Toward Increased Patient Safety? Electronic Communication of Medication Information Between Nurses in Home Health Care and General Practitioners

Merete Lyngstad, RN, MNsc, PhD candidate[1], Line Melby, PhD[1], Anders Grimsmo, MD, PhD[2], and Ragnhild Hellesø, RN, PhD[1]

Abstract

This study investigates how the use of an electronic messaging system influences patient safety in the medication information process between home health care nurses and general practitioners. Focus group interviews and semistructured interviews with 34 nurses and general practitioners were applied, and the results show that using a messaging system in the clinical communication and collaboration led to nurses in home health care and general practitioners more easily connecting, medication information being more accessible and medication information having a higher quality. The results also revealed that the use of a messaging system caused errors in the medication information. However, according to the nurses in home health care and general practitioners, the overall conclusion was that medication information improved and thereby patient safety increased.

Keywords

clinical communication, medication information, patient safety, electronic information exhange, messaging system, information technology

Well-functioning coordination, communication, and collaboration between health care providers are essential for the provision of high quality care, including the safe administration of medications.[1,2] Insufficient care coordination resulting in a lack or failure of medication information exchange between providers,[2-4] errors in prescribing and unintentional events related to medication administration have been identified as threats to patient safety.[3,5,6] In particular, changes to patients' medications and the reconciliation of medication records between home health care and general practitioners (GPs) have been reported to be a problem.[7-10] Different transition situations such as discharge from hospitals to home and visits to acute care facilities have led to discrepancies in the medication records because of errors in or incomplete discharge summaries that are forwarded to home health care and GPs.[4,11]

Much research has focused on information exchange between hospitals and home health care with regard to the discharge process and how it might affect the quality of patient care, though there is limited research on information exchange and communication between home health care and GPs in general and even less research on how they exchange and communicate medication information.[12-14] In this article, we address the information exchange and communication of medication information between nurses in home health care and GPs caring for homebound patients when information and communication technology (ICT) are introduced. More specifically, we report how the use of an electronic messaging system influences patient safety in the medication information process from the perspective of both nurses in home health care and GPs.

Background

There is a limited amount of evidence that the introduction of ICT will improve the quality of care by strengthening

[1]University of Oslo, Oslo, Norway
[2]Norwegian University of Science and Technology

Corresponding Author:
Merete Lyngstad, RN, MNsc, PhD candidate, Institute of Health and Society, Faculty of Medicine, University of Oslo, P.O. Box 1130 Blindern, N-0318 Oslo, Norway.
Email: Merete.Lyngstad@medisin.uio.no

information exchange and communication in health care. However, some studies indicate that the use of ICT systems, such as electronic health record systems (EHR systems) or computer order entry systems (CPOE systems), can resolve the problems caused by the manual exchange of medication information, thereby reducing errors and unintended events in the medication administration process.[15,16] One study showed that the use of ICT systems can alleviate some of the problems of medication discrepancies in the patient transition between hospitals and long-term care,[17] while other studies suggest that there is contradictory evidence to the assertion that ICT enhances patient safety in health care.[18-20] To achieve a higher degree of patient safety, it is necessary not only to be able to exchange information but also to communicate and have a shared understanding of the information content that is exchanged, as not only ICT systems but also health care providers have to interact.[21] This is in accordance with the sociotechnical perspective, which proposes that a system consists of several elements that interact with each other to produce an outcome.[22] Patient safety is dependent on how these elements work together, and success or failure is most often the result of several factors, and not only one.[19]

Clinical Collaboration and Communication

Clinical communication between providers is viewed as being particularly important because it is in this process that issues about care are shared, which is a prerequisite for interaction to occur. Tange et al.[23] have proposed a model for clinical collaboration that addresses the clinical dialogue and communication between actors such as individual health care professionals and/or collective subjects. The model is built on both Rector's idea of the faithful record[24] and Winograd and Flores' theory of conversation for action,[25] and implies that actors seek commitments to coordinate their activities.[23] This is achieved by conversation, of which there are two types, the order conversation and the result conversation. The order conversation or order phase involves requests and acceptation, whereas the result conversation or result phase involves feedback on the result of the action. Between the order phase and the result phase is the action that leads to alterations in what is called the "object of business," which in health care can be the patient's health or safety. The combination of the order-, action-, and result phase is called the transaction. The process is iterative and goes step-by-step until commitments are achieved.[23]

Ensuring clinical communication between health care providers is particularly challenging in distributed practices such as home health care, GP offices, and hospitals.

