Implementation of Telenursing Within Home Healthcare

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Abstract

The implementation of telenursing within home healthcare of leg wounds is an innovative development initiative that focuses on patients and to some extent next-of-kin in collaboration with nurses. Eleven patients and nine nurses participated in the study. The methods for data collection were surveys, field-notes descriptions, and care charts, as well as digital photos of leg wounds and videotaped observations. The results show that the utility of virtual concept is that continual learning takes place for both patients and nurses. The patients felt positively about being able to via videophone see the staff caring for them, and seeing a face inspired a sense of security, which had a calming effect. The learning for nurses lay in the everyday work with leg wounds and their care as experiences were taken advantage of with the assistance of the interactive technique. The nurses felt that their time at work was better utilized and that the virtual communication between patients and nurses constituted a humane complement in home healthcare.

Key words: home healthcare, distance learning, telenursing, leg wounds, treatment

Introduction

Information technology (IT) applications in medicine and care are rapidly expanding, due to the fast growing penetration of the Internet and mobile telephone technology. IT applications in the healthcare environment are focused on e-consultation,¹ home care delivery,² and the use of triage systems.³ Home care delivery is a crucial issue, covering management of chronic diseases, wellness, education, and information delivery on-demand. IT-based applications

for home care delivery are important media for increasing healthcare quality, increasing quality of life, and creating educational platforms expected to increase the mutually beneficial collaboration between patient and professionals.^{4,5} In Sweden, as in other Western countries, the health system is coping with increasing demand for services, partly due to aging populations. Still, using the Internet for communication, treatment, and consultation is underutilized in Sweden.⁶ Leg wounds and their treatment constitute a multidisciplinary problem area, involving the entire chain of care, although it is most commonly centered within the municipal home healthcare system.

Nursing via visual communication is an umbrella term for distant care, and constitutes a technique that makes caregiving more accessible and can reduce travel time and expenses.⁷ Through videophones, a more natural form of communication is guaranteed and this allows for a more personal, confidence-inspiring relation between patient and caregiver.⁸ Studies have shown that elderly persons are neither uninterested in technology nor incompetent in its use.⁹ Assistance via videophones within the home healthcare organization can transmit images interactively from the patient's home directly to the attending physicians, which allows for improved follow-up and wound treatment.¹⁰ This technology is also useful in following up on the patient's situation and planning care interventions, as well as for training patients and their caregivers. Telemedicine constitutes two distinct categories: real-time and store-and-forward.¹¹ Real-time involves synchronous interactivity between the affected parties, for example the activity of the patient and the nurse via videophone. Store-and-forward involves an asynchronous interactivity such as forwarding and referring a clinical query to a specialist who replies at an opportune time.

Due to a rapidly expanding knowledge base concerning leg wounds and their treatment there is a call for continual learning. Continual learning plays an important role in work life, and the need for competency development and renewal is growing in all areas.⁸ Because adult learning to a great extent takes place in the workplace, the need for integration of work and learning is predicated in research about continual learning.⁹ Learning in daily work is developed with the

introduction of new technologies.¹¹ All adult learning must take into consideration the adult person's life situation and be offered in flexible forms. Experience-based learning that assists the individual in identifying, interpreting, and reflecting on the information offered by experience assumes some form of cognitive support. This support can be made up of formal educational initiatives to promote knowledge development in relation to problems and occurrences in daily work.⁹

In this study we describe our experiment in comparing conventional methods with the virtual information and a consultation concept, *Everyday Learning-Leg Wounds and Their Treatment*,¹² for patients and caregivers within home healthcare in two municipalities in southern Sweden.

Materials and Methods

The virtual interaction had two components: a Web application and an Internet communication component through which patients were able to communicate with caregivers via videophone. Caregivers were also equipped with videophones and Web cameras and could communicate, as well, with each other in order to consult about treatment plans. The Web application was created with two links, one open to patients and kin containing advice on nutrition and exercise, as well as wound treatment and dressing, and the other link, which was more detailed and graphic, was used by caregivers in their everyday work.

The test group (from municipality A) consisted of 10 patients with wounds on the lower leg and/or the foot and of nurses who were their responsible caregivers. The inclusion criteria were: discernible wound, and broadband access for communication via videophone. In order to compare Internet-based communication with conventional consultations for leg wounds and their treatment during the same time period, 8 patients from municipality B formed a control group. Municipality B because is in the same region as A, and was willing to participate as part of the same healthcare system. The inclusion criteria were the same for both groups except the control group did not need access to broadband. *Table 1* shows the make-up of the groups before implementation, change over time, and in December, as the implementation was concluded. The study was approved by the Research Ethics Committee in Lund/Malmö, at Lund University (LU 424-03, 2003-09-11).

