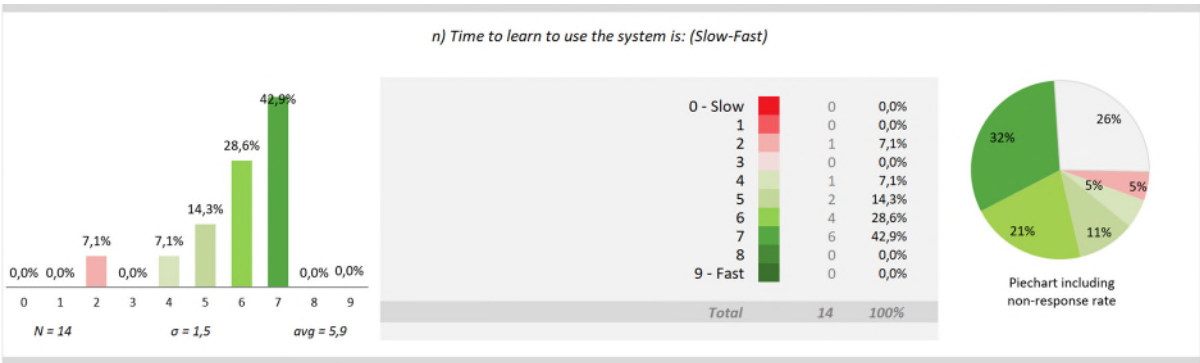


Figure 343 Time to learn to use the system is: [Slow|Fast]

Users' opinion about whether the exploration of features by trial and error was encouraging or not was positive, leaning towards "Encouraging" by almost 65% of the users rating it a 6 and 7; the average rating was 5.71, standard deviation 1.7 and there was a with 27% non-response rate.

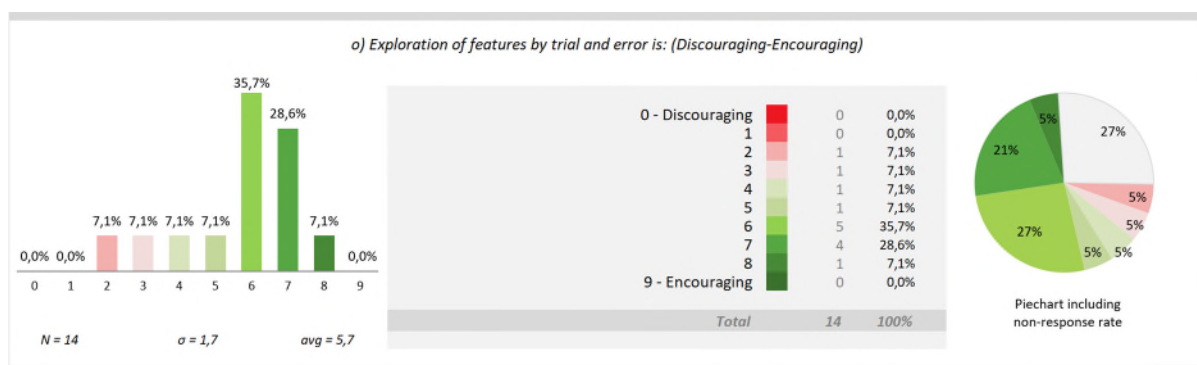


Figure 344 Exploration of features by trial and error is: [Discouraging|Encouraging]

Apart from a comparatively high non-response rate of 32%, the peak rating for statement (p) belonged to number 7 and 6 with 30.8% and 23.1%; the average was 5.62 and standard deviation 1.7. More than 30% of the users thought that the number of steps were in a way too many and left their comments (see comment 8 in **Table 96**).

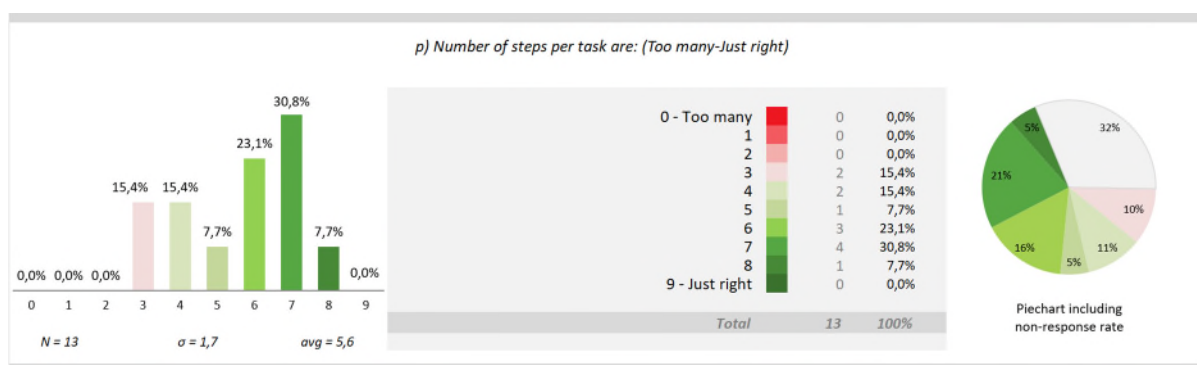


Figure 345 Number of steps per task are: [Too many|Just right]

When asked to rate whether the feedback on the completion of a sequence of steps was clear or not, the average rating showed 5.57 and standard deviation was 2.2; 26% of the respondents refused to rate this statement and about 14% thought the feedback given was somewhat unclear and one of them left a comment (see comment 9 in **Table 96**).

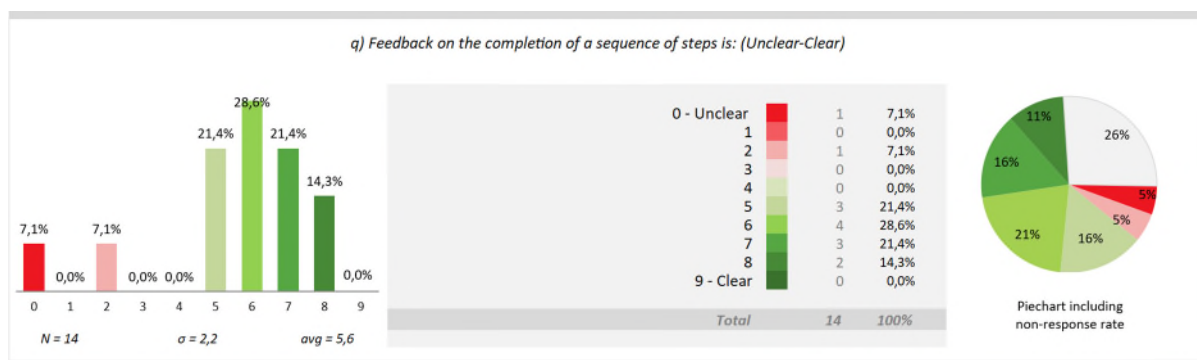


Figure 346 Feedback on the completion of a sequence of steps is: [Unclear|Clear]

Finally, when asked if the C3-Cloud training session was “Useless” or “Helpful”, the peak rating belonged to 7, with 38.9% and the average showed 6.4, standard deviation was 1.8 and 5.6% of the users also found the training session quite useless.

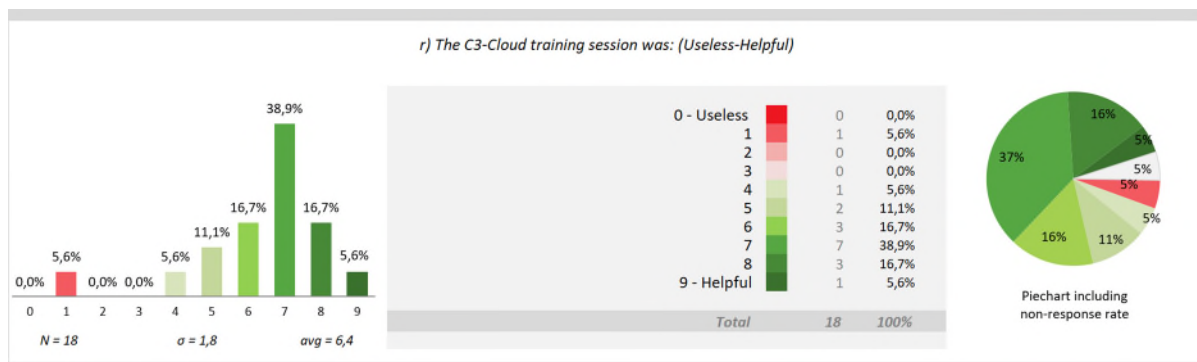


Figure 347 The C3-Cloud training session was: [Useless|Helpful]

The table below shows the collected comments related to the statements that were rated 0-5 in their original language (for the English language refer to **Table 9**).

Comments related to statements (original language)	
1)	The use of bolding is: [Unhelpful Very helpful] <ul style="list-style-type: none"> La verdad es que no me había dado cuenta de que algunas palabras están en negrita y otras no lo están.
2)	The screen layouts were helpful: [Never Always] <ul style="list-style-type: none"> Las pestaña de plan de atención debería ser más visual. Por el mismo tema que los caracteres de la pantalla. No se explicarlo bien, es como moy monolettra...monotono...no hace que me atariga el contenido.
3)	The arrangement of information on screen is: [Illogical Logical] <ul style="list-style-type: none"> Mucha información pero mal ordenada, es más sencillo buscar diabetes o HTA que gestión de glucosa o PA
4)	The sequence of screen is: [Confusing Clear] <ul style="list-style-type: none"> Me cuesta despazarme por las páginas.
5)	The next screen in a sequence is: [Unpredictable Predictable] <ul style="list-style-type: none"> No lo sé.
6)	Progression of work-related tasks is: [Confusing Clearly marked] <ul style="list-style-type: none"> Crteo que no controlo el Sistema.
7)	Time to learn to use the system is: [Slow Fast] <ul style="list-style-type: none"> El curso donde se nos explicó el manejo fue demasiado rápido.
8)	Number of steps per task are: [Too many Just right] <ul style="list-style-type: none"> HAY demasiada información en cada recuadro. Tengo el recuerdo que era un poco farragoso el crear tares, actividades.
9)	Feedback on the completion of a sequence of steps is: [Unclear Clear] <ul style="list-style-type: none"> NO entiendo la pregunta.

Table 96 1st survey for HCP, comments related to statements rated 0-5, original language

The second table below collects the users' general comments (only one comment in Castilian Spanish was left) about their interaction with the system and their level of satisfaction with it (for the English language refer to **Table 10**).

General Comments (original language)	
1)	Hemos empezado la utilización del sistemna C3-Cloud en un momento con bastante sobrecarga de trabajo y los pacientes han tenido dificultades para inscribirse. A la hora de utilizar el sistema no consigo avanzar.

Table 97 1st survey for HCP, QUIS7 general comments, original language

10.4. C3-Cloud: Second Survey for Patients

Test user were first asked to answer three basic questions. The first basic question asked about the users' age. Almost 80% of the respondents were between the age 65-79 years of age, and the rest of the age ranges were 3.8% each.

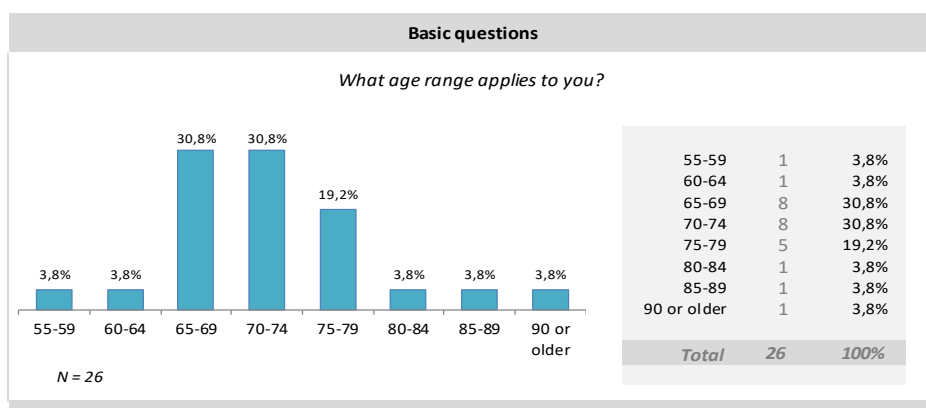


Figure 348 2nd survey for patients, basic question (age)

The next basic question asked the Technology trial participants for their sex. Out of the 26 participants, 16 were male comprising 61.5% of the respondents and 10 were female comprising 38.5% of the respondents.

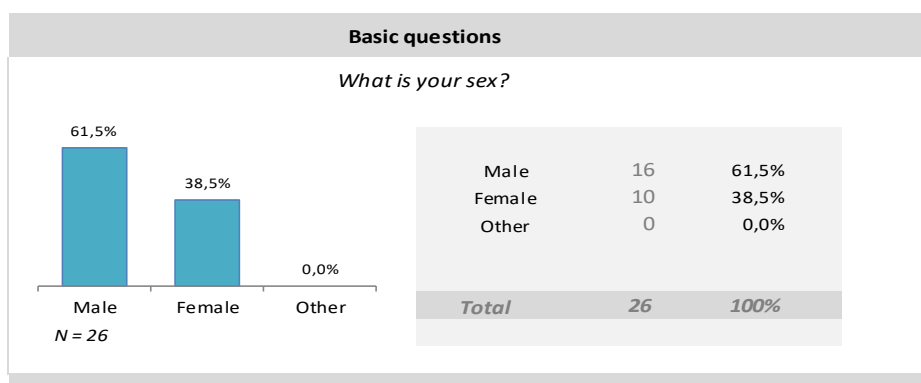


Figure 349 2nd survey for patients, basic question (sex)

The third and last basic question asked the Technology trial participants about the area they lived in. Out of 26 respondents, 18 or 69,2% of them, were from Region Jämtland in Sweden, 5 or 19,2% were from South Warwickshire in the UK and 3 or 11,5% were from the Basque Country in Spain.

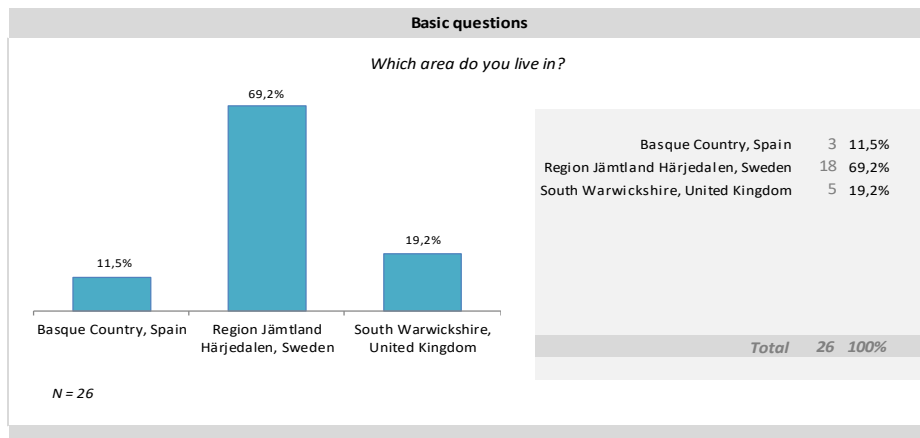


Figure 350 2nd survey for patients, basic question (area)

Unified Theory of Acceptance and Use of Technology (UTAUT)

Technology trial participants were then asked for their opinions about 20 statements. The users' reactions varied between colour red ("Strongly disagree") to dark green ("Strongly agree"). The following figure shows the mean ratings of almost 26 users to the statements a-j on a range from "Strongly disagree" to "Strongly agree".

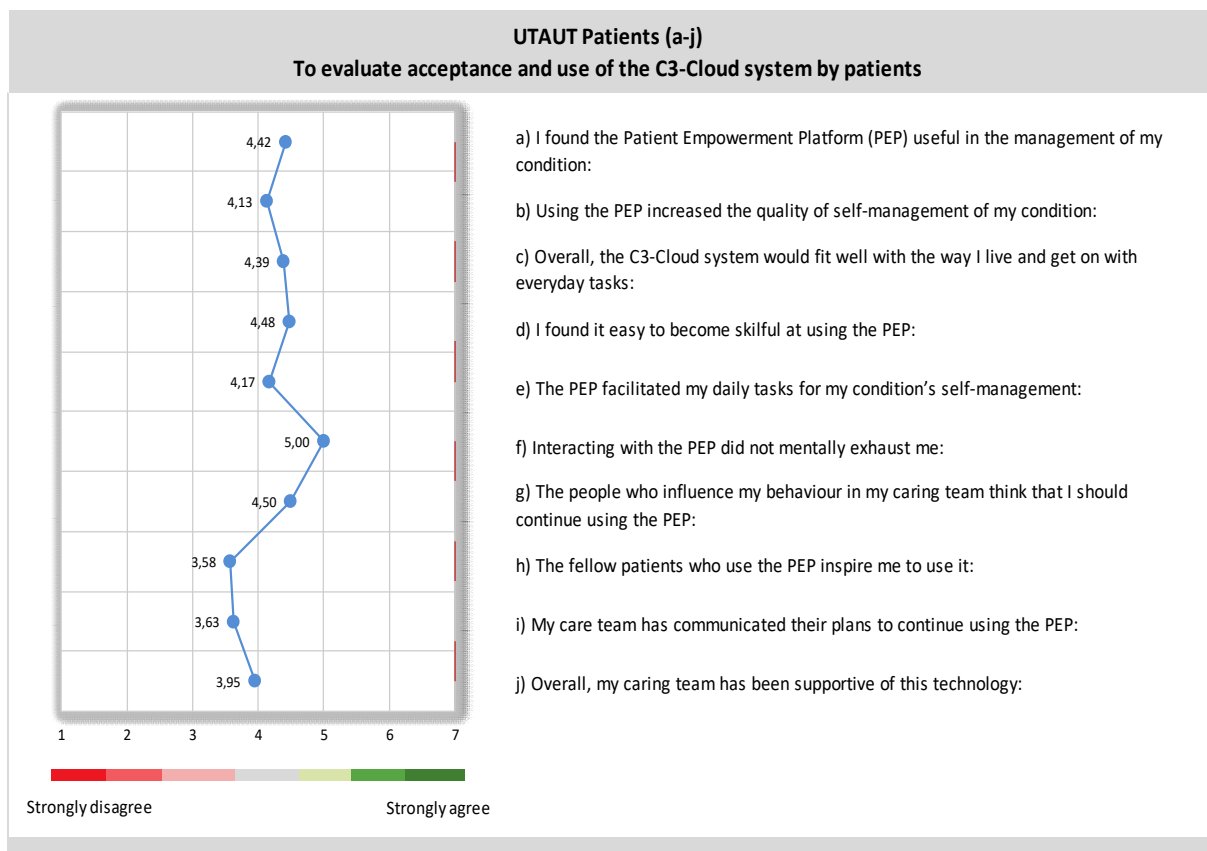


Figure 351 2nd survey for patients, UTAUT (a-j)

When asked if they found PEP useful in the management of their condition, the system was ranked an average of 4.2 with a standard deviation of 1.6 and a peak of 33.3% of users who had a neutral opinion about this statement.

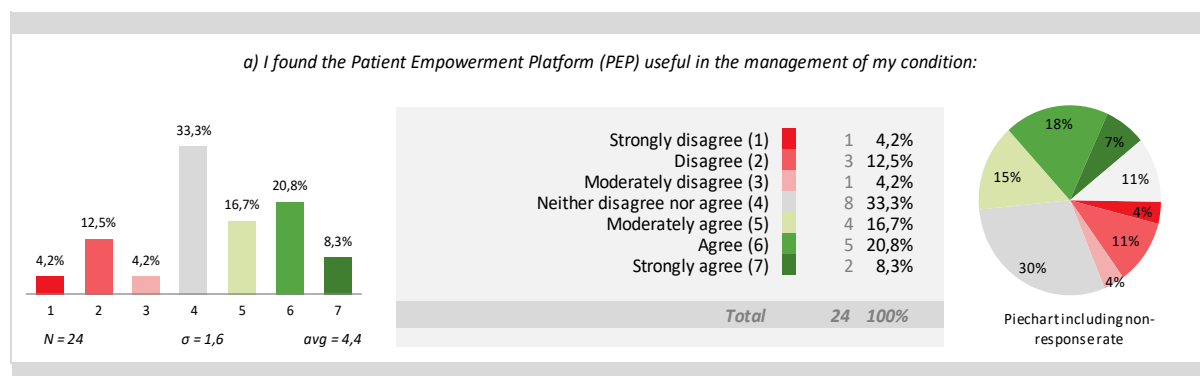


Figure 352 I found the Patient Empowerment Platform (PEP) useful in the management of my condition

When the respondents were asked if using the PEP increased the quality of self-management of their condition, PEP system was ranked an average of 4.13, the standard deviation was 1.8 and the peak belonged to those who disagreed with the statement with 26.1%.

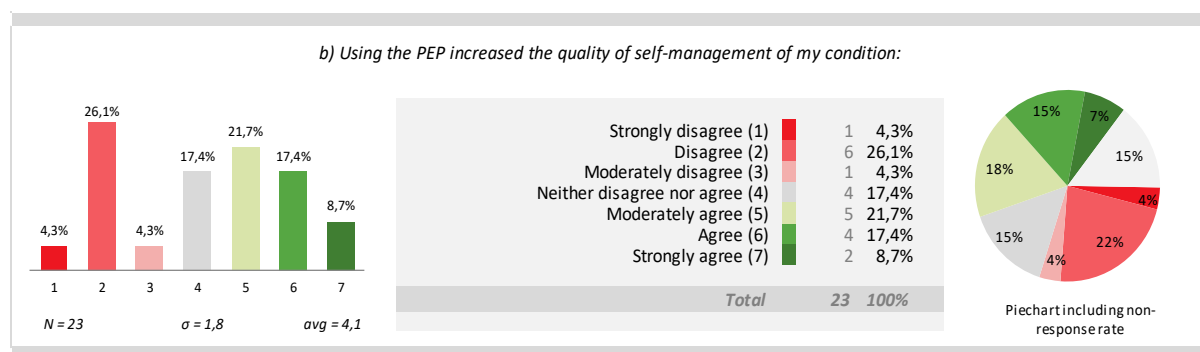


Figure 353 Using the PEP increased the quality of self-management of my condition

When asked if the C3-Cloud system would fit well with the way the respondents lived, an average of 4.39 shows that the respondents had quite a neutral opinion about the statement. Despite this, the peak response belonged to “Agree” with 34.8% of the responses and the standard deviation was 1.9.

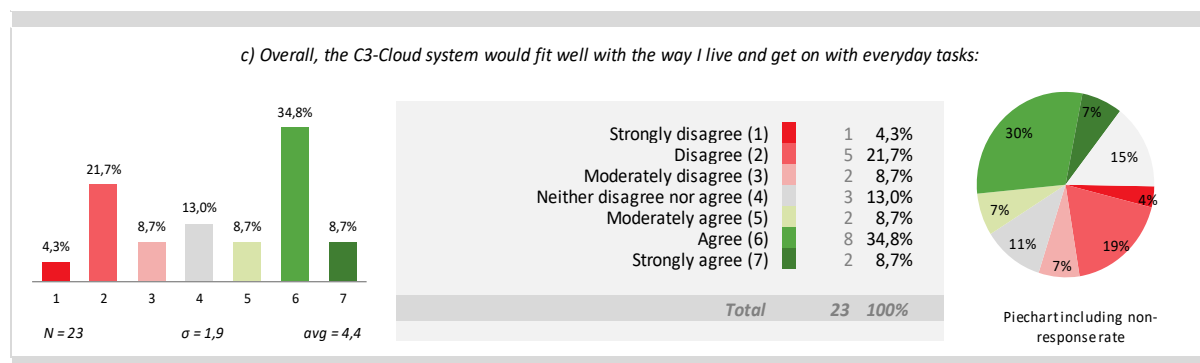


Figure 354 Overall, the C3-Cloud system would fit well with the way I live and get on with everyday tasks

An average of 4.5 for the statement (d) demonstrates that the respondents quite moderately agreed with the statement. The peak responses belonged to “Agree” and “Neither disagree nor agree” with 21.7% each, and the standard deviation was 1.8.

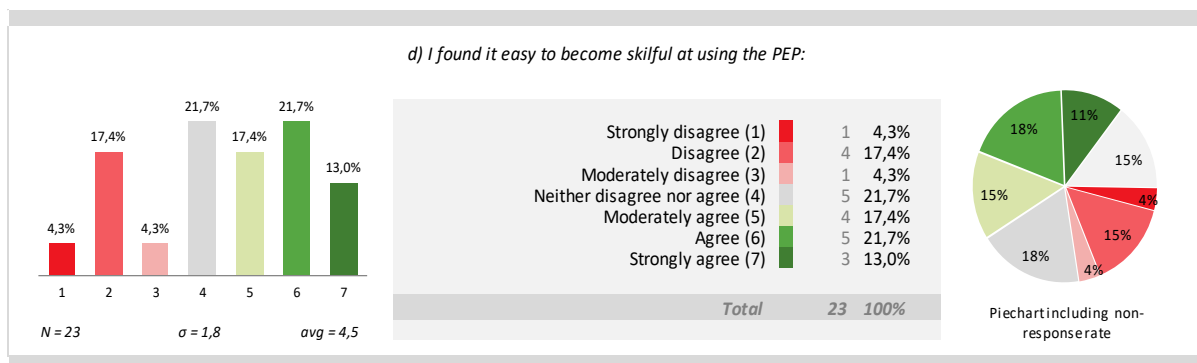


Figure 355 I found it easy to become skilful at using the PEP

Although for statement (e) the standard deviation was 1.8 and the average was 4.18, demonstrating that the respondents had a neutral opinion about the statement, 26.1% of the respondents disagreeing with this statement opens the floor for further discussion on why a comparatively high number of the respondents had a negative opinion about the facilitating power of the PEP in the respondents' self-management of their conditions.

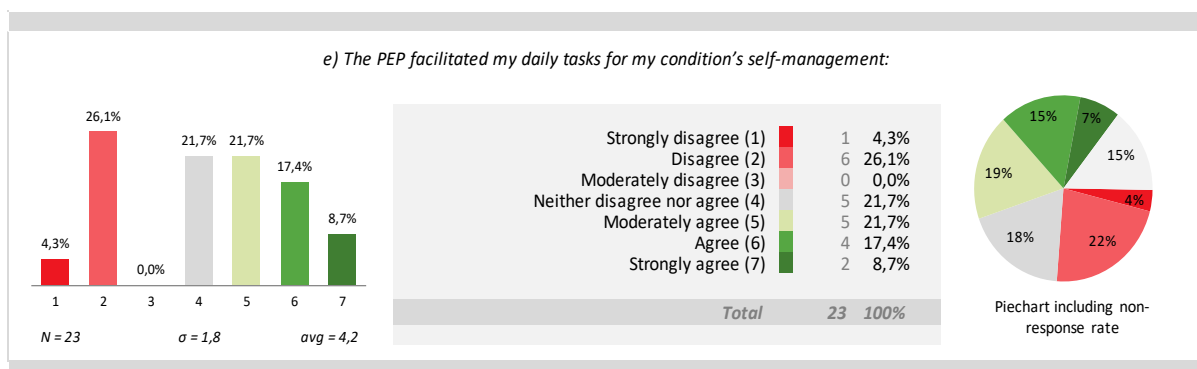


Figure 356 The PEP facilitated my daily tasks for my condition's self-management

With 27.3% for “Strongly agree” and “Agree” and an average hovering on 5, the respondents moderately agreed that interacting with the PEP did not mentally exhaust them.

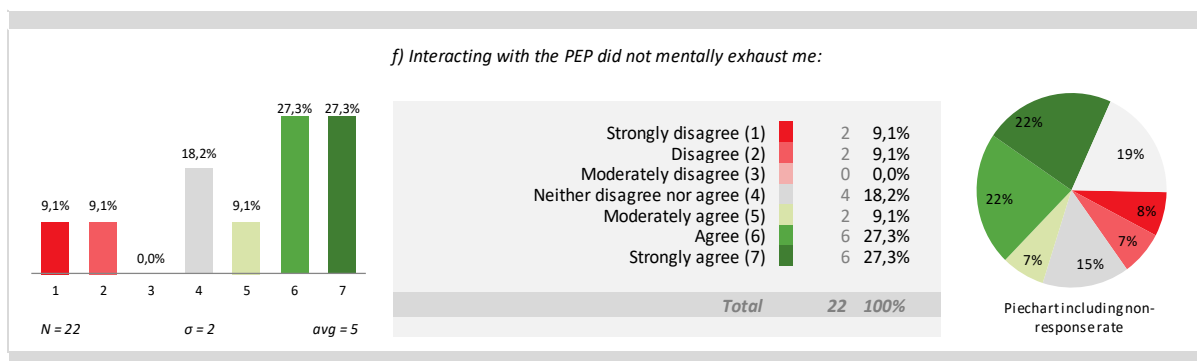


Figure 357 Interacting with the PEP did not mentally exhaust me

When asked if the people influencing the user behaviour in their care team thought that the user should continue using the PEP, the standard deviation was 1.6 and the average was 4.5. This is the result of 45% of the users having a neutral opinion about this statement. It should also be noted that the non-response rate for this statement was comparatively higher (26%).

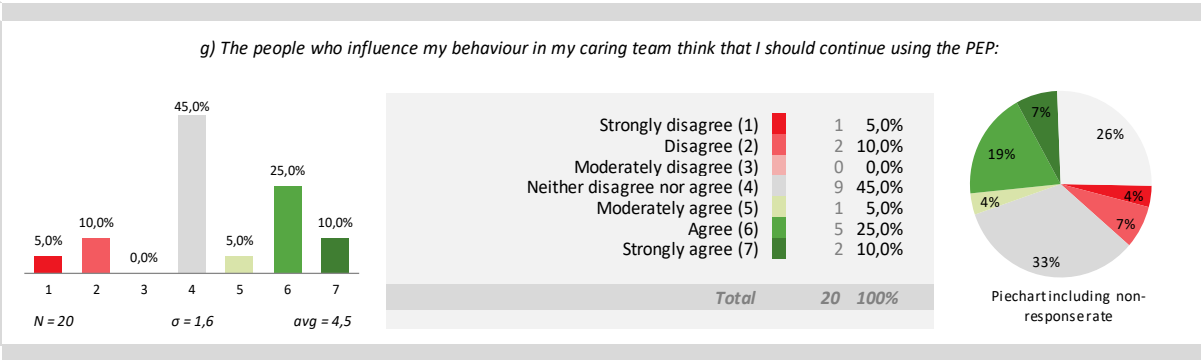


Figure 358 The people who influence my behaviour in my caring team think that I should continue using the PEP

When asked if their fellow patients who used the PEP inspired them to use it, the standard deviation was 1.7 with a peak of 52.6% of respondents having a neutral opinion. However, an average of 3.58 demonstrated that the users moderately disagreed with this statement, which necessitates further discussion. It should also be noted that a comparatively higher percentage of users (30%) refused to respond to this statement.

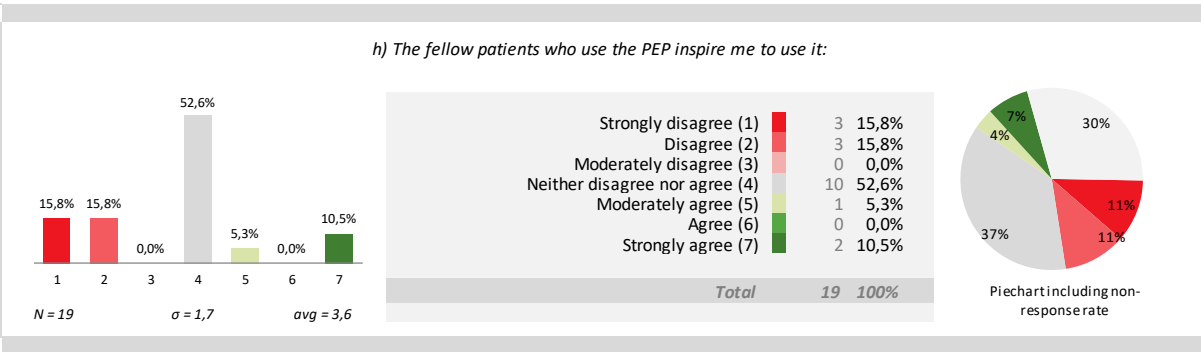


Figure 359 The fellow patients who use the PEP inspire me to use it

When asked if their care team communicated their plans to continue using the PEP, an average of 3.63 showed that the user moderately disagreed with the statement. A bar chart that was tilting towards grey and red colours indicated that further discussion would be needed on statement (i). As previously, a comparatively higher non-response rate should be noted.

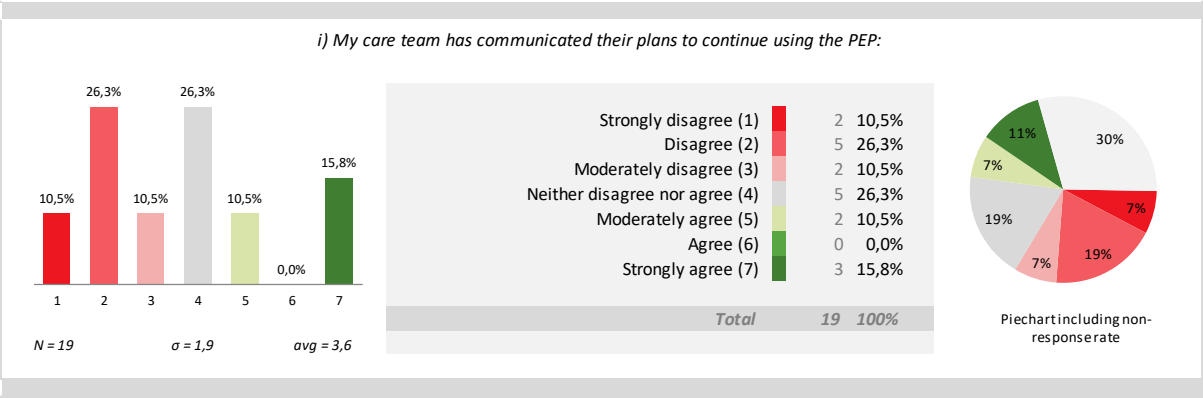


Figure 360 My care team has communicated their plans to continue using the PEP

For statement (j), the responses were almost equally distributed among all ranges leading to an average of 4 and a standard deviation of 2. Although, on average, the users had a neutral opinion about this statement, almost 40% of the users rated this statement within the “Disagree” range, thus opening the floor for further discussion.

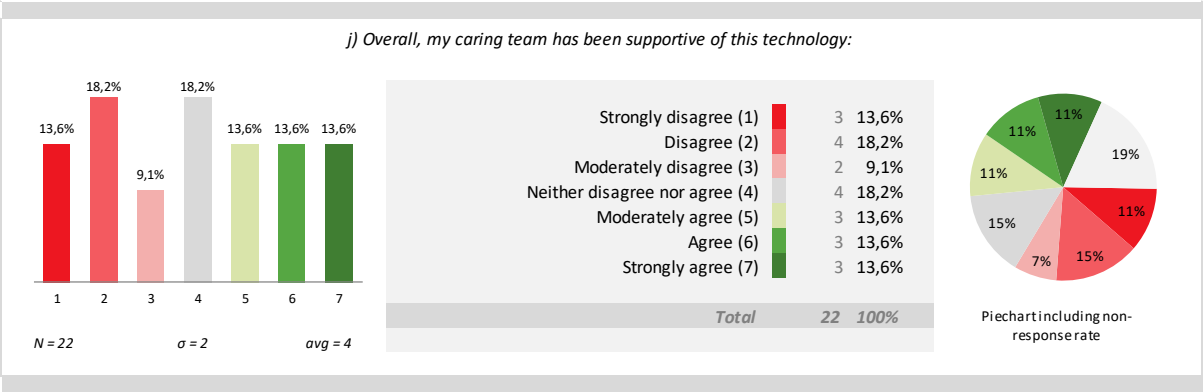


Figure 361 Overall, my caring team has been supportive of this technology

The below figure shows the mean ratings of the users to the statements (k-t) on a range from “Strongly disagree” to “Strongly agree”.

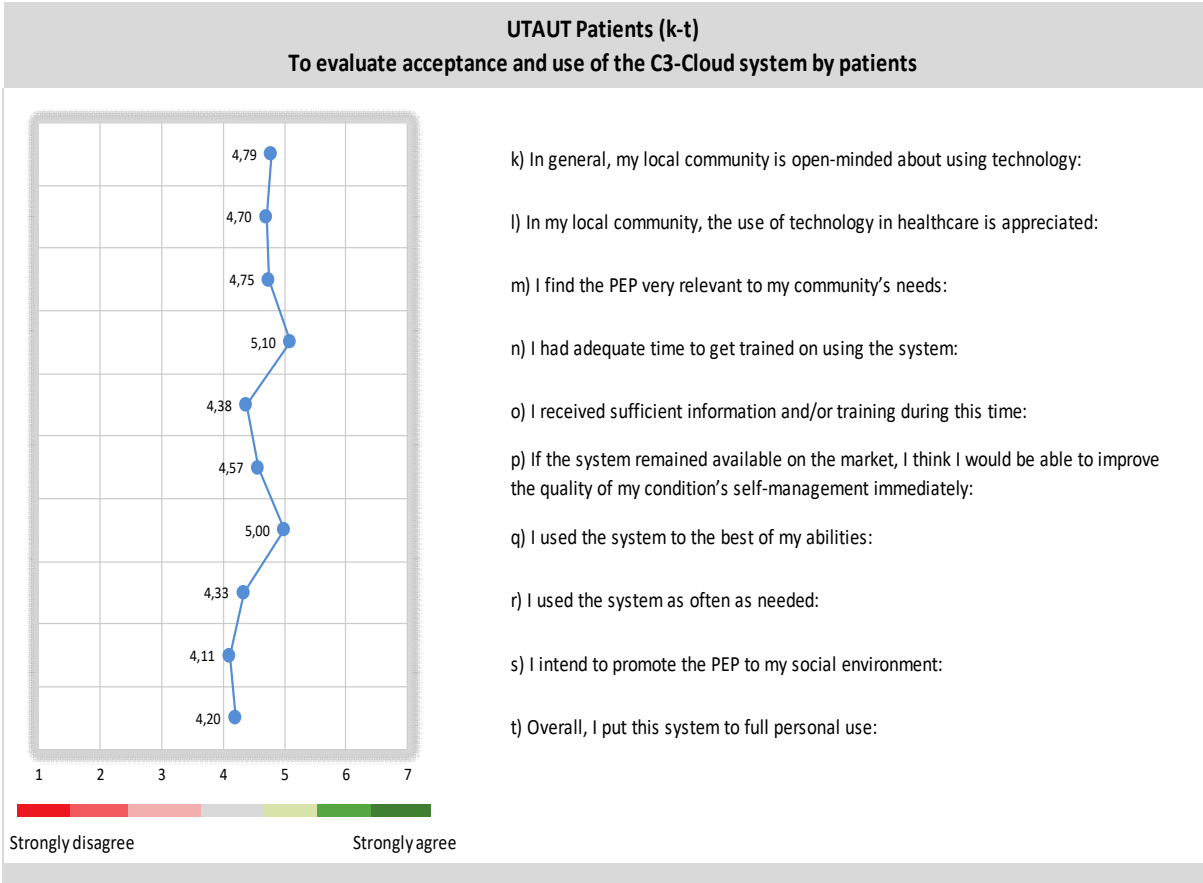


Figure 362 2nd survey for patients, UTAUT (k-t)

When asked if the users had enough time to get trained on how to use the system, the average of 4.79 showed that the respondents quite moderately agreed with the statement. The standard deviation was 1.7 and the peak of the responses was 36.8% who agreed with the statement. A non-response rate of 29% should also not be ignored.

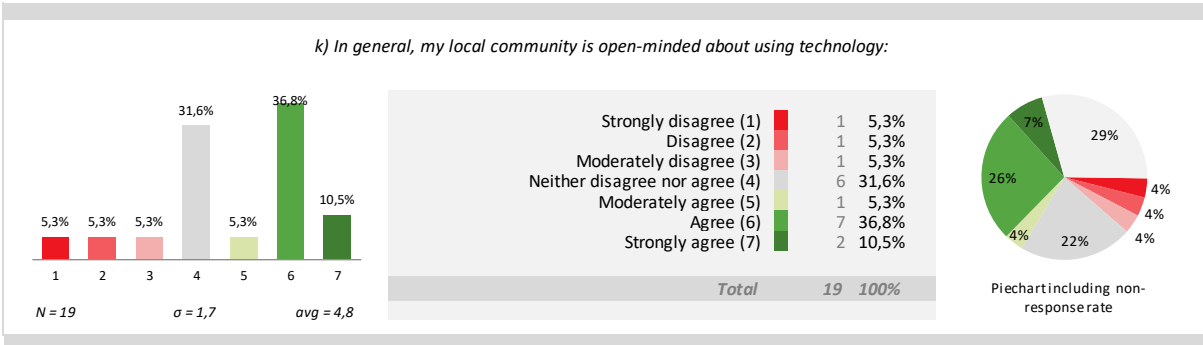


Figure 363 In general, my local community is open-minded about using technology

The responses leaned towards “Moderately agree” for statement (l), with the average being 4.70 and a standard deviation of 1.5. However, it should not be ignored that 45% of the respondents had a neutral opinion about statement (l) and the non-response rate was 26%.

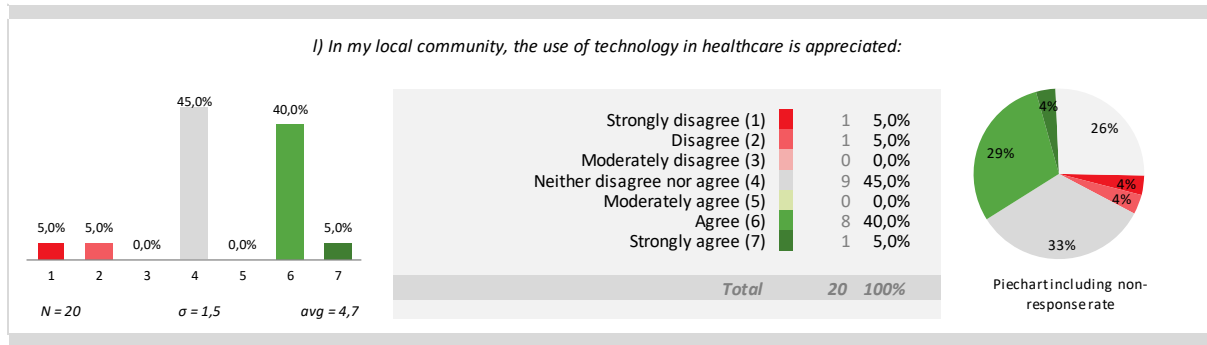


Figure 364 In my local community, the use of technology in healthcare is appreciated

When asked if they found the PEP relevant to their community's needs, an average of 4.75 showed that the users moderately agreed with the statement. The peak response for this statement was 40% for "Neither disagree nor agree" and a 26% non-response rate should not be ignored.

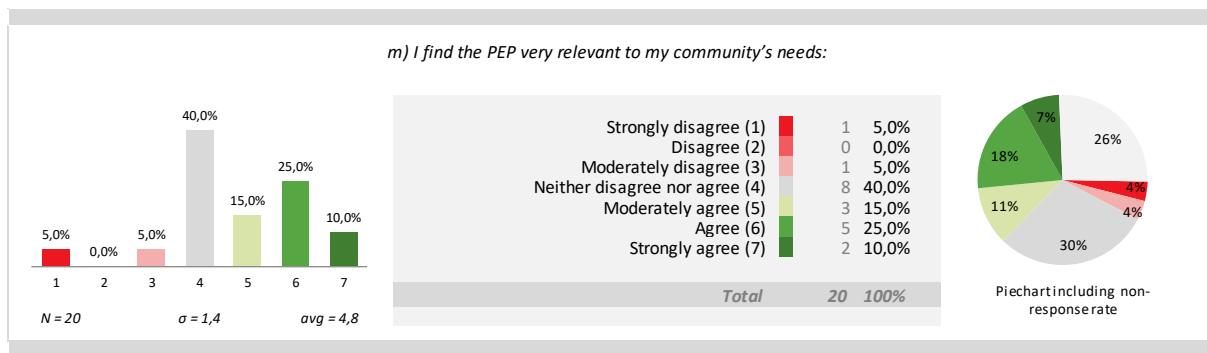


Figure 365 I find the PEP very relevant to my community's needs

The respondents moderately agreed with statement (n), represented in an average rate of 5.1. The peak rating belonged to "Agree" (47.6%), the standard deviation was 1.7 and the non-response rate 22%.

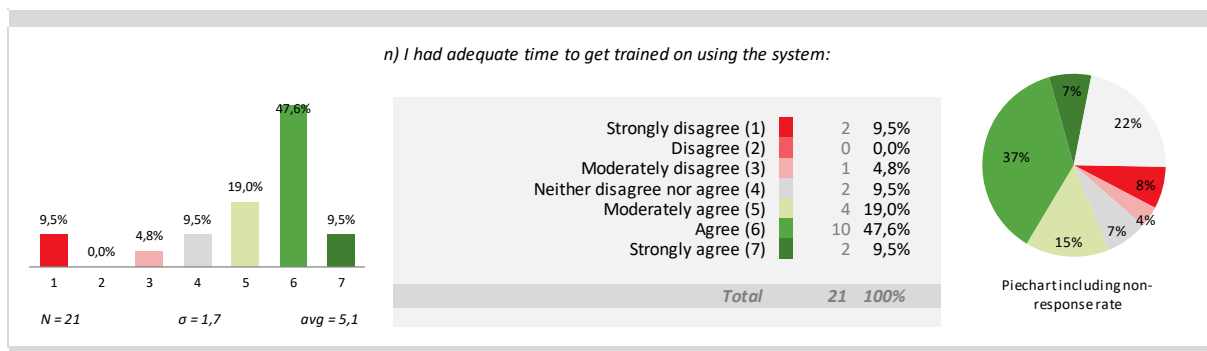


Figure 366 I had adequate time to get trained on using the system

When asked if they received enough information and training during the time they used the system, an average of 4.38 demonstrated that the users had quite a neutral opinion. The standard deviation was 1.9 and the non-response rate was 22%.

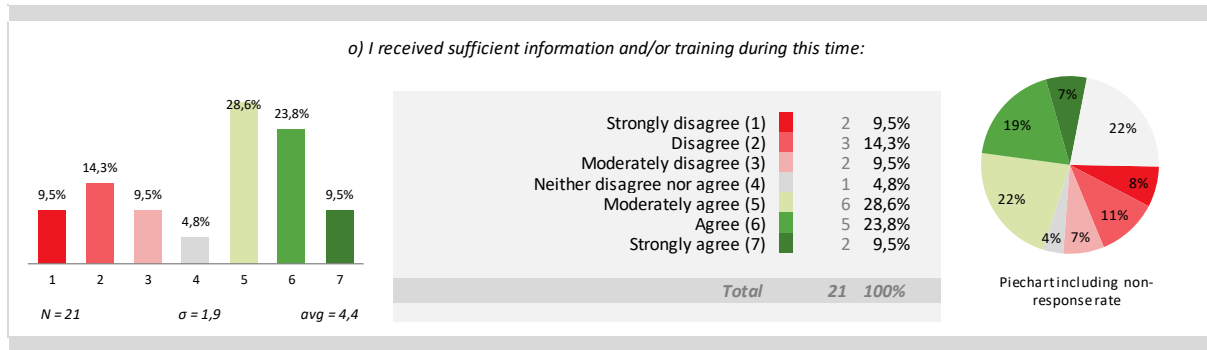


Figure 367 I received sufficient information and/or training during this time

The respondents quite moderately agreed with statement (p) with an average of 4.57. The peak rating belonged to “Agree” (33.3%), the standard deviation was 1.8 and the non-response rate was 22%.

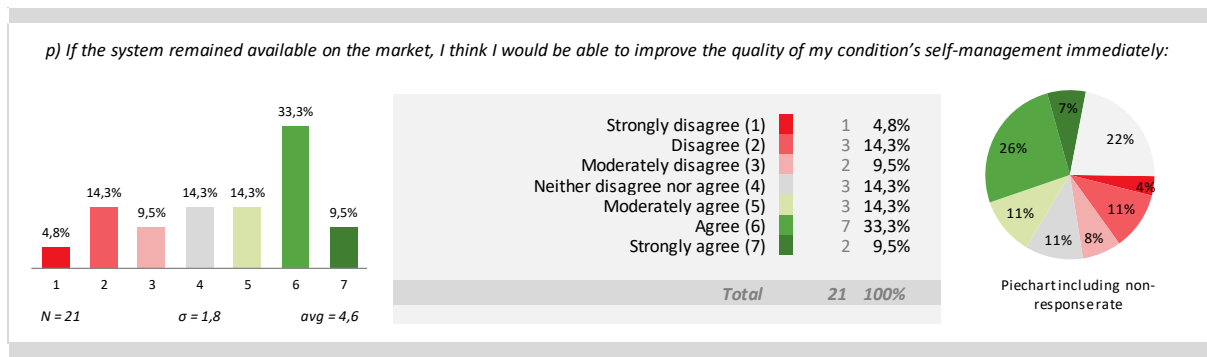


Figure 368 If the system remained available on the market, I think I would be able to improve the quality of my condition's self-management immediately

The same responses were almost repeated for statement (q). When asked if they intended to use the system as often as needed, an average of 5 and a peak of 38.1% for “Agree” showed that the respondents moderately agreed with the statement. Just like the previous statement, it should be noted that 22% of the users refused to respond to statement (q).

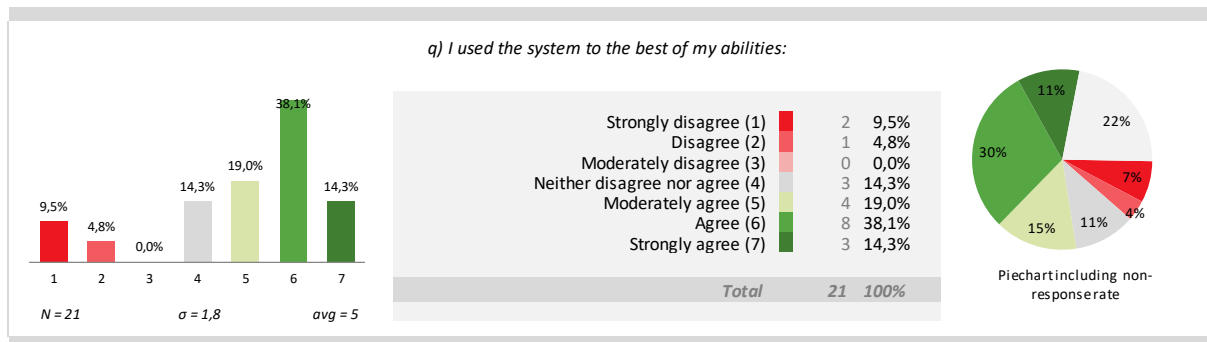


Figure 369 I used the system to the best of my abilities

For statement (r), an average of 4.33 showed that the respondents neither disagreed nor agreed, and the standard deviation was 1.9. Around 30% disagreed and strongly disagreed rates, thereby opening the floor for further discussion about this statement. A non-response rate of 22% should also not be ignored.

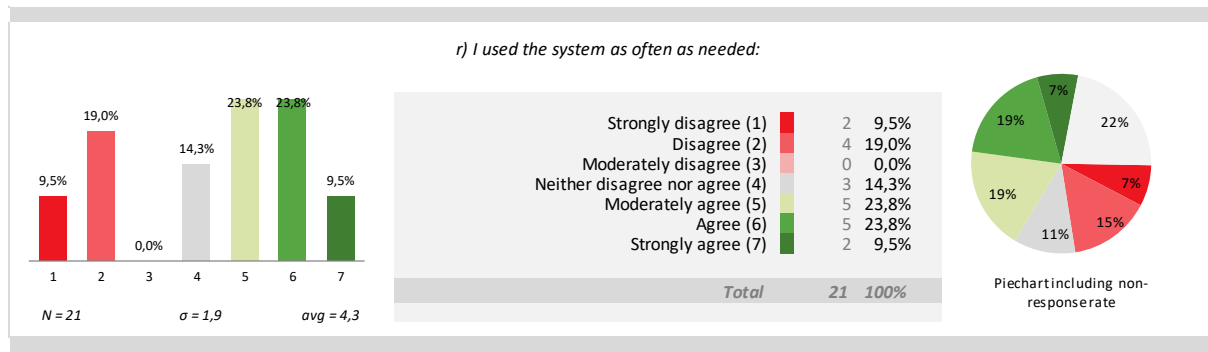


Figure 370 I used the system as often as needed

When asked if they intended to promote the PEP to their social environment, an average of 4.11 demonstrated that the user had quite a neutral opinion. The standard deviation was 1.9 and the non-response rate was 30%. The 26.3% disagree rating also opens the floor for further discussion on statement (s).

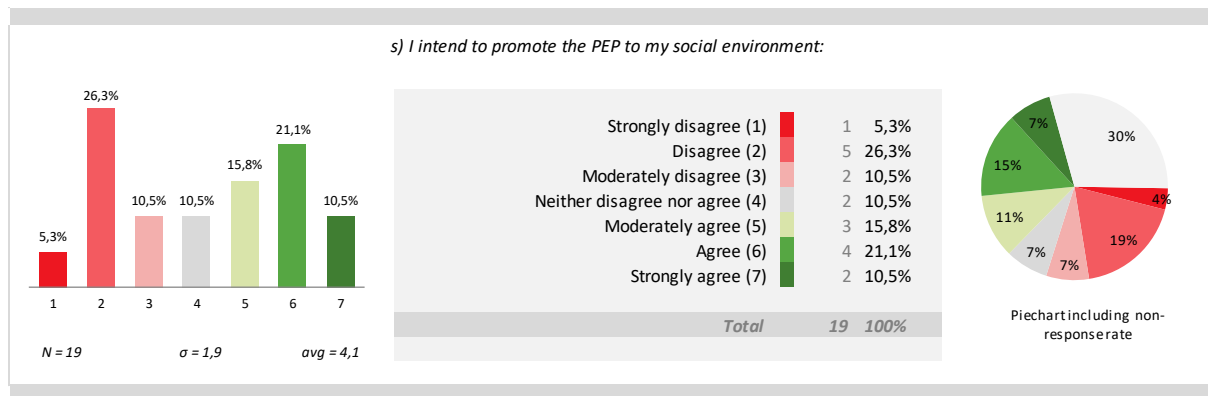


Figure 371 I intend to promote the PEP to my social environment

The last statement was leaning towards a neutral opinion with an average of 4.2. The peak rating belonged to “Agree” with 30%, the standard deviation was 2.1 and the non-response rate 26%. It would be worthwhile to reflect more about why 35% of the respondents rated this statement “Strongly disagree” or “Disagree”.

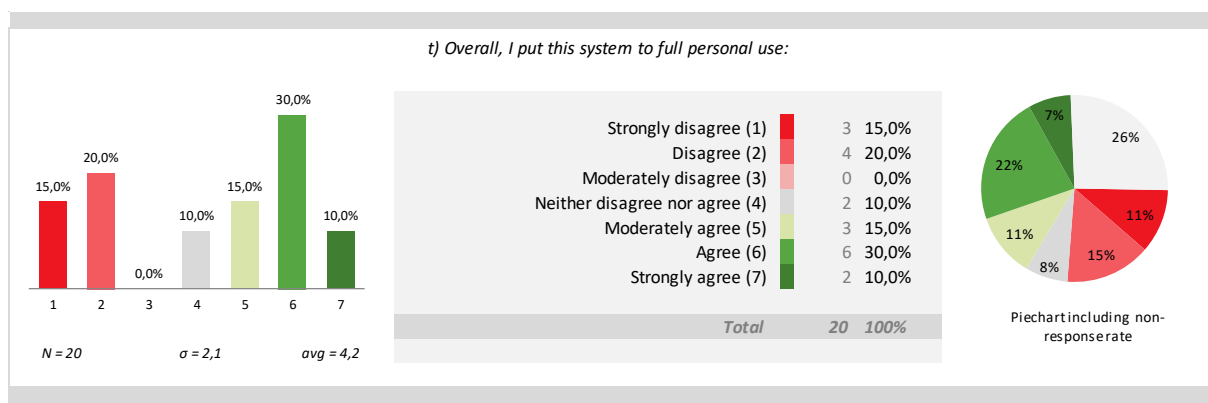


Figure 372 Overall, I put this system to full personal use

Finally, when asked if they had any further comments, the respondents gave their feedbacks, which are collected in the table below in the respondents' original language (for the English translation refer to

UTAUT, patients' general comments (English translation)	
25)	The system worked, but patient does not experience any major commitment / feedback from the system owner.
26)	I do not know what you are talking about, I have not received anything with more than 2 test messages. As far as I can think, no one has trained me in what C3-Cloud is. Why did I join here?
27)	So, I do not understand the meaning of this survey because I have not had any access at all to anything that would be within the system. No care plan, no contact at all other than this and previous survey. As I have experienced it, it is just a lot talk about new technology, but nothing that really seems to have to do with reality. How did it happen like this? Would like an explanation. I am very disappointed as I was prepared to participate in this study fully.
28)	I do not think I have learned to use the system. With my healthcare contacts, neither I nor anyone in healthcare has talked about C3-Cloud.
29)	I have a hard time understanding what is going to happen. I asked my doctor if she was in and working with the system. She was not.
30)	When I asked my carer about C3-Cloud, she was puzzled.
31)	Either I do not understand the program, or it has not started properly. No communication with healthcare professionals and no advice.
32)	Well worth doing, I particularly found the graph produced using blood sugar levels informative in showing trends. Not possibly as interactive as intended. Because of other people's priorities with the current virus epidemic.
33)	System unavailability at times was annoying.
34)	The tasks were completed early during the timescale so the need to log in decreased. the lack of ability to send messages to doctors meant that there was no inter communication so no ongoing benefit other than following the diet plan. The communication checks were probably of value to the organisers in assessing the ability of the patients, but to this 91-year-old were somewhat frustrating in that with an ability to communicate I could have new targets and a wider link and benefit from medical staff. For example, I would possibly benefit from monitoring my blood sugar level but cannot download this currently from my practice website although I have a six-monthly blood test and diabetic check. I have always found available report graphs invaluable in motivating and monitoring action.
35)	As I recall, the system was very late coming online and left little time before it closed. The aim of the trial was to establish if C3-Cloud could help me manage my pre-existing conditions, which I have had for many years. Treatment has remained constant, with minor 'tweaks' from time to time and hence, I have become very used to managing my conditions quite well. As such, I feel that I did not fully benefit from this study. I have not had the opportunity of discussing this with my GP, who I see infrequently and usually for reviews of medication.
36)	I would like to be informed by whomever it may concern whether I am using the system properly or not <ul style="list-style-type: none"> • Comments on the results • Tips?

Table 19). The comments number 1-7 are from the patients in RJH (Swedish language), 8-11 from SWFT (English) and comment number 12 from BC (Castilian Spanish).

UTAUT, patients' general comments (original language)
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1)	Jag vet inte vad ni pratar om, jag har inte fått något med än 2 provmeddelanden. Vad jag kan komma på så har ingen utbildat mig i vad C3-Cloud är. Varför har jag gått med här?
2)	Systemet fungerat, men jsg upplever inget större engagemang/feedback från systemägaren
3)	Alltså, jag fattar inte meningen med denna enkät eftersom jag överhuvudtaget inte fått någon som helst tillgång till något som skulle vara inom systemet. Ingen vårdplan, ingen kontakt överhuvudtaget annat än denna och föregående enkät. Som jag har upplevt det är det bara en massa prat om nya tekniken, men inget som egentligen verkar ha med verkligheten att göra. Hur blev det så här? Skulle gärna vilja ha en förklaring. Jag är mycket besviken då jag var beredd att delta i denna studie fullt ut.
4)	Tycker inte jag fått lära mig att använda systemet. Med mina vårdkontakter har varken jag eller någon i vården pratat om C3-Cloud.
5)	Jag har svårt att förstå vad som ska hända. Jag frågade min läkare om hon var inne och jobbade med systemet, det hade hon inte.
6)	När jag frågat/berättat om c3-cloud, är/har varit, sjukvårdspersonal lite frågande.
7)	Antingen förstår jag inte programmet eller också har det inte kommit igång ordentligt. Ingen kommunikation med sjukvårdspersonal och inga råd.
8)	Well worth doing, I particularly found the graph produced using blood sugar levels informative in showing trends. Not possibly as interactive as intended. Because of other people's priorities with the current virus epidemic.
9)	System unavailability at times was annoying.
10)	The tasks were completed early during the timescale so the need to log in decreased. the lack of ability to send messages to doctors meant that there was no inter communication so no ongoing benefit other than following the diet plan. The communication checks were probably of value to the organisers in assessing the ability of the patients, but to this 91 year old were somewhat frustrating in that with an ability to communicate I could have new targets and a wider link and benefit from medical staff. For example, I would possibly benefit from monitoring my blood sugar level but cannot download this currently from my practice website although I have a six-monthly blood test and diabetic check. I have always found available report graphs invaluable in motivating and monitoring action.
11)	As I recall, the system was very late coming online and left little time before it closed. The aim of the trial was to establish if C3-Cloud could help me manage my pre-existing conditions, which I have had for many years. Treatment has remained constant, with minor 'tweaks' from time to time and hence, I have become very used to managing my conditions quite well. As such, I feel that I did not fully benefit from this study. I have not had the opportunity of discussing this with my GP, who I see infrequently and usually for reviews of medication.
12)	Me gustaría que; a quien corresponda me informase si utilizo debidamente el sistema ó no Comentarios sobre los resultados Consejos?

Table 98 2nd survey for patients, UTAUT general comments, original language

10.5. C3-Cloud: Second Detailed Survey for Patients

Patient Questionnaire

Technology trial participants were asked for their opinions about 14 statements. The users' reactions were designed to be between colour dark red ("Strongly disagree") to dark green ("Strongly agree"). The figure below shows the mean ratings of the users to the statements (a-n) on a range from "Strongly disagree" to "Strongly agree".



Figure 373 2nd detailed survey for patients, patient questionnaire

When asked if they felt actively involved in planning their healthcare together with their health team when using PEP, the users rated the statement an average of 3.91 with a standard deviation of 2.2 and a peak rating that belonged to "Moderately agree". However, with 27.3% the average perception of the patients was close to neutral. It should also be noted that in all the below pie charts, there is a 59% non-response rate.

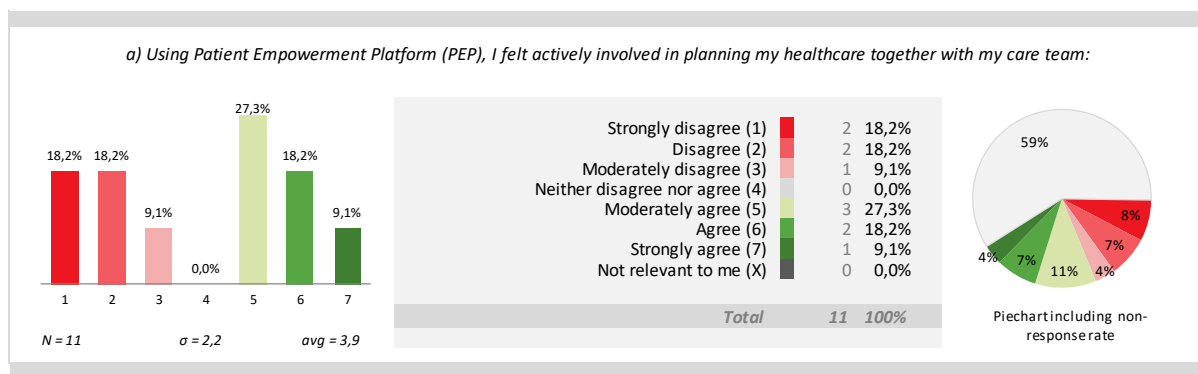


Figure 374 Using Patient Empowerment Platform (PEP), I felt actively involved in planning my healthcare together with my care team

When asked if the communication with their care team via PEP was easy, an average of 3.27 showed that the patients moderately disagreed with the statement and the standard deviation was 2. The peak response belonged to “Disagree” with 36.4% of the responses, which certainly opens the floor for further discussion about this statement.

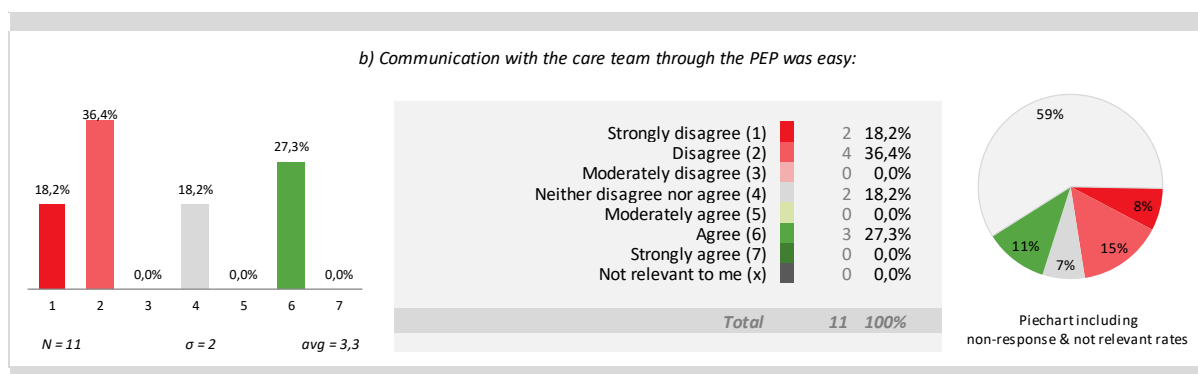


Figure 375 Communication with the care team through the PEP was easy

An average of 3.45 demonstrated that the patients’ opinion tilted slightly towards disagreeing with statement (c). The standard deviation was 1.7 and the peak belonged to “Disagree” with 27.3%, which means that this statement should be reflected upon for a better care aligned with the patients’ personal needs.

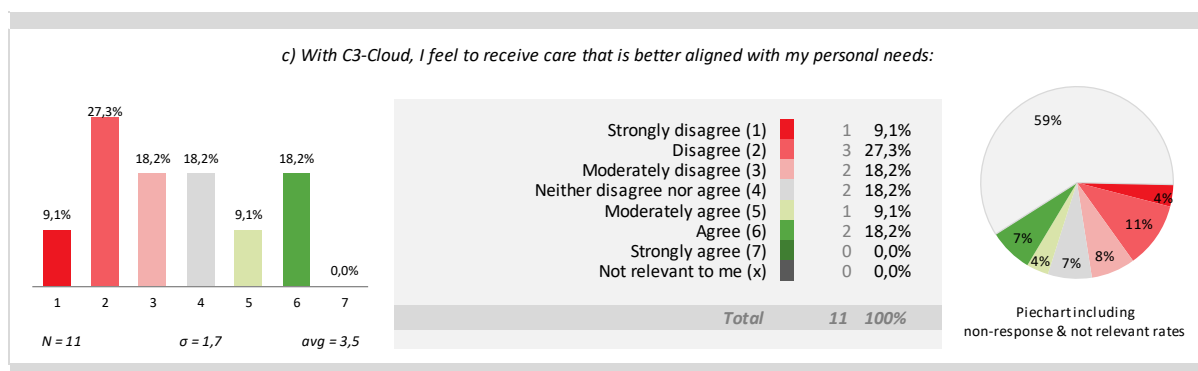


Figure 376 With C3-Cloud, I feel to receive care that is better aligned with my personal needs

When asked if PEP helped them define the care goals that matched their personal preferences, the average showed 3.82 and the standard deviation was 1.7. The peak rating belonged to “Neither disagree nor agree”, which reflected the patients neutral average rating of statement (d).

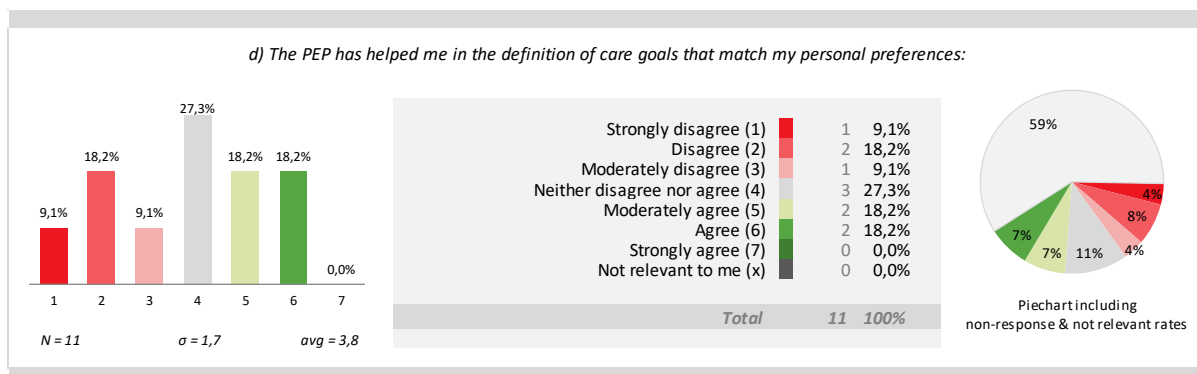


Figure 377 The PEP has helped me in the definition of care goals that match my personal preferences

For statement (e), the peak rating belonged to “Agree” with 36.4% while the average rating was 3.55, which demonstrated that the patients moderately disagreed with this statement. This necessitates a more in-depth look into why the patients did not believe that the PEP usage helped them adhere to their care plan.

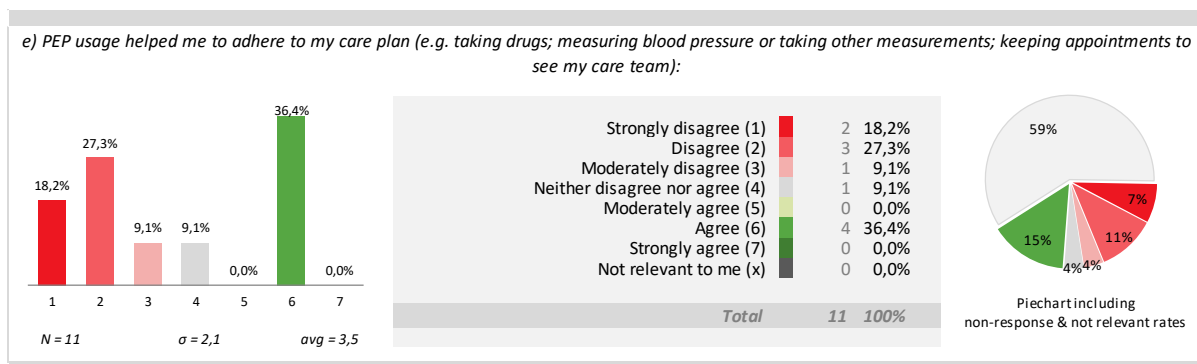


Figure 378 PEP usage helped me to adhere to my care plan (e.g. taking drugs; measuring blood pressure or taking other measurements; keeping appointments to see my care team)

Regarding statement (f), around 45% of the users somewhat disagreed while the peak rating of “Agree” (45.5%) resulted in an average of 3.91, thus making the patients overall opinion neutral.

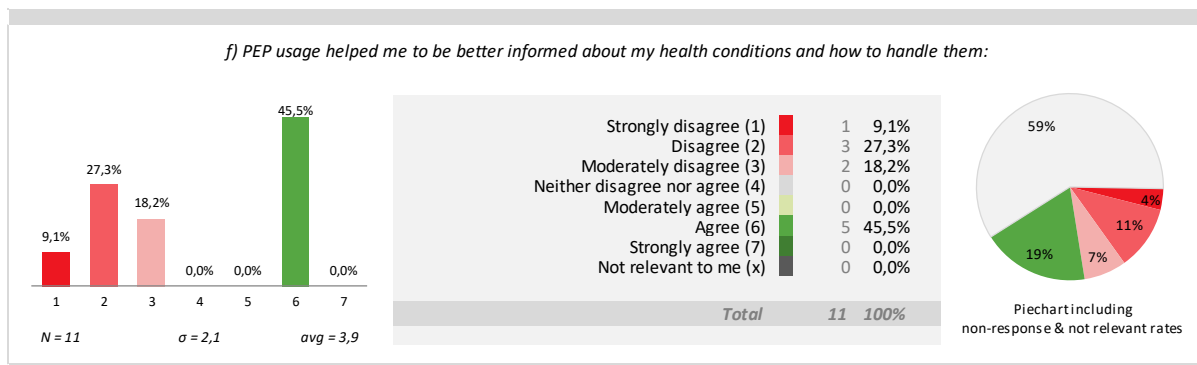


Figure 379 PEP usage helped me to be better informed about my health conditions and how to handle them

When asked if the support and information provided by PEP made them feel confident to adhere to their care plan, the average was 4.2, the standard deviation 1.9 and the peak belonged to “Agree” with 45.5%.

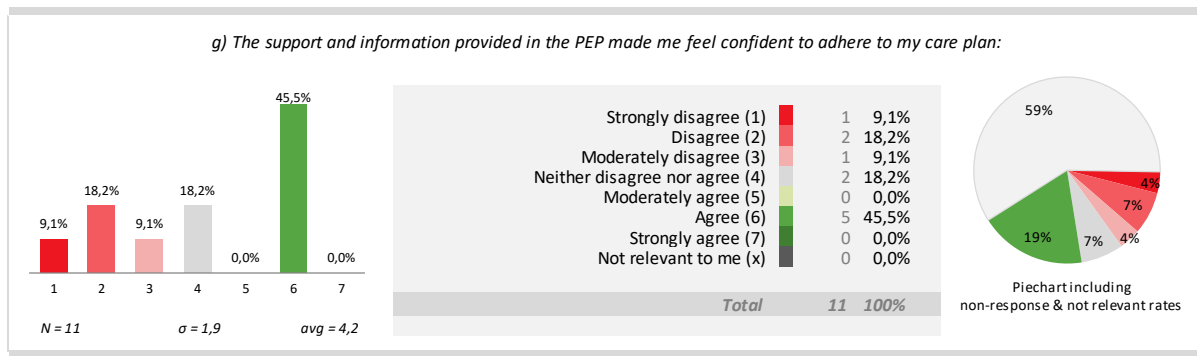


Figure 380 The support and information provided in the PEP made me feel confident to adhere to my care plan

A peak rating of 36.4% for “Disagree” and 18.2% who strongly disagreed made the average hovering around 3.1, which necessitates an investigation to find out where the dissatisfaction/disagreement lies.

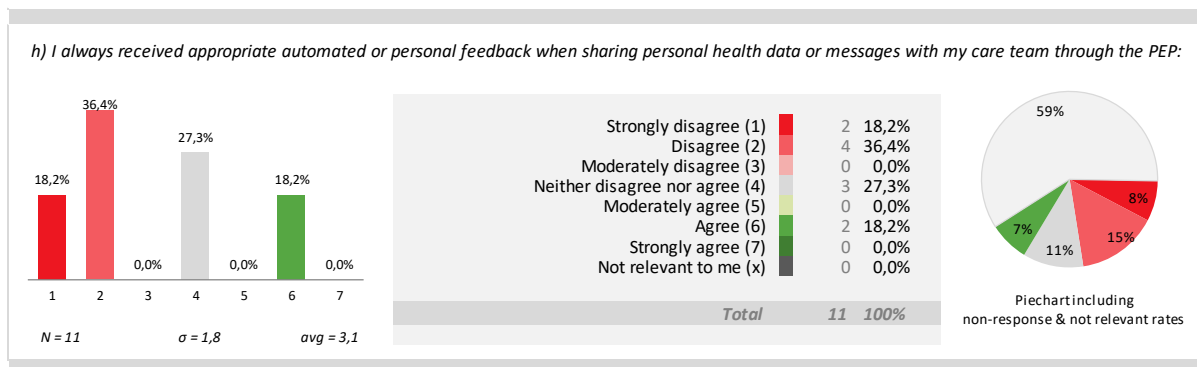


Figure 381 I always received appropriate automated or personal feedback when sharing personal health data or messages with my care team through the PEP

When asked if they felt perfectly informed about the goals and procedures of the drugs they took, the average was 4.73 and the standard deviation 1.8 which demonstrated that the patients quite moderately agreed with statement (i).

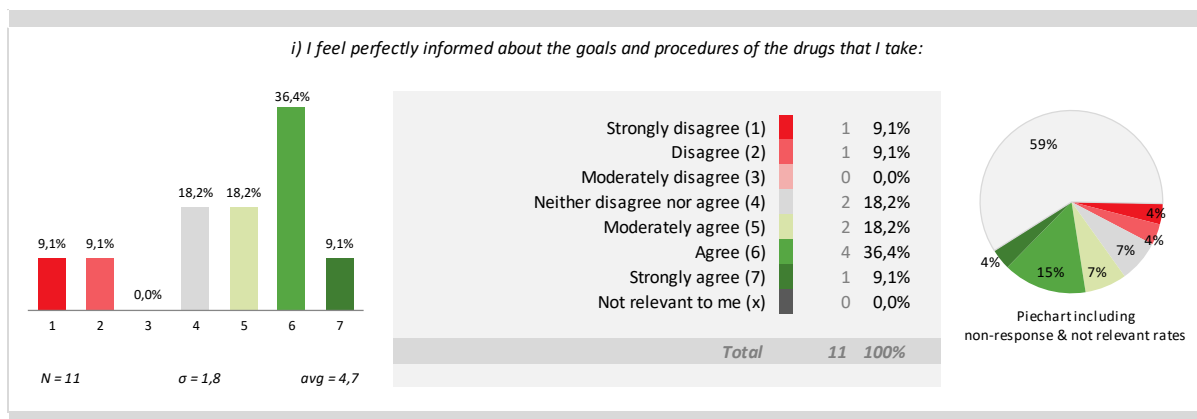


Figure 382 I feel perfectly informed about the goals and procedures of the drugs that I take

An average of 4.64 for statement (j) showed that the patients felt quite informed about their health conditions. The peak ratings belonged to “Moderately agree” and “Agree”, 27.3% each, and the standard deviation was 1.8.

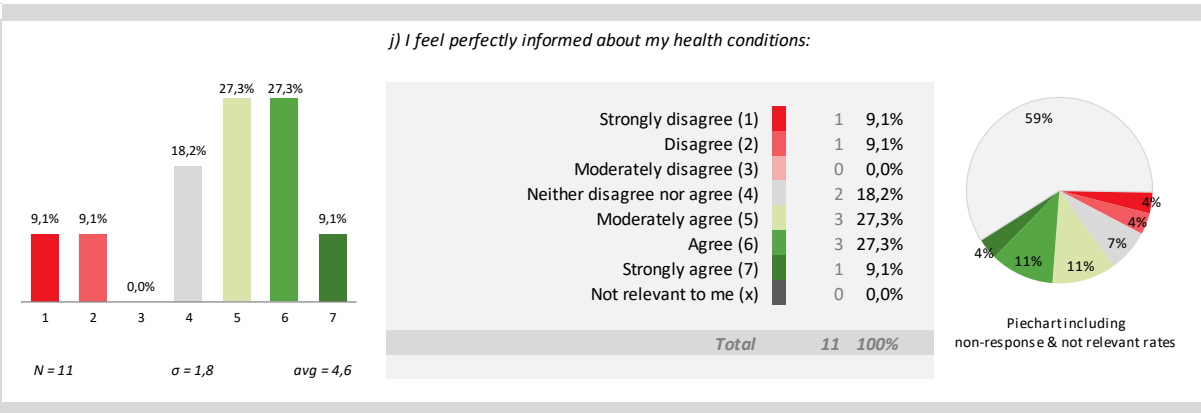


Figure 383 I feel perfectly informed about my health conditions

An average of 4.64 for statement (k) showed that the patients found it quite easy to adhere to treatment activities suggested by members of the care team. The peak ratings belonged to “Moderately agree” and “Agree”, 27.3% each, and the standard deviation was 2.2.

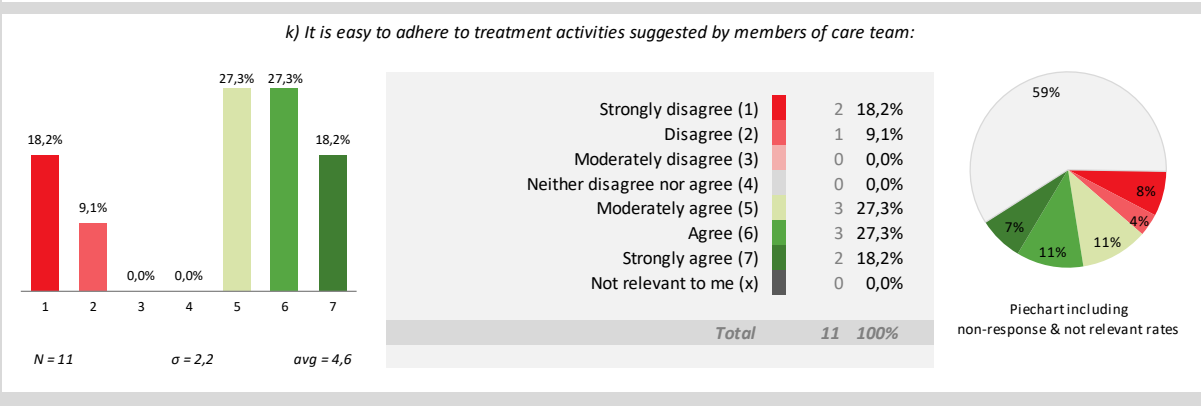


Figure 384 It is easy to adhere to treatment activities suggested by members of care team

When asked if they felt involved in the planning of activities to treat their multimorbidities, an average of 4 demonstrated that the patients had a neutral opinion about this statement. The peak ratings belonged to “Neither disagree not agree” and “Agree”, with 27.3% each, and the standard deviation was 1.7.

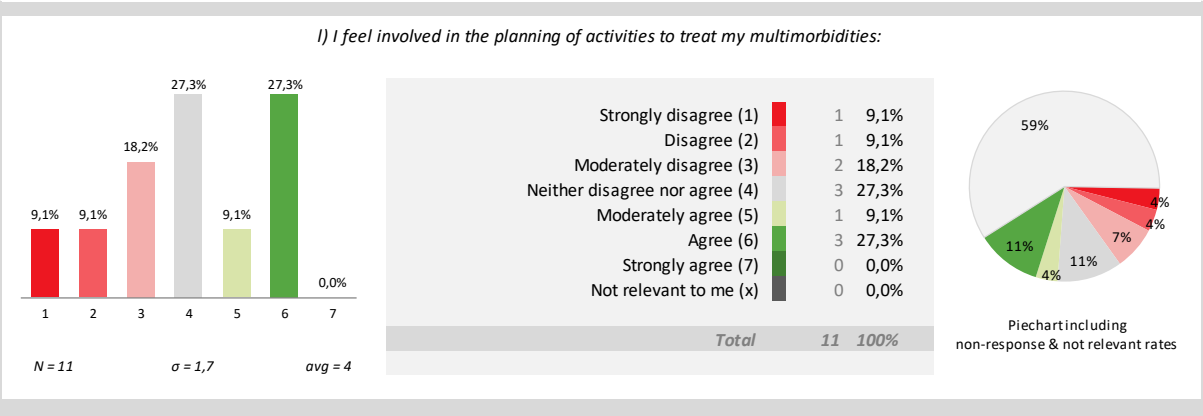


Figure 385 I feel involved in the planning of activities to treat my multimorbidities

When asked if they had a high personal motivation to follow their treatment plan and carry out treatment activities on their own, an average of 5 demonstrated that the patients moderately agreed with the statement. The peak rating belonged to “Moderately agree” and the standard deviation was 1.9.

