ABSTRACT

Objectives. The aim of this study was to describe how people in need of health care at home view technology.

Study design. A qualitative approach was used based on qualitative interviews, followed by qualitative content analysis.

Methods. District nurses (DNs) from 4 health care centres in Northern Sweden had access to different kinds of distance-spanning technology with mobile devices and who used it in their health care at home. Persons in whose home the technology was being used were asked to participate in an interview. The interviewed persons were selected consecutively.

Results. The results fall into 2 categories: (1) The well-known technology at hospital is new at home, (2) the new technology opens up possibilities but it also has limitations, with seven adherent subcategories.

Conclusions. The participants viewed the technology at home as something good and as something that could open up possibilities. At the same time, they placed the use of the technology in the hands of the staff which indicates some degree of dissociation from the technology. The importance of personal meetings between patient and caregiver was very clearly stressed even when distance meetings could be performed and accepted. The participants expressed immense trust in the nursing staff and considered them responsible for the new technology at home.

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Keywords: nursing, technology, homecare, views on technology, experiences, qualitative research
INTRODUCTION

Technology is something that surrounds us everywhere: at home, in the community, in health care settings and in nursing care centres. It has become a tool that nurses use for giving advice and support to persons at home. Literature surveys discuss the diffusion of virtual communities in health care (1), the evidence showing the benefits of telemedicine (2), the effectiveness and cost-analysis of telemedicine (3,4) and how technology supports older people living at home with their family caregivers (5). Most studies deal with the measurement of vital signs and audio/video consultations, while studies concerning technology used for information, communicating and decision support are relatively sparse (6).

When health care shifted from the hospital to the person’s home, advanced technology came into use to support that care (7). During this shift, ethical and safety aspects were to be given due consideration (8). In one study, nurses reported that they were comfortable taking technology into the patients’ homes (9) and more than half of those interviewed enjoy teaching the patients how to use new technology. They did have concerns, however, about introducing new technology into some patients’ homes because of the low-tech approach in palliative care at home (9). Poorly integrated technology in such settings could create uncomfortable situations for the patients, their family members and the visiting nursing staff (8).

Studies describing patients’ experiences or viewpoints continue to be sparse. In one case study (10), people who used a simple communication aid at home for their serious chronic illness felt less stifled when they used the technology; they also stressed the need for believing and trusting in the technology (10). Another study (11) showed that persons receptive to telecare tended to be younger than 80 years of age. They were more excited about new technology and believed that age was not a barrier to learning more about it. Those with good mobility welcomed the technology with greater fervour than those with reduced mobility. The participants were willing to use remote communications for receiving care, although their favoured means was face-to-face therapeutic interaction (11).

For an in-depth understanding of patients’ satisfaction with telehealth care, qualitative research is necessary (12). Several studies (13,14) consider that introducing new technology in care is ethically questionable (13,14). One can start building an ethical framework to use this technology by asking people in need of health care at home about their reasoning concerning the technology in combination with measurements of the vital sign parameters, communications and examinations at home.

The aim of this study was to describe how people in need of health care at home view technology.

MATERIAL AND METHODS

Design and context
In our study, we drew on qualitative interviews that we analysed by using the qualitative content analysis inspired by Berg (15). Qualitative content analysis is an appropriate method in qualitative research that aims to describe persons’ experiences and reasoning (16).
Technology in health care at home

The current study was performed as part of a project that involved district nurses (DNs) from 4 health care centres who had access to different kinds of distance-spanning technology for providing health care to patients at home. The project was organized as a partnership between municipalities, county council in Northern Sweden, companies and the university. DNs transported the technological equipment (Table I) in a bag on wheels. The DNs could gain access, through a 3G telephone, to patient’s records in the hospital along with registrations and notes. Also, they could directly contact general practitioners (GPs) as well as specialists at a particular hospital. The DNs registered the technology they used in a separate report; they sometimes used only one piece of equipment and, at other times, all the equipment. There were also situations when the technology failed to work.