Data were collected on three occasion; before the implementation (January), during (June), and after the implementation (December). Data gathering combined quantitative and qualitative methods.

Descriptive data were gathered with a survey distributed to patients within the test and control areas before the implementation commenced. The nurses within the test and control groups filled out a

Table 1. Overview of Research Groups Transformation over the Implementation Period

IMPLEMENTATION	RESEARCH GROUPS			
	TEST GROUP A		CONTROL GROUP B	
	PATIENT	NURSE	PATIENT	NURSE
Start February/March 2004	10	10	8	8
Mid-period June/July 2004	7	6	5	4
Conclusion December 2004	6	5	5	4

questionnaire of 22 questions. The nurses were asked to write field notes regarding the patient's leg wound.

Interviews in the form of conversations and 11 videotaped observations were conducted to follow the communication and treatment situation during the implementation process. To further illuminate various aspects of the interaction, the patients in the test group were asked two questions regarding their experience using the videophone in contact with the treatment nurse. The patients in the control group were asked about their experience of the ordinary encounter with the treatment nurse. Finally, a reflective dialogue between the observer and the nurse followed each observation. The conversations for the nurses in the test group focused on communication within the virtual encounter with patients, colleagues, and physicians in charge of treatment, as well as the Web material. For the nurses in the control group, the conversations were about communication in ordinary encounters with patients, colleagues, and attending physicians. These conversations were documented on video, as well as in notes. The observational notes and video-recorded reflective dialogues were transcribed verbatim. Eleven chart documents were examined according to an assessment protocol developed for this study. The assessment points focused on data on leg wounds and their treatment, as well as general information including identity, next of kin, and responsible physician, as well as date and signature. The assessment was graded from 0 (no) to 1 (yes, partly) and 2 (yes, fully) points per assessment point, with a possible total per chart of 38 points.

Following the implementation, descriptive data were gathered from the nurses with a questionnaire using the same questions as before implementation, somewhat modified in order to fit the final phase of implementation. A new description of the patient's situation and new photo of the leg wound were submitted to the project leader.

The analysis was performed according to the principles of triangulation.¹³ Processing of the data and analysis took place separately for each respective data set and in connection with the measurement period in question. The processing began at the very first measurement occasion and continued throughout the implementation. The set answers to the survey were compiled, and photos and the situational descriptions analyzed and presented descriptively. The open-ended questions of the survey were categorized manually with manifest analysis.¹⁴ The video-recorded observations were transformed into narrative text by the observer. A content analysis, both manifest and latent, was chosen for these data, and the observations were analyzed one after the other, starting with a naïve reading searching for headings, also known as open coding. Similar headings were then grouped together into broader subcategories and, from these, the process continued on to final the categories.^{15–17} The chart documents that dealt with leg wounds and their treatment were examined and graded by points. Finally, the analysis from the different sources of data were discussed by the two researchers, compared for similarities and differences, and grouped into four themes.

Results

The summary of the participants' data is in *Table 2*. The four themes presented are: (1) leg wounds and their treatment, (2) information and continual learning, (3) positive and negative factors connected to Web-based communication, and (4) Internet-based communication from a scientific perspective. It is worth noting that the groups are too small to generalize the findings, but it is possible to discern certain trends.

LEG WOUNDS AND THEIR TREATMENT

The survey of the patients revealed that there was no significant difference between the test and control groups in terms of the extent of time the patients had had the wounds, the number and location of wounds, or existence of previous wounds. The most notable difference between the groups was the length of treatment. In the test group, treatment length was typically longer and entailed more visits by caregivers (usually 2 to 3 time per week), since these patients were in poorer general condition than those in the control group. Thus, travel times were more frequent and longer for the nurses in the test group. There was no self-treatment among patients in either group.

With the exception of one patient in the control group, the patients stated that information from the caregivers was good and that they were participating in decisions and receiving good support at the time of treatments. In both groups the patients had gathered knowledge from pamphlets and books, as well as from kin and friends. All patients, in both groups, stated that the caregivers were easy to reach when needed and that it was important that they were kind. The participants in the test group felt that it was important to be able to discuss problems with staff. Five of six patients in the test group had not previously had any knowledge about digital support and virtual consultation in leg wound treatment. The patient who had some knowledge about IT support had read an article on the topic.

