

Sensor-floors

Changing Work and Values in Care for Frail Older Persons

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Sensor-floors: Changing Work and Values in Care for Frail Older Persons

Abstract

Based on an ethnographic study in a Danish residential care center, this article shows how the interplay of a sensor-floor technology and currently influential values of person-centeredness, privacy, and security in care transforms care work and care-interactions between residents and care workers. Based on an understanding of care as realized in a heterogeneous collective of human and non-human actors, the article illustrates how new modes of monitoring and interpreting residents' care needs at a distance arise, and how a new organization of work focusing on quick and responsive care is established. These new care practices lead to conflicts between the values of privacy and security, to ambivalent experiences among care workers of simultaneously increased security and insecurity in work, and, paradoxically, also often to a decentering rather than person-centering of care. Instead of accommodating simultaneous compliance to the values of privacy, security and person-centeredness, the use of the sensor-floors makes the tensions between these values continuously and loudly present in daily care practices.

Introduction

[A sensor-floor] helps the right nurses to be at the right place at the right time. Routine checks are reduced to save limited resources and improve the privacy of the residents. Quality of life is hugely improved having the constant assurance that help is

always available when needed: 24/7, 365 days a year. (Manufacturer of sensor-floors, MariCare 2017/2019)

Care for frail older persons in many western welfare states is currently undergoing extensive transformations, often involving use of new care-technologies. One such technology is sensor-floors. Sensor-floor technology has been used since the late 1990's, and has later been integrated into "ambient assisted living" (AAL) concepts, which use sensor-systems to facilitate cost-efficient, safe, monitored, and user-adapted independent living for (mostly) older persons receiving formal or informal care (Andries 2015; Amiribesheli, Benmansour, and Bouchachia 2015). Several manufacturers supply sensor-floors, and the type of floor studied here has been installed in more than 3000 dwellings in seven countries from 2008 until today (MariCare 2017/2019). As the quote above illustrates, the sensor-floors are intended by their manufacturer to provide a sense of privacy as well as security and easy access to assistance for individuals using them. Furthermore, they are projected to contribute to an efficient use of resources in the care sector. These are features that resonate well with national care policies.

In the Danish context, where this article is focused, sensor-floors and an array of other care-technologies, are currently being promoted for use in care work for older persons. Care-technologies are perceived as an answer to challenges facing the welfare state related to an ageing population and corresponding increases in demand for care services. Central policy actors expect the use of care-technologies to increase public sector efficiency and productivity by reducing the need for labor, while also enhancing the quality of care services by promoting increased autonomy and flexibility for recipients, supporting trust and security in public services, and adapting services to individual needs (The Government, LGDK,ⁱ and Danish Regions 2016; Hansen and Grosen 2019). Broadly speaking these technologies are thought to provide quality "care at a distance" (Pols

2012), as far as possible withdrawing professional care workers from recipients' private sphere, and saving limited welfare state resources.

In this policy-setting, three currently influential values are person-centered care, increased privacy for care recipients, and security. The term *person-centered care* can broadly be said to signify practices that emphasize flexibility and responsiveness to the needs of individual care recipients, and attend to their uniqueness (Wilberforce et al. 2017). Person-centered care thus represents an alternative to the tendency towards standardization of services inherent in previous New Public Management (NPM) reforms (see e.g. Dahl and Rasmussen 2012), and relates to longstanding movements towards deinstitutionalization of care services for older persons (Ranci and Pavolini 2013).

The value of increased *privacy* has developed from a general aim of increased autonomy for care recipients. As person-centered care, autonomy relates to the deinstitutionalization-movement, and often materializes in efforts to enable care recipients to manage everyday life with fewer or no care services, and with less presence of professional care workers in their private homes. While increased privacy is often a consequence of autonomy, it has also become a separate aim in Danish care policy and practice (Hansen, Grosen, and Kamp 2018).