**Subjects**

The interviewed persons were consecutively selected. Based on the DN’s assessment, every person who could participate in the interview (n=67) was asked by the DNs through a letter, along with information about the study, if he/she was willing to participate in the study. No reminders were sent. Nine persons (3 women, 6 men) conveyed their willingness to participate in the interview through a written reply addressed to the first author. All the willing

| Examination and facilities                          | Technology used                  | Number |
|-----------------------------------------------------|----------------------------------|--------|
| Blood glucose [Capillary]                           | Electronic device                | 2      |
| Haemoglobin [Capillary]                             | Electronic device                | 3      |
| Blood pressure                                      | Automatic device                 | 6      |
| Oxygen saturation                                   | Pulse oximetry                   | 4      |
| Ventilation capacity                                | Spirometry                       | 3      |
| Examination of heart                                | 12-lead ECG                      | 4      |
| Examination of heart sounds and breathing sounds    | Electronic stethoscope           | 5      |
| Measurement of residual urine                       | Bladder scanner                  | 4      |
| Direct access to patient’s record; sound, ECG and image transmission to patient’s record | Computer and 3G telephone | 8      |
| Sending digital photos, for example, photos of wounds to patient’s record | Digital camera, computer and 3G telephone | 2      |
| Direct access to physician at the health care centre | Web camera and head set, computer and 3G telephone | 5      |
persons were interviewed. The participants were between 51 and 91 years old (mean=73 years; median=78 years; standard deviation=14.05). Most of the participants had more than one experience of different technologies used during the project. All the participants gave both written and verbal consent to participate in this study. They were informed that their participation was purely voluntary and that they could withdraw from the study at any time without any explanation. The participants were asked to avoid names during the interview to protect the privacy of the persons concerned. The study was approved by the Regional Ethical Review Board in Umeå, Sweden (Dnr. 05-059M §67/05).

All the participants were mentally sound enough to recall their memories and tell their stories. They were aware of the aim of the interview and were willing to respond to the research questions by narrating their experiences. The participants considered themselves independent in everyday life at home, even though they were suffering with different aches and pains for which they got the support of DNs and home help service, safety alarms and training by physiotherapists. They preferred to stay at home for as long as possible, but when they became seriously ill and were in need of intensive care, they preferred hospitalization. They agreed that living amidst well-known people in a well-known environment was ideal for recovering from illness, and that place was home. However, they did not want to stay home if their presence affected their family’s life or when the family members considered their presence a burden. The safety alarm was helpful in prolonging their stay at home. All participants expressed that the best care was at home but that it depended on the situation and the state of their health.

But you should be in hospital when you are ill and then you go home and become healthy (laughs) it is correct yes it is so - so at home is the best - yes it is it is really so. (participant 7)

In their stories, the participants gave a comparative assessment of their current experiences with technology, their earlier experiences with other kinds of technology, and their experiences with regular health care, what constitutes the best care and their thoughts about life and living at home. According to the participants, common health care was easy to access and good when properly administered, but sometimes it was too bureaucratic. They had several experiences of both planned and unplanned visits to the health care centre and hospital; the waiting time was both long and tiring. They felt that their communications with staff were sometimes inadequate and ineffective, and that decisions were made without their opinion. They also had the experience of DNs caring for them at home. They expressed having a high level of trust for the DNs, the physicians and the health care system.

It is so wonderful nice the care there is no better health care then we have when you have reached it when you have got there then there is no better thus it is superb. (participant 8)

It is a very good health care we have when we when we are into it. (participant 8)
Procedure
The first author tape-recorded interviews with participating individuals which were carried out between November 2005 and April 2006. The interviews covered 4 areas (Table II) and started with the question, “Please tell about the DN’s visits and the care at home.” The interviewer framed the follow-up questions in such a way as to elicit a clearer picture of the areas for the interview.

After all the 9 interviews were completed, each of which lasted 20 to 80 minutes, the researchers felt satisfied that the interviews would be rich enough given the many interesting narrations, the descriptions of different situations and the participants’ impressions about the new technology. The interviews were transcribed verbatim and then analysed by using the qualitative content analysis inspired by Berg (15) so as to remain close to the original text. For the analysis, the Nvivo 7 qualitative analysis software package was used (QSR International Pty Ltd Doncaster, Victoria, Australia). According to the aim, the text was divided into meaning units. Each time a change was noticed in the content, a new meaning unit was started. Then the meaning units were condensed and assigned descriptive codes that were close to the text. The codes were brought together through a process of comparison of similarities and differences and, finally, subcategories were formulated and put together in the main categories. The entire text of the interviews was used in the analysis.

RESULTS
The analysis of the text resulted in 2 main categories and 7 subcategories (Table III). The categories and subcategories are presented and illustrated with exact quotations (italics=subjects, standard typed text=interviewer).