The interviews revealed that the work responsibilities of the nurses regarding leg wounds and their treatment were quite similar for both groups, with equal amounts of time pressure and disruptions in carrying out work responsibilities. The nurses reported that, at difficult

Table 2. Data for the Test and Control Groups

GROUP A AND B		AGE		SEX		HOUSING		TYPE OF LEG WOUNDS		NUMBER OF LEG WOUNDS		TREAT- MENT MINUTES/ WEEK		TRAVEL TIME MINUTES/ WEEK		LEG WOUND STATUS 12/2004		AGE		YEARS WORKING AS A NURSE		YEARS IN CURRENT WORK PLACE	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
A01	B01	84	79	W	W	Inst	Ord	Art/Ven	Artven	2	2	120	60	0	20	Reduced	Reduced	27	55	4	4	3	3
A02	B02	61	86	W	W	Ord	Ord	Ven	Ven	2	2	135	120	30	20	Unchanged	Unchanged	37	32	12	1	1	< 1
A03	B03	89	90	W	W	Ord	Ord	Art/Ven	Artven	3	2	180	60	90	20	Reduced	Unchanged						
A04	B04	87	79	W	W	Ord	Ord	Art/Ven	Ven	2	2-3	90	60	30	20	Unchanged	Healed	61	44	13	17	1,5	> 10
A05	B05	87	45	W	M	Inst	Ord	Ven	Artven	2	1	45	90	30	20	Reduced	Increased	58	61	8	35		6
A06		70	—	M	—	Inst	—	Art/Ven	—	2	—	180	—	0	—	Reduced	—	59	—	37	—	> 10	—

A01 to A06 for the Test Group and B01 to B05 for the Control Group.

W, woman; M, man; inst, Institution; Ord, ordinary; Art/Ven, Arterial/Venouse; Ven, Venouse.

times, the test group nurses received the least support and of the poorest quality, and the control group received the most support and of the best quality. In both groups the nurses reported that they had knowledge about leg wounds and their treatment, although in the test group there was one nurse who reported not having adequate knowledge. Ongoing information and news within the topic area of leg wounds were the least satisfactorily provided within the test group and somewhat better within the control group.

According to all the nurses, the most important task for a nurse at the first time of contact with a patient with leg wounds is to ascertain whether diagnosis and cause have been determined, whether treatment has been prescribed, whether medication is being administered and contact with a physician has been established. There was no difference between the groups regarding the perspective of looking holistically at the patient's situation to evaluate wounds, as well as to control dressings, weight alleviation, and compression. For the nurses in the test group the photographing of leg wounds worked extremely well. Problems occurred in the control group as there was only one digital camera available to check out and some of the nurses had very limited photography skills. This problem was solved by giving the responsibility of this task to one individual nurse, but this conflicted with other work responsibilities and the photos had to wait. Only one nurse in each group had followed up, documented, and evaluated caregiving interventions.

The nurses' documentation of leg wounds and their treatment could reach the sum of 38 points. From the test group, six chart documents showed the average value of 36.3 points, while the five controls chart documents had the average value of 31.6 points. There were differences for the variables of care diagnosis, treatment goals, and care plan. In the control group these variables were only partly documented. A few documents within the control group lacked registration regarding intervention and information about delegation or photos of leg wounds. All nurses had followed the respective municipality's recommendations for chart documentation.

INFORMATION AND CONTINUAL LEARNING

The majority of respondents saw the project leader's availability to both patients and nurses within the test group as positive. Patients were also, on the whole, satisfied with the information, but the time lag between first and second information was perceived as being too long. The patients understood that this was due to technical conditions not having functioned, partly between the municipalities' technicians and the broadband Internet's issuing of IP numbers, partly between the municipality's technicians and those from the supplier of the videophones. In particular for the nurses in the test group,

there was occasionally not enough time to make use of and maintain communication. The nurses had a positive attitude about the preparatory information and training offered. Patients and nurses within the control group, as well, had a positive attitude toward the information offered. All the nurses saw it as important to receive ongoing information and news regarding leg wounds. The nurses in the test group stated that this could have been better provided.