The value of *security* can be understood as a risk-oriented assurance that needs will be detected and problems acted upon. Orienting attention towards potentially risky events (e.g. a frail older person falling), the value of security permeates the organization of care at a distance (López 2010). Furthermore, over the last decades, Danish care workers have experienced an increased emphasis on security in their work with the introduction of expanded quality controls, documentation requirements, and an intensification of professional responsibility for the wellbeing of care recipients (Hansen, Grosen, and Kamp 2018). The use of sensor-floors in care work for older persons in Denmark is thus embedded in a political context emphasizing specific prominent values. Based on an ethnographic study of the use of sensor-floors in a residential care center, this article aims to show

how care work and care-interactions between residents and care workers are transformed in the interplay of the sensor-floor technology and values of person-centeredness, privacy and security.

Understanding sensor-floors in care work for frail older persons

The use of sensor-floors in care has not been widely studied, and most research in the field of AAL has been concerned with technical development of AAL technologies (e.g. Augusto et al. 2011; Amiribesheli et al. 2015). Some studies have focused on the views, experiences, and positioning of primary users of AAL technologies, and especially discuss issues and dilemmas of surveillance, trust and ethics related to their use (Lie, Lindsay, and Brittain 2016; Mortenson, Sixsmith, and Woolrych 2015). This article offers a different approach, as we direct our attention to care *practices* with sensor floors, and include the experiences of care workers who use the technology. A multitude of studies has shown how especially telecare technologies facilitating care at a distance change care work and care interactions (e.g. López and Domènech 2009; Pols 2011; Roberts, Mort, and Milligan 2012). The work functions affected by these technologies are often diagnosis, monitoring of specific health conditions, and responses to acute needs (e.g. falls), often performed by nurses and tele-operators, and targeting home-dwelling patients/care recipients. Unlike these, our study of sensor-floors examines the everyday continuous needs-assessment carried out by care workers when providing basic bodily and practical care for frail older persons. Using sensor-floors for these functions presents care workers with new dilemmas and paradoxes related to the balancing of the above-described values of person-centeredness, privacy, and security in care.

Our analytical approach is grounded in an understanding of care as best comprehended through the study of practices (Mol, Moser, and Pols 2010). Apart from highlighting that interpretations of good care are changeable and situated, such an approach renders care visible as constituted by multiplicities of practices, actors and elements. Among these, both care workers and care recipients are cen-

tral actors and their interactions are key to understanding care. Gherardi and Rodeschini (2016) emphasize the bearing of (among other things) technologies on care practices, by describing care as “an ongoing socio-material accomplishment.” They approach care as:

...an emergent process, a competence that is realized by a heterogeneous collective of more or less able-bodied humans, tools, technologies, rules and other “non-humans” or “more than humans” (Braidotti 2013) linked within sociomaterial relationships. (Gherardi and Rodeschini 2016, 268)

Thereby it becomes relevant to ask not simply how sensor-floors are being used in professional care practices to perform the same care by new means, but how they partake in reshaping care-interactions and thereby contribute to constituting care in new manners. In understanding this reshaping of care, the political framing of the technology—as facilitating care at a distance, and promoting values of person-centered care, privacy and security—cannot be disregarded, and must be seen as part of the heterogeneous collective co-constituting care at the studied center.

As mentioned, sensor-floors have not been widely studied yet, but other technologies facilitating care at a distance (and thus effecting changes in care interactions) have been studied. Studies of telemedicine and telecare have pointed to important changes in terms of an altered professional gaze on the care recipient, as well as to issues of changed access and opportunity to assess relevant information on the state of care recipients (Roberts, Mort, and Milligan 2012; Pols 2011). An aspect of such a changed professional gaze is the limited access to details that the technological set-up allows for. The opportunity to take cues from, for example, the patient’s surroundings into consideration when assessing the state of the care recipient is altered when the care worker is not physically present, but assesses the care recipient by way of technologies (see e.g. Van Hout, Pols, and Willems 2015). These insights turn our attention to how care workers’ seeing by way of sensor-floors come to shape care interactions and other professional practices involved in care (e.g. as-

essment). They also point to the importance of paying attention not just to what the care workers *can* see, but also what they *cannot* see, and how new fields of visibility and invisibility both support and counteract the realization of values of privacy, security and person-centeredness in care.