Table II. Areas for the interviews.

| Areas                                      |
|--------------------------------------------|
| The DN’s health care at home               |
| Use of the new technology at home by the DN|
| Thoughts about the DN using the new technology at home |
| Best care                                  |

Table III. Views on technology used in care at home based on interviews with persons in need of care at home, main categories (n=2) and subcategories (n=7).

| Main categories                                      | Subcategories                                           |
|------------------------------------------------------|---------------------------------------------------------|
| The well-known technology at hospital is new at home. | It is new and also common.                              |
|                                                        | It is new with beginner’s problems.                      |
| The new technology opens up possibilities but it also has limitations. | More examinations can be performed at home.              |
|                                                        | It should be used by the staff but not by me or my family members. |
|                                                        | It is for distance communication but personal meetings cannot be omitted. |
|                                                        | It is not for use in emergency situations.               |
|                                                        | It must fit as part of a chain that works and is secure. |
The well-known technology at hospital is new at home

It is new and also common. The participants came into contact with this kind of technology at home for the first time, even though a few were aware that it was similar to what they had experienced in hospital. They considered the technology good and positive both at hospital and at home. They felt that the examinations at home were simpler than those at hospital. At hospital, the examinations were faster, because more people were involved in them. The bladder scanner used at home was recognized to be exactly similar to that at hospital. The participants considered the use of a digital camera for the documentation of wounds beneficial for future comparison.

It is clear that that they are usually several [people] at hospital which makes them eee it goes faster if you say so yes but it is broadly the same. (participant 2)

It is new with beginner’s problems. The participants were aware that the DNs had to use several passwords to gain access to their records. To them, the new technology was acceptable and good for working, although it was intricate and failed to function sometimes. The technology was described as being still in its infancy and needing further development; however, the problems were of a temporary nature. The participants observed that the DNs were a little hesitant with the new technology in the beginning, but soon they got over it. Whenever the DNs repeated the measurements, the participants doubted the correctness of the measurements. Some of the participants doubted the reliability of the examinations routinely carried out at home, instead of at hospital, because of limited experience in using the technology. They considered that the examinations at hospital were more dependable, because the staff was more knowledgeable. The participants felt that if the DNs were well trained in using the new technology, then they would handle it more efficiently. Even if the technology failed, however, they expressed trust in their relationship with the DNs.

Oh it is very funny but at the same time I experienced a little feeling of that it was still troublesome for them to handle but I think the equipment is under development and is not finished with all programmes and conduct-routines in computers and things like those. (participant 9)

The new technology opens up for possibilities, but it also has limitations

More examinations can be performed at home. The participants expressed the fact that computers and other technologies have become so common in society that one has to accept them in health care, too. Some regretted that they lack technical knowledge; some used computers every day; and some advocated on behalf of using the new technology. The participants, regardless of how they described themselves, always considered the new technology at home as acceptable, and didn’t have any objections. They expressed that the new technology was what people did with it. They believed that it could open up new possibilities for them and that the new technology at home was interesting. They were also impressed that a single health package could include so much technology
and that it was almost like having an emergency room at home. The participants were not always clear about the examinations the DNs carried out, and their perceptions of the kind of examinations the technologies could help with were different from what was actually possible. The use of computers by the DNs for writing notes in the patient’s record, based on the participant’s description, was considered a timesaver. They described the technology at home as being good and less stressful; they felt more secure at home than when they were waiting for hours at the health care centre or hospital.

_It think that it is only to take I know that many people are in bed at home and cared for there yes and it is performed by the DNs yes they go and visit and take care of people and this must be perfect for those who are ill in bed mm if you are unwell it must be good to get a check up now and then yes it must be something good._ (participant 8)

_It should be used by the staff but not by me or my family members._

The participants complained of difficulties in getting support if they used the technology by themselves or with their family members. They saw the staff as users of the new technology which gave it possibilities. For the DNs, access to a patient’s record was regarded valuable both in terms of saving time and documentation. The participants believed that GPs could use new technology for seeking out the best specialized care from other physicians the world over. They expressed that they felt sure that when new technology was used in common then the DNs and the GPs could use it efficiently.

