Exploring socio-technical challenges in patient self-monitoring: a qualitative case study

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Abstract

Current demographic trends, characterized by an aging population and the prevalence of chronic illnesses, pose significant challenges for healthcare in Sweden and globally. Digital health, including patient self-monitoring of health data, is acknowledged as a promising approach to address these issues. However, self-monitoring also presents various socio-technical challenges from the perspective of healthcare professionals, as the integration of technology influences work tasks, professional roles, and clinical interactions. This case study examines the introduction of self-monitoring within the Swedish healthcare context, specifically focusing on the role of digitalization coordinators and their perceptions and insights regarding the integration of self-monitoring into daily clinical practice. The study identifies critical challenges and suggests solutions. First, it highlights the impact of self-monitoring on *professional identity and patient interactions*, emphasizing that balancing technology and personal contact is essential to ensure quality care and patient outcomes. Secondly, it also addresses issues related to *perceived complexity, resistance to technology, and resistance to change,* emphasizing the importance of education and stakeholder engagement to facilitate awareness, enhance staff's technological proficiency, and improve healthcare outcomes. In conclusion, findings from this study contribute to understanding the implementation of self-monitoring in Swedish healthcare and highlight the importance of preserving the human element in healthcare while leveraging the benefits of technology.

Keywords
Healthcare, digitalization, self-monitoring, socio-technical perspective, case study

1. Introduction

The digital transformation of healthcare refers to digital technology changes that can benefit both society and healthcare [1, 2] and is, to a large extent, socio-technical [3-5]. Digital health is a change within the healthcare sector that creates opportunities for digital transformation and integration between business units, processes, routines, and capacity. This, in turn, leads to a reevaluation of healthcare management and delivery [6, 7]. From technical, cultural, and social perspectives, digital health is considered one of the most significant innovations in healthcare [1, 2, 8], aiming to address the challenges brought about by 21st-century socio-economic changes [1, 2, 9, 10]. These challenges include increased demands on healthcare, an aging population, increased mobility among citizens, the need to handle large amounts of information, global competitiveness, and improved provision of healthcare [1, 9, 10]. Additionally, digital health can transform the health professional-patient relationship, impacting communication and individual behavior [6, 11].

Organizations, particularly within the public sector, such as healthcare, are increasingly examining the prospects afforded by innovative digital health services, such as remote care through self-monitoring, to support patients digitally in their homes [12, 13]. Self-monitoring includes interactive and non-interactive monitoring of signs and symptoms, fall prevention,

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safety, and maintenance of physical and mental health [13, 14]. It can potentially improve clinical and patient-reported outcomes while ensuring cost savings for the healthcare system despite challenges with adopting digital transformation technologies in the public sector [12]. However, there is a lack of evidence of increased patient benefit from self-monitoring, and the question remains whether it provides equivalent results to conventional care, as well as if there are risks involved [15]. Furthermore, although digital health has been identified as a fundamental approach to rethinking healthcare, it is still only in its infancy. Most organizations have not yet taken steps to take advantage of this type of digital technology, and introducing digital health in the form of self-monitoring is described as being met with barriers [6, 8].

Considering the need for more empirical data on digital health, especially from the perspective of its adoption and implementation by clinicians [6], as well as shortcomings in introducing self-monitoring in healthcare, which requires coordination and communication between actors [16], this qualitative case study examines the introduction of self-monitoring within the Swedish healthcare context, specifically focusing on the role of digitalization coordinators. Through capturing and analyzing narratives on the use of self-monitoring in daily activities, we aim to provide insights and a better understanding of experiences and perceptions as well as described needs regarding the implementation of self-monitoring in Swedish healthcare from the perspective of digitalization coordinators. The research question is: *What are digitalization coordinators' perceptions, experiences and described needs related to the introduction of self-monitoring?*

2. Related work

Prior research highlights that designing, using, and managing healthcare information systems involves complex, dynamic, and socio-technical challenges [4, 5, 17]. Digital health aims to bridge the growing gap between healthcare providers' needs and patients' demands. The need to reduce the burden and costs of care delivery is juxtaposed with the requirement for high-quality interventions, accessible care, personalized services based on tailored approaches to clinical conditions, transparency, and more control over general healthcare [6, 7]. Digital health allows healthcare providers and patients to exchange information and data remotely to support the diagnosis and treatment of medical conditions [6, 8]. 'Self-monitoring' is the process of obtaining information and regularly observing and measuring (i.e. recording) one's behavior, cognition, and mood to proactively implement self-management. This way, patients can objectively recognize their symptoms or physical sensations and strengthen their behavior [13, 14]. Projects, pilots, and the introduction of solutions for self-monitoring of chronic diseases are now taking place in several parts of the country. While development was previously driven by enthusiasts, the work is now included in strategic development plans, linked to a shift towards patient-centered care, with greater patient involvement and increased collaboration between hospital care, primary care, and municipal healthcare [18].