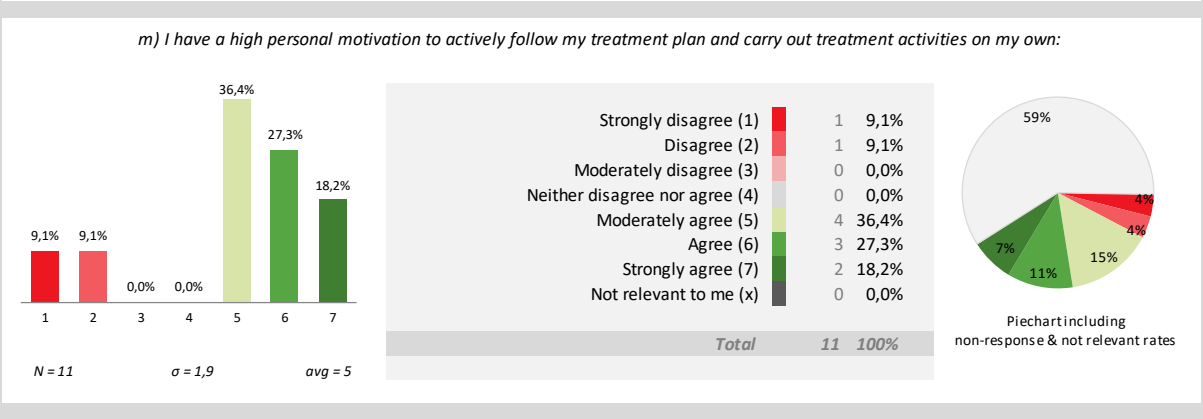


Figure 386 I have a high personal motivation to actively follow my treatment plan and carry out treatment activities on my own

Finally, when asked if the PEP feedback function was useful to communicate issues or progress related to their care plan with their care team, a peak rating of 36.4% disagreed, 18.2% strongly disagreed and the average was 3.09 which showed that the patients moderately disagreed with the statement, opening the floor for further discussion regarding PEP’s feedback function.

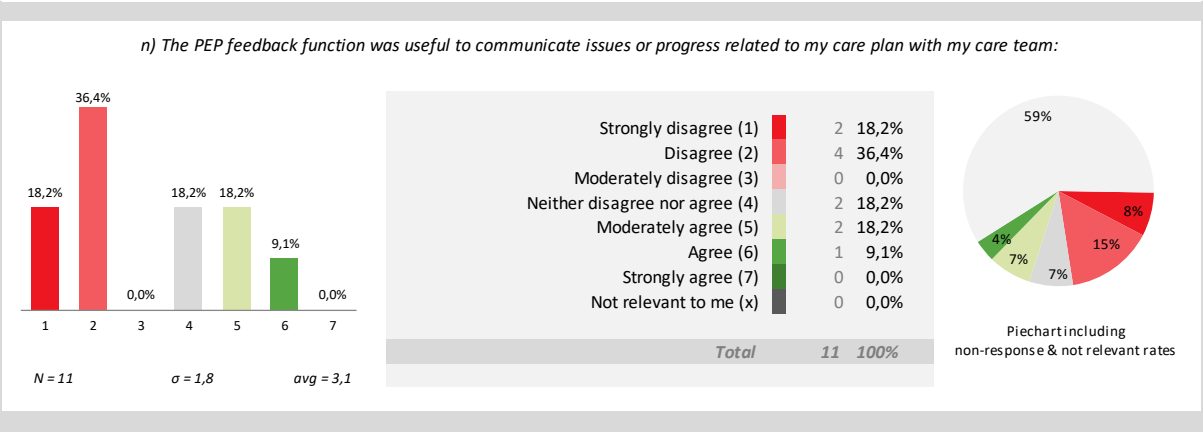


Figure 387 The PEP feedback function was useful to communicate issues or progress related to my care plan with my care team

Questionnaire for User Interaction Satisfaction 7 (QUIS7)

Technology trial participants were asked to rate their satisfaction with the system on a scale from 0-9. The figure below shows the mean ratings of 11 users' impressions to the first group of statements (a-o). Please note that in almost all the statements there was quite a high non-response rate that should be considered when analysing the system.

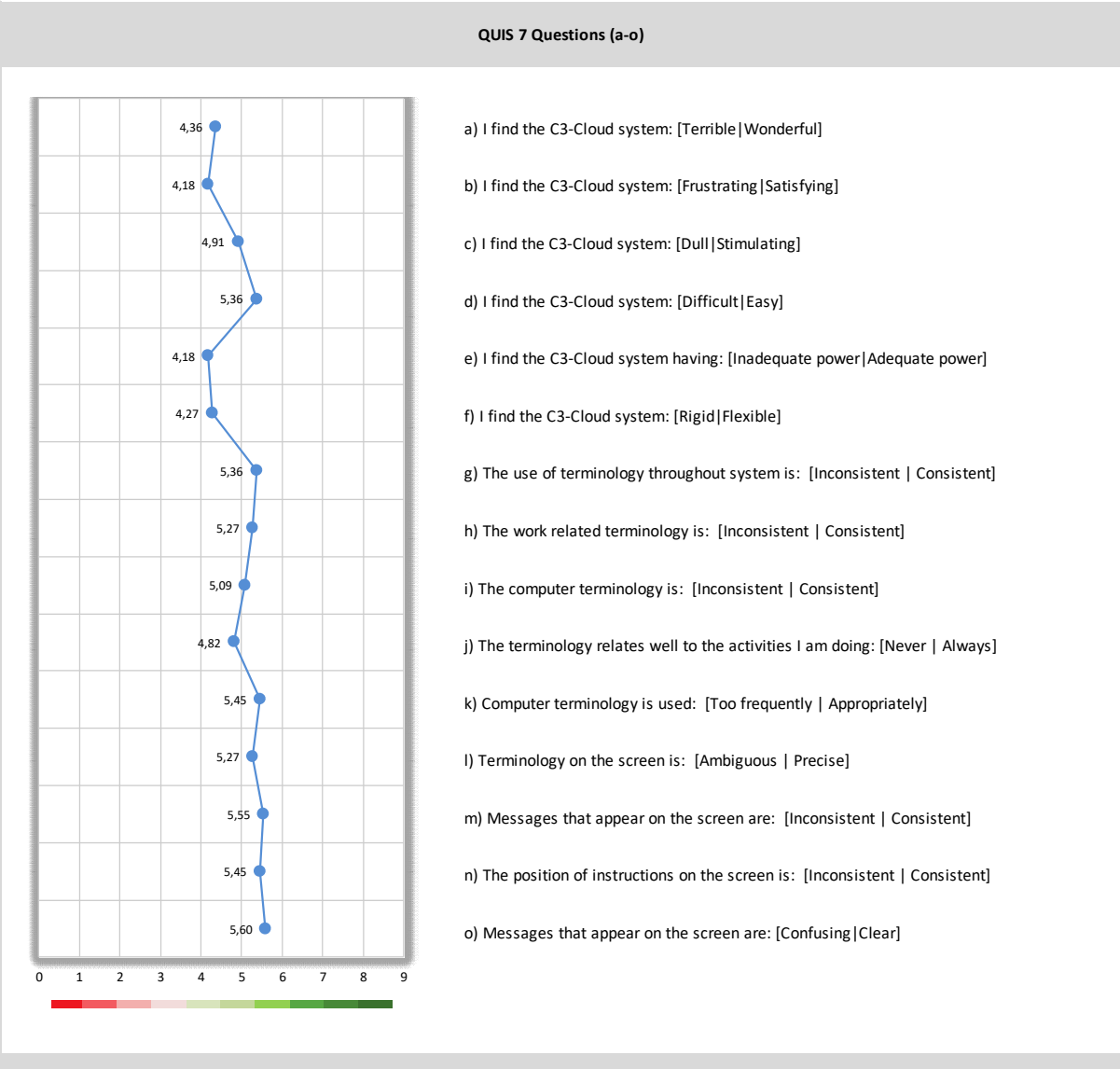


Figure 388 2nd detailed survey for patients, QUIS7 (a-o)

When asked to rate if they found the C3-Cloud system “Terrible/Wonderful”, an average of 4.36 with a standard deviation of 2.7 was the result. With 27.3% of the respondents rating this statement a 2, 9.1% a 0 and 3 each, further discussion on why the users were quite neutral about this statement should be considered. Some users also left their comments (see comment 1 in **Table 99**).

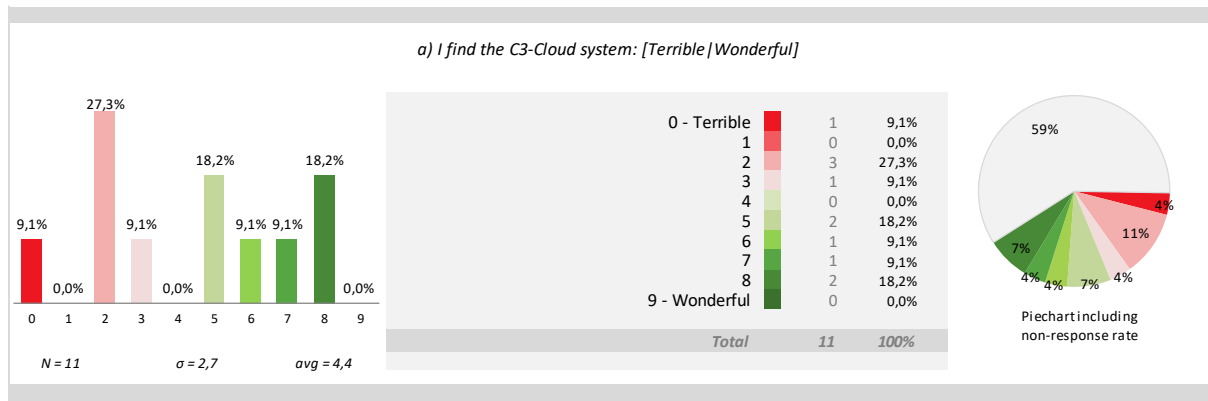


Figure 389 I find the C3-Cloud system: [Terrible|Wonderful]

When asked to rate if they found the C3-Cloud system “Frustrating/Satisfying”, an average of 4.18 with a standard deviation of 2.8 was the result. With 27.3% of the respondents rating this statement a 3, 9.1% a 0, 1 and 2 each, the floor is open for further discussion on why the users rating is slightly tilting towards “Frustrating”. Some users also left their comments (see comment 2 in **Table 99**).

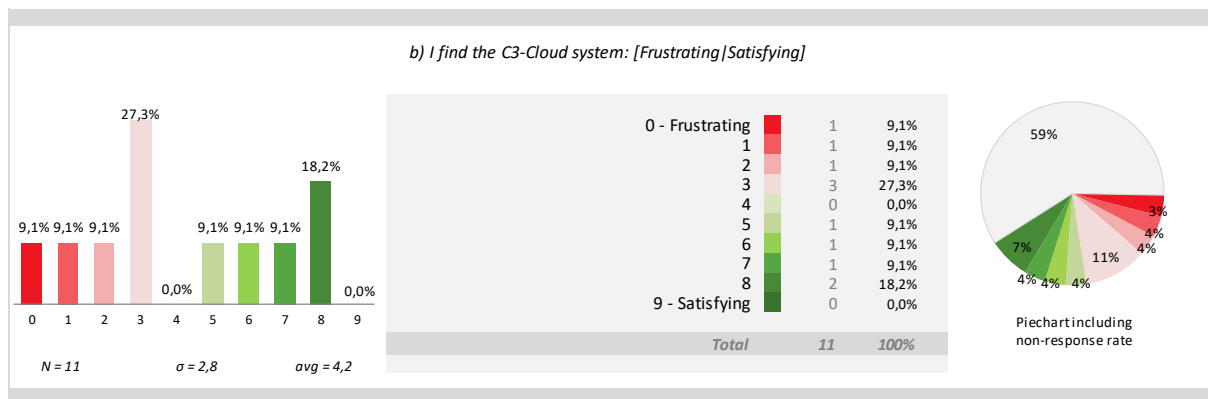


Figure 390 I find the C3-Cloud system: [Frustrating|Satisfying]

Statement (c) was rated an average of 4.91, the standard deviation was 2.5 and the peak ratings belonged to 5, 6 and 8 with 18.2% each. Two users also left their comments (see comment 3 in **Table 99**).

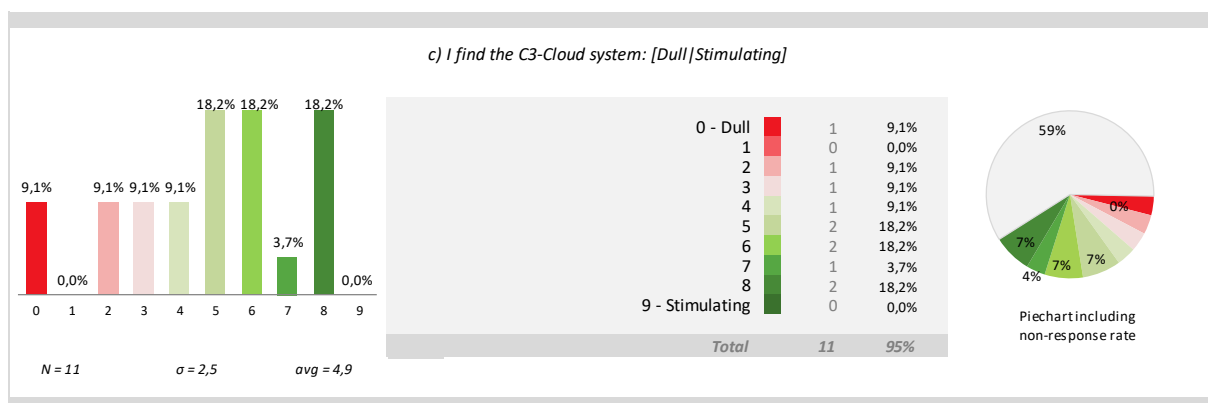


Figure 391 I find the C3-Cloud system: [Dull|Stimulating]

Statement (d) was rated an average of 4.36, the standard deviation was 3.5 and the peak ratings belonged to 7, 8 and 9 with 18.2% each. Despite this, 18.2% who rated this statement 0 and a

9.1% who rated it 1 should not be ignored. One user also left his/her comment (see comment 4 in **Table 99**).

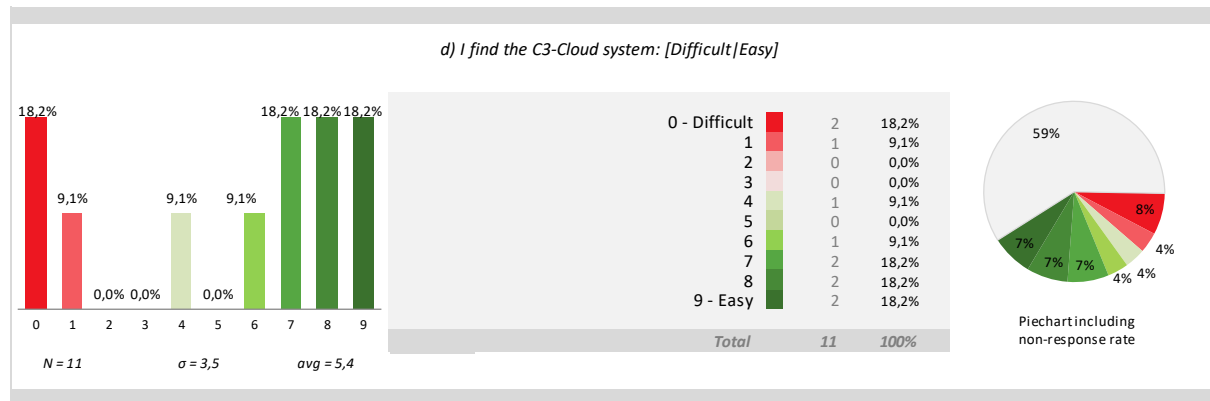


Figure 392 I find the C3-Cloud system: [Difficult|Easy]

An average of 4.18 and about 50% rating statement (e) between 0-3 opens the floor for further discussion on why the users found the C3-Cloud as having not enough power. Some users also left their comments (see comment 5 in **Table 99**).

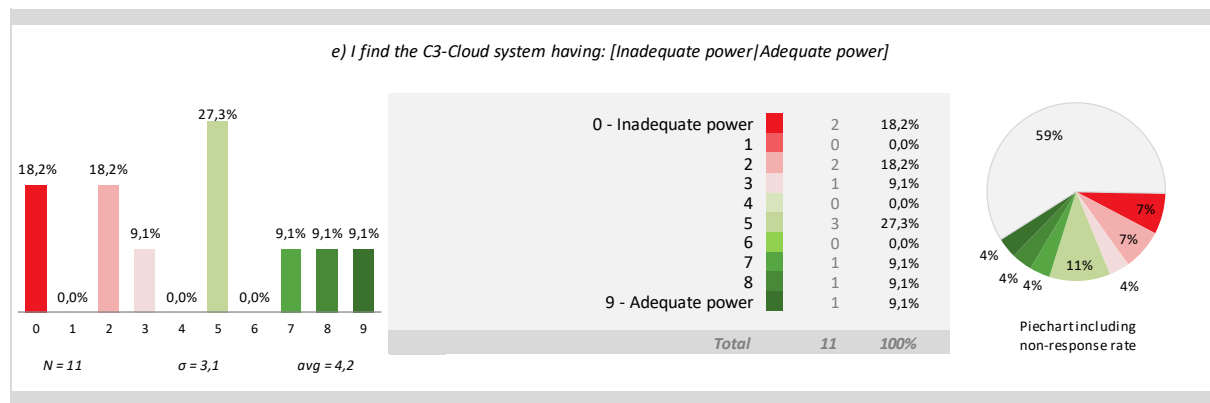


Figure 393 I find the C3-Cloud system having: [Inadequate power|Adequate power]

Statement (f) would be an interesting analysis as, except for the ratings 4 and 9, all the other ratings received a somewhat equal percentage of 9.1%. Although the peak rating belonged to 6 with 27.3%, it is almost balanced with an 18.2% rating that belong to 3. The standard deviation for this statement was 2.6 and the average 4.27, which opens the floor for further discussion. Some users left their comments (see comment 6 in **Table 99**).

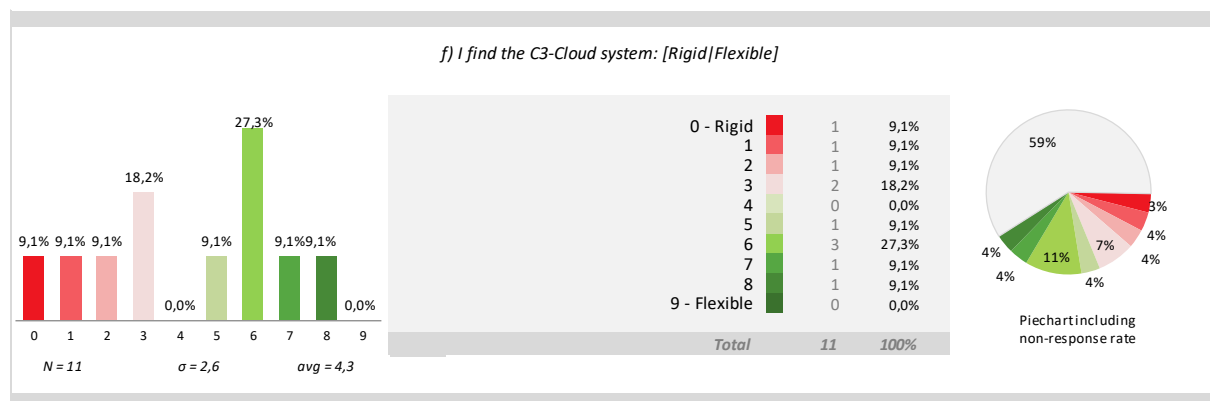


Figure 394 I find the C3-Cloud system: [Rigid|Flexible]

Statement (g) was rated an average of 5.36, the standard deviation was 3.1 and the peak ratings belonged to 8 with 27.3%. A user also left his/her comment (see comment 7 in **Table 99**).

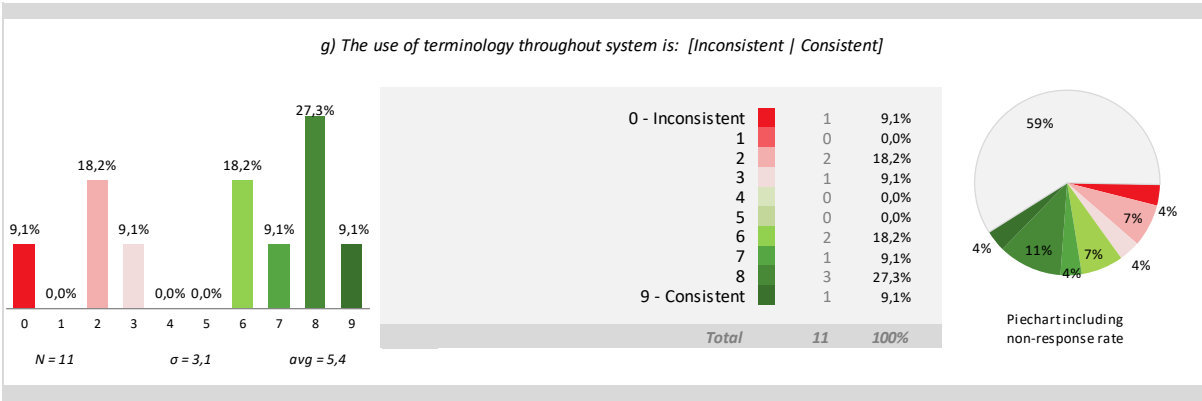


Figure 395 The use of terminology throughout system is: [Inconsistent|Consistent]

Statement (h) was rated an average of 5.27, the standard deviation was 3.2 and the peak ratings belonged to 8 with 27.3%. A user also left his/her comment (see comment 8 in **Table 99**).

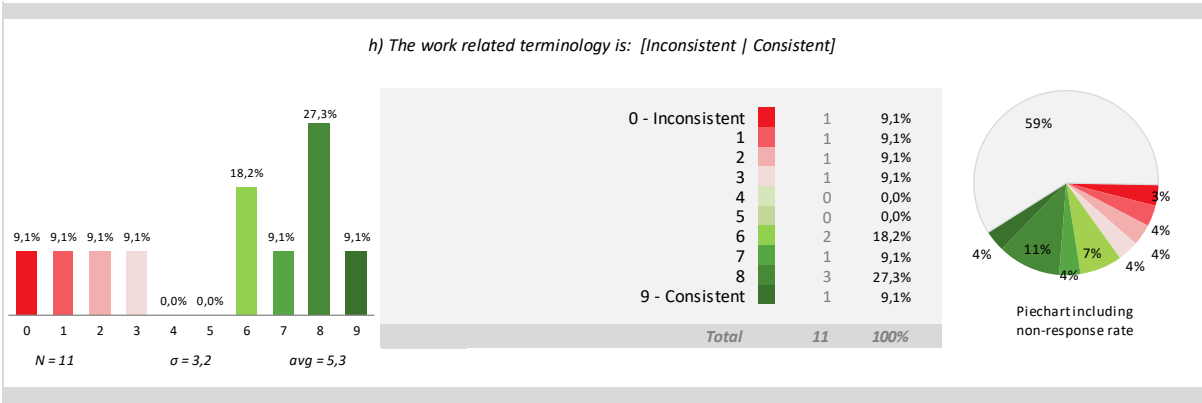


Figure 396 The work-related terminology is: [Inconsistent|Consistent]

Two peak ratings of 27.3% for 6 and 8 each, made the average for statement (i) hover on 5.09, showing that the computer terminology was quite consistent, and the standard deviation was 3.2. Around 40% of the users rated this statement within the range of 0-2, which should not be ignored. One user also left his/her comment (see comment 9 in **Table 99**).

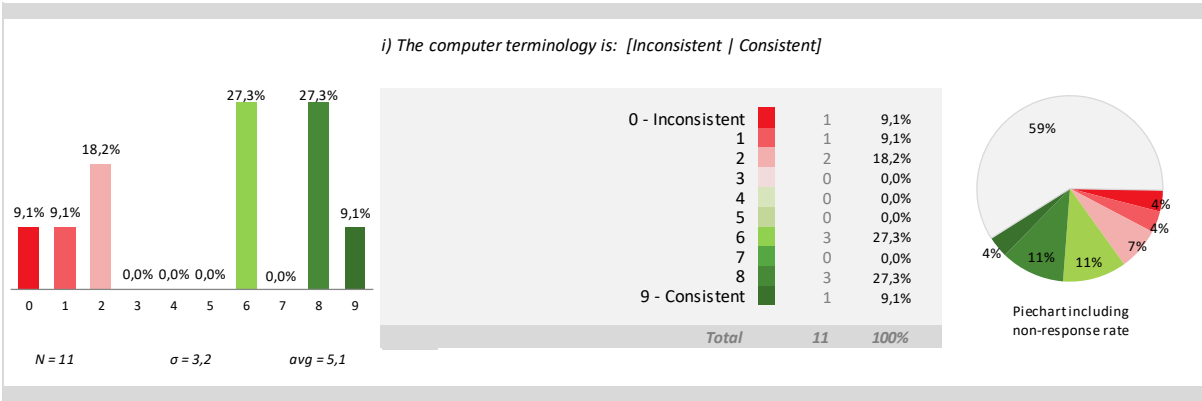


Figure 397 The computer terminology is: [Inconsistent|Consistent]

When asked to rate statement (j) between “Never” and “Always”, an average of 4.8 showed that the users’ opinions, if not neutral, tilted slightly towards the green range. The standard deviation was 2.8, the peak rating was 27.3% and around 30% of the users rated this statement within the range of 0-2. Two users also left their comments (see comment 10 in **Table 99**).

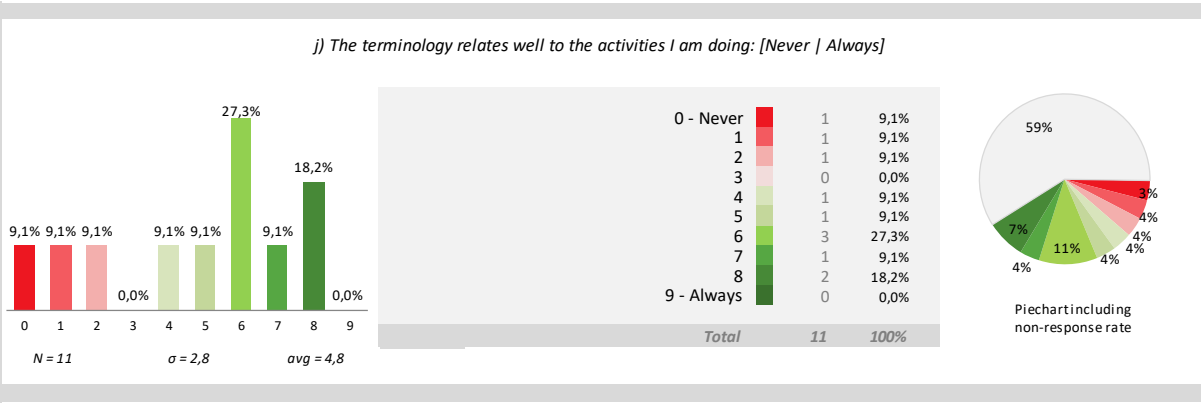


Figure 398 The terminology relates well to the activities I am doing: [Never|Always]

Statement (k) was rated an average of 5.45, the standard deviation was 3 and the peak rating belonged to 8 with 27.3%. One user left his/her comment (see comment 11 in **Table 99**).

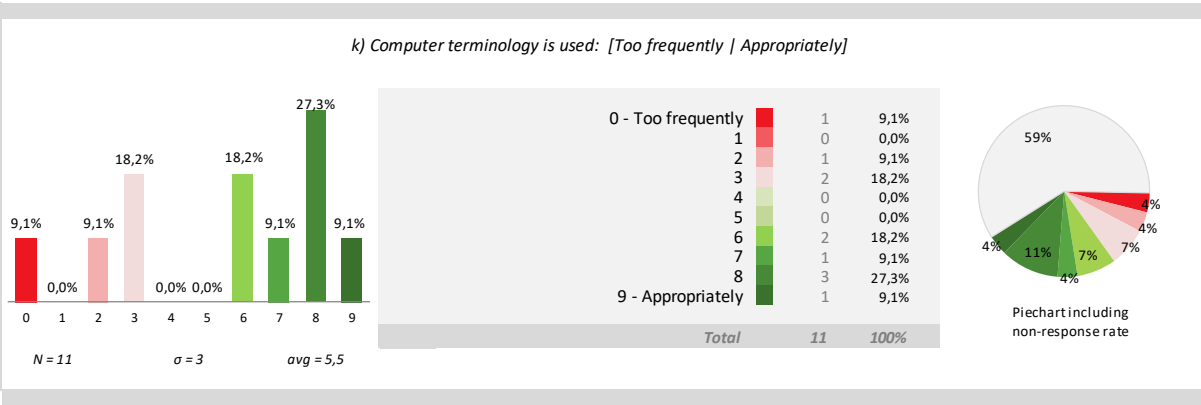


Figure 399 Computer terminology is used: [Too frequently|Appropriately]

Statement (l) was rated an average of 5.27, the standard deviation was 3.3, and the peak rating belonged to 8 with 27.3%. The 18.2% of the users who rated the statement 0 should not be ignored. A user also left his/her comment (see comment 12 in **Table 99**).

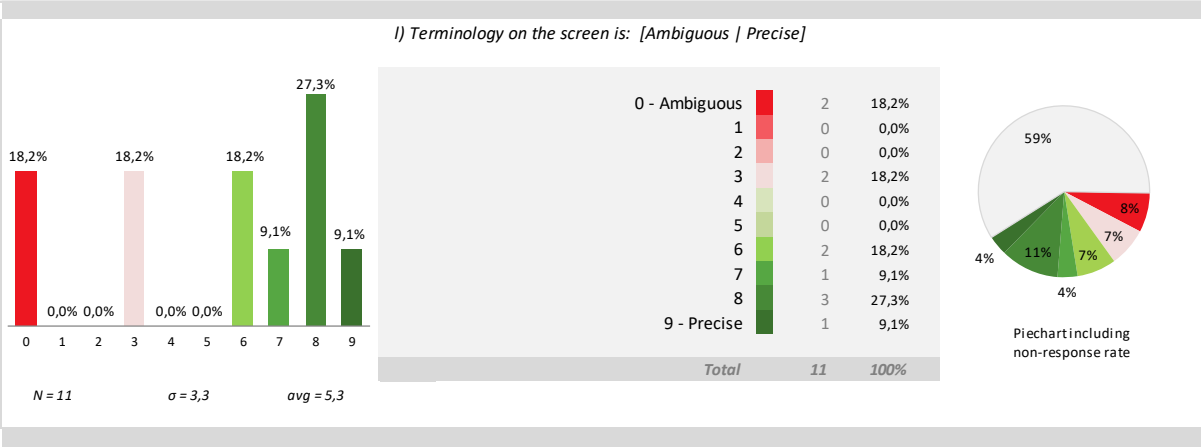


Figure 400 Terminology on the screen is: [Ambiguous|Precise]

Statement (m) was rated an average of 5.55, the standard deviation was 3.2 and the peak rating belonged to 8 with 36.4%. The 18.2% of the users who rated the statement 0 should not be ignored. A user also left his/her comment (see comment 13 in **Table 99**).

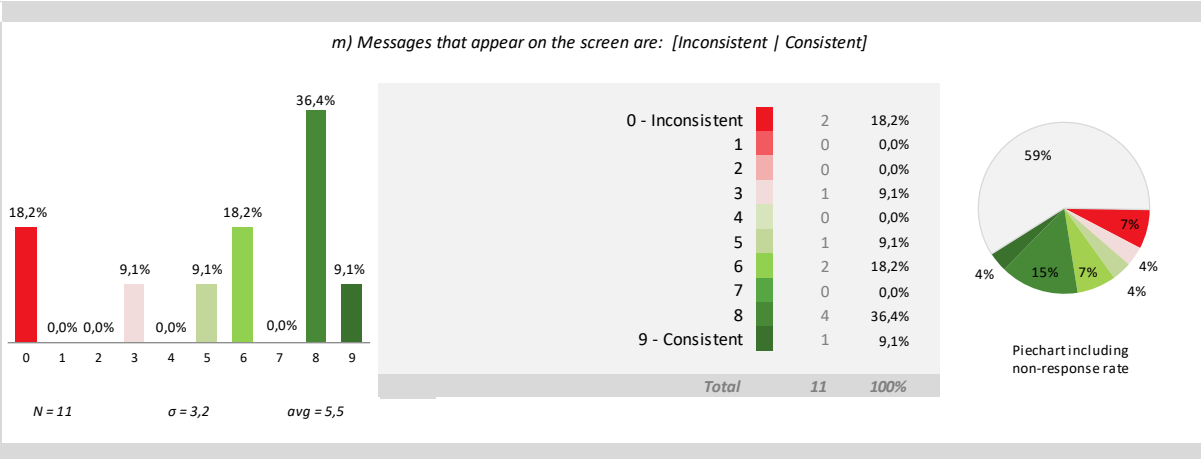


Figure 401 Messages that appear on the screen are: [Inconsistent|Consistent]

Just like the previous two statements, statement (n) was rated an average of 5.45, standard deviation was 3.3 and the peak rating belonged to 8 with 36.4%. The 18.2% of the users who rated the statement 0 should not be ignored. A user also left his/her comment (see comment 14 in **Table 99**).

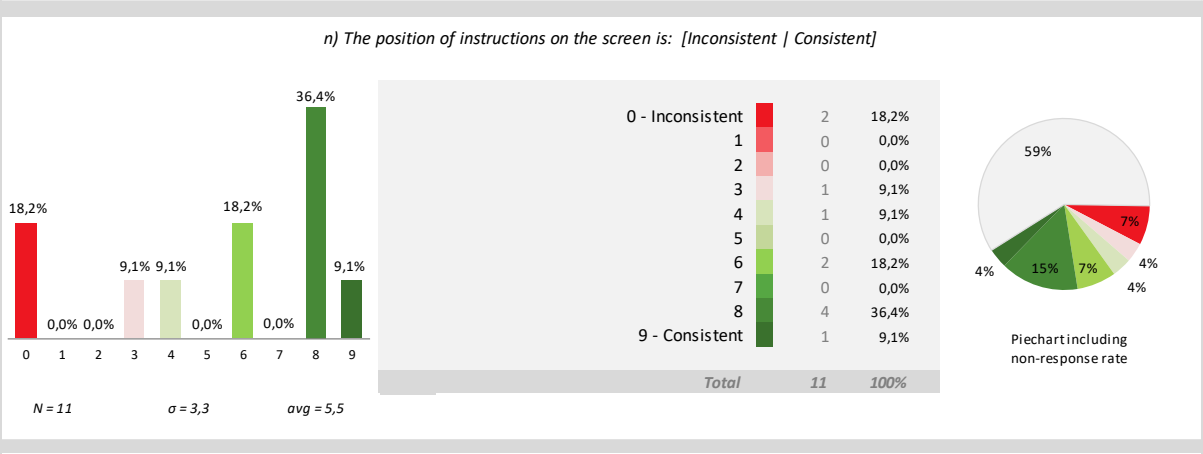


Figure 402 The position of instructions on the screen is: [Inconsistent|Consistent]

The above pattern is almost repeated when statement (o) was rated an average of 5.6, the standard deviation was 3.4 and the peak rating belonged to 8 with 40%. The 20% of the users who rated the statement 0 should not be ignored. One user also left his/her comment (see comment 15 in Table 99).

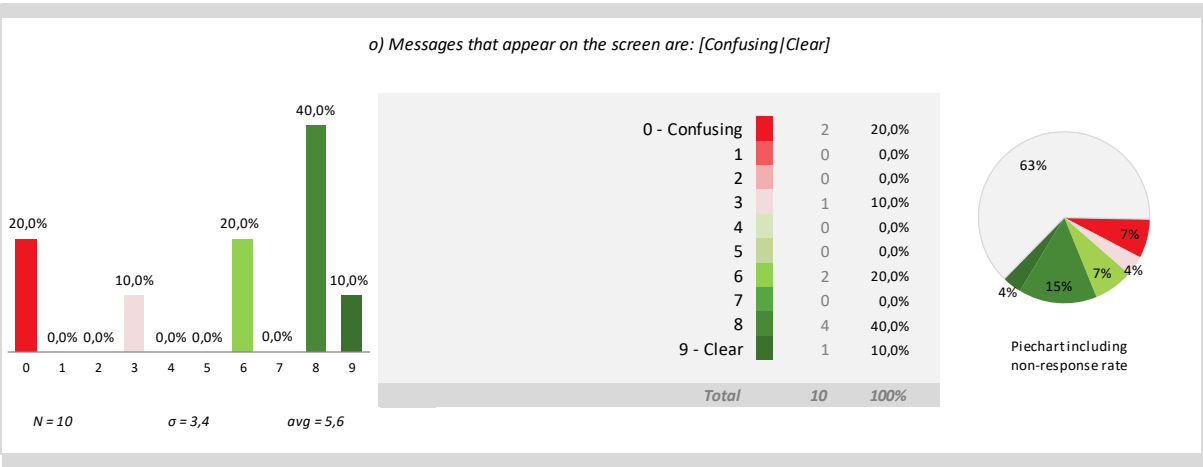


Figure 403 Messages that appear on the screen are: [Confusing|Clear]

The figure below shows the mean ratings of 11 users' impressions to the first group of statements (p-ad). Please note that in almost all the statements there is quite a high non-response rate that should be considered when analysing the system.

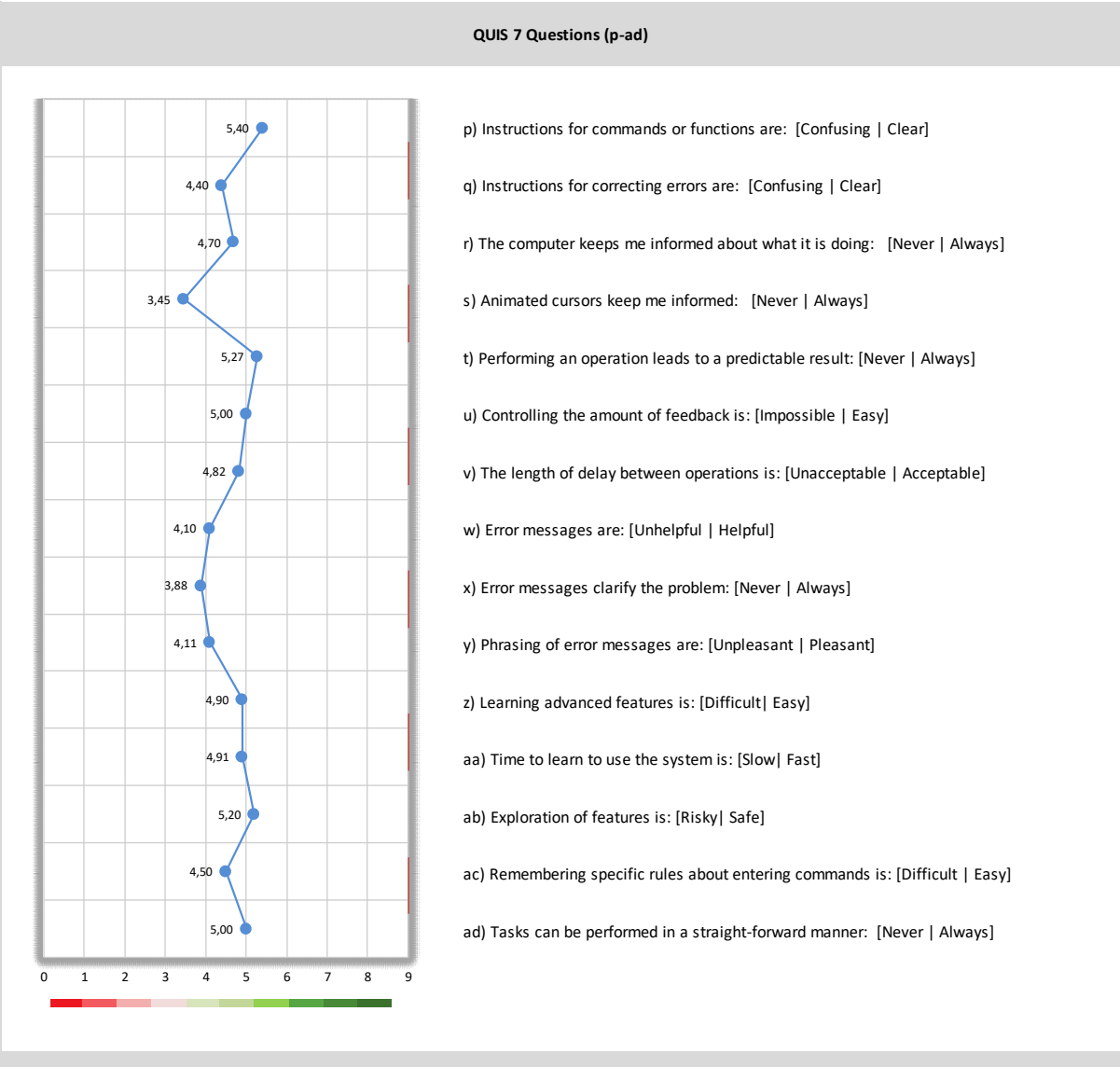


Figure 404 2nd detailed survey for patients, QUIS7 (p-ad)

When asked if they found the instructions for commands or functions confusing or clear, the average was 5.4, the standard deviation 3.3, and the peak belonged to 8 with 30%. It should be noted that 20% of the respondents rated this statement 0, which needs to be investigated further. A user also left his/her comment (see comment 16 in **Table 99**).

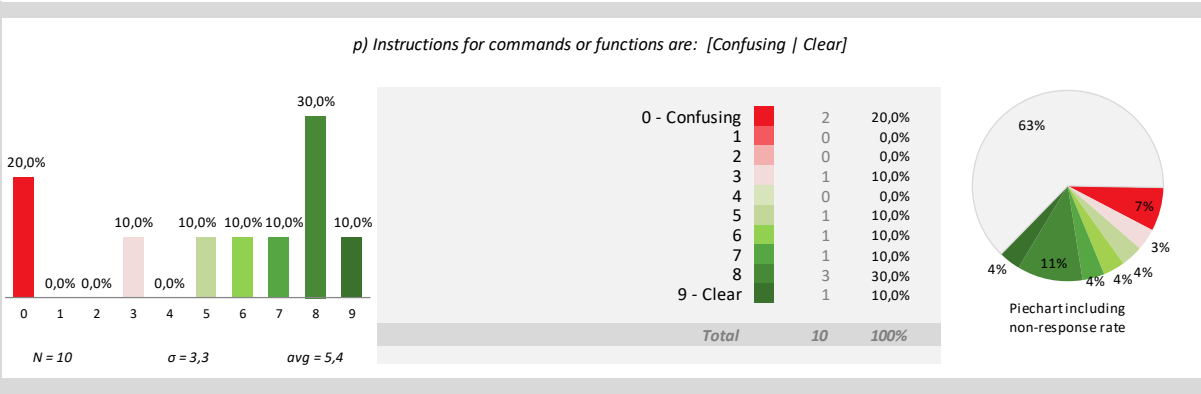


Figure 405 Instructions for commands or functions are: [Confusing|Clear]

When asked if the instruction for correcting errors were confusing or clear, the average was 4.4 and the standard deviation 3.2. Although the peak belonged to 6 with 30%, 20% of the respondents rated this statement 0, and 10% rated it 1, which needs to be investigated further. Two users left their comments (see comment 17 in **Table 99**).

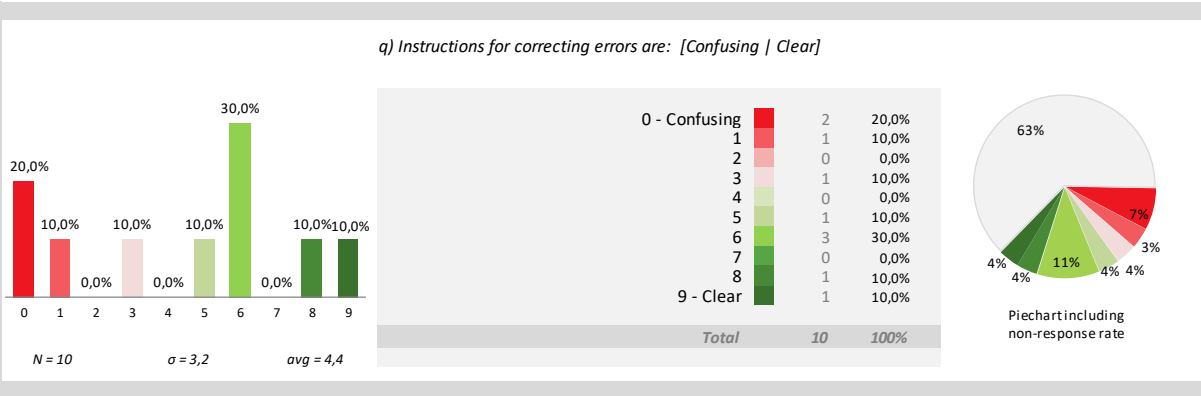


Figure 406 Instructions for correcting errors are: [Confusing|Clear]

When asked to rate if the computer kept them informed about what it was doing on a range between “Never” and “Always”, the average was 4.70 and the standard deviation 3.0. Although the peak belonged to 8 with 30% and 20% of the respondents rated this statement 6, the rates 0-3 received a 10% rating each, which needs to be reflected upon further. Two users also left their comments (see comment 18 in **Table 99**).

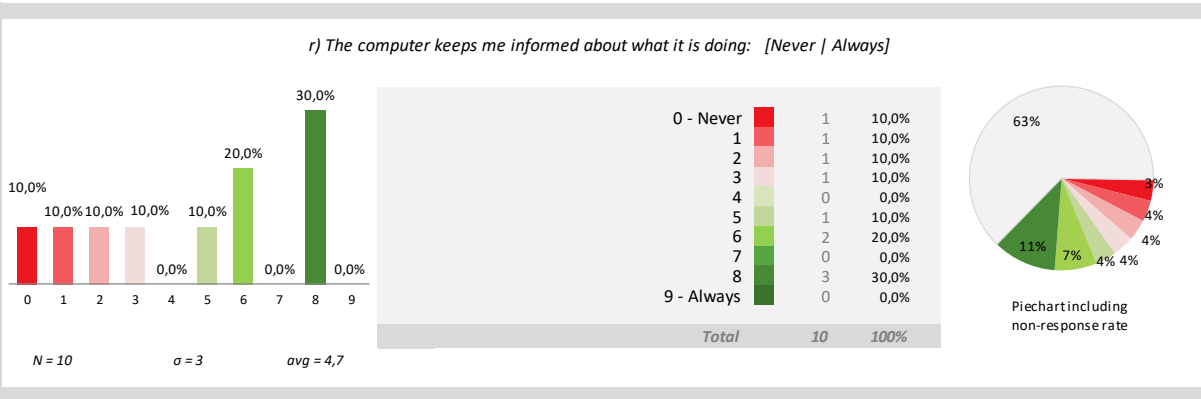


Figure 407 The computer keeps me informed about what it is doing: [Never|Always]

Statement (s) opens the floor for further discussion as its average was 3.45 and the peak rating belonged to 0 with 36.4% of the responses. The standard deviation was 3.2. The rating demonstrated that the users were not informed quite enough by the animated cursors and, hence, this problem should be considered. Some users also left their comments (see comment 19 in **Table 99**).

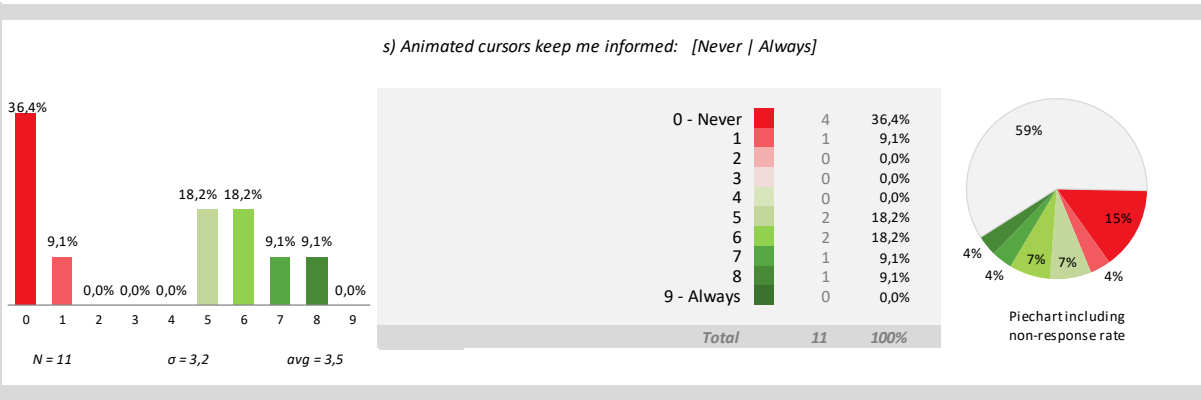


Figure 408 Animated cursors keep me informed: [Never|Always]

When asked if the instruction for correcting errors were confusing or clear, the average was 5.27 and the standard deviation 3.0. Although the peak belonged to 5, 7 and 8 with 18.2% each, almost 30% of the users rated this statement between 0-2, which needs to be considered. Two users also left their comments (see comment 20 in **Table 99**).

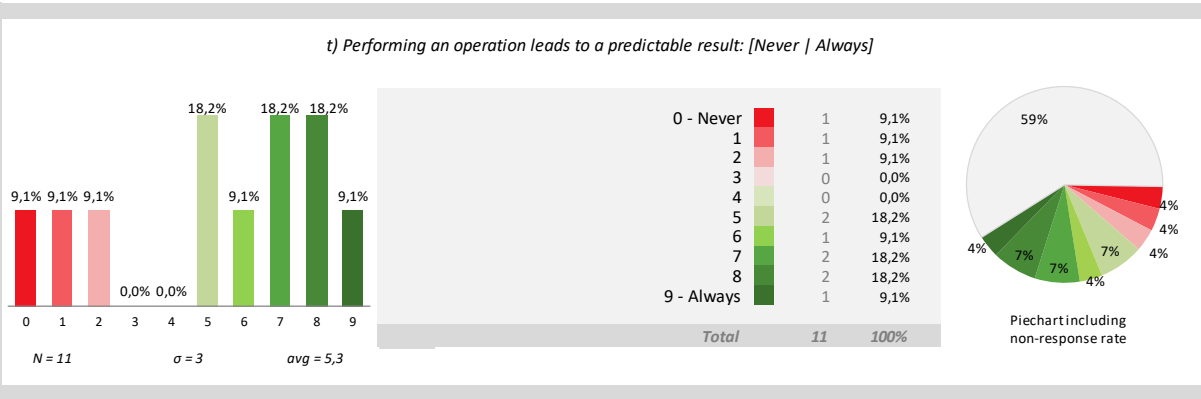


Figure 409 Performing an operation leads to a predictable result: [Never|Always]

When asked if the instruction for correcting errors were confusing or clear, the average was 5 and the standard deviation 3.3. Although the peak belonged to 8 with 27.3%, 18.2% of the respondents rated this statement 0, which needs to be considered. Two users also left their comments (see comment 21 in **Table 99**).

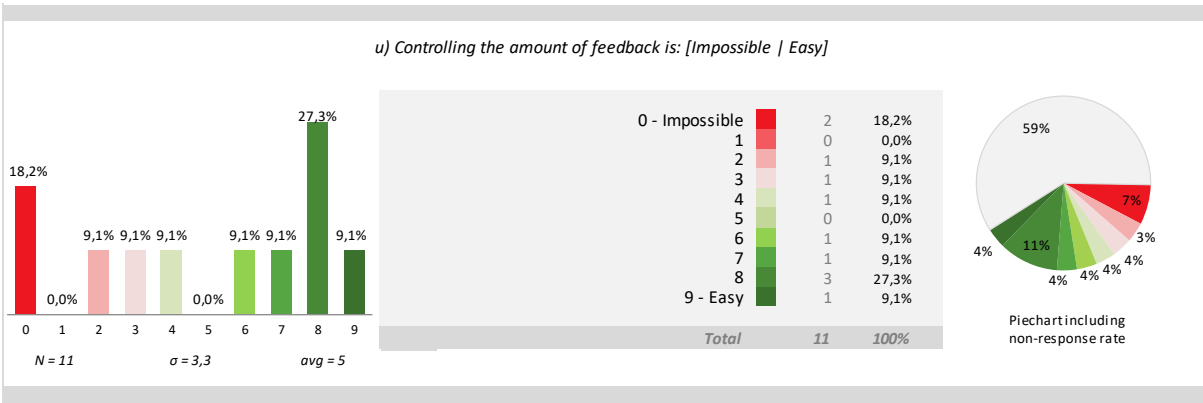


Figure 410 Controlling the amount of feedback is: [Impossible|Easy]

For statement (v), the average was 4.8, leaning slightly towards “Acceptable”. However, 27.3% of the users rated this statement 0, which needs to be considered. Two users also left their comments (see comment 22 in **Table 99**).

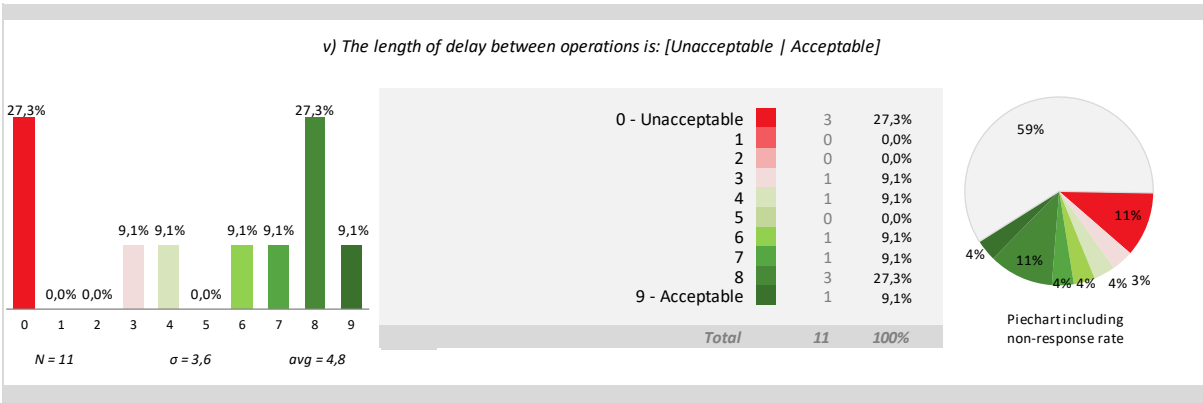


Figure 411 The length of delay between operations is: [Unacceptable|Accpetable]

For statement (w), the average was 4., slightly leaning towards “Unhelpful” since 30% of the users believed that the error messages were “Unhelpful”. This opens the floor for further discussion on error messages. It should also be noted that the non-response rate was comparatively higher. Some users also left their comments (see comment 23 in **Table 99**).

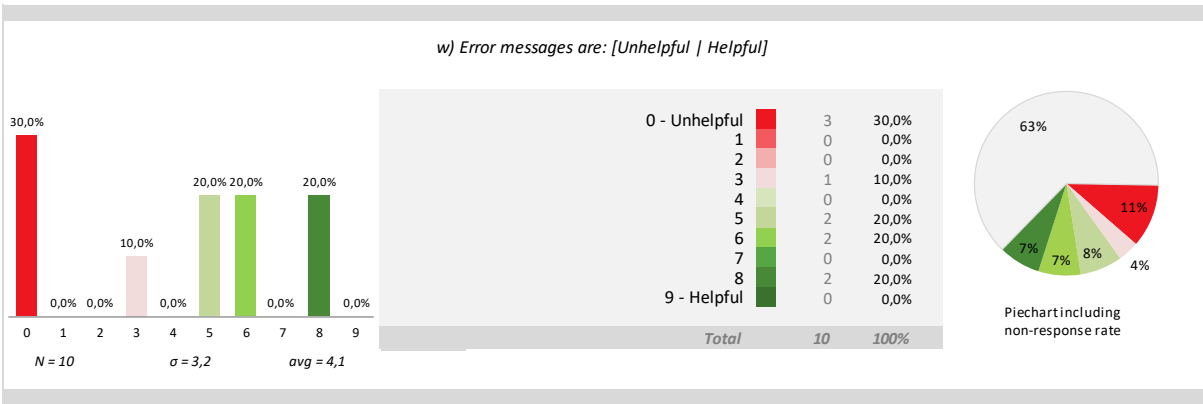


Figure 412 Error messages are: [Unhelpful|Helpful]

The average for statement (x) was also close to the previous statement with 3.88, and the standard deviation was 2.4. Although the peak belonged to 5 with 25%, the floor would be open for more discussions for this statement. It should also be noted that the non-response rate was comparatively higher. Some users also left their comments (see comment 24 in **Table 99**).

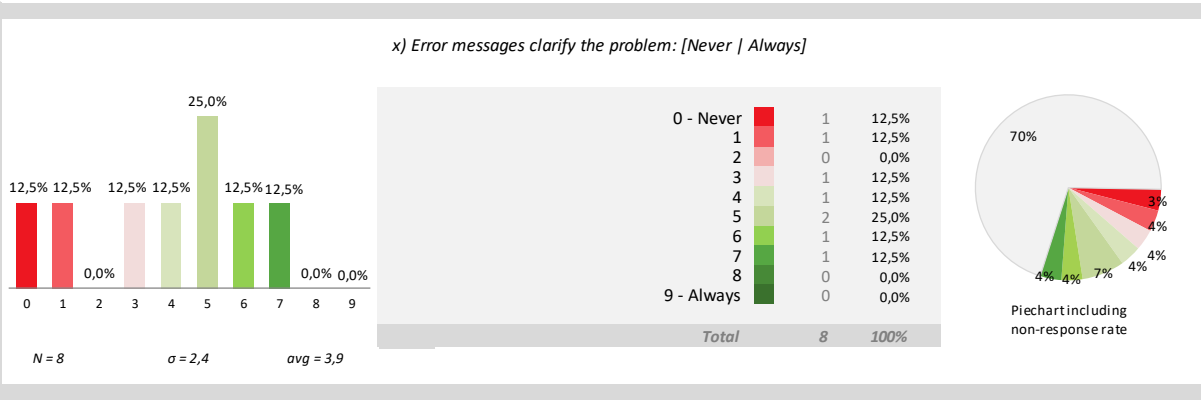


Figure 413 Error messages clarify the problem: [Never|Always]

The average for statement (y) was 4.1 and the standard deviation 2.8. Although the peak belonged to 5 with 22.2%, the floor would be open for more discussions for this statement as there was an equal rate of 11.1% for the ratings between 0-3. It should also be noted that the non-response rate was comparatively higher. Some users also left their comments (see comment 25 in **Table 99**).

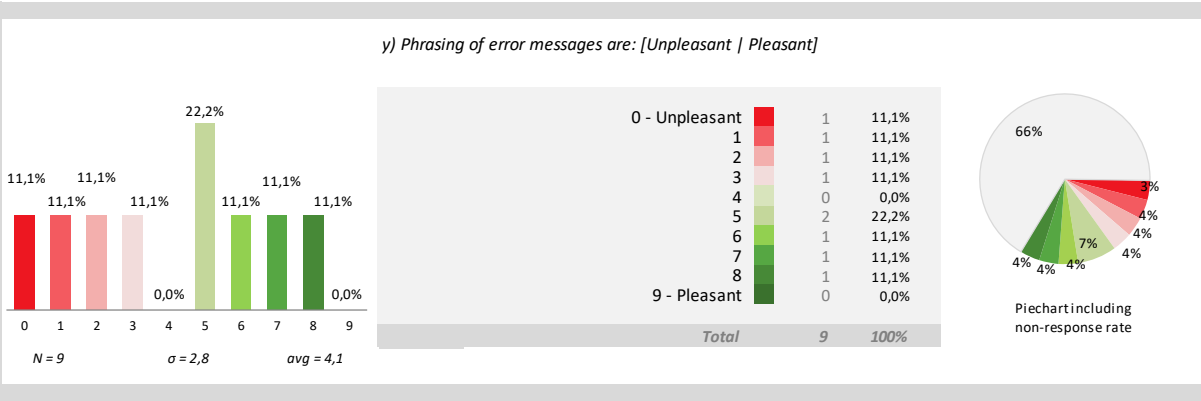


Figure 414 Phrasing of error messages are: [Unpleasant|Pleasant]

For statement (z), the average was 4.9 and thus, if not interpreted neutrally, leaning slightly towards “Easy”, reflected in the peaks for 5 and 6 with 30% and 20%. It should also be noted that the non-response rate was comparatively higher. Two users also left their comments (see comment 26 in **Table 99**).

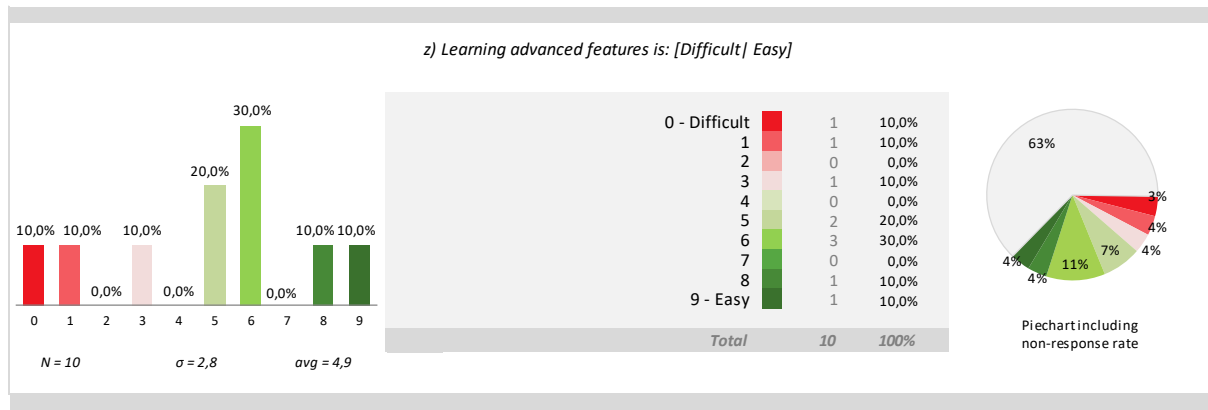


Figure 415 Learning advanced features is: [Difficult|Easy]

For statement (aa) the average was 4.9 and thus, if not interpreted neutrally, leaning slightly towards “Fast” as the peaks belonged to 6 with 36.4% and the ratings leaned mostly towards the green range. Two users also left their comments (see comment 27 in **Table 99**).

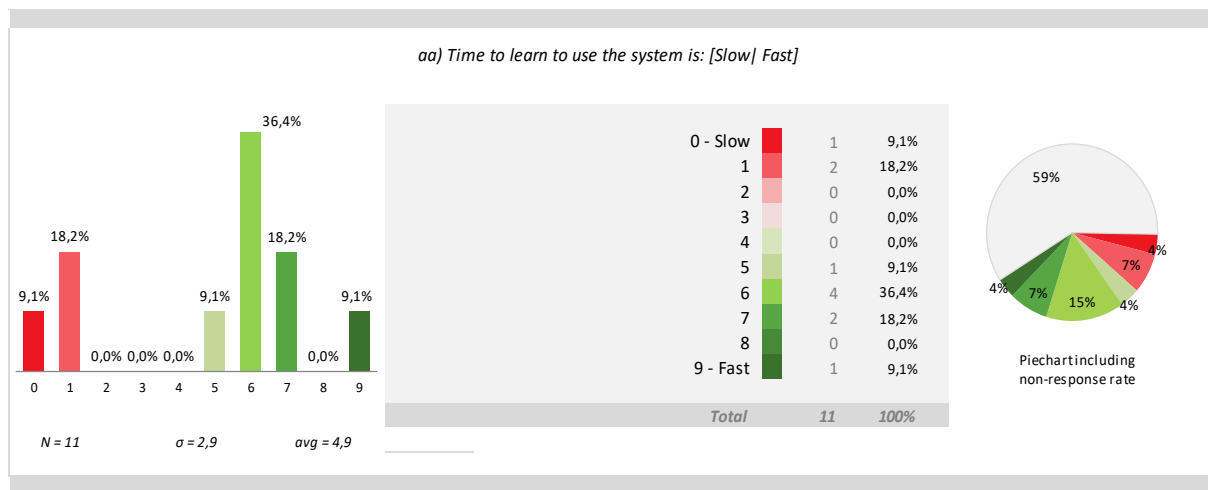


Figure 416 Time to learn to use the system is: [Slow|Fast]

For statement (aa), the average was 5.2 and the rating, if not interpreted neutrally, leaned slightly towards “Safe” as the peaks belonged to 6, 7 and 8 each with 20%. It should also be noted that the non-response rate was comparatively higher. Two users also left their comments (see comment 28 in **Table 99**).

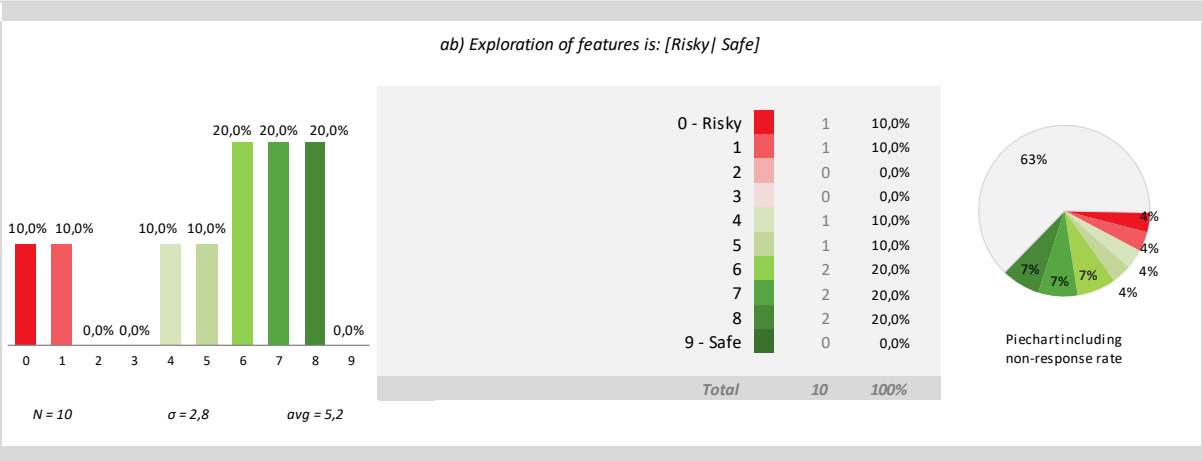


Figure 417 Exploration of features is: [Risky|Safe]

Statement (ac), although rated neutrally with an average of 4.5 (standard deviation 3.2), opens the floor for further discussion as 30% of the users believed that remembering specific rules about entering commands was “Difficult”. It should be noted that the non-response rate was comparatively higher. Two users left also their comments (see comment 29 in **Table 99**).

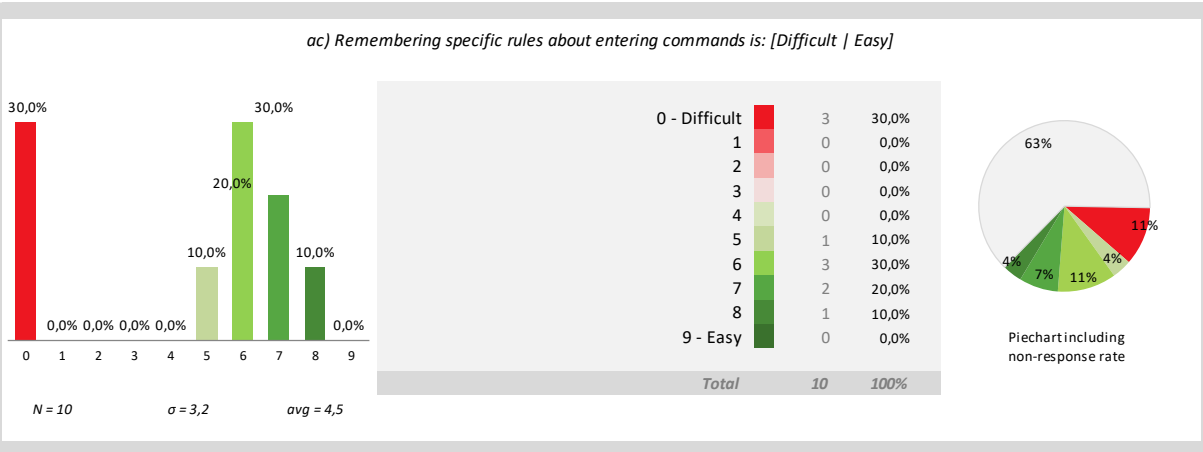


Figure 418 Remembering specific rules about entering commands is: [Difficult|Easy]

When asked if the tasks could be performed in a straight-forward manner, the average was 5 and the standard deviation 2.7. Although the peak belonged to 6 and 7 with 20% and 30%, 30% of the users rated this statement within a range of 0-2, which needs to be considered. It should also be noted that the non-response rate was comparatively higher. Two users also left their comments (see comment 30 in **Table 99**).

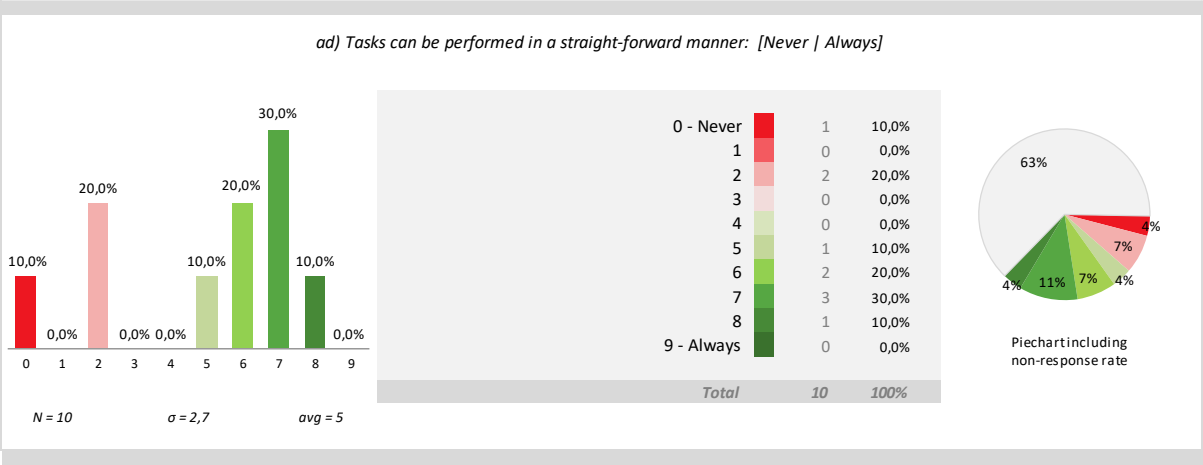


Figure 419 Tasks can be performed in a straight-forward manner: [Never|Always]

The figure below shows the mean ratings of 11 users' impressions to the first group of statements (ae-as). Please note that in almost all the statements there was quite a high non-response rate that should be considered when analysing the system.

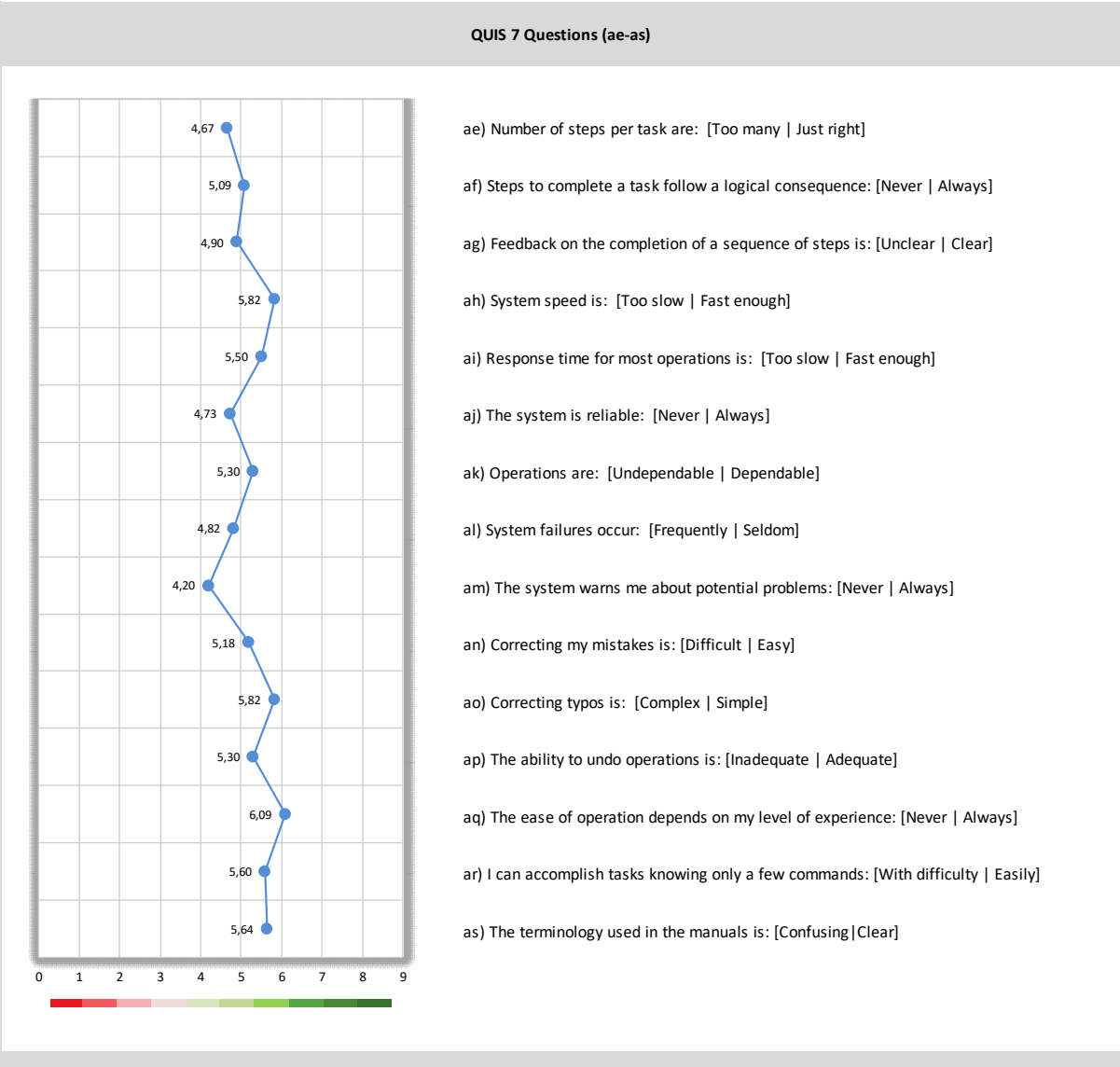


Figure 420 2nd detailed survey for patients, QUIS7 (ae-as)

When asked to rate the number of steps per task from “Too many” to “Just right”, the statement was rated an average of 4.67 with a standard deviation of 3. Although the statement was overall rated neutrally, it should be noted that 22.2% of the users believed that the number of steps were “Too many”, which should be considered for further analysis. A comparatively higher non-response rate should also be noted. Two users also left their comments (see comment 31 in **Table 99**).

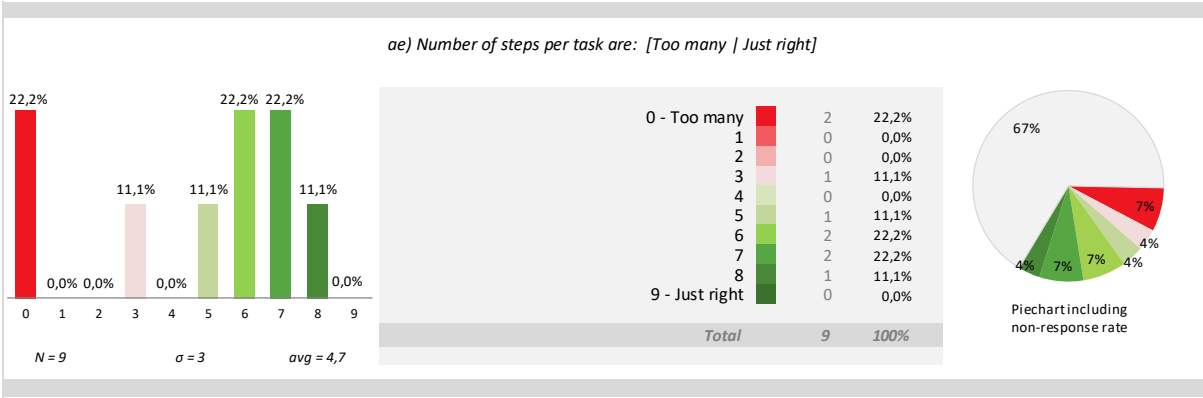


Figure 421 Number of steps per task are: [Too many|Just right]

When asked to rate if steps to complete a task followed a logical consequence from “Never” to “Always”, the statement was rated an average of 5.1 with a standard deviation of 2.7. The peak rating belonged to 6 with 36.4%. Two users also left their comments (see comment 32 in **Table 99**).

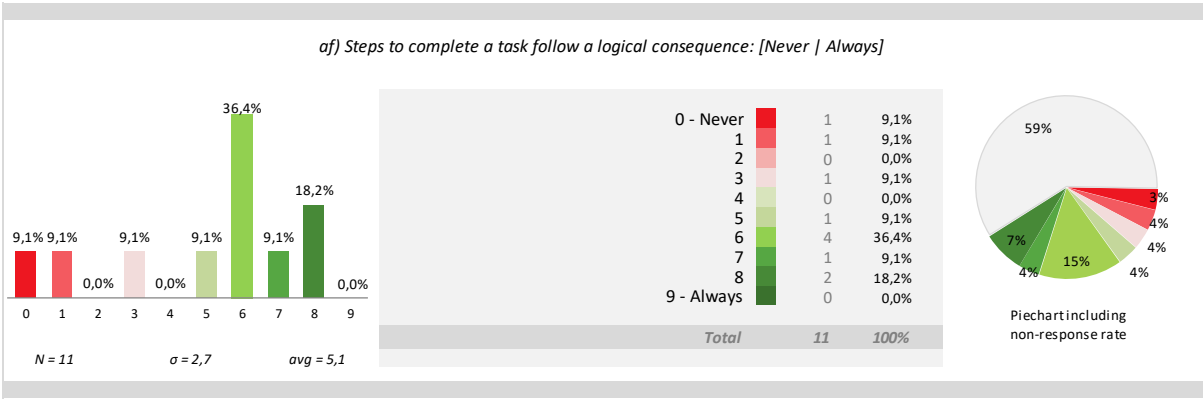


Figure 422 Steps to complete a task follow a logical consequence: [Never|Always]

When asked to rate if the feedback on the completion of a sequence of steps was “Unclear” to “Clear”, the statement was rated an average of 4.9 with a standard deviation of 3. The peak rating belonged to 6 with 30%, but 20% rating the statement 0 and a comparatively higher non-response rate should be noted. Two users also left their comments (see comment 33 in **Table 99**).

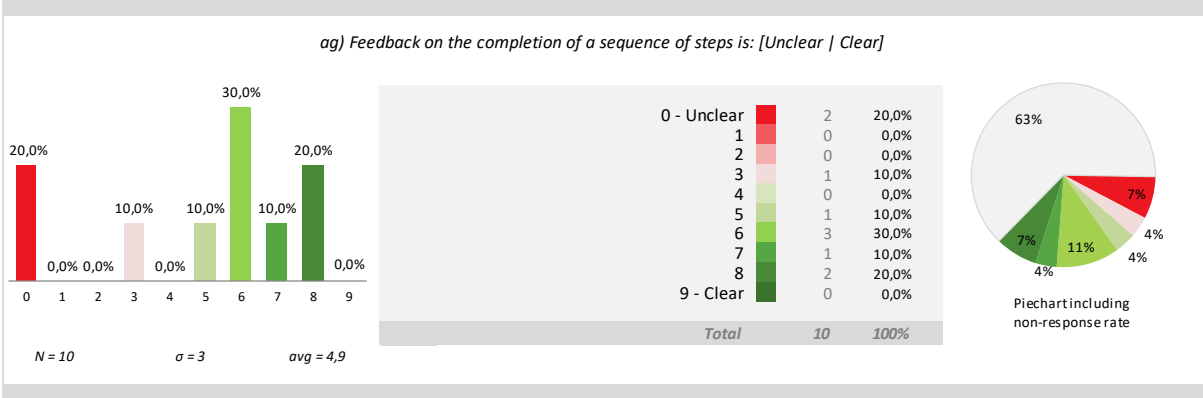


Figure 423 Feedback on the completion of a sequence of steps is: [Unclear|Clear]

When asked to rate the system speed from “Too slow” to “Fast enough”, the statement was rated an average of 5.8 with a standard deviation of 2.8. The peak rating belonged to 8 with 27.3%. One user also left his/her comment (see comment 34 in **Table 99**).

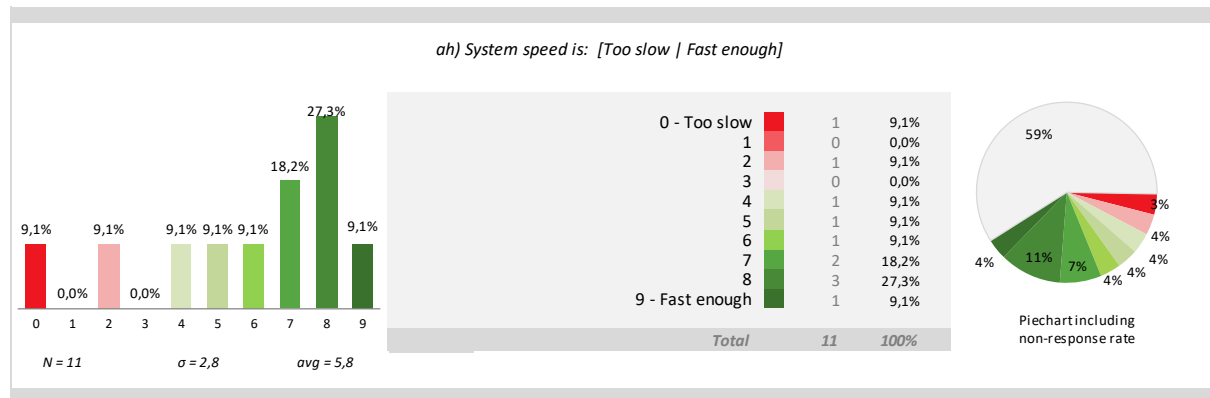


Figure 424 System speed is: [Too slow|Fast enough]

When asked to rate if the response time for most operation was “Too slow” to “Fast enough”, the statement was rated an average of 5.5 with a standard deviation of 3.3. The peak rating belonged to 8 with 30%. There was a comparatively high non-response rate. One user also left his/her comment (see comment 35 in **Table 99**).

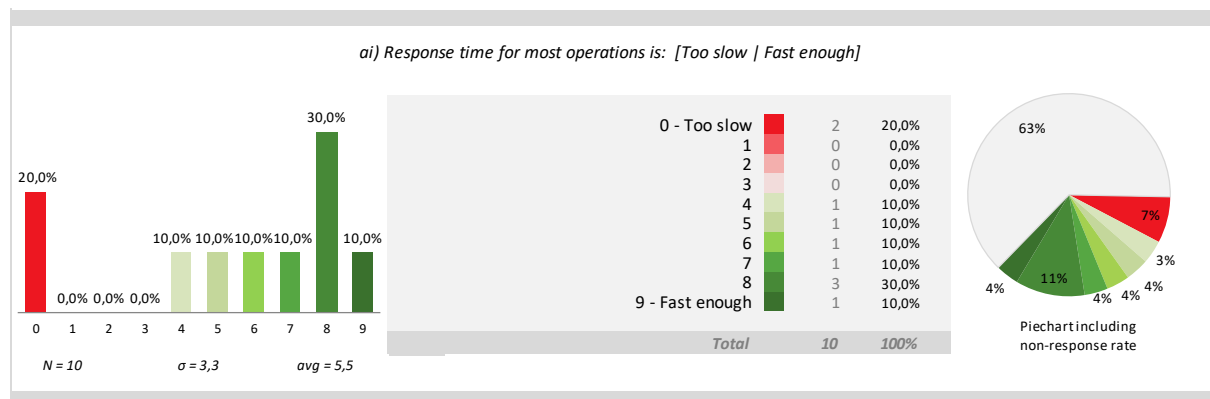


Figure 425 Response time for most operations is: [Too slow|Fast enough]

When asked to rate if the system was reliable from “Never” to “Always”, the statement was rated an average of 4.73 with a standard deviation of 2.7. The peak rating belonged to 5, 6 and 8 with 18.2% each. Some users also left their comments (see comment 36 in **Table 99**).

