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Exploration of ethical issues in the implementation of digital monitoring technologies in municipal health care services

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Abstract. The study is based on a research and innovation project on adoption and use of digital monitoring in municipal care services. The evolving use of technology is considered to meet future challenges in health and care services. However, the use of technological solutions in this context has also led to several challenges, and in this study, we focus on the ethical consequences of using welfare technology. Implementation projects are particularly relevant in this context because different stakeholders with different interest, values, assumptions need to collaborate closely and build integrated solutions to make such projects successful. Furthermore, it is a challenge to predict future consequences of using emerging technologies and we argue that ethical assessments must be part of the implementation process.

Introduction

The demographic change in society has led to increased pressure on the organization and performance of health care services. In particular, there is a need for new models and technologies to support long-term care of the increasing population of elderly as well as people with chronic illnesses and disabilities. Accordingly, various research fields have focused on telecare and assistive

technologies that have led to increased knowledge and insight into currently available solutions and enabling technologies (Memon, Wagner, Pedersen, Beevi, & Hansen, 2014). The term welfare technology has been used in Scandinavia and national initiatives in Norway highlights technological solutions that promote safety and enabling people to better manage their own health (Helsedirektoratet, 2014). Innovation in care services has been on the political agenda in recent years as a strategy to meet future challenges in health and social sector. In particular, the Norwegian strategy for innovation in health care services highlights the use of new technology as a resource for value creation and emphasizes user influence, participation, and co-creation in the development of future care services (The Ministry Health and Care Services, 2011). Despite the promising impacts and opportunities with the use of technologies in elderly care, there is limited and inconsistent evidence about the effects of assistive technologies (Barlow, Singh, Bayer, & Curry, 2007) as well as limited use beyond the pilot-study level (Memon et al., 2014). In line with the increased use of computers as an embedded part of everyday practices, the scope of healthcare technologies has moved from singular tools to networks of systems, practices, and people, i.e., socio-technical networks (Bygstad, Hanseth, & Truong Le, 2015). Moreover, the various stakeholders involved in welfare technologies may have different values, assumptions, and worldviews, which may affect implementation and use of digital technologies (Greenhalgh, Procter, Wherton, Sugarhood, & Shaw, 2012). On the one hand, welfare technology is considered as the rationale and cost-effective solution to meet challenges in the health and care services. However, the professional value of clinical quality, patient safety and privacy may conflict with the business value of efficiency and return of investment (Greenhalgh et al., 2012, p.10).

Several studies have pointed out ethical issues by using welfare technologies, especially regarding use of monitoring technologies in the residential care of people with dementia (Niemeijer et al., 2010). Ethical issues such as privacy, confidentiality, security, autonomy, and informed consent have been discussed in several studies. Most of these studies have been based on established social and ethical norms but does not address ethical tensions caused by emerging technologies (Mittelstadt, Stahl, & Fairweather, 2015). Thus, participatory design methods have been recommended as a way to incorporate ethical principles into the design process of new technologies (Mittelstadt et al., 2015). Accordingly, there is a need to explore how ethical assessments may be part of the design and implementation of welfare technology and how ethical consequences can be translated into practical activities.

This study is based on a research and innovation project on adoption and use of welfare technology in municipal care services. The term welfare technology includes several technological solutions such as assistive devices, sensor technology, mobile technology and so on. In this study, we use the term digital

monitoring technology which refers to various sensors used in the municipal care service. The same technological solution was implemented in different municipal care services as part of a research and innovation project. In this study, we focus on how the implementation process affected ethical aspects and how ethical dilemmas were translated into practical activities. Furthermore, our study is inspired by user-oriented methods that emphasize design and development as iterative processes for mutual learning (Robertson & Simonsen, 2012) and thus enable co-creation with community members in the context of their daily practice.

Related work

The terms ethics and morality are often used interchangeably and are closely related. Traditionally, ethics refers to the philosophical study of morality, where morality refers to special norms, principles, or beliefs (Mingers & Walsham, 2010). Ethical reflection has been an integrated part of healthcare for decades and "First do no harm" has been a predominant code of ethic among healthcare professionals. In nursing, there has been developed international code of ethics since 1953 which is based on four fundamental responsibilities: to promote health, to prevent illness, to restore health and alleviate suffering (International Council of Nurses, 2012). Furthermore, ethical assessments in the health service have been guided by fundamental human rights (privacy, dignity, security) and the principles of medical ethics (autonomy, beneficence, non-maleficence, and justice (Beauchamp & Childress, 2001).