To help support clinical communication between health care providers, the Norwegian authorities have established a national closed and secure health net. The health net represents a basic electronic infrastructure that is used exclusively to transmit health information, and embodies an all-to-all electronic communication platform with a messaging system used by the different actors in health care. This communication platform is intended to connect and integrate all health care providers and EHR systems,[26,27] with part of the messaging system developed to serve as a communication channel between home health care and GPs. There are several reasons for establishing such a communication channel: (a) The Norwegian primary health care is managed by the municipalities and includes home health care, with approximately 31,000 nurses and 4,000 GPs being contracted. These two services are organized separately, governed and financed differently, and also have incompatible EHR systems; (b) Legislation does not permit them to share EHR systems, but they are obliged to exchange patient information when required.[28] The nurses in home health care and GPs have many common patients, thus indicating that ensuring a good clinical communication is essential.

The messages in the electronic messaging system that are specially designed to cover the information exchange and clinical communication between home care and GPs are shown in Figure 1.

Among the messages are a dialogue message and a medication message, both of which can be used in the home care nurses' and GPs' medication information process. Both messages contain prefilled information such as the patient's name, their national personal ID number and the sender and recipient of the e-message. The dialogue message provides the possibility for informal communication and is used to discuss treatment and care. However, the medication message is much more formal in its content and is designed to generate structured information from the medication module in the EHR systems, hence eliminating the need for manually entering the information.[27] The messaging system is currently being deployed nationwide and can be viewed as a tool for the clinical dialogue and medication information transaction between nurses in home health care and GPs.[29]

Method

An explorative approach was used to investigate how the electronic messaging system influenced patient safety in the medication information process from the perspective of nurses in home health care and GPs.[30] We combined focus group interviews and semistructured interviews to achieve an in-depth perspective as well as to obtain as rich data as possible.[31,32] Focus group interviews provide large data inputs because the interactions between the participants generate new ideas and more deliberate reflections on topics that they might not have previously considered.[32-34] The semistructured interviews generate a more thorough description of a topic, which is particularly important when the topic has not been studied before.[35] Therefore, combining focus group interviews and semistructured interviews provided extensive, comprehensive data.
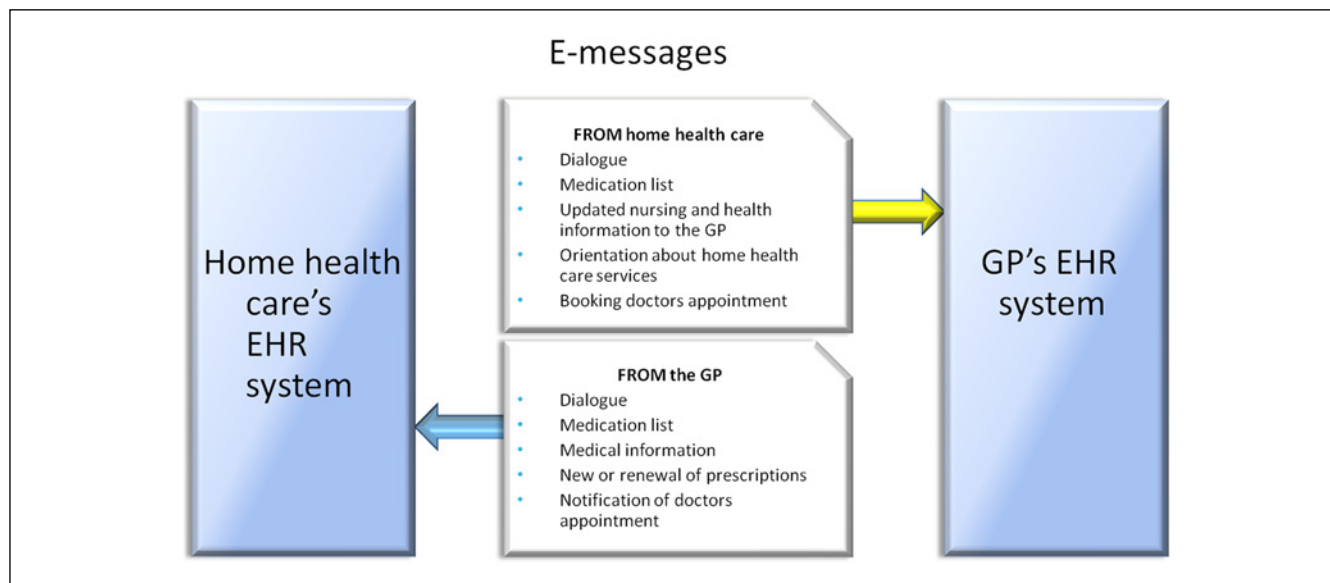
Figure 1. Electronic messaging system.