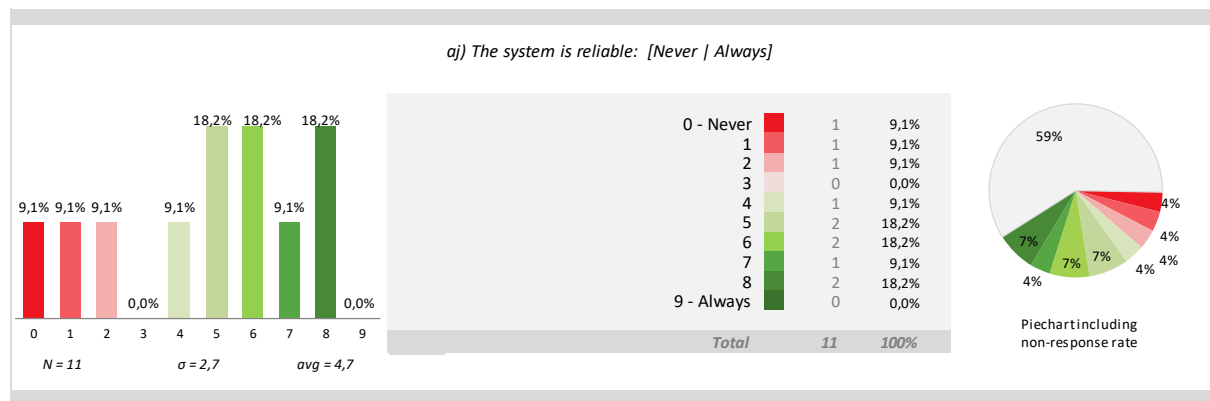


Figure 426 The system is reliable: [Never|Always]

When asked to rate if operations were “Undependable” to “Dependable”, the statement was rated an average of 5.3 with a standard deviation of 2.9. The peak rating belonged to and 8 with 40%. Some users also left their comments (see comment 37 in **Table 99**).

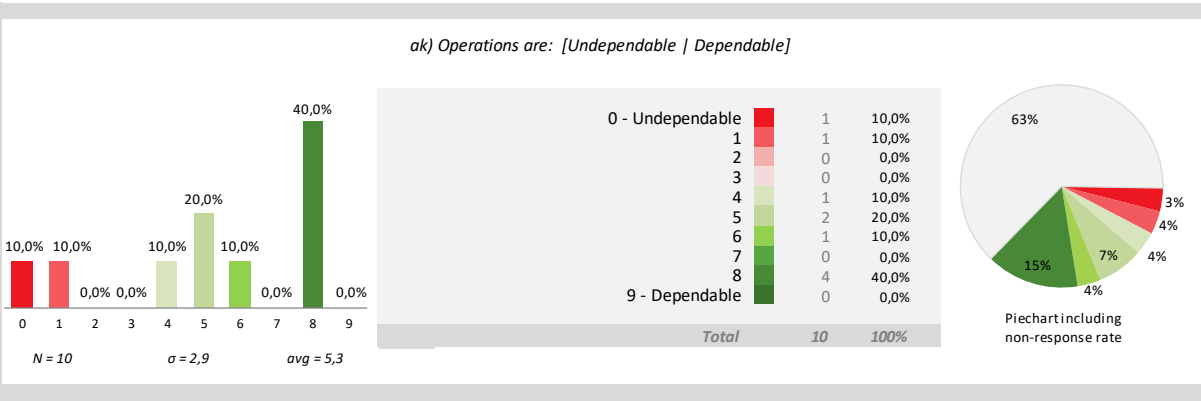


Figure 427 Operations are: [Undependable|Dependable]

When asked to rate if system failures occurred “Frequently” to “Seldom”, the statement was rated an average of 4.8 with a standard deviation of 3.3. It should be noted that 18.2% of the users thought that system failures occurred frequently. One user also left his/her comment (see comment 38 in **Table 99**).

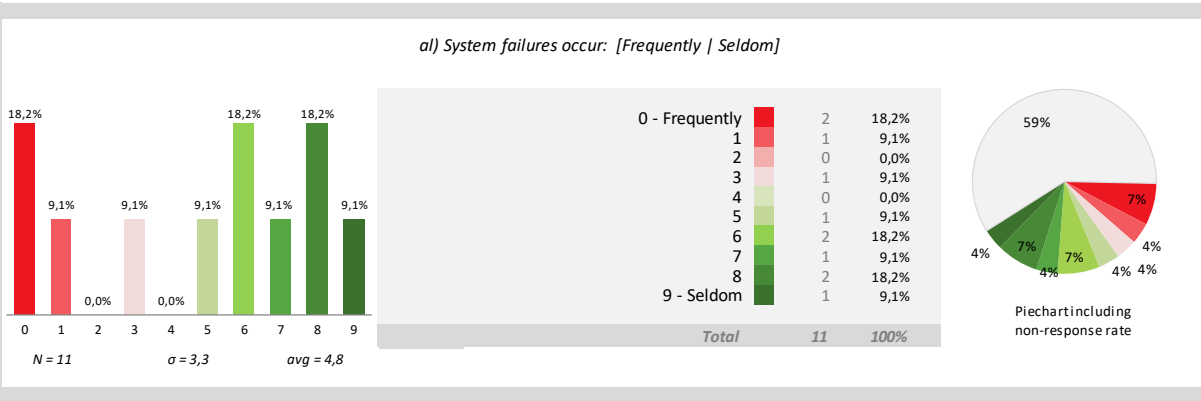


Figure 428 System failures occur: [Frequently|Seldom]

Statement (am) was rated an average of 4.2 with a standard deviation of 2.7. It should be noted that 20% of the users rated this statement 0 and the non-response rate was comparatively higher. One user also left his/her comment (see comment 39 in **Table 99**).

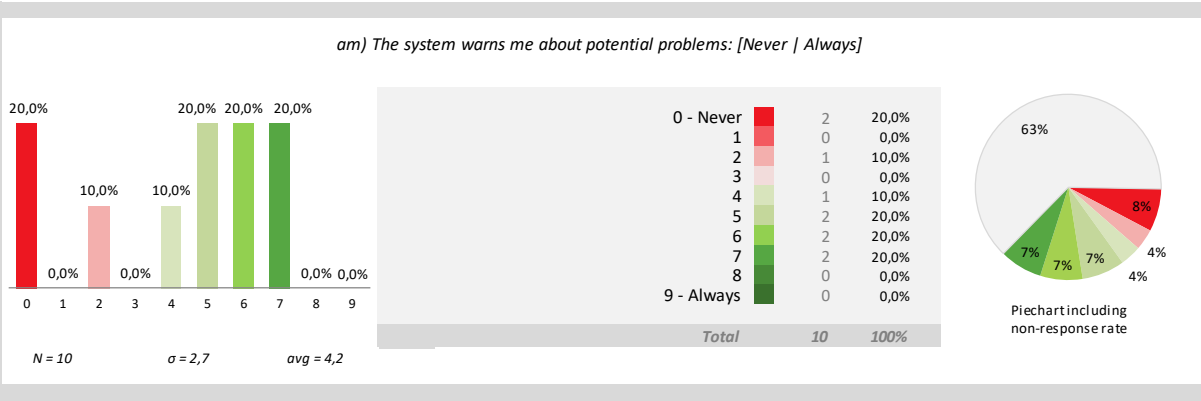


Figure 429 The system warns me about potential problems: [Never|Always]

Statement (an) was rated an average of 5.2 with a standard deviation of 3.5. It should be noted that 27.3% of the users rated this statement 0 which opens the floor for further discussion about this feature of the system. One user also left his/her comment (see comment 40 in **Table 99**).

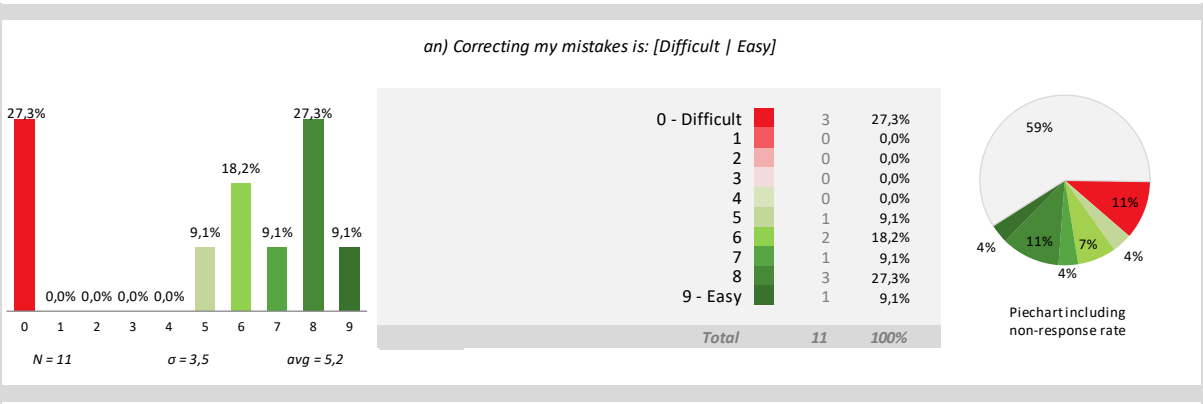


Figure 430 Correcting my mistakes is: [Difficult|Easy]

When asked to rate if correcting typos is “Complex” to “Simple”, the statement was rated an average of 5.8 with a standard deviation of 3.1. It should be noted that 18.2% of the users thought that correcting typos was complex. One user also left his/her comment (see comment 41 in **Table 99**).

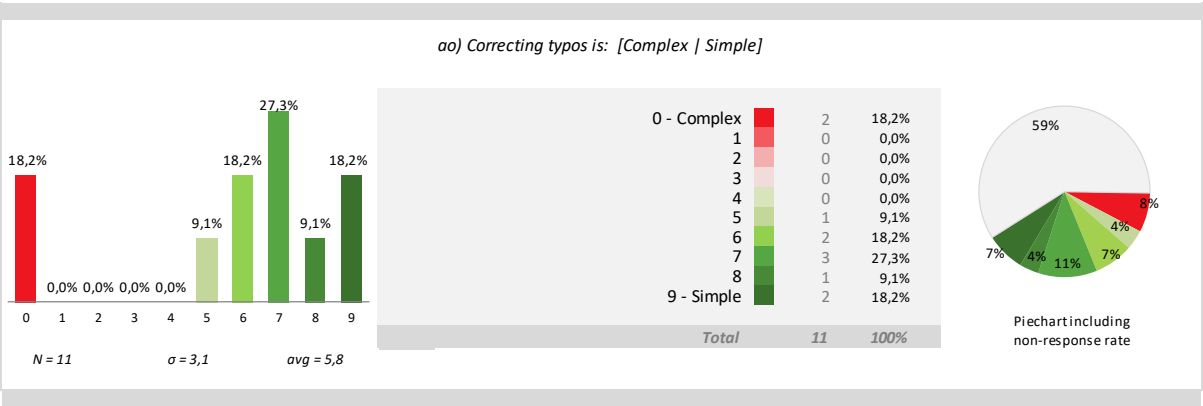


Figure 431 Correcting typos is: [Complex|Simple]

When asked to rate if the ability to undo operations was “Inadequate” to “Adequate”, the statement was rated an average of 5.3 with a standard deviation of 3.5 and the peak belonged to 8 with 40%. Despite this, 20% of the users thought that the ability to undo operations was inadequate. One user also left his/her comment (see comment 42 in **Table 99**).

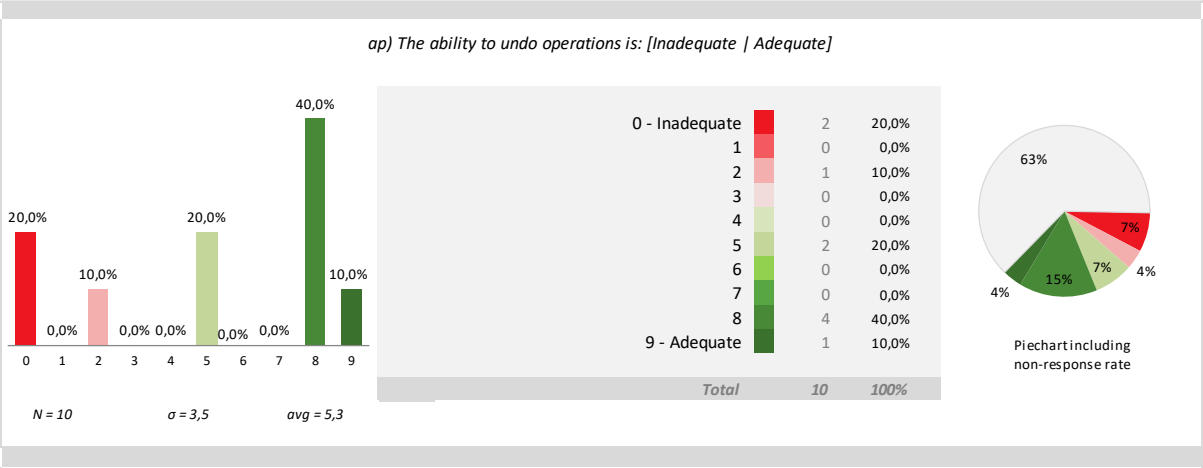


Figure 432 The ability to undo operations is: [Inadequate|Adequate]

Statement (aq) was rated quite positively with an average of 6.1, the standard deviation was 2.7 and the peak belonged to 6 with 27.3%. One user also left his/her comment (see comment 43 in Table 99).

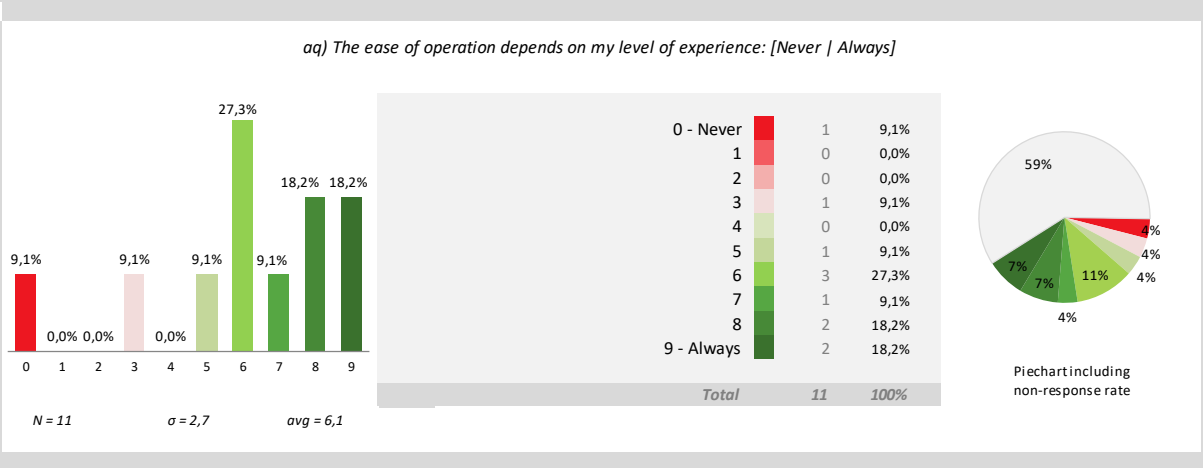


Figure 433 The ease of operation depends on my level of experience: [Never|Always]

When asked to rate if the users could accomplish tasks knowing only a few commands from “With difficulty” to “Easily”, the statement was rated an average of 5.6 with a standard deviation of 2.9 and the peak belonged to 8 with 30%. A comparatively higher non-response rate should also be noted. One user also left his/her comment (see comment 44 in Table 99).

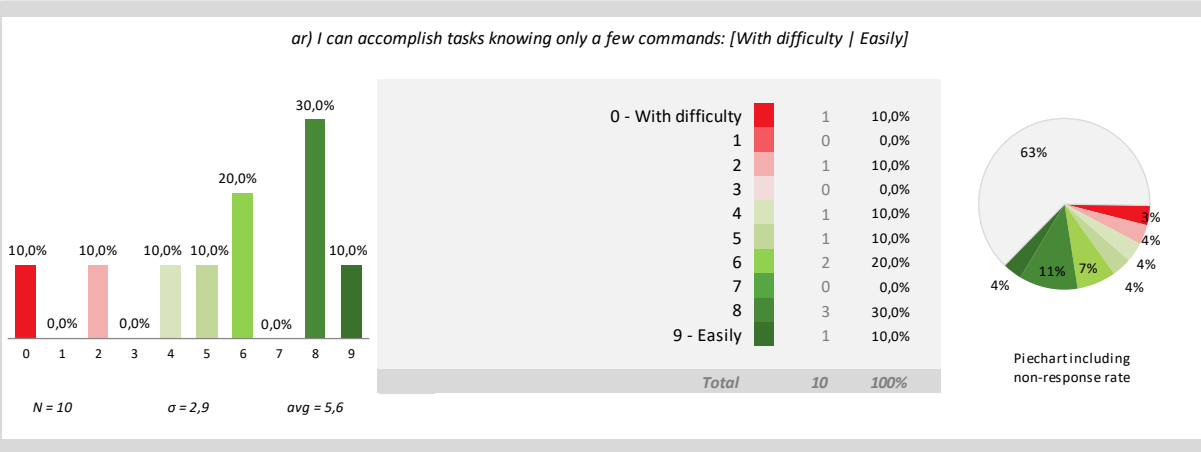


Figure 434 I can accomplish tasks knowing only a few commands: [With difficulty|Easily]

When asked to rate if the terminology used in the manuals was “Confusing” or “Clear”, the statement was rated an average of 5.6 with a standard deviation of 3.1 and the peak belonged to 8 with 27.3%. Despite this, it should be noted that 18.2% of the users believed that the terminology used in the manual was confusing. One user also left his/her comment (see comment 45 in **Table 99**).

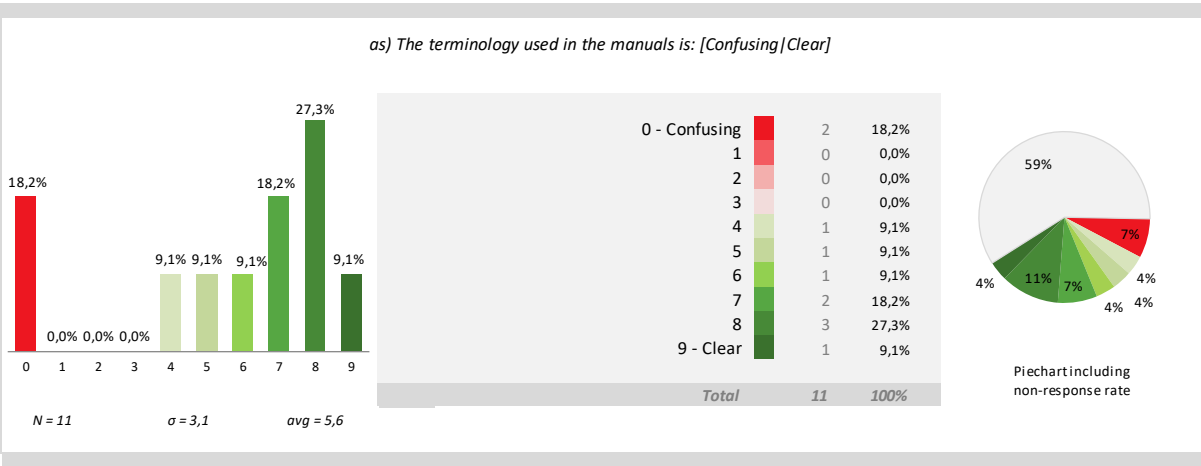


Figure 435 The terminology used in the manuals is: [Confusing|Clear]

The figure below shows the mean ratings of 11 users’ impressions to the next group of statements (at-bk). Please note that in almost all the statements there was quite a high non-response rate that should be considered when analysing the system. However, as we are approaching the end of the survey, the non-response rate is even becoming higher.

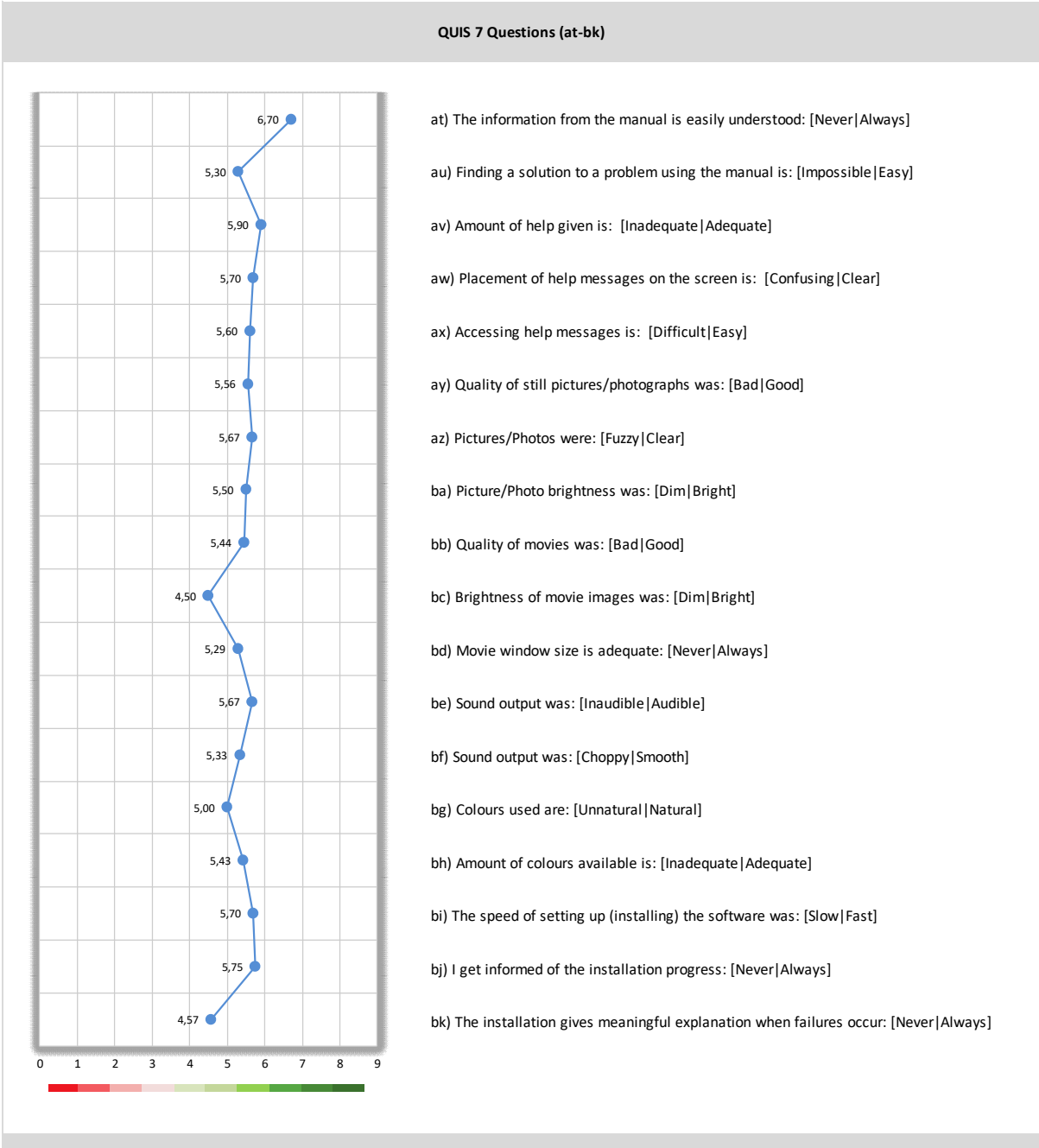


Figure 436 2nd detailed survey for patients, QUIS7 (at-bk)

When asked to rate if the information from the manual was easily understood “Never” or “Always”, the statement was rated an average of 6.7 with a standard deviation of 1.6 and the peak belonged to 8 with 30%. There was also a comparatively higher non-response rate.

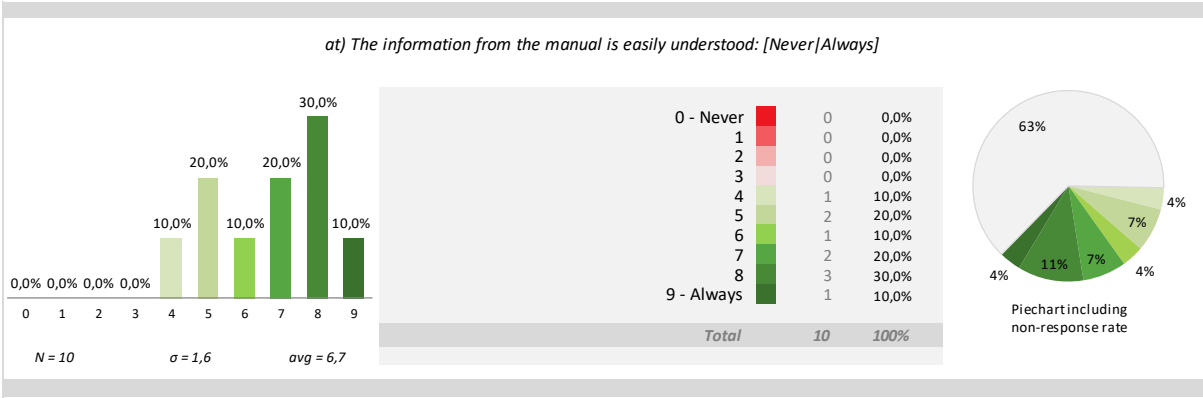


Figure 437 The information from the manual is easily understood: [Never|Always]

When asked to rate if finding a solution to a problem using the manual was “Impossible” or “Easy”, the statement was rated an average of 5.3 with a standard deviation of 2.4 and the peak belonged to 4, 5, 6 and 8 with 20% each. Despite this, it should be noted that 10% of the users rated this statement 0. Two users also left their comments (see comment 46 in Table 99).

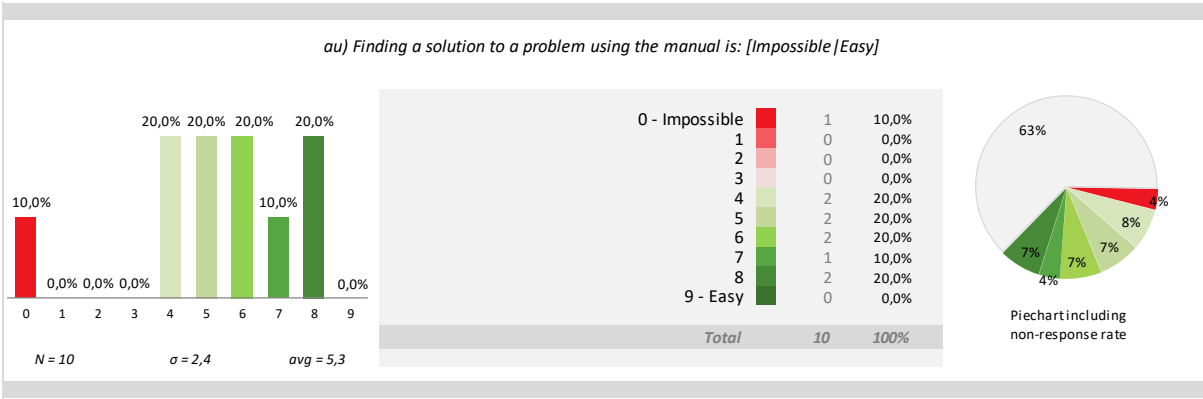


Figure 438 Finding a solution to a problem using the manual is: [Impossible|Easy]

When asked to rate if the amount of help given was “Inadequate” or “Adequate”, the statement was rated an average of 5.9 with a standard deviation of 2.6. Despite this, it should be noted that 10% of the users believed that the amount of help given to them was inadequate. One user also left his/her comment (see comment 47 in Table 99).

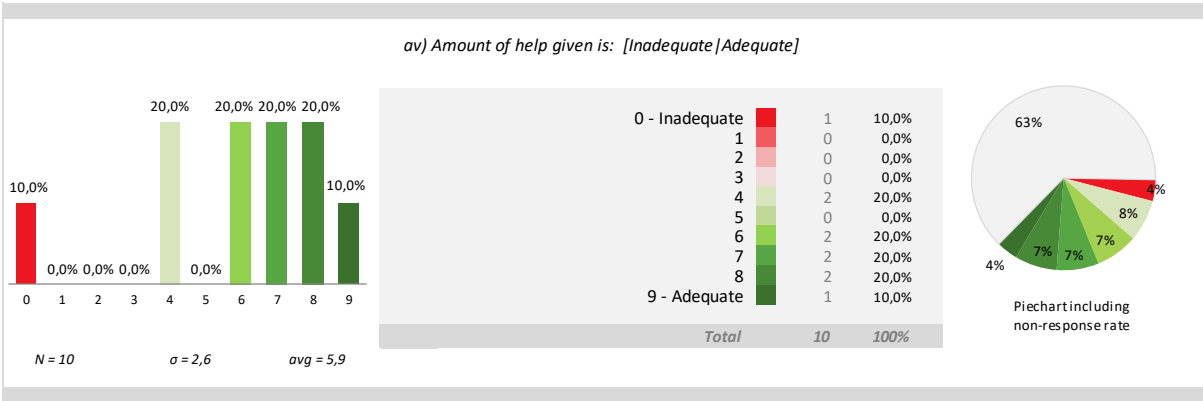


Figure 439 Amount of help given is: [Inadequate|Adequate]

When asked to rate the placement of help messages on the screen from “Confusing” to “Clear”, the statement was rated an average of 5.7 with a standard deviation of 3.2. The peak belonged to 8 with 40% and the non-response rate was comparatively higher. One user also left his/her comment (see comment 48 in **Table 99**).

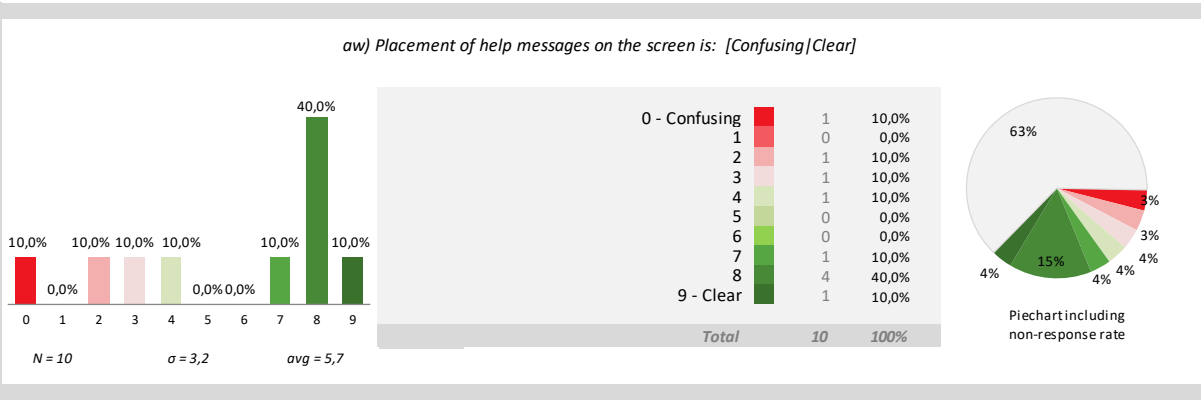


Figure 440 Placement of help messages on the screen is: [Confusing|Clear]

Quite like the previous statement, when asked to rate if accessing help messages was “Difficult” or “Easy”, the statement was rated an average of 5.6 with a standard deviation of 3.1. The peak belonged to 8 with 40% and the non-response rate was comparatively higher. One user also left his/her comment (see comment 49 in **Table 99**).

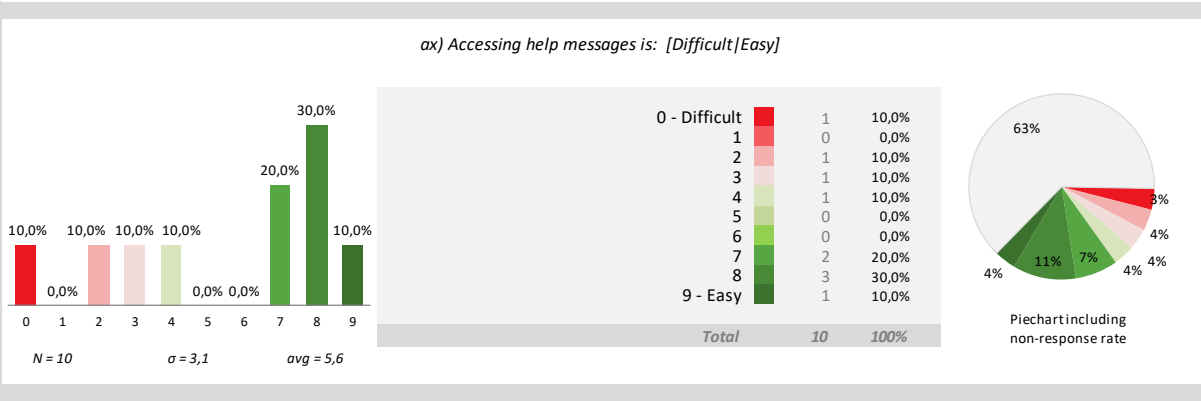


Figure 441 Accessing help messages is: [Difficult|Easy]

Statement (ay) was rated an average of 5.6, a standard deviation of 2.7 and a peak rating of 33.3% that belonged to 7. It should also be noted that the non-response rate was comparatively higher. One user also left his/her comment (see comment 50 in **Table 99**).



Figure 442 Quality of still pictures/photographs was: [Bad|Good]

When asked to rate if the pictures/photos were “Fuzzy” or “Clear”, the statement was rated an average of 5.7 with a standard deviation of 2.7. The peak belonged to 4, 6 and 7 with 22.2% each and the non-response rate was comparatively higher. One user also left his/her comment (see comment 51 in **Table 99**).

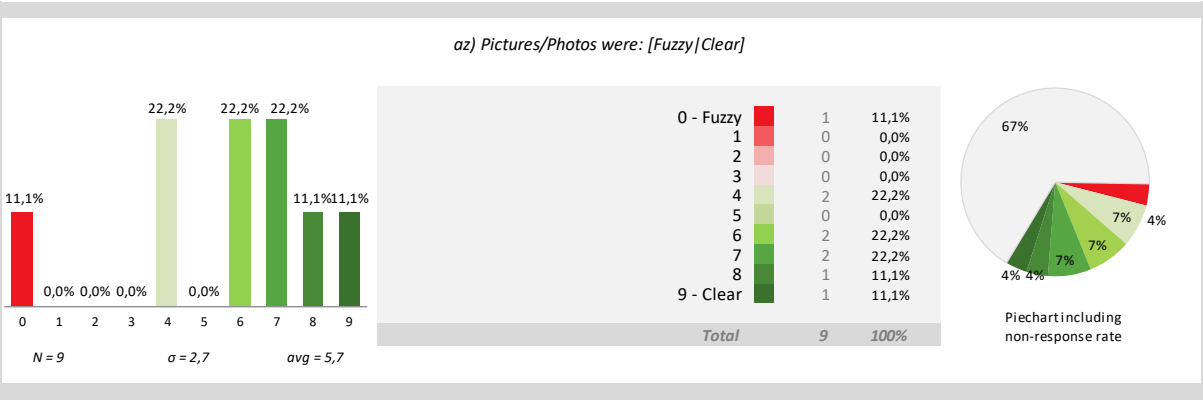


Figure 443 Pictures/Photos were: [Fuzzy|Clear]

Statement (ba) was rated an average of 5.5, a standard deviation of 2.7 and a peak rating of 25% that belonged to 6 and 7. It should also be noted that the non-response rate was comparatively higher. One user also left his/her comment (see comment 52 in **Table 99**).

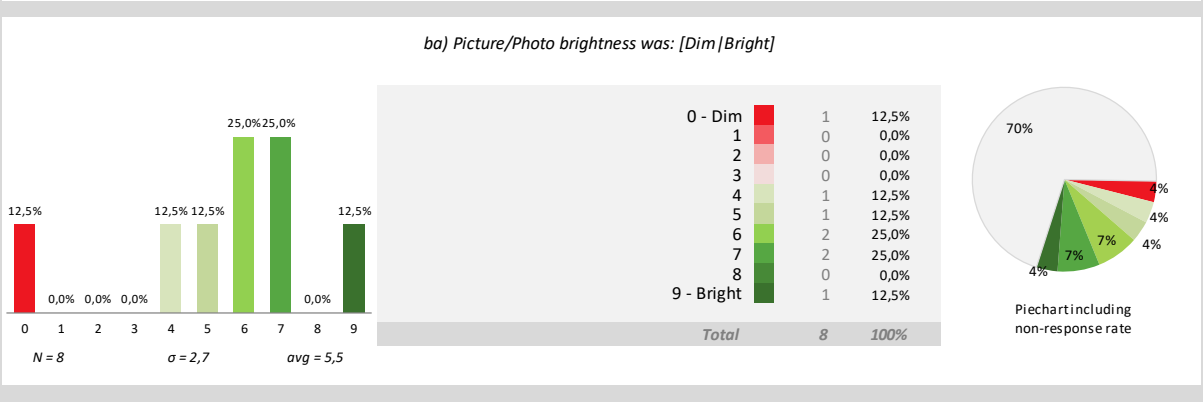


Figure 444 Picture/Photo brightness was: [Dim|Bright]

When asked to rate if quality of movies was “Bad” or “Good”, the statement was rated an average of 5.4 with a standard deviation of 2.7. The peak belonged to 6 with 33.3% and the non-response rate was comparatively higher. One user also left his/her comment (see comment 53 in **Table 99**).

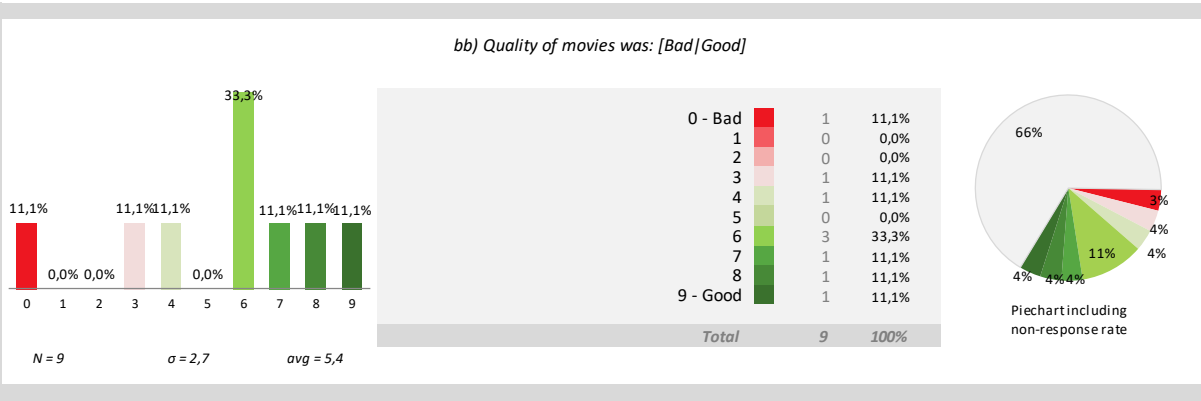


Figure 445 Quality of movies was: [Bad|Good]

Statement (bc) was rated an average of 4.5, a standard deviation of 2.6 and a peak rating 33.3% that belonged to 6. Despite this, 16.7% of the users rated it 0. It should also be noted that the non-response rate was substantially higher. A user also left his/her comment (see comment 54 in **Table 99**).

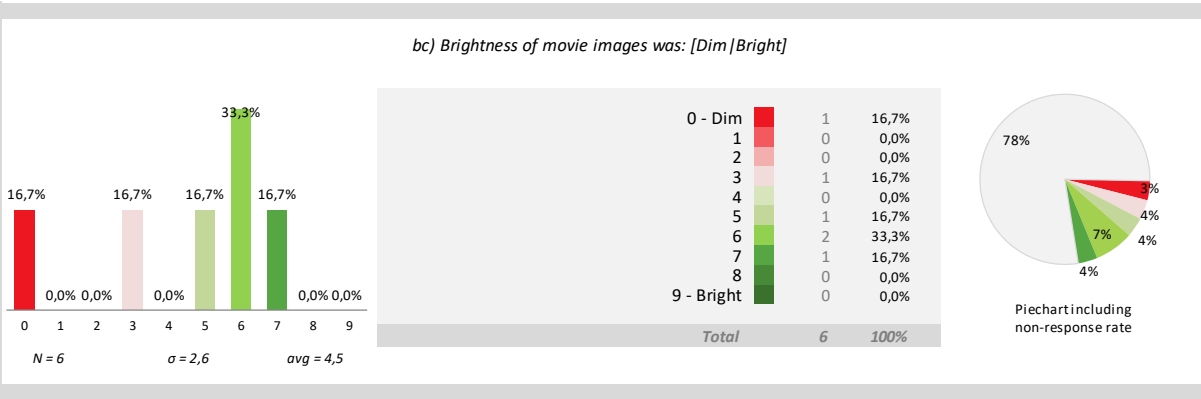


Figure 446 Brightness of movie images was: [Dim|Bright]

When asked to rate if the movie window size was adequate “Never” or “Always”, the statement was rated an average of 5.3 with a standard deviation of 3.0. The peak belonged to 7 with 28.6% and the non-response rate was comparatively higher. One user also left his/her comment (see comment 55 in **Table 99**).

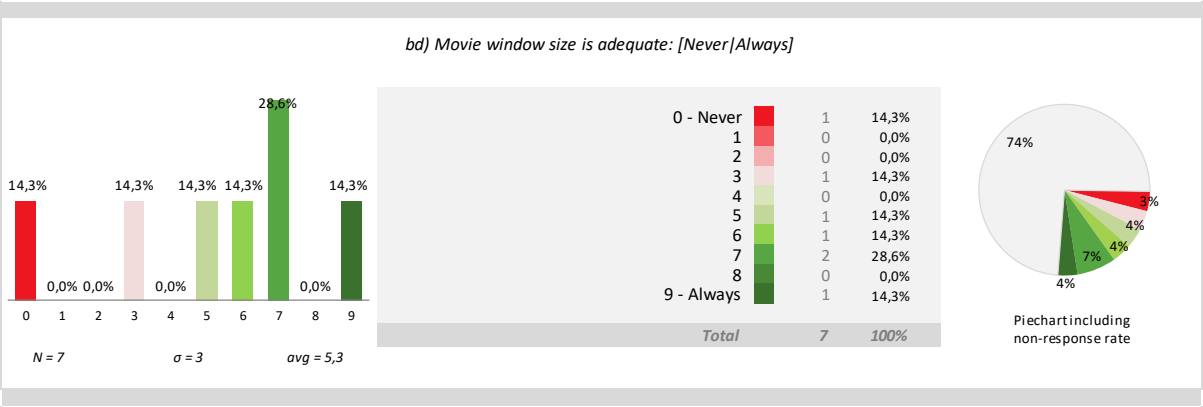


Figure 447 Movie window size is adequate: [Never|Always]

Statement (bc) was rated an average of 5.7, a standard deviation of 3 and a peak rating 50% that belonged to 6. Despite this 16.7% of the users rated it 0. It should also be noted that the non-response rate was substantially higher. A user also left his/her comment (see comment 56 in **Table 99**).

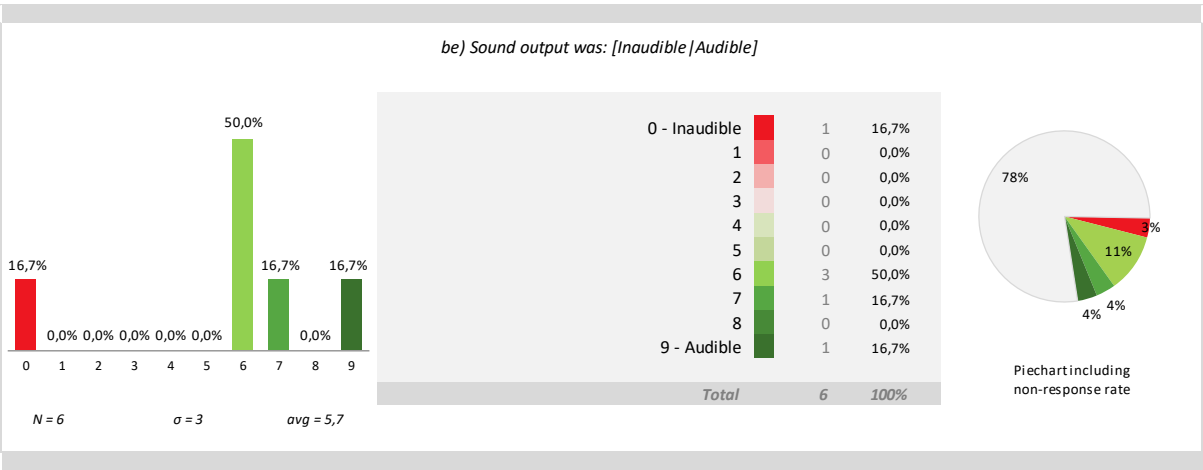


Figure 448 Sound output was [Inaudible|Audible]

When asked to rate if the sound output was “Choppy” or “Smooth”, the statement was rated an average of 5.3 with a standard deviation of 3.1. The peak belonged to 6 with 33.3% and the non-response rate was substantially higher. One user also left his/her comment (see comment 57 in **Table 99**).

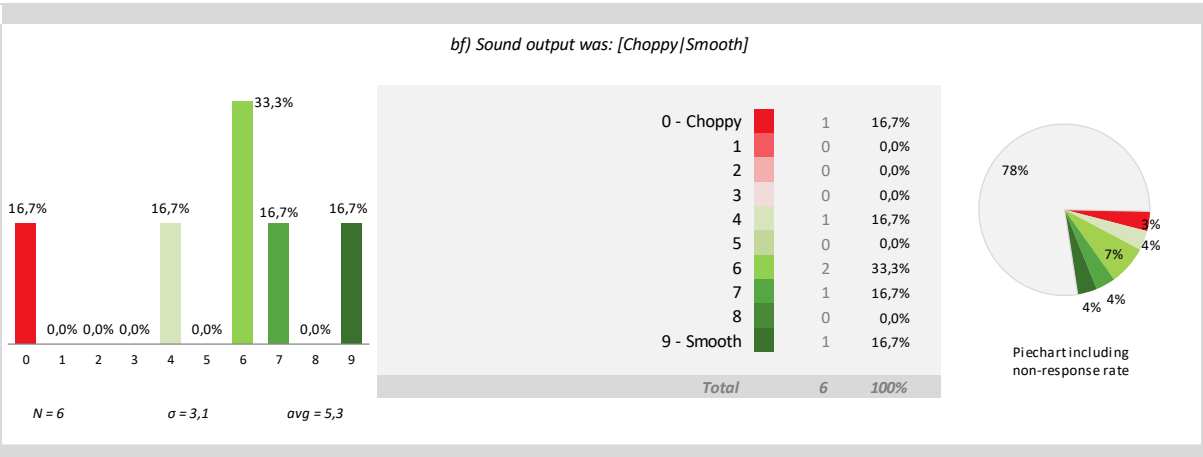


Figure 449 Sound output was: [Choppy|Smooth]

Statement (bg) was rated an average of 5, a standard deviation of 3.3 and a peak rating 33.3% that belonged to 6. Despite this 16.7% of the users rated it 0 and another 16.7% rated the statement 2, which should be reflected upon more. It should also be noted that the non-response rate was substantially higher. A user also left his/her comment (see comment 58 in **Table 99**).

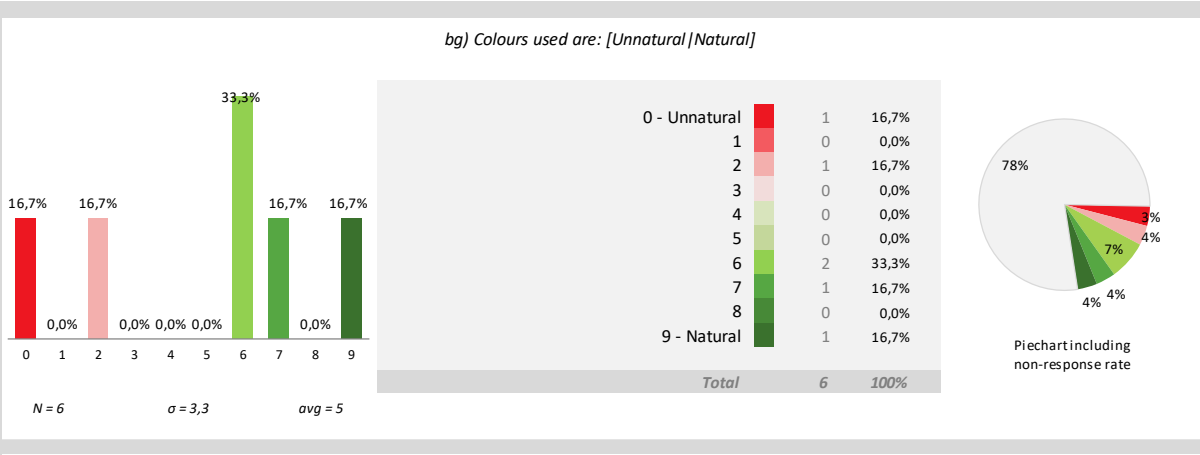


Figure 450 Colours used are [Unnatural|Natural]

When asked to rate if the amount of colours available was “Inadequate” or “Adequate”, the statement was rated an average of 5.4 with a standard deviation of 3. The peak belonged to 6 and 7 with 28.6% each and the non-response rate was substantially higher. One user also left his/her comment (see comment 59 in **Table 99**).

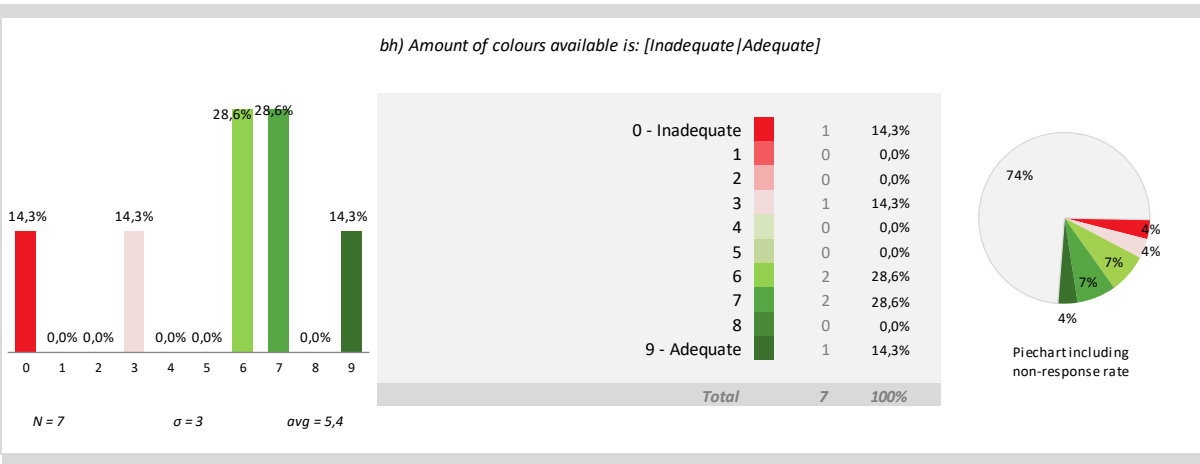


Figure 451 Amount of colours available is [Inadequate|Adequate]

Statement (bi) was rated an average of 5.7, a standard deviation of 3.3 and a peak rating 30% that belonged to 8. Despite this, 30% of the users rated it within a range of 0-3, which should be reflected upon more. It should also be noted that the non-response rate was comparatively higher. Some users also left their comments (see comment 60 in **Table 99**).

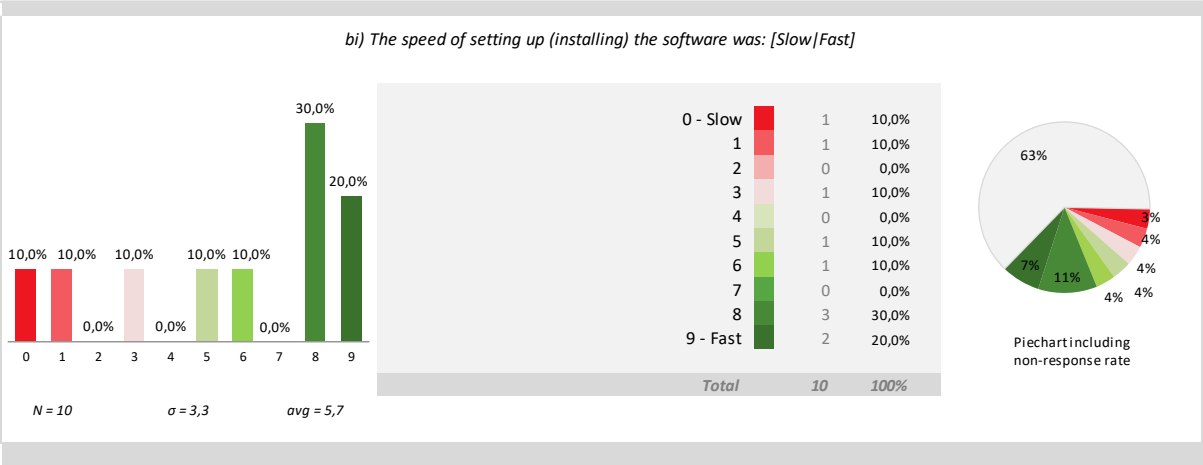


Figure 452 The speed of setting up (installing) the software was: [Slow|Fast]

When asked to rate if they got informed of the installation progress “Never” and “Always”, the statement was rated an average of 5.8 with a standard deviation of 3. The peak belonged to 8 with 25% and the non-response rate was comparatively higher. Some users also left their comments (see comment 61 in **Table 99**).

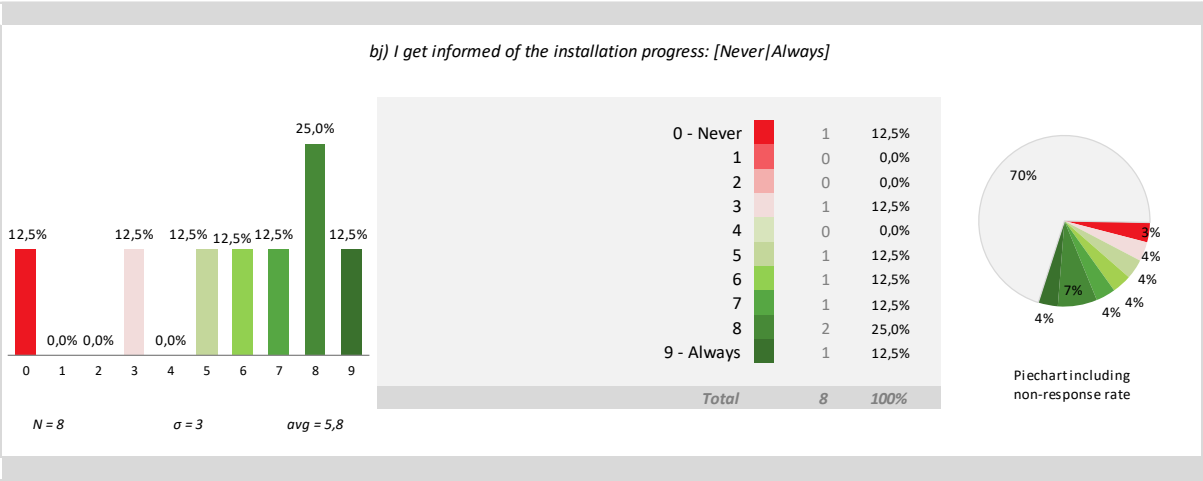


Figure 453 I get informed of the installation progress: [Never|Always]

Finally, statement (bk) was rated an average of 4.6 with a standard deviation of 2.5. The peak rating belonged to 5 with 42.9%. A higher non-response rate and 14.3% who rated the statement 0 should also be considered. Some users also left their comments (see comment 62 in **Table 99**).

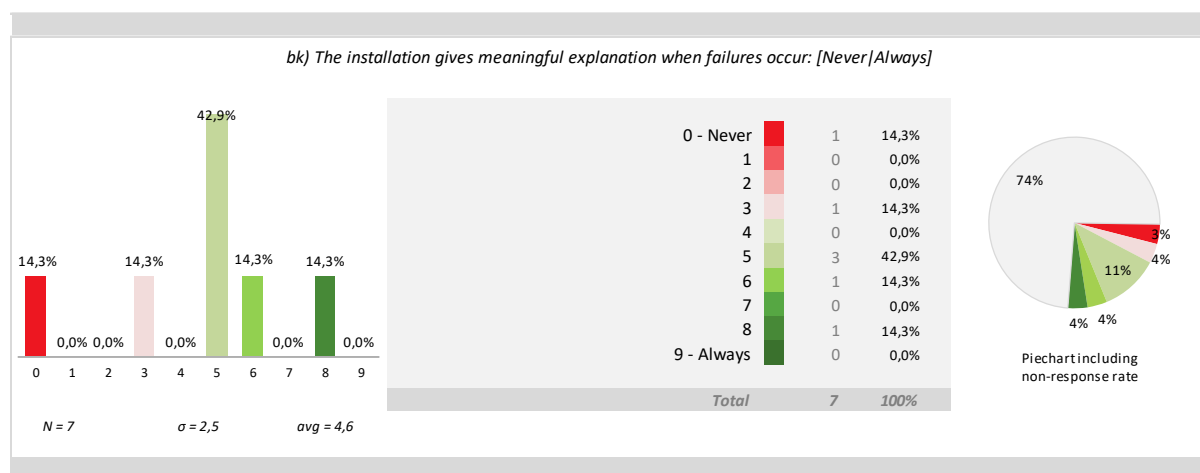


Figure 454 The installation gives meaningful explanation when failures occur: [Never|Always]

The table below shows comments in original languages (Swedish, Castilian and English), of those users who rated the question 0-5. For the English translation refer to **Table 20**.

Comments related to the statements (original language)	
1)	<p>I find the C3-Cloud system: [Terrible Wonderful]</p> <ul style="list-style-type: none"> Jag har ingen koll på detta! Es una aplicación un poco difícil de entender ya que lo primero para entrar lo de las coordenadas es un poco complicado, y lo demás bueno un poco lioso Difficulties at times inputting data. feel at times care team understandingly giving priority to virus pandemic over my conditions. system too restricted in scope, needs better feedback See previous comments. Did not derive the benefits I expected. Having said that, I did not require regular help in managing my conditions.
2)	<p>I find the C3-Cloud system: [Frustrating Satisfying]</p> <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till Lack of further tasks following initial targets. Possibly I have missed something as I understood that I could not request additional tasks as there was not to my knowledge any system to do so other than commenting and providing survey answers. I do try to avoid using busy doctors time with appointments, but strongly feel that the internet could help immensely if we could use it. I fully realise that diagnosis often relies on personal contact because patient views of need are often not accurate, but an initial email or system contact could help. For example, I think my age and conditions make me at serious risk if I get the Covid virus, and a 7 day wait and 111 would possibly be too late. I do not know of any alternative recommendation so would probably dial 111 or the Practice by day 2 or 3. Meanwhile I stay home. Email for personal guidance would avoid concern. Did not provide the help I expected.
3)	<p>I find the C3-Cloud system: [Dull Stimulating]</p> <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till Certainly not stimulating but then I suppose I did not find the need to use it regularly.

4)	I find the C3-Cloud system: [Difficult Easy] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till
5)	I find the C3-Cloud system having: [Inadequate power Adequate power] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till More feedback, with any corrective action I need to take. Limited ongoing tasks. I completed mine in a few weeks so have since only completed surveys, although I am awaiting a phone call from my practice on C3 today. Perhaps more use by me may have changed this.
6)	I find the C3-Cloud system: [Rigid Flexible] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till Only outward communication on a few simple tasks without ability to request follow ups. Not in a position to comment on this.
7)	The use of terminology throughout system is: [Inconsistent Consistent] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till
8)	The work-related terminology is: [Inconsistent Consistent] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till
9)	The computer terminology is: [Inconsistent Consistent] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till
10)	The terminology relates well to the activities I am doing: [Never Always] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till Not in a position to comment.
11)	Computer terminology is used: [Too frequently Appropriately] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till
12)	Terminology on the screen is: [Ambiguous Precise] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till
13)	Messages that appear on the screen are: [Inconsistent Consistent] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till
14)	The position of instructions on the screen is: [Inconsistent Consistent] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till
15)	Messages that appear on the screen are: [Confusing Clear] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till
16)	Instructions for commands or functions are: [Confusing Clear] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till
17)	Instructions for correcting errors are: [Confusing Clear] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till. There were none so I cannot comment. Should be "Not applicable" response available

18)	<p>The computer keeps me informed about what it is doing: [Never Always]</p> <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till • No comment.
19)	<p>Animated cursors keep me informed: [Never Always]</p> <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till • never noticed any. • Cannot remember any but initial communication memory may have forgotten them. • No comment.
20)	<p>Performing an operation leads to a predictable result: [Never Always]</p> <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till • No comment.
21)	<p>Controlling the amount of feedback is: [Impossible Easy]</p> <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till • what feedback?
22)	<p>The length of delay between operations is: [Unacceptable Acceptable]</p> <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • If by operations, you mean follow up medical tasks there were not any. Additionally, as the site seemed to block me out recently and there were no further tasks, there was no point in logging in frequently, so I expected an email to trigger for example a response to this questionnaire.
23)	<p>Error messages are: [Unhelpful Helpful]</p> <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • None cannot comment. • No comment.
24)	<p>Error messages clarify the problem: [Never Always]</p> <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • None cannot comment. • No comment.
25)	<p>Phrasing of error messages are: [Unpleasant Pleasant]</p> <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • None cannot comment. • No comment.
26)	<p>Learning advanced features is: [Difficult Easy]</p> <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • Unable to comment.
27)	<p>Time to learn to use the system is: [Slow Fast]</p> <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • Unable to comment.

28)	Exploration of features is: [Risky Safe] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • Unable to comment.
29)	Remembering specific rules about entering commands is: [Difficult Easy] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • Unable to comment.
30)	Tasks can be performed in a straight-forward manner: [Never Always] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • Unable to comment.
31)	Number of steps per task are: [Too many Just right] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • Unable to comment.
32)	Steps to complete a task follow a logical consequence: [Never Always] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • Unable to comment.
33)	Feedback on the completion of a sequence of steps is: [Unclear Clear] <ul style="list-style-type: none"> • No or bad explanation for what I use C3-Cloud for. • Unable to comment.
34)	System speed is: [Too slow Fast enough] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
35)	Response time for most operations is: [Too slow Fast enough] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
36)	The system is reliable: [Never Always] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till • it was unavailable several times. • Did not find this to be the case when first started and completed survey had to be repeated.
37)	Operations are: [Undependable Dependable] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • As above.
38)	System failures occur: [Frequently Seldom] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
39)	The system warns me about potential problems: [Never Always] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • Unable to comment.
40)	Correcting my mistakes is: [Difficult Easy] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
41)	Correcting typos is: [Complex Simple] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.

42)	The ability to undo operations is: [Inadequate Adequate] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
43)	The ease of operation depends on my level of experience: [Never Always] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
44)	I can accomplish tasks knowing only a few commands: [With difficulty Easily] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
45)	The terminology used in the manuals is: [Confusing Clear] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
46)	Finding a solution to a problem using the manual is: [Impossible Easy] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till. • Not required.
47)	Amount of help given is: [Inadequate Adequate] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
48)	Placement of help messages on the screen is: [Confusing Clear] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
49)	Accessing help messages is: [Difficult Easy] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
50)	Quality of still pictures/photographs was: [Bad Good] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
51)	Pictures/Photos were: [Fuzzy Clear] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
52)	Picture/Photo brightness was: [Dim Bright] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
53)	Quality of movies was: [Bad Good] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
54)	Brightness of movie images was: [Dim Bright] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
55)	Movie window size is adequate: [Never Always] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
56)	Sound output was: [Inaudible Audible] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
57)	Sound output was: [Choppy Smooth] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
58)	Colours used are: [Unnatural Natural] <ul style="list-style-type: none"> • Ingen eller dålig förklaring till vad jag använder C3-Cloud till.

59)	Amount of colours available is: [Inadequate Adequate] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
60)	The speed of setting up (installing) the software was: [Slow Fast] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till. the link given did not work - I had to key in to load it Unable to comment.
61)	I get informed of the installation progress: [Never Always] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till. Unable to comment.
62)	The installation gives meaningful explanation when failures occur: [Never Always] <ul style="list-style-type: none"> Ingen eller dålig förklaring till vad jag använder C3-Cloud till. Cannot remember any. You really do need a N/A button sometimes. Unable to comment.

Table 99 2nd detailed survey for patients, comments related to statements rated 0-5, original language

The table below also shows the users' general comments (in Swedish English and Castilian) about their interaction with the system and their level of satisfaction with it (for the English translation refer to **Table 21**).

Comments (original language): Swedish/RJH (1), English/SWFT (2 and 3), Castilian (4)	
1)	Ingen eller dålig förklaring till vad jag använder C3-Cloud till
2)	No please read those made.
3)	No.
4)	Es bastante complicada en general

Table 100 2nd detailed survey for patients, general comments, original language

Patients eCare Client Impact Survey (eCCIS)

When the patients were asked how often they usually did their home-based self-measurements, 40% responded about 2 to 4 times a week, 30% chose "Less than once per week" and 10% said they did it more than once per day. 20% of the respondents also claimed that this question was not relevant to them.

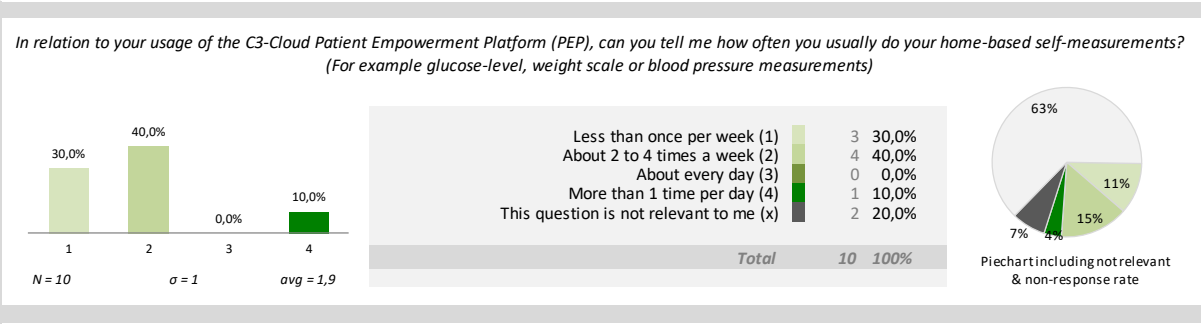


Figure 455 How often you usually do your home-based self-measurements

When asked how much time they usually spent doing their home-based self-measurement readings, half of the respondents said “Less than 10 minutes per session”, 30% said between 10 minutes and half an hour per session, and 20% chose that it was not relevant to them.

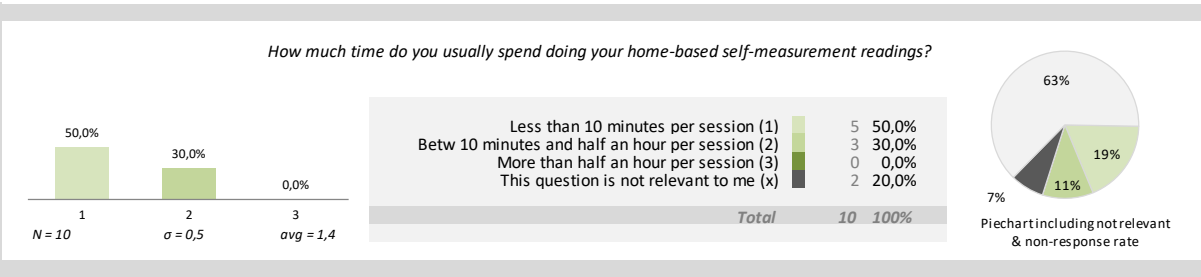


Figure 456 How much time do you usually spend doing your home-based self-measurement readings

When asked how often they used the C3-Cloud PEP, 70% said less than once per week, 10% chose about 2 to 4 times per week, 10% said about every day and 10% said that it was not relevant to them.

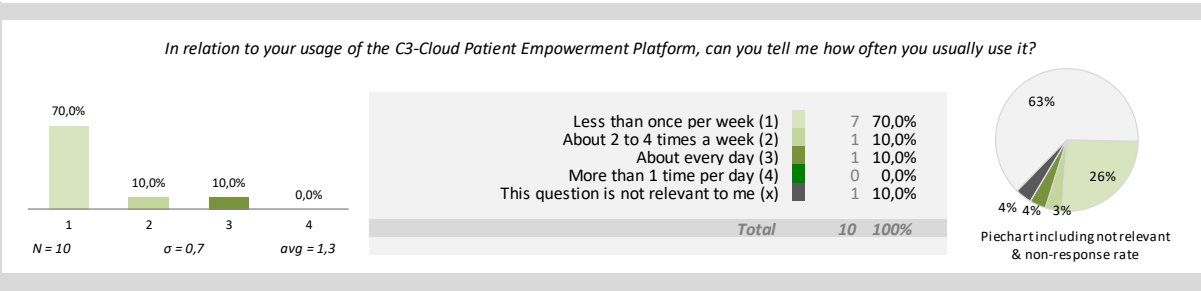


Figure 457 In relation to your usage of the C3-Cloud Patient Empowerment Platform, can you tell me how often you usually use it

To the question how much time they usually spent on using the C3-Cloud PEP, 30% of the users replied less than 10 minutes per session, half of the respondents said between 10 minutes and half an hour per session, 10% said more than half an hour per session and 10% said that it was not relevant to them.

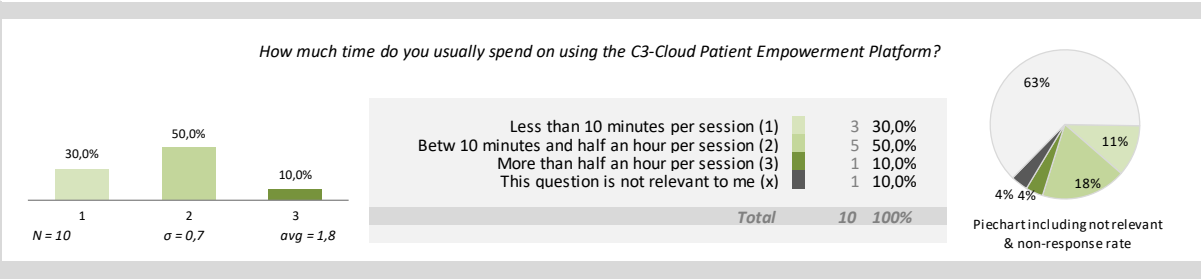


Figure 458 How much time do you usually spend on using the C3-Cloud Patient Empowerment Platform

When asked how much time a visit to a GP takes them, half of the users responded with “Less than an hour”, 40% said between one and two hours and 10% said it was not relevant to them.

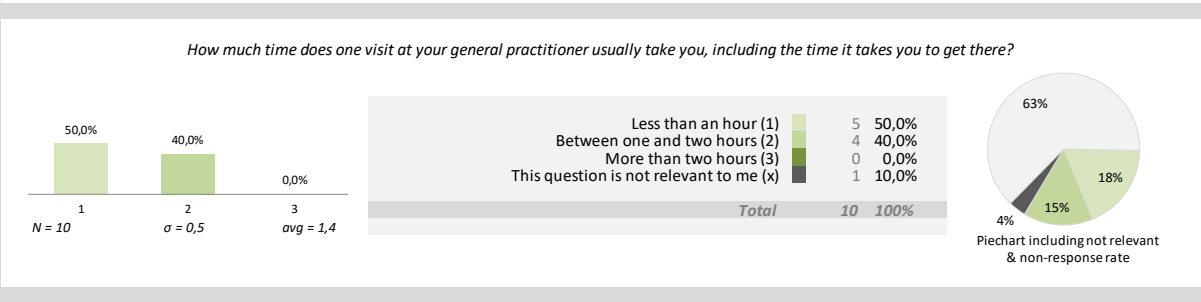


Figure 459 How much time does one visit at your general practitioner usually take you, including the time it takes you to get there

When asked how much time a visit to their health consultant took them, 30% of the users responded with “Less than an hour”, 40% said between one and two hours and 30% said more than three hours.

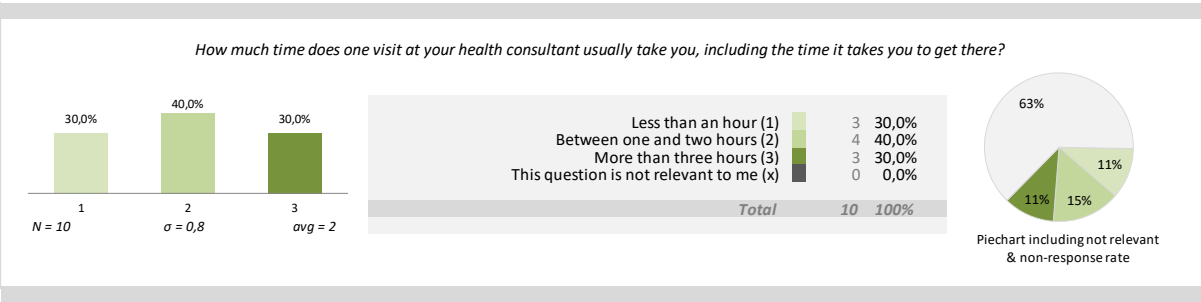


Figure 460 How much time does one visit at your health consultant usually take you, including the time it takes you to get there

When asked to what extent C3-Cloud participation affected their motivation to perform daily physical activities, 50% of the respondents said it had not affected their motivation, 40% said it had increased their motivation a little and 10% chose it was not relevant to them.

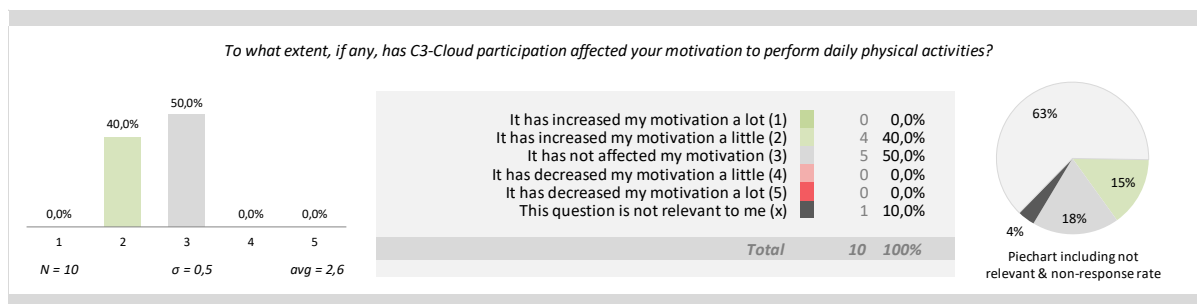


Figure 461 To what extent has C3-Cloud participation affected your motivation to perform daily physical activities

When asked to what extent C3-Cloud participation affected their ability to perform daily physical activities, 70% of the respondents said it had not affected their ability, 20% said it had increased their ability a little and 10% chose it was not relevant to them.

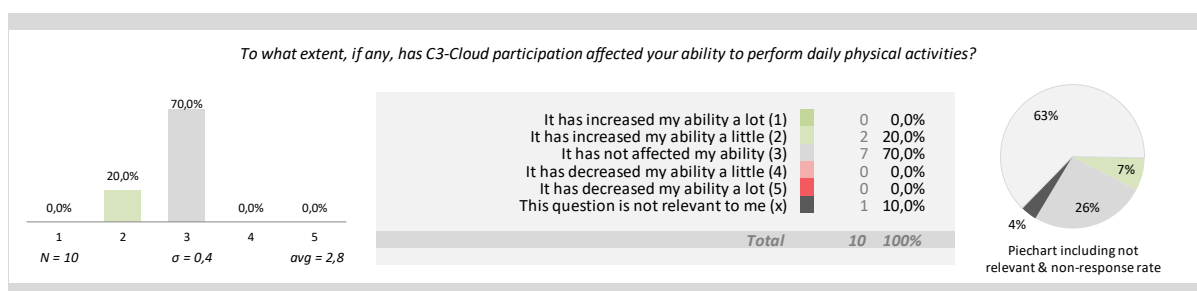


Figure 462 To what extent has C3-Cloud participation affected your ability to perform daily physical activities

When asked to what extent C3-Cloud participation affected their emotional wellbeing, 70% of the respondents said it had not affected their emotional wellbeing, 20% said it had increased their emotional wellbeing a little and 10% chose it was not relevant to them.

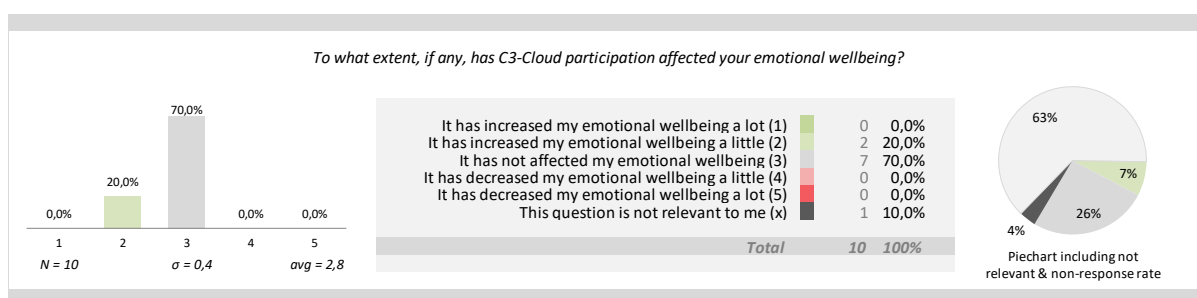


Figure 463 To what extent has C3-Cloud participation affected your emotional wellbeing

When asked to what extent C3-Cloud participation affected their ability to get along with their health condition in day-to-day life, 70% of the respondents said it had not affected their ability, 20% said it had increased their ability a little and 10% chose it was not relevant to them.

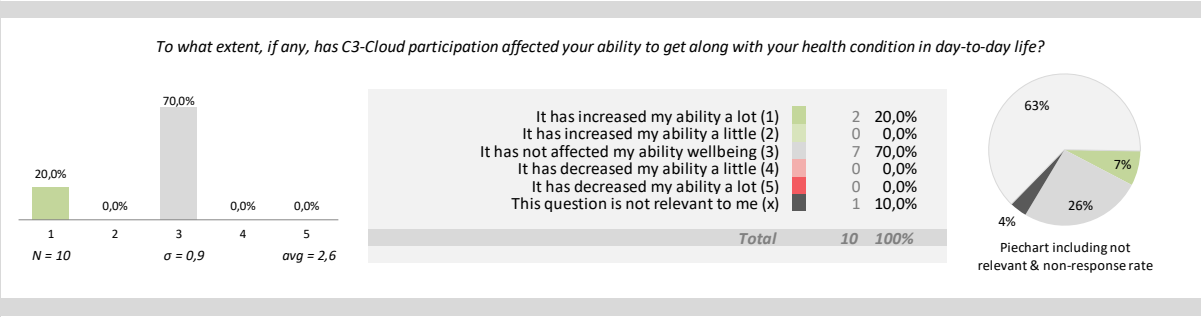


Figure 464 To what extent has C3-Cloud participation affected your ability to get along with your health condition in day-to-day life

When asked to what extent C3-Cloud participation affected their anxiety about their health condition, 70% of the respondents said it had not affected their anxiety about their health condition, 10% said it had increased their anxiety about their health condition a little, 10% also chose it was not relevant to them.

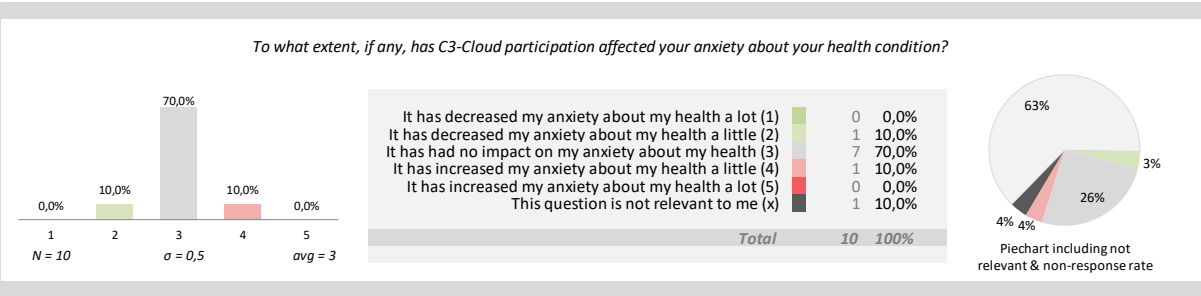


Figure 465 To what extent has C3-Cloud participation affected your anxiety about your health condition

When asked to what extent C3-Cloud participation affected how lonely they felt, 80% of the respondents said it had not affected how lonely they felt, and 20% chose it was not relevant to them.

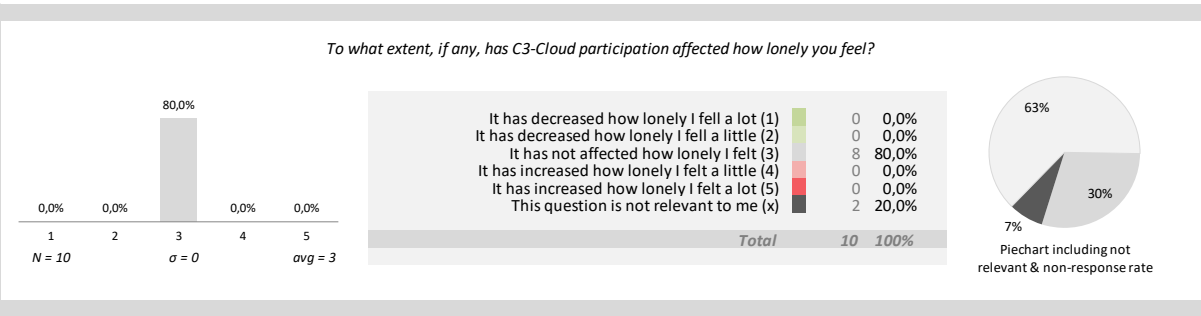


Figure 466 To what extent has C3-Cloud participation affected how lonely you feel

When asked to what extent C3-Cloud participation affected their relationship with their family carer, 44.4% of the respondents said it had not affected their relationship with their family carer, 22.2% said it had improved their relationship a little and 33.3% chose it was not relevant to them.

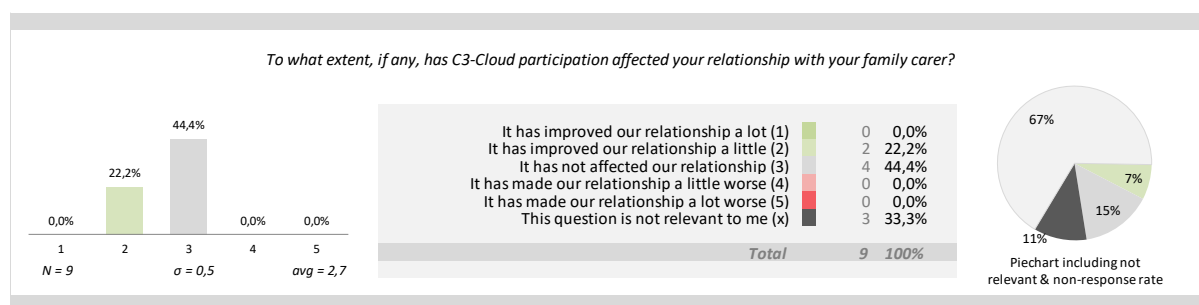


Figure 467 To what extent has C3-Cloud participation affected your relationship with your family carer

When asked to what extent C3-Cloud participation affected their relationship with the professional carers looking after them, 70% of the respondents said it had not affected their relationship, 10% said it had improved their relationship a little and 20% chose that it was not relevant to them.