Increasing patients' awareness and ability to manage their illnesses requires their involvement in health monitoring [1, 2, 8, 14]. Significant changes in healthcare practices can be achieved through increased utilization of consumer health technologies and various wearables, such as mobile health apps for self-care and symptom tracking. As highlighted in previous research, patient-generated health data (PGHD) fosters increased engagement and understanding by enabling patients to manage their health through data transparency and accessibility [11, 19, 20]. Despite the benefits and potential, there are barriers to implementing and integrating digital health solutions in healthcare organizations [1, 8].

Self-monitoring, including interactive and non-interactive monitoring of signs and symptoms, prevention of falls, safety, and maintenance of physical and mental health [13, 14], has demonstrated and shows the potential to improve clinical and patient-reported outcomes and ensure cost reductions for the healthcare system [13]. Patient-driven self-management has mainly been designed as small pilot projects with the potential to overcome existing barriers and present feasible solutions to provide care that would otherwise not be provided [13]. Self-

monitoring enables remote care that collects and integrates patient data outside of the traditional healthcare setting and can, therefore, provide an alternative or complement to conventional care with potential social and economic value for both patients and providers [16]. Caregivers can follow several patients simultaneously, monitor their vital signs and report on their symptoms, provide educational materials promoting health and self-care, and customize care to better meet patients' needs. In return, patients can receive care in a more comfortable and familiar setting and avoid exposure to unnecessary risks and psychological distress [16].

Several studies highlight data quality and interpretation of data as issues of concern related to self-monitoring [21, 22]. Variations in patients' ability to accurately use measurement tools and follow instructions for conducting precise measurements can affect data quality [21, 22]. Individual differences in the interpretation of measurement results can lead to inaccurate or unclear reported data, and there may be situations where patients incorrectly report or misinterpret their symptoms and health conditions, further increasing the uncertainty in the measurement results [21, 23]. Additional challenges regarding the quality of the same data are the reliability and proper calibration of the measurement instruments used [21, 23]. Technical errors or incorrect calibration of measurement tools can result in inaccurate measurement results, which can affect the assessment and treatment of the patient [21]. Additionally, research highlights that implementing new care models follows the same challenges as implementing digital health, such as perceived usability or interaction with the new model [24]. The implementation of self-monitoring follows healthcare provider-related barriers, suggesting that further research is needed to better explore the underlying factors contributing to these challenges and to gain a deeper understanding of how these broad barriers are experienced explicitly by the involved healthcare professionals [25].

3. Research approach

In this case study, a qualitative approach was used to examine experiences, perceptions, and needs regarding self-monitoring from the perspective of digitalization coordinators in a Swedish healthcare context. The digitalization coordinators represent all clinics and medical departments and play a central role in preparing for and implementing digital healthcare initiatives in the hospital. As such, they make up a relevant group for the purpose of this study. The coordinator serves as the point of contact with the project and participates in networking activities with other coordinators. The responsibility also includes keeping updated on the development of digital health, planning and organizing the implementation and training at a local level, working with change management, and keeping the organization informed about ongoing activities.

The study is based on ten individual semi-structured interviews. It is linked to ongoing development work on digital health at one of the larger hospitals in the region. The semi-structured interview form was chosen as it enables a broader understanding of thoughts and experiences regarding the introduction of self-monitoring. Semi-structured interviews allow informants to talk freely on a given topic, where the interviewer is responsive and listens actively to ask relevant follow-up questions, and new information and new perspectives can thus be brought up [26].