_Elderly today has no idea about how a computer works for example so that it and many don’t want to learn either so it is obvious that somebody comes and use somebody who can use the technology._ (participant 3)

_It is for distance communication but personal meetings cannot be omitted._

Examinations at home with the new technology were considered useful by the participants. Their understanding was based on the results, that is, a hospital visit with long travels could perhaps be avoided or the GPs could refer the person directly to the correct ward and thus reduce the waiting time. They felt that as long as they could physically go to the health care centre or to hospital, the examinations should be done there. But, if there were problems in going to the health care centre or hospital, examinations at home become more relevant. The participants argued that in making decisions from a distance, the GPs must know the person concerned and must be interested in using the new technology. It was further argued that personal contact with a GP had to be possible even when the new technology was introduced; sometimes it was better to talk “between four eyes” and perhaps without any notes. To be examined by technology only without a doctor or a nurse seeing the person was considered an abuse.

_I hope that the technology don’t take away one thing don’t take away another but to use the technology to improve efficiency but you understand that maybe you can not only look at the technology without a person behind there is a person behind and I mean that it is both ups and downs it is so for most of us._ (participant 7)
It is not for use in emergency situations.

The participants reasoned that even though the new technology could be efficient, there were situations when people had to go to hospital. They argued that it was neither possible to get advanced care at home nor was it safe in all situations, e.g., in case of myocardial infarction. In an emergency situation, going to hospital rather than staying at home was inevitable.

Yes it is obvious that but if you happen to be in a situation with extreme bleeding when evacuation of the bowels then I think you want a physician with your side as you can’t handle that for your self. (participant 2)

It must fit as part of a chain that works and is secure.

The participants expressed that the new technology at home is part of a chain and that the technology can be efficient only when the other parts of the chain are taken good care of. They wished that the DNs would practise using the new technology so that they could work fast and send information to the GPs promptly. Also, at least some GPs at the health care centre should keep themselves free from other patient appointments, so that the GPs can assess the information about them and make quick decisions about the care they need. The information has to be handled discreetly, assigning the right priority to the patient who needs to be immediately taken to hospital. Any indiscretion in this regard would render the new technology at home futile. Another suggestion for reflection was if an examination was done at home, it must be repeated at hospital if the person goes there. The participants thought that if the new technology was both secure and fast then the coordination of health care would become easier. The participants also felt that if the technology in this project was ensured to be safe and secure, then it could be used on a permanent basis, but this decision had to be made by DNs and GPs. They also warned that persons who misuse the technology are always one step ahead of those who work for the good of the system.

I mean that the technology as such is good if it works the whole way because otherwise it is useless if you not can get it in function between the sick person to the physician and so on then it is worthless if it not works the chain it has to work rapidly. (participant 8)

DISCUSSION

The aim of this study was to describe how people in need of health care at home view technology. The participants in this study had good experience of health care, which they used in their reasoning about the technological equipment. They were aware of the common medical technology used routinely at both health care centres and hospitals and felt that the new technology at home was almost similar to that used in more common health care settings. They clearly identified the new aspects of the health technology being used in their homes; however, they looked at things from a broader perspective in order to shape their views and understanding.

The participants in different ways expressed trust for the DNs, the GPs and the health care system. They believe that the DNs and GPs were competent enough to decide when and how the new technology could be used safely in regular care. The participants’ trust of the new technology was so high that it bordered
on blind faith. One can assume that the participants saw the staff as the main users of the technology and their trust of the staff in this position probably overflowed onto the technology, even when the technology sometimes failed to function. The participants were very much worried that the technology could be misused; they cautioned that it must be handled following correct priorities. The staff needed to realize that the technology could not replace the person and similarly e-meetings could not compensate for all face-to-face meetings. This is borne out by interviews with health care providers in the elder care system (14). The caregivers feared that e-meetings between caregivers and the persons in need of care would result in only superficial relationships without the closeness and intimacy that characterizes personal meetings. People who find it hard to communicate by talking, find that the new technology offers them an opportunity to communicate through sending text messages to the DN, regardless of how unsafe it might be if the DN is not there to receive the messages (10). The technologies used in different studies are common; yet, many studies have reservations about the consequences of introducing technology into health care at home.

The review of literature (17) shows that most patients are happy with telemedicine, but the fact remains that studies that focus on assessing the preference between distance-spanning and face-to-face consultations are few. Most studies measure only a few dimensions of satisfaction (17). Some authors argue (18) that issues relating to patient satisfaction in telehealth require further exploration from the perspectives of both the clients and providers in real situations and not artificial ones. In our study, no explicit inquiry was made about the participants’ level of satisfaction. The participants received the same usual care at home, but along with new technology that created an artificial situation. If the care with new technology had just replaced the usual care, the result could have been different. In this study, the participants described the technology as good and said that they trusted the staff for whom the new technology could prove beneficial. If the participants’ perceived the new technology as being good for the staff, it could have been difficult for them to express a different opinion.