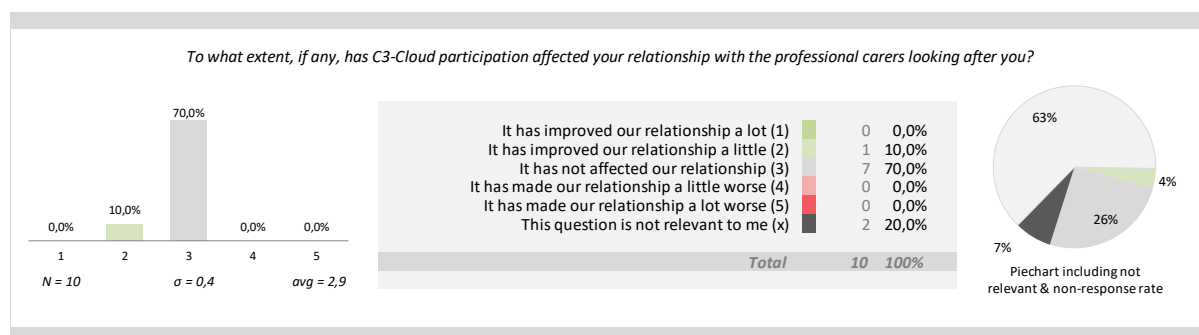


Figure 468 To what extent has C3-Cloud participation affected your relationship with the professional carers looking after you

When asked if they had to repeat their health information a lot when talking to different people treating and caring for them, 30% said that they usually had to give such information only once, 20% said that they sometimes needed to repeat this information, and 20% said that they had to repeat such information quite frequently. 30% chose it was not relevant to them.

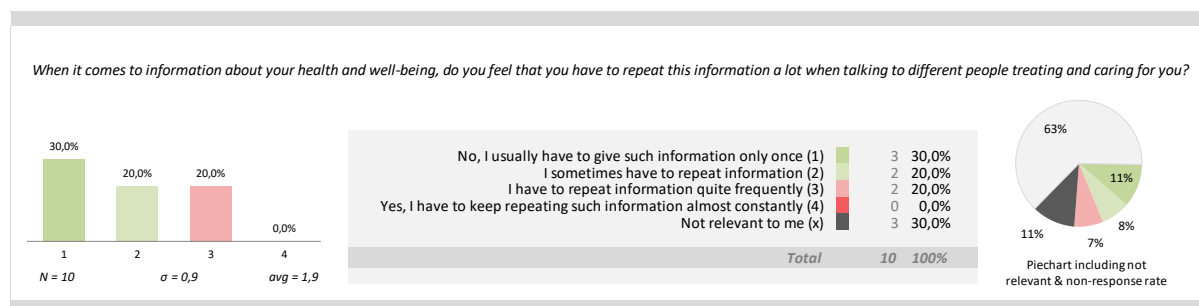


Figure 469 When it comes to information about your health and well-being, do you feel that you have to repeat this information a lot when talking to different people treating and caring for you

When asked if patients had a feeling that different people treating and caring for them worked well together, 60% said all of them worked well together, 10% said most of them worked well together and 20% chose that some of them worked well together. 10% of the respondents decided that this question is not relevant to them.

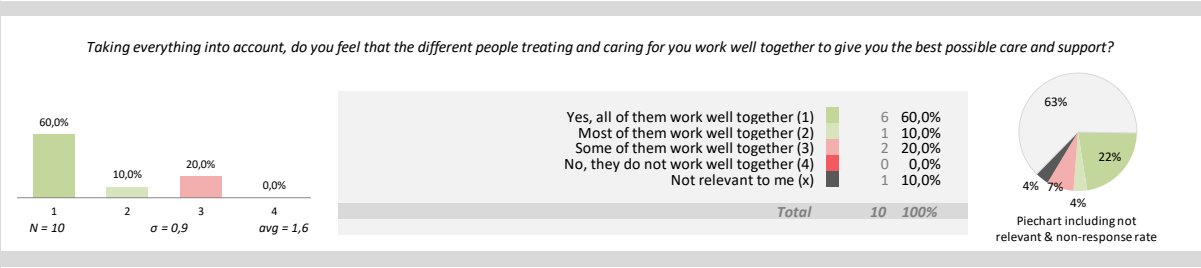


Figure 470 Taking everything into account, do you feel that the different people treating and caring for you work well together to give you the best possible care and support

When asked how satisfied the users were with the C3-Cloud application, 9.1% said that they were very satisfied, 27.3% said that they were fairly satisfied, another 27.3% said that they were neither satisfied nor dissatisfied, 9.1% chose fairly satisfied and 18.2% were very dissatisfied with the application. 9.1% of the respondents decided that it is not relevant to them.

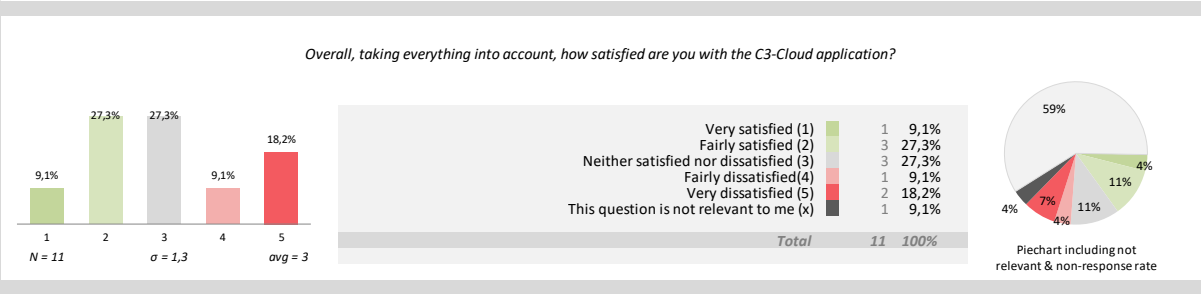


Figure 471 Overall, how satisfied are you with the C3-Cloud application

When asked if the C3-Cloud application was worth the effort involved in using it, 9.1% said “Yes, very much”, 36.4% said “Yes, mostly”, 9.1% had a neutral opinion, 27.3% said “No, mostly not” and 18.2% said “No, certainly not”.

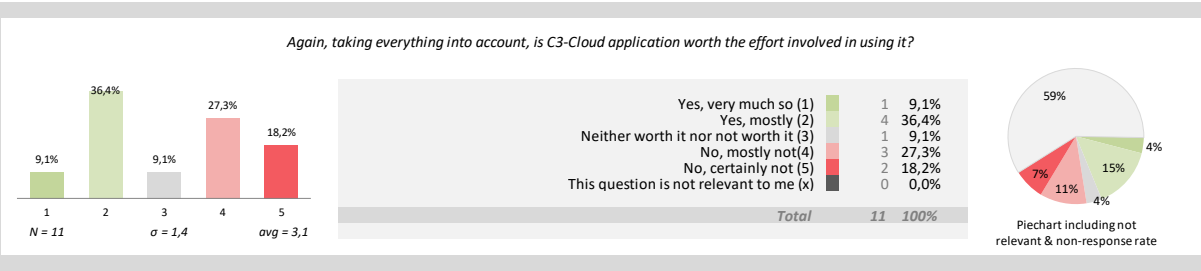


Figure 472 Is C3-Cloud application worth the effort involved in using it

Finally, regarding the question if they wanted to continue using the C3-Cloud application in the future, a peak of 36.4% replied with “Definitely yes”, 18.2% would probably continue using the application, 9.1% were of a neutral opinion, 27.3% would probably not want to use the application and 9.1% said that they will certainly not continue using the C3-Cloud application.

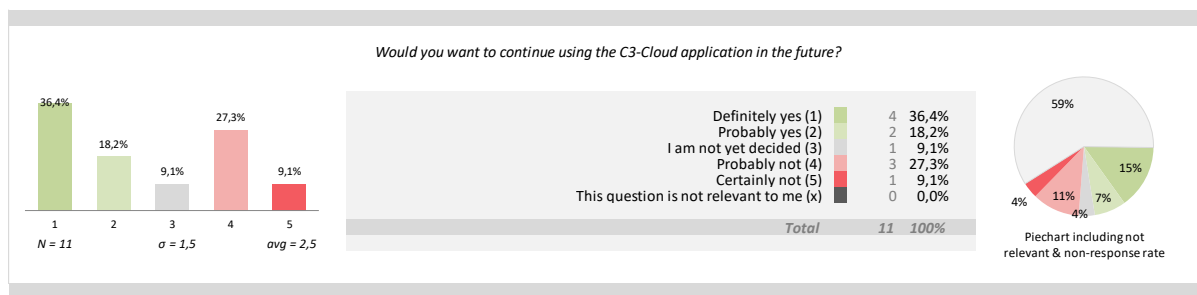


Figure 473 Would you want to continue using the n C3-Cloud application in the future

eCCIS, patients' general comments (Original language)	
1)	Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
2)	No thank you.
3)	Ingen eller dålig förklaring till vad jag använder C3-Cloud till.
4)	Allt är beroende om det är ordinarie eller tillfällig personal som arbetar. Någon av mina sjukdomar är ovanliga och i kombination av varandra kan de vara lite spec, att behandla. Många nya i personalstyrkorna är intresserade av vad tex, AIP är och vad som sker vid anfall och vad som kan ha orsakat dem. Vilket jag finner är bra,
5)	Om jag får en bättre förklaring på vad programmet gör för mig så kan det vara något för mig.
6)	I think a C3 system with ongoing intercommunication and patient response/request system is an essential in this digital age and could have been invaluable in the present Covid crisis. The phone is not the best contact, as there is much material the Practice could provide with authority, which we now seek directly from the internet.
7)	For reasons as stated throughout this survey. With well managed conditions, there was little or no need to refer to this on a regular basis.

Table 101 eCCIS general comments, Original language

Patient Training Material

The feedback for C3-Cloud's patient training material was asked for through a range of free text questions. The below table provides the answers in original language (for these comments in English refer to **Table 23**).

Answers given to patient training material questions (original language)	
1)	<p>What did you like most about the offered training material?</p> <ul style="list-style-type: none"> • Ingenting, vart finns det materialet? • Lärorikt och bra när man pratar med andra när man har bra fakta. • Me ha ayudado a saber mejor mis patologías • Good for reference • Clarity, although it is possibly more extensive than necessary and could do with condensing for general use. • Understandable

2)	<p>Please describe in your own words the main problems you have faced (if any) with the use of the training material?</p> <ul style="list-style-type: none"> • Har inga. • Sigo pensando que la aplicacion es dificil para meter los datos es muy lento • None, except time to digest. • None
3)	<p>Please describe in a few words if and how the training material affected your capability to manage your health?</p> <ul style="list-style-type: none"> • Olika tips om vad man ska tänka på för att underlätta att klara sin sjukdom. • Igual que antes • No effect • Little if any • It did not
4)	<p>Is the way and sequence in which training material is offered to you helpful and appropriate?</p> <ul style="list-style-type: none"> • No muy útiles • Yes, although long since used • No comment
5)	<p>What additional material or information do you think would be helpful to you?</p> <ul style="list-style-type: none"> • Pues no sé, lenguaje más sencillo • Ability to communicate with Practice or Medical responder. • None
6)	<p>Do you think the provided material helps you to learn from other patients with multi-morbidity?</p> <ul style="list-style-type: none"> • Tveksam • No • Have not found any such material. Have I missed it, if so how? • Not at all
7)	<p>What are your thoughts about supporting and getting support from other patients by engaging with them in support groups?</p> <ul style="list-style-type: none"> • Vet ej • No he tenido eso en esta app • Good • Not applicable
8)	<p>What are your recommendations for future enhancements to the training material?</p> <ul style="list-style-type: none"> • Simplify and condense. • None

Table 102 Patient training material, original language

The last question was put in the form of an array question that asked the users to rate if the way in which PEP directed them to training material was intuitive and natural; this statement received an average of 4, which demonstrated that the users were neutral about the intuitiveness of the way PEP directed them to training material. The standard deviation was 2 and the peak rating belonged to “Disagree”, “Neither disagree nor agree” and “Moderately agree” each with 22.2%.

The non-response rate was also quite high and 11.1% of the users strongly disagreed with this statement, which should not be ignored.

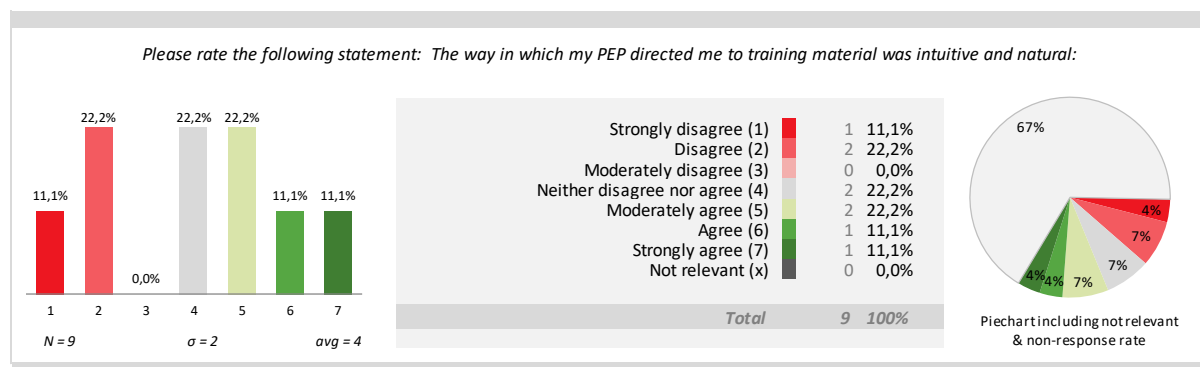


Figure 474 The way in which my PEP directed me to training material was intuitive and natural

10.6. C3-Cloud: Second Survey for Healthcare Professionals

Seventeen HCP Technology trial participants responded to basic questions about their age, sex, and the area they lived in. The age groups 45-49 and 55-59 were represented predominantly with four HCPs (23,5%) each. The second biggest group were those aged 50-54 (17,6%) and the third biggest group were those aged 30-34 (11,8%). One respondent each (5,9%) belonged to the age group 29 or below, 35-39, 40-44 and 70 or above.

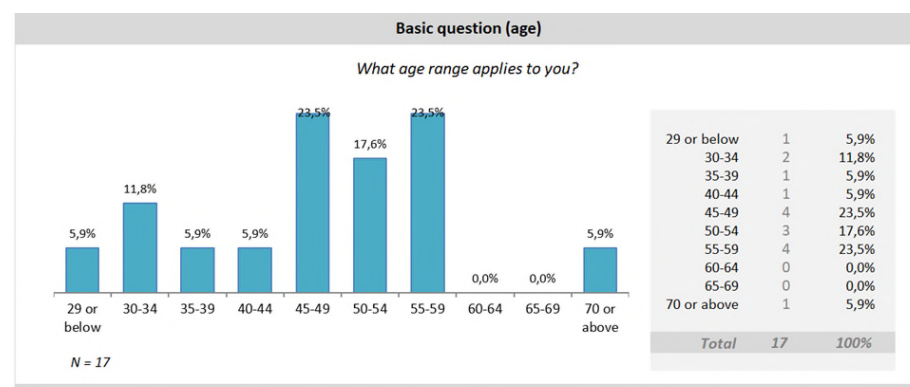


Figure 475 2nd survey for HCP, basic question (age)

Out of the 17 HCPs, 12 participants were female (70,6%), four were male (23,5%) and one identified with "Other" (5,9%).

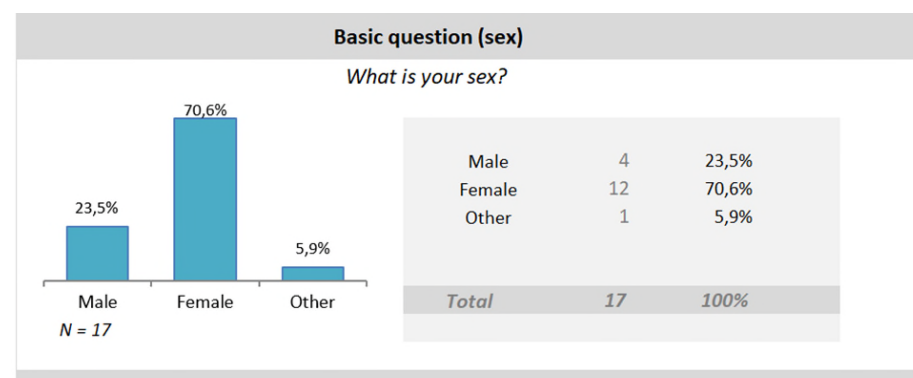
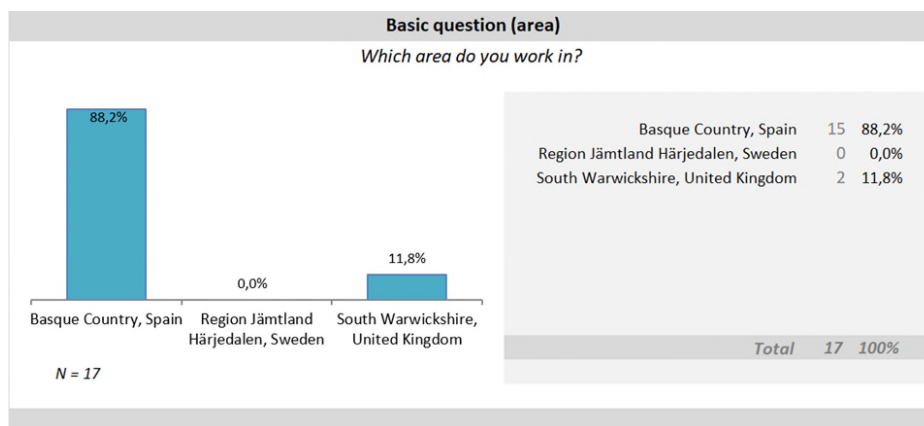


Figure 476 2nd survey for HCP, basic question (sex)

Regarding the area they worked in, 15 HCPs were in the Spanish Basque Country (88,2%) and two in South Warwickshire in the UK (11,8%).

**Figure 477 2nd survey for HCP, basic question (area)**

Moreover, 16 HCPs submitted their job titles, which are presented in their original language below (for the English translation, refer to **Table 11**).

HCP job titles			
1)	Project manager	2)	Enfermera × 3
3)	Médico × 3	4)	Médico de atención primaria × 3
5)	Médico/médica de familia × 4	6)	Enfermero de AP
7)	Médico-JUAP	8)	

Table 103 2nd survey for HCP, job titles, original language

MDT Questionnaire

Technology trial participants were asked for their opinion to multiple statements (a-ae), which, for instance, assessed the usefulness and support of C3DP in care plan creation and management. Respondents ranked their agreement to the statements from “Strongly disagree” (dark red) to “Strongly agree (dark green). The figure below displays the mean ratings of respondents to statements (a-j).

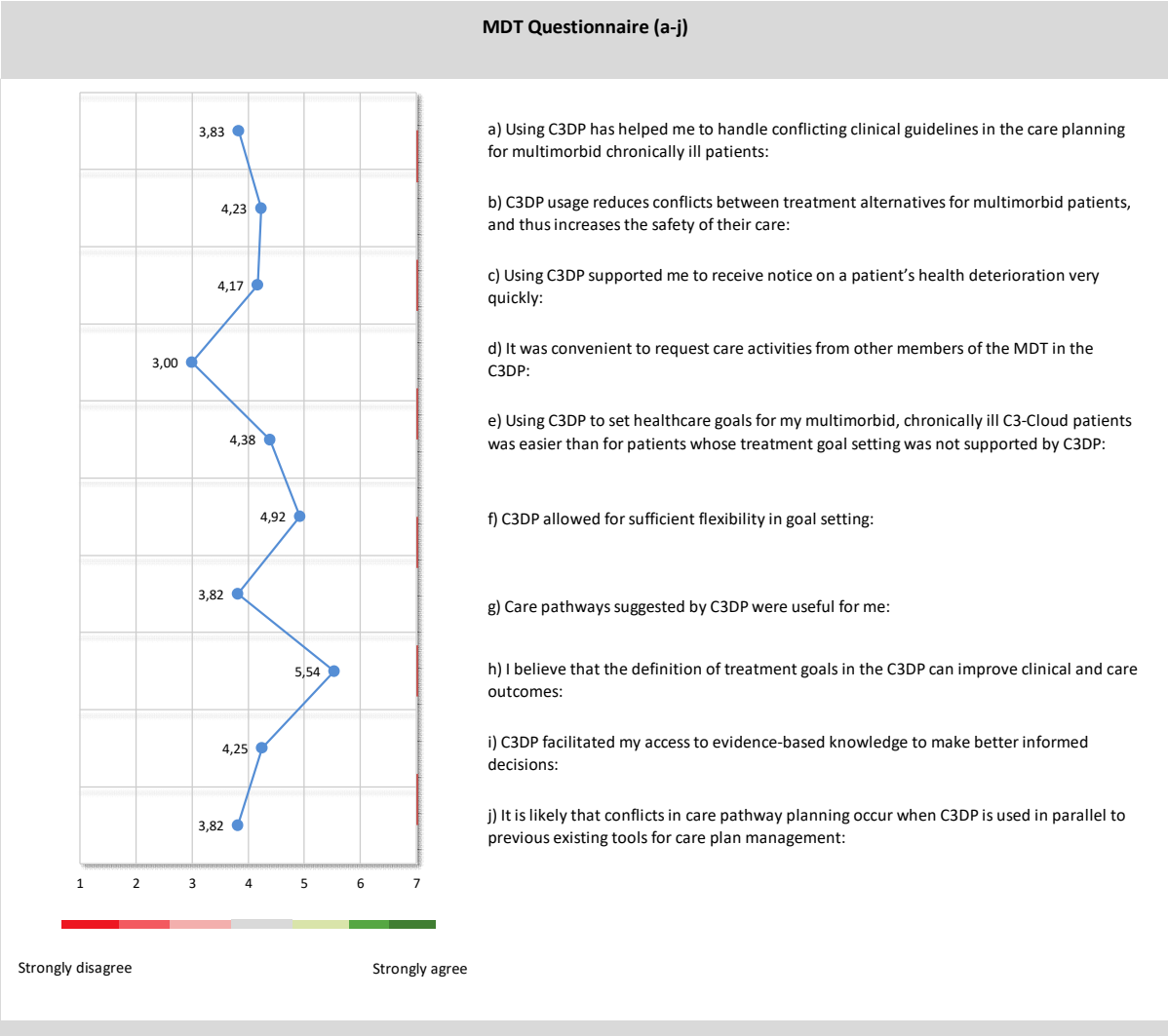


Figure 478 MDT questionnaire (a-j)

When asked if the HCPs found the C3DP helpful to handle conflicting clinical guidelines in the care planning for multimorbid patients, the users moderately disagreed with an average of 3.8 and a standard deviation of 1.5. Almost half of the respondents chose “Neither disagree nor agree” (46.2%). However, the 23% non-response rate should be considered.

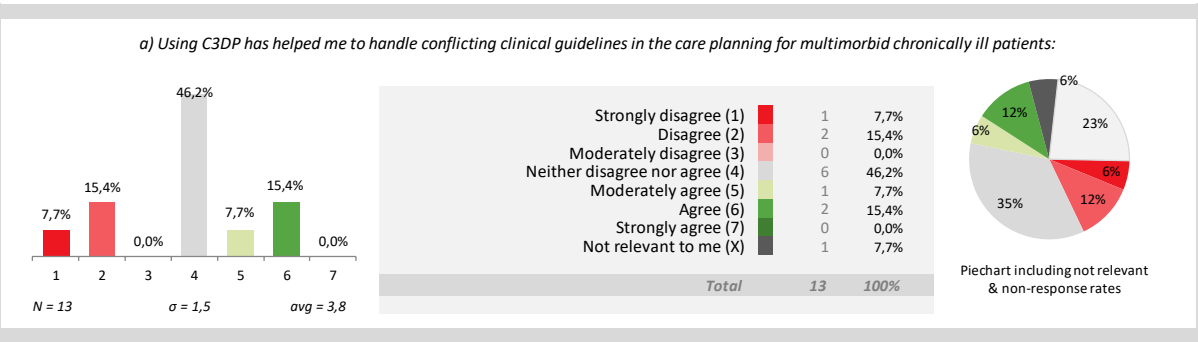


Figure 479 Using C3DP has helped me to handle conflicting clinical guidelines

With an average of 4.2, a standard deviation of 1.7 and a peak rating for “Neither disagree nor agree” (30.8%), respondents were neutral towards the statement that C3DP usage reduced

conflicts between treatment alternatives for multimorbid patients, thereby increasing safety. Three respondents (23.1%) moderately agreed to this statement and 23% did not submit a response.

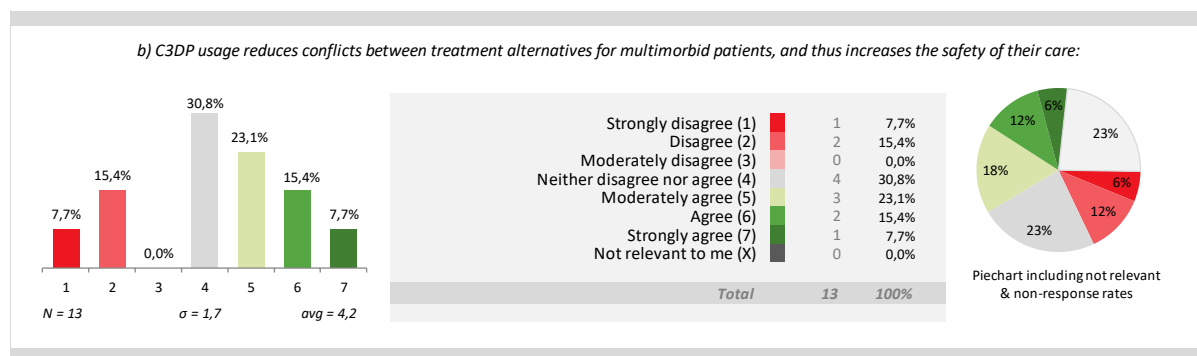


Figure 480 C3DP usage reduces conflicts between treatment alternatives and increases safety

Regarding the third statement whether using C3DP supported HCPs to receive very quick notice on patient's health deterioration, most respondents (30.8%) were neutral, followed by 23.1% disagreeing. On average, respondents were neutral (4.2) with a standard deviation of 1.8 and 23% non-response rate.

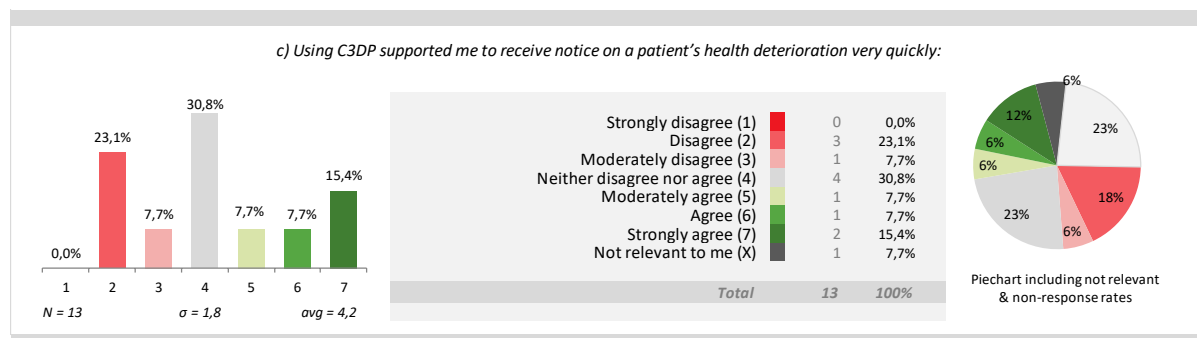


Figure 481 Using C3DP supported me to receive notice on patient's health deterioration very quickly

Although almost half of the 13 Technology trial participants ranked statement (d) neutrally (46.2%), 23% did not submit a ranking and 23.1% stated it was "Not relevant to me", respondents on average moderately disagreed that requesting care activities from other MDT members in the C3DP was convenient. Thus, 15.4% each strongly disagreed and disagreed to this statement.

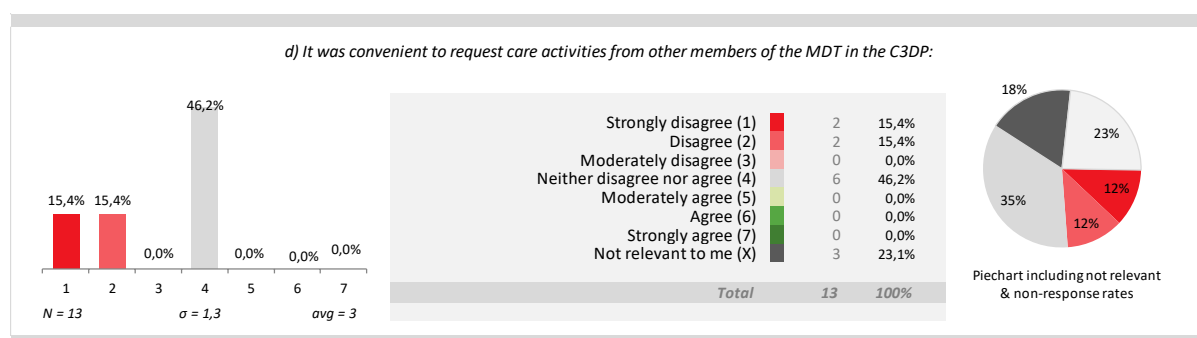


Figure 482 It was convenient to request care activities from other members of the MDT

Statement (e) proposed that using the C3DP to set healthcare goals for C3-Cloud patients was easier than for patients whose goal setting was not supported by C3DP. With an average of 4.4, a standard deviation of 1.7 and 23% non-response rate, Technology trial participants were neutral

towards this statement. Most ranked this statement as “Neither disagree nor agree” (30.8%), followed by “Disagree” and “Moderately agree” (23.1% each).

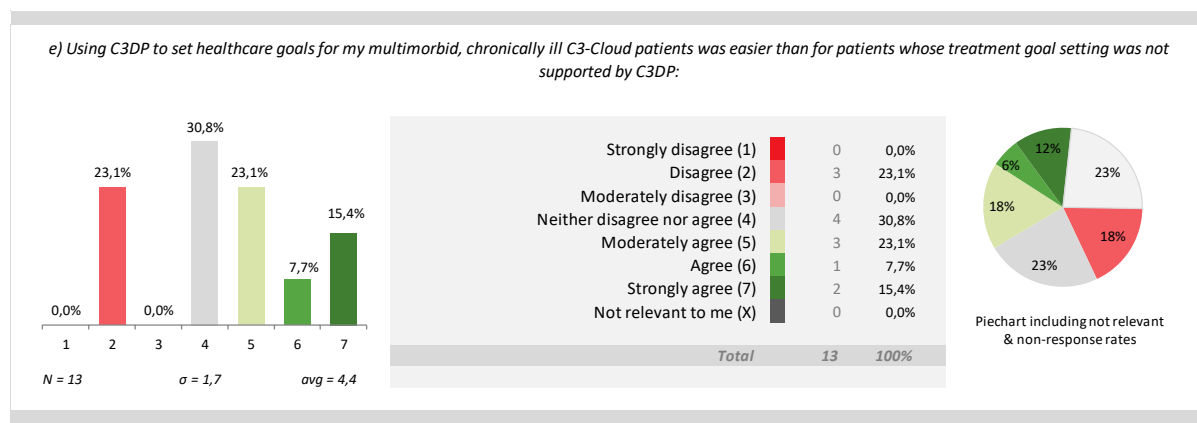


Figure 483 Using C3DP to set healthcare goals for my C3-Cloud patients was easier

When asked whether C3DP allowed for sufficient flexibility in goal setting, 30.8% of respondents each were neutral and moderately agreed, while 15.4% each agreed and strongly agreed. Thus, respondents tended to be slightly positive towards this statement with an average ranking of 4.9, a standard deviation of 1.4 and a non-response rate of 24%.

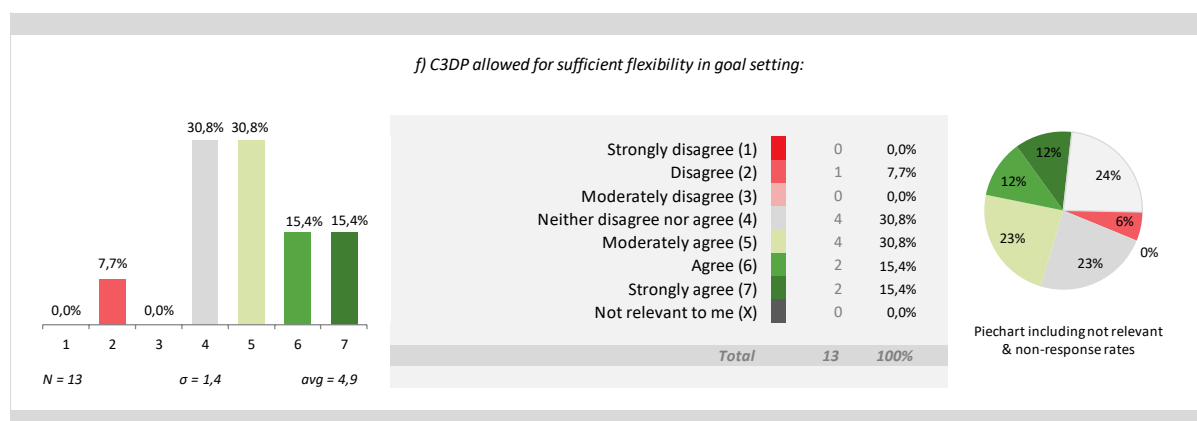


Figure 484 C3DP allowed for sufficient flexibility in goal setting

The following statement assessed whether care pathways suggested by C3DP were useful for HCPs. While the option “Neither disagree nor agree” was ranked the highest (30.8%), respondents overall tended to moderately disagree with an average of 3.8. Thus, 15.4% moderately disagreed and 7.7% each disagreed and strongly disagreed.

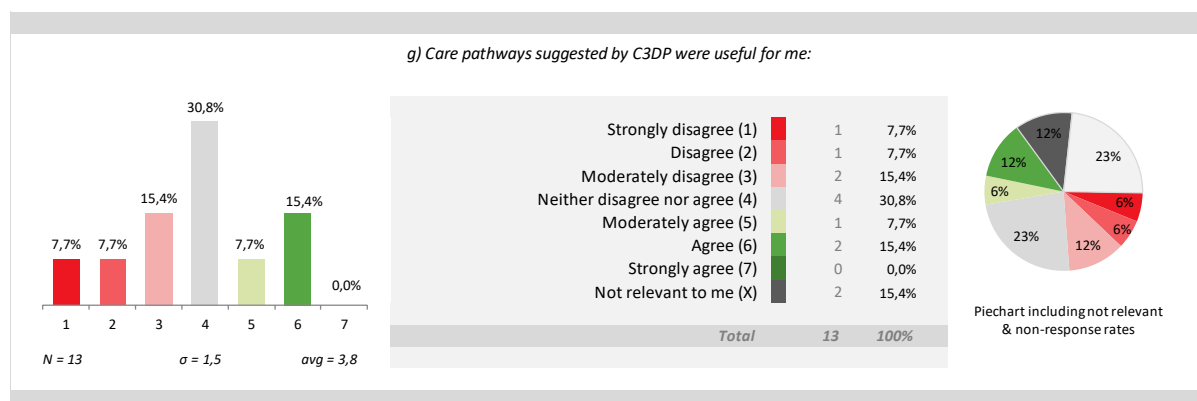


Figure 485 Care pathways suggested by C3DP were useful for me

Regarding statement (h), most respondents believed that the definition of treatment goals in the C3DP could improve clinical and care outcomes. Technology trial participants were positive with an average of 5.5 and a standard deviation of 1.3. Only one respondent (7.7%) disagreed, while the majority moderately agreed (38.5%), agreed (30.8%) and strongly agreed (23.1%).

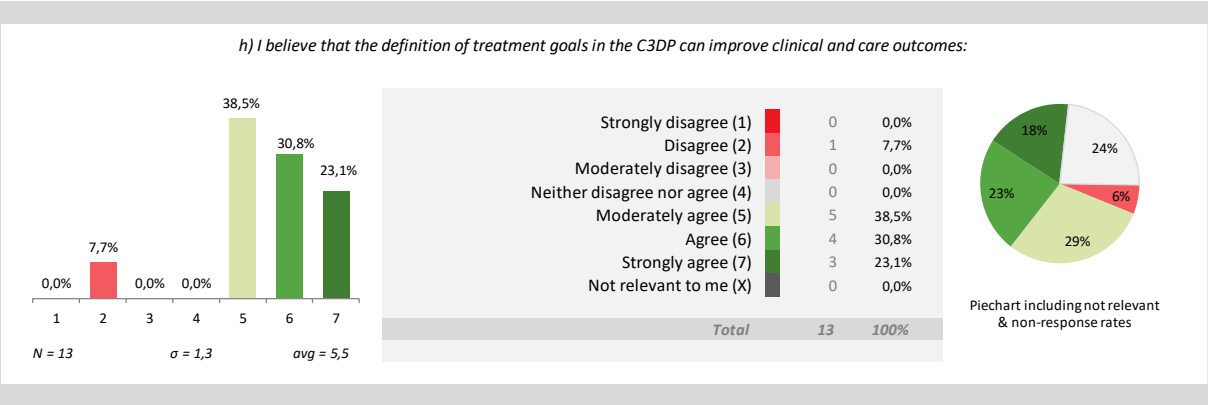


Figure 486 I believe that the definition of treatment goals in the C3DP can improve clinical and care outcomes

Although one quarter of the Technology trial participants (25%) moderately agreed and 8.3% each agreed and strongly agreed to the statement that C3DP facilitated their access to evidence-based knowledge to make better informed decisions, respondents were on average neutral (4.3). Thus, there was a peak ranking of 41.7% for “Neither disagree nor agree” while 8.3% each strongly disagreed and disagreed. Notably, 29% did not submit a ranking for statement (i).

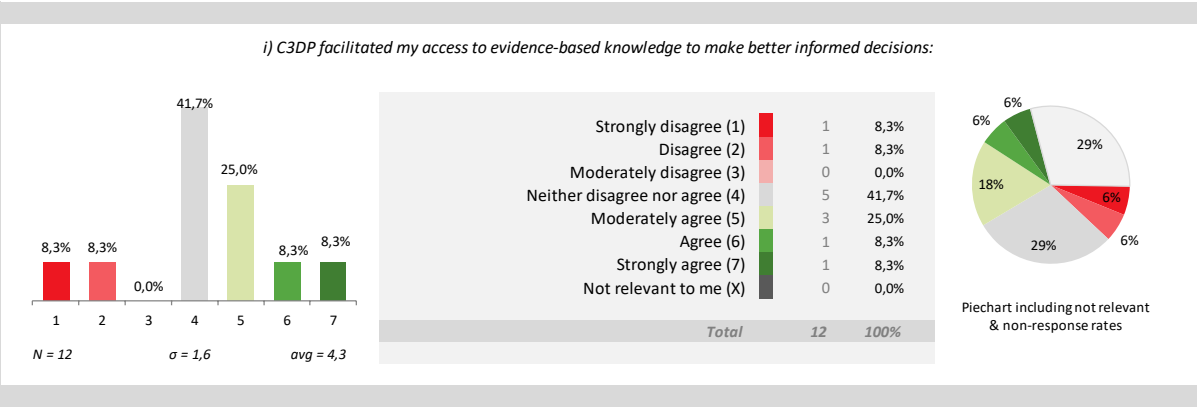


Figure 487 C3DP facilitated my access to evidence-based knowledge to make better informed decisions

Considering the last statement in the first set, 12 respondents moderately disagreed on average (3.8) that conflicts in care pathway planning were likely to occur when C3DP was used in parallel to previous existing tools for care planning management. One third of Technology trial participants (33.3%) was neutral, followed by 16.7% disagreeing. Each other option was ranked by one participant (8.3%), resulting in a scattered picture. 29% refused to submit a ranking to this statement.

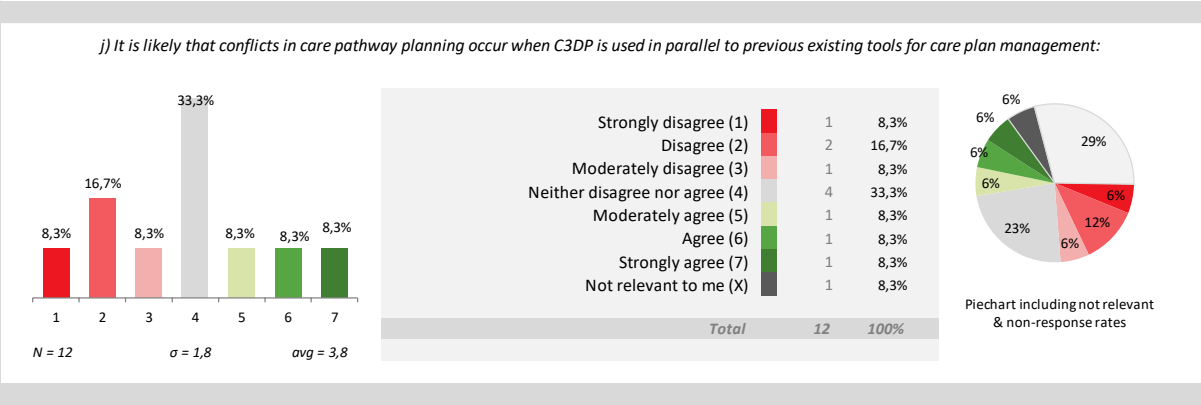


Figure 488 It is likely that conflicts in care pathway planning occur when C3DP is used in parallel

The first set of statements was followed by a second set of statements (k-t). The figure below displays the mean ratings of 12 respondents to each of these statements.

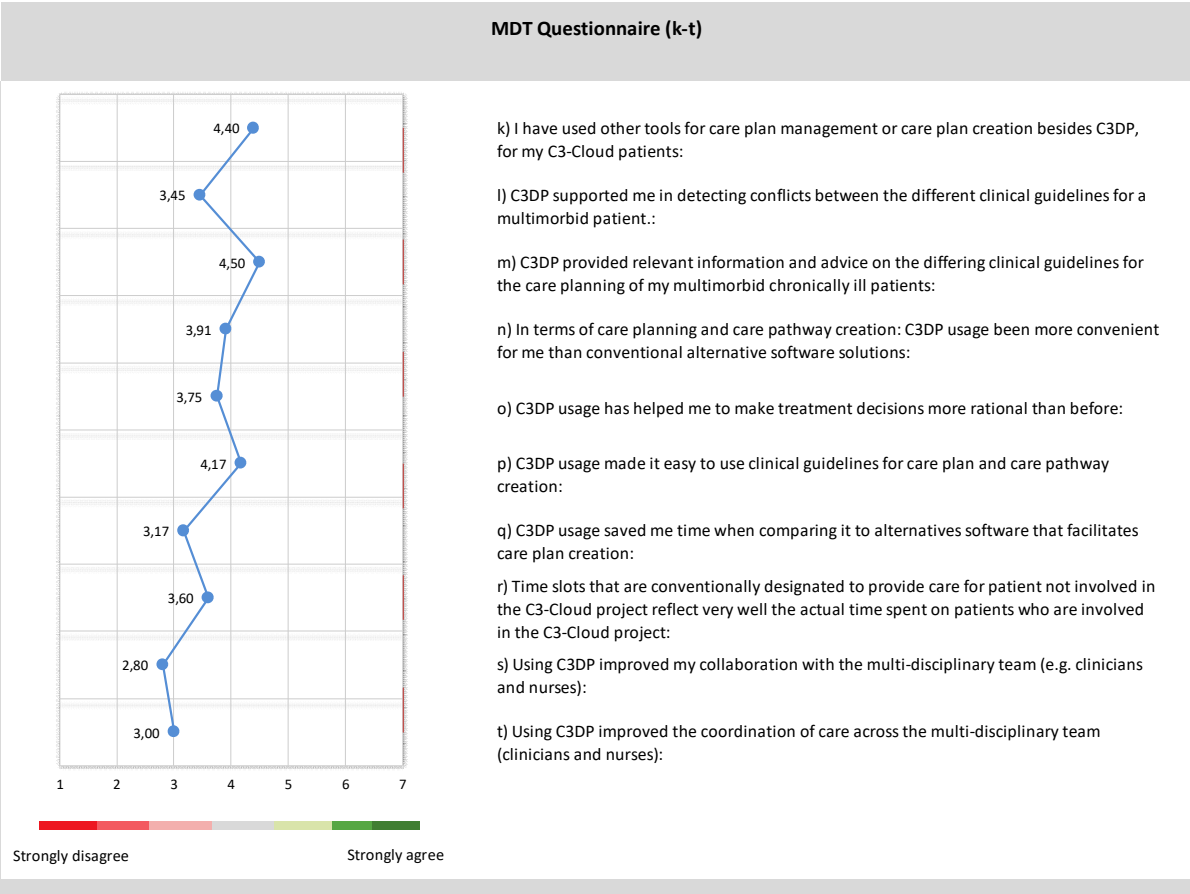


Figure 489 MDT questionnaire (k-t)

When asked whether HCPs used other care plan management and creation tools besides C3DP for their C3-Cloud patients, the 12 respondents were overall neutral with an average ranking of 4.4, a standard deviation of 2.1 and a 29% non-response rate. However, the peak ranking was for “Agree” (25%), and 16.7% moderately agreed in addition to one respondent (8.3%) who strongly agreed, indicating a positive tendency. In contrast, 16.7% disagreed and one respondent (8.3%) strongly disagreed, while another HCP neither disagreed nor agreed.

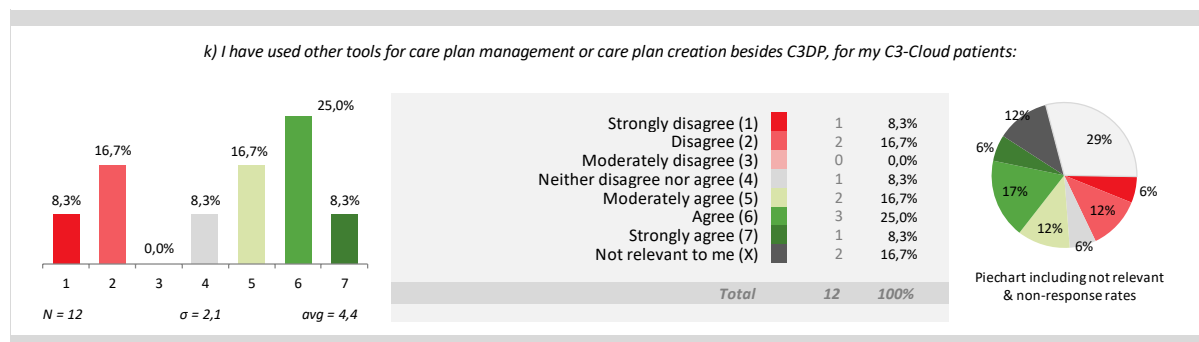


Figure 490 I have used other tools for care plan management or care plan creation besides C3DP

Although half of the respondents (50%) had a neutral opinion towards the statement that C3DP was supportive in detecting conflicts between different clinical guidelines for multimorbid patients, HCPs on average moderately disagreed (3.5) with a standard deviation of 1.4 and a 29% non-response rate. While one respondent considered it not relevant and one agreed (8.3% each), the remaining users were negative (8.3% moderately disagreed, 16.7% disagreed, 8.3% strongly disagreed).

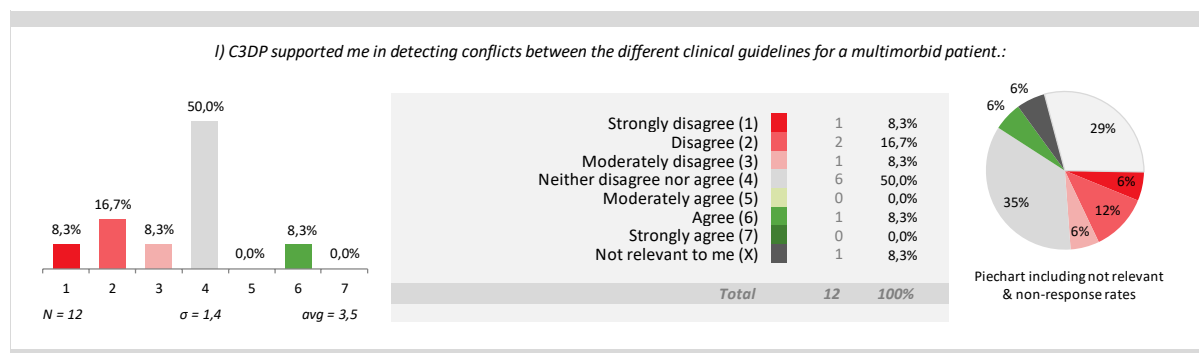


Figure 491 C3DP supported me in detecting conflicts between different clinical guidelines

Statement (m) proposed that C3DP provided relevant information and advice on the differing clinical guidelines for the care planning of multimorbid chronically ill patients. Although the peak ranking was given for the option “Agree” (33.3%), and one respondent each (8.3%) chose the option “Strongly agree” and “Moderately agree”, the average ranking to this statement was 4.5, indicating a neutral opinion. Hence, one quarter (25%) of respondents neither disagreed nor agreed and 25% disagreed. The standard deviation was 1.8 and 29% did not submit a response.

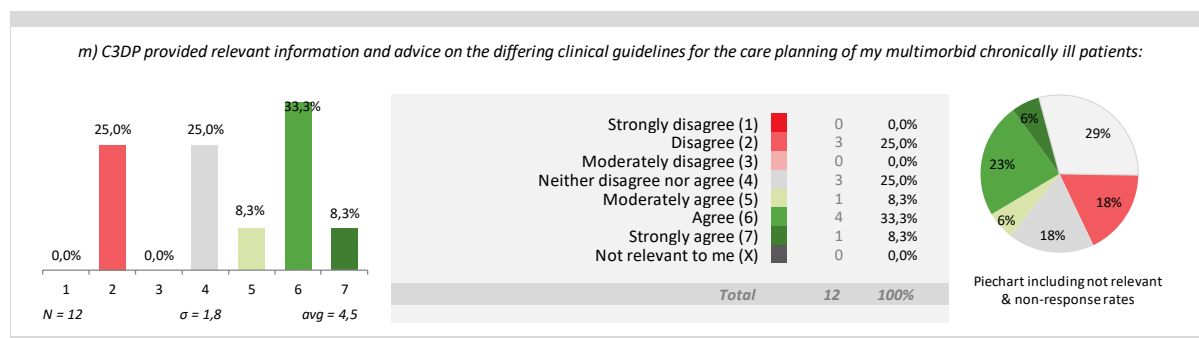


Figure 492 C3DP provided relevant information and advice on the differing clinical guidelines for the care planning

When asked whether HCPs perceived C3DP more convenient for care planning and care pathway creation than conventional software solutions, respondents on average moderately disagreed (3.9) with a standard deviation of 1.5 but tended to be neutral. The peak ranking of 41.7% was for “Neither disagree nor agree”, followed by 16.7% “Agree”.

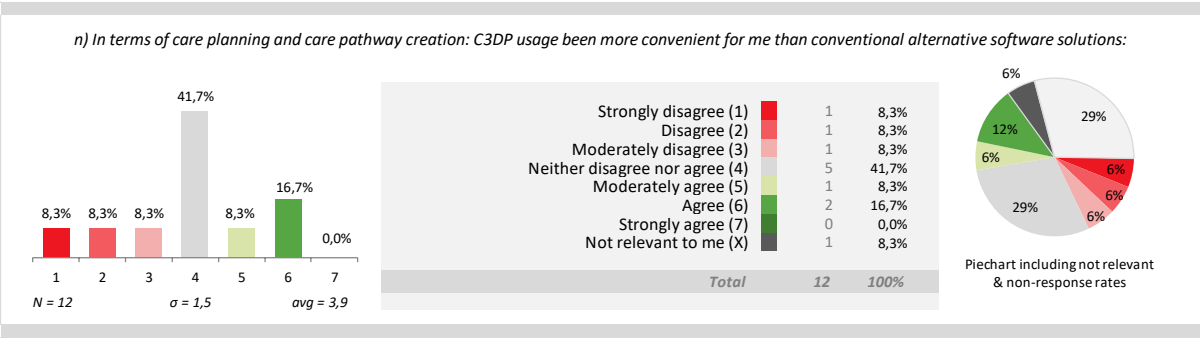


Figure 493 In terms of care planning and care pathway creation: C3DP usage has been more convenient

Considering whether C3DP usage helped HCPs to make treatment decisions more rational than before, most respondents neither disagreed nor agreed (41.7%) and one quarter disagreed (25%), while 16.7% moderately agreed. With an average of 3.8, a standard deviation of 1.3 and a 29% non-response rate, Technology trial participants thus moderately disagreed overall.

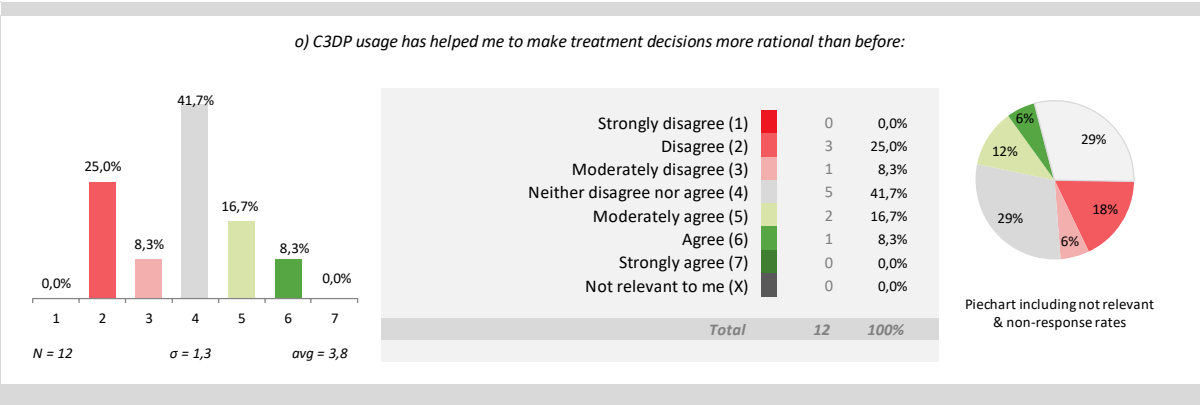


Figure 494 C3DP usage has helped me to make treatment decisions more rational than before

When asked whether C3DP usage made it easy to use clinical guidelines for care plan and care pathway creation, respondents were on average neutral (4.2) with a standard deviation of 1.6, but they tended to be slightly positive as the peak ranking of 41.7% was “Moderately agree” and 16.7% chose “Agree”. 16.7% neither disagreed nor agreed and disagreed, while one user (8.3%) strongly disagreed.

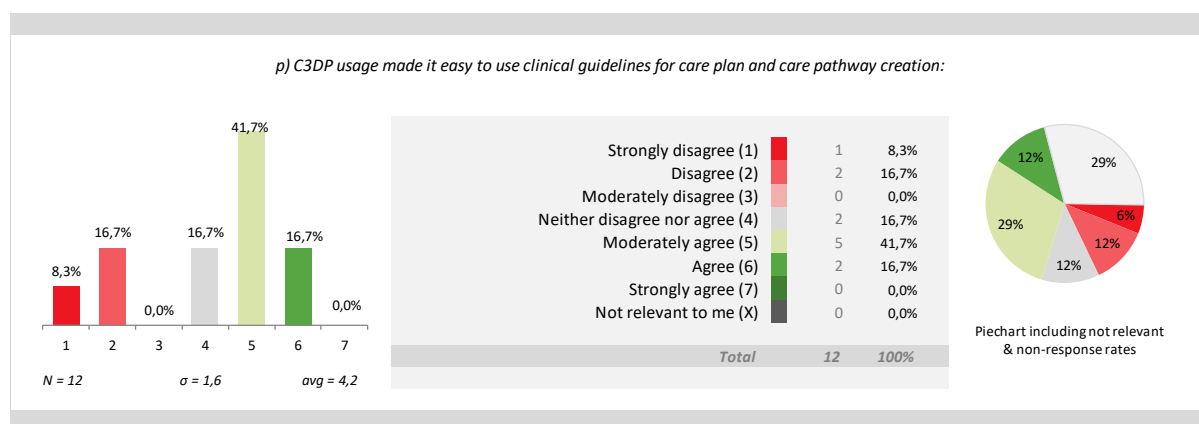


Figure 495 C3DP usage made it easy to use clinical guidelines for care plan and care pathway creation

Assessing whether C3DP usage saved HCPs time compared to alternative software solutions for care plan creation, statement (q) was on average ranked 3.2, indicating that respondents moderately disagreed. The option “Disagree” was chosen most frequently (33.3%) and 16.7% strongly disagreed. In contrast, one quarter (25%) were neutral, 16.7% moderately agreed and 8.3% agreed to this statement.

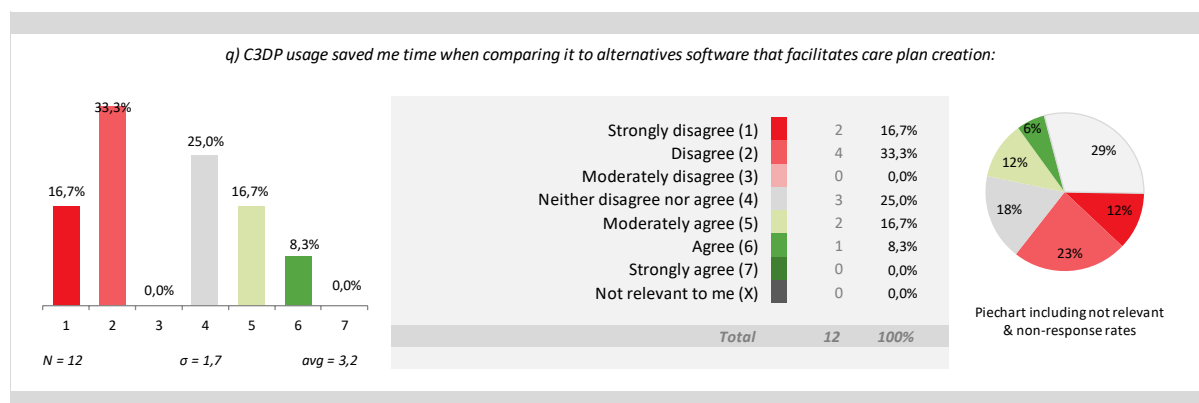


Figure 496 C3DP usage saved me time when comparing it to alternatives software

When asked whether conventionally designated time slots for the care of patients not involved in C3-Cloud reflected very well the actual time spent on patients involved in C3-Cloud, 25% of respondents had a neutral opinion, followed by those disagreeing, moderately agreeing and those considering it inapplicable (16.7% each). The statement was ranked 3.6 on average with a standard deviation of 1.6, proposing that respondents moderately disagreed overall.

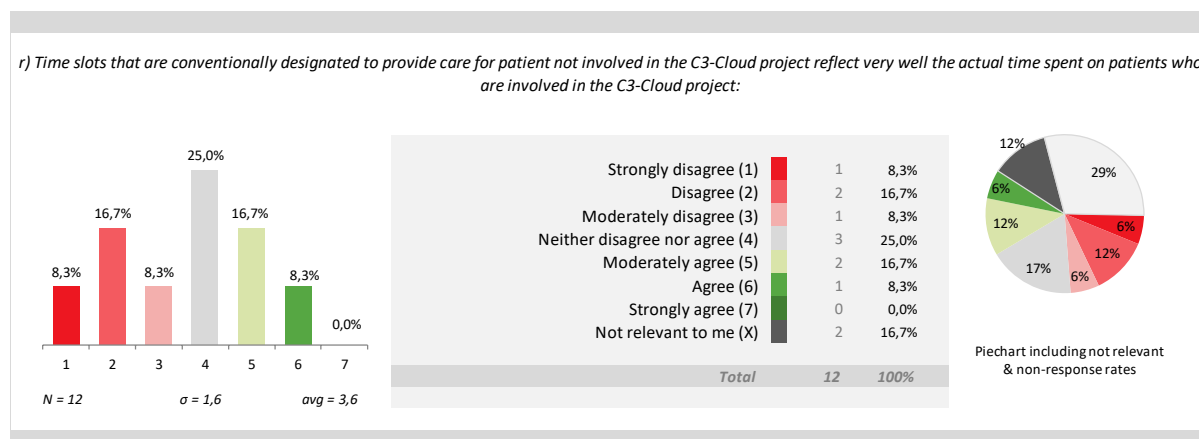


Figure 497 Time slots that are conventionally designated to provide care for patients not involved in C3-Cloud reflect very well actual time spent on patients involved

Statement (s) assessed if HCPs perceived that C3DP usage improved their collaboration with the MDT. With a peak ranking of 33.3% for “Disagree”, followed by 25% for “Strongly disagree”, respondents were overall negative and did not perceive an improvement in their collaboration due to C3DP. In contrast, 16.7% moderately agreed and 8.3% strongly agreed that C3DP resulted in better collaboration. The average rating to this statement was 2.8 with a standard deviation of 2.1 and 29% of Technology trial participants not submitting a response.

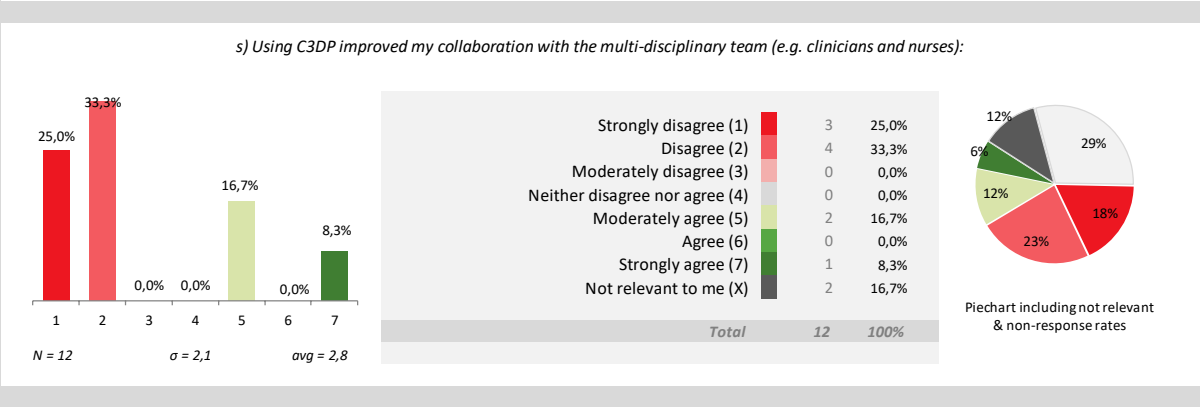


Figure 498 Using C3DP improved my collaboration with the MDT

The last statement to this set proposed that using C3DP improved the coordination of care across the MDT, which most respondents (33.3%) disagreed and 16.7% strongly disagreed with, while 16.7% moderately agreed and 8.3% strongly agreed. Considering that one quarter found this statement inapplicable and 29% did not submit a response, the average rating was 3.0 with a standard deviation of 2.1.

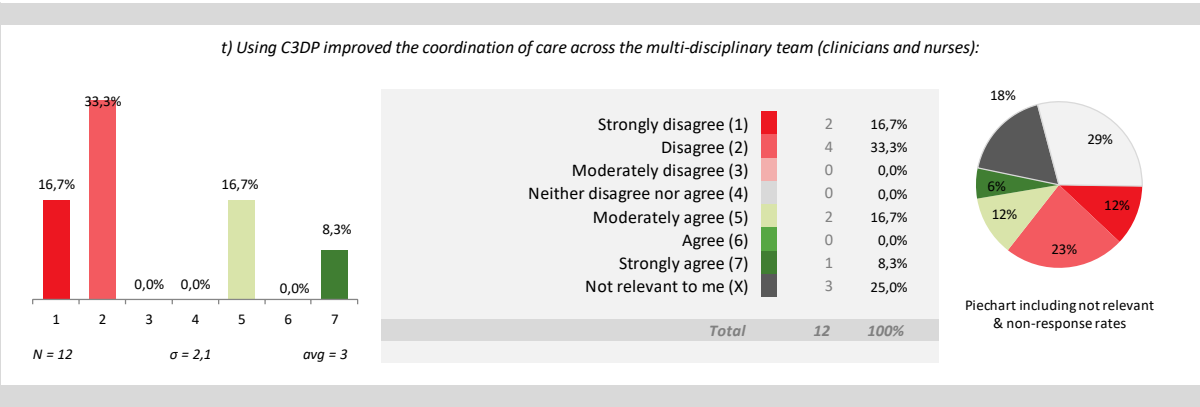


Figure 499 Using C3DP improved the coordination of care across the MDT

The third set of statements (u-ae) focused on the messaging function, data from home-based self-measurements and clinical patient questionnaires suggested by C3DP. Statement u was ranked by 11 respondents, the remaining statements by 12 respondents. The figure below presents the mean ratings to each of these statements.

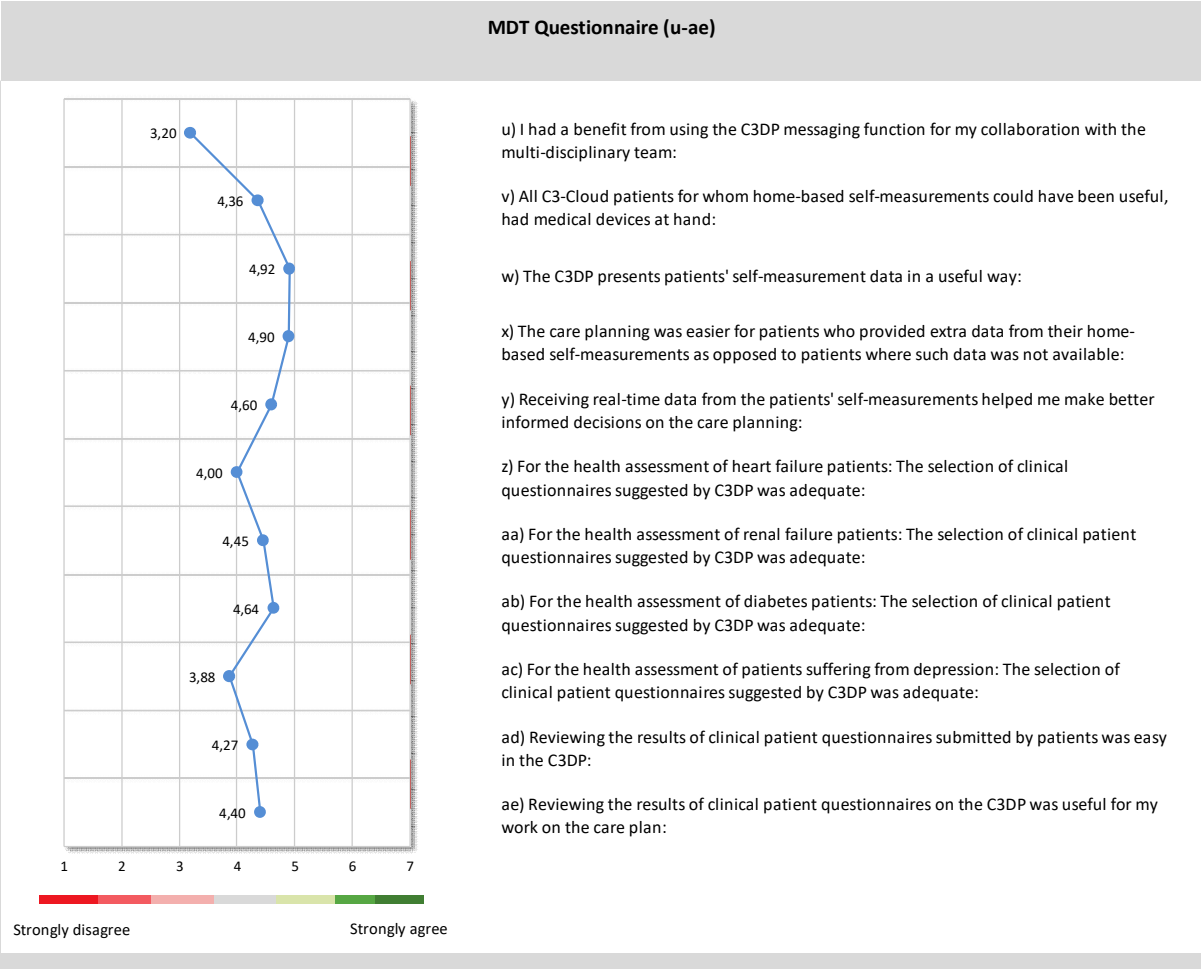


Figure 500 MDT questionnaire (u-ae)

With an average of 3.2 and a standard deviation of 1.5, respondents moderately disagreed with the statement that using the C3DP messaging function was beneficial for collaborating in the MDT. Most respondents (36.4%) disagreed, followed by 27.3% who moderately agreed and 18.2% who were neutral. Notably, 35% did not respond to this statement.

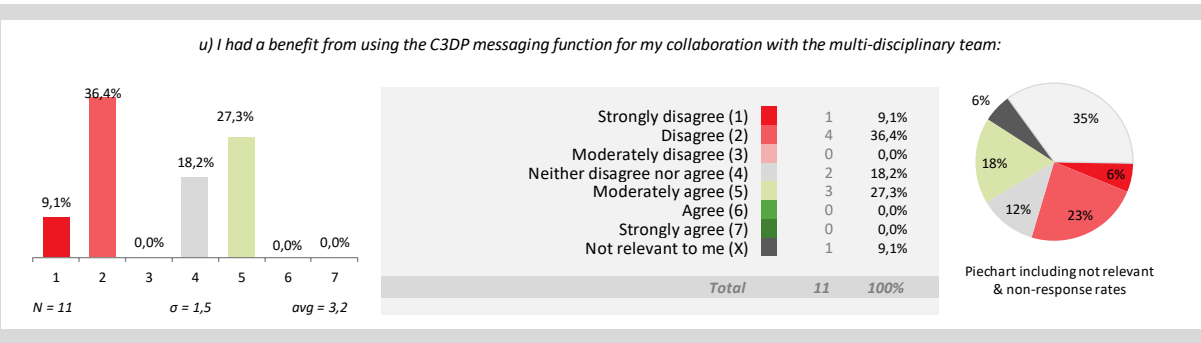


Figure 501 I had a benefit from using the C3DP messaging function for my collaboration with the MDT

When asking whether all C3-Cloud patients for whom home-based self-measurements could have been useful had medical devices available, the peak ranking was “Agree” (33.3%), 16.7% moderately agreed and 8.3% strongly agreed. In contrast, one quarter (25%) disagreed and 8.3%

strongly disagreed, which resulted in an average ranking of 4.4, indicating a neutral opinion. The standard deviation was 2.2 with a 29% non-response rate.

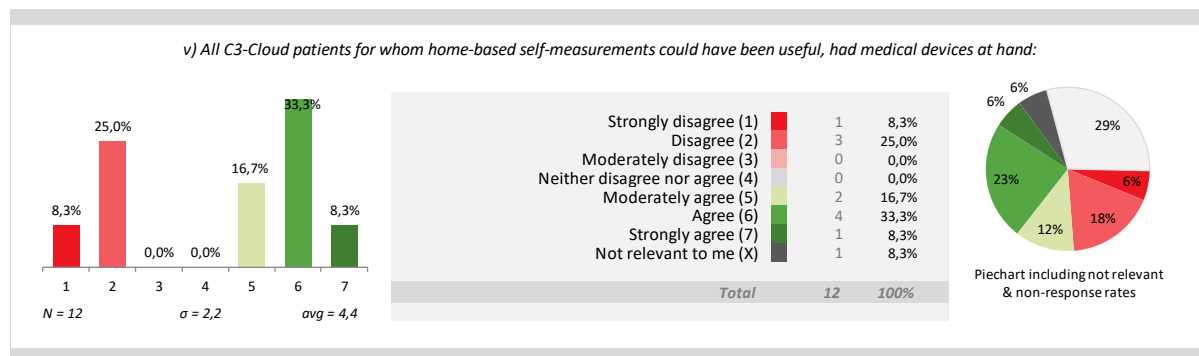


Figure 502 All C3-Cloud patients for whom home-based self-measurements could have been useful had medical devices

Statement (w) proposed that C3DP presents patients' self-measurement data in a useful way, towards which Technology trial participants tended to be slightly positive with an average rating of 4.9 and a standard deviation of 1.6. 25% of users submitted "Agree" and "Neither disagree nor agree", followed by 16.7% "Strongly agree" and "Moderately agree".

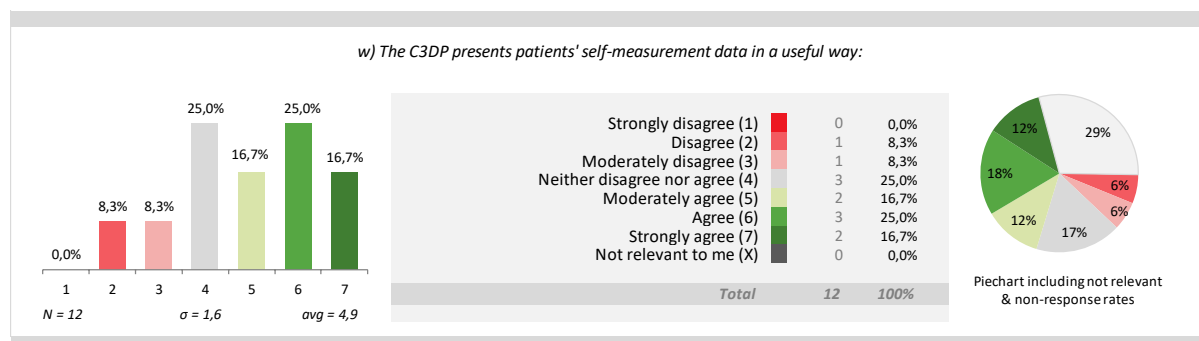


Figure 503 C3DP presents patients' self-measurement data in a useful way

When asking whether the care planning was easier for patients who provided extra data from home-based self-measurements than for patients not providing those data, Technology trial participants tended to be slightly positive with an average of 4.9 and a standard deviation of 1.6. Most respondents (33.3%) were neutral, 16.7% agreed and strongly agreed, and 8.3% moderately agreed and disagreed.

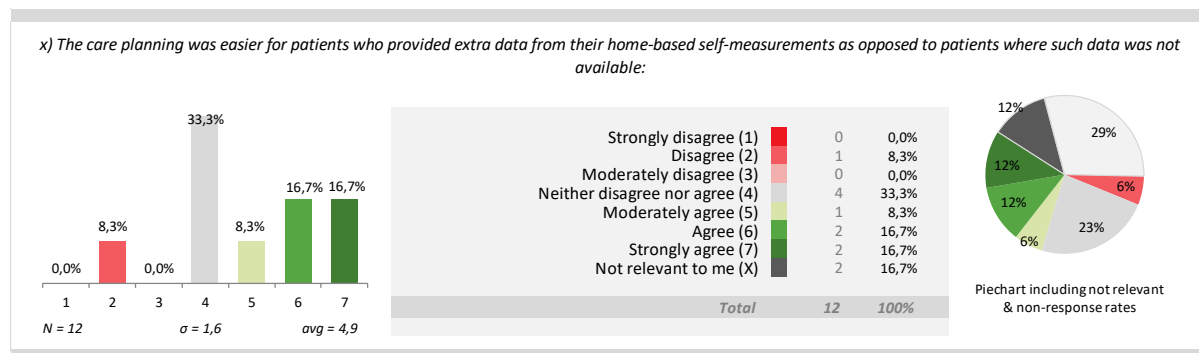


Figure 504 Care planning was easier for patients who provided extra data from their home-based self-measurements

With an average of 4.6 and a standard deviation of 1.9, respondents had an overall neutral opinion towards the statement that receiving real-time data from patients' self-measurements helped to make better informed decisions on care planning. Except for the option "Strongly disagree", all rankings were represented. Thus, 16.7% chose "Disagree", "Neither disagree nor agree", "Agree", "Strongly agree" and "Not relevant to me", while 8.3% chose "Moderately disagree" and "Moderately agree".

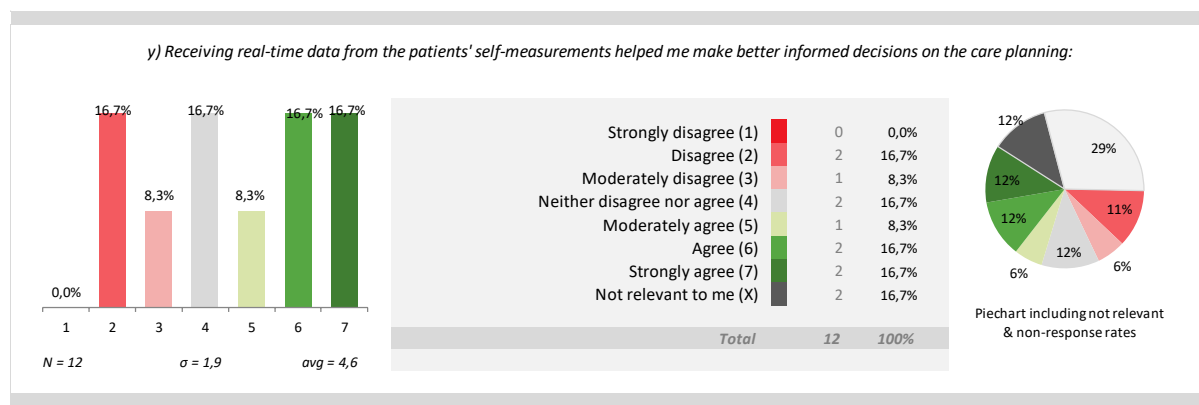


Figure 505 Receiving real-time data from the patients' self-measurements helped me

Regarding the suitability of clinical patient questionnaires suggested by C3DP for heart failure patients, 33.3% considered this statement not relevant, while one quarter (25%) neither disagreed nor agreed. 16.7% disagreed and moderately agreed, resulting in an average ranking of 4.0 with a standard deviation of 1.4, indicating an overall neutral opinion.

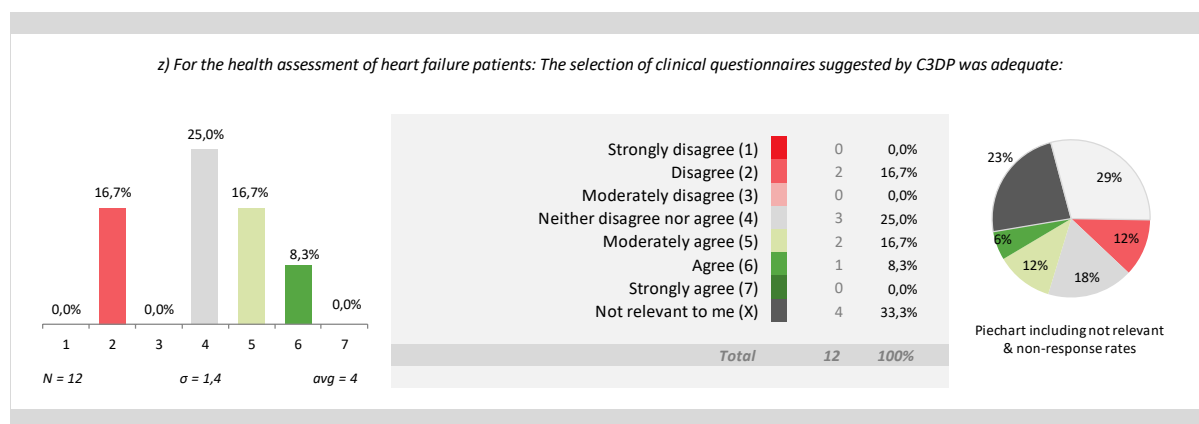


Figure 506 The selection of clinical patient questionnaires by C3DP was adequate (heart failure)

When asked whether the selection of clinical patient questionnaires suggested by C3DP was adequate for the health assessment of renal failure patients, respondents had a neutral to slightly positive opinion with an average of 4.5. The peak ranking was 33.3% for "Moderately agree", followed by 25% who agreed and 16.7% who disagreed.

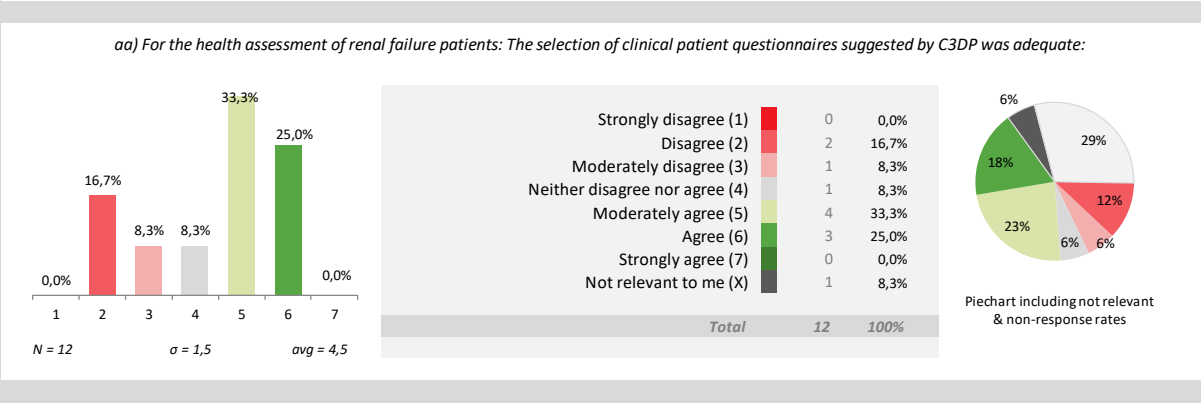


Figure 507 The selection of clinical patient questionnaires suggested by C3DP was adequate (renal failure)

Regarding the suitability of clinical patient questionnaires suggested by C3DP for the health assessment of diabetes patients, the responses were like the statement concerning renal failure patient questionnaires. Most HCPs moderately agreed and agreed (33.3% each), while 16.7% disagreed. This resulted in an average ranking of 4.6 with a standard deviation of 1.6, proposing a neutral to slightly positive opinion.

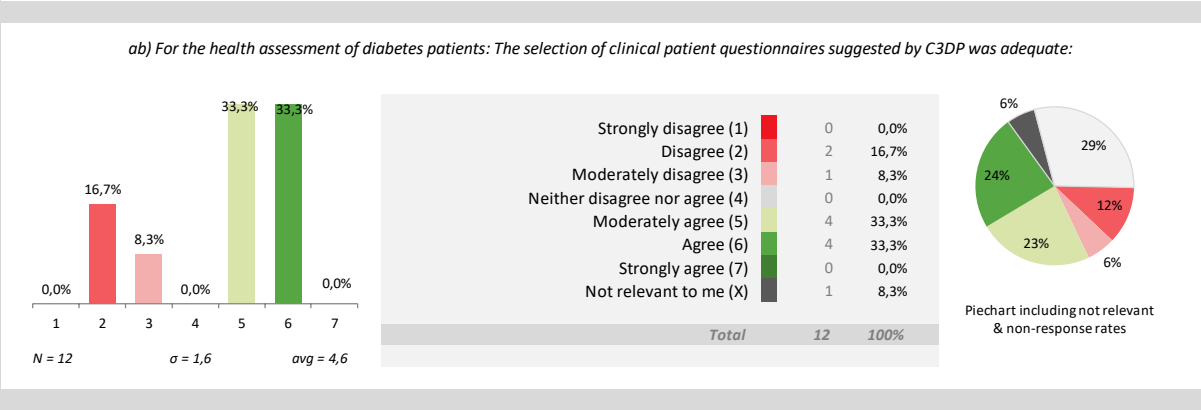


Figure 508 The selection of clinical patient questionnaires suggested by C3DP was adequate (diabetes)

When asked whether the selection of clinical patient questionnaires suggested by C3DP was adequate for the health assessment of patients suffering from depression, Technology trial participants were less positive than for the other health conditions considered, represented in an average of 3.9 with a standard deviation of 1.5. 16.7% of respondents disagreed, neither disagreed nor agreed and moderately agreed to the statement, while most users (33.3%) considered it inapplicable to them. One respondent (8.3%) each moderately disagreed and agreed to the statement.

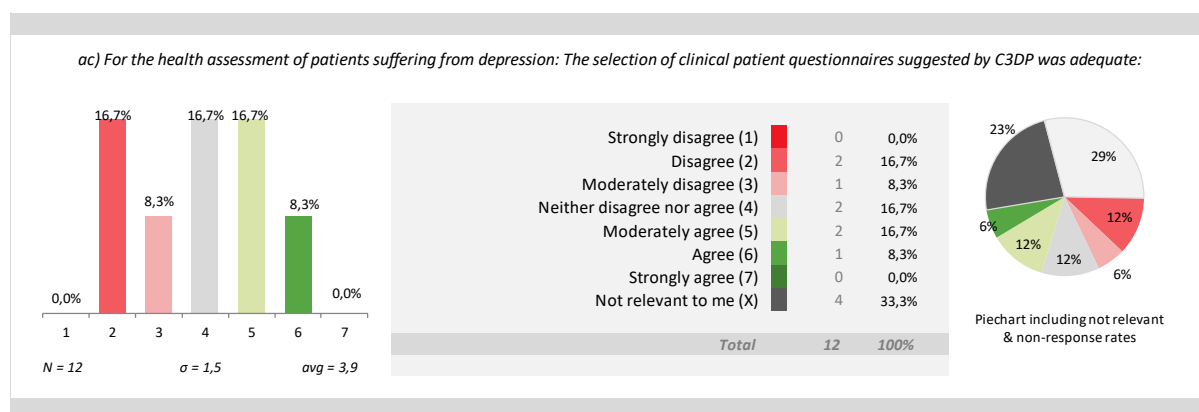


Figure 509 The selection of clinical patient questionnaires suggested by C3DP was adequate (depression)

Considering the reviewing of results of clinical patient questionnaires submitted by patients, respondents were overall neutral (average of 4.3, standard deviation of 1.5) towards the statement that this was easy to do. 25% of respondents neither disagreed nor agreed and 25% agreed, while 16.7% disagreed and moderately agreed.