POSITIVE AND NEGATIVE FACTORS IN RELATION TO INTERNET-BASED COMMUNICATION

The patients in the test group would have liked to familiarize themselves more with the technology, but also replied that it was excellent to be able to use visual contact in communication. One of the patients was very interested in image transfer as a form of contact and very happy and grateful to have had the opportunity to participate in the testing of a videophone. In particular, this patient stressed the significance of direct image contact and receiving a rapid reply. A few next-of-kin engaged in image communication. The elderly who lived in institutional housing had closer personal contact with a nurse and therefore the image communication was not used to any great extent. Instead the caregivers could communicate with a nurse directly from the patient's residence.

The nurses reported in both interviews and in questionnaire that in everyday situations the computer support was more useful for the staff than for the patients, but were of the opinion that in the future this will change as more and more elderly persons will be used to computers. They stated that it was a good humanitarian and financial gain to not have to send a seriously ill or disabled person to a physician, but instead be able to communicate digitally with speech and images. The nurses in the test group felt that the web material was an educational resource for the patient/next-of-kin, colleagues, and coworkers. Because the patients lacked computers, they were offered access to the Web-based material through a nurse who showed the material on the videophone or printed it and handed it to the patient. The nurses' common opinion about computer support in clinical decision-making was that first there must be a functioning technology with support before it can be incorporated into daily caregiving work. They felt that it was not worth investing work into something that does not function properly; and one nurse mentioned as an example that she had reached the decision that no images were to be sent to the municipal clinic's physicians for assessment.

Nonetheless, the nurses in the test group were unanimous in stating that with a functioning technology in place computer support, both in real-time and for store-and-forward, were a good help in their everyday work.

INTERNET-BASED COMMUNICATION DEVELOPING A SCIENTIFIC PERSPECTIVE

According to the field notes, photos, and video-recorded reflective dialogues, the healing of leg wounds did not differ significantly between the test and control groups. But there was a difference in how nurses within the test group developed a scientific perspective toward their work by taking an interest in and participating in new research. They also became more conscious of their role, could better utilize their time at work, and used digital cameras most frequently. The nurses emphasized the utility of this tool in following any changes in the leg wounds, but they expressed disappointment over staff members in primary and hospital-based care who did not want to participate in communication and consultation with image transfer via e-mail. On the Internet there was no possibility as the systems differed, and there were firewalls in place that prevented direct Internet connection and imaging between the nurses and the doctors.

Discussion

The implementation of *Everyday Learning—Leg Wounds and Their Treatment* is an initiative focusing on patients and to some extent next-of-kin in collaboration with nurses. Information technology and the Internet are important and powerful tools for more efficient and higher quality healthcare, but require collaboration across boundaries and technical support. This did not function properly during the implementation, despite the affected municipalities having expressed support for the initiative. The different IT systems must be able to cooperate in an effective way. Responsible managers must become engaged in the utilization of IT and take responsibility to maintain and guide this activity.⁷ In order for a national IT strategy to be realized, there is a need for further small-scale projects that concretely address difficulties.¹⁸

The results show that the utility of the concept is that continual learning takes place for both patients and nurses. The learning for the nurses in the test group lay in the everyday work with leg wounds and their care, as experiences were taken advantage of with the assistance of interactive technology. This opportunity for reflection and learning was strengthened during the implementation process in encounters with patients, next-of-kin, and coworkers. They also became conscious of their responsibility for their own competency development by actively gathering, evaluating, disseminating, and utilizing knowledge, as well as contributing to coworkers' competency development on the topic. Other studies, with larger research groups, have shown that IT and the Internet are efficient tools for learning and raising competency.^{10,11} The virtual teaching and consultation concept support an active form of learning where nurses together with patients and colleagues created a learning community

in using the Web-based materials. In addition, the nurses have used the Web camera to photograph leg wounds and built an archive for follow-up of the wound healing process. Patients and nurses have noted the importance of images in communication. The administrative leadership within healthcare ought to increase awareness of and the ability to make use of the potential for learning presented through everyday work, including caregiving.⁹

The negative factors can be traced to municipal and regional administration, structure, and organization. In order for continual learning to not remain a mere vision in an organization, it is essential that collaborators take a positive stance toward change and that there is in place an organizational structure that supports and encourages learning and organizational activities for both production and learning. The patients in the test group felt positively about being able to, via videophone, see the staff caring for them, and seeing a face inspired a sense of security which had a calming effect. Arnert and Delesie⁷ have shown that elderly people appreciate the opportunity to use a videophone to communicate with a nurse.

