Remote Monitoring of Heart Failure Patients Treatment Programme: Customer Experience, Expectations, Barriers and Conditions

Annamaija Paunu and Nina Helander

Information and Knowledge Management, Tampere University, Tampere, Finland

Abstract: Telemedicine in health care is becoming more important as digitalization continues to spread in all areas of our everyday life. The ageing population, not only in Finland, but all over the world, and the shortage of health care personnel forces to develop new solutions. This case study investigates the effectiveness of the telecare programme from the perspective of patients' service experiences and identifies barriers and conditions that should be taken into account in the wider introduction of a new type of telecare service. Empirical study points out the patients' expectations of the new telehealth service model and presents benefits and challenges that may occur in new telehealth services. Self-monitoring of health through the device portfolio seems to be an interesting possibility for several respondents in the study. The patient experience in regards to health care and health care personnel was satisfactory and participants had a positive view of remote monitoring of heart failure through the device portfolio.

1 INTRODUCTION

Health care is facing major challenges from different directions: ageing population and increasing prevalence of chronic diseases (Lim et al. 2017, Christensen et al. 2009), at a time when the demographic dependency ratio is declining and the funding base for tax-funded health systems is shrinking. Alongside these challenges, there are many new opportunities for health systems. Medical advances are making it possible to address an increasing number of ailments and to cure more and more diseases. Technological advances also make it possible to do things in a whole new way.

Healthcare is still largely based on traditional appointment-based mode in which physical visits and services are centralised in physical buildings (e.g. hospitals and health centres) where patient care takes place (McKee et al, 2020). However, current technological solutions mean that in the future an increasing proportion of patients will be able to benefit from digital solutions based on continuous data collection and exchange between patients and healthcare professionals, alongside or replacing traditional service models. According to the literature, remote monitoring has the potential to improve patients' quality of life, prevent unnecessary office visits, reduce costs and enable timely and early treatment intervention in situations where the patient's need for care is increasing with advancing illness (Scalvini et al 2020, Walker, Tong et al 2019). In the Finnish context, we know relatively little about how remote monitoring affects the patient's experience of care and what barriers or conditions are associated with the use of this new type of service. However, these are key factors influencing patients' engagement in and ability to benefit from treatment. Mapping patients' experiences is also important to enable health service providers to better identify those people who are most likely to benefit from remote monitoring.

The purpose of this study was to investigate the effectiveness of the telecare programme from the perspective of patients' service experiences and to identify the barriers and conditions that should be taken into account in the wider introduction of a new type of telecare service. It also explored patients' expectations of the new telehealth service model and how the new service was perceived in relation to traditional appointment-based, physical outpatient clinic visits.

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Research questions

1. What are patients' expectations of using telehealth and how do they differ from their expectations of traditional outpatient services?

2. What are the effects of implementing telehealth on patients' quality of life and perceived well-being?

3. What factors contribute to the uptake and adherence to telehealth?

4. What are the barriers to telehealth adoption and engagement?

The remain of the paper is organized as following. Theoretical base is first introduced shortly. Research method and the case is introduced and followed by the description of the key results of the empirical study. The paper is finalized by the conclusions and discussion section.

2 TOWARDS PATIENT-ORIENTED TELECARE

Digitalization is inducing an important shift in the division of labour in healthcare, with telemedicine-based patient self-care (Borries et al., 2019) and remote care (Queirós et al., 2018) that are becoming increasingly prevalent and more important. According to Akhlaghi & Asadi (2002) in the area of telecare there is great potential due to the ageing populations throughout the world. However, more work needs to be done on making equipment easy to use and moreover, succeeding in the continuously evolving digital technologies require more in-depth knowledge about the customer experience on digital technology and the ways the data from multiple sources can be empowered to create impactful solutions and development of new kinds of digital services (Khodadad-Saryazdi, 2021), such as telecare (Akhlaghi & Asadi, 2002).