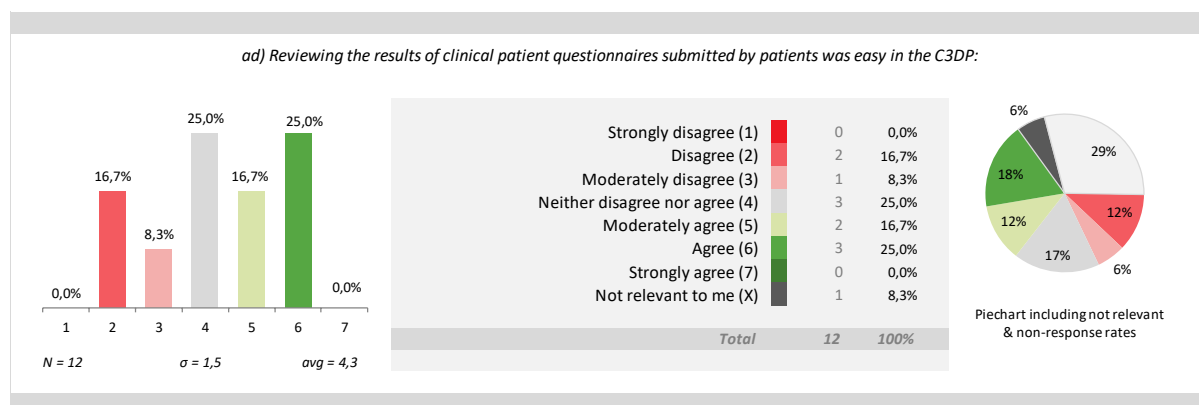


Figure 510 Reviewing the results of clinical patient questionnaires submitted by patients was easy

When asked whether reviewing the results of clinical patient questionnaires on the C3DP was useful for working on care plans, most HCPs (33.3%) neither disagreed nor agreed, followed by one quarter (25%) who agreed. On average, this statement was ranked 4.4 with a standard deviation of 1.3, suggesting an overall neutral opinion of HCPs.

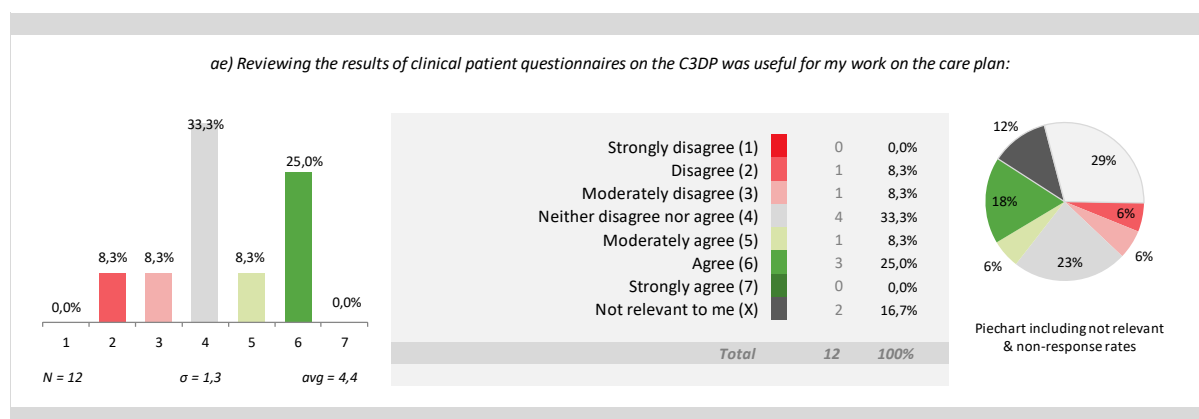


Figure 511 Reviewing the results of clinical patient questionnaires on the C3DP was useful

Additionally, two questions were asked concerning the average time that HCPs spent on care plan creation for patients involved and not involved in C3-Cloud, to which 13 HCPs (N=13) responded. Regarding the non-involved patients, 30.8% of respondents spent more than 30 minutes on creating a care plan, followed by 23.1% requiring 20-30 and 5-10 minutes, while 15.4% spent 10-20 minutes. This resulted in an average rating of 3.7 with a standard deviation of 1.2, indicating that HCPs spent at least 10-20 minutes. 23% did not submit a response to this question.

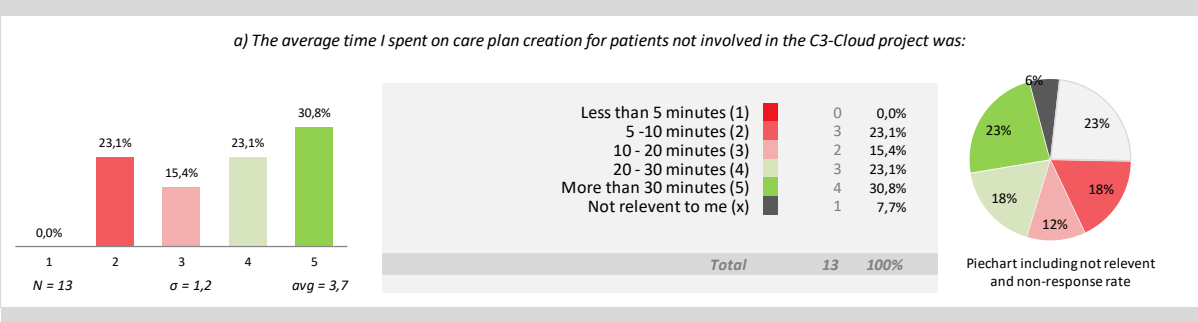


Figure 512 The average time I spent on care plan creation for patients not involved

Regarding the average time spent on care plan creation per patient involved in C3-Cloud, the peak ranking of 23.1% was “20-30 minutes”. 15.4% spent more than 30 minutes, 10-20 minutes, and 5-10 minutes each, leading to an average ranking of 3.6 with a standard deviation of 1.1, which corresponds to “10-20 minutes”.

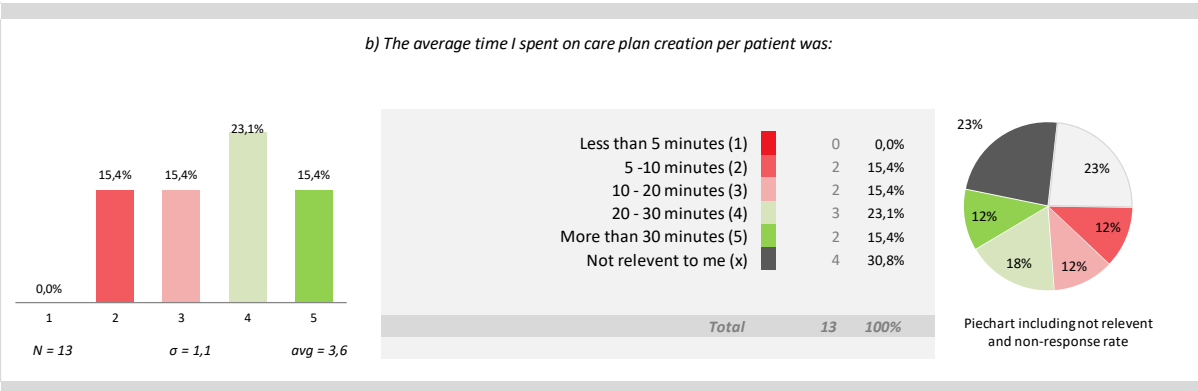


Figure 513 The average time I spent on care plan creation per patient

12 HCPs responded to the question how often they experienced conflicting clinical guidelines in the treatment of the average patient not involved in C3-Cloud. The peak ranking was “One or two times” with 33.3%, followed by 8.3% for “Not at all”, “One time” and “Three times”. The average ranking was 2.9 with a standard deviation of 1.2. 41.7% found this question “Not relevant to me” and 29% submitted no response.

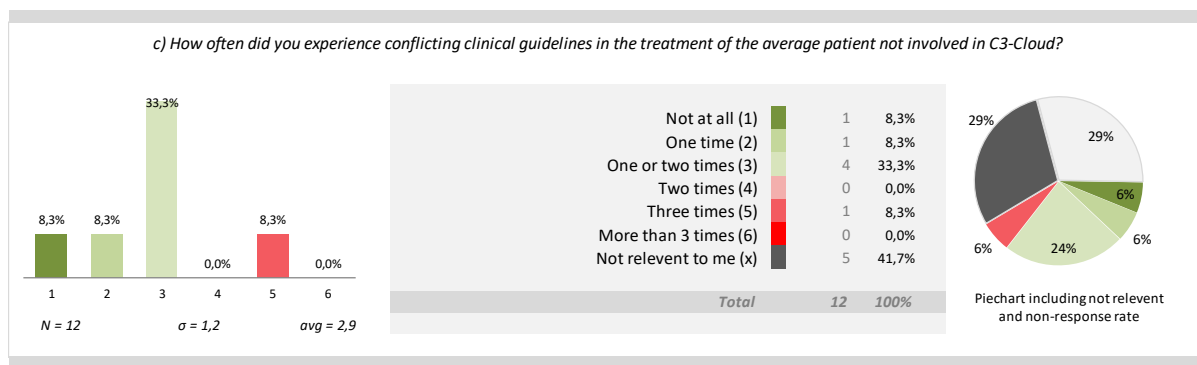


Figure 514 How often did you experience conflicting clinical guidelines in the treatment of the average patient not involved

The table below presents the comments to five open questions in the original language (Castilian). For the English translation refer to **Table 12**.

Comments to open questions (original language)

- 1) How does the C3DP system help you in the access to and compilation of the needed clinical information for patients?
- La plataforma me ofrece inicialmente un resumen de la historia clínica del paciente (patología y tratamiento fundamentalmente) lo cual es muy importante de cara a tener una visión general del paciente.
 - De modo resumido y bastante claro.
 - Puede tener utilidad en pacientes muy concretos con habilidades tecnologicas y con un plan de cuidados específico.
 - Mejora el contacto con el paciente. Creo que estaría bien enfocado el acceso para pacientes con mucha dispersión geográfica que les cuesta venir a consulta o teniendo cita no acuden, esta herramienta facilitaria su seguimiento.
 - Me parece una plataforma clara y bastante sencilla para trabajar.
 - He podido mantener una comunicación más estrecha con el paciente.
 - Entre otros, a través de C3C se puede interactuar con los pacientes y puede ayudar a mejorar sus situación clínica a través de órdenes de tratamiento, entrega de material informativo, consejos para autocuidados... Ellos pueden incluir además dudas y parámetros (como TA o glucemias) para poder valorarlos y tenerlos en cuenta en consulta o a la hora de solicitar pruebas, por ej. De una forma clara y fácil de encontrar tanto para los pacientes, como para los profesionales sanitarios implicados.
 - Me ayuda a mantenerme actualizado en la informacion basica del pacienteme permite integrar.
 - En cuanto a recogida de informacion clinica es adecuada ,aunque algo complicada.
 - Ayuda a fijarse en patologias importantes y centrarse en ellas,creando un plan de atencion.
 - Muy poco.
 - Práctico, porque se visualiza resumen en una pantalla.
 - Me ayuda organizando las patologias para poder realizar un plan de atencion.

2)	<p>How does it affect your work if patients have other health conditions that are not within the scope of C3-Cloud (i.e. besides Diabetes Type II, renal failure, heart failure or depression)?</p> <ul style="list-style-type: none"> • Es importante que estas condiciones de salud figuren en el resumen inicial, aunque no estén dentro del alcance de C3-Cloud, dado que pueden condicionar un futuro tratamiento. • No mucho. Pero los informes que se pueden descargar desde la plataforma también ayudan para otras patologías en general (dieta saludable...). • Bueno nuestro trabajo es así, nuestra valoración debe ser integral en todas las esferas, desarrollo horizontal de la atención. • No da visión en conjunto del paciente. • Los informes adicionales son muy útiles para todo tipo de patología ya que muchas de ellas engloban información general. • No entiendo muy bien la pregunta. • De forma positiva, me ha parecido que los planes individuales sirven para recopilar objetivos de forma global considerando todas las patologías consideradas. • Ayuda a la toma de decisiones clínicas rutinarias o no urgentes, en la mayoría de los casos. • Me permite integrar la salud en un aspecto global. • No está incluido por lo que habría que considerarlo aparte. • Hay que tenerlas en cuenta a través de la historia clínica. • Me afecta mucho, por ejemplo en caso de demencia. • No afecta. • Tengo que recordarlo, habría que incluirlo de alguna manera.
3)	<p>Has C3-Cloud helped you to react on patients' health evolution? If yes: How? If no: Why not?</p> <ul style="list-style-type: none"> • Sí. He visto que un paciente tenía tensiones elevadas en el domicilio, lo cual me ha llevado a subir la dosis de un antihipertensivo que tomaba. • No. Nuestro paciente no se ha manejado muy bien con el programa. • No me ha ayudado, es verdad que era un paciente con mucha comorbilidad y con difícil margen de mejora. • Sí, pEj: hay información continua de constantes como el peso, y facilita cumplimiento de objetivo: bajar peso, reforzando este cambio y motivando a seguir. • Nuestro caso no ha sido muy útil, ya que el paciente no se ha manejado muy bien con la herramienta. • En el que yo he tenido, no, porque ha habido estabilidad en su estado de salud. • No, porque los pacientes no tienen hábito de utilizar herramientas por internet. • No demasiado, ya que no han colaborado demasiado en la subida de datos y en el feedback con nuestros mensajes a través de la plataforma. Han preferido coger cita telefónica con su Equipo de Atención Primaria (EAP), a pesar de haber mandado mensajes para ayudar o incitarles a su uso, incluso les he realizado llamadas telefónicas para ayudar o preguntar si había algún problema y han

	<p>venido de forma presencial para resolver alguna duda con la plataforma y su acceso, o cuando han venido por otro motivo al Centro de Salud (CS).</p> <ul style="list-style-type: none"> • La experiencia ha sido corta no tengo criterio para valorar esta pregunta. • Me ha ayudado poco a interactuar con el paciente por las dificultades técnicas. • Al principio la plataforma permitía la interacción y era fácil, luego un momento que no se podía contactar con el paciente. • No especialmente. No permite reaccionar con rapidez. • Sí, porque cuando introducen datos clínicos (TA, glucemia) es posible realizar cambios de tratamiento, si los ves adecuados. • Sí; es una herramienta adecuada para interactuar.
4)	<p>Did C3DP usage support you to be better informed when setting up a care plan for the patient?</p> <ul style="list-style-type: none"> • Sí. C3-Cloud ayuda a estructurar el plan de atención al paciente. • No mucho. • Tampoco me ha ayudado. • Desde luego que sí. • Sí que ayuda a realizar un plan de cuidados. • Puedes controlar más fácilmente sus constantes y cambiar tratamientos, si procede. • No, lo poco que hemos podido utilizarlo por la situación de pandemia global. Hemos tenido más desinformación con los pacientes que beneficio. • Sí, a pesar de los pocos datos subidos por los pacientes. • Sí. • Te obligue a repasar y centrarte en sus problemas descritos y pensar como interactuar. • Sí. • Sí. • Sí. • Sí, ya que lo organizas.
5)	<p>Does C3DP lack any functionality, so that you were inclined to use other tools instead or in parallel? If yes: What were the functionalities that you missed?</p> <ul style="list-style-type: none"> • No he echado de menos otras funcionalidades. • Apoyo informático. • Veo que tiene funcionalidad para un determinado perfil de persona, desgraciadamente a las personas de nuestro cupo que les hemos ofrecido participar han declinado participar, y solo hemos tenido un participante con lo cual no es valorable. Sí que veo que es una herramienta muy útil en determinado tipo de paciente, y en el futuro abarcara a muchos pacientes. • Ha costado acceder en ocasiones. He echado de menos que sea más dinámico y rápido. • Como ya he mencionado anteriormente, nuestro paciente no le ha sacado la utilidad que vemos que podría sacarle si hubiera utilizado adecuadamente la plataforma. • No. • Una notificación directa en la agenda profesional diaria, por ejemplo. • No carece de funcionalidad, de hecho pienso que es una buena plataforma, pero creo que queda bastante para que la sociedad de este municipio "se haga" con

	<p>este tipo de herramientas sanitarias. Es un principio. Como he dicho, han preferido usar otros canales para interactuar con el CS.</p> <ul style="list-style-type: none"> • No. • Ha habido dificultades tecnicas en cuanto a la plataforma de comunicacion con el paciente que no se han podido solucionar. • Hemos tenido que recurrir a las vias habituales ya que por problemas tecnicos no se ha podido solucionar la comunicacion. • Un evolutivo. • No. • El problema ha sido la herramienta como tal, problemas tecnicos.
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Table 104 MDT questionnaire, comments to open questions, original language

HCP Unified Theory of Acceptance and Use of Technology (UTAUT)

Technology trial participants were asked for their opinions to statements divided into two groups (a-l, m-x). Users' agreement with the statements was rated between dark red ("strongly disagree") to dark green ("strongly agree"). The summary figure below shows the mean ratings of 12 HCPs to the statements (a-l).

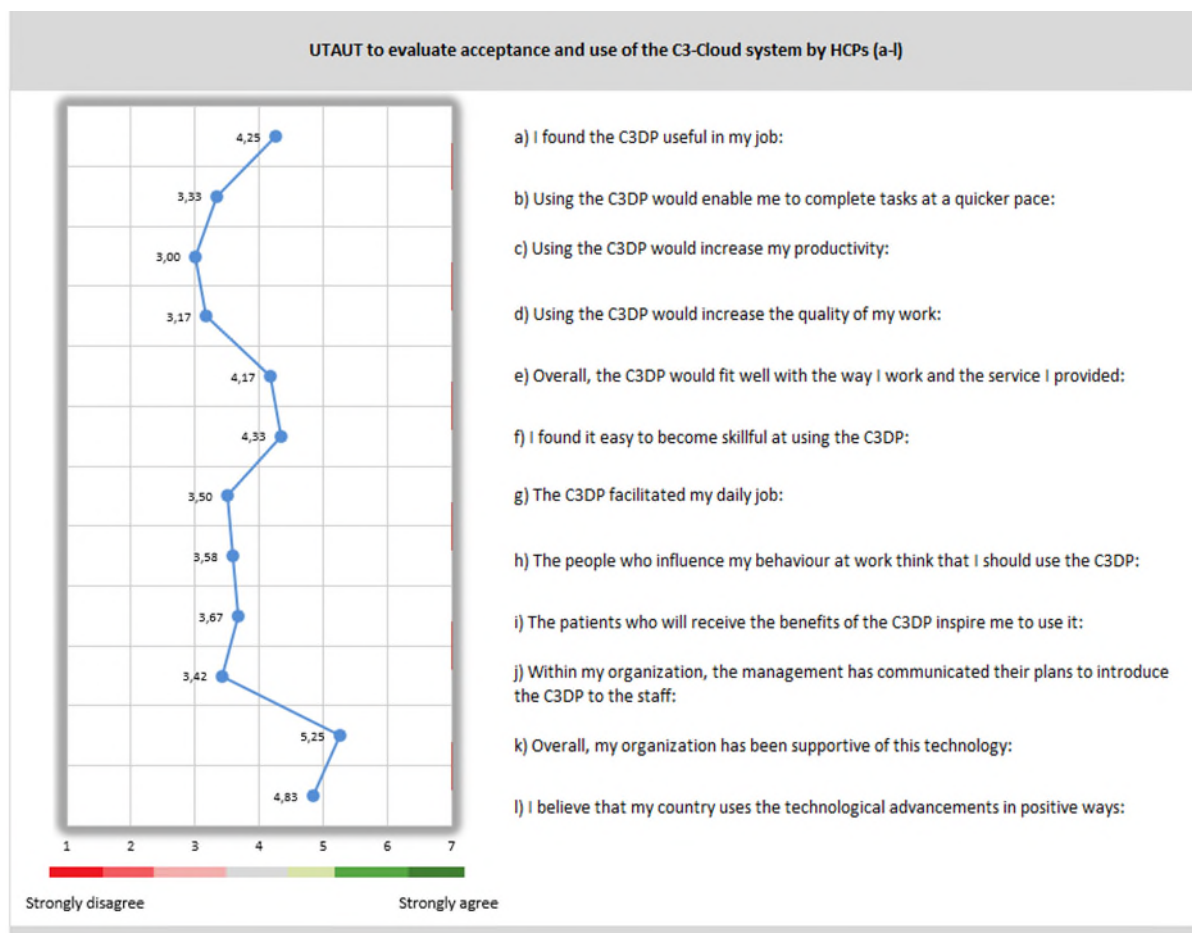


Figure 515 2nd survey for HCP, UTAUT (a-l)

When asked whether they found the C3DP useful in their job, HCPs had on average a neutral opinion (average 4.3; standard deviation 1.7). Peak rankings of 25% each were "Disagree" and "Moderately Agree". 16.7% of respondents each chose a neutral ranking and agreed, while 8.3% each moderately disagreed and strongly agreed. Notably, the non-response rate was 29%.

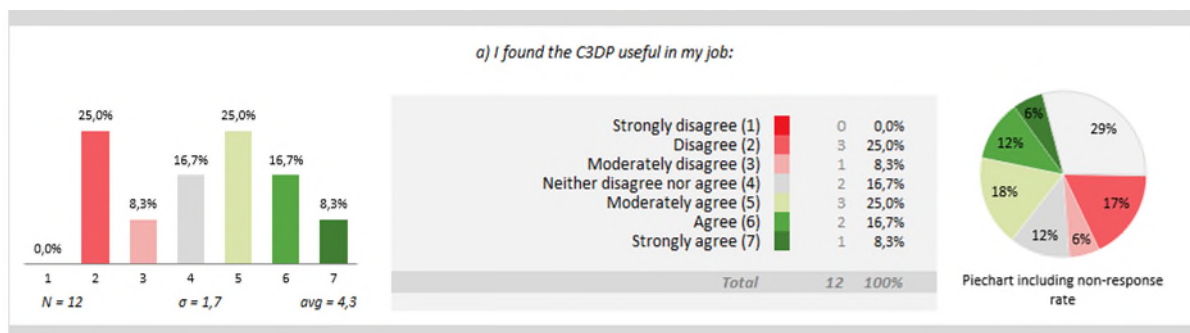


Figure 516 I found the C3DP useful in my job

Regarding the statement that C3DP usage enabled HCPs to complete tasks more quickly, respondents were overall more negative, but opposing opinions are observed as 33,3% each responded “Disagree” and “Moderately agree”, followed by 16,7% of respondents who neither disagreed nor agreed. With a standard deviation of 1,5, the average ranking was 3,3.

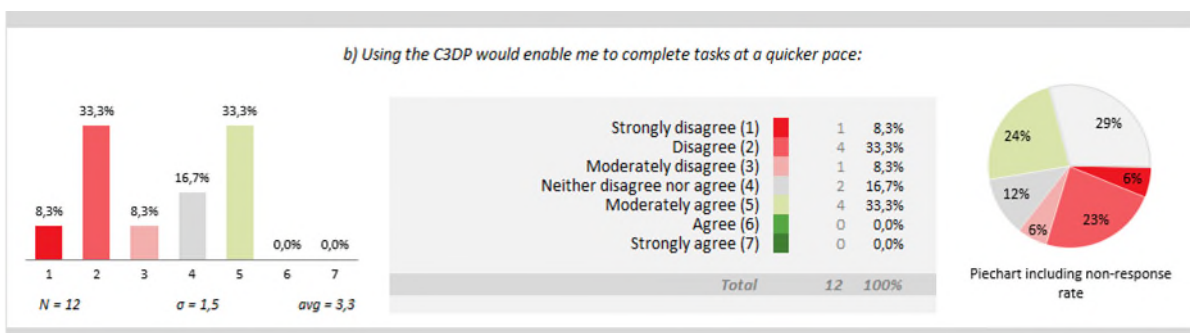


Figure 517 Using the C3DP would enable me to complete tasks at a quicker pace

The statement that C3DP usage would increase productivity of HCPs received an even lower average ranking of 3,00 (standard deviation of 1,5). While 16,7% of respondents were more positive, 33,3% each were neutral and disagreed, and 16,7% strongly disagreed.

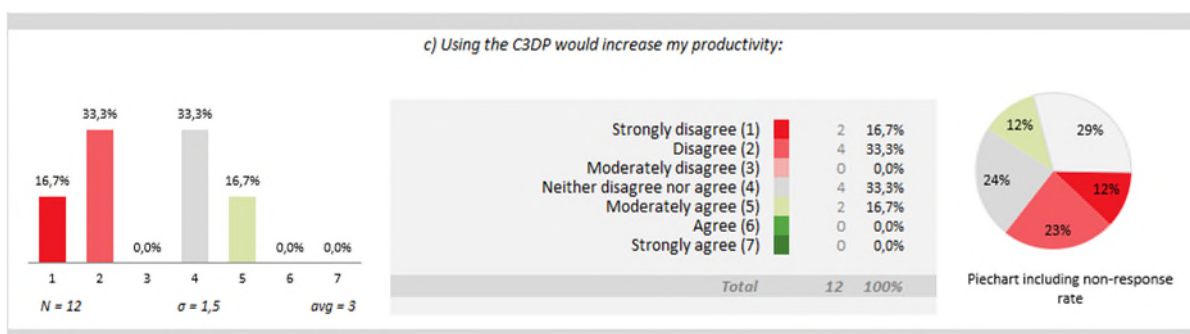


Figure 518 Using the C3DP would increase my productivity

When asked whether C3DP usage would increase the quality of their work, respondents moderately disagreed overall (average of 3,2; standard deviation of 1,8). Peak rankings of 33% each were “Disagree” and “Neither disagree nor agree”, followed by 16,7% for “Strongly disagree”. 8,3% of respondents, however, moderately agreed and strongly agreed to the statement.

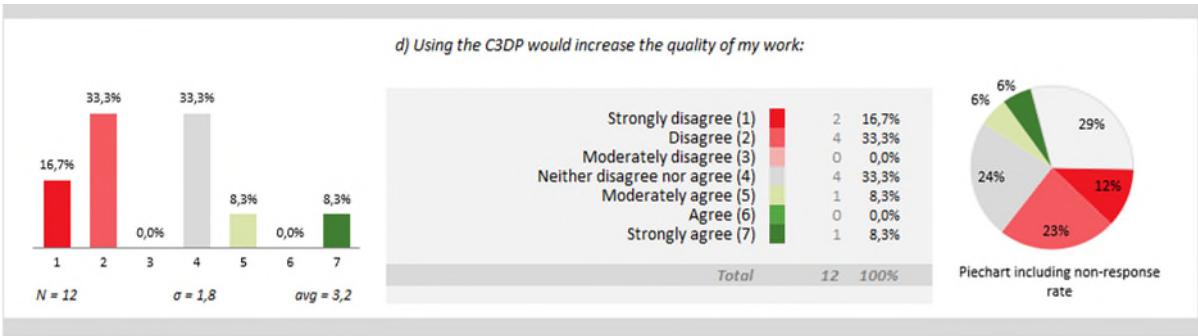


Figure 519 Using the C3DP would increase the quality of my work

Regarding whether C3DP would fit well with the way HCPs work and the service they provided, respondents had overall a neutral opinion (average of 4.2; standard deviation of 1.6). While 25% of respondents disagreed and 8.3% moderately disagreed, the peak ranking of 33.3% was “Agree” and 8.3% moderately agreed. One quarter of Technology trial participants was neutral.

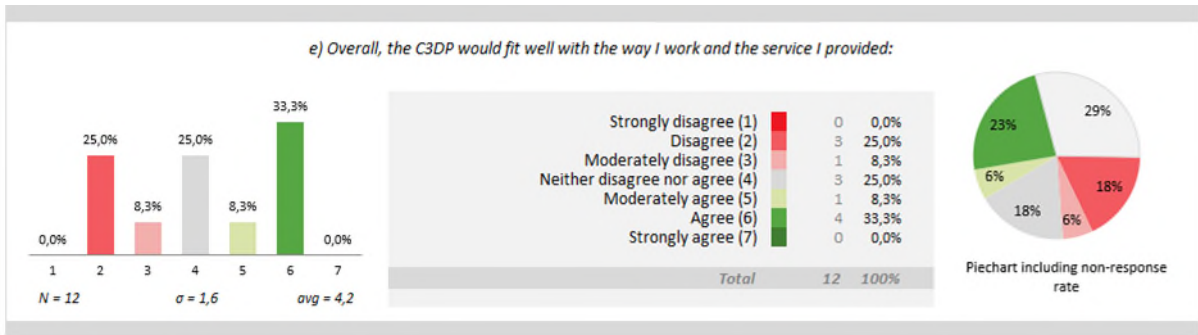


Figure 520 Overall, the C3DP would fit well with the way I work and the service I provided

Assessing whether HCPs found it easy to become skilful at using the C3DP, statement (f) received scattered responses, resulting in an overall neutral ranking of 4.3 with a standard deviation of 2.0. The response “Agree” was submitted most frequently (33.3%), followed by 16.7% for “Neither disagree nor agree” and “Disagree, while 8.3% each chose the remaining options.

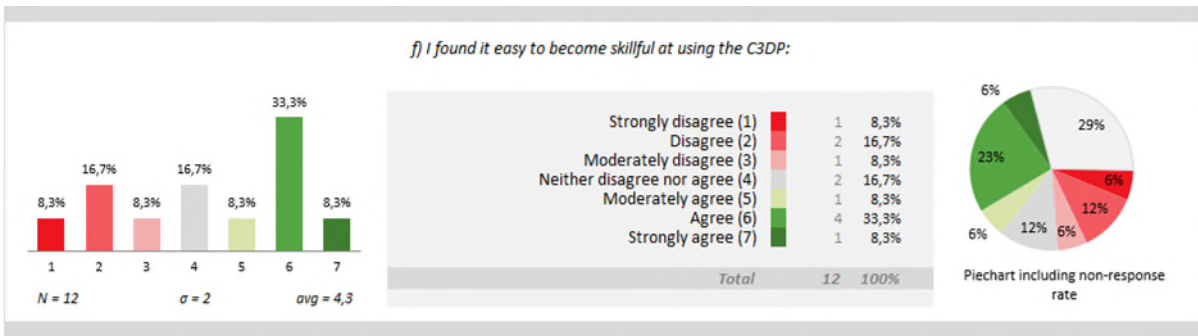


Figure 521 I found it easy to become skilful at using the C3DP

On average, respondents moderately disagreed with the statement that C3DP facilitated their daily job (average of 3.5; standard deviation of 1.7). The peak ranking of 33.3% was a neutral opinion, while 16.7% agreed, disagreed, and strongly disagreed. One respondent each moderately disagreed and moderately agreed.

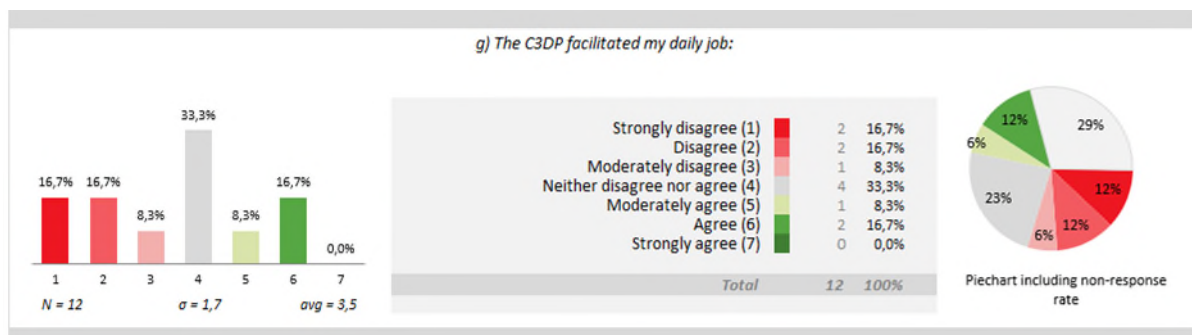


Figure 522 The C3DP facilitated my daily job

When asked whether the people who influenced their behaviour at work thought that respondents should use the C3DP, the vast majority had a neutral opinion (66.7%). One quarter of HCPs disagreed and 8.3% moderately agreed, resulting in a slightly negative overall ranking of 3.6 (standard deviation of 1).

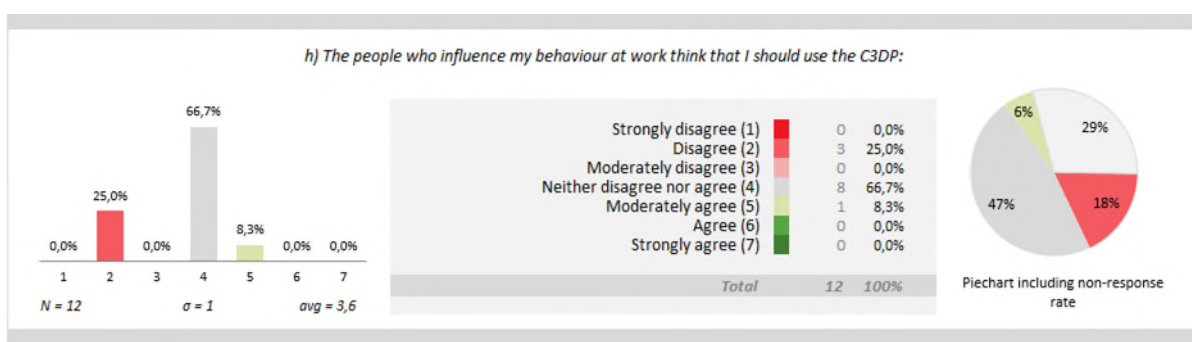


Figure 523 The people who influence my behaviour at work think that I should use the C3DP

The statement that patients who would benefit of the C3DP inspired HCPs to use it was mainly regarded neutral (66.7%) while 16.7% of respondents disagreed and 8.3% moderately disagreed and moderately agreed. This resulted in slightly negative to neutral average ranking of 3.7 with a standard deviation of 0.9.

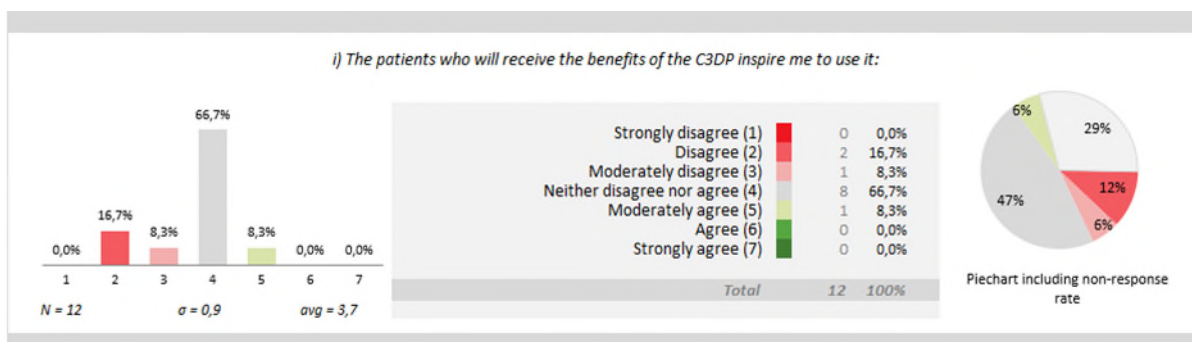


Figure 524 The patients who will receive the benefits of the C3DP inspire me to use it

When asked whether the management within their organisation communicated their plans to introduce the C3DP to the staff, respondents overall moderately disagreed (average of 3.4; standard deviation of 1.6). Peak rankings of 33.3% each were “Disagree” and “Neither disagree

nor agree”, followed by 16.7% of respondents who moderately agreed. 8.3% of respondents each strongly disagreed and agreed.

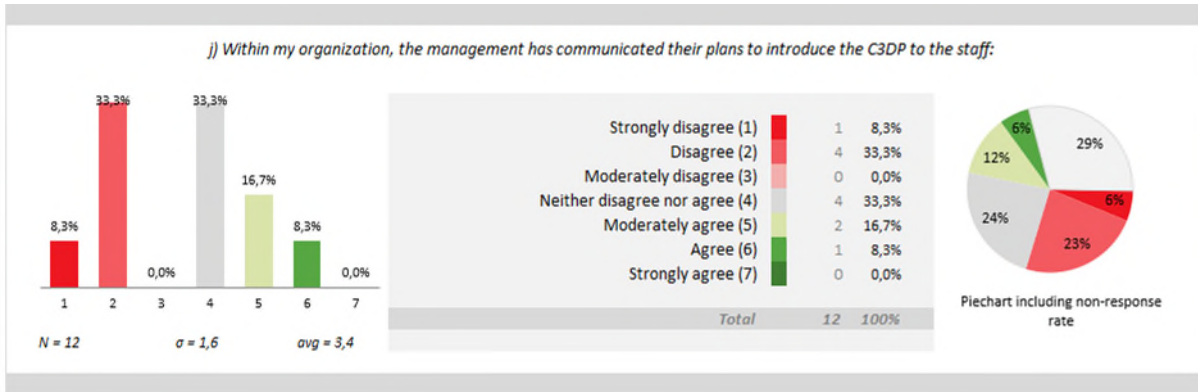


Figure 525 Within my organization, the management has communicated their plans to introduce the C3DP

When stating that their organisation was overall supportive of C3DP, the half of the respondents agreed, resulting in a positive average of 5.3 (standard deviation of 1.4). 16.7% of respondents each moderately agreed and were neutral. Only one respondent (8.3%) was negative and disagreed with the statement.

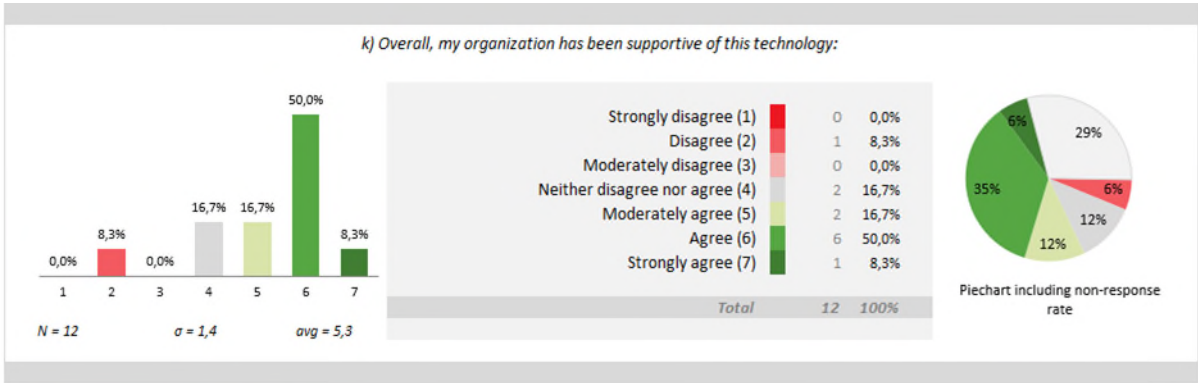


Figure 526 Overall, my organization has been supportive of this technology

When asked whether respondents believed that their country used technological advancements in positive ways, respondents were overall neutral to positive (average of 4.8; standard deviation of 1.6). The peak ranking of 33.3% was a neutral opinion, but one quarter agreed and 16.8% strongly agreed to the statement. 8.3% each moderately agreed, moderately disagreed, and disagreed.

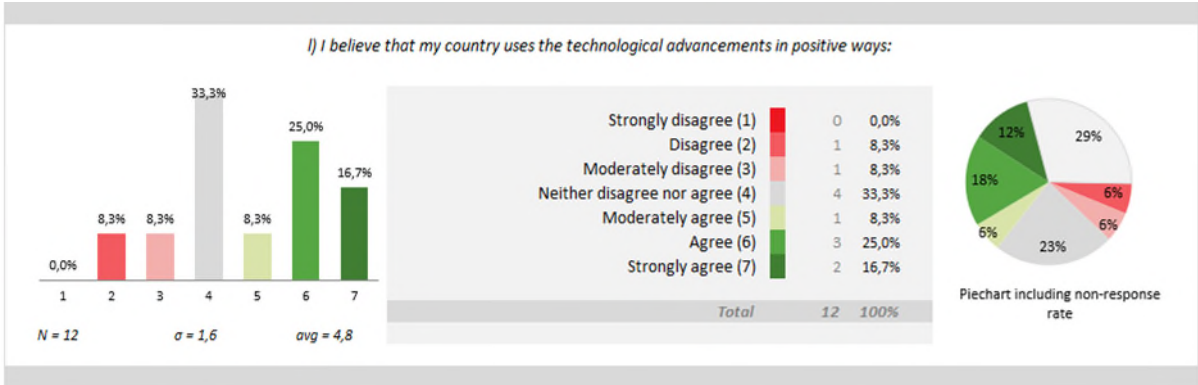


Figure 527 I believe that my country uses the technological advancements in positive ways

The figure below shows the mean ratings to the statements (m-x).

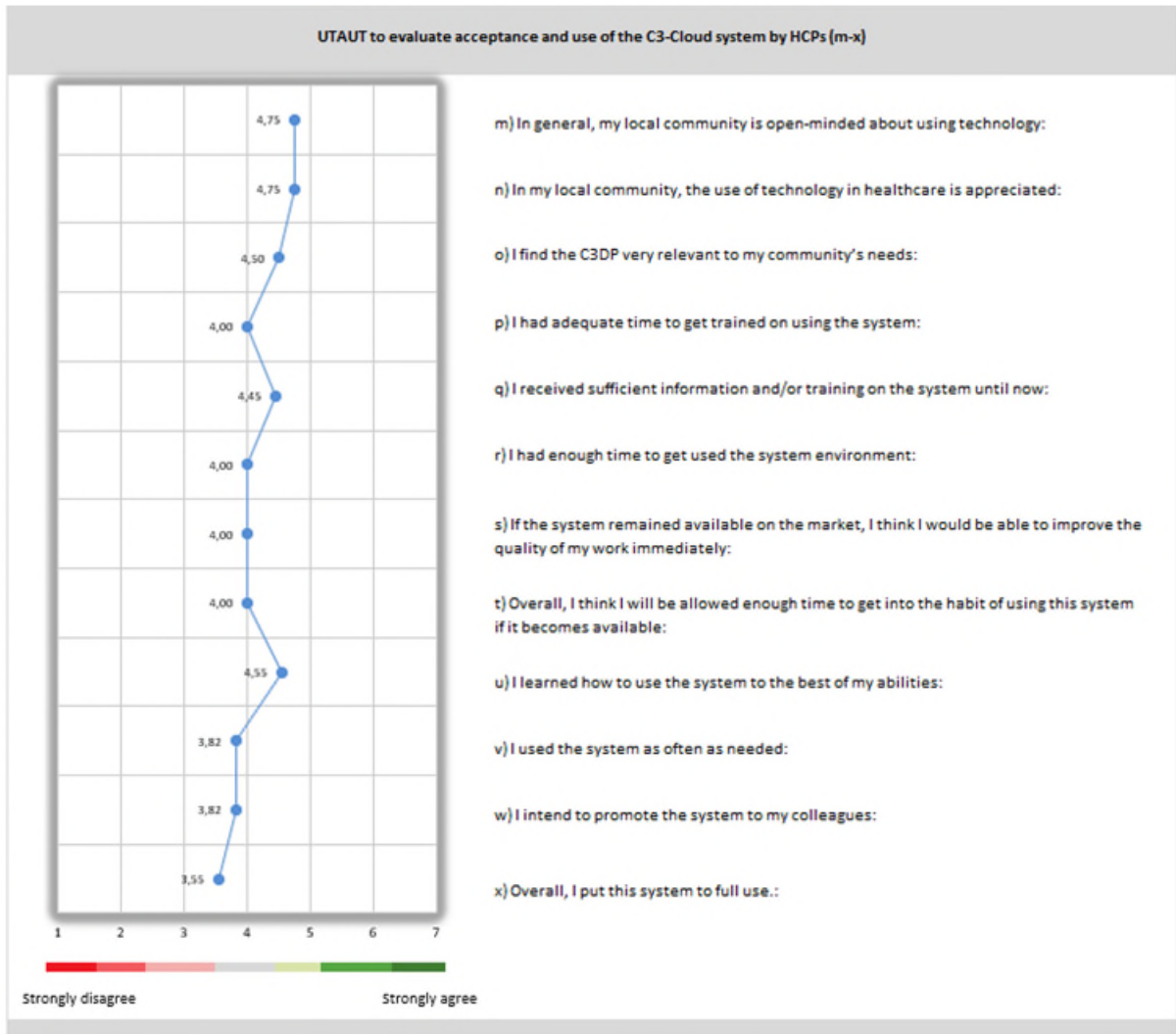


Figure 528 2nd survey for HCP, UTAUT (m-x)

When asked whether their local community was open-minded about using technology, HCPs were neutral with a positive tendency as the average ranking was 4.8 (standard deviation of 1.7). Most respondents rated this statement “Moderately agree” (41.5%) and one quarter “Agree” (25%). 8.3% each chose the remaining options, except for “Moderately disagree”. The non-response rate was 29%.

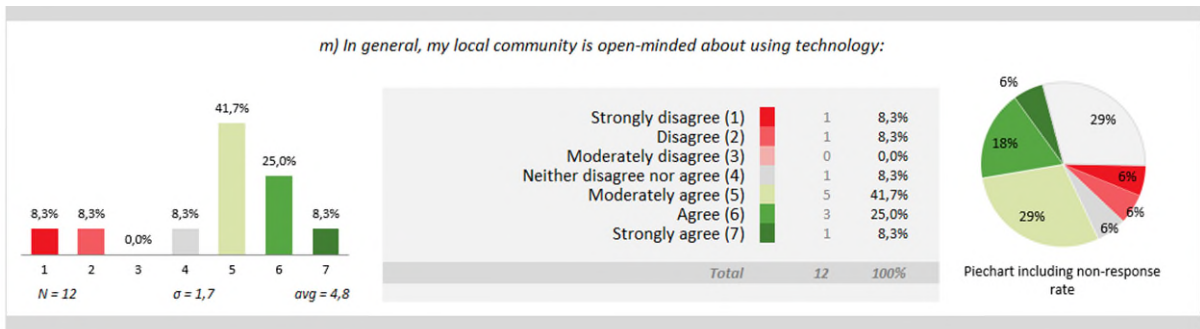


Figure 529 My local community is open-minded about using technology

Similar results were obtained for the second statement about whether the use of technology in healthcare was appreciated in respondents' local community. With an average ranking of 4.8 and a standard deviation of 1.7, users had a neutral to slightly positive opinion. The peak ranking of 41.7% was "Moderately agree" and 25% of the users agreed. One respondent (8.3%) each chose the remaining options, except for "Moderately disagree".



Figure 530 In my local community, the use of technology in healthcare is appreciated

When asked whether they found the C3DP very relevant to their community's needs, HCPs were neutral with an average rating of 4.5 (standard deviation of 1.7). 33.3% of respondents moderately agreed that they found it very relevant, 25% neither disagreed nor agreed, 16.7% agreed and 8.3% each strongly agreed, disagreed, and strongly disagreed.

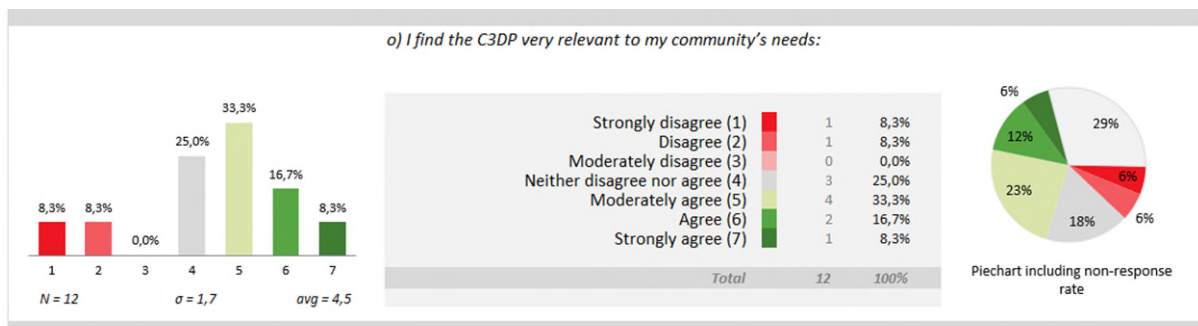


Figure 531 I find the C3DP very relevant to my community's needs

The 11 respondents were on average neutral towards the statement that they received adequate time to get trained on using C3DP, although no respondent chose "Neither disagree nor agree". As 27.3% each moderately disagreed and agreed, HCPs had opposing opinions. 18.2% further disagreed, 9.1% strongly disagreed, but also moderately agreed and strongly agreed. 35% submitted no response to this statement, the average rating was 4.0 and the standard deviation 2.0.

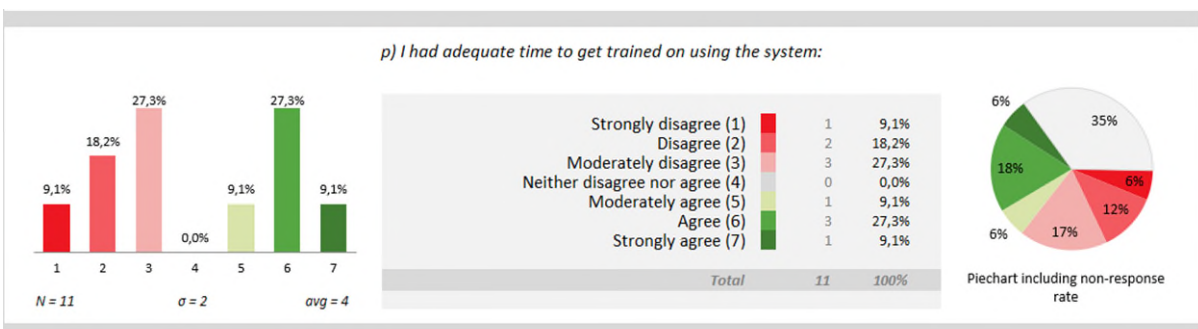


Figure 532 I had adequate time to get trained on using the system

With an average of 4.5, respondents were neutral but slightly more positive towards the statement that they received sufficient information and/or training on the system. The peak rating was 36.4% for “Agree”, followed by 18.2% of respondents who moderately disagreed. The remaining options were each chosen by one respondent (9.1%). The standard deviation was 2.0 and the non-response rate 35%.

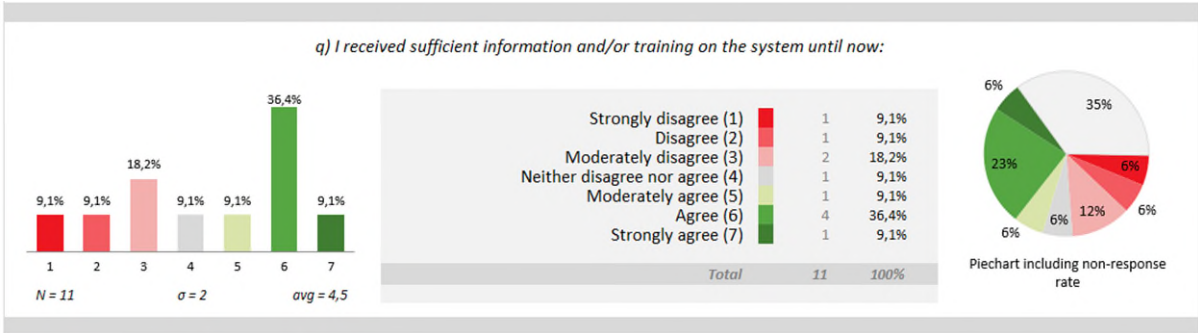


Figure 533 I received sufficient information and/or training on the system until now

The degree of agreement towards the statement that HCPs had enough time to get used to the system largely differed, resulting in overall neutral rating (average of 4.0; standard deviation of 1.9). 18.2% of respondents each chose “Disagree”, “Moderately disagree”, “Moderately agree” and “Agree”, while 9.1% each strongly disagreed, neither disagreed nor agreed, and strongly disagreed.

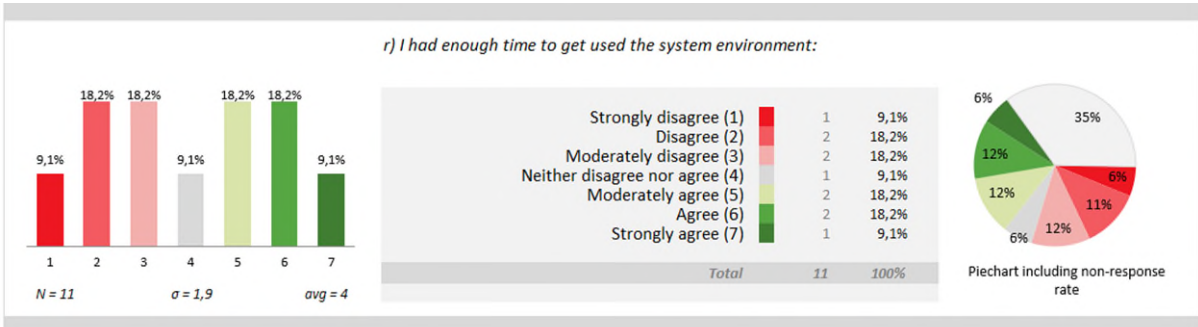


Figure 534 I had enough time to get used to the system environment

When asked whether HCPs believed that they would be able to improve the quality of their work immediately if the C3-Cloud remained available on the market, users were unsure (average of 4.0; standard deviation of 1.6). 27.3% of respondents moderately agreed while 18.2% each agreed, was neutral and moderately disagreed. While 9.1% each strongly disagreed and disagreed, no respondent strongly agreed to the statement.

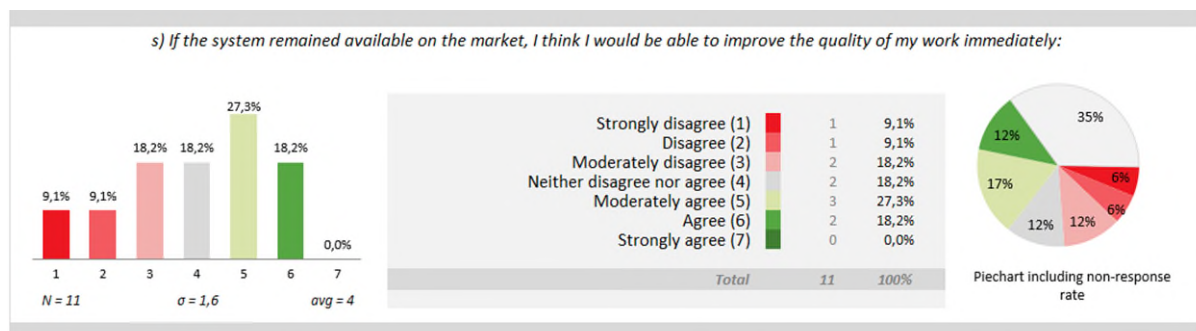


Figure 535 If the system remained available on the market, I think I would be able to improve the quality of my work

When asked whether they would be allowed enough time to get into the habit of using C3-Cloud if it became available, the opinions greatly differed. 18.2% of HCPs disagreed, moderately disagreed, moderately agreed, and agreed, while 9.1% strongly disagreed, were neutral, and strongly agreed. This resulted in an average neutral ranking of 4.0 with a standard deviation of 1.9 and a 35% non-response rate.

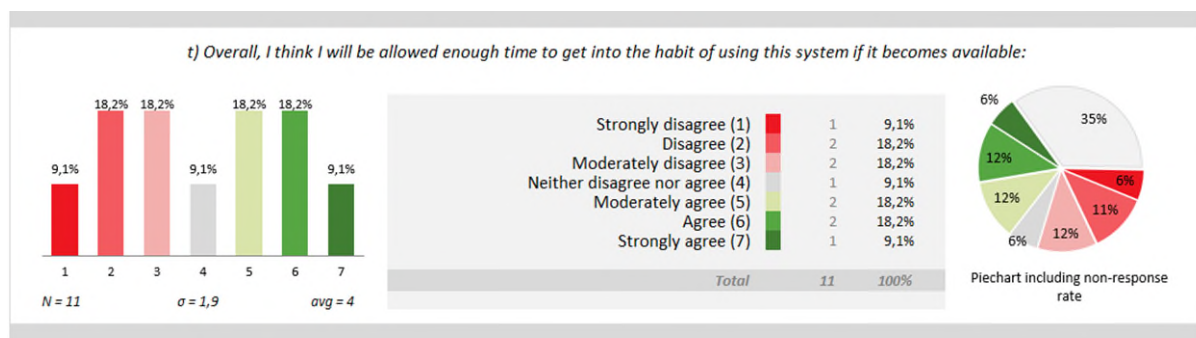


Figure 536 Overall, I think I will be allowed enough time to get into the habit of using this system

Respondents were neutral with a somewhat positive tendency towards the statement that they learned how to use the system to the best of their abilities (average of 4.5; standard deviation of 1.7). The peak rating of 36.4% was “Agree”, followed by 27.3% of respondents who moderately agreed and 18.2% who were neutral. In contrast, 9.1% strongly disagreed and disagreed.

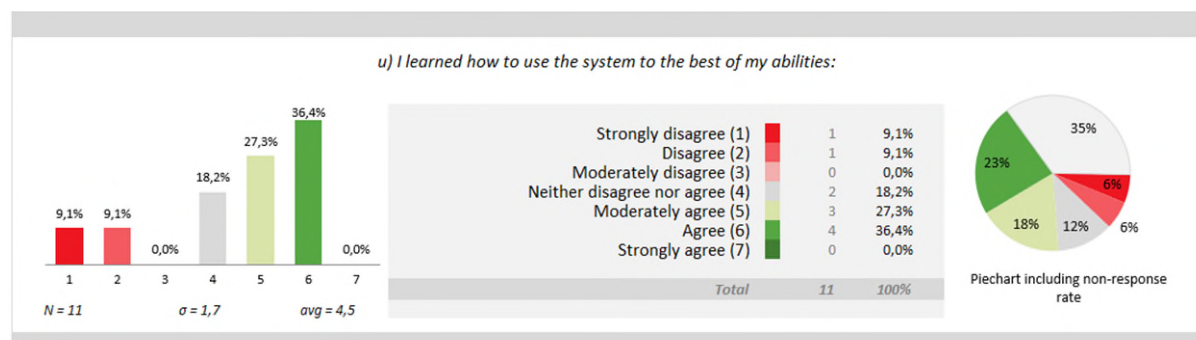


Figure 537 I learned how to use the system to the best of my abilities

With an average rating of 3.8 (standard deviation of 2.0), respondents overall indicated to not having used the system as often as needed. 27.3% of respondents disagreed that they did, 18.2% were neutral and agreed. One respondent (9.1%) each strongly disagreed, moderately disagreed, and strongly agreed with the statement.

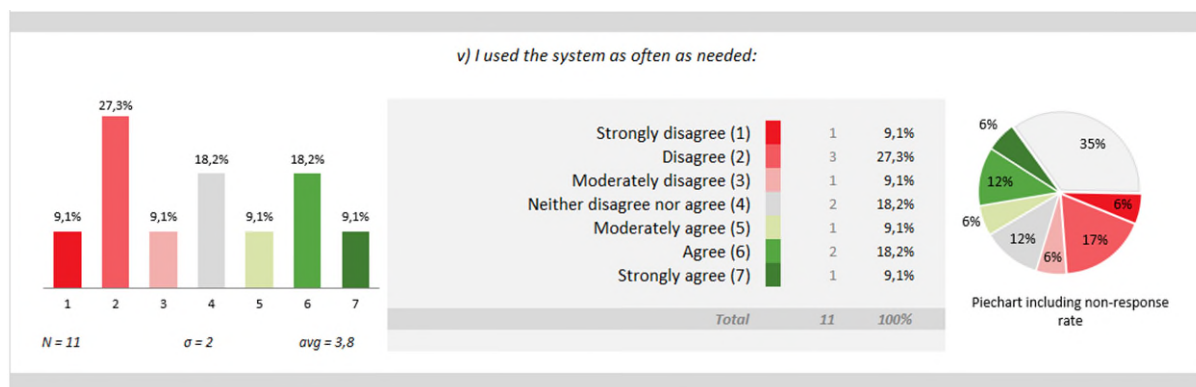


Figure 538 I used the system as often as needed

When asked whether they intended to promote the system to colleagues, Technology trial participants were slightly negative (average of 3.8; standard deviation of 1.8). More than one third had a neutral opinion (36.4%) while 18.2% disagreed. The remaining options were each chosen by one respondent (9.1%).

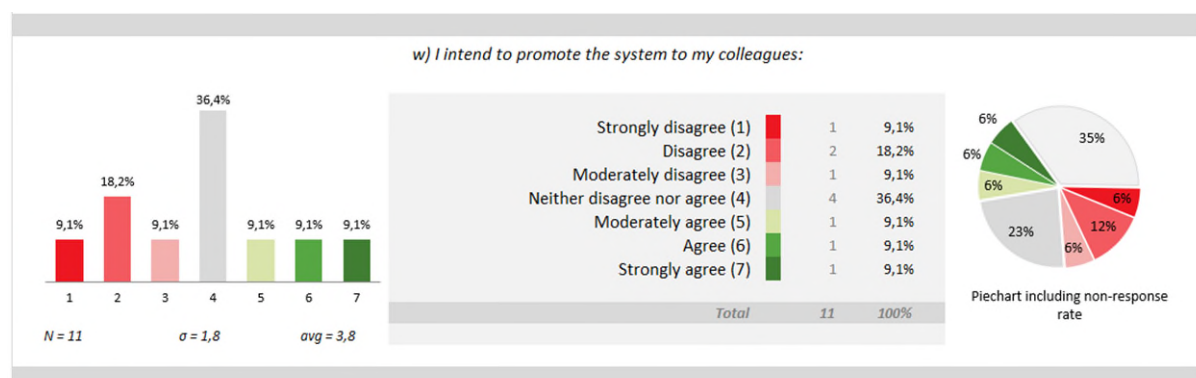


Figure 539 I intend to promote the system to my colleagues

Lastly, respondents moderately disagreed with the statement that they put C3-Cloud to full use. The peak rating of 27.3% was “Disagree”, while 18.2% each chose “Moderately disagree”, “Moderately agree” and “Agree”. 9.1% each strongly disagreed and neither disagreed nor agreed with the statement. This resulted in an average rating of 3.5 with a standard deviation of 1.8.

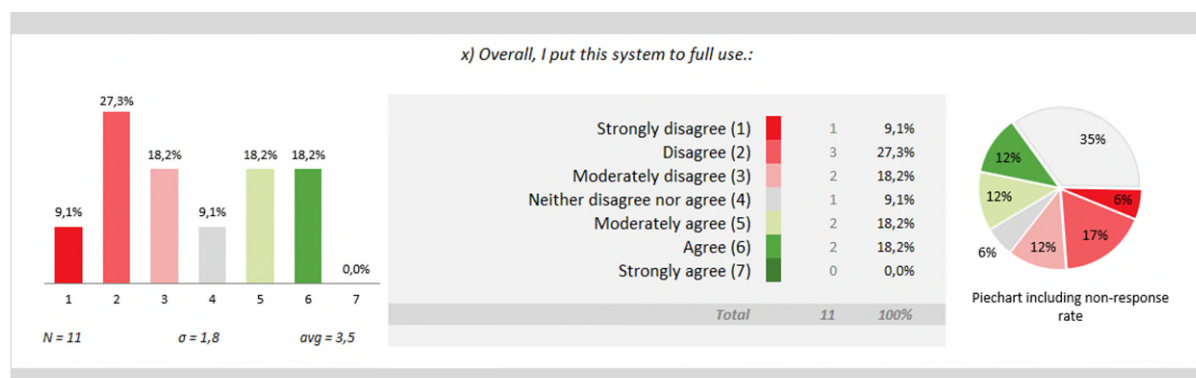


Figure 540 Overall, I put the system to full use

The table below depicts general comments by HCPs (in Castilian, Spanish) about their experience with the system (for the English translation refer to **Table 13**).

UTAUT, HCP general comments (original language)	
1)	Creo que el sistema C3-Cloud es una buena base para crear una plataforma de control y tratamiento de pacientes pluripatológicos.
2)	Mi experiencia con la plataforma ha sido limitada por que desgraciadamente solamente pudimos probarla con un paciente. Me parece una plataforma que en el futuro proximo ayudara mucho en el autocuidado por parte del paciente.
3)	En mi caso no he utilizado el programa como me hubiera gustado, ya que el paciente no se ha manejado bien. Pero a pesar de ello, sí me parece una herramienta útil para nuestro trabajo y para la autonomía del paciente.
4)	<p>Antes de escribir una crítica constructiva, quisiera puntualizar que no hemos podido realizar una valoración completa de la herramienta a causa de la pandemia covid-19.</p> <p>La herramienta me ha parecido algo engorrosa, con mucha información de primeras al entrar al sistema. EStaría bien tener una visión algo más esquemática y ordenada según relevancia de información de la historia clínica.</p>
5)	Creo que debería facilitarse más el acceso a la plataforma por parte de los pacientes y sus familiares, ya que han tenido problemas a la hora de acceder por tema de claves, links, etc. Además, nos han comentado que tardan bastante en acceder a las diferentes pantallas, subir datos clínicos (ej.: glucemias...) y les va lento el sistema.
6)	La herramienta me parece útil. el tiempo del que he dispuesto para trabajar con ella ha sido para mi escaso y accidentado (pandemia COVID-19) he podido seleccionar pocos pacientes y alguno ha tenido dificultades para manejar la informática. Creo que es una buena manera de apoyar a las personas con patologías crónicas sin hacerles gastar mucho tiempo, evitando que se sientan enfermas, haciéndolas mas activas en la toma de decisiones, con este medio podríamos estar haciendo seguimiento a muchos pacientes pluripatologicos sin que estos tuvieran que correr riesgos de contagios con una calidad asistencial mejor mas activa participativa y continua.
7)	Ha sido una pena no haber tenido tiempo suficiente para utilizar la plataforma y conocerla bien, pero no me ha resultado fácil ni ágil. Creo que este tipo de plataformas serán útiles pero quizás habría que empezar con otros grupos de edad.

Table 105 2nd survey for HCP, UTAUT general comments, original language

HCP Questionnaire for User Interaction Satisfaction 7 (QUIS7)

Technology trial participants were asked for their opinions to statements divided into six groups. Users' agreement with the statements was rated on a 9-point scale from dark red to dark green. The summary figure below shows the mean ratings of 11 HCPs to statements (a-k).

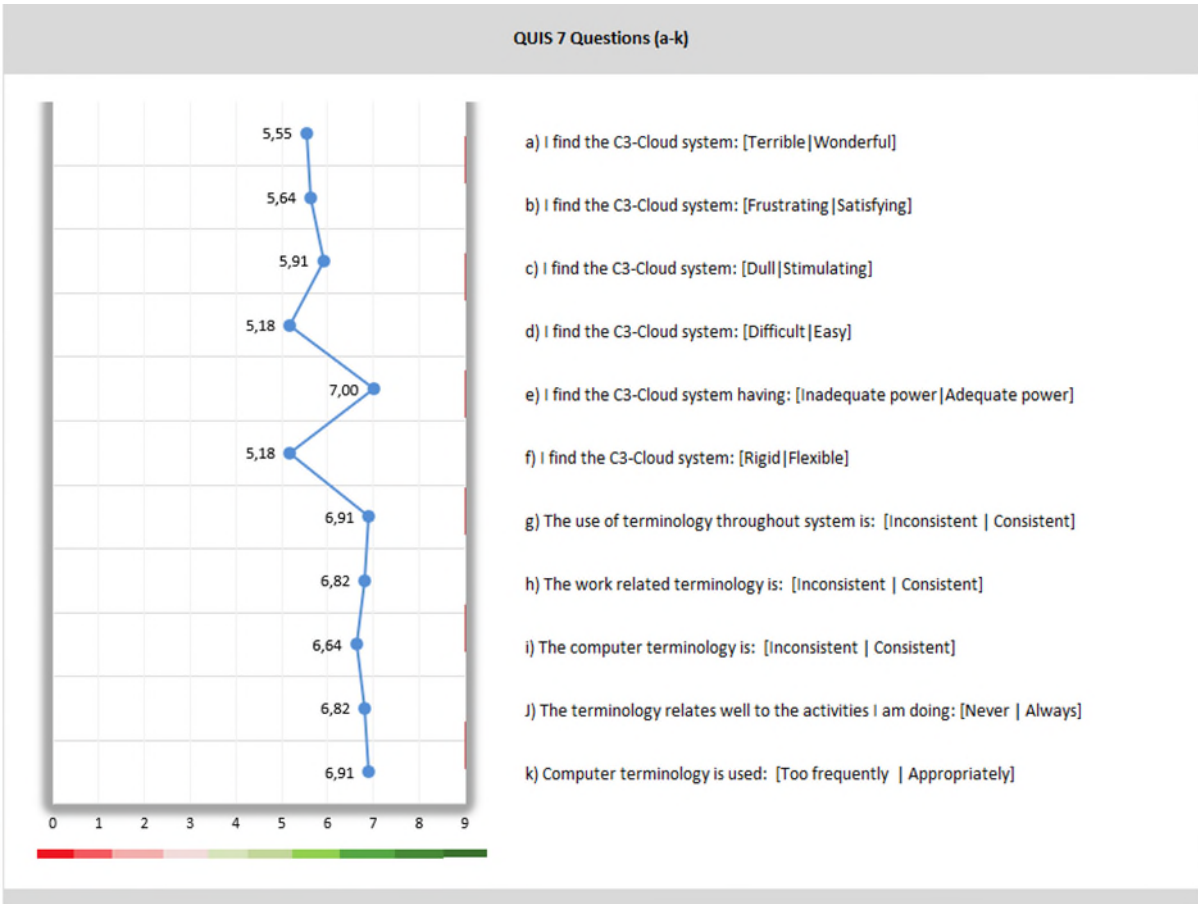


Figure 541 2nd survey for HCP, QUIS7 (a-k)

When asked to rate the C3-Cloud system from “Terrible” (0) to “Wonderful” (9), most respondents were positive, reflected in an average of 5.5 with a standard deviation of 2.1. 27.3% of respondents found the system quite wonderful and 18.2% chose the second highest rating possible. However, more than one fifth of respondents were rather negative. 18.2% rated this statement 3 points, 9.1% gave 2 points. The non-response rate of 35% needs to be considered.

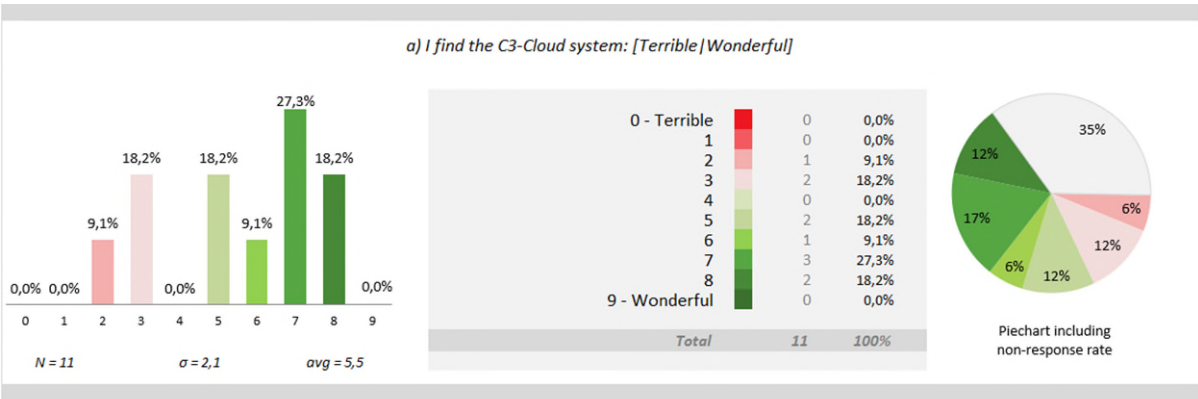


Figure 542 I find the C3-Cloud system: [Terrible|Wonderful]

When asked to rate the C3-Cloud system from “Frustrating” to “Satisfying”, respondents were overall again rather positive with an average of 5.6 and a standard deviation of 2. The peak rating of 27.3% was for 6 points, and 36.4% were even more satisfied with the system. The remaining users were moderately satisfied or found the system somewhat frustrating.

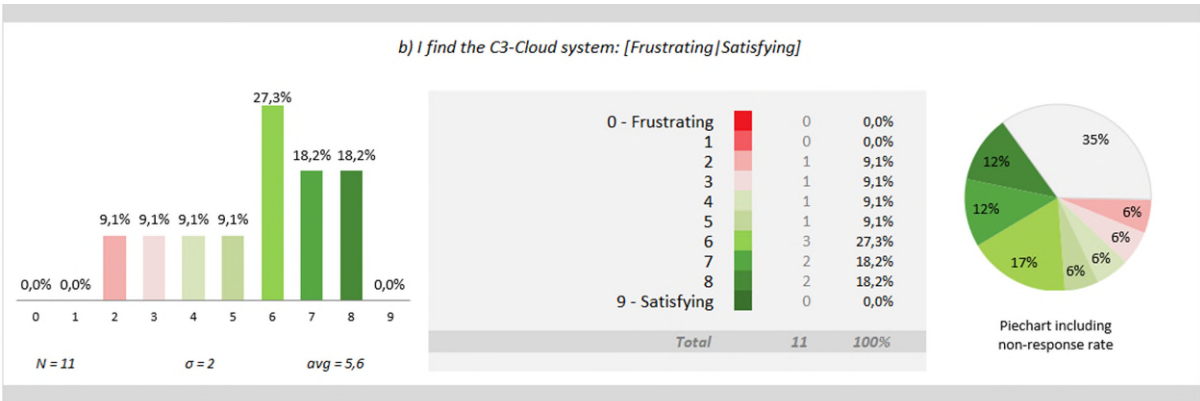


Figure 543 I find the C3-Cloud system: [Frustrating|Satisfying]

On average, respondents found the C3-cloud system quite stimulating (average 5.9; standard deviation 1.9). 27.3% each rated this statement 6 and 7, and 18.2% were very positive. In contrast, 18.2% in total found the system less stimulating and rather dull.

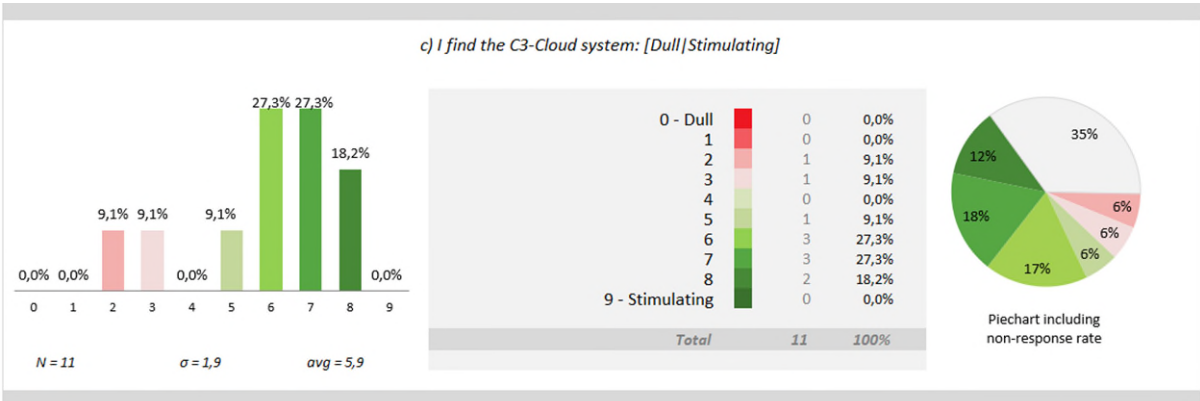


Figure 544 I find the C3-Cloud system: [Dull|Stimulating]

Rating the ease of use from “Difficult” to “Easy”, users tended to find it rather easy. The average rating was 5.2 with a standard deviation of 2. While 18.2% in total found C3-Cloud more difficult, 36.4% rated the ease of use 6, and more than one quarter (27.3%) found it even easier.

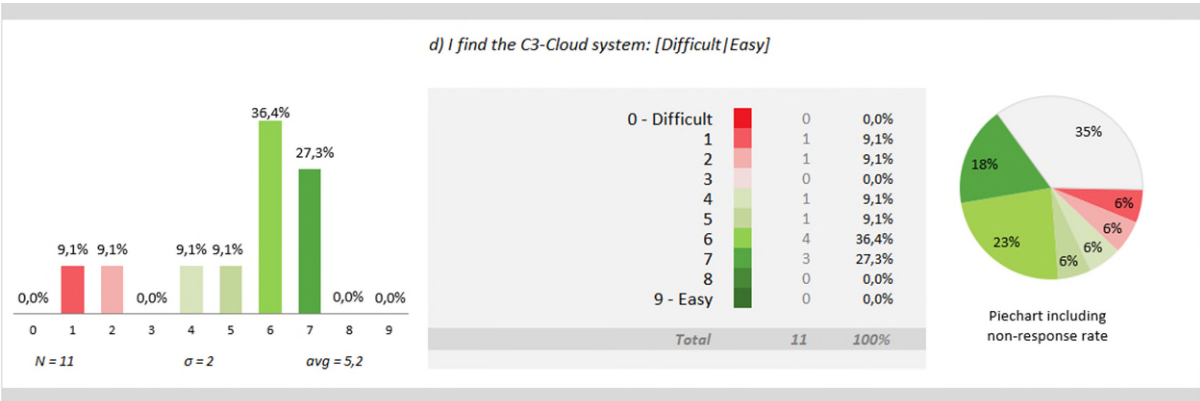


Figure 545 I find the C3-Cloud system: [Difficult|Easy]

When asked to rate the C3-Cloud system’s power from inadequate to adequate, all respondents were positive, resulting in an average rating of 7 and a standard deviation of 1.2. Almost half

(45.4%) believed the power was quite adequate. 18.2% chose the highest rating possible and thus found the power adequate.

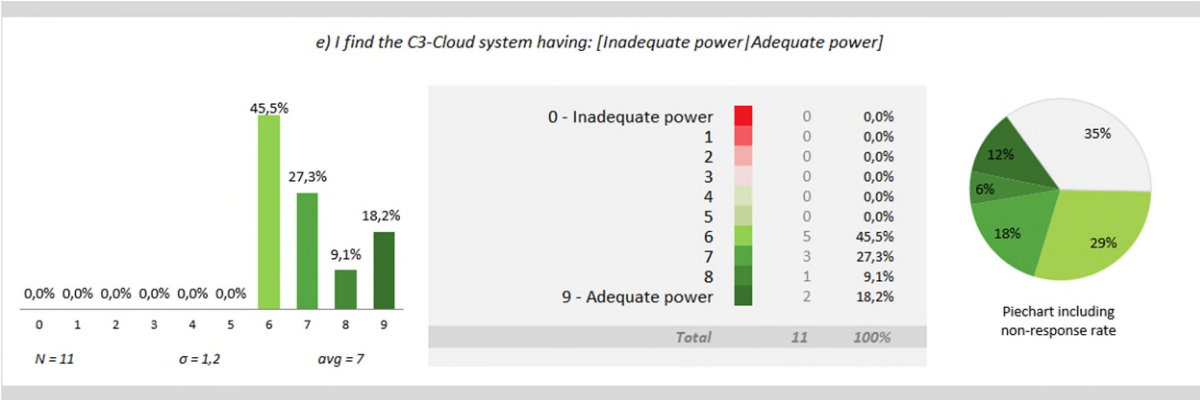


Figure 546 I find the C3-Cloud system having: [Inadequate power|Adequate power]

When asked to rate the C3-Cloud system from “Rigid” to “Flexible”, Technology trial participants were moderately positive with an average of 5.2 and a standard deviation of 2.1. More than one third (36.4%) were quite positive about the flexibility and 27.3% were somewhat positive. In contrast, 27.3% in total perceived it negatively and found the system more rigid.

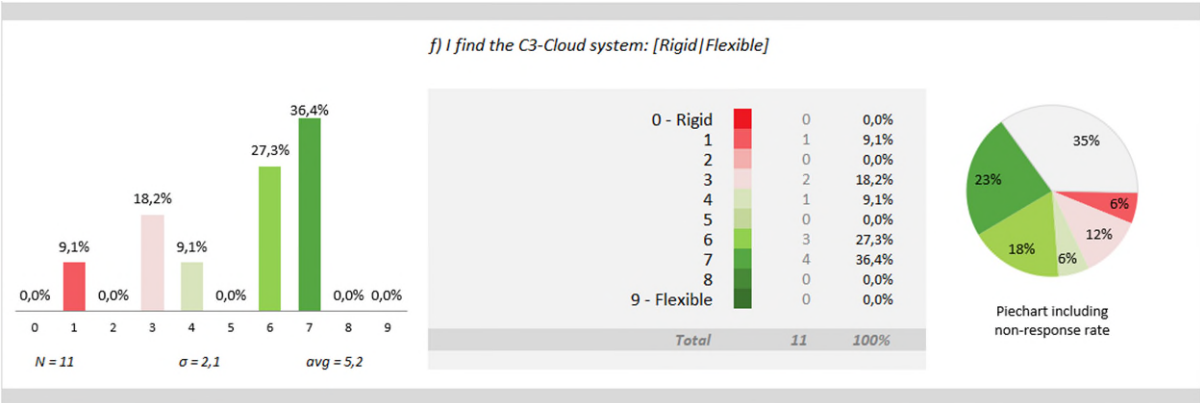


Figure 547 I find the C3-Cloud system: [Rigid|Flexible]

Respondents were quite positive about the consistency of the terminology used throughout the system (average 6.9; standard deviation 1.8). 18.2% of users chose the highest rating and found it consistent, while 9.1% of respondents found it slightly inconsistent.

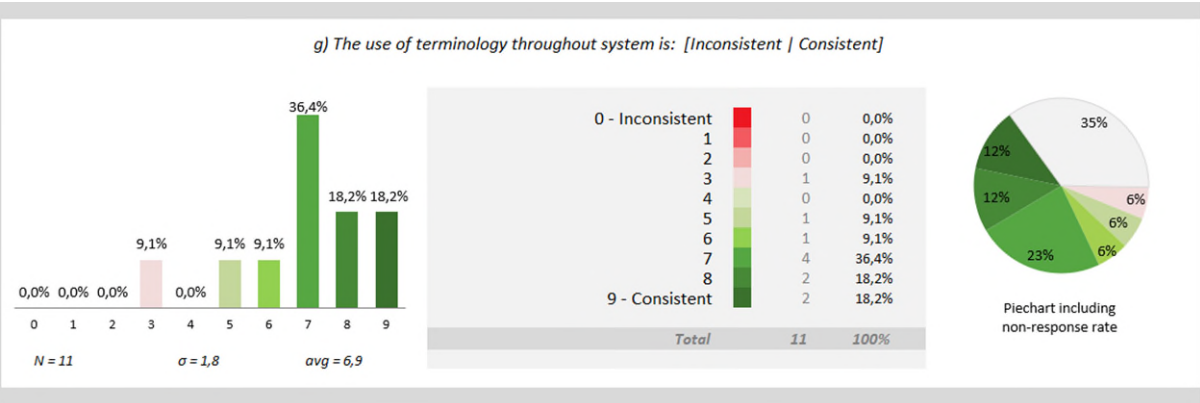


Figure 548 The use of terminology throughout the system is: [Inconsistent|Consistent]

Concerning the terminology related to their work, HCPs found it quite consistent (average 6.8; standard deviation 1.7). No respondent was negative and perceived the work-related terminology to be inconsistent.