Several studies have focused on ethical aspects of welfare technology. A study by Hofmann (2012) has identified some potential benefits of welfare technologies such as better and more focused care, reduced risk and increased safety, and increased coping and self-determination, (Hofmann, 2012). The study also illustrates some moral dilemmas and that balancing between risk and benefits is challenging. On the one hand, tracking technology has been documented to increase safety and reduce fear and insecurity. However, it raises special issues with confidentiality, privacy, and dignity (Hofmann, 2012, p.395). Conflicting goals between stakeholders was also identified as a challenge, for examples when people with different competence enter the health care arena and become indispensable. Hofmann (2012) also argues that "technology may direct attention towards instrumental values, productivity and efficiency, and away from other phenomena important for human welfare such as hope, coping, vulnerability, dignity and meaningfulness" (p. 399). Similarly, a study by Mort et al (2015) pointed out that evaluation of telecare systems for older people has mainly concerned effectiveness and efficiency, while their social and ethical implication have received little attention (p. 439). They also argued that telecare cannot be meaningfully evaluated as an entity, but rather in the situated relation people and technology create together (p. 438). The study also showed how telecare practice

draws on a large sociotechnical system or network, how responsibilities in care networks are shifted and delegated in new ways, and how redistribution of tasks implies new meaning for privacy and confidentiality.

So far, studies have provided insight into the ethical debate and how welfare technology affects ethical values such as dignity, privacy, and autonomy. However, monitoring technologies are still in an experimental phase and there are few studies that demonstrate the outcome of such technologies (Hofmann, 2012; Niemeijer et al., 2010). The rapid development of digital technologies in the health service makes it difficult to predict the ethical dimension of emerging technologies. As stated by Mittelstadt et al. (2015), "it is a tension between the empirical and normative dimension of dealing with future and emerging technologies" (p. 2) Furthermore, they argue that potential consequences of emerging technologies are based on uncertain normative claims (how the future will and should be) and suggest ethical argumentation and discourse in order to clarify their epistemic and normative components (Mittelstadt et al., 2015). Based on Habermas' approach to political discourse, they suggest a "methodology of translation" which involves "translation' of uncertain claims to be comprehensible to other stakeholders in discourse" (p.1027). As indicated in the studies mentioned above, ethical aspects related to welfare technologies is not a static entity, but a dynamic process that is shaped in the socio-technical network.

Research setting and method

The study is based on a research project in the municipal care services involving partners from different professional communities and organizational units. The project originates from a health innovation cluster that was formed in 2008 as a partnership between academia, public sector, and industry. This, in turn, resulted in a prolongation of the collaboration and a research project that lasted from 2014-2017. Eight municipalities, two vendors (companies) and researchers from two universities participated in this project. Participation was voluntary and ethical approval was granted by the Norwegian Social Science Data Service (NSD), no. 34831.

Digital monitoring technologies was selected based on identified needs related to the major challenge of maintaining safety for people affected by cognitive impairment and dementia. Behavior such as wandering, where people get up in the middle of the night, was associated with increased risk of falling and getting lost. Although healthcare workers carried out regular supervisions during the night, high-risk behavior was still a challenge in the time between the supervisions. Thus, digital monitoring was considered as a suitable option in this context. The technological solution was a web-based portal and sensors embedded in mattresses, bed-frames, and doors. The web-based portal played a key role, with an integration module that enabled the linkage to both existing

technologies and new technical devices. An alarm was triggered and sent to the night staff (mobile phone or tablets/pads) if the resident left the bed without returning within a specific duration of time according to alarm parameters in the portal. The alarm settings could be adapted to individual users by configuring alarm parameters in the portal. All municipalities adopted the same solution to a limited number of residents in nursing homes and residential care homes. The technology was known, but the figuration and context were new, and the technology had to be altered for the health care context. Furthermore, the process of the implementation was done in close cooperation between the vendor and the customer. This represented an innovative work method and included new service design and an iterative process of testing, altering, and retesting the technology in the clinical settings.

This study applies the interpretive approach to case study research and aims at producing an understanding of the implementation of digital monitoring technologies in municipal care service and the mutual influence between the system and its context over time (Walsham, 1995). Data collection has been a combination of participant observations, semi-structured interviews, and archival documents. A main source of data collection has been participant observation at workshops. In total, we have participated at six workshops that have gathered all the key people involved in the project, that is, nurses, nursing assistants, vendors, employees at the IT departments, and researchers. I addition, we have carried out 12 interviews with project members in the municipalities that included health providers and employees at the IT-department. Analysis of data was based on an interpretative approach to qualitative research (Walsham, 1995) and we have used NVivo to identify and categorize topics related to ethical aspects among stakeholders in our study.