Telecare includes a promise towards more cost-efficient care that is free of the limitations of physical distance and strict office hours (Queirós et al., 2018). For example, remote monitoring makes it possible to improve the patient's quality of life, to prevent unnecessary reception visits, reduce costs and enable timely and early therapeutic intervention in situations where the patient's need for treatment is increasing (see e.g., Tortorella et al. 2020, Goodridge & Marciniuk, 2016). Even though the potential of telecare has been well recognized, many healthcare activities are still largely based on traditional appointments, physical reception visits and services are centralised in physical buildings (e.g., hospitals) where the patient's treatment takes place. In healthcare, it is traditionally used to the fact that the service provider and the patient meet physically. However, through digitalization, this is no longer the case. Because there is an immense number of digital services and opportunities available nowadays also in healthcare, you have to think about it in advance how they are perceived by the patients and what is their impact on patient care (Hermes et al, 2020). This makes it easier to find the right tools, target groups and services. Thus, to leverage telecare use in practice, more information is needed from the patient point of view.

3 RESEARCH METHODS AND CASE STUDY DESCRIPTION

One of the strategic goals of the case hospital has been to establish a digital care pathway for heart failure patients and to implement a related telehealth programme. Based on preliminary studies, the case hospital started piloting a new service for heart failure patients in October 2020, with 47 patients already enrolled (December 2021). The programme of care service includes a guiding visit and introduction to the digital system for the heart failure patient, the tools needed by the patient (alternatively a mobile app provided on the patient's smartphone or a complete monitoring toolkit including a tablet computer, mobile connection, scales and device instructions), a daily assessment of the treatment balance by the case hospitals nurse and remote interventions for heart failure treatment. In this case study a total of 15 patients were interviewed, of which 13 were interviewed twice according to the study design. Interviewees were recruited between May and October 2022 and the first interviews took place during the same period. The interviews were conducted as semi-structured thematic interviews by one researcher. Semi-structured thematic interviews allow for a conversational atmosphere and provide still the opportunity to delve deeper and ask questions like why, what and how. The method is particularly well suited to studying a phenomenon where there are several variables, and the phenomenon is not yet fully understood. The interviews were conducted by telephone and recorded with a separate recorder and later transcribed. All materials were stored securely by the research organizations data administration. The interviews were conducted in two stages:

1) as soon as possible after the start of the telecare programme, in order to identify the baseline situation and expectations for the telecare programme, and
2) during the course of the telecare programme, at 3-12 months, to gather experiences of using telecare and to highlight barriers and enablers

The study also included a group interview with nurses in the heart unit of the hospital. This interview was conducted as a semi-structured thematic interview by two researchers. The interview was a live event and was recorded on a recorder. The interview was transcribed, and all materials were equally securely stored.

The empirical study on patients' experiences, expectations and barriers/conditions to use was conducted as a qualitative interview study. The transcribed interview data was examined using the content analysis method. The interview data was coded to identify key words from each interview and categorise these under broader themes. The themes identified from individual interviews were in turn aggregated together, paying particular attention to convergent and divergent empirical findings. Content analysis as a method is particularly well suited to the analysis of data collected through thematic interviews, as it allows for a genuinely data-driven identification of the interviewees' views and experiences of the phenomenon under study.

4 CASE STUDY RESULTS

4.1 Expectations, Feeling and Technology

The first round of interviews was conducted with participants soon after the orientation and introduction of the telemonitoring portfolio for heart failure, in order to get a sense of their actual expectations and feelings and to get a snapshot of the situation. The expectations of several respondents were neutral and the comment "no expectations" was repeated in the responses. Being continuously monitored by the device portfolio seemed to provide participants with a sense of security and safety in terms of their health and care. Self-monitoring of health through the portfolio also seemed an interesting possibility for several respondents. Overall, participants had a positive view of remote monitoring of heart failure through the device

portfolio and the monitoring through the device portfolio created a sense of security for participants.

The patient experience at the hospital was largely very satisfactory. The staff is perceived as knowledgeable, competent and thorough. The induction and guidance on the equipment portfolio and remote monitoring of heart failure received positive feedback. The guidance was adequate, unhurried and comprehensive. The interviews also revealed that good care and patient experience requires good interpersonal skills and a people-oriented and holistic approach. Especially in a new health situation, it is important that the patient and his or her awareness of the situation is taken into account and that the health situation, and the treatment plan are presented in a way that the patient is sure to understand.