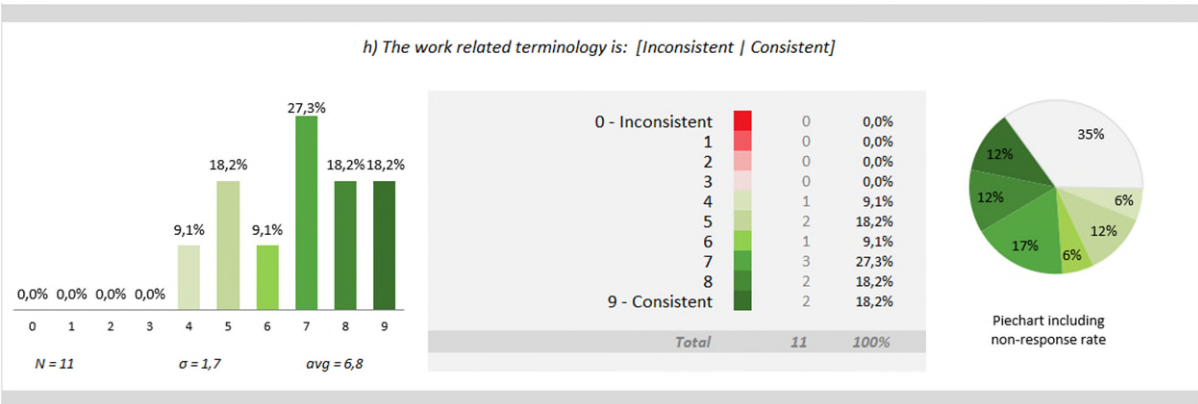


Figure 549 The work-related terminology is: [Inconsistent|Consistent]

Concerning the consistency of the computer terminology, all Technology trial participants were positive and rated it from 4 (18.2%) to 9 (9.1%). On average, respondents found the computer terminology quite consistent (6,6; standard deviation 1.6).

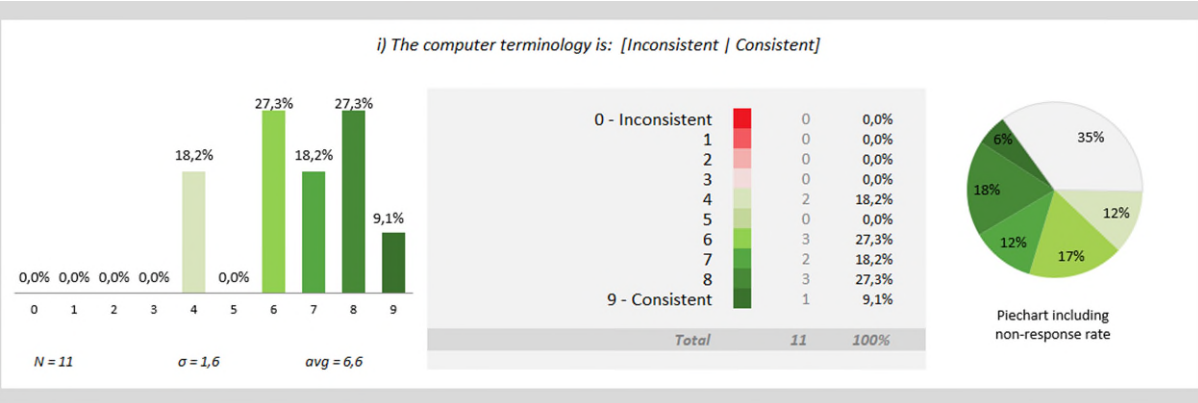


Figure 550 The computer terminology is: [Inconsistent|Consistent]

When asked how often the terminology related well to Technology trial participants' activities, no respondent indicated a negative experience. 36.4% of HCPs found that the terminology most of the time related well to the activities they were doing. The average rating was 6.8 with a standard deviation of 1.3.

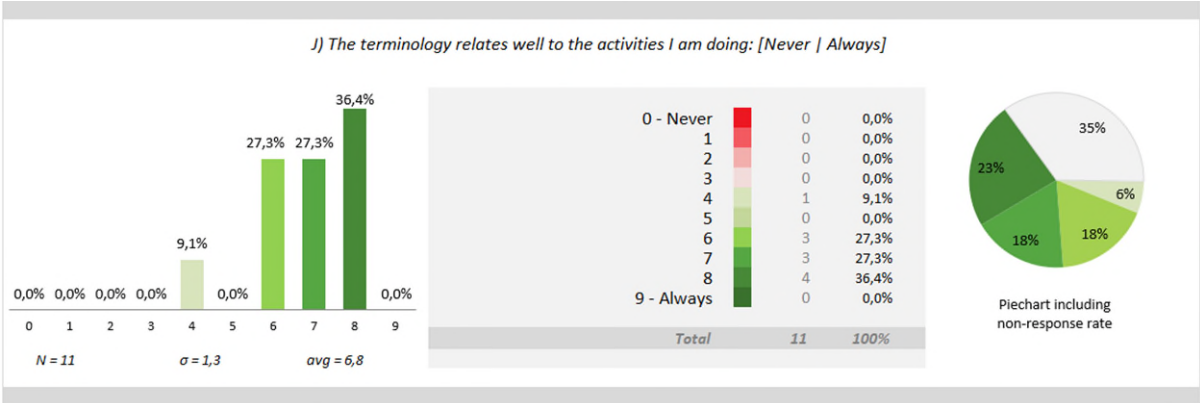


Figure 551 The terminology relates well to the activities I am doing: [Never|Always]

All Technology trial participants found that computer terminology was used rather appropriately and not too frequently with an average rating of 6.9 and a standard deviation of 1.3. 9.1% found the computer terminology appropriate, followed by 27.3 respondents who chose the second highest rating.

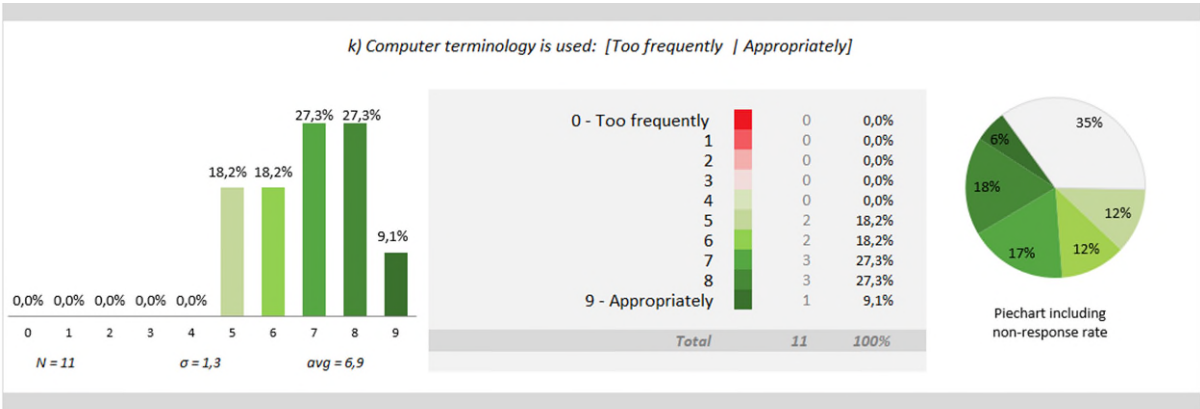


Figure 552 Computer terminology is used: [Too frequently|Appropriately]

The summary figure below displays the mean ratings of 11 respondents to questions (l-v).

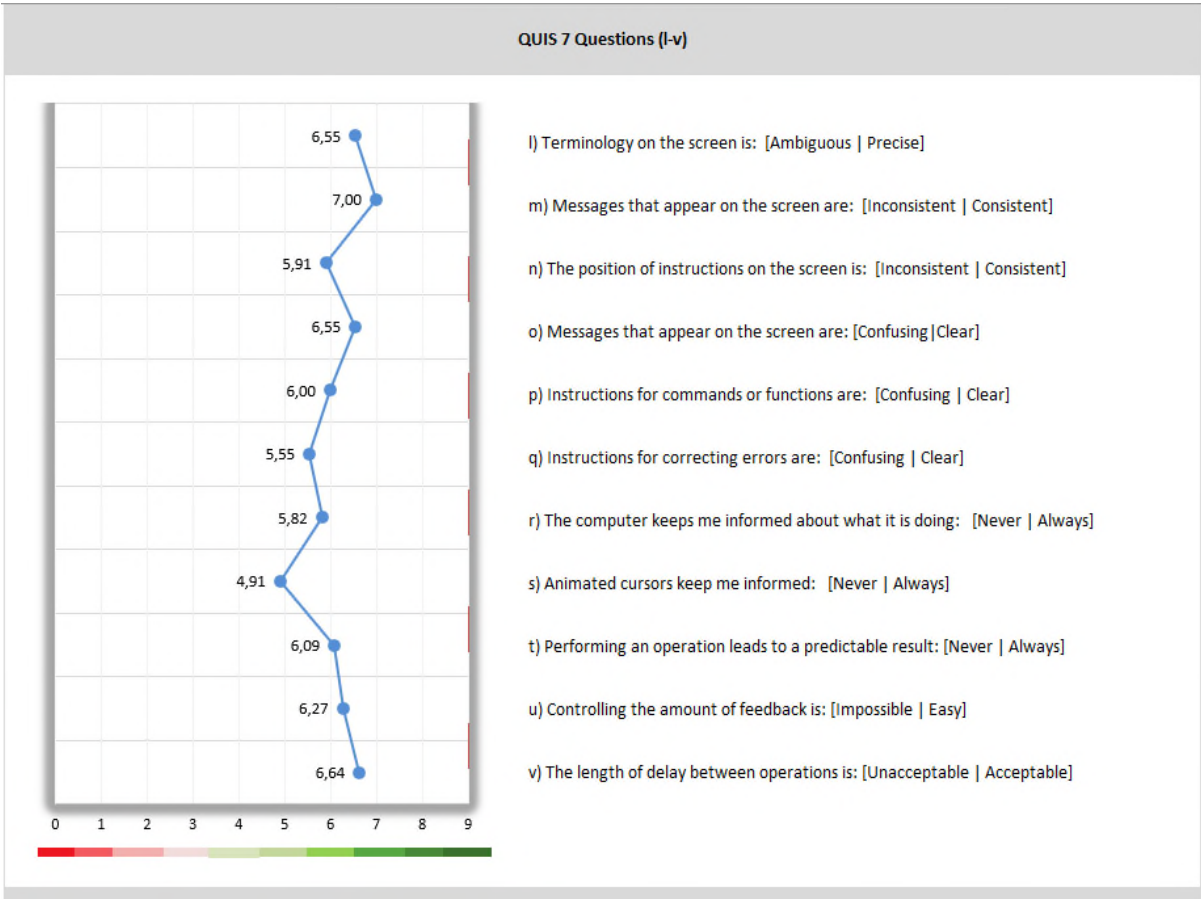


Figure 553 2nd survey for HCP, QUIS7 (I-v)

When asked to rate the terminology on the screen from “Ambiguous” (0) to “Precise” (9), almost all HCPs were rather positive. One respondent (9.1%) found the terminology on the screen quite ambiguous while another respondent found it precise and chose the highest rating. 36.4% found it rather precise and chose 7 points. The average rating was 6.5 with a standard deviation of 2.3. Notably, the non-response rate was 35%.

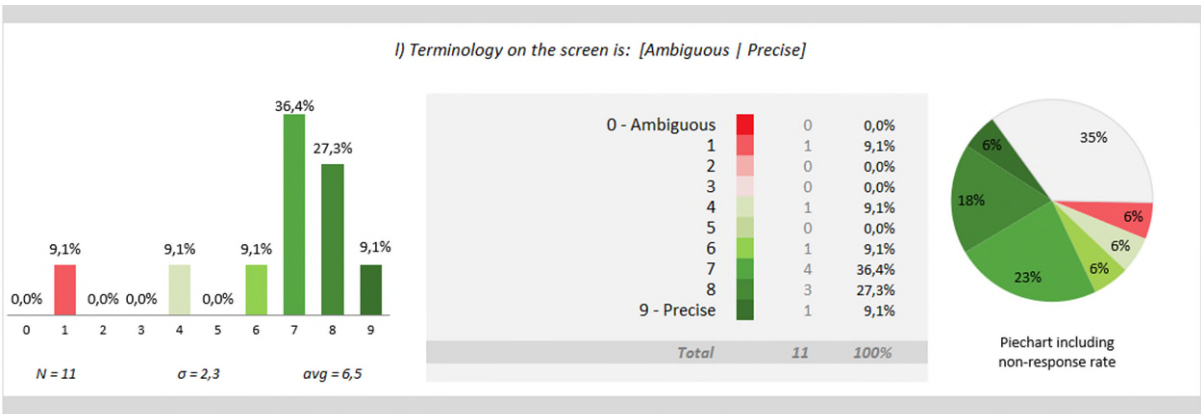


Figure 554 Terminology on the screen is: [Ambiguous|Precise]

Regarding the consistency of messages appearing on the screen, all except one test user found it rather consistent (6) to consistent (9). The peak of 36.4% was the second highest rating, while one respondent (9.1%) found the messages somewhat inconsistent. This resulted in an average rating of 7 and a standard deviation of 1.6.

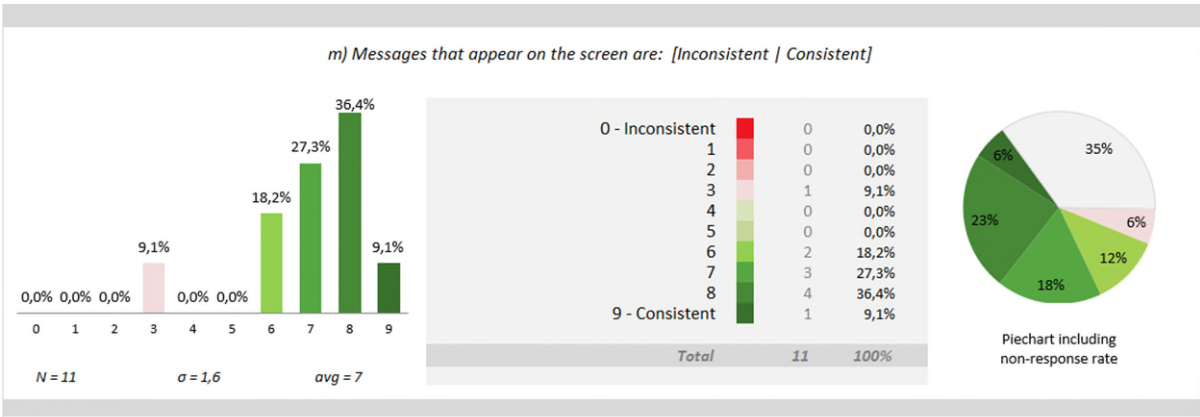


Figure 555 Messages that appear on the screen are: [Inconsistent|Consistent]

When asked about the consistency of the positions of instructions on the screen, respondents had overall positive opinions, but to different degrees. While the majority rated the consistency from 5 (18.2%) to 9 (9.1%), one respondent each (9.1%) found the position of instructions somewhat inconsistent and quite inconsistent. The average rating was 5.9 with a standard deviation of 2.3.

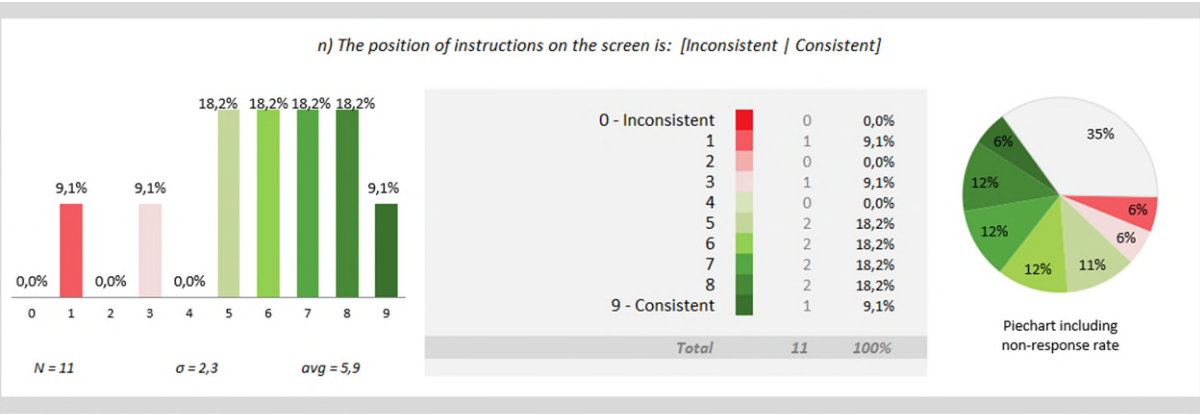


Figure 556 The position of instructions on the screen is: [Inconsistent|Consistent]

Considering the clarity of messages appearing on the screen, users found it overall rather clear (average 6.5; standard deviation 1.8). 18.2% of respondents chose the highest rating and found the messages clear while 9.1% found them somewhat confusing. The remaining users were positive, and the peak rating was 27.3% for 7 points.

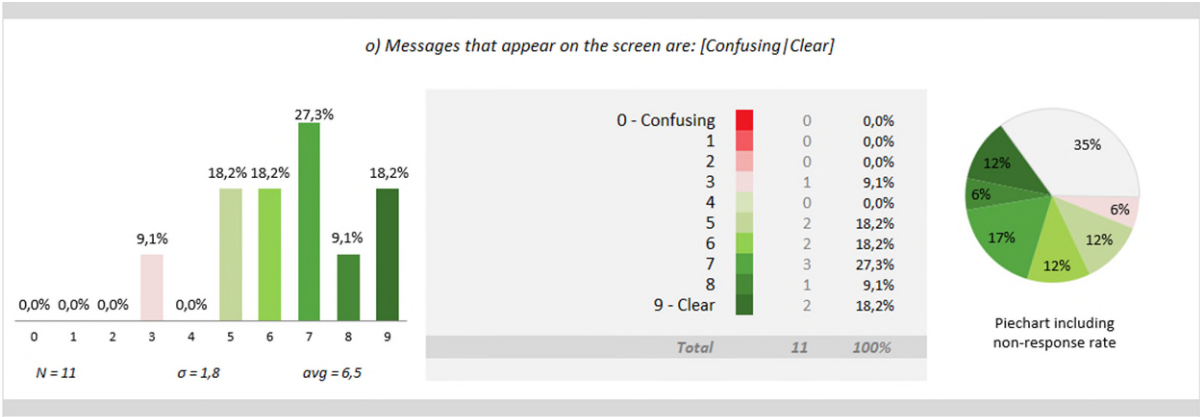


Figure 557 Messages that appear on the screen are: [Confusing|Clear]

When asked to rate the instructions for commands or functions from “Confusing” to “Clear”, respondents found them on average rather clear (average 6; standard deviation 2.4). More than one third gave 6 points and 18.2% gave the highest rating. However, 9.1% each found the instructions for commands or functions somewhat confusing and quite confusing.

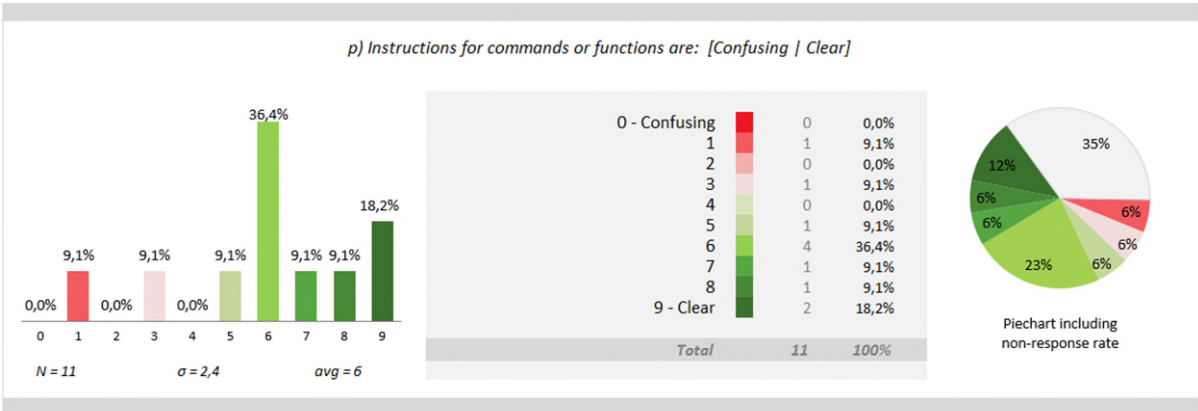


Figure 558 Instructions for commands or functions are: [Confusing|Clear]

Concerning the clarity of instructions for correcting errors, respondents were overall moderately positive (average 5.5; standard deviation 2.2). While the majority rated the clarity between 5 (27.3%) and 9 (9.1%), 9.1% each found the instructions for correcting errors somewhat confusing and quite confusing.

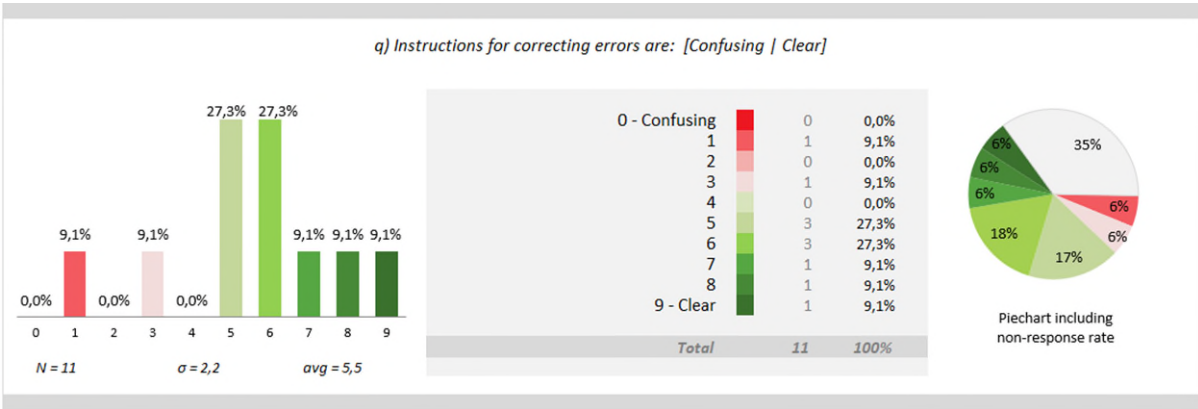


Figure 559 Instructions for correcting errors are: [Confusing|Clear]

When asked how often the computer kept users informed about what it was doing from “Never” to “Always”, respondents had diverse opinions but tended to be informed rather frequently (average 5.8; standard deviation 2.8). Although few users were almost never informed about what the computer was doing (18.2%), the remaining respondents were positive and 18.2% indicated to be always kept informed.

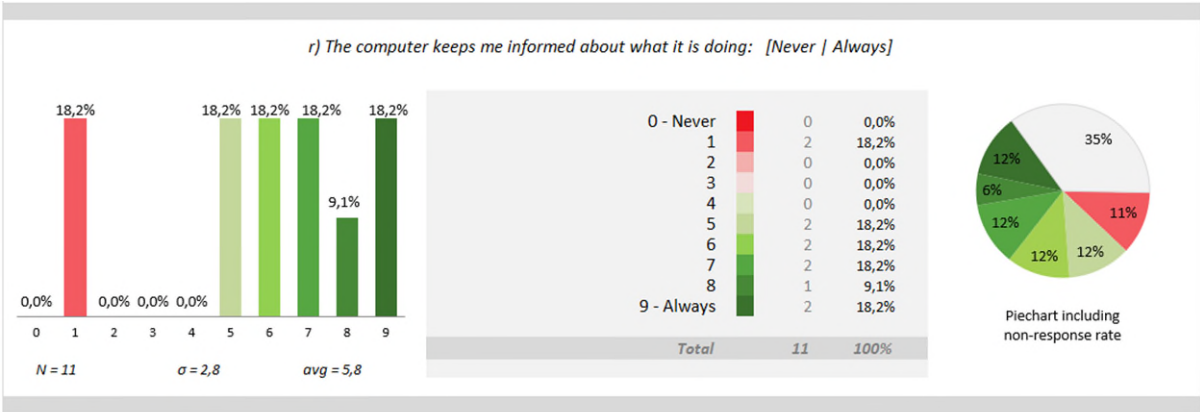


Figure 560 The computer keeps me informed about what it is doing: [Never|Always]

When asked how often animated cursors kept users informed, HCPs were on average sometimes informed (average 4,9; standard deviation 2.8). However, 27.3% in total had negative experiences. The peak rating of 27.3% was given for 6 points and 9.1% of respondents were always kept informed by animated cursors.

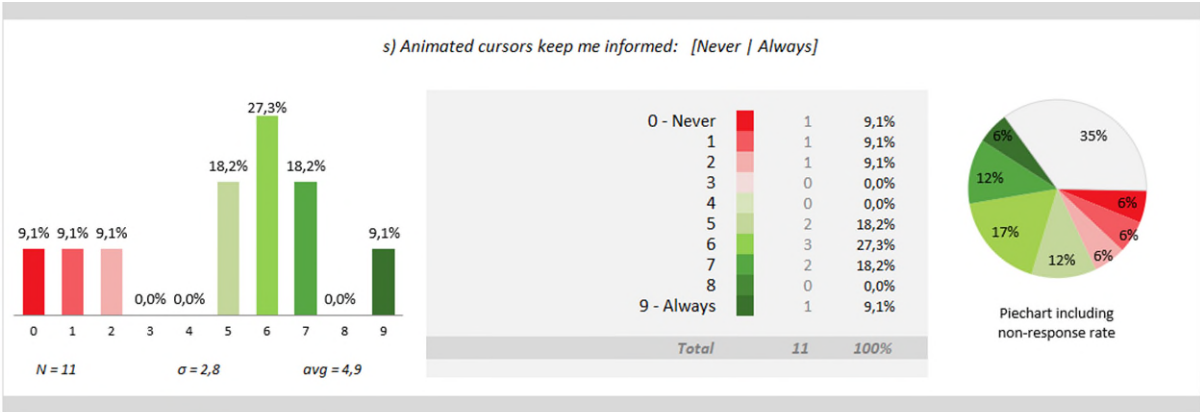


Figure 561 Animated cursors keep me informed: [Never|Always]

When asked how often performing an operation led to a predictable result from “Never” to “Always”, almost all participants found sometimes to always, resulting in an average rating of 6.1 with a standard deviation of 1.9. While one respondent (9.1%) found that performing an operation hardly led to a predictable result, 9.1% each found that it always and almost always led to a predictable result.

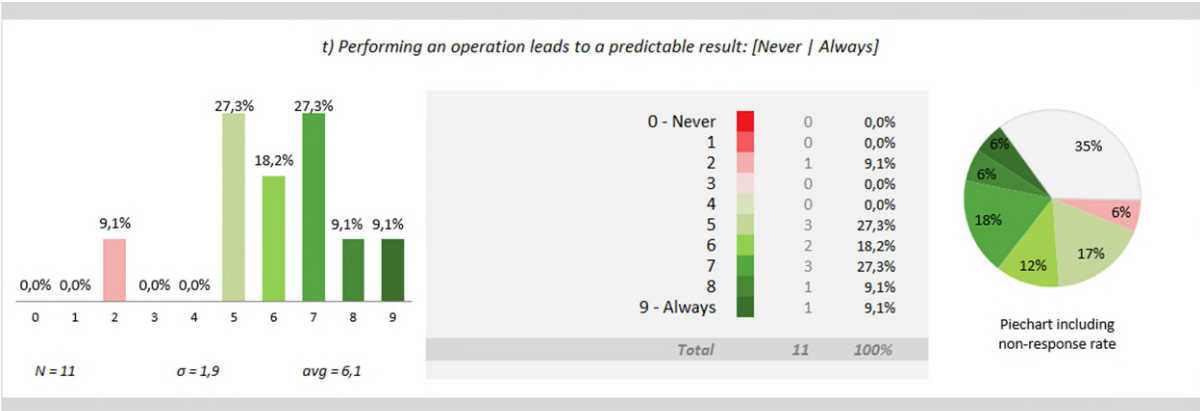


Figure 562 Performing an operation leads to a predictable result: [Never|Always]

Regarding the ease of controlling the amount of feedback, respondents found it overall rather easy with an average rating of 6.3 and a standard deviation of 1.6. One respondent (9.1%) experienced problems and found it somewhat impossible, but the remaining users were positive. More than one quarter of respondents each chose 6 and 7 points.

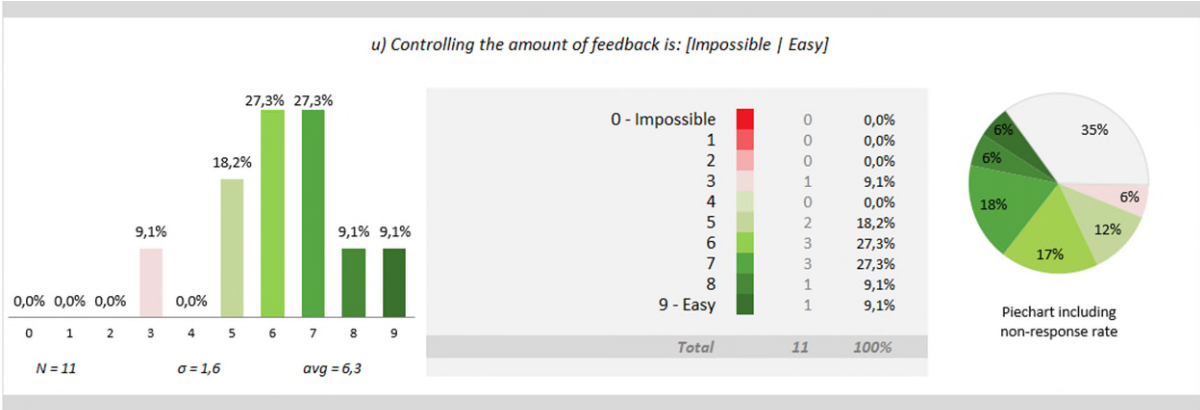


Figure 563 Controlling the amount of feedback is: [Impossible|Easy]

When asked to rate the length of delay between operations from “Unacceptable” to “Acceptable”, only one respondent considered it somewhat unacceptable (9.1%). The remaining participants were positive and 36.4% chose the third highest rating possible. With an average rating of 6.6 and a standard deviation of 1.6, Technology trial participants found the length of delay between operations overall rather acceptable.

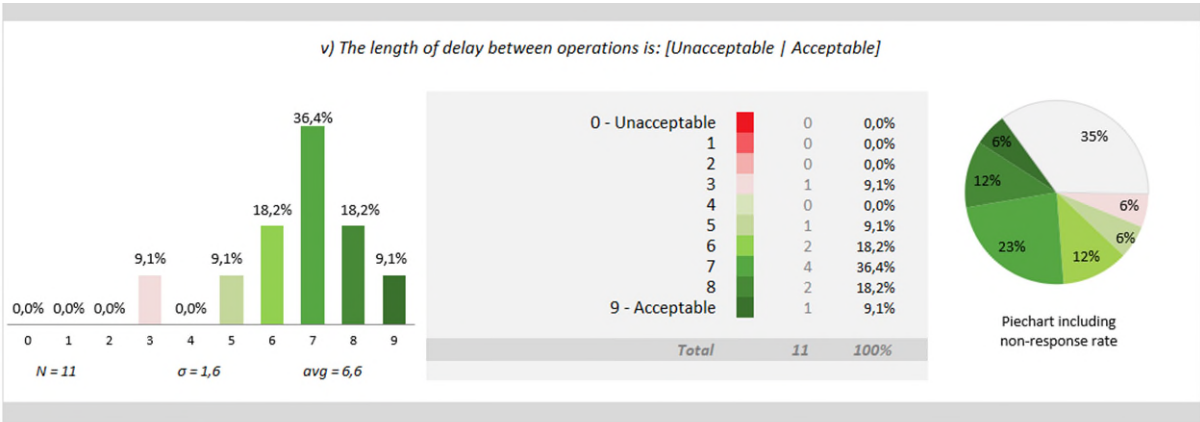


Figure 564 The length of delay between operations is: [Unacceptable|Acceptable]

The figure below shows the mean ratings to statements (w-ag). Except for statement (z), which was rated by 10 respondents, 11 Technology trial participants submitted their ratings to this group.

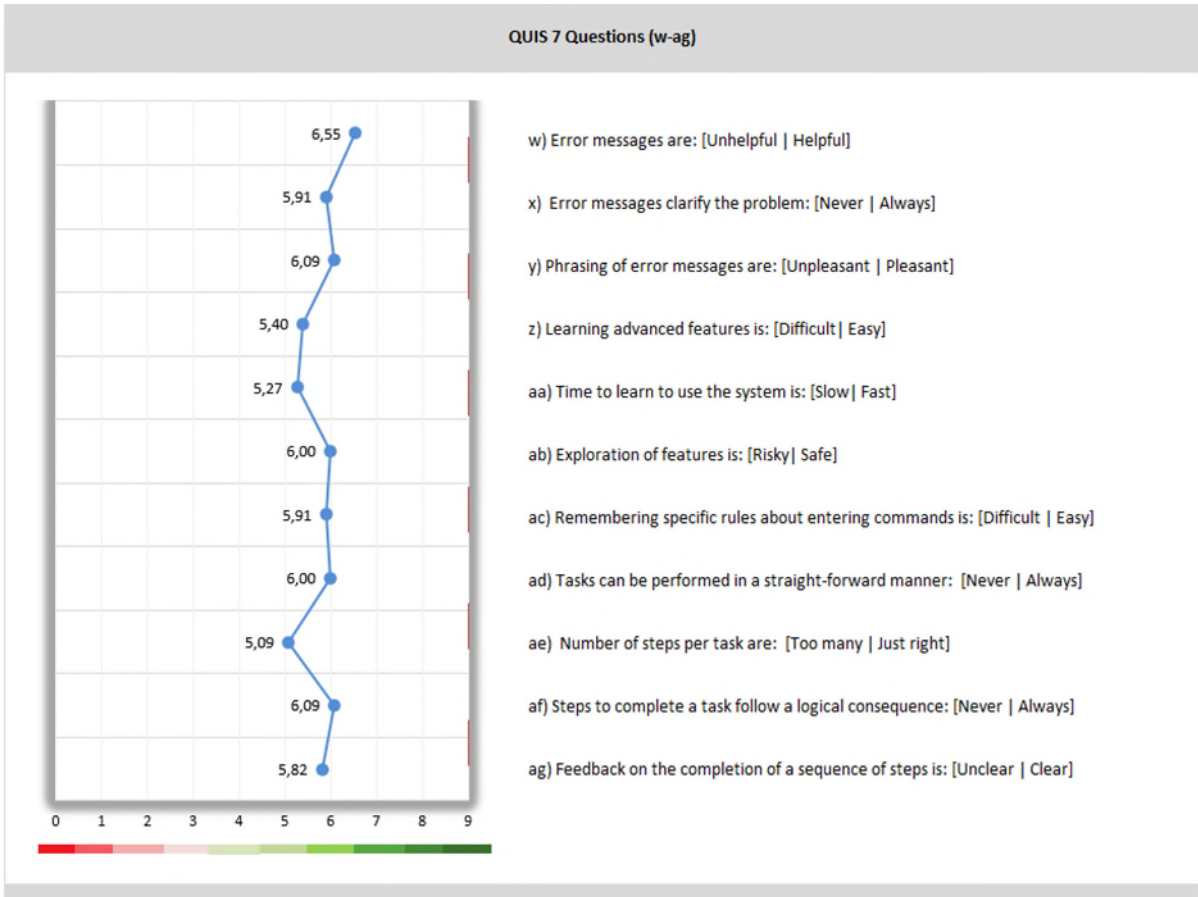


Figure 565 2nd survey for HCP, QUIS7 (w-ag)

When asked how helpful they found error messages from “Unhelpful” to “Helpful”, most HCPs was positive and provided ratings from 5 (18.2%) to 9 (18.2%). 36.4% of respondents found error messages quite helpful, reflecting the average rating of 6.5 with a standard deviation of 2. However, one respondent (9.1%) found error messages rather unhelpful. The 35% non-response needs to be considered.

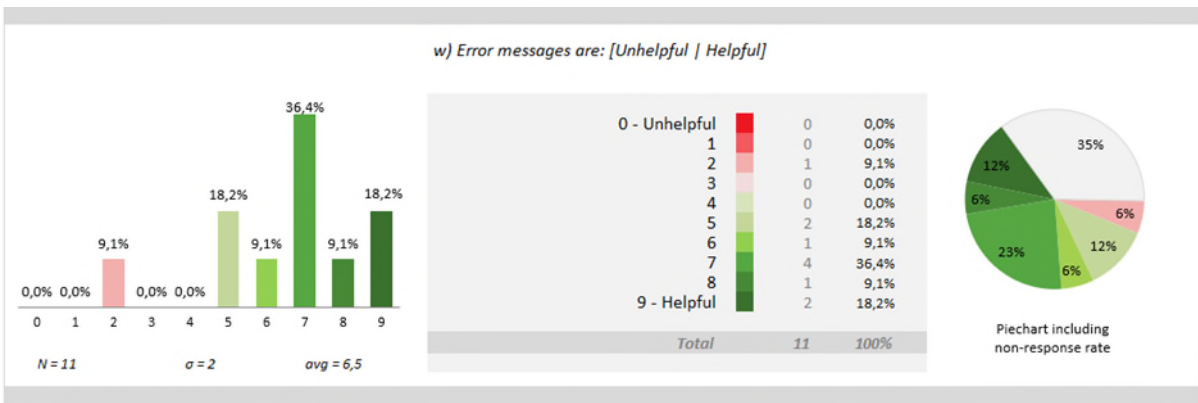


Figure 566 Error messages are: [Unhelpful|Helpful]

Respondents were on average moderately positive about how often error messages clarified the problem (average 5.9; standard deviation 1.6). 36.4% indicated that error messages sometimes clarified the problem, 27.3% found that they usually clarified the problem, and 9.1% found that

they always clarified the problem. One respondent (9.1%), however, had more negative experiences.

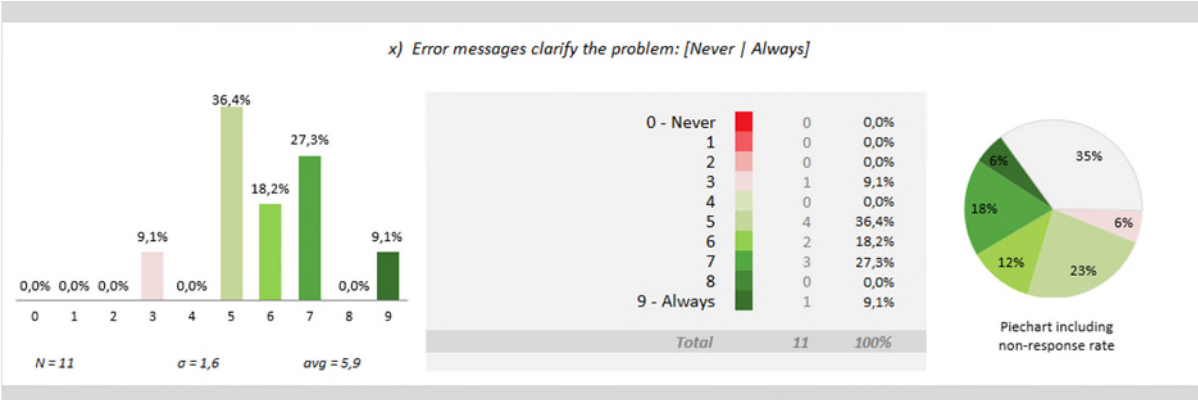


Figure 567 Error messages clarify the problem: [Never|Always]

Concerning the phrasing of error messages, Technology trial participants regarded it was overall rather pleasant (average 6.1; standard deviation 1.5). While 9.1% found the phrasing somewhat unpleasant, 36.4% chose a moderately positive rating of 6, and 27.3% rated the phrasing with 7 points.

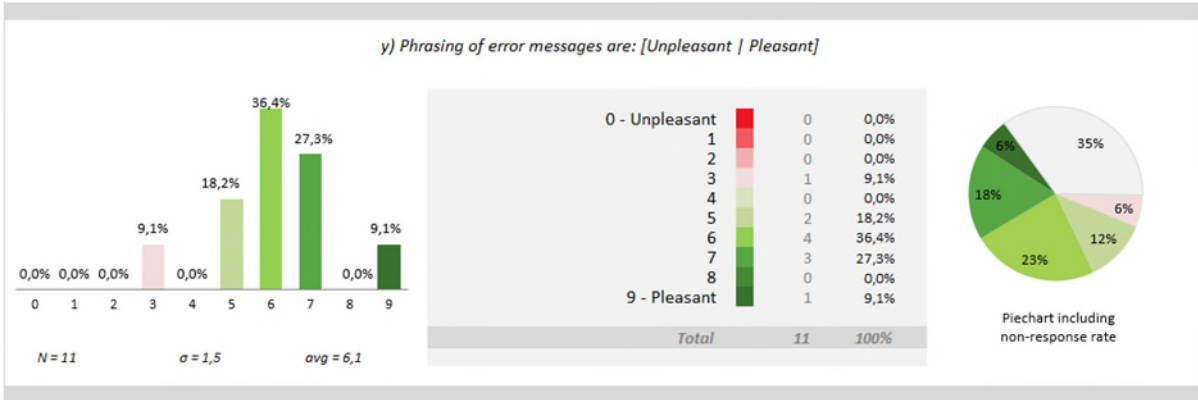


Figure 568 Phrasing of error messages are: [Unpleasant|Pleasant]

Although 40% of the 10 respondents found that learning advanced features was rather easy, and one fifth considered it quite easy, the average rating of 5.4 (standard deviation 2.3) indicated only a slightly positive tendency. 10% of Technology trial participants each found learning advanced features difficult and somewhat difficult, and no respondent regarded it easy. Notably, the non-response rate was 41%.

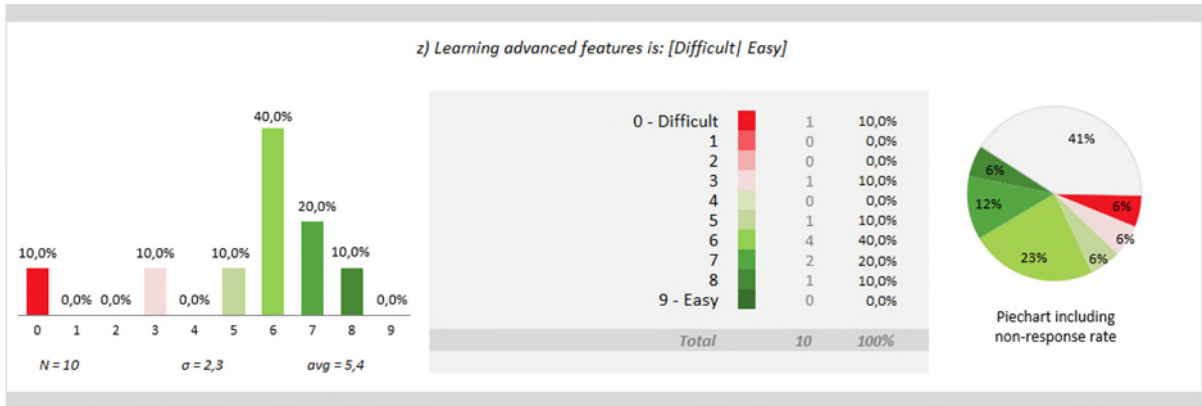


Figure 569 Learning advanced features is: [Difficult|Easy]

When asked to rate the time to learn to use the system from “Slow” to “Fast”, respondents showed on average a neutral to slightly positive opinion (average 5.3; standard deviation 1.8). Almost half of the Technology trial participants (45.5%) found the time to learn to use the system rather fast. However, 18.2% regarded that the time required was somewhat slow, and 9.1% found it quite slow. The non-response rate was 35%.

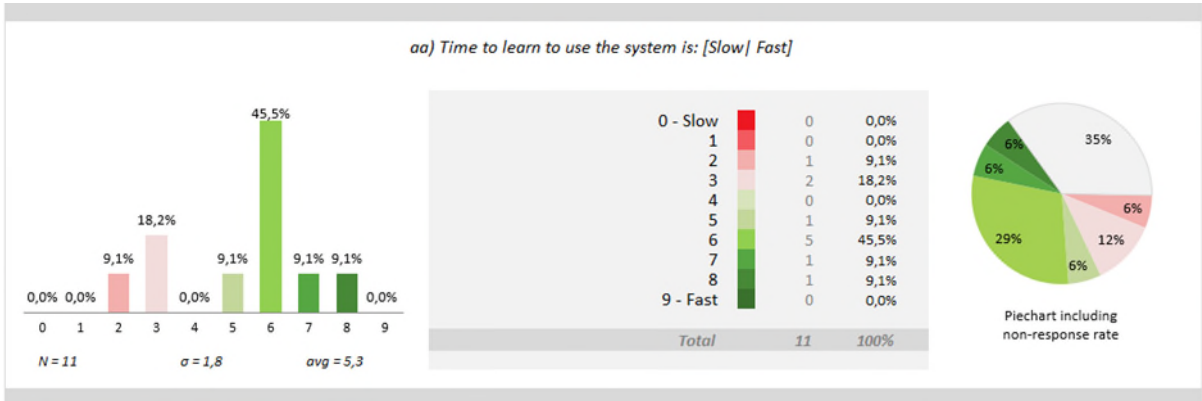


Figure 570 Time to learn to use the system is: [Slow|Fast]

Concerning the safety of exploring features, 18.2% found it somewhat risky, while most Technology trial participants found the exploration of features rather safe. 9.1% of respondents each chose the highest and second highest rating, followed by 27.3% of respondents each rating the safety with 7 and 6 points. This resulted in an average rating of 6 with a standard deviation of 2.

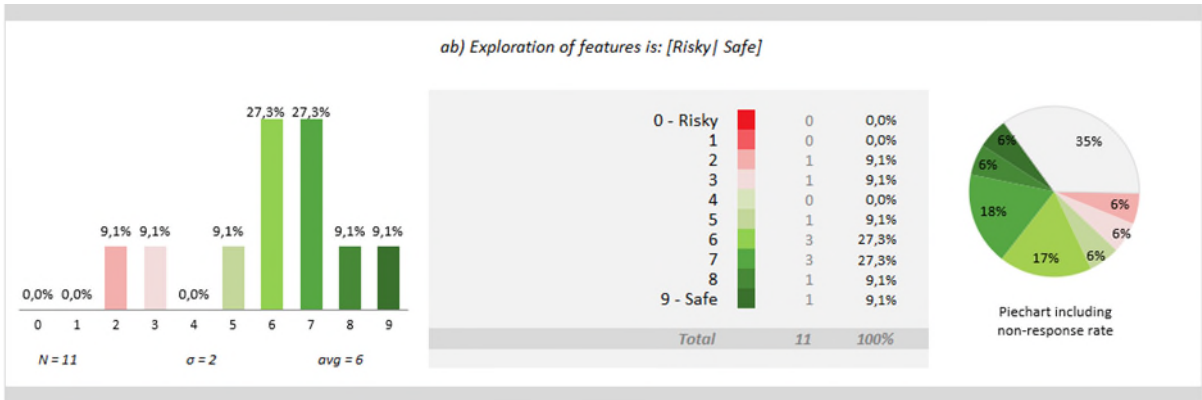


Figure 571 Exploration of features is: [Risky|Safe]

When asked how difficult it was to remember specific rules about entering commands, more than one third of respondents (36.4%) considered it rather easy. While 9.1% experienced no difficulties at all and found it easy, 9.1% each perceived it difficult and somewhat difficult. On average, respondents were slightly positive with a rating of 5.9 and a standard deviation of 2.5.

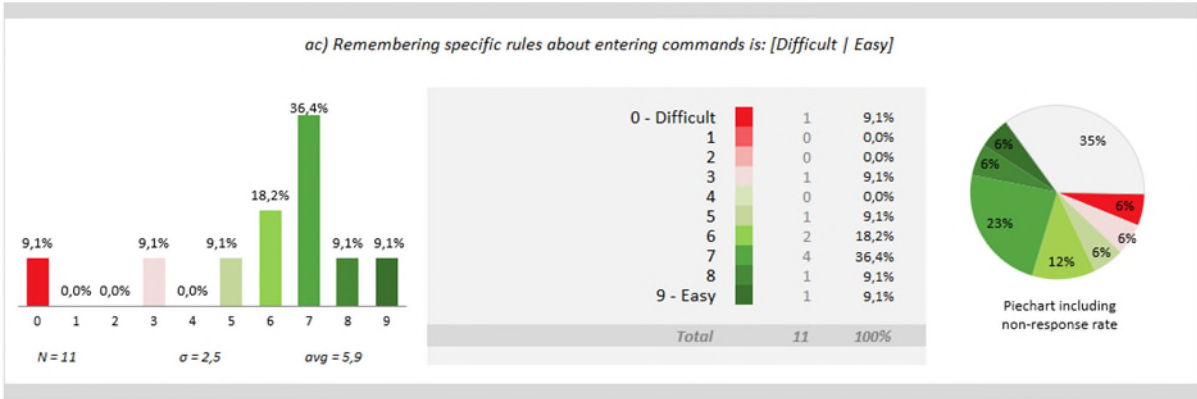


Figure 572 Remembering specific rules about entering commands is: [Difficult|Easy]

Considering how often tasks could be performed in a straight-forward manner from “Never” to “Always”, 36.4% experienced that this was usually the case, and 18.2% experienced it almost always. However, 18.2% of Technology trial participants were more negative, although no respondent indicated that performing tasks in a straight-forward manner was never possible. This resulted in an average rating of 6 and a standard deviation of 1.9.

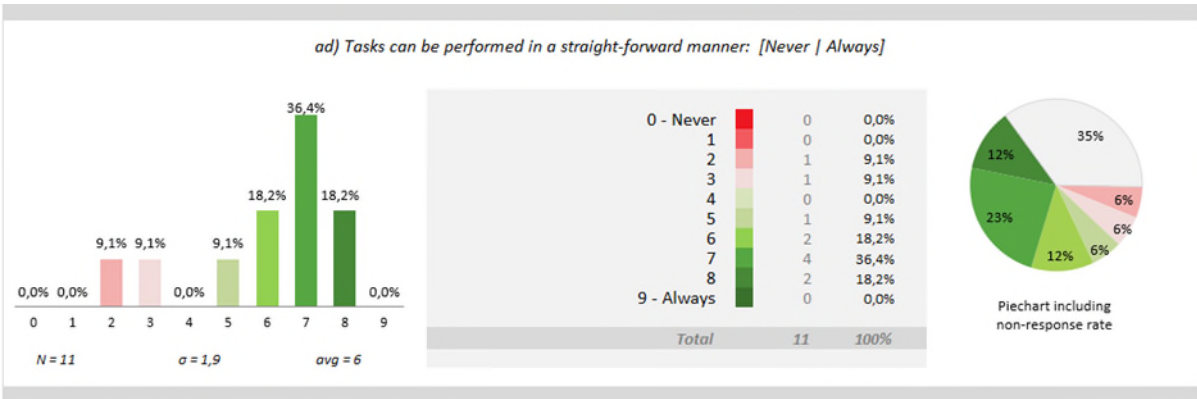


Figure 573 Tasks can be performed in a straight-forward manner: [Never|Always]

When asked whether the number of steps per task was adequate, Technology trial participants had mixed opinions. 27.3% of respondents considered the number of steps per task rather adequate and 18.2% quite adequate. 27.3% in total indicated that the number of steps per task taken should be decreased, while the remaining respondents tended to be more positive. The average rating of 5.1 was neutral to moderately positive with a standard deviation of 2.3.

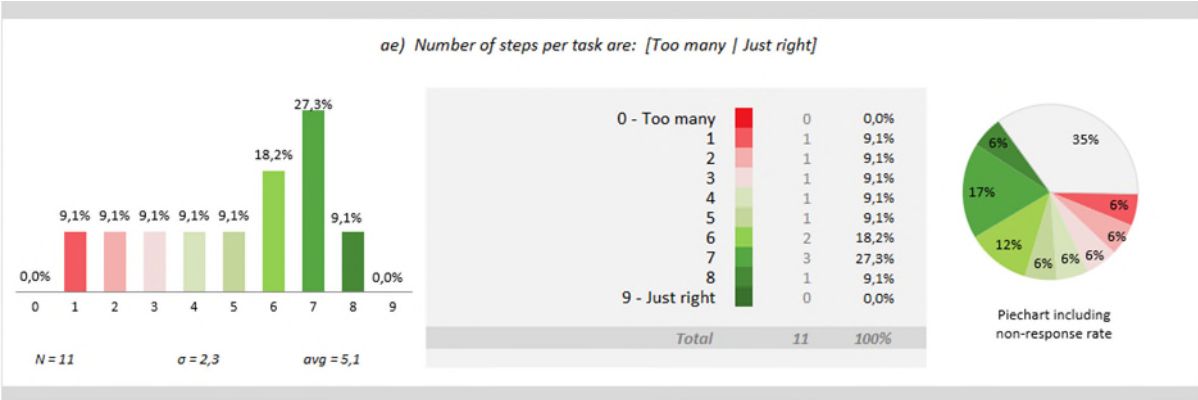


Figure 574 Number of steps per task are: [Too many|Just right]

When asked how often steps to complete a task were logically sequenced, more than half of the Technology trial participants indicated that this was usually the case (54.5%), and one respondent found that steps were always logically ordered. 18.2%, however, had fewer positive experiences. On average, this statement was rated 6.1 with a standard deviation of 2.

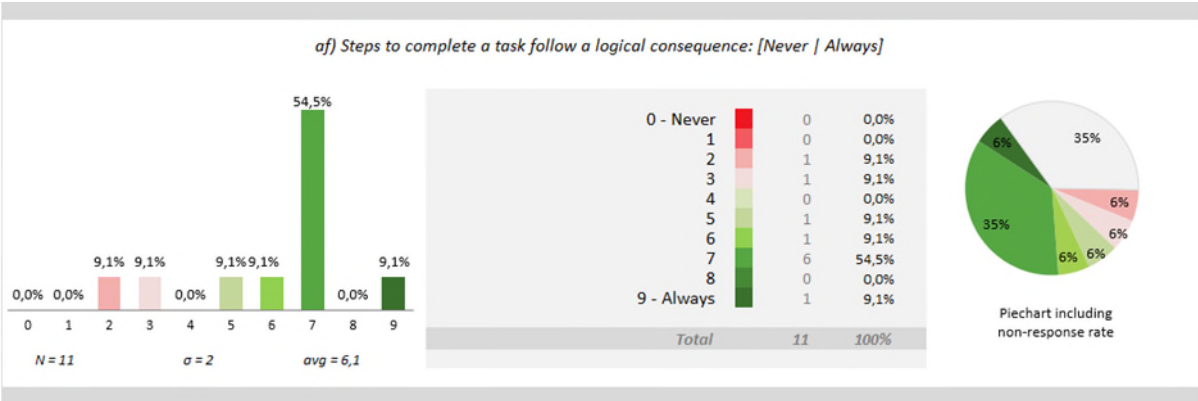


Figure 575 Steps to complete a task follow a logical consequence: [Never|Always]

Regarding the clarity of feedback on the completion of a sequence of steps, 18.2% believed it was rather unclear. The remaining Technology trial participants found the feedback clearer and almost half (45.5%) considered it quite clear. The average rating of 5.8 (standard deviation 2.2) indicates a positive tendency.

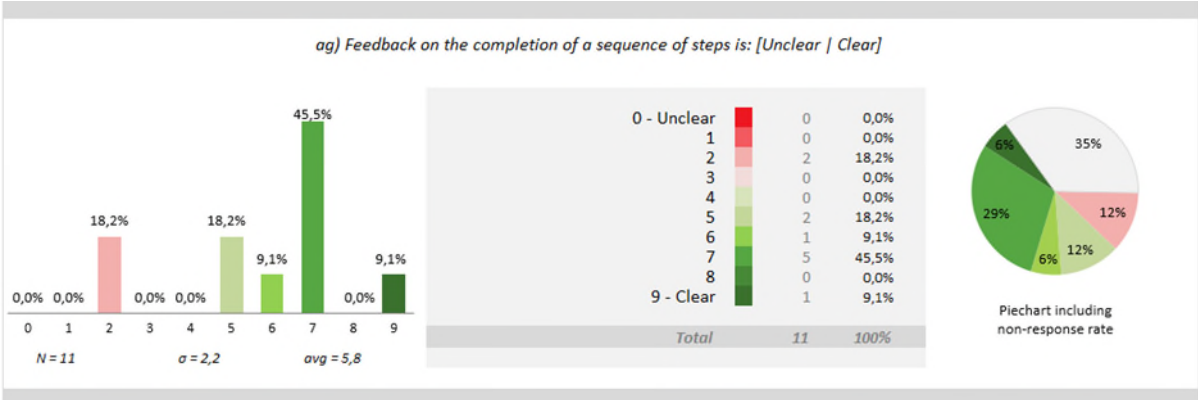


Figure 576 Feedback on the completion of a sequence of steps is: [Unclear|Clear]

The summary figure below presents the mean ratings to statements (ah-ar).

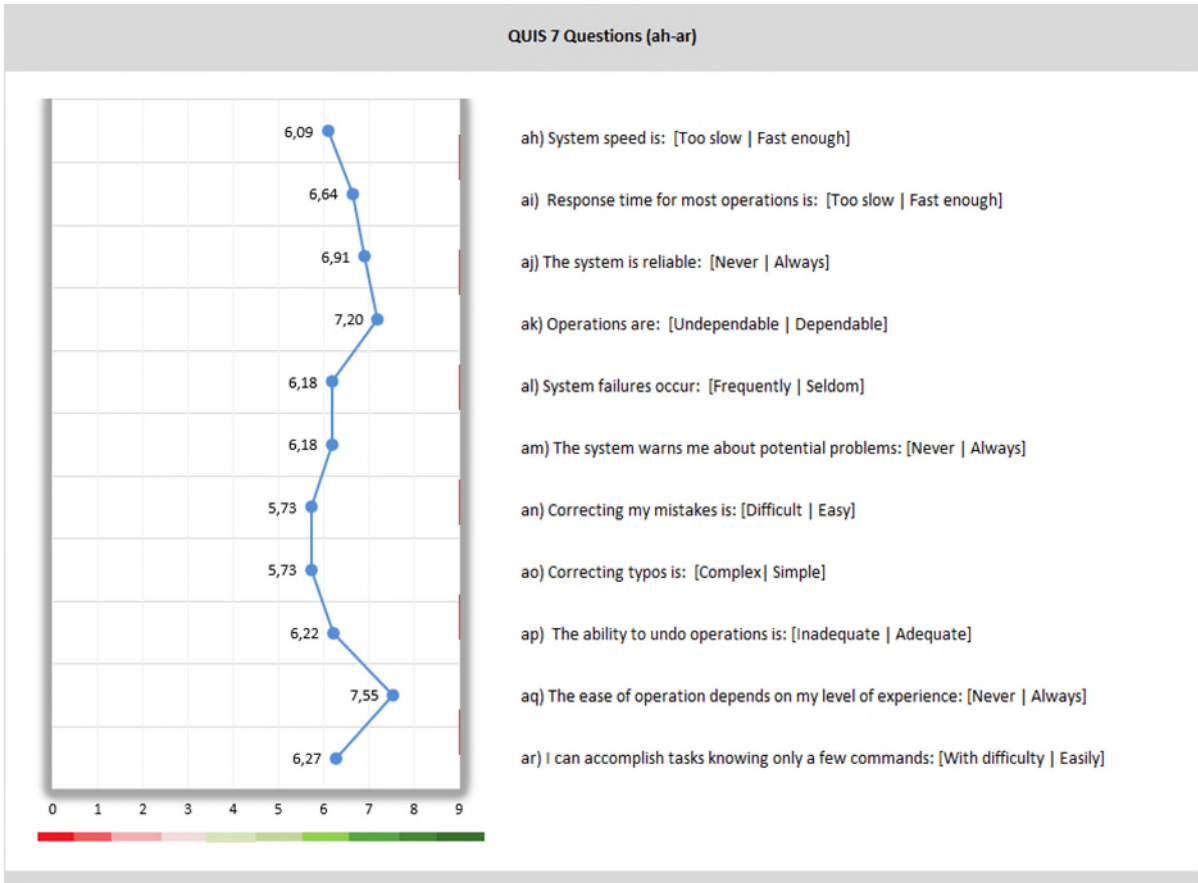


Figure 577 2nd survey for HCP, QUIS7 (ah-ar)

When asked to rate the system speed from “Too slow” to “Fast enough”, all except one respondent, who found the system speed somewhat slow, submitted a positive rating. The peak rating of 36.4% was noted for 7 points, suggesting that more than one third found the system speed almost fast enough. The average rating was 6.1, the standard deviation 1.4 and the non-response rate 35%.

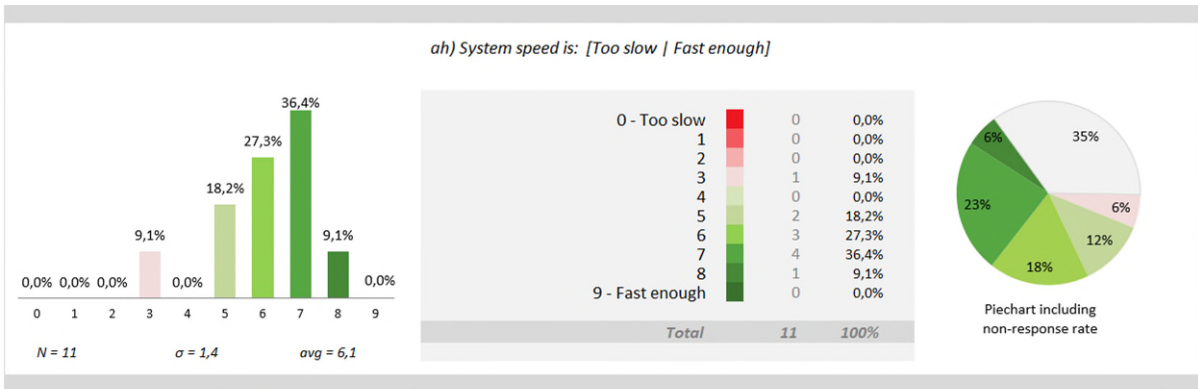


Figure 578 System speed is: [Too slow|Fast enough]

Regarding the response time for most operations from “Too slow” to “Fast enough”, all Technology trial participants indicated a positive experience. Almost half of respondents (45.5%) chose the third highest rating and 18.2% the second highest rating. This resulted in an average rating of 6.6 with a standard deviation of 1.

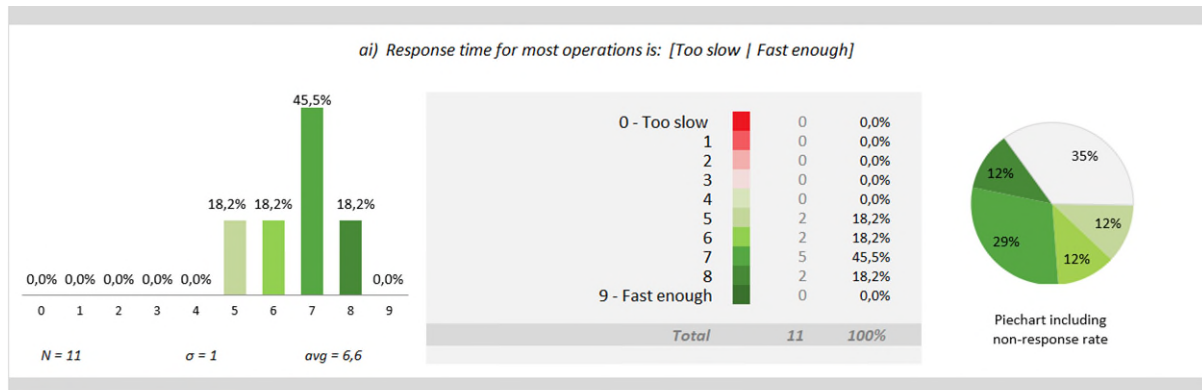


Figure 579 Response time for most operations is: [Too slow|Fast enough]

When asked how often the system was reliable, no test user had a negative perception. 45.5% of respondents indicated that the system was usually reliable, 18.2% found it almost always reliable and 9.1% considered it always reliable. On average, the system reliability was rated 6.9 with a standard deviation of 1.3.

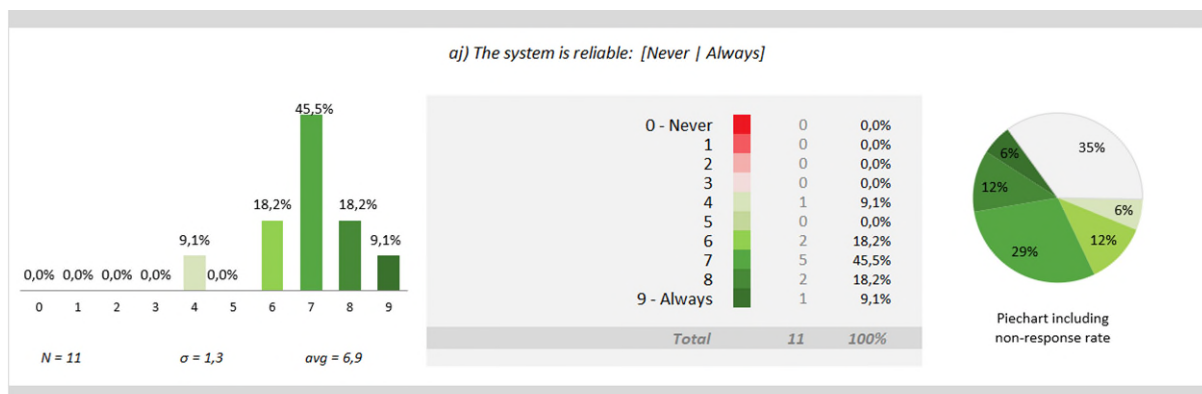


Figure 580 The system is reliable: [Never|Always]

Concerning the dependency of operations, half of the participants rated it rather dependable, one fifth found it somewhat dependable and quite dependable, and 10% considered it dependable. No negative ratings were submitted. This resulted in an average rating of 7.2 with a standard deviation of 0.9. Notably, the non-response rate was 41%.

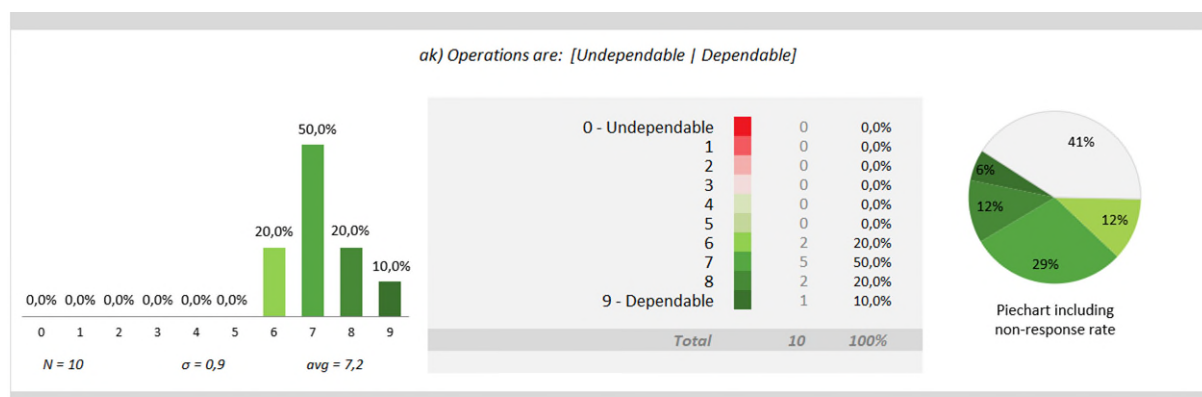


Figure 581 Operations are: [Undependable|Dependable]

When asked to rate the frequency of system failures from “Frequently” to “Seldom”, almost all participants rated it 6 (36.4%) and 7 (54.5%), which suggested that the majority did not experience system failures frequently. Only one respondent (9.1%) indicated to experience system failures rather frequently. The average rating was 6.2, the standard deviation 1.5 and the non-response rate 35%.

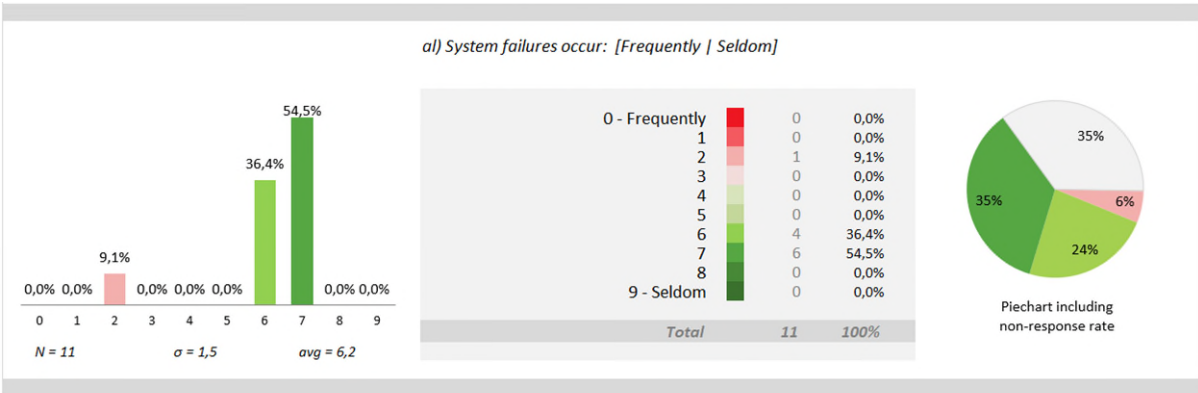


Figure 582 System failures occur: [Frequently|Seldom]

Considering how often the system warned Technology trial participants about potential problems, HCPs were overall positive with an average rating of 6.2 (standard deviation 1.8). More than half of respondents encountered warnings about potential problems quite frequently and 9.1% always received warnings. One respondent (9.1%), however, hardly encountered warnings about potential problems.

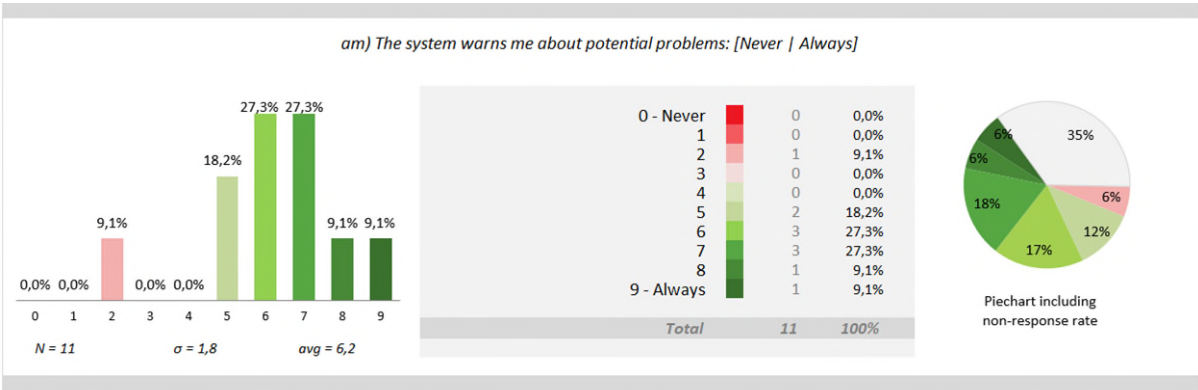


Figure 583 The system warns me about potential problems: [Never|Always]

When asked about the ease of correcting mistakes, almost half of Technology trial participants considered it rather easy and 27.3% regarded it quite easy. One respondent (9.1%) experienced more difficulties, resulting in an average rating of 5.7 and a standard deviation of 1.4.

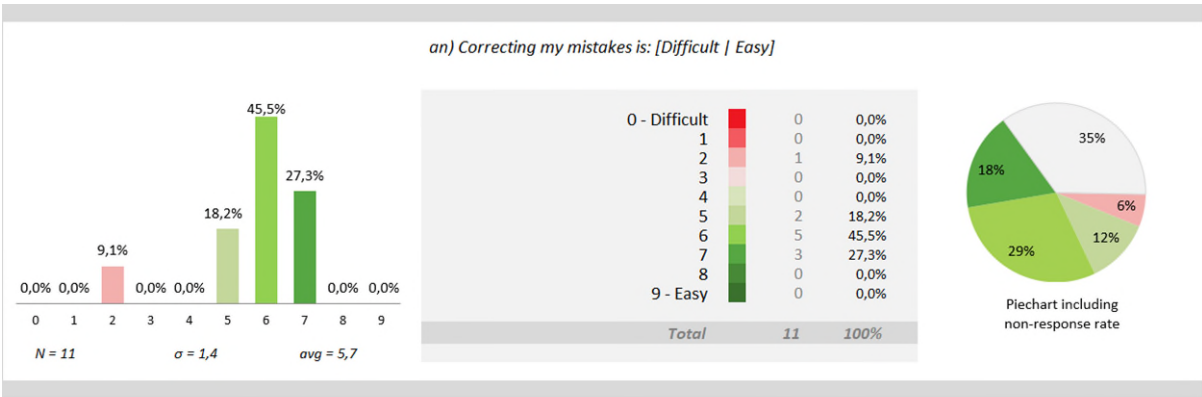


Figure 584 Correcting my mistakes is: [Difficult|Easy]

When asked how easy it was to correct typos, the same pattern as in the previous statement was observed. 45.5% of Technology trial participants found correcting typos rather simple, 27.3% found it quite simple and 9.1% of respondents considered it rather complex. The average rating was 5.7 and the standard deviation 1.4.

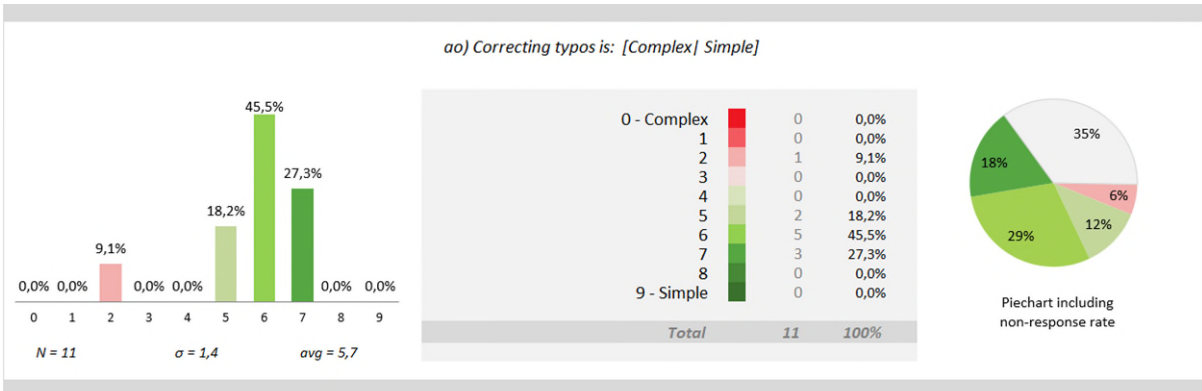


Figure 585 Correcting typos is: [Complex|Simple]

No respondent submitted a negative rating concerning the ability to undo operations. Almost half of the Technology trial participants regarded their ability rather adequate and approximately one third rated their ability higher. The average rating of users' ability was 6.2 with a standard deviation of 1. The 47% non-response rate needs to be considered.

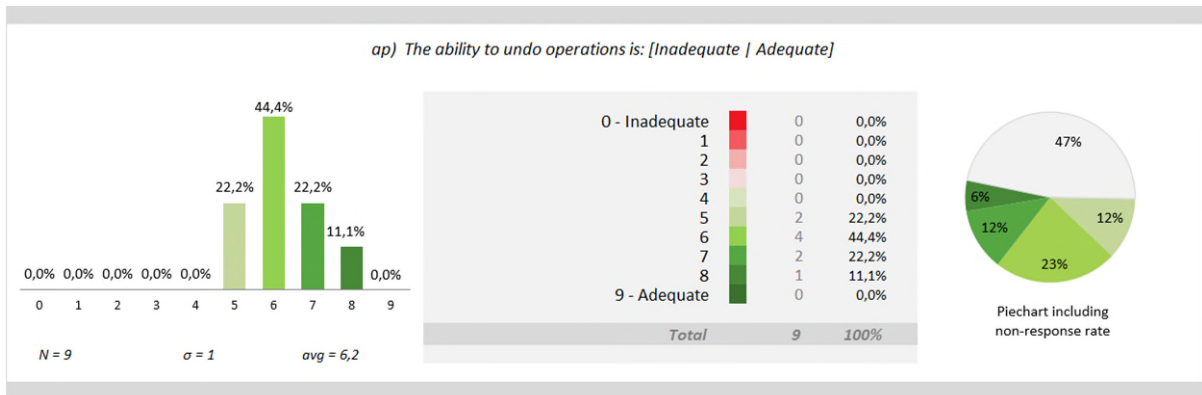


Figure 586 The ability to undo operations is: [Inadequate|Adequate]

When asked how often the ease of operation depended on their level of experience, respondents indicated that it often depended on their experience (average 7.5; standard deviation 1.1). No test user found that the ease of operation did not depend on their level of experience, but 36.4% believed that it almost always, and 18.2% that it always depended on experience.

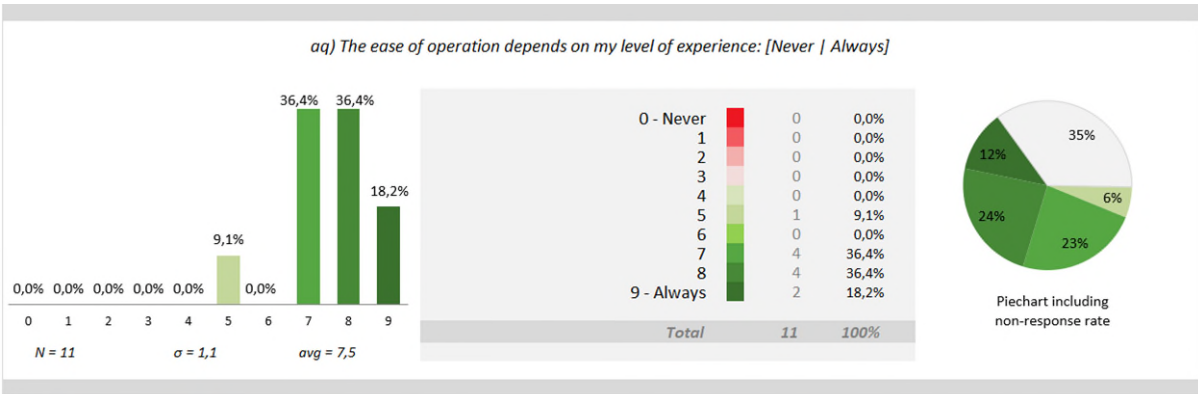


Figure 587 The ease of operation depends on my level of experience: [Never|Always]

When asked about the ease of accomplishing tasks knowing only a few commands from “With difficulty” to “Easily”, almost all respondents suggested to not experience difficulties. 36.4% could accomplish tasks knowing only a few commands rather easily and 18.2% quite easily, but no respondents could do it easily. On average, the ease of accomplishing tasks with few commands was rated 6.3 with a standard deviation of 1.7.

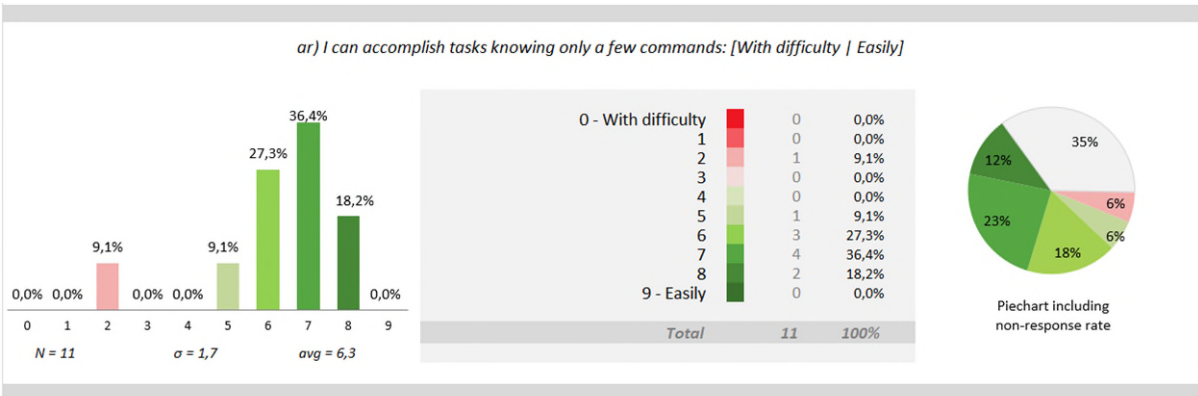


Figure 588 I can accomplish tasks knowing only a few commands: [With difficulty|Easily]

The figure below presents the mean ratings to statements (as-bc).

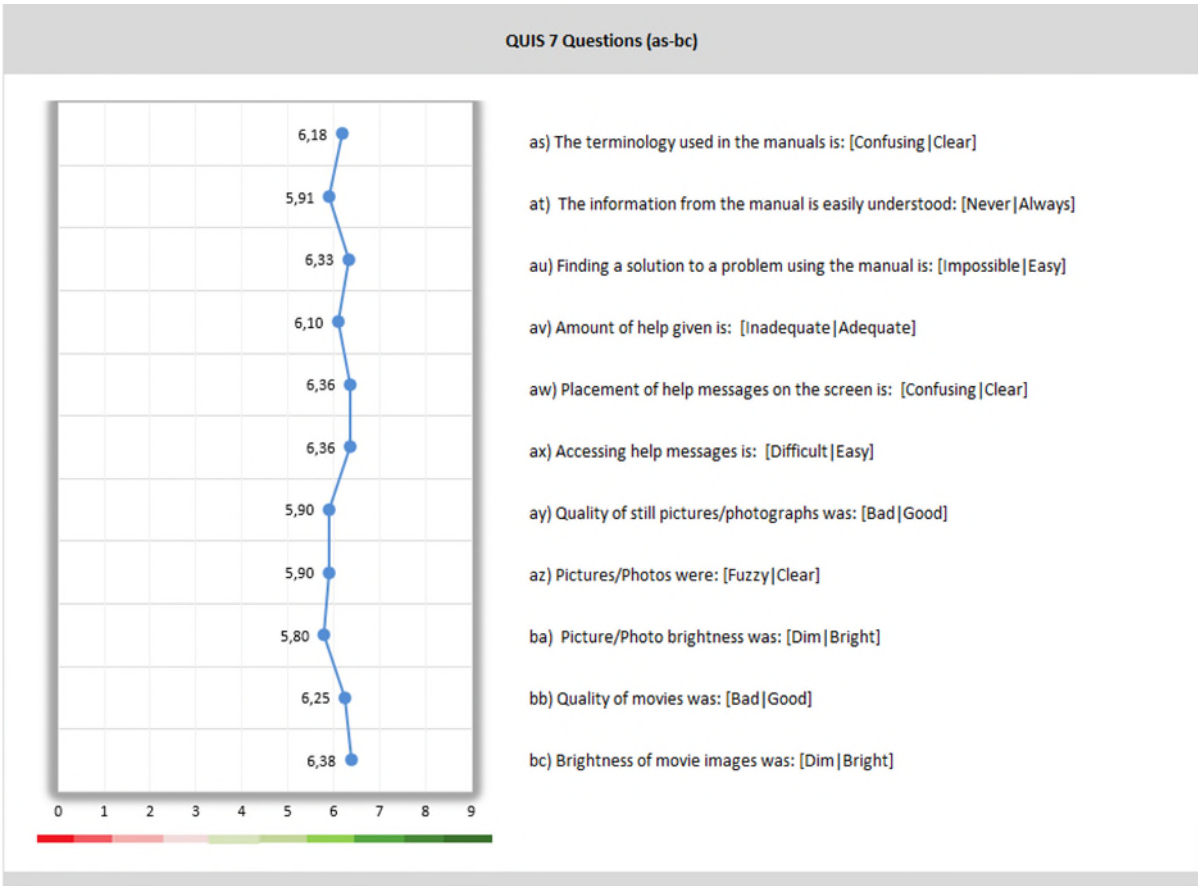


Figure 589 2nd survey for HCP, QUIS7 (as-bc)

With an average rating of 6.2 and a standard deviation of 2.0, Technology trial participants regarded the terminology used in the manuals rather clear, represented with the 27.3% peak ratings for points 6 and 7. 18.2% chose the highest possible rating. One respondent (9.1%), however, perceived the terminology quite confusing. It needs to be considered that 35% of Technology trial participants did not submit a rating to this statement.