There are several limitations inherent in our study. The patients in the test group were in poorer general condition and we cannot say in what way this affected our results. Also, the differences in nurses' ages and experiences were a potential limitation. This study was designed with the intention of combining quantitative and qualitative methods, through which a greater claim can be made for tendencies to be credible/trustworthy, as results are verified in more than one way, making up for the small sample size. The triangulation of methods was a way to reach trustworthiness and credibility in spite of the small number of participants, even if we did not foresee the dropout from both groups. Through this integrated approach the researchers took advantage of events, actions, norms, and values from the perspective of the persons studied. There are no single correct universal applications of research findings, only the most probable meaning from a particular perspective. It remains the reader's decision whether or not the findings are transferable to another context.¹⁴

Conclusion

Virtual communication between patients and nurses constituted a benevolent counterpart in home healthcare. The nurses felt positively about and were interested in using this form of communication in real time, as did the elderly patients, despite their advanced age. There is a need for further studies with larger sample size, studies that investigate telenursing as a tool for continual learning.

Disclosure Statement

No competing financial interests exist.

REFERENCES

1. Borowitz SM, Wyatt JC. The origin, content, and workload of e-mail consultations. *JAMA* **1998**;280:1321–1324.
2. Balas EA, Iakovidis I. Distance technologies for patient monitoring. *BMJ* **1999**;319:1309–1311.
3. Rosenblatt E. Telephone triage. A common sense approach. *RN* **2001**;3(suppl):2–3.
4. Stricklin ML, Jones S, Niles SA. Home talk/healthy talk: Improving patient's health status with telephone technology. *Home Health Nurse* **2000**;1:53–61.
5. Cherry JC, Moffat TP, Rodrigues C, Dryden K. Diabetes disease management program for an indigent population empowered by telemedicine technology. *Diabetes Technol Ther* **2002**;6:783.
6. Umefjord G. Nätbaserad vård ställer nya krav på personalens utbildning [Net-based care raise new demands on staff training.] In Petersson G, Utbult M, eds. *Nätverka för nätlärande inom medicin, vård och omsorg [Networking for Net-learning in Medicine, Care-giving, and Treatment]*. Rapport 2. Härnösand: Distansutbildningsmyndigheten, [Institution for Distance Learning] **2002**:49–56.
7. Arnaert A, Delesie L. Telenursing for the elderly: The case for care via video-telephony. *J Telemed Telecare* **2001**;7:311–316.
8. Svensson L, Ellström PE, Åberg C. Integrating formal and informal learning: A strategy for workplace learning. *J Workplace Learning* **2004**;8:479–491.
9. Ellström PE. Integrating learning and work: Conceptual issues and critical conditions. *Hum Resour Dev Q* **2001**;12:4.
10. Nicolas L, Franco A, Provost H, Amico L, Berenguer M, Lombard F, Tyrrell J, Couturier P, Bosson JL, Wernert S, Schnee D, Basset D, Chemarin A, Frossard M. Videophone assistance and home hospitalization: The ViSa Dom Program. *Press Med* **2005**;34:1059–1064.
11. Harnett B. Telemedicine systems and telecommunications. *J Telemed Telecare* **2006**;12:4–15.
12. Jönsson AM, Willman A. Distant care—Virtual and visual learning about leg wound treatment in home health care. *J Telemed Telecare* **2007**;5:236–240.
13. Bryman A. *Quantity and Quality Social Research*. London: Routledge, **1995**:58–98.
14. Graneheim U.H, Lundman B. Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today* **2004**;24:105–112.
15. Berg BL. *Qualitative Research Methods for the Social Sciences*. 5th ed. Boston: Allyn and Bacon, **2004**:265–297.
16. Burnard P. A method of analyzing interview transcripts in qualitative research. *Nurse Educ Today* **1991**;11:461–466.
17. Burnard P. Interpreting text: An alternative to some current forms of textual analysis in qualitative research. *Soc Sci Health* **1995**;4:236–245.
18. Nationell IT-strategi för vård och omsorg [National IT-Strategy for Care-giving and Treatment]. Regeringens skrivelse, [Government publication]. S 2006. 007. www.regeringen.se/content/1/c6/05/96/62/abac6cb0.pdf (Last accessed October 22, 2008).

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