Interaction with the nursing staff was generally perceived positive in both rounds of interviews, i.e. at the time of implementation and during implementation. Interaction and communication with the care staff via the mobile device was also largely perceived as effective; questions were answered and contact was actively taken if there were any discrepancies in answers or values. On the other hand, it was also noted that if everything goes according to plan, e.g. no deviations in the weight, the feedback is mainly a daily acknowledgement message on the mobile device. Some participants had no interaction at all with the care staff because the care was balanced. This may have resulted in participants becoming slightly unmotivated with remote monitoring and lead to some level of boredom.

Overall, the expectations and feelings in the first round of the interviews were both positive and neutral. Expectations included the consolidation of self-monitoring and the ease of technology-enabled monitoring. Several respondents mentioned the feeling of security that comes with remote monitoring; the medical staff seems to be closer or at least easier to reach. In both rounds, interviewees mostly described monitoring as a routine activity. According to the interviewees, measuring weight and answering questions is not an effort, mostly a minor inconvenience, but it is notable that the monotonous situation in the follow-up, as good as it really is, also seems frustrating and can lower the motivation to do this routine in the beginning of each day. The questions are repeated in the same way and when the state of health is under control, feedback may not be received.

The interviewees felt that good care was provided during the remote monitoring. A few interviewees had used remote monitoring to balance their

medication and felt that this approach was effective. Most interviewees had had pre-arranged outpatient clinic visits and did not feel the need for additional visits. For most interviewees, nothing unexpected had happened during the telemonitoring and the telemonitoring had worked routinely. However, a few interviewees had discontinued the telemonitoring on their own initiative. The interviewees who had done so were not contacted by the nursing staff to find out why the remote monitoring had stopped.

In summary, the level of engagement from all parties, that took place during the remote monitoring, whether it was the use of the patient's device or, for example, communication with the patient, was perceived as quite adequate and in some places even abundant. (Table 1).

Table 1: Expectations and performance of remote monitoring of heart failure.

Expectations	Performance
- More efficient information sharing	- Routine measure
	- Easy to use
- Monitoring and treatment nearby	
	- Nothing unexpected/surprises happened
- Closer monitoring of your own health	
	- Questions are repetitive, simple
- A positive feeling	

With regard to the technology itself i.e. the device portfolio, the interviewees felt that the initial training was sufficient and thorough. The second round of interviews asked about the functioning of the device, its drawbacks and problems, and its ease of use. Basically, the device was easy to use. Almost all interviewees had experienced problems with the login update in the beginning, when a new log-in procedure was introduced. Almost all had needed to take a contact with hospital personnel or needed to try to log into the mobile device several times on their own. In a few cases, the device had not been restarted and remote monitoring had stopped as a result. All in all, the update to the log-in (four-digit code) was perceived as an improvement, logging in was initially more difficult. Currently, technical support is provided by nursing staff, who should not be performing this type of task. These contacts place an unnecessary burden on nursing staff, who should be able to concentrate on their actual nursing duties. Technical issues related to the operation of the device should be referred to a separate technical support

service. This wish was also expressed in the interviews.

4.2 Benefits and Challenges

When planning the introduction of a new approach, it is important to identify the benefits to be gained, while at the same time identifying the potential challenges. It is also particularly important to get feedback on the benefits and challenges from users and staff during the implementation process. The survey asked both the nursing staff and the patients for their experiences and thoughts on the benefits of remote monitoring of heart failure and also asked them to reflect on any challenges or drawbacks. Table 2 below shows the benefits of remote monitoring from patient and healthcare professionals' perspective while table 3 shows the challenges for patient and health care personnel.

Table 2: Benefits of remote monitoring of heart failure for patients and healthcare professionals.

Patients	Health care personnel
Balance of care; medication, well-being, ability to work	Patient activity: better engagement in treatment and better monitoring of their own health
Improved monitoring of one's own health	
Interaction and ease of contact (mobile contact versus waiting in line on the phone)	For health care professionals, easier monitoring of the patient's condition - regular data collection
Mental well-being - feeling of security	Increased communication, interaction and contact
Easy to use and hassle-free (digital/manual))	

In terms of benefits, both the patient interviewees and the nursing staff consider that the patient's own activity and monitoring of their own health status is enhanced. The importance of communication and interaction is also highlighted by both groups of respondents. For the patient group, the ease of contact is emphasized, and this is reflected in increased contact from the nursing staff. For the patient group, the sense of security, the emotional well-being of having "someone watching" is significant, and for the nursing staff this can be interpreted as an indication

of the nursing staff's experience of facilitating the monitoring of the patient's condition - data is accumulated daily, the system processes the data according to set limits and reports deviations.