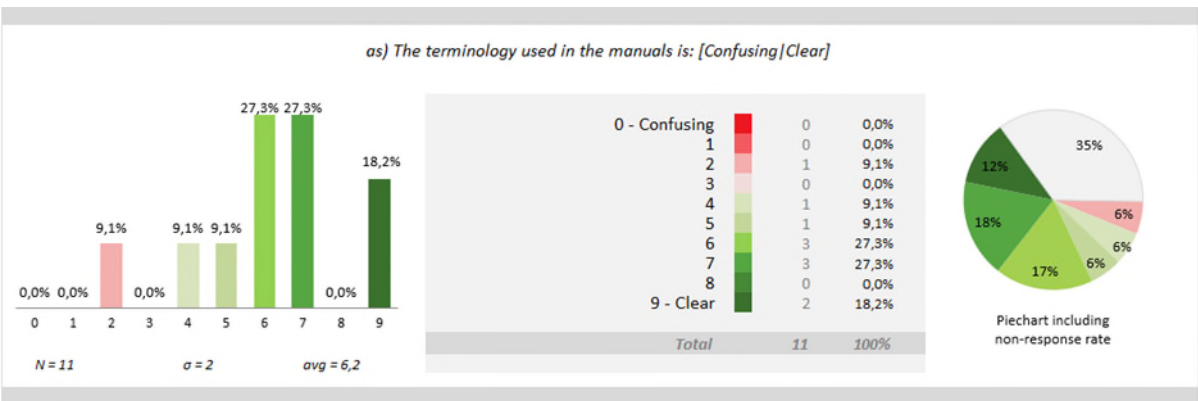


Figure 590 The terminology used in the manuals is: [Confusing|Clear]

Respondents were moderately positive towards whether the information from the manual was easily understood. With an average rating of 5.9 (standard deviation of 2.3) and a peak rating of 36.4% for 6 points, Technology trial participants indicated that information from the manual was often easily understood. 18.2% agreed that they always understood the information easily, while another 18.2% were somewhat negative and suggested difficulties.

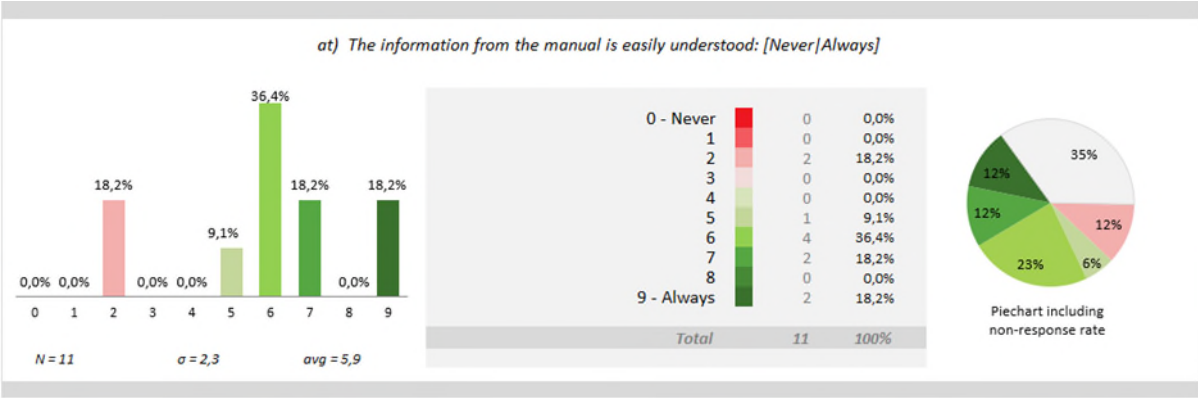


Figure 591 The information from the manual is easily understood: [Never|Always]

When asked to rate the ease of finding a solution to a problem using the manual, all 9 respondents submitted a positive rating, resulting in an average of 6.3 and a standard deviation of 1.0. About one third of Technology trial participants each found finding a solution using the manual rather and quite easy, and 11.1% found it even easier. Notably, the non-response rate to this statement was 47%.

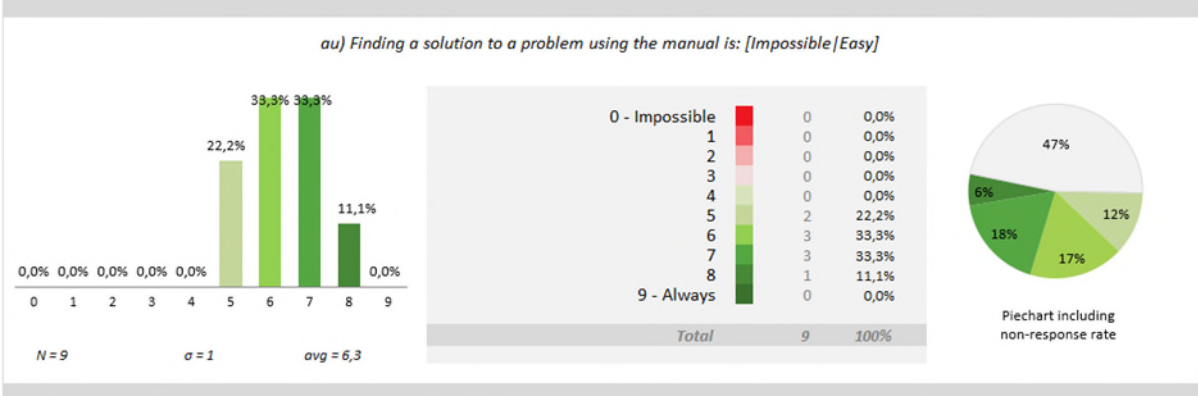


Figure 592 Finding a solution to a problem using the manual is: [Impossible|Easy]

When asked to rate the amount of help given from “Inadequate” to “Adequate”, only one of the 10 Technology trial participants (10%), perceived it somewhat inadequate. 40% regarded the amount of help given rather adequate, 30% found it quite adequate and 10% agreed that it was adequate. This resulted in a moderately positive average rating of 6.1 with a standard deviation of 1.8. The non-response rate of 41% needs to be considered.

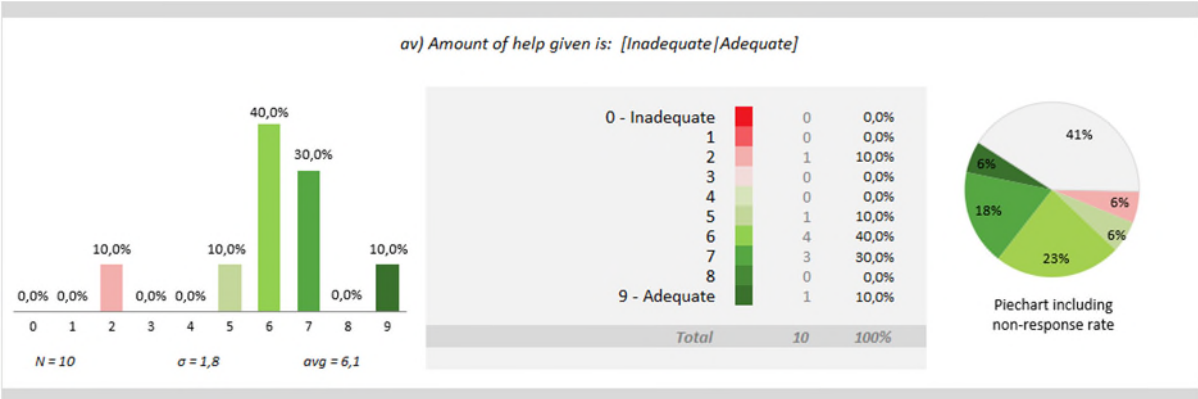


Figure 593 Amount of help given is: [Inadequate|Adequate]

Considering the clarity of placement of help messages on the screen, 11 Technology trial participants found it on average rather clear (average 6.4; standard deviation 1.9). While 9.1% experienced the placement a bit confusing, the remaining Technology trial participants perceived it clearer, but to varying degrees. 27.3% indicated that they found the placement of help messages quite clear, and 9.1% chose the highest rating possible. The non-response rate to this statement was 35%.

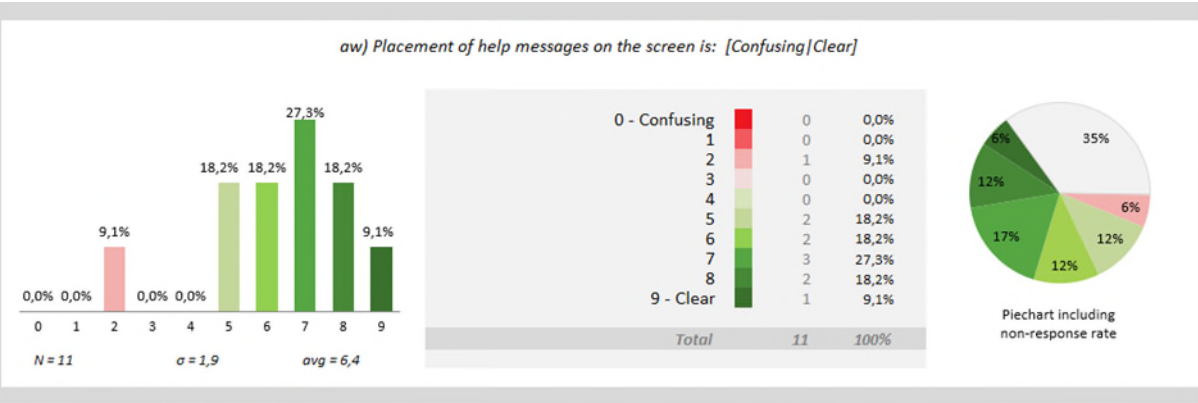


Figure 594 Placement of help messages on the screen is: [Confusing|Clear]

When asked about the ease of accessing help messages, the same picture as in the previous statement was observed. On average, Technology trial participants considered accessing help messages rather easy (average 6.4; standard deviation 1.9). While 9.1% found it easy, another 9.1%, however, experienced more difficulties. The remaining respondents submitted positive ratings, with a peak rating of 27.3% for 7 points out of the 9 possible. 35% did not answer this statement.

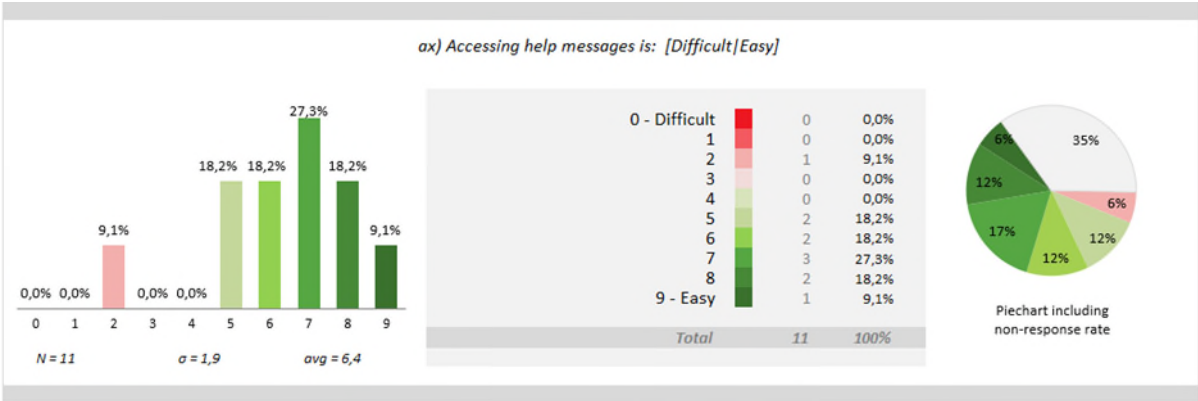


Figure 595 Accessing help messages is: [Difficult|Easy]

All Technology trial participants were positive towards the quality of still pictures or photographs, resulting in an average rating of 5.9 and a standard deviation of 1. 40% agreed that the quality was rather good and 30% found it quite good. Notably, the non-response rate was 41%.



Figure 596 Quality of still pictures/photographs was: [Bad|Good]

The same ratings as in the previous statement were submitted when asked to rate the pictures or photos from “Fuzzy” to “Clear”. Thus, 40% of Technology trial participants perceived the pictures or photos rather clear, and 30% quite clear. No respondent regarded the pictures or photos fuzzy. The average rating was 5.9 with a standard deviation of 1. 41% of Technology trial participants did not respond to this statement.

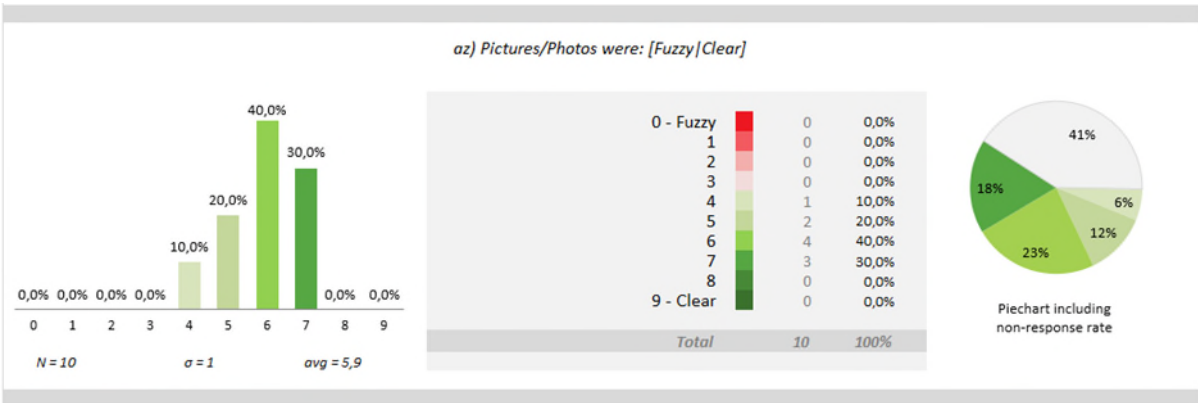


Figure 597 Pictures/photos were: [Fuzzy|Clear]

Regarding the brightness of pictures of photos, Technology trial participants were on average moderately positive (average 5.8; standard deviation 0.9). Half of the respondents agreed that pictures or photos were rather bright, and one fifth found it quite bright. The remaining 30% found it less bright, but no respondent submitted a negative rating. The non-response rate to this statement was 41%.

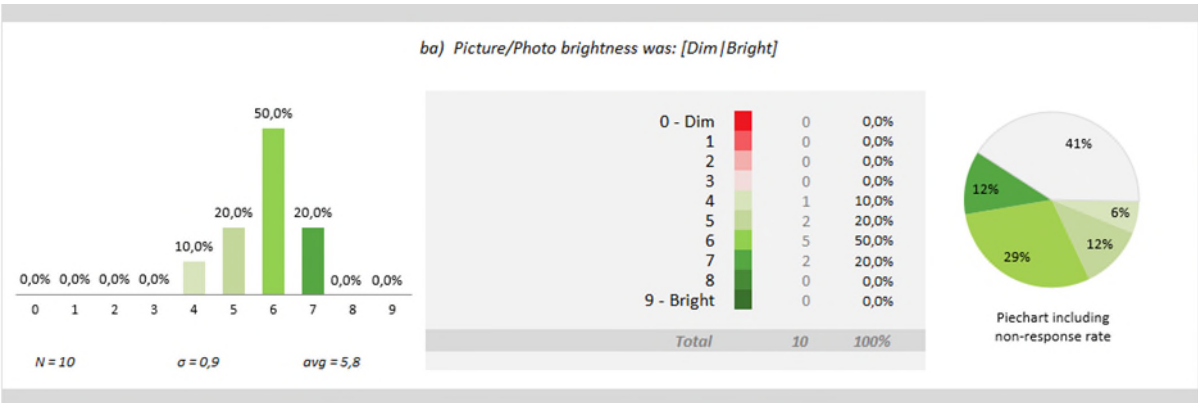


Figure 598 Picture/photo brightness was: [Dim|Bright]

When asked to rate the quality of movies from “Bad” to “Good”, no test user gave a negative rating. 37.5% of respondents perceived the quality rather good, 25% quite good and 12.5% chose the second highest rating. This resulted in an average of 6.3 with a standard deviation of 1. The non-response rate to this statement was considerably high with 53%.

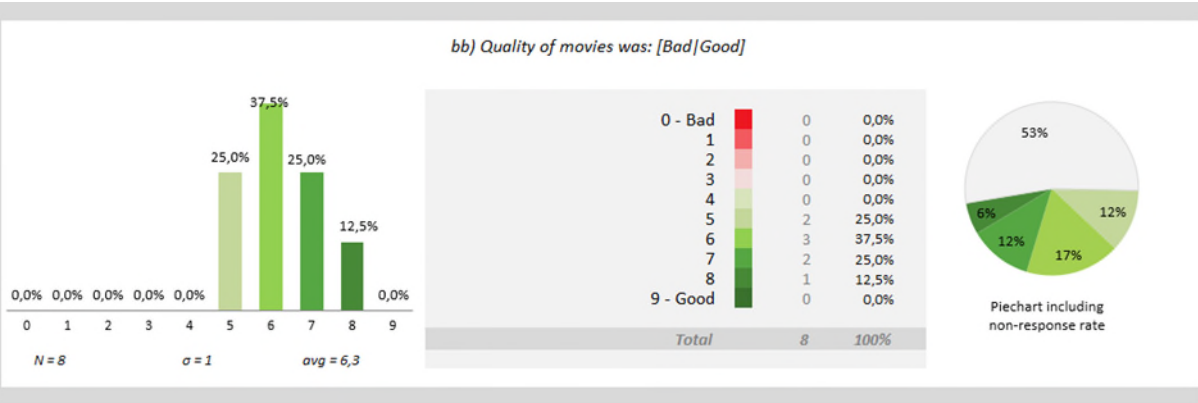


Figure 599 Quality of movies was: [Bad|Good]

Concerning the brightness of movie images, half of the Technology trial participants perceived it rather bright and 37.5% in total found it even brighter. No respondent submitted a negative rating, leading to a moderately positive average of 6.4 with a standard deviation of 0.9. However, 53% did not respond to this statement.

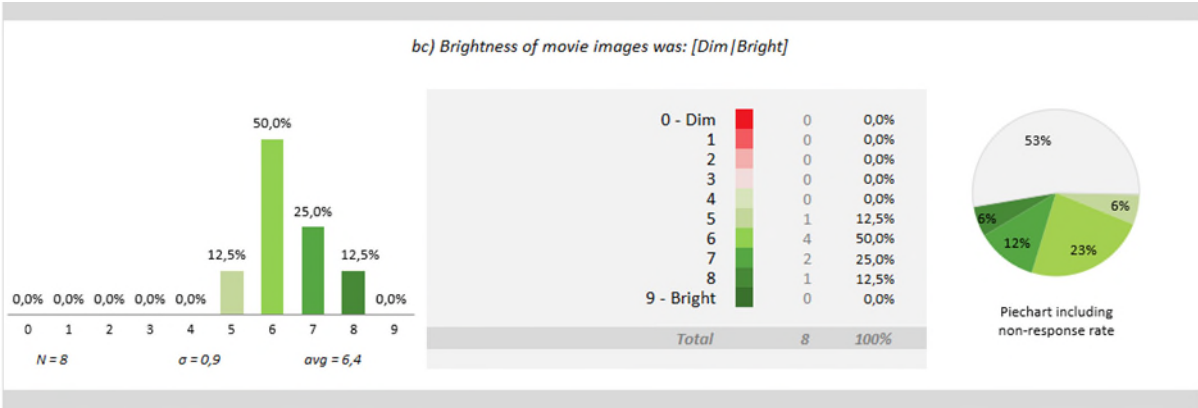


Figure 600 Brightness of movie images was: [Dim|Bright]

The following summary figure displays the mean ratings to statements (bd-bk).

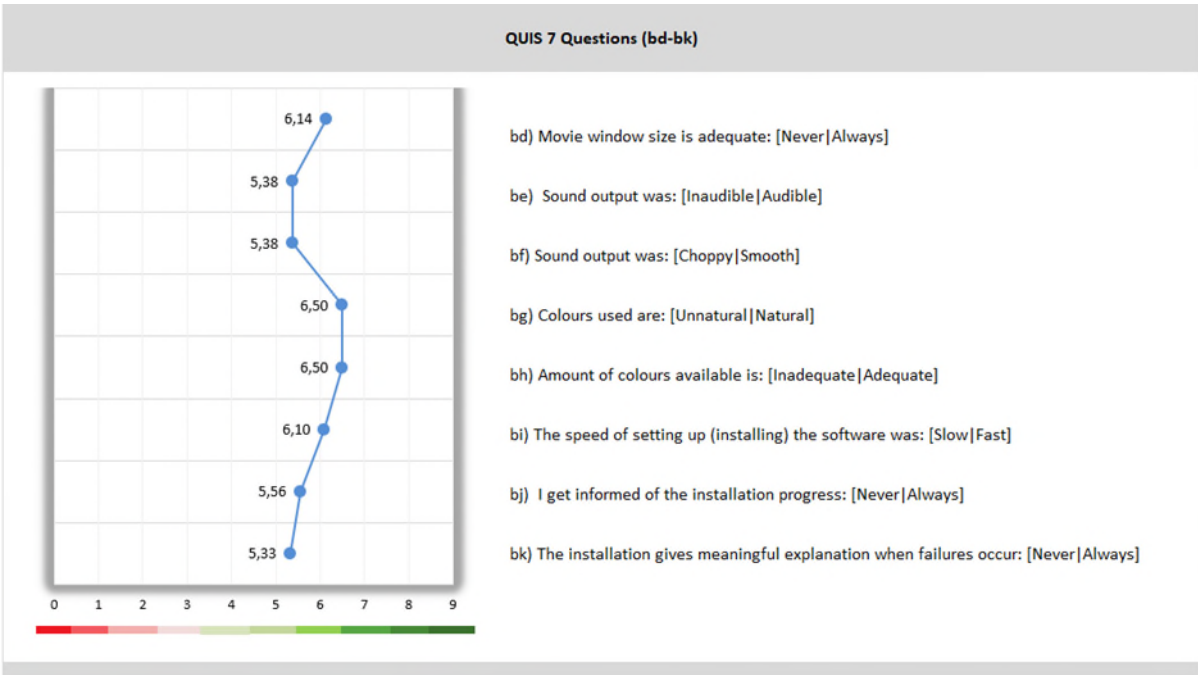


Figure 601 2nd survey for HCP, QUIS7 (bd-bk)

When asked how often they found the movie window size adequate, more than half of the respondents (57.1%) agreed that it was often adequate and 28.6% were even more positive. No respondent experienced the window movie size inadequate. This resulted in an average rating of 6.1 with a standard deviation of 0.7. The high non-response rate of 59% needs to be considered.

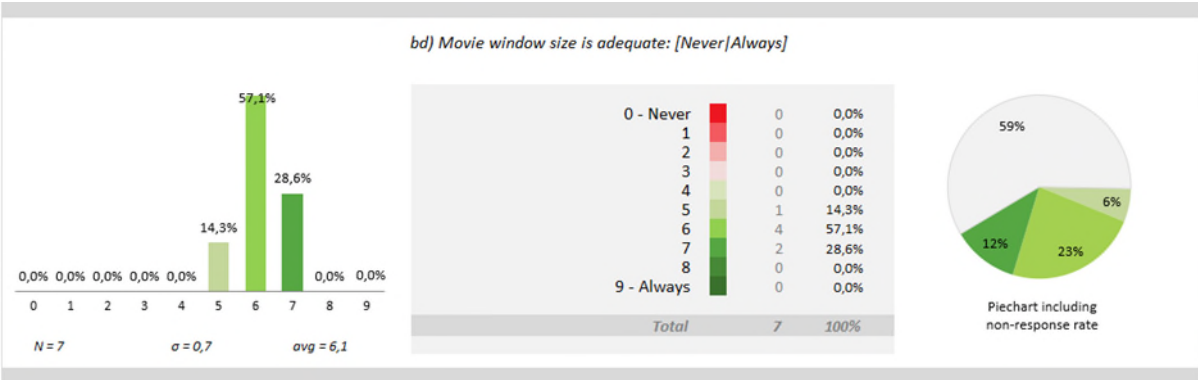


Figure 602 Movie window size is adequate: [Never|Always]

Regarding the sound output, Technology trial participants were regarded it on average rather audible, represented in the 50% peak rating for 6 points out of the 9 possible. 25% found the sound output quite audible, but no respondent agreed that it was audible. 12.5% of Technology trial participants chose the lowest possible rating, indicating that sound output was inaudible. The average rating was 5.4, the standard deviation 2.3 and the non-response rate 53%.

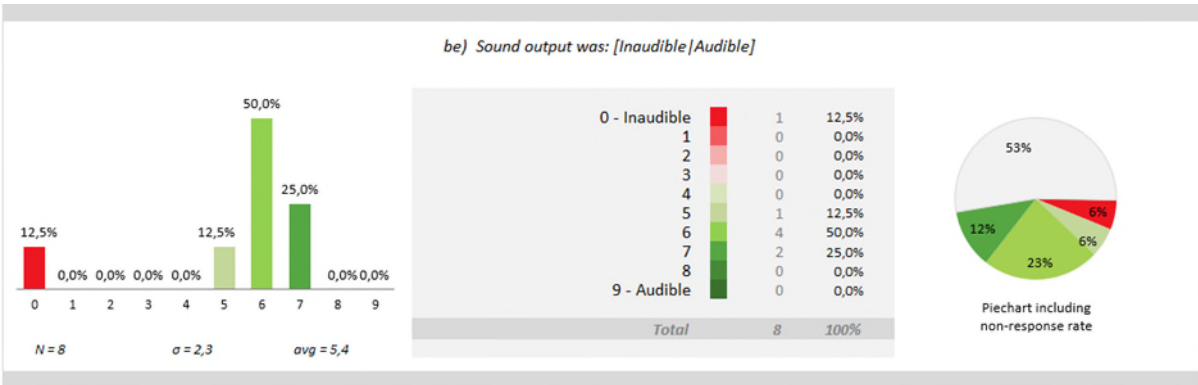


Figure 603 Sound output was: [Inaudible|Audible]

The same ratings as in the previous statement were submitted when asking about the quality of sound output from “Choppy” to “Smooth”. 50% of Technology trial participants regarded the sound output rather smooth, 25% quite smooth, but 12.5% considered the sound output choppy. This resulted in an average of 5.4 and a standard deviation of 2.3. The non-response rate was 53%.

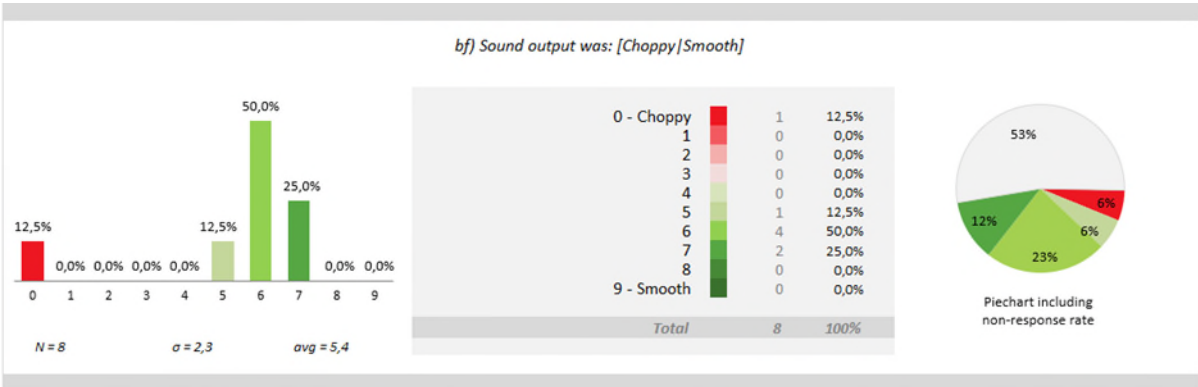


Figure 604 Sound output was: [Choppy|Smooth]

Regarding the colours used, all Technology trial participants were positive, and no respondent considered colours unnatural. Half of the Technology trial participants found the colours used rather natural and 37.5% in total perceived them even more natural. The average rating was 6.5, the standard deviation 1.1 and the non-response rate 53%.

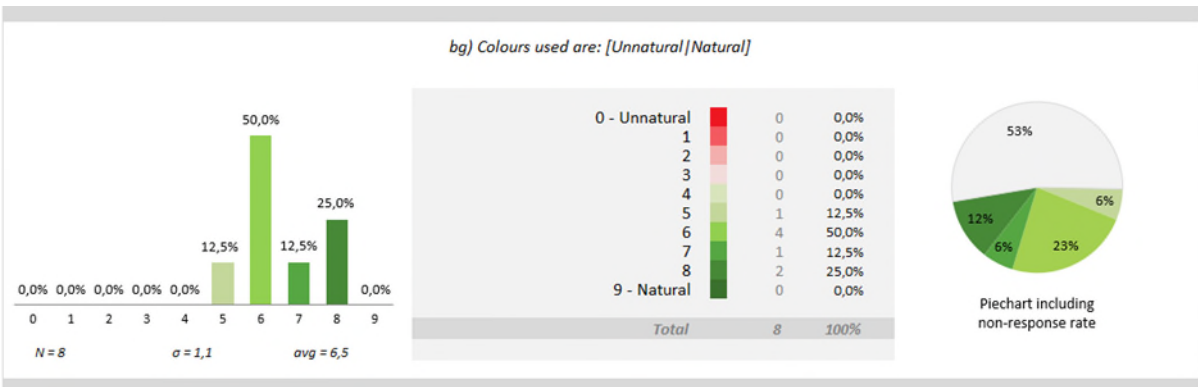


Figure 605 Colours used are: [Unnatural|Natural]

When asked to rate the amount of colours available from “Inadequate” to “Adequate”, the same ratings as previously were observed. 50% perceived the amount of colours rather adequate and 37.5% regarded them more adequate. No respondent thought that the amount of colours was inadequate. Thus, respondents were moderately positive with an average rating of 6.5 and a standard deviation of 1.1.

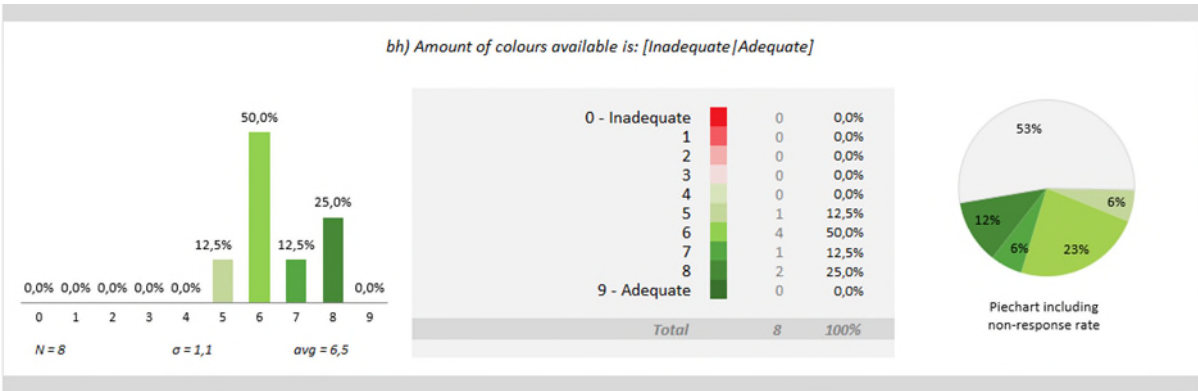


Figure 606 Amount of colours available is: [Inadequate|Adequate]

When asked about the speed of setting up the software, Technology trial participants had diverse opinions, but only one user (10%) considered the speed quite slow. The remaining respondents submitted positive ratings with the majority choosing 6-8 points. 10% was very satisfied with the speed of setting up the software by indicating that it was fast. The average rating was 6.1, the standard deviation 2.3 and the non-response rate 41%.

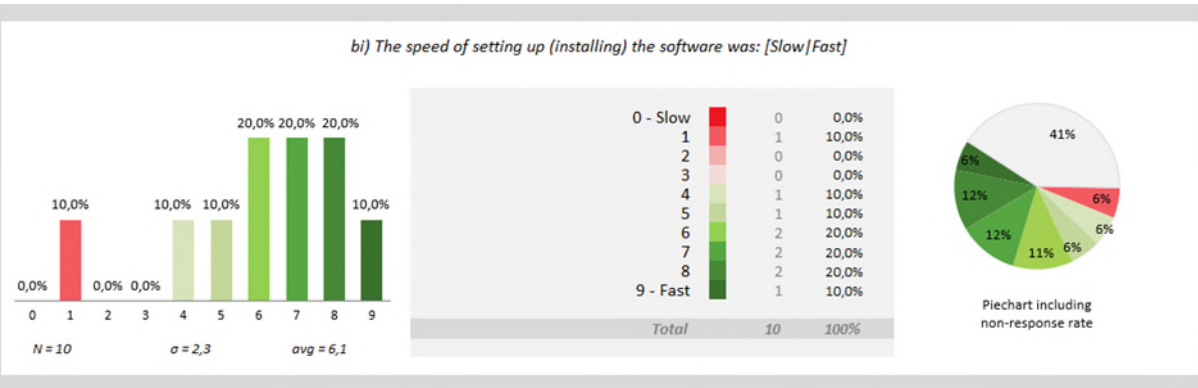


Figure 607 The speed of setting up (installing) the software was: [Slow|Fast]

The average rating of 5.6 (standard deviation 2.5) indicated that Technology trial participants got sometimes informed of the installation progress. While 33.3% got often informed, 22.2% got usually, and 11.1% got always informed. However, the remaining participants were slightly less positive and 11.1% stated to never got informed of the installation progress. 47% did not submit a rating to this statement.

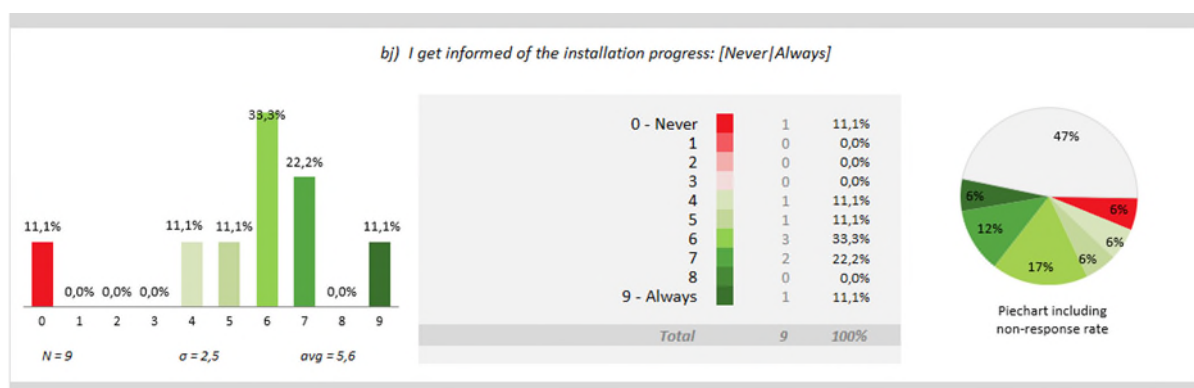


Figure 608 I get informed of the installation progress: [Never|Always]

When asked how often the installation gave meaningful explanations when failures occurred, Technology trial participants were moderately positive. The peak rating of 33.3% for 7 points indicated that Technology trial participants usually received meaningful explanations for failures during the installation progress, but the other respondents experienced explanations less often. 11.1% proposed to almost never received meaningful explanations in case of failures, resulting in an average rating of 5.3 and a standard deviation of 1.9. The non-response rate was 47%.

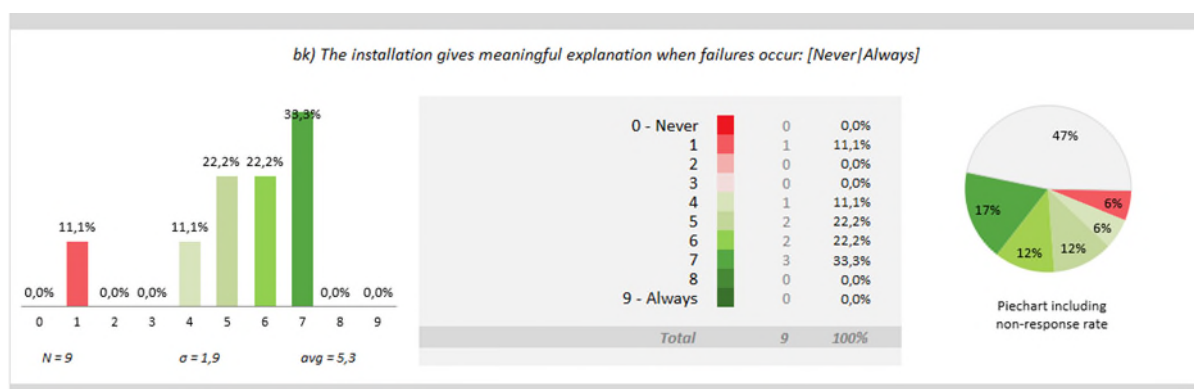


Figure 609 The installation gives meaningful explanations when failures occur: [Never|Always]

The following table displays comments related to statements ranked 5 or below in the original language (Castilian). For the English translations refer to **Table 14**.

Comments related to statements (original language)	
1)	<p>I find the C3-Cloud system: [Terrible Wonderful]</p> <ul style="list-style-type: none"> Se puede mejorar el acceso y más formación para utilizarlo. Creo que habría que explicar más sencillamente y con más tiempo el uso de la plataforma al paciente. Es muy farragoso. Precisa una integración directa en los programas que utilizamos.
2)	<p>I find the C3-Coud system: [Frustrating Satisfying]</p> <ul style="list-style-type: none"> Lo veo lento.
3)	<p>I find the C3-Cloud system: [Dull Stimulating]</p> <ul style="list-style-type: none"> Una herramietna que si mejorara podría servir para su explotación de una forma útil o práctica.

4)	I find the C3-Cloud system: [Difficult Easy] <ul style="list-style-type: none"> • Explicando mejor a los pacientes. • Ha habido problemas tecnicos que no se han llegado a resolver.
5)	I find the C3-Cloud system: [Rigid Flexible] <ul style="list-style-type: none"> • En el tiempo en el que he participado me ha costado acceder a las encuestas no podía ver el contenido de las mismas para apoder elegirlas, los ítems en muchas oaciones eran difíciles de entender.
6)	The use of terminology throughout the system is: [Inconsistent Consistent] <ul style="list-style-type: none"> • Puede tratarse de un problema de traduccion y coherencia lingüística de los distintos países participantes?
7)	The position of instructions on the screen is: [Inconsistent Consistent] <ul style="list-style-type: none"> • Creo que he cometido varios errores al utilizar el programa porque no siempre era capaz de poner las tareas en su lugar adecuado...me ha faltado tiempo para poder evaluarlo mejor seguramente.
8)	Instructions for commands or functions are: [Confusing Clear] <ul style="list-style-type: none"> • Complicado.
9)	Instructions for correcting errors are: [Confusing Clear] <ul style="list-style-type: none"> • No he tenido errores, por lo que no he precisado instrucciones.
10)	Animated cursors keep me informed: [Never Always] <ul style="list-style-type: none"> • No sé a qué se refiere con los cursores animados. No soy consciente de haber visto ninguno. • A día de hoy, tenemos que realizar un seguimiento activo por parte del profesional para ver si tenemos alguna notificación. • No sé a qué se refiere con "cursores animados".
11)	The length of delay between operations is: [Unacceptable Acceptable] <ul style="list-style-type: none"> • Problema tecnicos en la plataforma.
12)	Error messages clarify the problem: [Never Always] <ul style="list-style-type: none"> • No he tenido errores, salvo de espera y han sido útiles para saber qué pasa. En este caso que comento, la puntuación para este ítem sería 9.
13)	Time to learn to use the system is: [Slow Fast] <ul style="list-style-type: none"> • Creo que se precisa más tiempo.
14)	Number of steps per task are: [Too many Just right] <ul style="list-style-type: none"> • A veces hay que realizar demasiados pasos por tarea.
15)	System speed is: [Too slow Fast enough] <ul style="list-style-type: none"> • Estaría mejor si fuese un pco más rápida. • En varias ocasiones se ha atascado y ha requerido esperar varios minutos para continuar. En algún caso he tenido que salir del sistema y volver a entrar. Sin embargo, no perdí datos.
16)	System failures occur: [Frequently Seldom] <ul style="list-style-type: none"> • Fallos tecnicos ,que no se solucionaron. No podiamos contactar con el paciente,se le remitió al correo para problemas tecnicos y no se lleo a solucionar.

17)	Quality of still pictures/photographs was: [Bad Good] <ul style="list-style-type: none"> No ha habido imágenes ni fotografías.
18)	Pictures/photos were: [Fuzzy Clear] <ul style="list-style-type: none"> No ha habido imágenes ni fotografías.
19)	Picture/photo brightness was: [Dim Bright] <ul style="list-style-type: none"> No ha habido imágenes ni fotografías.
20)	Sound output was: [Inaudible Audible] <ul style="list-style-type: none"> No tenía volumen. El único vídeo que he podido ver era el de explicación en cuanto a uso de la plataforma, para explicar a los pacientes y no tenía volumen.
21)	Sound output was: [Choppy Smooth] <ul style="list-style-type: none"> No tenía volumen. El único vídeo que he podido ver era el de explicación en cuanto a uso de la plataforma, para explicar a los pacientes y no tenía volumen.
22)	The installation gives meaningful explanation when failures occur: [Never Always] <ul style="list-style-type: none"> No he tenido fallos en la instalación.

Table 106 HCP survey, comments related to statements rated 0-5, original language

MDT eCare User Impact Survey (eCUIS)

To evaluate the utility that C3-Cloud brings to MDTs, respondents were asked 17 questions (a-q) and three concluding evaluations.

When asked how often they needed to support their C3-Cloud patients filling in home-based self-measurements on the PEP from “Never” to “More than 1 time per day”, most HCPs (63.6%) responded to do so less than once per week, followed by 27.3% who never had to provide this support. 9.1% regarded this question inapplicable and 35% did not respond.

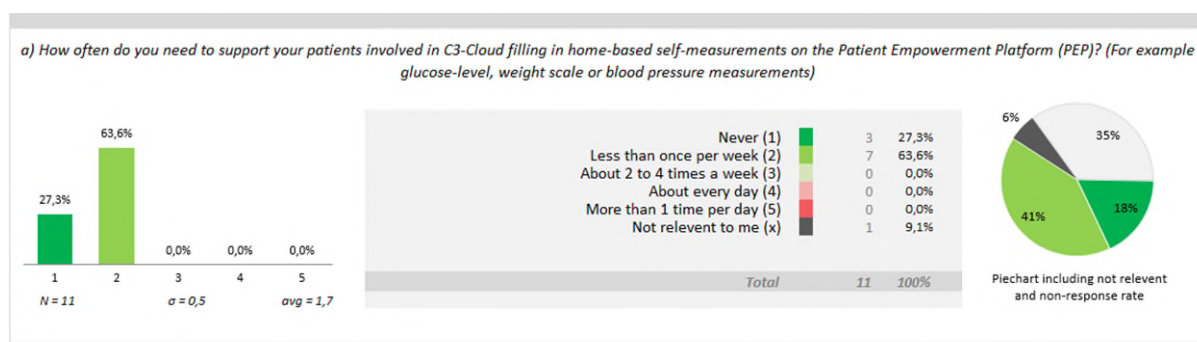


Figure 610 How often do you need to support your patients involved in C3-Cloud filling in home-based self-measurements

Considering the time spent supporting patients with home-based self-measurement readings, 42.9% reported to spend less than 10 minutes per session, followed by 28.6% who spent between 10-30 minutes and 14.3% requiring more than 30 minutes. Notably, 59% of Technology trial participants did not respond to this question.

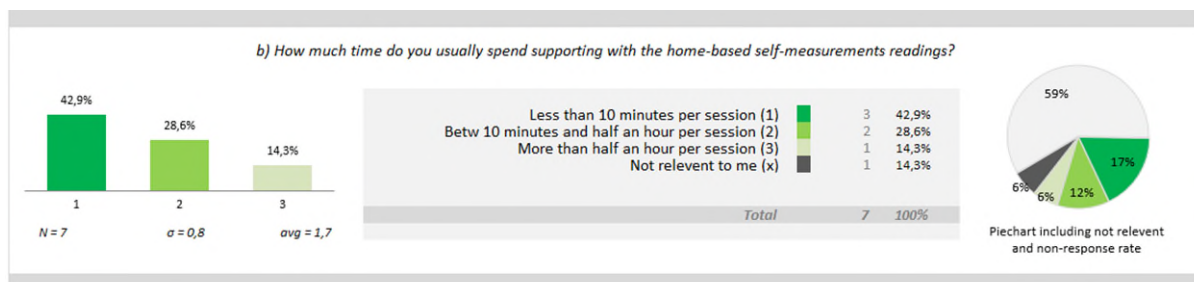


Figure 611 How much time do you usually spend supporting with the home-based self-measurements readings

When asked how often they usually helped patients using the PEP, the average response equalled “Less than once per week” with a standard deviation of 0.7. Thus, 45.5% agreed with this answer, while 18.2% indicated to help patients 1-4 times per week. In contrast, another 18.2% reported to never help patients with the PEP. The non-response rate was 35%.

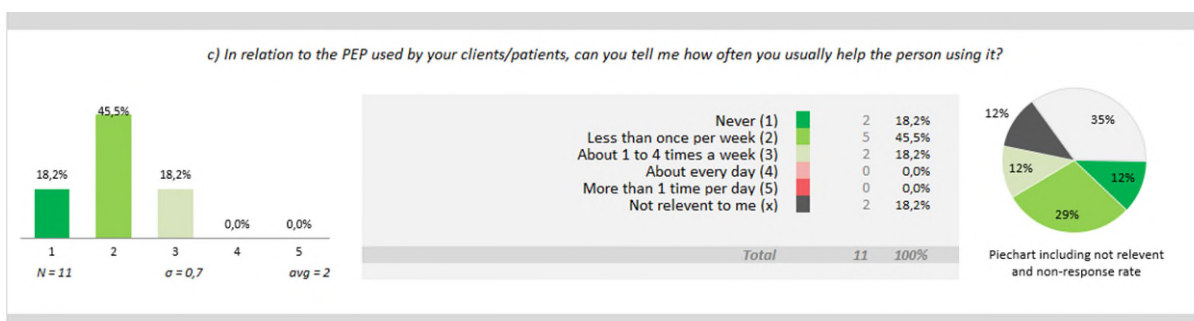


Figure 612 In relation to the PEP used by your clients, can you tell me how often you usually help the person using it

Concerning the time HCPs usually spent helping with the PEP, 57.1% of respondents reported to spend less than 10 minutes per session, 28.6% spent 10-30 minutes and 14.3% more than 30 minutes, resulting in an average between less than 10 and maximum 30 minutes per session. 59% of Technology trial participants did not submit a response to this question.

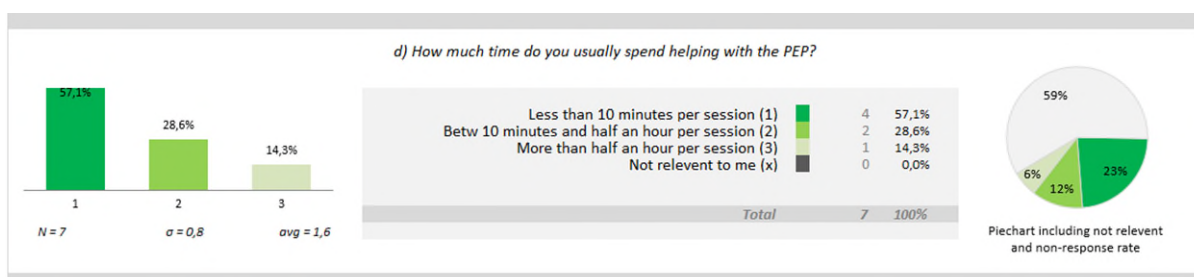


Figure 613 How much time do you usually spend helping with the PEP

When asked how much time one patient consultation took, including preparation and follow-up, most HCPs (45.4%) required between 15-30 minutes. 36.4% reported that it took less than 15 minutes and 18.2% found this question inapplicable. The non-response rate was 35%.

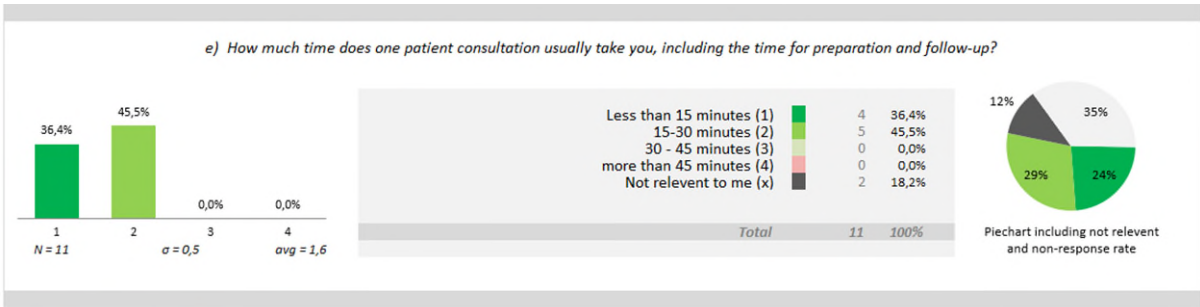


Figure 614 How much time does one patient consultation take you

Regarding the number of care planning meetings for one C3-Cloud patient, 54.5% stated to attend those meetings every 1-3 months, while 27.3% did so more than once a month. 18.2% found this question not relevant and 35% of Technology trial participants did not submit a response.

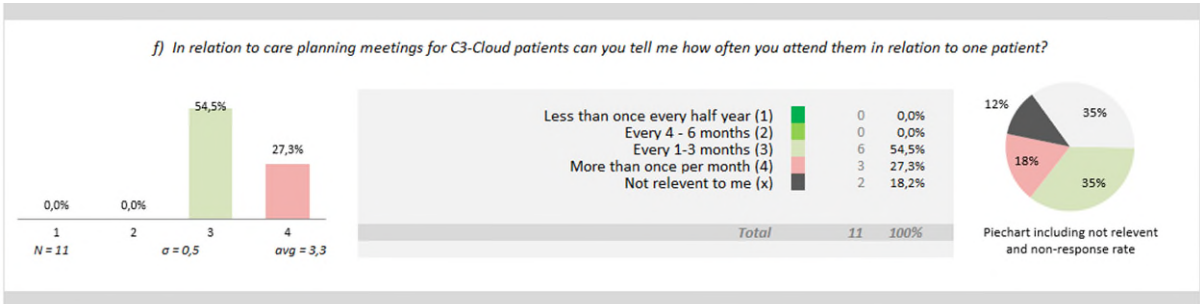


Figure 615 In relation to care planning meetings for C3-Cloud patients, how often do you attend them

When asked how much time it took HCPs to go on one meeting with their care team, including the time to get there, 36.4% of respondents needed less than half an hour, 18.2% between half an hour and one hour, and 9.1% needed between 1-2 hours. 36.4% found the question inapplicable and 35% of users did not respond. The average time was between less than 30 and maximum 60 minutes (average 1.6; standard deviation 0.8).

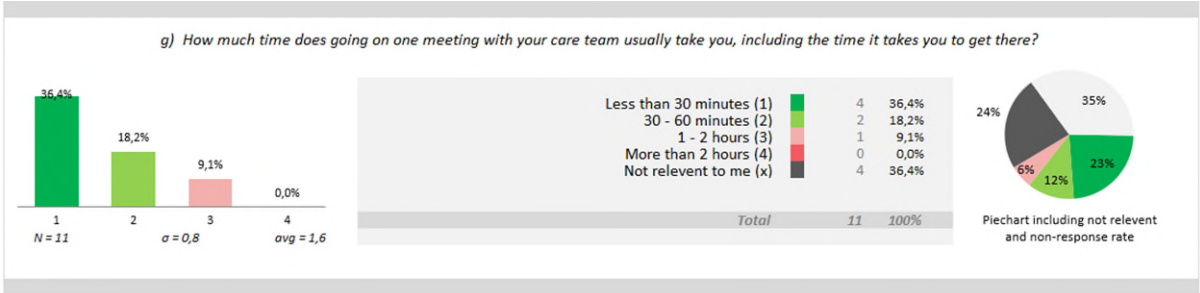


Figure 616 How much time does going on one meeting with your care team usually take you

Concerning virtual care planning meetings for C3-Cloud patients, 27.3% attended every 1-3 months, 9.1% less than every 6 months, and another 9.1% more than once per month. More than half stated that this question was not relevant to them.

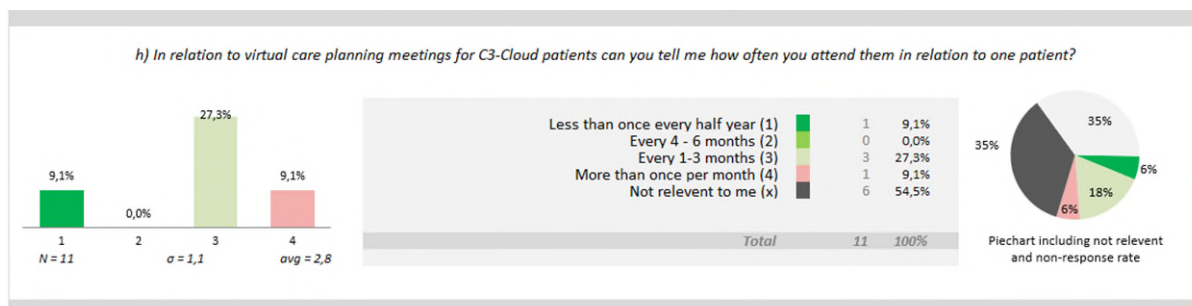


Figure 617 In relation to virtual care planning meetings for C3-Cloud patients, can you tell me how often you attend them

When asked how much time going on one meeting usually took them, including the time to get there, 27.3% of HCPs indicated “Less than 30 minutes”, 18.2% needed 30-60 minutes and 9.1% 1-2 hours. However, 45.5% considered the question inapplicable. The non-response rate was 35%.

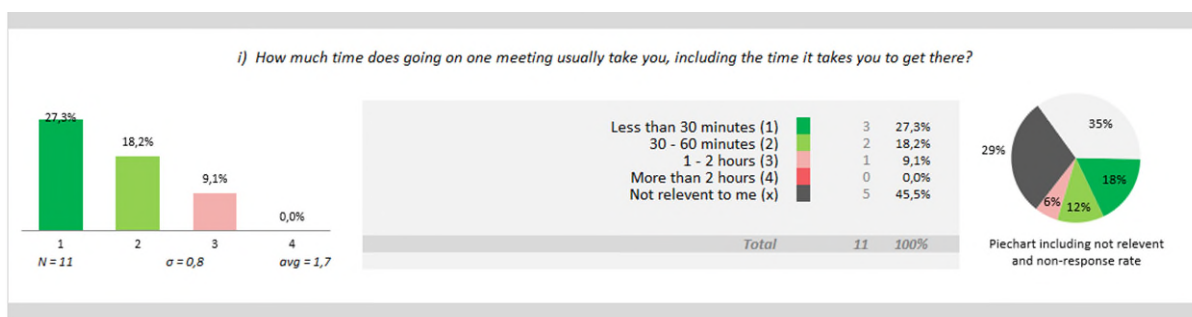


Figure 618 How much time does going on one meeting usually take you

When asked how often HCPs usually accessed C3DP in relation to one C3-Cloud patient, more than half (63.3%) reported “Less than once per week” and 18.2% of users 1-4 times a week. 18.2% chose that the question was not relevant to them and 35% submitted no response.

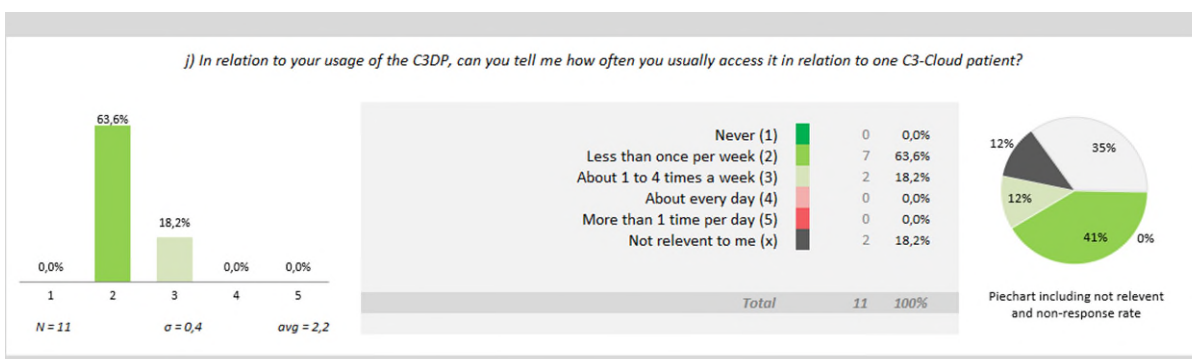


Figure 619 In relation to your usage of the C3DP, can you tell me how often you usually access it

Regarding the time HCPs usually spent using the C3DP in relation to one patient, respondents indicated mixed experiences. More than one third (36.4%) agreed with “Less than 10 minutes per session”, 27.3% stated between 10-20 minutes, 18.2% between 20-30 minutes and 9.1% spent between 30-60 minutes. This resulted in an average of 2.0 (standard deviation 1.1), suggesting that respondents usually spent between 10-20 minutes per session. The non-response rate to this question was 35%.

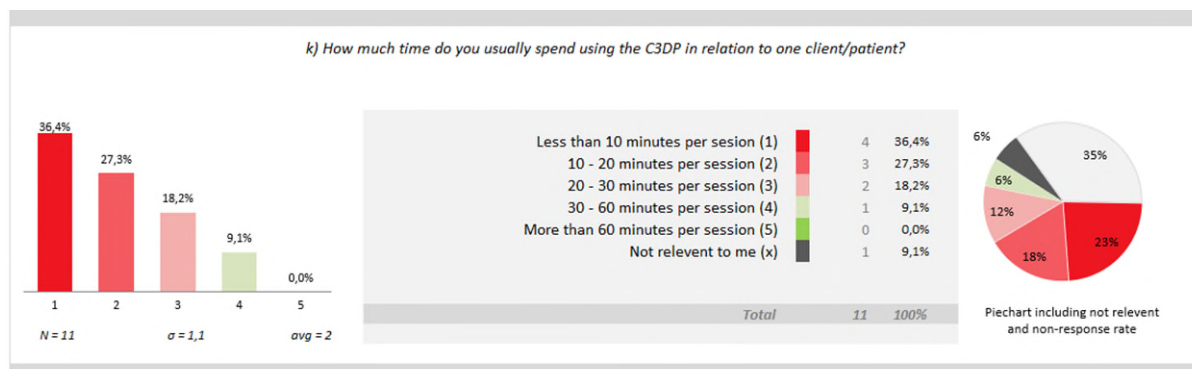


Figure 620 How much time do you usually spend using the C3DP in relation to one patient

When asked about their perceived impact of C3DP on their ability to manage the overall workload, more than half (54.5%) believed that it had no effect, while 18.2% agreed that it increased their ability a little. 9.1% disagreed and perceived that C3DP slightly decreased the ability to manage the workload. This led to a rather neutral opinion on average (average 2.9; standard deviation 0.6). 18.2% indicated that the question was not relevant to them and 35% of Technology trial participants did not submit a response.

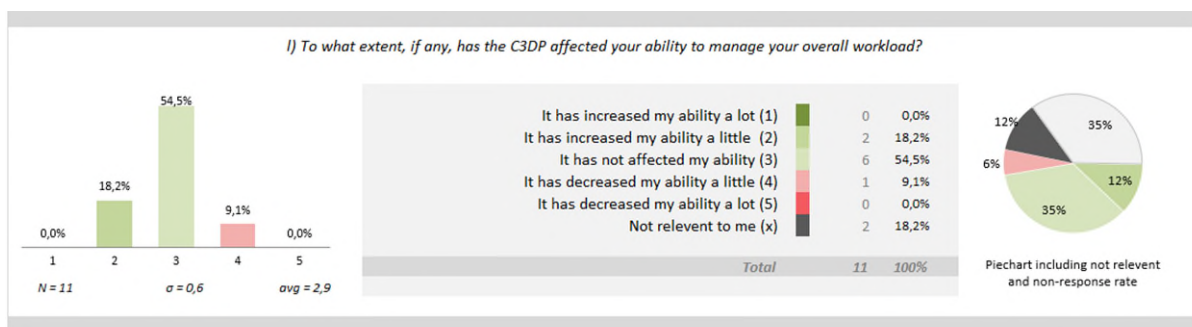


Figure 621 To what extent has C3DP affected your ability to manage your overall workload

Concerning the effect of C3DP on their ability to provide care to individual patients, 45.5% believed it had no impact. 18.2% were slightly positive and agreed that it increased their ability, while 9.1% were slightly negative and stated that it decreased their ability. This resulted in a neutral to slightly positive opinion on average. 18.2% found this question inapplicable.

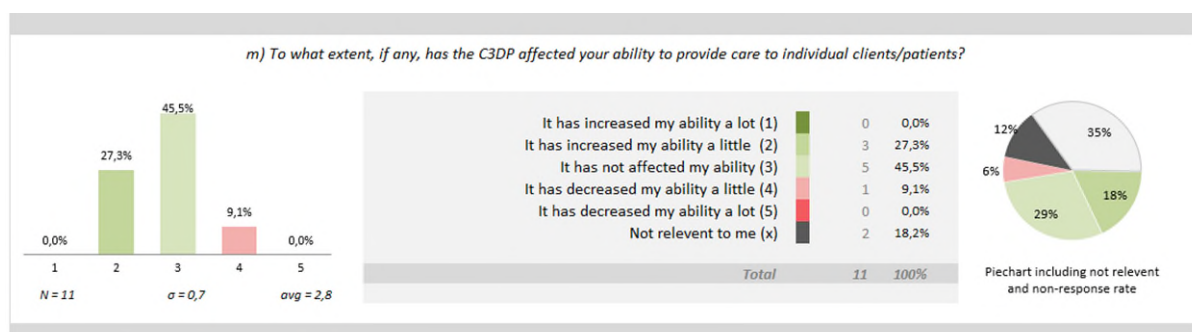


Figure 622 To what extent has C3DP affected your ability to provide care to individual patients

When asked how they perceived the impact of C3DP on their efficiency at work, more than one third (36.4%) suggested that it had no impact. While 27.3% stated that it had a little positive impact, 9.1% each found that it decreased their efficiency a little and a lot. The average response

thus equalled the option “It has not changed my efficiency” with a standard deviation of 1. 18.2% of users indicated that the question was not relevant to them.

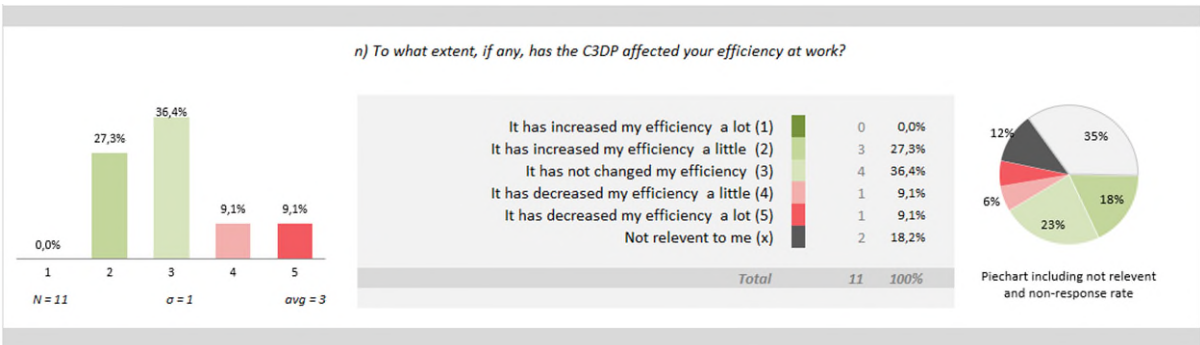


Figure 623 To what extent has C3DP affected your efficiency at work

Most HCPs (54.5%) believed that C3DP slightly improved the relationship with their patients. 27.3% believed it did not affect their relationship, while 9.1% were slightly negative and stated that it worsened the relationship. One respondent (9.1%) did not consider this question relevant and 35% of Technology trial participants submitted no response.

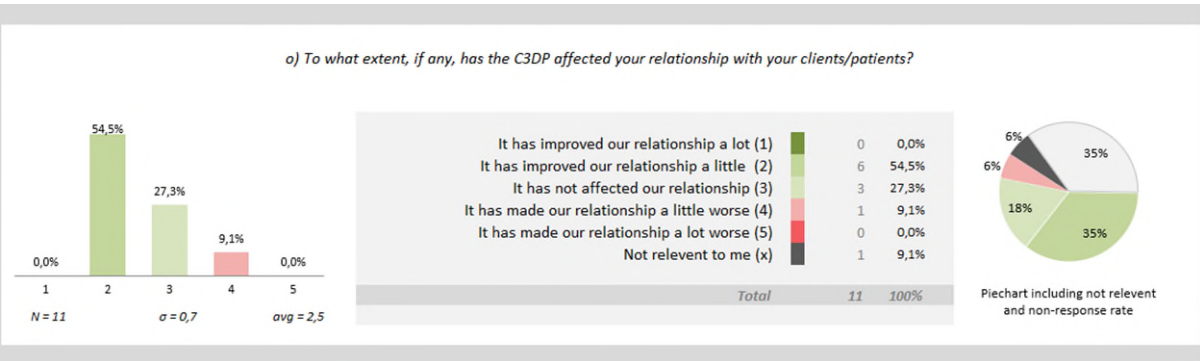


Figure 624 To what extent has C3DP affected your relationship with your patients

Regarding the impact of C3DP on their level of work-related stress, the vast majority (72.7%) found that the system did not affect their stress level. However, one respondent (9.1%) had a slightly negative experience by indicating that C3DP increased the work-related stress level a little. 18.2% stated that it was not relevant to them.

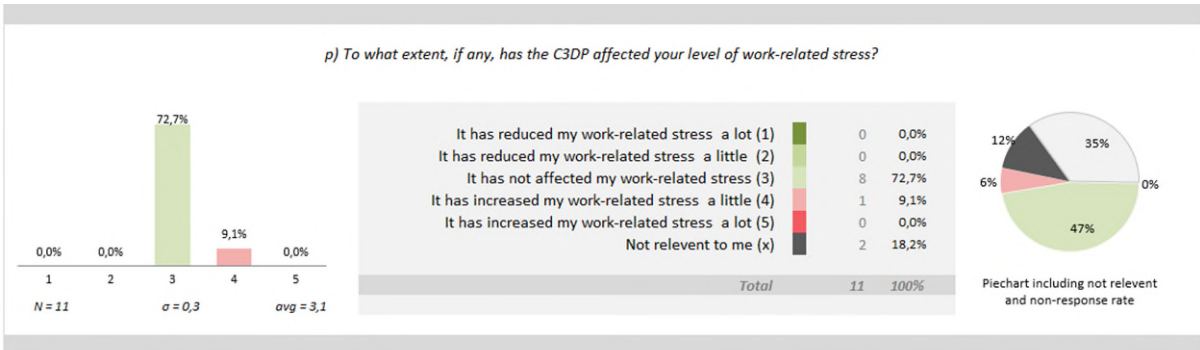


Figure 625 To what extent has C3DP affected your level of work-related stress

When asked to what extent C3DP affected their satisfaction with work, 45.5% of users responded that it did not change their satisfaction. While 27.3% stated that it had a positive impact, 9.1%

stated it had a slightly negative impact, resulting in an overall neutral to slightly positive opinion (average 2.8; standard deviation 0.7). 18.2% considered this question inapplicable.

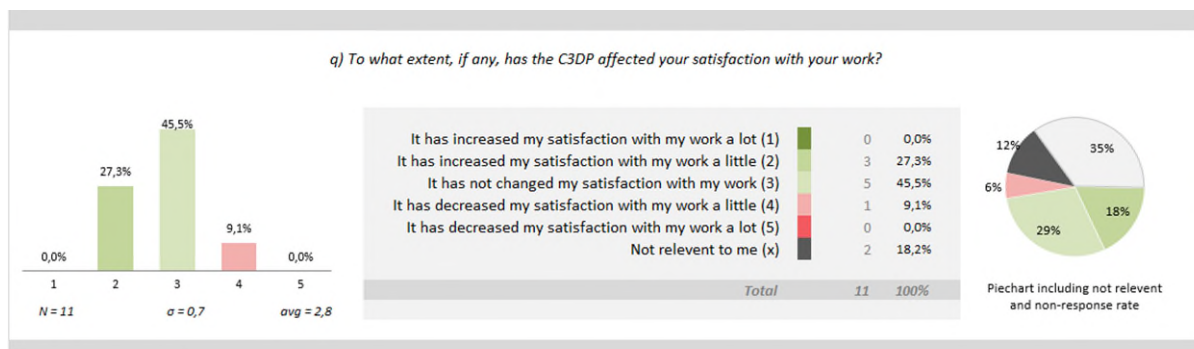


Figure 626 To what extent has C3DP affected your satisfaction with your work

As a concluding evaluation, HCPs were firstly asked for their overall satisfaction with C3DP. Responses ranged from “Fairly satisfied” (36.4%) and “Neither satisfied nor dissatisfied” (45.5%) to “Fairly dissatisfied” (18.2%). The non-response rate was 35%.

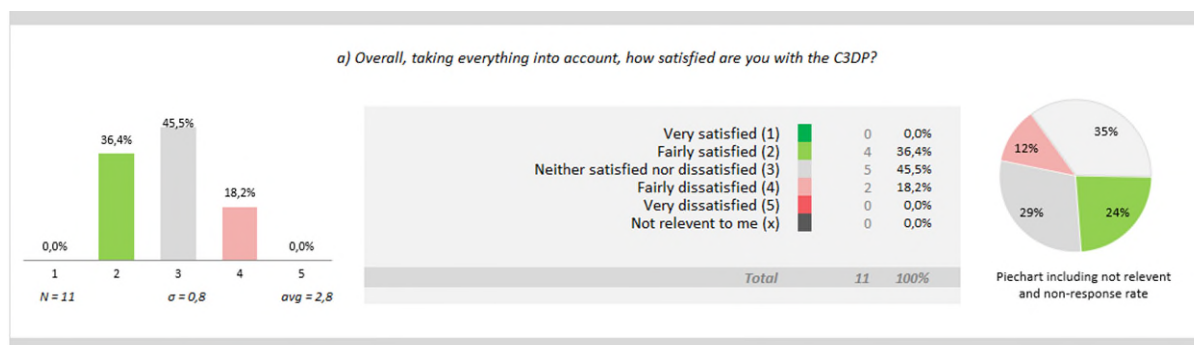


Figure 627 Overall, how satisfied are you with the C3DP

Secondly, respondents were asked to state whether they regarded C3DP worth the effort involved using it. 36.4% of users mostly agreed while 18.2% very much agreed. More than one quarter of respondents (27.3%) was neutral and 18.2% believed that it was mostly not worth the effort. This resulted in a neutral to slightly positive average rating (average 2.5; standard deviation 1.0).

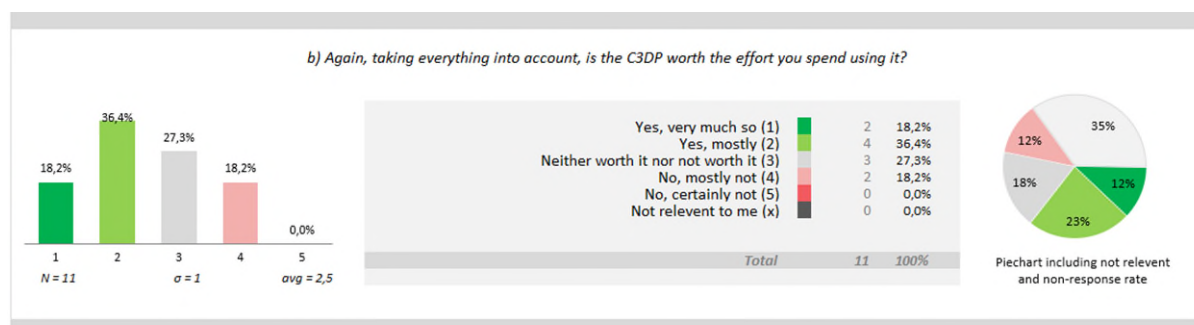


Figure 628 Is the C3DP worth the effort you spend using it

When asked if they would want to continue working with C3DP in the future if the decision was up to them, respondents had different opinions. The answer “Probably yes” was chosen most frequently by HCPs (36.4%), followed by 27.3% for “I am not yet decided”, 18.2% for “Probably

not” and 9.1% each for “Definitely yes” and “Certainly not”. This resulted in a neutral to slightly positive tendency on average (average 2.8; standard deviation 1.2).

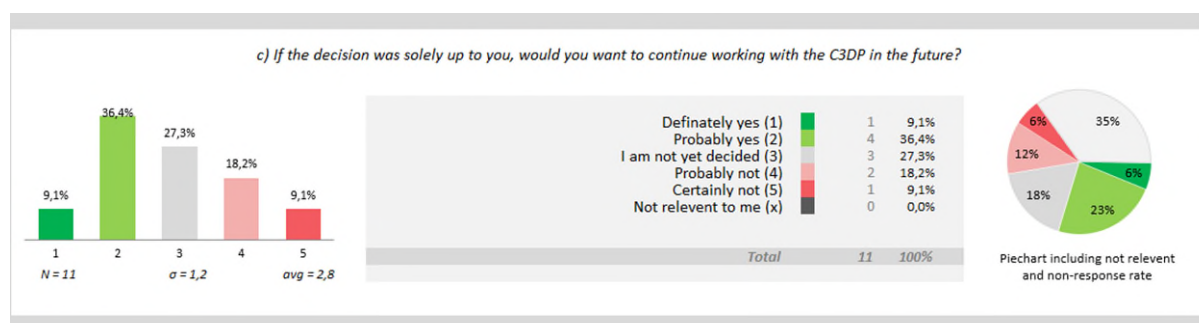


Figure 629 If the decision was solely up to you, would you want to continue working with the C3DP in the future

The table below displays further comments provided by MDT members about C3DP’s utility and users’ overall satisfaction with the system. The comments are presented in the Castilian original (for comments in the English translation, refer to **Table 15**).

eCUIIS, MDT further comments (original language)	
1)	Me ha precido una herramienta complicada y de un aprendizaje lento, que precisa tiempo para su potencial explotación. Un tiempo que no tenemos a día de hoy en nuestro día a día. SI tuebieramos del tiempo necesario, podría plantearmelo.
2)	Mis pacientes que estaban en el estudio no han sido muy activas ni muy colaboradoras, por lo que no hemos podido "sacar todo el jugo" a la plataforma. Sin embargo, sí que me ha parecido interesante y los datos "subidos" por ellas, han servido de apoyo a decisiones en consulta, pero no han sido decisivos. Hablando con compañeros del CS, sí que les ha resultado más prolífico.
3)	<p>Creo que en una zona rural donde haya dispersión puede ser una opción buena.</p> <p>Con 1 paciente, no puedo realmente opinar sobre el proyecto. Veo que puede ser útil para estar más fácilmente en contacto, pero a día de hoy, conlleva más carga de trabajo.</p> <p>Veo útil el envío de un mensaje cuando se añadiera alguna información nueva en la historia, sin necesidad de tener que entrar para ver si hay algo nuevo introducido por parte del paciente.</p> <p>Tampoco ha habido internistas a los que poder consultar dudas.</p>
4)	Me gustaria trabajar con el C3-Cloud funcionando adecuadamente sin problemas en la plataforma,y si los hubiera que se solucionasen a tiempo no como en mi caso que no se han podido solucionar.

Table 107 2nd survey for HCP, eCUIIS further comments, original language

10.7. C3-Cloud: First Survey for Informal Caregivers

Three respondents (N=3) in three polit sites submitted their responses to these basic questions. Of those respondents, one was between 50-54, one was between 60-64, and one was between 70-74 years of age.

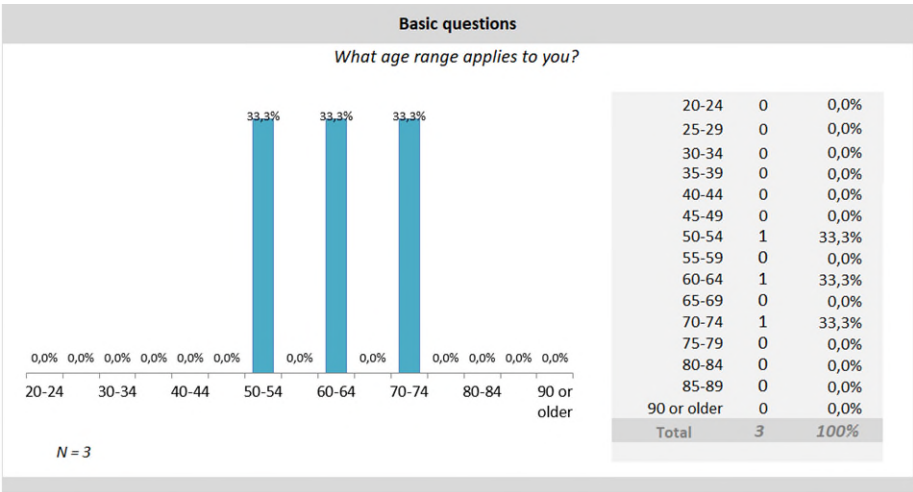


Figure 630 1st survey informal caregivers, basic question (age)

The second and third basic questions asked the respondents about their sex and which area they lived in. The results showed that all three respondents were female and lived in Region Jämtland Härjedalen.

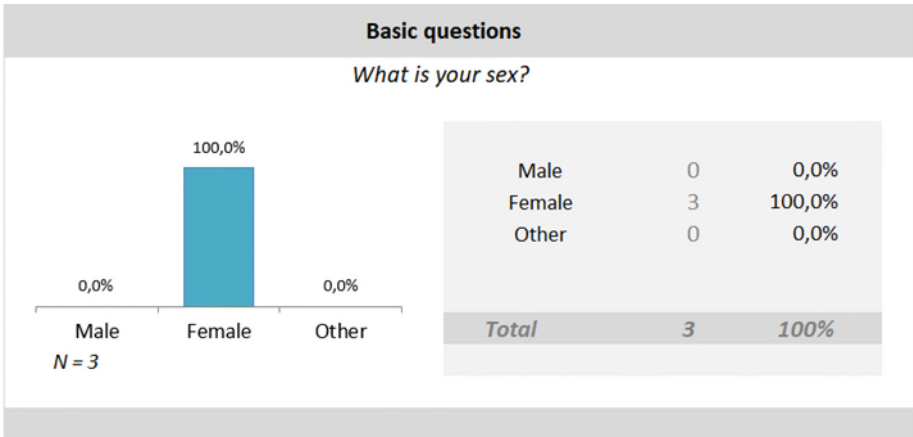


Figure 631 1st survey informal caregivers, basic question (sex)

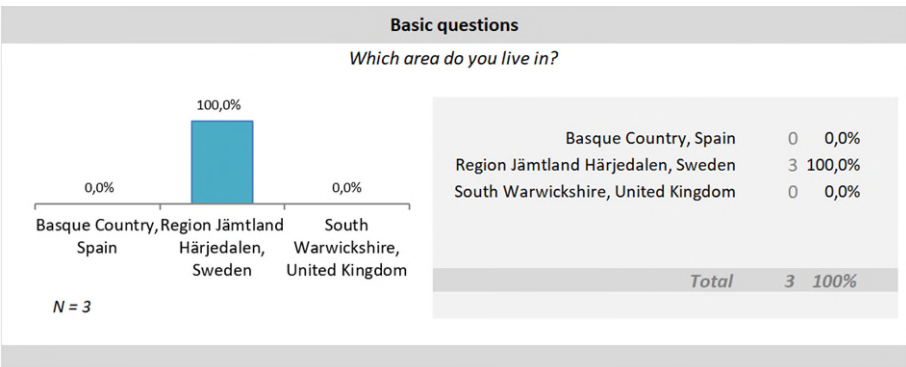


Figure 632 1st survey informal caregivers, basic question (area)

The eCare Client Impact Survey (eCCIS)

When informal caregivers were asked how often they usually helped the person doing his/her home-based self-measurements, 67% responded that it was not relevant to them and 33% chose “About every day”.

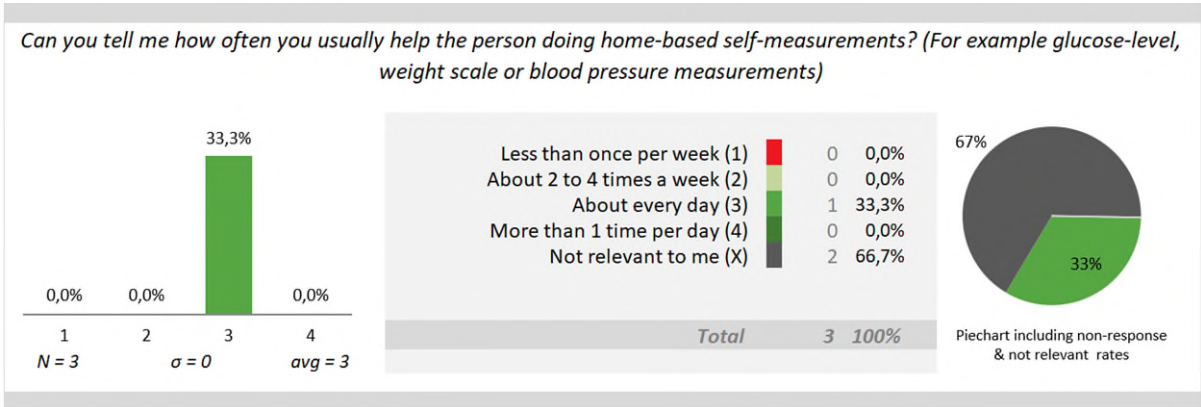


Figure 633 How often do you usually help the person doing home-based self-measurements

When asked how much time they spent with home-based self-measurement readings, 67% of the respondents said that it was not relevant to them and 33% confirmed that they spent less than 10 minutes per session with self-measurement readings.

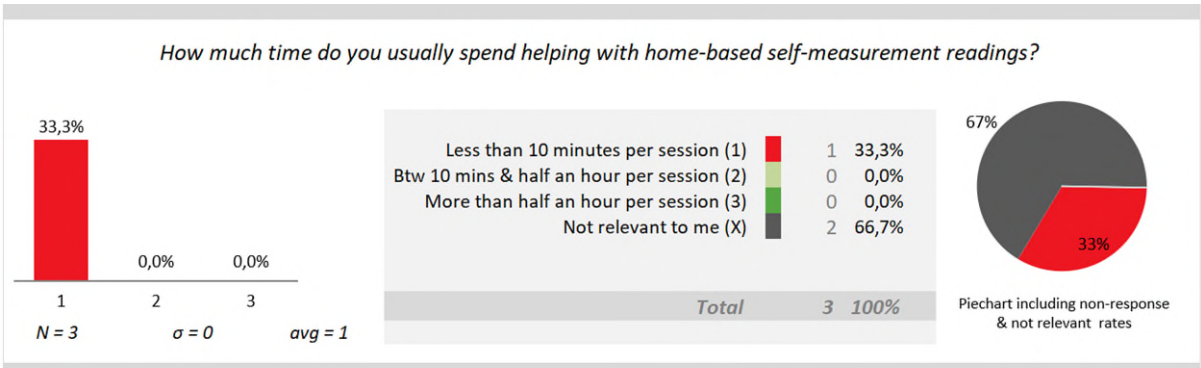


Figure 634 How much time do you usually spend helping with home-based self-measurement readings

To the question how much time they spent going to the general practitioner, including the time it took them to get to the physician’s office, 67% responded with “Less than an hour” and 33% said it was not relevant to them.