An invitation e-mail was sent to the participants, describing the purpose and objectives of the study. Ten digitalization coordinators agreed to participate (see Table 1). All informants hold the position of digitalization coordinators, but they have different prior experiences with the introduction of digital health projects and self-monitoring. What they have in common is that, upon their appointment as digitalization coordinators, none of them had backgrounds in informatics or communication from higher education. The recruitment of new interview participants ceased when no further information was identified in the interviews, indicating data saturation [26]. Participants received written and oral information about the study and were included after informed consent. The interviews lasted 45-60 minutes, and the interview participants were interviewed individually in Swedish. The transcription of the recorded

interviews was done verbatim within 24 hours of the end of the interview. The transcription of the recorded interviews was later translated into English.

Table 1
Data collection and participants

Informant	Date of interview	Interview time (in minutes)
A	24/4-23	67
B	25/4-23	40
C	26/4-23	46
D	27/4-23	52
E	28/4-23	51
F	3/5-23	47
G	4/5-23	49
H	5/5-23	48
I	8/5-23	55
J	8/5-23	35

Before conducting the semi-structured interviews, an interview guide with several open questions was developed. The design of the interview guide started with broad and more abstract questions on digitalization in healthcare in general, while towards the end of the interview, the questions targeted self-monitoring in specific. Thematic analysis was used to identify and describe themes in the collected empirical data [26, 27]. The transcripts from the interviews were coded, and the implementation of the coding led to the division of the transcript into different parts that represent different themes or topics. First, the main themes identified in the material were assigned a color, with the ultimate goal of dividing the text into parts for further analysis. In the next step, possible links and connections between concepts and how concepts are varied in terms of the informants' characteristics and experiences were examined [27].

4. Results

The results are presented based on key themes that emerged from the analysis. These themes summarize the perceived advantages, disadvantages, challenges, and needs related to self-monitoring from the perspective of digitalization coordinators. Each theme is presented and elaborated upon below, with illustrative quotes from the interviews.

4.1 Perceived advantages of self-monitoring

One of the primary advantages described by the informants regarding self-monitoring is that healthcare professionals do not need to make physical visits to monitor patients' health. This was mentioned as particularly beneficial for patients who may initially feel uncomfortable having unfamiliar individuals in their home environment. The informants describe that introducing self-monitoring in healthcare can reduce the need for frequent physical visits; instead of coming into the hospital or health center for every minor change or control, the patients can regularly report their measurements. By avoiding the need for in-person visits, self-monitoring reduces the burden on both healthcare professionals and patients:

> *"If you think of benefits, I think partly that you can follow up with the patient more often, or if you think like that, it is more convenient for the patient to be able to avoid having to go to the clinic and make an appointment and maybe leave work"* (Informant C)

The informants described that the reduced burden on healthcare staff and reduced need to make appointments for face-to-face visits can lead to shorter waiting times, increased availability,

and improved quality of care for patients requiring immediate attention or treatment: *"Then you can take in more patients instead of having two patients in progress, so maybe you can have eight"* (Informant D). However, they also emphasized that self-monitoring cannot replace all physical care and medical assessment. Some conditions and treatments still require direct physical encounters and medical examination by healthcare professionals.

> *"[Self-monitoring] is not the solution for everyone, but if it can free up that amount of time and resources, then we will actually have time for those who really need to be in the hospital"* (Informant C)

4.2 Perceived disadvantages of self-monitoring

While the informants agreed on the advantages of self-monitoring as an effective digital healthcare tool to save time for healthcare professionals, they described potential challenges regarding the reliability and accuracy of the data collected, which was perceived as a significant potential disadvantage. They gave specific examples of factors affecting the quality of self-monitoring data, such as the variation in patients' ability to correctly use measurement tools and follow instructions to take accurate measurements. Individual differences in the ability to interpret measurement results can also lead to inaccurate or unclear reported data.

> *"Then there is a risk that the values are not correct"* (Informant H)

> *"But the disadvantage is that the patient has to be able to handle the technical device, etc. yes, the disadvantage is the guarantee that the information is really transferred so that there is no loss of information just because it has taken place in the home environment"* (Informant A)

There may be situations where patients incorrectly report or misinterpret their symptoms and health conditions, which may further contribute to uncertainty regarding the quality of measurement results. In addition, another aspect mentioned regarding the impact on the quality of self-monitoring data is the reliability and correct calibration of the measuring instruments used. Technical errors or incorrect calibration of measuring tools can lead to inaccurate measurement results, which can affect the assessment and treatment of the patient.