Table 3: Challenges of remote monitoring of heart failure from the perspective of patients and healthcare professionals.

Patients	Health care personnel
Simultaneous use of other devices with a remote monitoring mobile device does not work	Implementation requires a customer visit and guidance
Absent-mindedness in using the device, not a routine activity	Increased communication and contacts: sufficiency of resources
Boredom due to the monotonous proceedings, lack of motivation	False or unwarranted contacts: technical issues, non-urgent care
	Awareness of remote monitoring of heart failure among other medical staff
	Compatibility of information systems – still manual recording of data
	System does not support e.g. automatic feedback to the patient

Challenges for patient interviewees included boredom with routine procedures or distraction from remote monitoring. On the one hand, telemonitoring had become a routine every morning, but was almost as easily forgotten by some of the interviewees, who were more likely to telemonitor a few times a week rather than daily. This was also influenced by the lack of motivation that emerged as a challenge; if the data and answers are the same every day and there is no feedback on the answers, in the longer run remote monitoring can also be perceived as a useless and even futile exercise. The same phenomenon emerged in interviews with the nursing staff who called for the system to enable automatic feedback to the patient, especially in cases where the balance of care is good, and which therefore do not appear as 'red flags' in the nursing staff's system. The nursing staff expressed the wish that it would be possible to send some kind of positive feedback to those who consistently performed well. A major challenge, particularly for

the nursing staff, is the incompatibility of information systems, with data currently being recorded in multiple locations and copied from one location or system to another. There is a risk of data fragmentation and errors in the data.

5 CONCLUSIONS AND DISCUSSION

This case study shows that remote monitoring of heart failure generally works well with the current approach. Suggestions for improvement from the patient and health care personnel included the integration of other devices into the mobile heart failure telemonitoring device, such as the measurement of glucose levels and blood pressure. These were currently delivered manually to the mobile device by self-recording. Also there seems to be a need for variability in the question set. The questions were repetitive, and this was perceived as a factor reducing motivation. The question set should be made more variable, e.g., new question or at least rephrased questions at certain intervals. Adding questions that measure the quality of life would provide important and useful information for health care staff. It can also be concluded from the interviewees' answers that some positive, encouraging feedback through the technology device from time to time would better maintain motivation for remote monitoring. To be able to give feedback via the system also emerged in the interviews with the nursing staff. In the future, it would be good to explore with the equipment supplier the possibility of a partially or fully automated feedback system, e.g., monthly reports from the *Oura* ring with "crowns" or *Apple* health reports in the corresponding applications. It would also be advisable to develop a feedback system for patients on a mobile device, e.g., a *happy or not* -type feedback questionnaire, for example a few questions per week, which would provide up-to-date information on users' feelings and the impact of remote monitoring. Combining these user feedback questions with the quality-of-life questions proposed above would allow for a reasonably easy collection of data that could be analysed to meet patient needs and to give important and useful infomation for the social and welfare staff.

Providing functional and timely technical support for the device, both for patient users and medical staff, is of paramount importance. At present, technical support for patient users is in practice provided by nursing staff, whose duties do not include

this. It would be important for users and medical staff alike to make a clear distinction between technical support and contact for heart failure care. Nursing staff should be able to concentrate on nursing care and answering related questions and messages. This is also important for the future, as remote monitoring of heart failure will expand and patient numbers will increase, with a corresponding increase in the number of contacts for nursing staff. Technical support should address the problems of both patient users and medical staff in a comprehensive manner. At present, it is very difficult to make changes to the system, e.g. to edit questions.

This study has several limitations. The empirical data is gathered only from one case, representing Finnish health care hospital. The empirical data was gathered only by qualitative means, thus the study is lacking quantitative evidence. However, this study was able to provide initial empirical insights of the patients experiences and feelings on new telecare procedure. It also highlights some benefits and challenges from two perspectives; patients and health care personnels. Further empirical studies are needed.

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