In their study of practices of telecare, Roberts, Mort and Milligan (2012) illustrate some consequences of practices of caring at a distance and seeing through technologies. Noting that it is often unclear what is happening in the older persons' homes and how the information received by the professionals is often ambiguous, they demonstrate that the assessment of care needs from a distance is challenging and often creates uncertainty for care workers, and thereby a sense of insecurity in their work. Despite the sensor-floors' promise of 24/7 monitoring, they cannot be expected to provide a "full picture" of the resident. Surveillance technologies never simply picture or represent "reality," but can merely be expected to create specific zones of visibility—and simultaneously they must be expected to create specific zones of invisibility (Latour 2005).

The surveillance made possible by the sensor-floors can be expected to provide a detailed view into some aspects of residents' state of health and wellbeing and doings in their apartments, while leaving other aspects out of sight. These new zones of visibility and invisibility have consequences for the care workers' ability to perform care, and for care interactions between residents and care workers.

Our approach to the study of sensor-floors thus highlights their entanglement with care practices, and the multiplicity of actors and elements involved in these. We see the floors, and the political expectations and values related to them, as mediating the professional gaze and practices of care workers—not simply transforming the "method of caring" at the center, but constituting understandings of "good care" and care practices in new manners.

A high-tech care center

Before proceeding to the analysis, an introduction to the studied care center and their use of sensor-floors is pertinent. The center was one of the first in Denmark to implement sensor-floors, and thus it is considered one of the more experienced and advanced actors concerning their use. This choice of case allows us to avoid a focus on the inevitable “teething troubles” related to implementation of new technologies, and instead focus on how the use of the floors has been integrated in everyday care practices.

The center was built in 2012-2013 to replace an existing care center in the municipality, whose buildings were considered outdated, and both staff and residents were transferred from the old to the new. The center has 104 one-room apartments. There are approximately 155 staff covering a range of professional groups, the majority being social and healthcare aides and assistantsⁱⁱ, and registered nurses. In Danish care policies, care centers are reserved for very weak and frail citizens who can no longer be cared for at home. Since the establishment of the center, extensive use of care-technologies has been a management priority. This approach was incorporated into the center’s design, and all apartments thus come equipped with a built-in sensor-floor. The sensor-floors have become a vital part of care practices at the center.

The sensor-floors resemble regular parquet-floors, but are equipped with sensors (sensing heat and pressure), which send signals to staff smartphones. For example, the sensors will send an alarm to staff members if a resident has taken a fall. Based on individual evaluation of risks and needs, the floors can be adapted through personalized settings for each apartment. When necessary, specific fields of a resident’s floor—for example in front of the bed, at the threshold to the bathroom, or at the apartment entrance—are set to register pressure and send an alarm to staff. The alarm signals appear on the staff’s smartphones as very short notifications—e.g. “214: bathroom” (214 being the apartment number)—and are accompanied by a sound. If no staff member initially reacts to the no-

tification, a backup notification is sent a few minutes later. This not only allows the staff to monitor residents' movements in their apartments, but also allows them to react immediately to the signals, for example by offering residents help in getting out of bed or going to the bathroom. Furthermore, all movements on the floors are automatically logged, allowing staff to analyze residents' movement-patterns over time. Residents may choose not to have the floor activated in their apartment, but very few do so.

Methods and methodology

Our study took place over approximately four months from 2015-2016, and is based on shadow observations (Czarniawska 2007), group interviews, individual interviews, examination of documents, as well as a feedback workshop between researchers, center management and employees. The study focuses mainly on the social and healthcare aides and assistants working in the center, as they are the primary staff groups performing practical care and working with the sensor-floors. In the following, these two groups will be collectively termed "care workers."

The authors carried out shadow observations of 11 care workers and 1 physiotherapist on day, evening, and night shifts, amounting to approximately 96 hours of observation. Observations were focused on how care-technologies, especially the sensor-floors, became part of care interactions with residents. The two authors did not participate directly in work activities, but interacted and conversed with both care workers and residents when appropriate, acting as partly participating observers (Fangen 2010). Observations were documented through notes and shortly after shifts elaborated to fuller written accounts.

These observations were supplemented by 12 individual interviews with the shadowed employees immediately after or during their shifts. Eight of these were carried out as formal interviews following a semi-structured guide, and recorded and transcribed. Due to time-pressure on the shifts the

remaining four took place as more informal interviews, e.g. in breaks. These interviews were documented in the same manner as the shadow observations. In addition, we carried out five group interviews with the center management (2 participants), local trade union- and safety-representatives (4 participants), registered nurses (2 participants), care workers (7 participants), and representatives of the center's "technology committee" (2 participants). All interviews focused on experiences with technology-use in the center, and on how these related to practices and values of care. Finally, we concluded the study with a workshop with six staff representatives and the manager of the center.