Findings

Presentation of the results is organized around three core themes: quality of care and effectiveness; privacy and safety; and responsibility and accountability. By focusing on condition, interaction/action, and consequences of the implementation process, provided an analytical lens to uncover ethical issues when using digital monitoring technologies in practice.

Quality of care and effectiveness

The organization of the health and care service has undergone many changes in recent years and digital technologies have become part of everyday practice in the municipalities. Nevertheless, the use of digital monitoring technologies to support work processes during the night shift was a new intervention and was driven by policy strategies to ensure effective health services in the future. Health

professionals considered digital monitoring technology as an opportunity to provide more reliable care and act at the right time when the residents needed assistance during the night. Thus, they had a positive attitude towards the use of technology in this context as a means of promoting responsible nursing to the residents.

> "Our employees actually have quite good attitudes towards the use of technology. I think a lot of employees find it quite exciting. Because if the technology is developed in a good way, then there are many of the people who live at home who will feel much safer (...)"

However, the implementation process also revealed some challenges such as the tension between the duty to provide responsible nursing and the efficiency of the service. At the start of the project, healthcare workers were concerned that digital technology would replace human resources. On the one hand, the management in the municipality has expectations that digital technology can replace human resources and thus lead to cost savings. National programs for the use of welfare technologies have highlighted benefits such increased quality, time saving, and cost-efficiency. Thus, there was an assumption that the use of digital monitoring technology would increase the efficiency of the service. However, healthcare workers considered digital technology as a useful supplement in their work as stated in a quote from a project member:

> "The technology helps the person to work at night alone, but the workload is not less, but it is somewhat more organized (..) a little more overview (…) someone have to receive the alerts, someone must act on the alert, someone has to deal with it and report if something is going wrong, so I do not look at this as a replacement of the staffing we have lost, the only thing is that it facilitates the work of the night nurse because they can be with the one who needs it most".

The quote illustrates how digital monitoring supports the organization of work; however, it was not considered as a replacement of professional resources.

Privacy and safety

The use of digital technology in nursing home/residential care homes affects ethical values such as privacy and some of the municipalities have included ethical reflection as part of the training program. Privacy issues have also been discussed at workshops and increased the awareness of individual assessments as illustrated by the statement from a healthcare worker:

> "(...) it's fine for those who need it. For those who do not need it, we deactivate the bed alarms so that the patient can go to the toilet without us knowing about it. It is about using the technology where it is necessary - assessments are important".

Privacy issues have also been discussed in relation to the "face-to-face" supervision traditionally performed during the night and some healthcare workers considered the use of digital monitoring systems to be less intrusive on privacy than regular "rounds". Furthermore, patient safety is a major concern for healthcare workers and the use of digital monitoring technology provided increased safety and enabled more individualized care during the night. As

mentioned, restless behavior is a challenge for residents with dementia and cognitive impairment. A major concern for healthcare workers on night duty is when the residents get up in the middle of the night and the use of welfare technology provided an opportunity to act quickly and thus prevent the risk of falls and that the residents get lost. Although digital monitoring has led to increased safety of the residents, it has also led to challenges such as a lack of trust in the system due to technical issues. Lack of trust in the technology thus affected the safety of the digital service and led to delays in the implementation process.

Responsibilities and accountabilities

The challenges of technological failure have raised the question of who is responsible for discovering and notify failure – healthcare workers or IT department or the vendor. Support from the vendor and IT department are mainly available during daytime, and thus entails a great responsibility for healthcare workers who have limited time and skills to detect system errors. Use of digital monitoring technologies has thus identified a need for extended IT support and risk and vulnerability analysis has been initiated to coordinate responsibilities and measures to ensure the safety and security of the service. However, a challenge has been coordination of activities and obtains commitment among participants. First and foremost, healthcare workers do not rely completely on the system and acts as a link between the vendor and the IT department. Project managers in municipalities have mostly cooperated with the vendor who has been responsible for the installation of technological devices, as well as user training. Still, collaboration with local IT department has been a challenge. The digital solution depends on the local wireless network, which is part of the technological infrastructure of the municipality, and thus the IT department is an important player in the project. They have been involved in workshops, but a challenge was a lack of resources to deal with issues that have been identified in the project. Moreover, the IT departments are organized in different ways and have various agreements on support. Several municipalities only have support during the day (08-16), while some also have support around the clock. In addition, several IT departments have recently merged the IT service in their municipality to regional networks and have become large organizational units. Thus, the technological solution of digital monitoring must be integrated into the local or regional infrastructure, and thus become part of a complex infrastructure arrangement. A quote from an IT consultant in municipalities illustrate this complexity:

> "We have made a strategic decision to use a Windows-based platform (...) We have not allocated resources to maintain multiple platforms. Then when someone comes with a Linux Platform (which by the way is brilliant in itself) there will be a process that goes far beyond the project and beyond welfare technology as such, because we need to build up expertise on it"

Thus, the project required resources and expertise from the IT department as well as a common understanding of the complexity of the system. Although it has been a challenge, it has also been a useful experience as stated by an employee at the IT department:

> "(…) But I have to say that the project has been very helpful to us, in terms of expertise, and if we had not made it, we would not have the understanding we have today in relation to infrastructure (...) the importance of involving IT (…) to see things in context, integrations and so on. I feel there has been a boost in competence for us, so it has been very useful"

A project manager in the municipality also suggested a slightly more pragmatic approach to the problem:

> "(…) there is too much focus on not being able to rely on the systems rather than to make a plan for what you actually do when it (the system) goes down"

Some of these statements illustrate the ongoing negotiations on security and accountability in relation to the service. Healthcare workers are accountable for the outcome of the service and thus an important link between the different actors. However, the management have the responsibility for technological and organizational resources involved in the various tasks that affect the outcome of the services. Participation in the project created an increased awareness of the complexity of the new service as stated by a vendor; "it is both the technological and organizational - it is complex". In addition, it formed the basis for a shared learning space that enabled the preparation of procedures to ensure the safety and quality of the service.

Discussion and conclusion

This study has identified some challenges and "uncertain normative claims" related to the use of digital monitoring in municipal healthcare services. First and foremost, this study has illustrated the importance of balancing different moral values in the introduction of digital technologies in municipal healthcare settings. Stakeholders involved in the project had different expectations for the use of the digital service and illustrated a dilemma between the professional duty of nurses to promote quality care and the strategic goal of cost savings. This type of dilemma led to some reluctance to use the digital technology among health workers at the beginning of the project. However, practical use of the system in daily practice also showed that the technology enabled better care for the residents. Several studies have pointed out that the use of technology can direct attention to instrumental values (Hofmann, 2012) and may lead to a conflict between professional values and the business values of efficiency (Greenhalgh et al., 2012). A rational approach to the use of technology can be explained in terms of consequentialism that considers an action in terms of the consequences that it has (Mingers & Walsham, 2010). However, nurses have a duty to promote quality care (ICN) that focuses on the action itself (deontology) (Mingers & Walsham,

2010). Thus, the use of digital technology must be considered in relation to practice and Burton-Jones et al (2017) have conceptualized effective use of information systems as the effective actualization of affordances arising from the relation between the system and its user (p. 470). The findings from our case study illustrated various affordances (potentials for action) such as the ability to provide more individualized care and act at the right time when residents needed professional assistance. However, the use of digital technology did not lead to less use of human resources in this context, but it was used more effectively to provide responsible nursing to the residents. Furthermore, professional values such as respect, responsiveness, compassion, reliability, and integrity (International Council of Nurses, 2012) refer to character traits that nurses must demonstrate in order to make moral decisions. The ethical theory of virtue focuses on how people develop behaviors that lead to well-being for the individual and society. According to this approach to ethics, phronesis (practical wisdom, judgement) is emphasized as an overriding virtue that is developed in practice as part of a community (Mingers & Walsham, 2010). Practical wisdom can thus be included in ethical assessment as an ability to balance different and potential conflicting values. For example, balancing the need for privacy with the need for security to promote ethical decisions in practice.

The findings from this study also revealed ethical issues by integrating the new service into the infrastructure arrangement in the municipalities. The challenges illustrated in the case study were not just technical issues, but involved coordination of responsibilities, establishment of routines and negotiations to come to a shared agreement. Participants in our case belong to different professional communities with different interests, values, and knowledge. Several studies have illustrated the challenges and trade-offs when people with different competences enter the health care arena (Greenhalgh et al., 2012; Hofmann, 2012; Mort et al., 2015). The negotiations on socio-technological issues were more complex than anticipated and influences redistribution of task and responsibilities and implies new meaning for privacy, confidentiality, and safety (Mort et al., 2015). This illustrates the complexity of integrating new technologies into existing systems and implies that practice cannot be changed instantly, but co-evolves slowly over time (Hanseth & Lundberg, 2001). The ethical issues related to responsibility and accountability need to be translated into practical activities and made comprehensible to participant involved in the project (Mittelstadt et al., 2015).

Some of the ethical implications that have been identified in this study have been discussed during workshops to gain a mutual understanding of the use of technology in this context. This has led to the development of procedures and adjustments of the technological solution to increase safety when using the system. Thus, all participants in the project have participated in practical

discourses and show the importance of including ethical reflections as part of the design and development of welfare technologies.

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