The participants reasoned that they wanted to avoid unnecessary travel; however, if they could go by themselves to the health care centre then they preferred going there rather than having the examinations done at home. They understood that technology is as good as what we do with it, and they were aware of the need for changes in organization and new routines for health care staff if and when the new technology becomes commonly used in home care. The new technology was understood not as a whole chain but as part of a chain that must be linked to other parts of the chain, namely, the hospital or the health care centre.

The technology used at hospital was assessed to be better than the technology used at home, although the latter was considered acceptable for preparatory check-ups. However, the participants pointed out that they had good contact with the DNs at home unlike the contacts at hospital and they felt safe and calm during the assessments at home. According to Barnard and Sandelowski (19), there is a tension between technology and humane care. They argue that what determines experiences to be dehumanizing is not technology but how technologies are used in specific contexts and the meanings that are attributed to it. Barnard
(20) opines that the influence of technology on nursing practice is not neutral. One needs to understand the relationship between technology and nursing practice and he expresses the need for a more critical view of the belief that technology is a neutral object and that it originates from being cognizant of arguments that both support and oppose the assertion.

The participants did not see themselves or their family members as users of the new technology. This can be understood as a consequence of the technology and the troubles the DNs experience in using it; but it can also be understood as a degree of dissociation from the technology. One study (6) speaks of a future scenario in which an informed person may find it obligatory to manage his/her health status. Other studies also support the usability of communication aids by persons in need of care (10). The possibility that the person could be independent in using technology for contacting the health care is seen as a way to empower the person and support her/his autonomy. Collste (21) argues that only in situations where there is a real choice is it meaningful to speak of patient autonomy. He also argues that to be able to make an autonomous decision, the person needs to be competent and have the ability to understand reliable and relevant information and process a decision based on that. Once technology is introduced into health care at home, it is not clear if it is possible for persons to be autonomous in decisions about using it.

Magnusson and Hanson (13) cautioned about the ethical issues that can arise from bringing the technology to a person’s home and stressed the importance of discussing and evolving guidelines for this purpose. Bauer (22) argues that the technology at home might impinge on the privacy of the home and that it may render the thin line between a person’s public and private lives obscure. One needs to appreciate the potential of technology in the home to transform the private living environments, the family and its relation to the public sphere. Also, one should remember that what heals and comforts is dedicated care, not electronic exercises (22). In this study there were no arguments on this issue, and perhaps it is so because the participants saw the DNs as visitors who brought the technical equipment with them.

In some studies (2,6), the focus has been on the viewpoints of when the new technology is suitable. The participants in this study expressed that the suitability depends on the situation and what needs to be done rather than on the diagnosis. Although the participants saw possibilities with having health care technology at home, they also indicated that it could not be used at just any time and in just any way. It seemed that in every situation they wanted to choose whether they should receive care in the home and to have the freedom to change their decisions in unique situations.

Methodological considerations
In this qualitative study, 67 people were invited to participate but only 9 did so. Why so many people chose not to participate is not clear. It is possible that those who participated had positive attitudes towards new technology. But it is also possible that those who had negative attitudes wanted to participate to share their opinions. It could be that problems with technology affected their interest in participating. Some participants, in their interviews, referred to their limited experiences with the new technology. During the study, the participants had
access to ordinary health care and this might have affected their views about the use of the new technology in routine care. The participants were dependent on the DNs, and to avoid any influence this might have on the participants’ views, the DNs were not given any information about who participated in the study. In the interviews, the participants described all the equipment that was used, and there were variations in the reasons for using technology in health care at home. None of the participants chose to discontinue their interview. After the interview they had the opportunity to reflect and ask questions and all the participants confirmed that they wanted to participate in the study.

Conclusions
We conclude that the participants viewed the technology in their homes as something good and that opened up possibilities for improved health care. At the same time, however, they placed the use of the technology squarely in the hands of the staff and this indicates some degree of their dissociation from the technology. This also indicates that people need time to adjust to the introduction of new technology and to decide what they are prepared to accept and use. The importance of having personal meetings is very clearly stressed in our results even when distance meetings can be performed and are accepted as alternatives. The ethical reasoning about the use of new technology in home care has to be based on empirical data. This study shows that participants are quite clear in setting their own limitations for using it. Our interpretations are that personal meetings, personal contacts, touch and respect for the integrity of the person who need care. Also the person wants to be involved in the decisions about using the new technology.

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