4.3 Challenges and needs regarding the implementation of self-monitoring

The informants described the introduction of self-monitoring as facing the same challenges as many other digital health projects, often about resistance to technology and change from the healthcare professionals. Informants explained that one of the reasons for the resistance is that many healthcare professionals have chosen the profession because they want to work with people. Introducing technology that replaces human contact can, therefore, be seen as a threat to their professional identity and beliefs about what is important in healthcare.

> *"So, a lot of [employees] see it as taking away their basic profession [...] So, you change the task to something that is not in parity with what they had a picture of when they were studying"* (Informant F)

Another common challenge addressed in the interviews is that healthcare professionals tend to be technology-shy and uncomfortable using digital tools. Introducing self-monitoring can, therefore, lead to anxiety and uncertainty, along with a sense of threat to their professional identity. Further challenges described by informants are that people generally do not like change. All informants provided that convincing health professionals of something they do not believe in or are unsure of is challenging. Additionally, informants commented on the COVID-19 pandemic as a catalyst for the introduction of digital healthcare tools. At the same time, the pandemic has

also led to a paradoxical situation where a coercive force is not based on an external force, and a pandemic is considered too authoritarian.

> *"We have made a big leap forward when it comes to [digital healthcare tools] because we have been forced to do otherwise, as I mentioned, so there is resistance among healthcare staff to make these changes"(informant B)*

Despite the challenges that can arise with the introduction of self-monitoring in healthcare, informants shared a positive attitude. They especially noted that the difficulties associated with self-monitoring were less significant than those encountered when introducing other digital tools in healthcare. The explanation for this positive attitude is that self-monitoring is, to some extent, based on already established and familiar technologies. The informants also commented that introducing self-monitoring can be a gradual process, where healthcare professionals gradually become accustomed to using self-monitoring. This can give people time to adapt to the new routine.

> *"There is resistance from healthcare professionals, but you need to get around this by building up a positive image of how this benefits the patient. What this benefits you because then it will fall on more and more so it will be like a snowball effect [...] [employees] building up a positive image is very important" (informant E)*

They also stated that in dealing with staff who have shown resistance to the introduction, it is important to listen to their concerns and understand their position. It was seen as crucial to focus on increasing understanding and awareness of the new healthcare technology and providing sufficient information and education so that people can make informed decisions. This, in turn, can also reduce resistance since it can help identify the reasons for their resistance and thus make it easier to work with them. Showing self-monitoring's positive effects and benefits can help create a positive attitude. However, challenges can also arise from engaging some staff and using them as 'ambassadors.' If there is no one in a department to act as an ambassador, it can be not easy to convince staff of the benefits of the new healthcare technology.

5. Discussion

In this paper, we have identified and addressed perceived advantages, disadvantages, challenges, and needs related to self-monitoring from the perspective of digitalization coordinators. The study contributes to identified gaps in understanding the integration of digital technologies into complex work environments such as healthcare [4, 5, 17] while also responding to calls for more research on digital health and the effect of self-monitoring on clinical work in particular [6, 16]. Our findings suggest that self-monitoring is linked to socio-technical issues shaping and influencing implementation and use. Based on our empirical data analysis, we outline two specific considerations.

First, self-monitoring is perceived as significantly influencing *professional identity and patient interactions*, emphasizing that balancing technology and personal contact is essential to ensure quality care and patient outcomes. In line with previous research, our findings highlight that it is important to note that self-monitoring cannot replace all physical care. [13, 16]. Some health conditions and treatments still require physical examinations and assessments by healthcare professionals, and situations may arise where a physical exam or meeting is necessary to accurately assess a patient's health condition. Therefore, self-monitoring needs to be complemented with traditional physical care in some cases or used as a supplement to ensure comprehensive and personalized care for patients.

Furthermore, our results confirm and extend previous research regarding healthcare professionals' perceptions of what is important in healthcare and their professional identity, by

shedding light on concerns about how their relationships with patients are affected by self-monitoring and how their caregiving role changes [8, 11, 28, 29]. The idea of self-monitoring replacing human contact can challenge the professional identity of those working in healthcare, as many have chosen the profession precisely for this relationship with care recipients [8, 29]. Thus, to overcome the difficulties in the healthcare professional-patient relationship, it is important to consider the roles of healthcare professionals and their need for human interaction. When implementing and designing self-monitoring, the importance of personal contact should be taken into account, ensuring that technology is used as a complement rather than a replacement for human interaction. Providing healthcare professionals with education and support can help them adapt to self-monitoring while maintaining their roles as caregivers and their interactions with patients.