The management and the observed and interviewed employees gave their consent for the study, and the research was conducted in accordance with approval-procedures and ethical guidelines in the Danish Code of Conduct for Research Integrity. To protect their privacy, all individuals have been given pseudonyms in the following, and details that might lead to easy identification have been blurred.

Our analysis of the empirical material took place both during and after the four-month study period in an iterative process moving between data-gathering and analysis (Timmermans and Tavory 2012). During the study, we continuously discussed our insights and pursued emerging lines of interest in ensuing interviews and observations. Towards the end of the study, a systematic reading of the entire empirical material resulted in identification of preliminary themes and findings, which were then discussed with staff and management at the above-mentioned workshop, adding more nuance to our understandings. Our analysis originates in these discussions and themes, but zooms in on the specific use of the sensor-floors in relation to values of person-centered care, privacy and security.

The analysis presented in the following section is thus based on an in-depth study highlighting the everyday use of sensor-floors to realize care in accordance with values of person-centeredness, privacy and security. With this approach we take inspiration from Shore & Wright's concept of "an-

thropology of policy,” and we consider the center an example of a small site *“that open[s] windows onto larger processes of political transformation”* (Shore and Wright 2011, 12). Our study is thus of local and context-dependent practices, but these local practices and their implications are understood, analyzed and discussed in relation to broader political transformations in the field of welfare state care services.

Monitoring and interpreting needs at a distance

Monitoring and assessing care needs is a central part of care workers’ professional responsibilities. With the use of sensor-floors, these tasks change. In line with the value of increasing residents’ privacy, the floors are used to conduct these tasks at a distance, as they can now be performed without entering residents’ apartments while still ensuring security and enabling person-centered care. The signals sent from the floors to the staff’s phones reflect residents’ movements on the floor, but they are used and understood by the care workers as communications of needs; the interpretation of whether there is a need for assistance and the communication of needs is delegated to the floor. Thereby, the floor and the signal it sends come to act as a proxy for the residents, their whereabouts and needs. With this use of the floors, detection and interpretation of needs can (to a certain extent) be carried out without the use of senses such as smell, sight, hearing and touch. Care workers come to rely on signals from the floors instead of traditionally used cues and signs. One of the care workers explained the new practice with an example of a resident who needed help using the toilet, and had a sensor-floor-alarm set at the entrance to her bathroom:

The first thing she does when she wakes up is to go to the bathroom. Therefore, whether it’s in the morning or after her mid-day nap, we don’t have to run there and check if she’s awake yet, because we hear that automatically. When she steps over

that boundary [the threshold to the bathroom], we know that we have to be there quite quickly. (Jeanette, care worker)

With the alarm in the sensor-floor, Jeanette and her colleagues are able to go about their other tasks without worrying about physically checking up on this resident's whereabouts and needs, and disturbing her privacy and possibly her sleep. However, through the technological proxy for the residents' needs, they are still able to monitor when a need arises and react to it swiftly.

Nonetheless, for this practice to work, a knowledgeable translation is required of the compressed messages sent from the floors to the staff phones. To assess what action is needed in response to a message such as "308: bathroom," the care worker has to have detailed knowledge of who lives in apartment 308, and of his or her physical and mental abilities, habits, and current state. Jeanette knows that this particular resident is in the habit of going to the bathroom immediately upon waking up, and that her physical or mental state necessitates care worker assistance at that time. Furthermore, the initial setting-up of a precise technological proxy for a need requires an analysis of the resident's situation, and of how the technology might best facilitate the meeting of his or her needs. As Julia explained:

We have a dialogue with the families when they move in. (...) We recommend to everyone to have the fall-alarm activated, and then we take it from there and add on. Because we don't know them—we need about a week to get to know this resident's little habits and all kinds of things from their life history (...) and then we can see: what might work here? How might we use the technology here?" (Julia, care worker)

Using knowledge of the care recipient's personal habits and life-history as part of the interpretation of needs is common in care work (Kamp 2012). However, as the interpretation of needs at the center now occurs at a distance, and the professional gaze is cast without actual visual contact, this el-

ement of the work gains a more abstract and less intuitive character. Analysis of a resident's needs and habits is crucial when setting up and adjusting the technological proxy, alarm signals have to be translated into relevant action, and the immediacy of such action has to be assessed. As we will show in the next sections, these translations of movements on the floor via alarms into perceived care needs and relevant actions were not simply neutral interpretations of needs through technological means—perceptions of the character of residents' needs, and of what generally constitutes “good care,” changed.