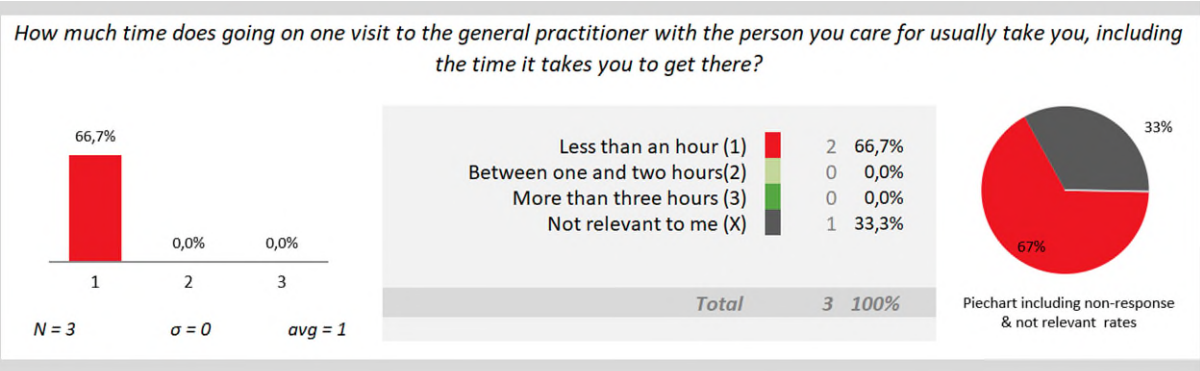


Figure 635 How much time does going on one visit to the general practitioner with the person you care for usually take you

Finally, regarding the time they usually spent going to a health consultant, including the travel time, 33% responded with “Less than an hour”, 33% responded with “Between one and two hours”, and another 33% responded that it was not relevant to them.

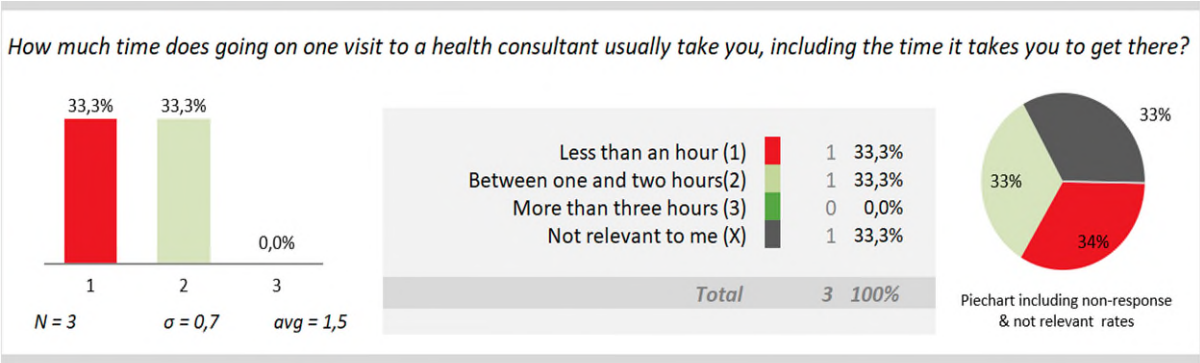


Figure 636 How much time does going on one visit to a health consultant usually take you

10.8. C3-Cloud: Second Survey for Informal Caregivers

Informal caregivers of patients using C3-Cloud were firstly asked three basic questions to which two users ($N=2$) responded. One caregiver was between 45-49 and one between 65-69 years of age.

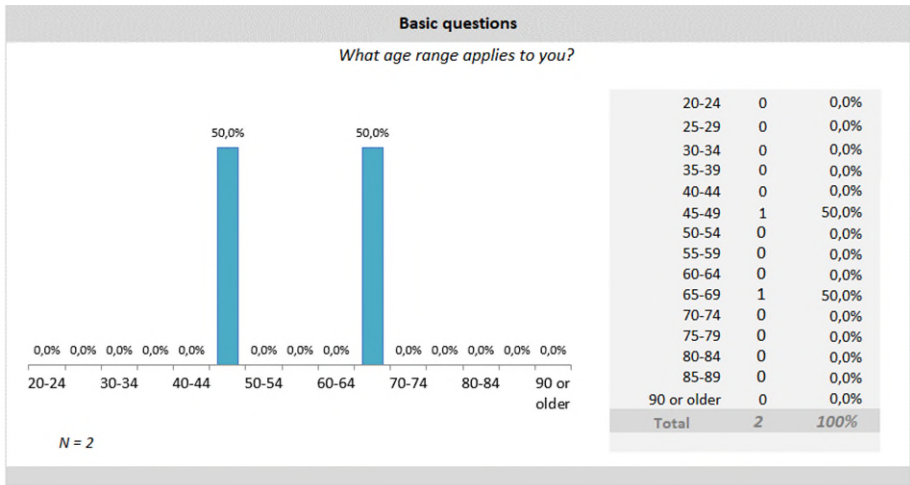


Figure 637 2nd survey for informal caregivers, basic question (age)

Responding to the basic question about their sex, one informal caregiver was male, and one was female.

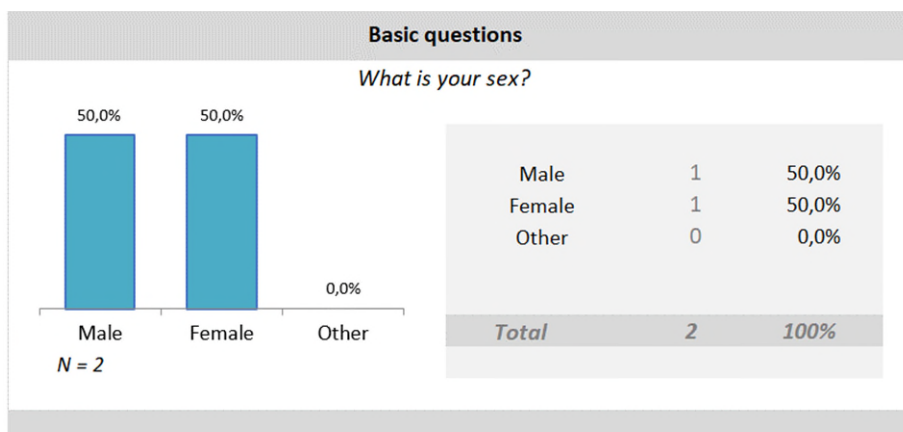


Figure 638 2nd survey for informal caregivers, basic question (sex)

Both respondents completing the second survey for informal caregivers came from the Basque Country in Spain.

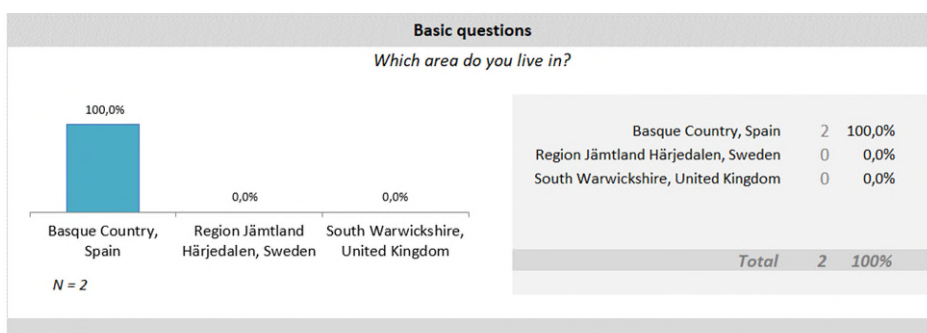


Figure 639 2nd survey for informal caregivers, basic question (area)

The eCare Client Impact Survey (eCCIS)

The eCCIS asked informal caregivers C3-cloud specific questions concerning the time spent with home-based self-measurements and readings, visiting the general practitioner or a health consultant. The two informal caregivers submitting responses both usually helped the person they cared for two to four times per week with home-based self-measurements.

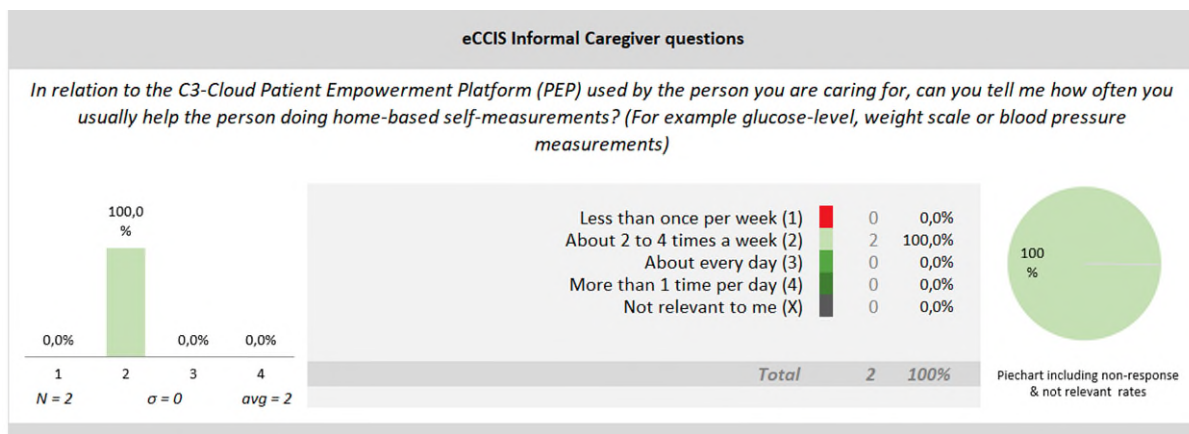


Figure 640 How often do you usually help the person doing home-based self-measurements

Further, the two respondents spent between 10-30 minutes helping the person they cared for with self-measurement readings per session.

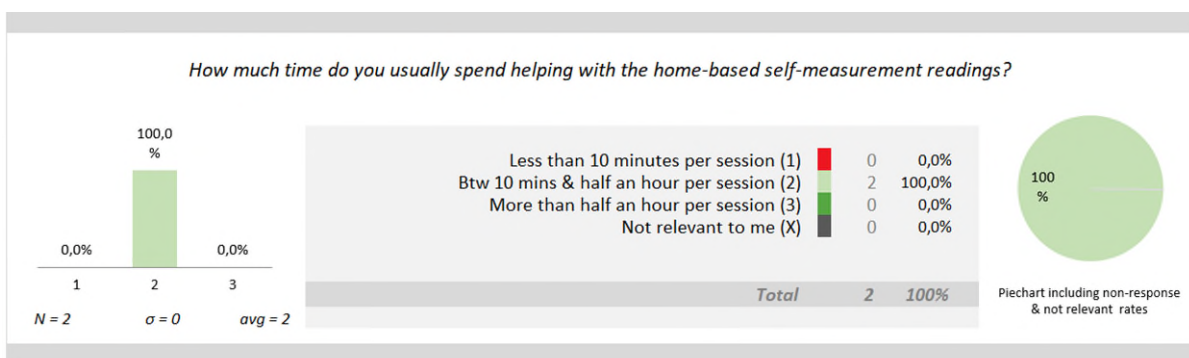


Figure 641 How much time do you usually spend helping with home-based self-measurement readings

Considering the time needed for one visit to the general practitioner, both respondents spent between 1-2 hours.

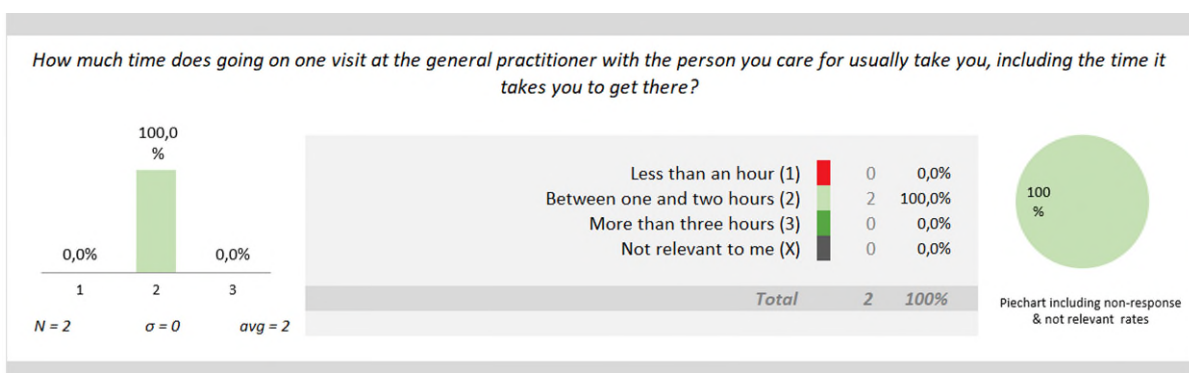


Figure 642 How much time does going on one visit at the general practitioner with the person you care for usually take you

Considering the time, it took them to go on one visit at the health consultant, including the travel time, one respondent indicated “Less than an hour”, while the other needed “Between one and two hours”.

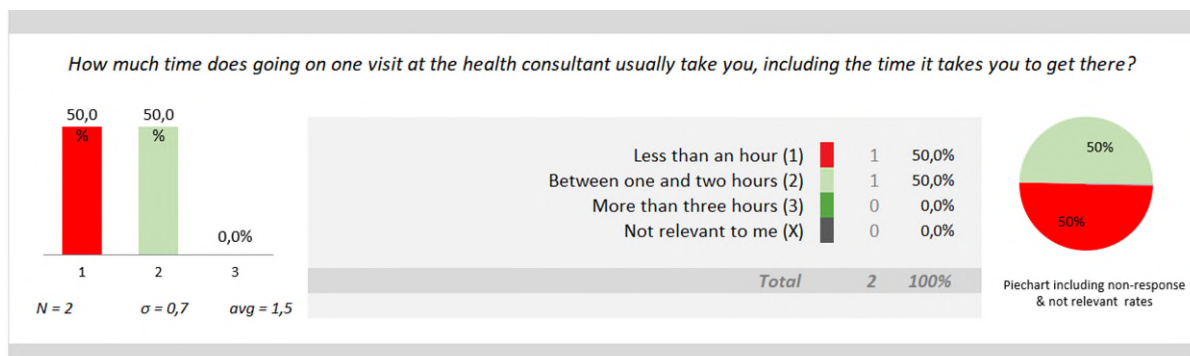


Figure 643 How much time does going on one visit at the health consultant usually take you

Thirdly, respondents were asked five questions about their perceived impacts of C3-Cloud on their role as an informal caregiver. When being asked to what extent C3-Cloud participation affected their ability to manage the care activities, both respondents agreed that it had no effect.

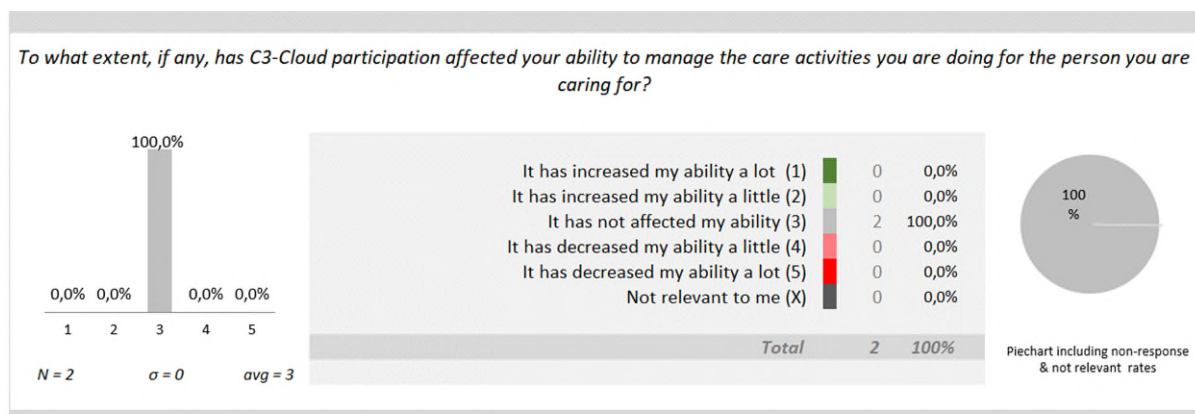


Figure 644 To what extent has C3-Cloud participation affected your ability to manage the care activities

When asked to what extent C3-Cloud participation affected their relationship with the person they cared for, the two respondents noted that it had no impact.

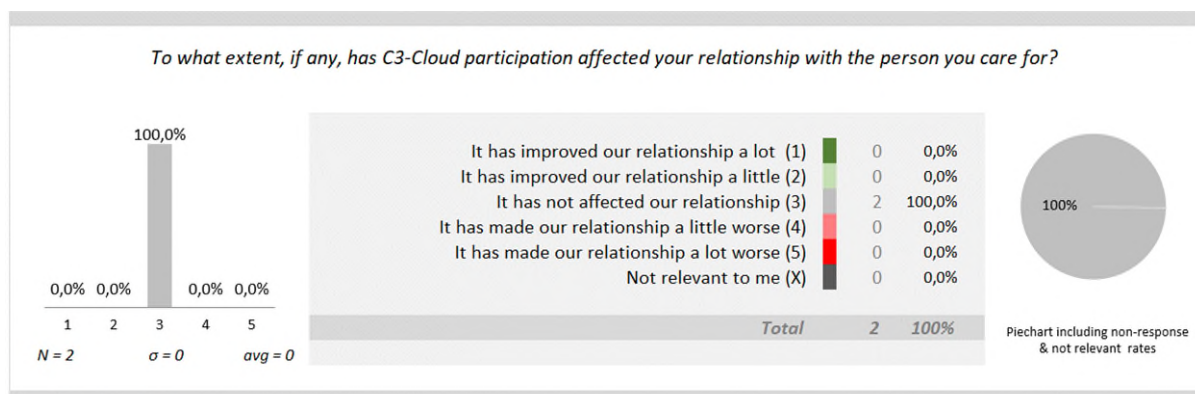


Figure 645 To what extent has C3-Cloud participation affected your relationship with the person you care for

Evaluating the effect of C3-Cloud participation on informal caregivers' level of anxiety about the health and well-being of the person they cared for, both respondents were neutral.

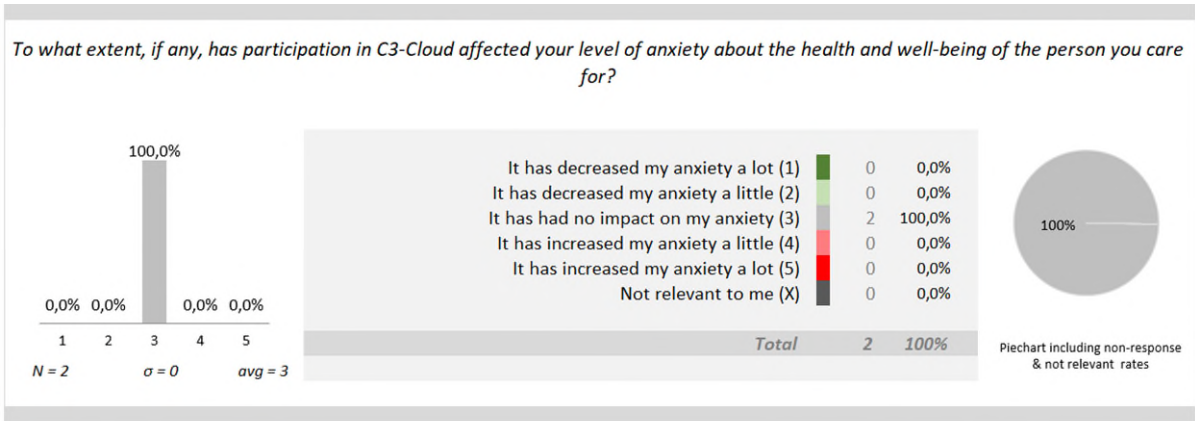


Figure 646 To what extent has C3-Cloud participation affected your level of anxiety

Similarly, the two respondents indicated that C3-Cloud participation did not affect their emotional well-being.

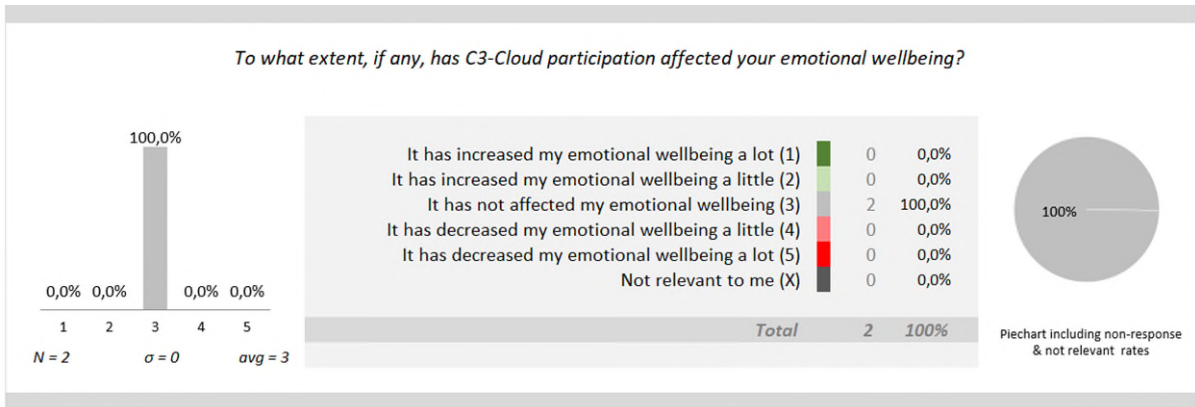


Figure 647 To what extent has C3-Cloud participation affected your emotional wellbeing

When asked to what extent C3-Cloud participation supported informal caregivers in their role, both respondents believed it neither made them feel more nor less supported.

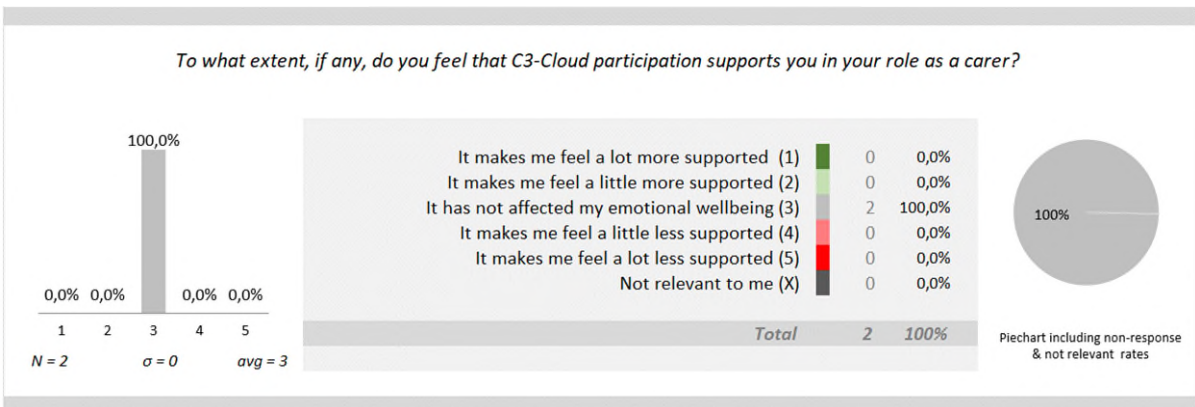


Figure 648 To what extent do you feel that C3-Cloud participation supports you in your role as a carer

The following part of the second survey for informal caregivers focused on the perceived coordination of C3-Cloud among different people in the patient’s care team. While one

respondent sometimes had to repeat patient-specific information when talking to different HCPs, the other respondent had to repeat information quite frequently.

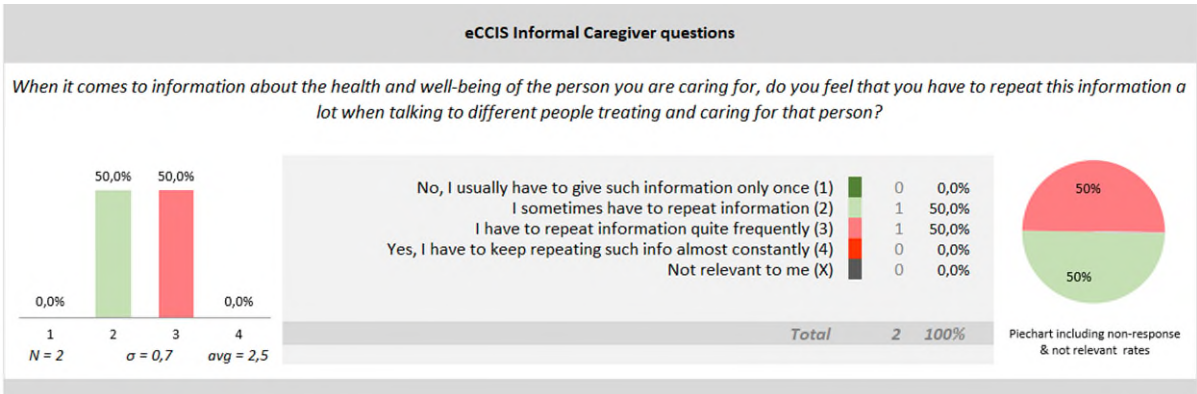


Figure 649 Do you feel you have to repeat information about the health and well-being of the person you are caring for when talking to different HCPs

When asked whether respondents felt that different people in the care team worked well together, one respondent perceived that all HCPs involved collaborated well, while the other respondent believed that this was the case only for some.

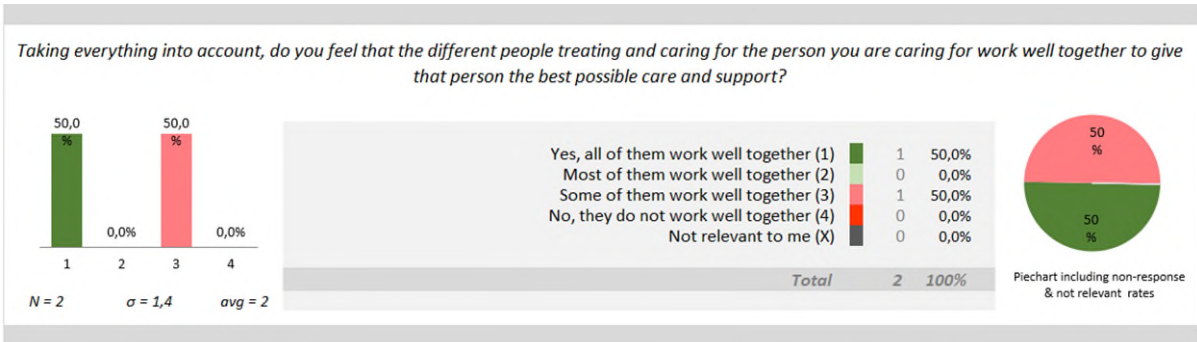


Figure 650 Do you feel that the different people treating and caring for the person you care for work well together

Finally, a summary evaluation for informal caregivers' overall satisfaction with C3-Cloud was provided. While one respondent was "Very satisfied", the other respondent was neutral.

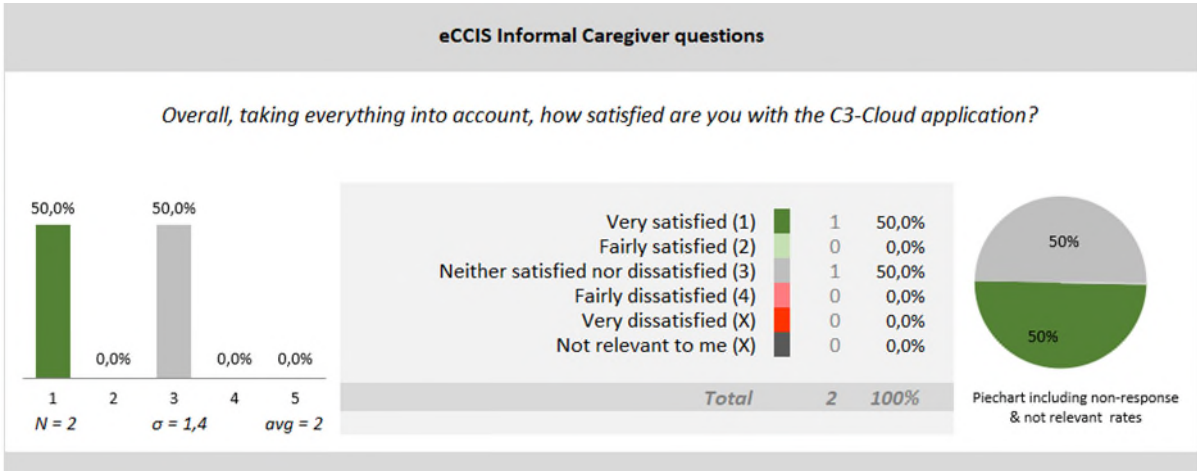


Figure 651 Overall, how satisfied are you with the C3-Cloud

When being asked whether C3-Cloud was worth the effort involved in using the application, one informal caregiver strongly believed it was, while the other informal caregiver had a neutral opinion.

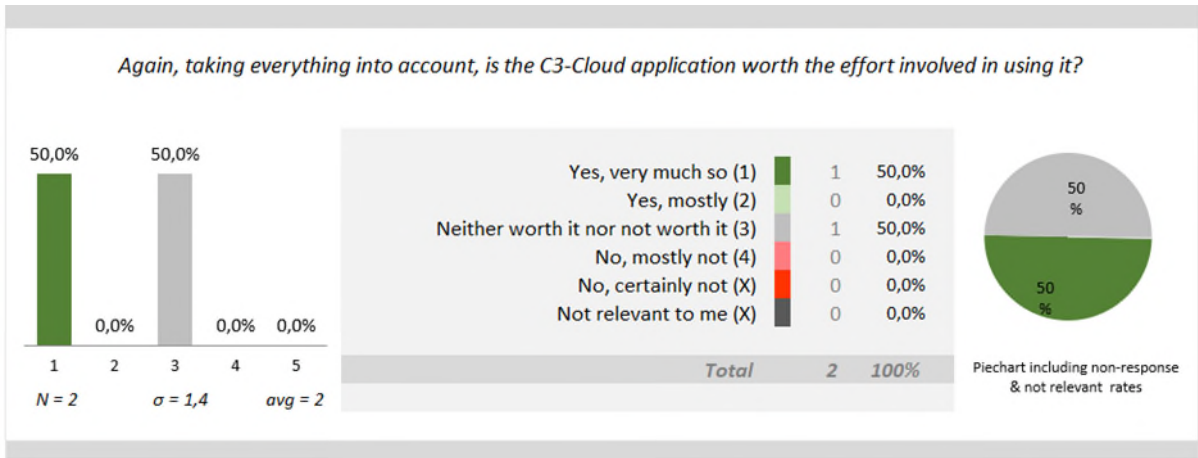


Figure 652 Taking everything into account, is C3-Cloud worth the effort involved in using it

Concluding the survey, it was assessed whether respondents would want to continue using the C3-Cloud application in the future, to which both respondents submitted “Definitely yes”.

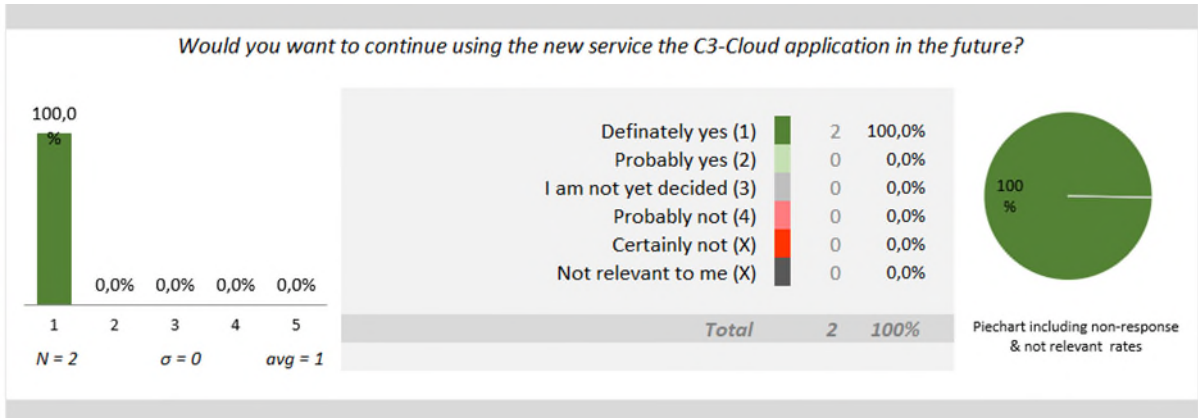


Figure 653 Would you want to continue using C3-Cloud in the future

10.9. RJH Patient Device Usage

Two respondents (N=2) located in RJH submitted answers to two basic questions in the patient device usage survey. Regarding the first basic question, both respondents were male.

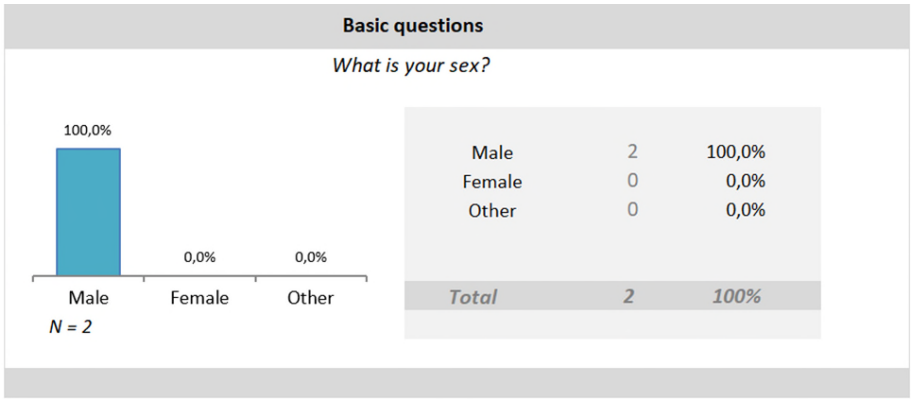


Figure 654 RJH patient device usage, basic question (sex)

Regarding the second basic question about their age range, one respondent reported to be 60-64 years of age, while the other respondent was 70-74 years of age.

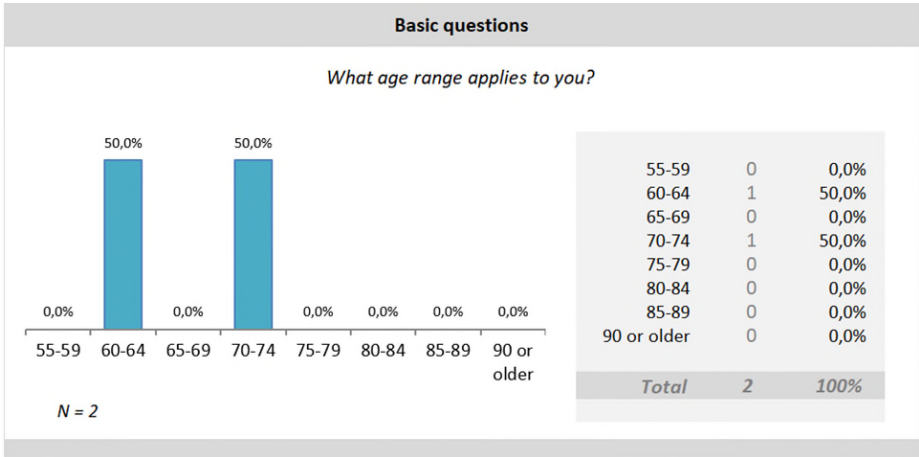


Figure 655 RJH patient device usage, basic question (age)

Patient Device Usage

Two respondents submitted answers to two binary questions about the C3-Cloud application in relation to medical device(s) use for home-based self-measurements. Firstly, both respondents used a blood pressure meter connected to the C3-Cloud over the last months.

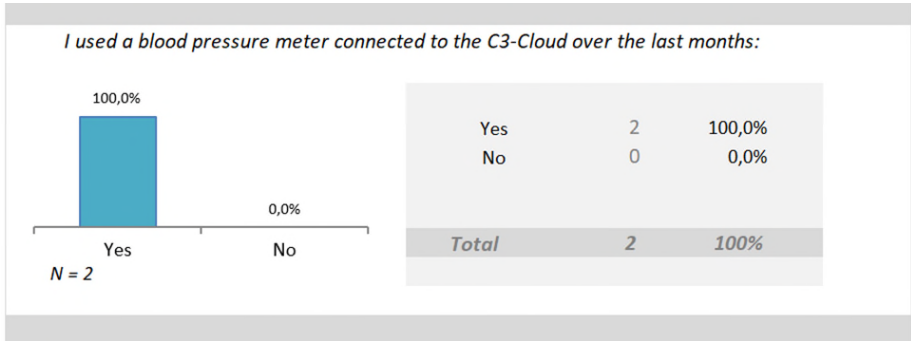


Figure 656 RJH patient device usage (blood pressure meter)

Secondly, both respondents used a weight scale connected to the C3-Cloud over the last months.

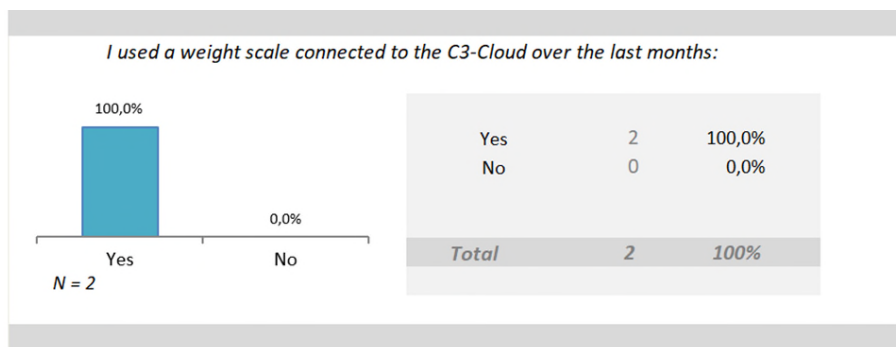


Figure 657 RJH patient device usage (weight scale)

The final part of the survey on patient device usage for home-based self-measurements, which was completed by one respondent located in RJH (N=1), asked to rate five statements (a)-(e) on a scale from “strongly disagree” to “strongly agree”. The summary figure and separated bar charts and pie charts including non-response rates are provided below.

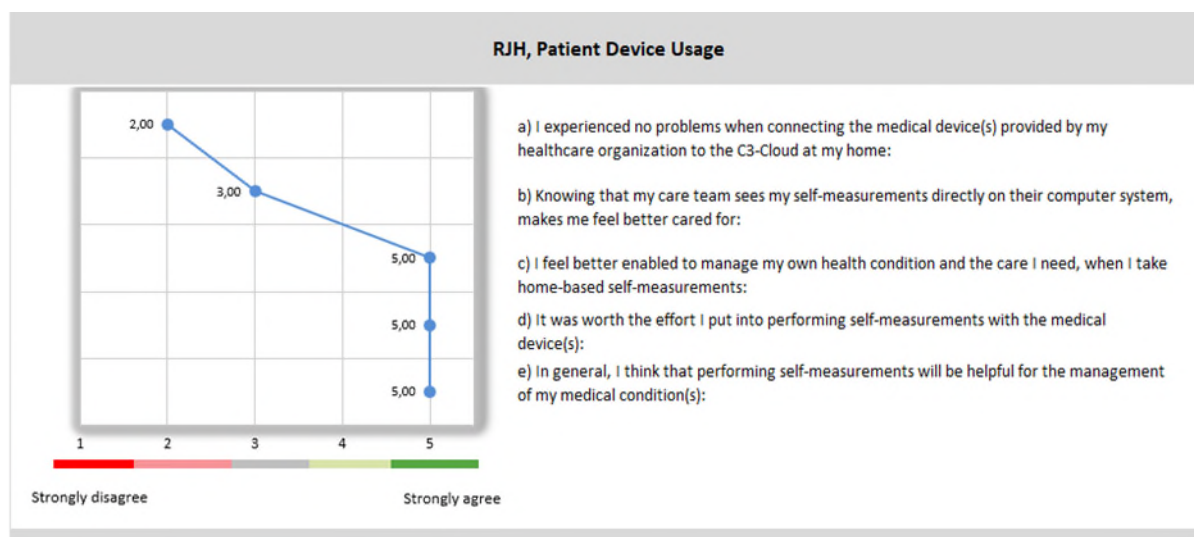


Figure 658 RJH patient device usage (a-e)

The first statement (a) proposed that the patient experienced no problem when connecting the medical device(s) to C3-Cloud, which the respondent disagreed with.

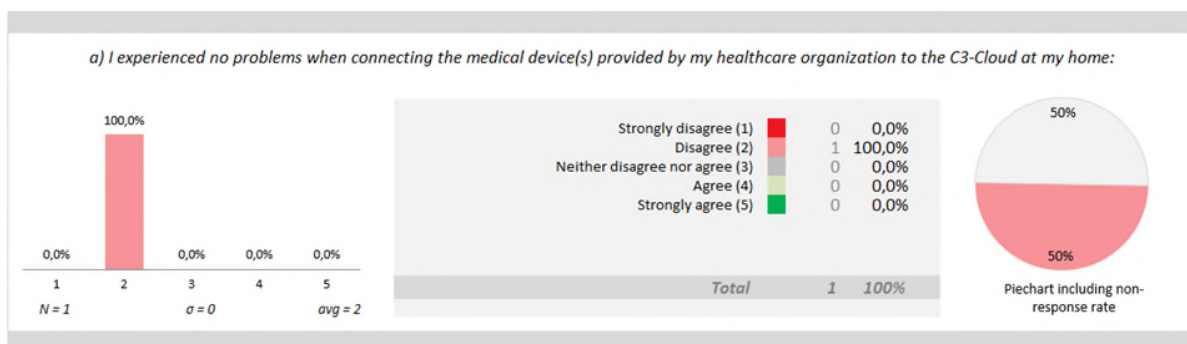


Figure 659 I experienced problems when connecting the medical device(s)

The respondent neither disagreed nor agreed to the second statement (b) considering whether knowing that the care team sees home-based self-measurements immediately in their system made the patient feel better cared for.

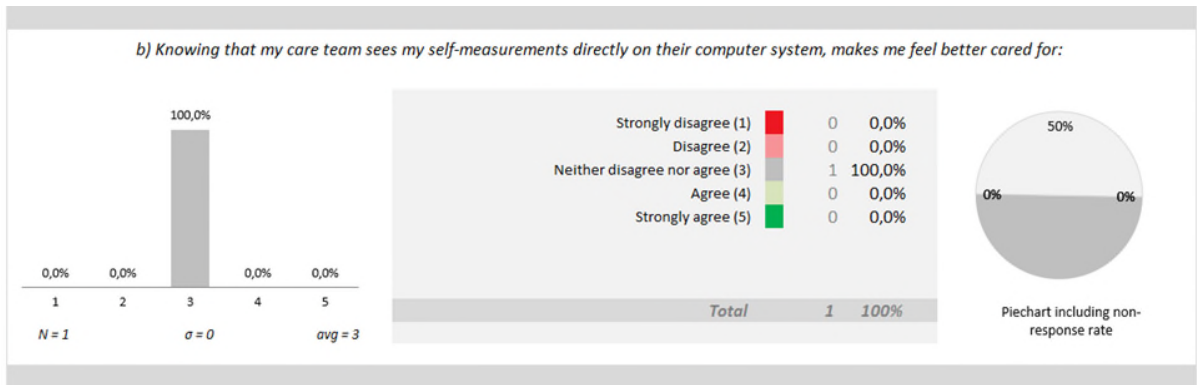


Figure 660 Knowing that care team sees self-measurements directly makes me feel better cared for

Thirdly, it was asked whether taking home-based self-measurements made the patient feel better enabled to manage his/her own health condition and individual care, with which the respondent strongly agreed.

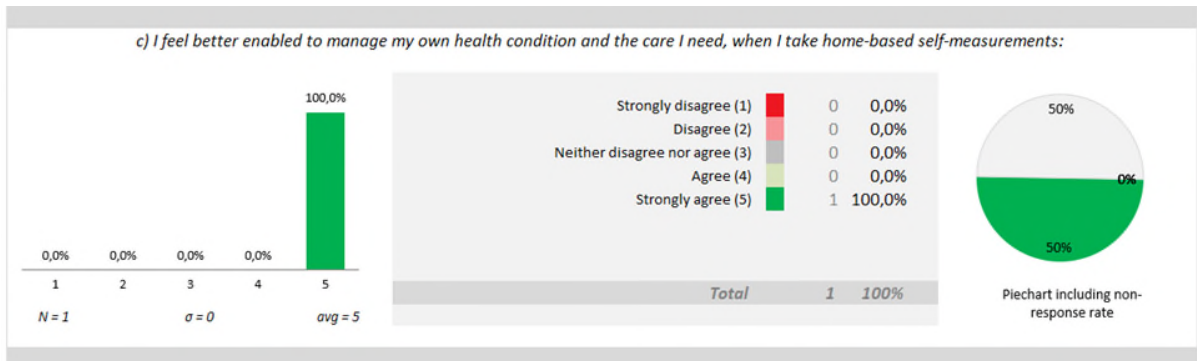


Figure 661 I feel better enabled to manage my own health condition and the care I need when I take home-based self-measurements

Similarly, the respondent strongly agreed to the statement that taking home-based self-measurements with the medical device(s) was worth the effort involved.

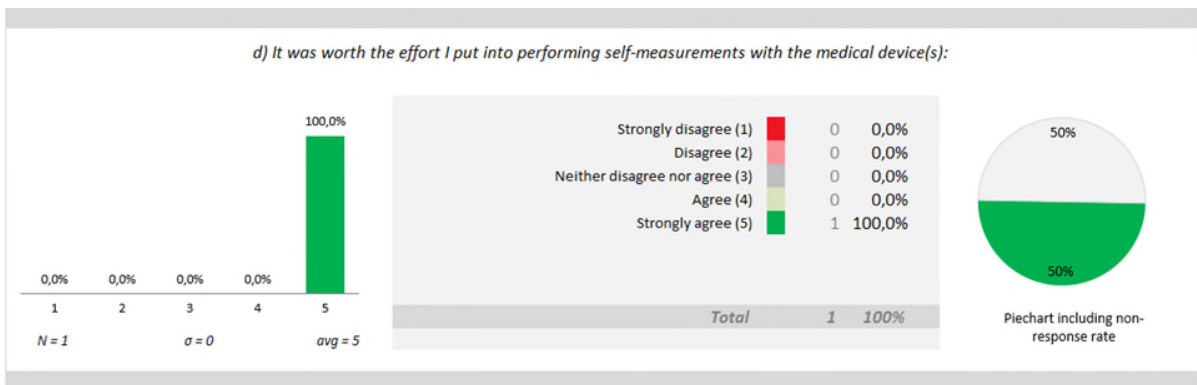


Figure 662 It was worth the effort I put into performing self-measurements

Lastly, statement (e) proposed that performing self-measurements would be helpful for patient self-management, with which the respondent strongly agreed.

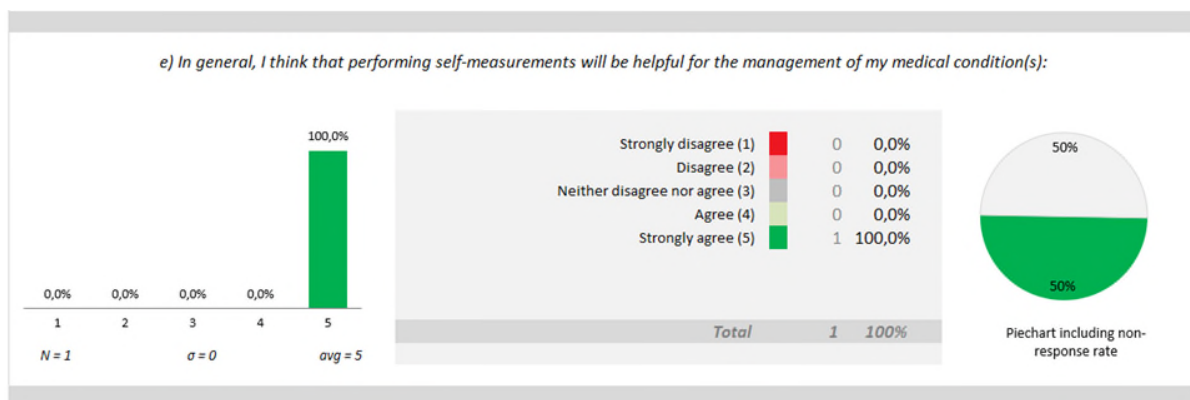


Figure 663 In general, I think that performing self-measurements will be helpful for the management of my medical condition(s)

10.10.DES tables and figures

Table 108 - The criteria that were taken into account for each disease to identify the target population in the Basque Health Service databases and medication ATC codes.

Disease	Clinical criteria	Medication ATC codes
Diabetes Mellitus	Type II (ICD-9: 250.x0 and 250.x2; ICD-10: E11.xx)	A10
Heart failure	NYHA I-II, first stages	C01-C10
Renal failure	eGFR/GFR 30-59, no need for haemodialysis	C01-C10, A11-A12, B03
Depression	Mild/moderate in Yesavage Geriatric Depression Scale	N06A

Table 109 - Unit costs of different resources obtained from pilot sites.

Resource	Basque Country	Jämtland Härjedalen		South Warwickshire	
	EUR (€)	SEK (kr)	EUR (€)	GBP (£)	EUR (€)
PC nurse (at centre)	12.19	823.00	78.11	15.00	17.66
PC nurse (at home)	22.15	823.00 ^a	78.11 ^a	20.00	23.54
PC nurse (by telephone)	6.10	310.00	29.42	10.00	11.77
General practitioner (at centre)	27.64	2,017.00	191.42	25.00	29.43
General practitioner (at home)	38.71	2,017.00 ^a	191.42 ^a	50.00	58.86
General practitioner (by telephone)	13.82	650.00	61.69	15.00	17.66
Cardiology (first consultation)	135.22	4,045.00	383.89	187.00	220.13
Cardiology (successive consultation)	79.52	4,045.00 ^b	383.89 ^b	132.00	155.39
Endocrinology (first consultation)	159.60	4,045.00	383.89	188.00	221.31
Endocrinology (successive consultation)	87.35	4,045.00 ^b	383.89 ^b	141.00	165.98
Nephrology (first consultation)	144.51	5,215.00	494.93	175.46	206.55
Nephrology (successive consultation)	82.51	5,215.00 ^b	494.93 ^b	131.07	154.29
Psychiatry (first consultation)	122.58	4,573.00	434.00	185.36 ^c	218.21 ^c
Psychiatry (successive consultation)	70.96	4,573.00 ^b	434.00 ^b	141.02 ^c	166.00 ^c
Internal medicine (first consultation)	136.70	4,045.00	383.89	191.00	224.84
Internal medicine (successive consultation)	80.22	4,045.00 ^b	383.89 ^b	160.00	188.35
A&E services (per contact)	170.99	3,606.00	342.23	141.00	165.98
Hospitalisation (per day)	481.28	8,000.00	759.24	-	-
Hospitalisation (per stay)	2,310.08	-	-	1,346.00	1,584.50

^a Consultation at centre value was used.^b First consultation value was used.^c Mean value of the rest of the specialities was used.

Table 110 - Prevalent and incident cohorts in 2017 obtained from Basque Health Service databases and the incident cohort extrapolation to 2025.

		Prevalence		Incidence							
		2017	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total		1,588	266	270	274	280	283	288	296	302	306
Men	55-59	64	7	7	7	7	7	7	7	7	7
	60-64	60	11	11	12	12	12	12	12	13	13
	65-69	92	22	22	22	22	22	23	24	24	25
	70-74	148	27	28	29	29	29	29	30	30	30
	75-79	143	23	23	25	27	28	29	31	32	32
	80-84	172	29	28	27	25	26	25	26	28	30
	85-89	126	15	16	17	17	17	18	17	17	16
	≥90	33	6	7	7	8	9	10	11	11	12
Women	55-59	26	8	8	8	8	8	8	8	8	8
	60-64	33	9	9	9	10	10	10	10	10	10
	65-69	49	4	4	4	4	4	4	4	4	5
	70-74	83	19	20	20	21	20	20	21	21	21
	75-79	136	27	27	29	31	32	34	35	36	36
	80-84	211	30	29	27	26	26	25	25	27	28
	85-89	146	21	22	22	23	23	23	23	22	20
	≥90	66	8	9	9	10	10	11	12	12	13

Table 111 - Logistic regression parameters used to set patients entrance characteristics.

		Diabetes mellitus ^a	Heart failure ^a	Renal failure ^a	Depression ^a	Pharmacy costs ^b
Sex	Women	-	-	-	-	-
	Men	0.826	0.149	0.383	-0.387	-0.135
Age group	55-59	-	-	-	-	-
	60-64	0.535	0.488	-0.039	-0.368	-0.488
	65-69	1.584	0.479	-0.048	-0.504	-0.050
	70-74	2.138	0.919	-0.405	-1.372	-0.228
	75-79	0.607	0.878	-0.596	15.020	-0.260
	80-84	0.789	1.123	-0.748	15.042	-0.464
	85-89	0.575	1.314	-0.315	14.948	-0.603
	>90	0.756	1.686	0.326	15.118	-1.200
Diabetes mellitus	No	-	-	-	-	-
	Yes	-	-0.812	-6.468	-37.459	-0.455
Heart failure	No	-	-	-	-	-
	Yes	-	-	-5.476	-49.528	-0.548
Renal failure	No	-	-	-	-	-
	Yes	-	-	-	-50.844	-1.045
Depression	No	-	-	-	-	-
	Yes	-	-	-	-	-0.734
Constant		3.043	-0.051	7.957	67.569	7.326

^a Logistic regression.^b Linear regression with logarithmic transformation.

Table 112 - Distributions and parameters of the time until event functions for primary care.

		PC nurse (at centre)		PC nurse (at home)		PC nurse (by telephone)		GP (at centre)		GP (at home)		GP (by telephone)	
		First	Second	First	Second	First	Second	First	Second	First	Second	First	Second
Type of function		Gompertz	Gompertz	Weibull	Weibull	Weibull	Weibull	Gompertz	Gompertz	Weibull	Weibull	Weibull	Weibull
Sex	Women	-	-	-	-	-	-	-	-	-	-	-	-
	Men	0.201	0.063	-0.230	0.118	-0.042	-0.016	0.068	0.039	-0.287	-0.043	-0.087	-0.113
Age group	55-59	0.000	0.000	-	-	-	-	0.000	0.000	-	-	-	-
	60-64	0.002	0.051	0.256	1.715	-0.065	0.070	0.050	0.031	0.565	-0.199	0.013	-0.048
	65-69	0.026	-0.044	0.740	1.553	0.016	0.103	0.069	0.101	0.736	0.090	0.001	-0.009
	70-74	0.104	0.003	1.192	1.244	0.092	0.023	0.158	0.108	1.192	0.203	0.073	0.048
	75-79	0.265	0.048	1.644	1.302	0.222	0.169	0.286	0.190	1.441	0.290	0.172	0.196
	80-84	0.124	-0.092	1.888	1.144	0.248	0.305	0.226	0.177	1.887	0.146	0.249	0.313
	85-89	0.012	-0.117	2.400	1.335	0.521	0.258	0.137	0.135	2.274	0.328	0.418	0.385
	>90	-0.335	-0.274	2.723	1.096	0.436	0.187	-0.139	0.077	2.725	0.137	0.398	0.296
Diabetes mellitus	No	-	-	-	-	-	-	-	-	-	-	-	-
	Yes	0.419	0.600	-0.407	-0.008	0.179	0.082	0.298	0.249	-0.170	-0.583	0.046	-0.026
Heart failure	No	-	-	-	-	-	-	-	-	-	-	-	-
	Yes	0.570	0.643	0.094	-0.030	-0.016	0.014	0.454	0.292	0.088	-0.045	-0.049	0.080
Renal failure	No	-	-	-	-	-	-	-	-	-	-	-	-
	Yes	-0.170	0.178	-0.748	0.000	-0.010	-0.358	-0.090	-0.098	-0.794	-0.173	-0.002	-0.126
Depression	No	-	-	-	-	-	-	-	-	-	-	-	-
	Yes	0.294	0.491	0.122	0.255	-0.012	0.213	0.328	0.178	0.077	-0.008	-0.084	0.092
Constant		-4.395	-3.773	-4.927	-3.571	-4.342	-2.775	-4.419	-3.629	-5.812	-2.620	-4.496	-3.012
Beta		-0.007	-0.012	0.494	0.741	0.629	0.657	-0.007	-0.008	0.581	0.711	0.811	0.712

Table 113 - Distributions and parameters of the time until event functions for hospital care and death.

		Outpatient services		A&E services		Death
		First	Second	First	Second	
Type of function		Weibull	Weibull	Weibull	Weibull	Gompertz
Sex	Women	-	-	-	-	-
	Men	0.153	-0.038	0.055	0.038	0.875
Age group	55-59	-	-	-	-	-
	60-64	-0.271	-0.148	-0.145	-0.177	-0.729
	65-69	-0.162	-0.210	0.032	-0.250	-0.417
	70-74	-0.201	-0.212	0.131	-0.307	0.238
	75-79	-0.221	-0.327	0.264	-0.228	1.366
	80-84	-0.354	-0.385	0.308	-0.184	1.886
	85-89	-0.659	-0.478	0.388	-0.245	2.586
	>90	-1.303	-0.839	0.298	-0.389	3.224
Diabetes mellitus	No	-	-	-	-	-
	Yes	0.127	0.229	0.417	0.227	-
Heart failure	No	-	-	-	-	-
	Yes	0.549	-0.221	0.563	-0.249	-
Renal failure	No	-	-	-	-	-
	Yes	-0.682	-0.263	-0.252	-0.327	-
Depression	No	-	-	-	-	-
	Yes	0.040	-0.080	0.608	-0.081	-
Constant		-3.953	-3.336	-5.967	-3.566	-10.795
Beta		0.592	0.838	0.744	0.743	0.000

Table 114 - Multinomial logistic distribution parameters to set the type of contact.

		Outpatient services				A&E services
		Endocrinology	Cardiology	Nephrology	Psychiatry	Hospitalisation
Sex	Women	-	-	-	-	-
	Men	-0.589	0.032	0.223	-0.390	0.260
Age group	55-59	-	-	-	-	-
	60-64	0.096	0.352	1.038	-0.689	0.226
	65-69	-0.385	-0.226	-0.399	-0.102	0.406
	70-74	-0.475	0.208	-0.056	-0.859	0.779
	75-79	-1.649	-0.358	-0.461	-1.933	0.699
	80-84	-1.809	-0.251	-0.929	-1.894	0.486
	85-89	-1.803	0.241	-0.224	-0.485	0.882
	>90	-3.304	-0.864	-16.607	-3.110	0.832
Diabetes mellitus	No	-	-	-	-	-
	Yes	-11.608	-14.648	-12.632	-28.757	0.762
Heart failure	No	-	-	-	-	-
	Yes	0.782	0.471	0.400	-15.904	0.436
Renal failure	No	-	-	-	-	-
	Yes	2.512	1.538	2.496	-12.624	0.035
Depression	No	-	-	-	-	-
	Yes	1.517	0.767	2.000	-12.962	0.098
Constant		12.051	14.883	11.528	43.837	-2.226

Table 115 - Univariate statistical analysis of sociodemographic and clinical differences between intervention and historic control group.

		Total	Control	Intervention	p-value ^a
Nº patients	Total	858	635	223	
Site	Basque Country	480 (55.9%)	453 (71.3%)	27 (12.1%)	< 0.001
	Sweden	378 (44.1%)	182 (28.7%)	196 (87.9%)	
Sex	Female	442 (51.5%)	346 (54.5%)	96 (43.0%)	0.004
	Male	416 (48.5%)	289 (45.5%)	127 (57.0%)	
Age range	<80	539 (62.8%)	378 (59.5%)	161 (72.2%)	0.001
	≥80	319 (37.2%)	257 (40.5%)	62 (27.8%)	
	55-59	28 (3.3%)	23 (3.6%)	5 (2.2%)	0.001
	60-64	54 (6.3%)	42 (6.6%)	12 (5.4%)	
	65-69	116 (13.5%)	79 (12.4%)	37 (16.6%)	
	70-74	154 (17.9%)	104 (16.4%)	50 (22.4%)	
	75-79	187 (21.8%)	130 (20.5%)	57 (25.6%)	
	80-84	162 (18.9%)	122 (19.2%)	40 (17.9%)	
	85-89	106 (12.4%)	86 (13.5%)	20 (9.0%)	
	≥90	51 (5.9%)	49 (7.7%)	2 (0.9%)	
Caregiver	No	685 (79.8%)	505 (79.5%)	180 (80.7%)	0.776
	Yes	173 (20.2%)	130 (20.5%)	43 (19.3%)	
Diabetes mellitus	No	132 (15.4%)	123 (19.4%)	9 (4.0%)	< 0.001
	Yes	726 (84.6%)	512 (80.6%)	214 (96.0%)	
Heart failure	No	670 (78.1%)	458 (72.1%)	212 (95.1%)	<0.001
	Yes	188 (21.9%)	177 (27.9%)	11 (4.9%)	
Renal failure	No	570 (66.4%)	379 (59.7%)	191 (85.7%)	< 0.001
	Yes	288 (33.6%)	256 (40.3%)	32 (14.3%)	
Depression	No	555 (64.7%)	359 (56.5%)	196 (87.9%)	< 0.001
	Yes	303 (35.3%)	276 (43.5%)	27 (12.1%)	
Death	No	837 (97.6%)	618 (97.3%)	219 (98.2%)	0.629
	Yes	21 (2.4%)	17 (2.7%)	4 (1.8%)	
Follow-up	Mean	179,41	179,86	178,13	0.191

^aDifferences between intervention and control groups were analysed by Fisher's exact test for categorical variables and Student's t-test for continuous variables.

Table 116 - Univariate statistical analysis of the use of health services between intervention and historic control group during the trial.

			Total	Control	Intervention	p-value ^a
Nº patients			858	635 (74%)	223 (26%)	
General practitioner	Total	<i>Mean (SD)</i>	3.6 (4.2)	4 (4.5)	2.4 (2.9)	< 0.001
		<i>Median (Q1, Q3)</i>	2 (1,5)	3 (1,5)	1.3 (0,3)	< 0.001
	At centre	<i>Mean (SD)</i>	1.7 (2.2)	2 (2.4)	0.9 (1.2)	< 0.001
		<i>Median (Q1, Q3)</i>	1 (0,2)	1 (0,3)	1 (0,1)	< 0.001
	By telephone	<i>Mean (SD)</i>	1.7 (2.6)	1.8 (2.7)	1.4 (2.1)	0.071
		<i>Median (Q1, Q3)</i>	1 (0,2)	1 (0,2)	1 (0,2)	0.343
	At home	<i>Mean (SD)</i>	0.2 (0.9)	0.3 (1)	0.1 (0.5)	< 0.001
		<i>Median (Q1, Q3)</i>	0 (0,0)	0 (0,0)	0 (0,0)	< 0.001
PC nurse	Total	<i>Mean (SD)</i>	3.1 (5.1)	3.2 (5.3)	3 (4.3)	0.493
		<i>Median (Q1, Q3)</i>	1 (0,4)	1 (0,4)	2 (1,3.1)	0.261
	At centre	<i>Mean (SD)</i>	1.6 (3)	1.7 (3.1)	1.4 (2.7)	0.322
		<i>Median (Q1, Q3)</i>	1 (0,2)	1 (0,2)	1 (0,2)	0.930
	By telephone	<i>Mean (SD)</i>	1 (2.1)	0.8 (1.9)	1.3 (2.4)	0.009
		<i>Median (Q1, Q3)</i>	0 (0,1)	0 (0,1)	0 (0,1.8)	0.001
	At home	<i>Mean (SD)</i>	0.6 (2.7)	0.7 (3)	0.2 (1.4)	0.001
		<i>Median (Q1, Q3)</i>	0 (0,0)	0 (0,0)	0 (0,0)	< 0.001
Specialist	Total	<i>Mean (SD)</i>	0.7 (1.7)	0.7 (1.7)	0.6 (1.5)	0.495
		<i>Median (Q1, Q3)</i>	0 (0,1)	0 (0,1)	0 (0,1)	0.480
	Cardiology	<i>Mean (SD)</i>	0.1 (0.6)	0.2 (0.6)	0.1 (0.5)	0.754
		<i>Median (Q1, Q3)</i>	0 (0,0)	0 (0,0)	0 (0,0)	0.792
	Endocrinology	<i>Mean (SD)</i>	0.1 (0.3)	0.1 (0.4)	0 (0.3)	0.109
		<i>Median (Q1, Q3)</i>	0 (0,0)	0 (0,0)	0 (0,0)	0.174
	Internal medicine	<i>Mean (SD)</i>	0.2 (0.9)	0.1 (0.7)	0.3 (1.2)	0.041
		<i>Median (Q1, Q3)</i>	0 (0,0)	0 (0,0)	0 (0,0)	0.002
	Nephrology	<i>Mean (SD)</i>	0.2 (0.8)	0.2 (0.9)	0.1 (0.5)	0.006
		<i>Median (Q1, Q3)</i>	0 (0,0)	0 (0,0)	0 (0,0)	0.024
	Psychiatry	<i>Mean (SD)</i>	0.1 (0.7)	0.1 (0.8)	0.1 (0.5)	0.109
		<i>Median (Q1, Q3)</i>	0 (0,0)	0 (0,0)	0 (0,0)	0.077
Emergency department	Total	<i>Mean (SD)</i>	0.4 (1)	0.4 (0.9)	0.3 (1.1)	0.159
		<i>Median (Q1, Q3)</i>	0 (0,0)	0 (0,0)	0 (0,0)	0.001
	At least one contact	<i>N (%)</i>	172 (20%)	145 (22.8%)	27 (12.1%)	0.001
Hospitalization	Mean contacts in total	<i>Mean (SD)</i>	0.2 (0.7)	0.2 (0.7)	0.2 (0.6)	0.401
		<i>Median (Q1, Q3)</i>	0 (0,0)	0 (0,0)	0 (0,0)	0.618
	At least one contact	<i>N (%)</i>	84 (9.8%)	64 (10.1%)	20 (9%)	0.727
	Mean hospital stay days*	<i>Mean (SD)</i>	11.6 (16.4)	12.7 (18.2)	8.3 (7.9)	0.133
		<i>Median (Q1, Q3)</i>	8 (3.9,15)	9 (4,16.2)	5.5 (3.2,11.2)	0.154

^aDifferences between groups were examined using the Student's t-test or by nonparametric Wilcoxon rank-sum test, when medians were displayed.

* Considering only those with any hospitalization (n=84).

SD = Standard deviation; Q1, Q3 = First and third quartile.

Table 117 - Estimation of the differences of the intervention group over the control group derived from the regression models.

	Coefficient	Standard Error	t value	p-value ^a
Nº of contacts with general practitioner	-0.119	0.094	-1.266	0.206
at Centre	-0.468	0.180	-2.602	0.009
by phone	0.176	0.125	1.407	0.160
at Home	-0.564	0.413	-1.365	0.173
Nº of contacts with PC nurse	0.005	0.115	0.042	0.966
at Centre	-0.299	0.133	-2.249	0.025
by phone	0.470	0.169	2.787	0.005
at Home	-0.808	0.335	-2.411	0.016
Nº of contacts with specialist	0.126	0.135	0.939	0.348
Cardiology	0.161	0.316	0.509	0.611
Endocrinology	-0.392	0.436	-0.898	0.370
Internal medicine	0.774	0.432	1.792	0.073
Nephrology	0.204	0.450	0.453	0.651
Psychiatry	0.400	0.545	0.735	0.463
Nº of Emergency visits	-0.198	0.232	-0.854	0.394
At least one emergency visit ^b	-0.565	0.249	-2.271	0.023
Nº of hospitalizations	-0.366	0.348	-1.053	0.293
At least one hospitalisation ^b	-0.184	0.307	-0.599	0.550
Hospital stay in days ^c	-0.454	0.288	-1.574	0.120

^aNegative binomial regression models (log link).

^bLogistic regression models (logit link).

^cZero adjusted negative binomial models (log link), considered only those patients with any hospitalization (n=84).

Table 118 - C3-Cloud intervention effect presented as odds ratio and significance.

	C3-cloud intervention effect
General practitioner (at centre) ^a	0,63 (0,44-0,89)**
PC nurse (at centre) ^a	0,74 (0,57-0,96)*
PC nurse (at home) ^a	0,45 (0,23-0,86)*
PC nurse (by telephone) ^a	1,60 (1,15-2,23)**
Emergency ^b	0,57 (0,35-0,93)*

* p-value ≤ 0.05 , ** p-value ≤ 0.01 .

^aNegative binomial regression models (log link).

^bLogistic regression models (logit link).

Table 119 - Target population characteristics.

N° patients	Total	1,854	100%
Age	Mean (years)	76.8	
Age distribution	55-59	105	5.7%
	60-64	113	6.1%
	65-69	167	9.0%
	70-74	277	14.9%
	75-79	329	17.7%
	80-84	442	23.8%
	85-89	308	16.6%
	≥90	113	6.1%
Sex	Men	978	52.8%
	Women	876	47.2%
Diseases	Diabetes mellitus	1,826	98.5%
	Heart failure	1,009	54.4%
	Renal failure	697	37.6%
	Depression	200	10.8%
Death	No	1,686	90.9%
	Yes	168	9.1%

Table 120 - Goodness of fit test for different resources differentiated by sex.

Women	PC nurse (centre)	PC nurse (home)	PC nurse (telephone)	GP (centre)	GP (home)	GP (telephone)	Outpatient services	A&E services	Hospitalisation
Correlation coefficient (R): > 0.8	0.869	0.871	0.873	0.873	0.836	0.873	0.839	0.862	0.853
Normalized mean squared error (NMSE): < 0.5	0.019	0.257	0.083	0.004	0.141	0.145	0.040	0.018	0.040
Fractional bias (FB): [-0.5, 0.5]	-0.104	0.331	0.180	-0.037	0.130	0.260	0.065	-0.024	-0.078
Fractional variance (FV): [-0.5, 0.5]	0.136	0.382	0.273	0.070	0.394	0.336	0.346	0.170	0.226
Factor of two (FAC2): > 0.8	1.000	0.917	1.000	1.000	0.833	1.000	1.000	0.917	0.833
Men	PC nurse (centre)	PC nurse (home)	PC nurse (telephone)	GP (centre)	GP (home)	GP (telephone)	Outpatient services	A&E services	Hospitalisation
Correlation coefficient (R): > 0.8	0.862	0.855	0.871	0.869	0.851	0.873	0.872	0.860	0.837
Normalized mean squared error (NMSE): < 0.5	0.012	0.186	0.070	0.004	0.072	0.103	0.021	0.016	0.137
Fractional bias (FB): [-0.5, 0.5]	0.055	-0.306	-0.225	-0.006	-0.060	-0.275	-0.115	-0.002	0.269
Fractional variance (FV): [-0.5, 0.5]	0.193	0.362	0.235	0.118	0.288	0.273	0.124	0.218	0.399
Factor of two (FAC2): > 0.8	1.000	0.917	1.000	1.000	0.917	1.000	1.000	1.000	1.000

Table 121 - Target population, resource consumption and cost extrapolation from 2017 to 2025 for a conventional scenario.

		2017	2018	2019	2020	2021	2022	2023	2024	2025
Target population (number of patients)	Prevalence	1,588	1,676	1,762	1,851	1,928	2,002	2,066	2,134	2,204
	Incidence	266	270	274	280	283	288	296	302	306
	Mortality	178	183	185	203	208	223	228	231	256
Resource consumption (number of contacts)	PC nurse	42,333	50,750	54,509	58,162	60,885	62,907	65,070	67,352	68,937
	General practitioner	28,756	33,554	35,739	37,652	39,309	40,844	42,369	43,635	44,747
	Outpatient services	3,215	4,273	4,950	5,508	5,852	6,200	6,515	6,899	7,111
	A&E services	1,717	2,048	2,354	2,536	2,730	2,896	3,020	3,091	3,195
	Hospitalisation	687	802	912	988	1,055	1,143	1,156	1,169	1,222
Cost (€)	PC nurse	550,860	671,269	722,609	772,037	808,639	835,253	865,009	895,172	915,428
	General practitioner	719,477	834,189	889,526	935,915	978,466	1,016,452	1,056,484	1,087,348	1,115,361
	Outpatient services	275,285	367,051	424,694	473,069	502,479	532,910	559,647	593,753	611,873
	A&E services	293,658	350,153	402,579	433,665	466,751	495,153	516,458	528,530	546,279
	Hospitalisation	1,587,949	1,852,915	2,107,024	2,282,590	2,436,441	2,639,266	2,671,146	2,700,946	2,822,687
	Total resources	3,427,229	4,075,577	4,546,432	4,897,276	5,192,777	5,519,034	5,668,744	5,805,748	6,011,628
	Medication	533,697	573,078	610,294	645,085	677,905	707,010	728,888	756,291	780,272
	Total	3,960,926	4,648,655	5,156,726	5,542,361	5,870,682	6,226,043	6,397,632	6,562,039	6,791,899

Table 122 - Target population, resource consumption and cost extrapolation from 2017 to 2025 for a c3-Cloud scenario.

		2017	2018	2019	2020	2021	2022	2023	2024	2025
Target population (number of patients)	Prevalence	1,588	1,676	1,762	1,851	1,928	2,002	2,066	2,134	2,204
	Incidence	266	270	274	280	283	288	296	302	306
	Mortality	178	183	185	203	208	223	228	231	256
Resource consumption (number of contacts)	PC nurse	33,247	40,068	43,490	46,304	48,774	51,192	52,862	54,490	55,971
	General practitioner	21,216	24,152	25,857	27,260	28,498	29,650	30,491	31,517	32,302
	Outpatient services	3,215	4,273	4,950	5,508	5,852	6,200	6,515	6,899	7,111
	A&E services	1,046	1,358	1,661	1,826	2,007	2,198	2,280	2,369	2,488
	Hospitalisation	687	802	912	988	1,055	1,143	1,156	1,169	1,222
Cost (€)	PC nurse	381,538	447,473	479,978	508,952	533,961	558,777	576,886	593,325	607,574
	General practitioner	511,074	574,323	616,385	648,678	679,653	707,056	728,163	752,414	771,387
	Outpatient services	275,285	367,051	424,694	473,069	502,479	532,910	559,647	593,753	611,873
	A&E services	178,873	232,187	283,980	312,211	343,211	375,836	389,806	405,007	425,457
	Hospitalisation	1,587,949	1,852,915	2,107,024	2,282,590	2,436,441	2,639,266	2,671,146	2,700,946	2,822,687
	Total resources	2,934,719	3,473,949	3,912,060	4,225,499	4,495,745	4,813,845	4,925,647	5,045,445	5,238,977
	Medication	533,697	573,078	610,294	645,085	677,905	707,010	728,888	756,291	780,272
	Total	3,468,416	4,047,027	4,522,355	4,870,583	5,173,649	5,520,855	5,654,535	5,801,736	6,019,249

Table 123 - Discrete event simulation monthly cost per patient outputs for the Basque County pilot site from 2017 to 2025 in euros used to feed ASSIST tool.

	2017						2025				
	January	February	March	April	May	...	August	September	October	November	December
PC nurse (total)	21,87	21,38	22,82	23,98	24,55	...	41,58	40,80	40,47	40,41	40,14
PC nurse (at centre)	14,99	15,11	16,17	16,84	17,14	...	25,23	24,92	24,72	24,63	24,27
PC nurse (at home)	5,49	5,08	5,40	5,90	6,13	...	13,70	13,26	13,13	13,15	13,24
PC nurse (by telephone)	1,40	1,19	1,26	1,23	1,28	...	2,65	2,62	2,62	2,62	2,62
PC doctor (total)	31,67	29,34	30,58	31,10	32,28	...	50,49	49,65	49,54	49,43	48,38
PC doctor (at centre)	23,94	22,64	23,81	24,24	25,03	...	37,09	36,40	36,18	35,85	35,05
PC doctor (at home)	4,00	2,91	2,83	2,78	2,98	...	6,16	6,06	6,09	6,35	6,22
PC doctor (by telephone)	3,74	3,79	3,94	4,08	4,27	...	7,25	7,19	7,28	7,23	7,11
Outpatient services (total)	14,82	11,09	11,06	11,08	11,44	...	27,04	27,82	27,41	27,03	27,66
Outpatient services (endocrinology)	3,39	2,60	2,72	2,57	2,81	...	6,98	7,44	7,03	6,84	6,95
Outpatient services (cardiology)	5,83	4,39	4,34	4,23	4,18	...	9,89	9,86	10,20	10,07	10,32
Outpatient services (nephrology)	1,67	1,23	1,26	1,26	1,30	...	3,20	3,44	3,25	3,15	3,51
Outpatient services (psychiatry)	1,10	0,83	0,74	0,77	0,97	...	2,52	2,45	2,44	2,49	2,24
Outpatient services (internal medicine)	2,82	2,04	2,00	2,25	2,19	...	4,46	4,63	4,49	4,48	4,64
A&E services	13,15	13,28	12,77	12,77	12,90	...	24,79	24,49	23,96	25,00	24,15
Hospitalisation	72,27	73,39	66,91	69,65	70,65	...	121,11	123,23	123,60	130,21	125,85
Medication	24,84	24,69	24,54	24,38	24,21	...	35,02	34,71	34,46	34,20	33,95

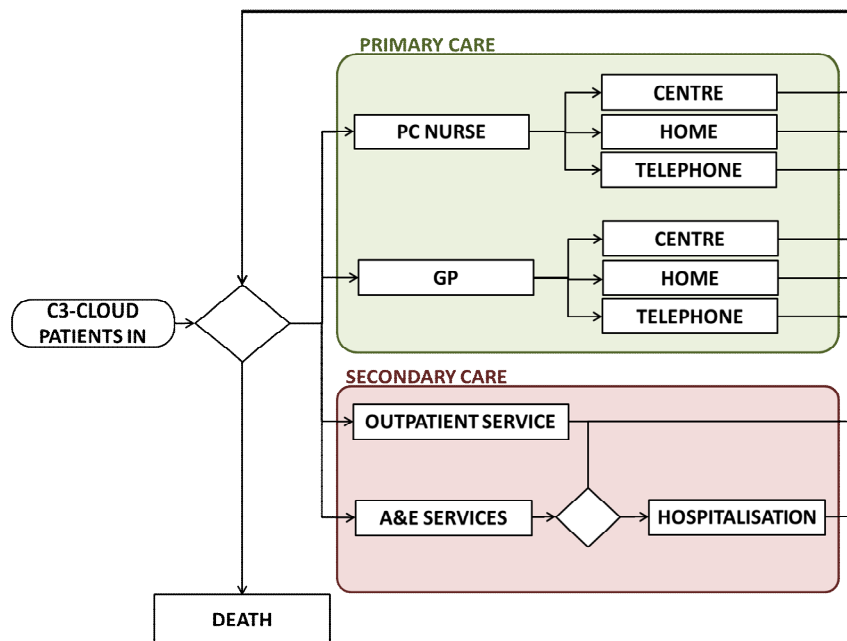


Figure 664 BIA Conceptual model.

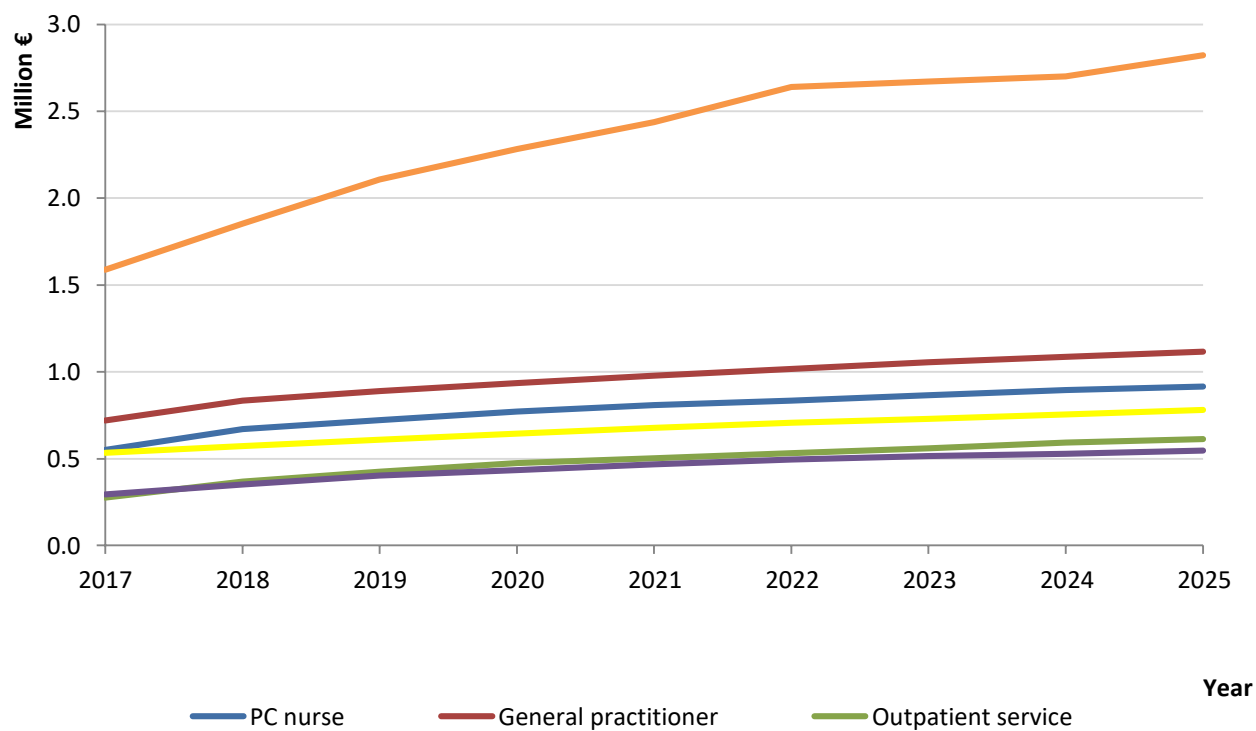


Figure 665 Budget impact analysis from 2017 to 2025 of the conventional scenarios disaggregated by resource type.

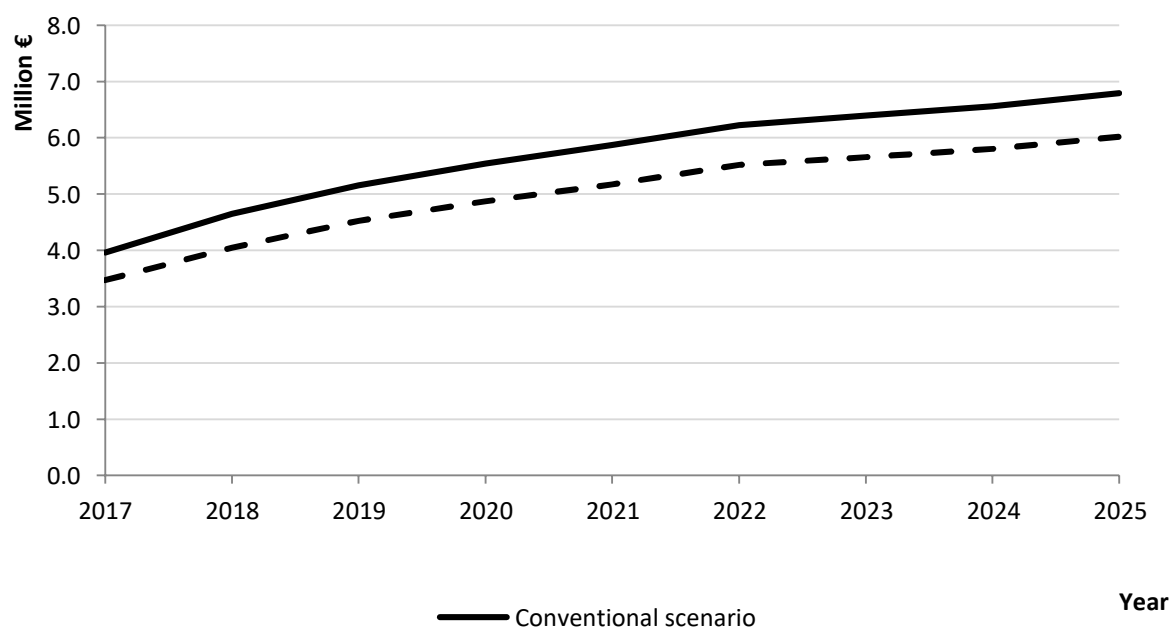


Figure 666 Budget impact analysis of the total healthcare costs from 2017 to 2025 for a conventional scenario and C3-Cloud scenario.