Secondly, self-monitoring is also related to socio-technical issues in terms of perceived *complexity, resistance to technology, and resistance to change*, emphasizing the importance of education and stakeholder engagement to facilitate awareness, enhance staff's technological proficiency, and improve healthcare outcomes. Resistance to workplace technology is also common outside of healthcare, but healthcare differs from many other settings with regard to the professional autonomy of physicians and their influence and power to impact the introduction of new technology [30]. Healthcare professionals' resistance to digital health technology, coupled with general resistance to change, thus presents significant challenges for implementing self-monitoring in healthcare [1, 24]. These factors should be taken into consideration because, while self-monitoring offers advantages such as time savings for healthcare professionals, reduced in-person visits for patients, better patient outcomes, and increased patient engagement, there are also potential drawbacks, including the risk of making healthcare processes more complex, concerns about data security and privacy, and the risk of excessive reliance on technology. Based on the provided information, healthcare professionals' perceptions and concerns are crucial for the successful implementation of self-monitoring in healthcare. It is important to listen to and understand healthcare professionals' perspectives to create a positive attitude and address any resistance that may arise during implementation. Providing sufficient information and education to healthcare professionals is a critical step [7, 8, 24]. In addition to information, involving key stakeholders is crucial. Creating a supporting and engaging culture is possible by involving leaders, managers, and other key healthcare professionals. These key individuals can serve as role models and share positive experiences and outcomes of self-monitoring with their colleagues.

In sum, our findings highlight the need for a balanced implementation of self-monitoring while maintaining the human element in healthcare. To ensure that patients receive the care they need while continuing to support and respect healthcare professionals' professional identity, a proper balance between technology and personal contact needs to be established.

5.1 Limitations and suggestions for future research

This study is not without limitations. The implementation of self-monitoring and digital health is still in its early stages [6, 8, 14], and the transferability of previous research to the current implementation of self-monitoring in Swedish healthcare is not straightforward. Previous research on healthcare provider-related barriers in the implementation of self-monitoring requires further investigation to better explore the underlying factors [25]. Therefore, much of the informants' narratives in this study are linked to previous research on digital health and the described healthcare provider-related barriers. The research question pertains to Swedish healthcare based on the principle of anonymity, which may be an unfair generalization, as the interviewed informants have responsibilities limited to a specific part of Sweden.

In addition to further investigating the underlying factors related to the implementation of self-monitoring, additional research can focus on patients' perceptions, experiences, and involvement in the use of self-monitoring. Examining the patient's perspective can lead to a deeper understanding of how digital healthcare tools affect patients. Focusing on patients' perceptions, experiences, and involvement makes it possible to identify barriers and challenges

that need to be addressed to improve the patient's experience. Various interesting aspects exist to explore within the realm of patients' perceptions, experiences, and involvement. One aspect is to investigate patients' opinions of self-monitoring. Another intriguing aspect is how self-monitoring affects patients' disease management and identifies potential barriers and challenges that patients experience. Finally, there is the aspect of individualization and support in using self-monitoring since each patient is unique and has varying needs. Conducting studies in these areas can generate a deeper understanding of patient's perspectives and experiences regarding self-monitoring.

6. Conclusion

This case study has examined the introduction of self-monitoring within the Swedish healthcare context, specifically focusing on the role of digitalization coordinators and their perceptions and insights regarding the integration of self-monitoring into daily clinical practice. The study contributes insights to research and practice by identifying and discussing socio-technical challenges shaping and influencing self-monitoring implementation and use.

In conclusion, findings from this study suggest that self-monitoring has the potential to enable healthcare professionals to save time and improve their practices; it reduces the need for regular in-person visits for patients; it enhances patient outcomes through continuous monitoring; and it increases patients' confidence and involvement in their care. However, there are drawbacks to consider, including the risk of making healthcare processes more complex, concerns about data security and privacy, and the risk of excessive reliance on technology. To ensure that patients receive the care they need while supporting the professional identity of healthcare professionals, it is crucial to balance the implementation of self-monitoring with preserving the human factor in healthcare.

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