Responsive care—a new organization of care practices

Both the staff and management described work at the new center as very different from their previous practices. The access to floor-based need-interpretation and -detection founded an intentional re-organization of work in which the values of person-centered care, privacy and security were very influential. The manager of the center saw the floors as instrumental in changing the way employees understood and planned their work, arguing that the floors enabled them to be:

...present with our care at the time that it's needed, by way of the technology. This means that, instead of having like a plan of: “First I'll go there, then I'll go there, then I'll go there...”—well, you have to modify that and think: “I'll go when the residents themselves let me know” (...) when they themselves, by way of the technology, say: “I'm awake now, and I need help now.” (Elizabeth, manager)

With this understanding and use of the sensor-floors, immediate responsivity to care needs is emphasized. This understanding echoed throughout our observations and interviews as an imperative of responding to residents' needs as they arose and were detected and communicated by the floors, as opposed to the scheduled practices of other care institutions. While proper planning could be seen as the answer of a traditional institution to the question of responding to needs in a timely fash-

ion, immediate responsivity here became the answer to meeting and even pre-empting the care needs of the residents—as illustrated in this excerpt from one of our group interviews:

Jane: ...you see, if there's an alarm set by the bed, you can reach them when they get to the bathroom and help them so they don't have time to wet themselves (...) kind of catch them at it, right? (The other participants agree in the background.) So it's kind of like: "Wow, you came just in time!" (Voice imitating a surprised resident.)

Interviewer: So you're able to pre-empt these situations sometimes?

Jane: Yes—so you don't have to change all their clothes.

(Jane, care worker)

In line with the values of privacy, security, and person-centered care, the very weak and frail residents at the center are positioned as non-institutionalized and autonomous actors who—intentionally or unintentionally—say what they need and when they need it, through the floors, allowing a timely and individually adapted response. The care workers are in turn positioned as flexible and ever-attentive service workers, ready to meet needs immediately, as they are expressed. Furthermore, the work is intensified as the care workers are expected not just to accommodate present needs but also future needs. Based on the constant monitoring rendered possible by the sensor-floors, the idea of what needs should be accommodated is expanded.

Instead of working their way through a planned sequence of services and help to particular residents at particular times, and doing regular rounds to check up on residents, the care workers worked more flexibly by way of the floors—as Jeanette explained about reacting to floor-signals:

So, you can't just finish what you're doing at that moment, you know that now you can't do what you were planning to do. You have to go there right away. (Jeanette, care worker)

This quote and Elizabeth's quote above illustrate that the care workers had to be prepared to interrupt on-going activities to react to newly arisen needs. Furthermore, they were no longer to "do rounds." Doing rounds was viewed by the management as an unnecessary institutional practice, which had become obsolete with the use of the floors. The most concrete manifestation of this view was that the night staff at the center had been reduced by 20 %, as four people were now expected to cover the same number of residents as five had in the past. Furthermore, both staff and management considered "doing rounds" as a potentially unwelcome disturbance of residents' privacy.

The use of the sensor-floors as part of the collective of actors accomplishing care, thus contributed to a transformation of both work organization and need-interpretation at the center. As noted above, the interpretation of needs and organization of work practices to meet these needs were not neutral practices. They were highly influenced by the local interpretation of the values of person-centeredness, privacy and security, prioritizing residents' perceived needs for an undisturbed day-to-day life and for immediate responsiveness to care needs as they arise. The use of the floors thus underpins a specific understanding of good care and good care work: responsive and quick service in a non-institutionalized and private environment, as well as a positioning of residents as autonomous, non-institutionalized, privacy-seeking individuals, and care workers as flexible, ever-attentive, privacy-respecting service workers.