Setting and Sample

Two of the municipalities that were among the first to implement the messaging system were strategically chosen for the purpose of this study because they had used the messaging system for the longest amount of time and had the most experience. Municipality A was a large city by Norwegian standards and had used the messaging system for 13 months, and during this period 85,000 messages were exchanged between home care services and GPs. Municipality B was a small town that had been using the messaging system for 12 months, and here, 3750 messages were exchanged between home care services and GPs. Hence choosing these two municipalities ensured maximum variation.[36]

In addition to 15 semistructured interviews with 16 nurses and five GPs, three focus groups interviews with six nurses in home care and six GPs were conducted (Table 1). The nurses and GPs participated in one interview each.

All nurses and GPs had to fulfill the following inclusion criteria to be enrolled in the study: (a) They were employed in at least a 50% position; (b) They had been employed for the last 6 months or more; (c) They could read and write Norwegian, and (d) They had used the messaging system for more than 3 months prior to the interviews.

Data Collection Procedure

The study was conducted between May 2011 and October 2011, and the nurses and GPs were recruited by the managers in the municipalities according to the inclusion criteria. An interview guide was developed based on a literature search and previous research.[37-40] The topics in the questions included how the nurses and GPs (a) experienced

implementing the use of the messaging system; (b) experienced using the messaging system; (c) assessed their communication and collaboration via the messaging system in general, and in particular (d) assessed the information content of the messages. The group interactions were characterized by an open and free discussion of the topic, and the interviews took place in the home health care offices and in GPs' offices. The focus group interviews lasted from 85 to 100 min, the semistructured interviews lasted from 30 to 45 min and all the interviews were taped and then transcribed by a research assistant and the first author. No names or recognizable characteristics of the participants were used in the transcribed interviews.

Ethics

The study has been approved by the Norwegian Social Science Data Services and anonymity, confidentiality, and voluntary participation have been ensured. The participants have been recruited by a contact person in their municipalities and have received verbal and written information about the study and given their written informed consent.

Analysis

We applied a qualitative analysis with a stepwise deductive inductive approach[35] and started out the analysis with the questions from the interview guide and obtained a good overview of the material. Thereafter, we identified and coded meaningful units from the transcribed interviews, using QSR NVivo version 9 in this process.[41] After the codes were identified, we merged the codes into subthemes, and the interview text, the codes, and the subthemes were read

Table 1. Participants in Focus Group Interviews and Semistructured Interviews.

Interviews	Focus group interviews (*N* = 3)		Semistructured interviews (*N* = 15)		
Municipality	Municipality A	Municipality B	Municipality A	Municipality B	Total
GPs					
- Male	4	2	2	2	10
- Female	—	—	1	—	1
Nurses					
- Male	1	—	—	1	2
- Female	2	3	8	8	21
Total	7	5	11	11	34

several times and reinterpreted before the themes were finally established. This was an iterative process inspired by the literature and in which we repeatedly moved between the texts, the codes, and the subthemes.[35]

Trustworthiness

Credibility, rigor, and the researchers' role have been all been emphasized when planning, sampling, interviewing, transcribing, and analyzing the data. Moreover, the validity of the results has been maximized by the researchers reading through the interviews, independently identifying themes and subthemes, and then discussing the results in the research team until a consensus was established.[42]

Reflexivity

The first author participated in the project that developed and piloted the messaging system used between home health care and GPs, first as the project manager and then as the chairman of the steering group. She has not been operative in the actual implementation of the project after she took up the position of chairman and has not been the public face. Because of her previous role, she chose not to be the moderator in the interviews but instead the assistant moderator. We experienced that her knowledge in the field helped to generate questions during the interviews, which contributed to achieving in-depth insight.