Person-centered or decentered care?

Both care workers and management were eager to tone down the institutional aspects of life in a care center, and valued the deinstitutionalization and privacy agenda. However, with up to 104 resi-

dents living in the same facility, multiple needs for care will inevitably be present simultaneously. The signals from the sensor-floors to the staff's phones made this coexistence of many individual needs loudly present at all times and in all areas of the center.

The individual care worker would receive notifications on their phones pertaining to between 12 and 24 residents. This resulted in a working and living environment characterized by frequent notifications from staff phones. As the staff expressed it, the phones would “ring and chime” incessantly, creating a working environment with frequent noises and interruptions. A phone could, for example, receive several notifications during an intimate care situation with a resident, informing the care worker of other residents' needs. Staff members reported how they would, for example, have to interrupt bathing a resident, take off their latex gloves to check the phone, assess the notification and the immediacy of another resident's needs, then put on fresh gloves and continue, only to be interrupted again minutes later. They also told stories of how the phones' alarms and interruptions annoyed some residents, making them cranky and thus disturbing the care interaction and the rapport the care worker had worked to establish in the specific situation. In one of our group interviews, the care workers explained:

Annie: You have to get your phone out and click it to see what it's about.

Marie: But one thing is that this can be stressful for us, another is that it's also stressful for the residents—really often. They tell us: “Answer that phone already, will you?,” or “Just answer it!” It just keeps on beeping, you know. (Other participants agree in the background.) You know: “Get rid of that thing!” It's really stressful.

Jane: And you can't just accept it [the notification], you can't just turn it off, because then it might happen that a resident [is missed], I mean if you're in someone else's apartment, you can't just turn it off. (Another participant says “no” in

the background.) So therefore, it keeps beeping for a while sometimes. (Annie, Marie and Jane, care workers)

The care workers were obliged to check their phones whenever they received a notification, and consider if another resident needed their immediate attention. Even though the staff generally appreciated working with the sensor floors, they also found the number of alarms and interruptions stressful, and found that they could negatively affect care interactions.

The technology taken to support a person-centered, individualized form of care hence paradoxically contributed to a decentering and fragmentation of care work, where the person immediately being cared for could not necessarily expect to remain the center of attention. The needs of other residents gained a distinct audible presence in the residents' private apartments, and as such the fact that care at the center took place in an institutional setting was highlighted rather than toned down.

Security and insecurity

Despite these decentering effects, the staff generally appreciated working with the sensor-floors. Working with the sensor-floors not only underpinned security as an organizing principle related to risks and needs of the residents, but also provided care workers with a sense of increased security based on their new insight in residents' day-to-day doings and conditions—they would know if their help was needed and could avoid undignified or dangerous situations. The floors were seen as facilitating a distanced, but also intensified attentiveness to residents. In our interviews and observations, many staff members related that they appreciated working with the floors: they could avoid disturbing residents unnecessarily, prevent a confused resident from leaving his or her apartment disheveled or unclothed, and the floors provided them with increased knowledge and an ability to react faster, for example if a resident took a fall. Furthermore, the floors enabled the staff to know and document the exact times of events in residents' apartments via the floor logs—for example, the

time of a fall and the time that the staff arrived to help. This gave the staff a sense of security as they felt they could now better document that they had lived up to their responsibilities for taking care of the residents, in case this was called into question. As one of our interviewees explained:

At one point we had a resident who had taken a fall, and the hospital called and said that he had been lying on the floor for several hours. Then you can go and find a [floor-]log on him, and then we could see that he hadn't actually been lying there for very long. So you kind of know what you're dealing with, right? So in that way it's also a tool for us—it's also for our sake as staff. There really isn't anything worse than having this feeling of: "Oh my, I left a man lying on the floor for five hours and he was totally helpless" (...) you can eliminate that now, by going in and checking.

(Kirsten, care worker)

The sensor-floors opened a window into otherwise invisible events in the residents' private apartments and enabled both quick reactions by care workers and documentation of those reactions. Furthermore, the floors provided information to care workers that could be included in decisions on care and treatment of particular residents. A much-used example in our interviews and observations was that the floors could be used to detect urinary tract infections among the residents, as the floor-logs could reveal frequent toilet-use, and care workers could respond to this information and test for infection. Another example from our observations regarded a decision on whether or not to provide sleeping pills to a resident:

Hans (a resident) has complained to the staff that he cannot sleep at night, and has asked for sleeping pills. Lise (care worker) decides to check the floor-log of his apartment on the computer. Opening the log, she comments to the observer, that looking in the log like this is a bit of a grey area [privacy wise]. She checks the last

five nights between 1am and 8am, and sees that there have been no movements on Hans' floor. She comments that during these nights he has gone neither to the bathroom nor to his armchair, where he usually smokes. Lise concludes that then he must have been sleeping, and therefore does not need sleeping pills. She discusses this with a nurse; they agree on the conclusion and note it in Hans' record. (Shadow observations, Lise)

The floors thus facilitate increased insight into Hans' doings during the night—an insight that could not have been obtained without the floors, as the care workers are not present in his apartment at nighttime, unless they are called for. However, using this insight is also described as a grey area, and effectively the information contributes to the care workers disregarding Hans' experience and wishes for treatment. The information from the floors is considered more reliable and overrules his experience. The use of the floors as a source of information thus also presents care workers with ethical dilemmas and tensions regarding the reconcilability of the values of security, privacy and person-centered care in practice. Lise's checking the floor log seems to be on the verge of legitimate use of the technology, and could be considered a violation of Hans' privacy. However, her actions comply with the value of security by possibly avoiding the risk of overmedication. But, while for perhaps sound professional reasons, disregarding and overruling a resident's experiences and wishes in this manner may be seen as an institutionalizing act, compromising the value of person-centered care.

Nevertheless, the new sense of security and distanced but intensified attentiveness facilitated by the floors could not always be realized in practice. The monitoring of residents' needs through the floors was not always sufficient, and in line with Latour's observations regarding surveillance technologies, some aspects of residents' lives became very visible, while other aspects disappeared from sight.

Complaints about lapses in the Wi-Fi coverage that mediated the signals between the floor sensors and staff phones were frequent in our observations and interviews. Furthermore, there were “dead” areas: certain places in the center where phones would go offline. These lapses in coverage and dead areas created a sense of insecurity for the care workers, who could not always be sure that they would be notified of needs.

Additionally, the care workers were aware that the sensor-floor technology had blind spots and provided only partial insight into events and activities within residents’ apartments. As described earlier, the sensors register heat and movement on the floors. These properties of the technology create a field of visibility concerning residents’ activities on the floor—these are magnified. Conversely, the floors offer no information on the residents’ well-being and needs while they lie in their beds. For example, Hans may have been lying awake in his bed all night, but this cannot be determined from the floor-log. Other stories of blind spots include residents weighing too little for the floor to sense that they had fallen, or falls that were not registered because the resident fell on top of a duvet. The distanced and intensified attentiveness thus offers only partial insight, a fact well understood by the care workers. This led some care workers to continue doing rounds, in spite of official priorities at the center. As one care worker from the night shift explained:

... they might be lying there, dead, in bed all night. As our manager says: it’s a possibility that they die the moment after you leave their apartment. You can’t guard yourself against that, but it’s just our... I just feel better if I check. So I actually check on everyone on my morning round, because I don’t feel I can give my report [to the day shift] and say that everyone is OK, if I don’t actually know that they are.

(Natasha, care worker)

Natasha thus kept doing rounds and risked disturbing residents’ privacy in order to put her mind at ease that everyone really is all right. Her practice expresses a daily dilemma for the care workers,

who have to balance their sense of professional responsibility and the value of security against the value of increased privacy for residents. In some cases, such as the one described above, the desire to know more and to make sure that one had lived up to one's professional responsibility won. But this took place at the cost of the staff doing additional and invisible work (Star and Strauss 1999), not taken into account in the center's staffing levels. Trying to counteract this, the manager expressed awareness that the increased ability to monitor the needs of the residents ironically created a desire to monitor even more. Nonetheless, in these cases the care worker's professional conscience was eased at the cost of an increased workload.

The floors provided an increased sense of security in care work and could help document responsible professional behavior, but they also led to increased insecurity. This type of technologically mediated and distanced care work provided new knowledge and cues concerning residents' needs, but came up short in some areas. Blind spots were created by the practice of need-detection through the floors combined with physical withdrawal from residents' private spaces. This combination of increased security *and* insecurity created an ambivalent situation for the staff, who both appreciated the floors and knew their limitations. Furthermore, the three prominent values of security, privacy, and person-centered care were not always reconcilable in practice, leading to difficult balancing acts and invisible work.

Concluding discussion

The insights presented in this article support earlier claims that technologically supported care from a distance not only changes the setting and means of caring, but transforms care interactions (Roberts, Mort, and Milligan 2012; Pols 2011). Our analysis points out the intertwining of such transformations with national care policies and influential care values of person-centeredness, privacy and security.

The sensor-floor case provides new insights that in some ways differ from the expansive literature on care at a distance through telecare. For example, in his study of a telecare service, López (2010) found that its orientation towards risk and security was not related to any specific utopian project. It was instead informed by a mainly technical rationality - “a norm without morality.” Our study points in a different direction, as it took place in an environment heavily influenced by prominent values of good care. The use of sensor-floors at the care center was deeply intertwined with a utopian project constructing welfare-state care practices as physically withdrawn from residents’ private spheres, yet instantly responsive and flexibly adapted to individual needs and risks. This difference may be related to the fact that the work functions affected by the use of the sensor-floors—needs detection and assessment—are still embedded in the daily care practices of care workers at the center. Many authors studying telecare have emphasized how care tasks are redistributed in networks spanning multiple actors and geographical locations, often implying an increased division of care labor (Langstrup 2013; Roberts and Mort 2009). Roberts and Mort (2009) found that this increased division of labor fails to take into account the complex intertwinements of different dimensions of care work (monitoring, physical care, socio-emotional care). In our study, these different dimensions of care work are carried out by the same care workers who, despite imperatives to withdraw from residents’ private spheres, remain geographically close. This less fragmented organization of care work, where care recipients, care workers and management remain in close daily interaction, may be more conducive to the communication, development and maintenance of shared norms and values of care, than more distributed forms of care at a distance. But, working according to these shared norms and values was not without tension and required a lot of balancing-work from care workers.

One tension concerns the conditions for shouldering professional responsibility. The care workers are expected to increase privacy, which requires care worker absence, while at the same time to

deliver quick, individually adapted care whenever needed, which requires care workers' constant attentiveness to risks and needs. The sensor-floors are used to handle this tension by enabling a distanced, but intensified and documentable attentiveness to residents. Yet the blind spots and limited visibility created with the floors cause new insecurities, and can lead to work-intensification through additional and invisible work, in care workers' efforts to live up to their professional responsibilities. These practices are oriented towards the value of security, but risk compromising the value of privacy, and thus the tension between increasing care recipients' privacy and delivering appropriate, individually adapted, safe and timely care, persists.

Another tension regards the reorganization of care work that takes place with the use of the floors to realize the political and professional objective of deinstitutionalization. Studies have exposed how technologies implemented to support and deinstitutionalize the lives of care recipients concurrently may create experiences of institutionalization of the home and increased experiences of being ill or fragile (e.g. López and Domènech 2009). Where the experience of institutionalization in these studies is related to the visible presence of technology in the home, the sensor-floors are a largely invisible technology that often contributes to balancing conflicting demands of facilitating a non-institutionalized life in the inherently institutional setting of a care center. The floors do however have a distinct audible presence that in many situations may augment the experience of living and working in an institutional setting, rather than decrease it. Other residents' needs intrude into the privacy of one resident's home and care interaction, disturbing and fragmenting care. The expectations of flexible attentiveness to individual needs thus produce new, conflicting demands on the care workers' dispositions and contain ethical dilemmas and paradoxes.

On one hand, working with the sensor-floors enables the care workers to work according to the values of privacy, security, and person-centeredness in conjunction. On the other hand, these values often seem impossible to realize in concordance with each other, when more than one person's

needs must be met. The sensor-floors thus do not deliver a smooth and integrated package of person-centered, secure, and privacy-enhancing care. In concrete care situations these care values still have to be balanced and prioritized in relation to each other by care workers, and the continuous audible presence of multiple differentiated needs for care makes the tension between these values very present in sensor-floor mediated care practices, rather than dissolving it.

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