Results

Before elaborating on the results, we will elucidate on how the communication of medication information was prior to the implementation of the messaging system. Both the nurses and GPs told about approaching each other by telephone or face-to-face meetings before starting to communicate electronically, and they reported problems and difficulties in getting ahold of the right person. The nurses said that before implementing the messaging system they seldom received information in writing stating what medication the patients should be given and that there were discrepancies between the home health cares' and GPs'

medication records for the same patients. They received information about a patient's medication by telephone call and paper prescriptions delivered by the patient or the next of kin. Sometimes, information was handed over by letters using the postal service and face-to-face meetings, and nurses even occasionally had to go to the GP's office to obtain the information they needed. We will further elaborate on the changes they experienced in their information exchange process after they started using the messaging system.

From the perspective of nurses and GPs, three overall themes were identified that influenced their medication information process using electronic communication, and which had implications for improving patient safety. The messaging system served as a tool for (a) connecting health care providers; (b) making information and communication accessible, and (c) reevaluating medication information. In the next sections, we will elaborate on these three themes.

The messaging system as a tool for connecting health care providers. When GPs and home care became electronically connected, it led to a change in communication patterns between them concerning patients' medication, and the GPs stated that they sent more electronic messages about medication than they would have expected. One nurse replied, "We get feedback and information that we didn't get before." In addition, the nurses said that the threshold for contacting the GPs was lower because they felt that, compared to phone calls, they did not disturb the GPs when using the messaging system. Both the nurses and GPs stated that using the messaging system enabled them to communicate more efficiently with each other.

> Nurse: We save a lot of time. There's probably nothing you spend more time on than trying to get contact with GPs.

Previously, the GPs' receptionists, the patients themselves, and/or the patients' next of kin regularly acted as mediators between nurses and GPs. Becoming connected was of importance in avoiding misunderstandings; as one GP expressed it,

Yes, it was a Warfarin dose that . . . I just had to let them know . . . it was the first time a change was made. . . . it was always the patients who delivered it to home care . . . And I thought that the safest course is that it goes directly between the nurse and me.

Different situations determined what kind of information exchange method nurses and GPs chose. For example, in urgent situations when the medication had to be discussed immediately, they still used the telephone. One nurse said,

". . . but often we need to change the medication today, you might say. And when they want to change the medication right away, they call.

In situations that were less urgent, they used the messaging system.

Both nurses and GPs expressed concerns about not being sure whether the medication information was followed up after the message was sent because they did not receive confirmation that the messages were received and read. They reported that the messaging system did not offer an option for automatic notification after a message had been read, which in some cases led to phone calls being made to be on the safe side.

The messaging system as a tool to make information accessible. To give safe care, the nurses were concerned about having access to the proper medication information when they needed it, and expressed that they were dependent on this at any given time to take good care of their patients. The e-messages were designed to be stored in the nurses' and GPs' EHR, which was highly appreciated:

GP: I think it is very good that it comes within the EHR. That it is documented exactly how it happened. I think it's a huge advantage.

Both the nurses and GPs expressed that the accessibility of patients' medication information in the EHR was a catalyst for preventing errors. As one GP said,

And given that the largest source of error is the incorrect use of medication, there's a significant quality improvement in that we can document the medication communication. It was hazardous before.

The nurses and GPs were concerned about the patients with complex problems and medication. However, becoming more aware of the content made it possible to correct the medication that was wrong.

GP: . . . And we see the benefit in relation to the medication lists. And especially if it is a patient with a complex condition, then you have to work a little with the medication

record, update it and get it right. So now we have the opportunity to do so and it's easier, I have sent quite a few such lists.

Using the messaging system made nurses more confident that their medication records were updated and correct. However, in patient transitions from hospitals to home health care, they said that there could be problems in updating the medication records between all health care providers because hospitals did not use the messaging system. This meant that when a patient had been admitted to a hospital there was a risk that the GPs did not receive information about changes to medication or that it took a long time before they received the discharge summary.

The messaging system as a tool for reevaluating medication information. A third theme identified was the messaging system as a tool for reevaluating medication information. The connectivity, accessibility, and better overview of the patients' medication records had implications for (a) Medication reconciliation; (b) The reviewing of existing medication, and (c) The detection of errors.

Using the messaging system provided a tool for both nurses and GPs in the reconciliation of medication records:

GP: I try to send the medication record that I think matches with my picture of what drugs the patient uses and see if the nurses in home care agree, and somehow get a consensus. You have to sit in peace and quiet and compare what you have on your medication records against the last discharge summary and the records that home care has, perhaps asking the patient, etc. So it's a puzzle, but I think it works.

Nonetheless, the nurses reported that the GPs did not always update the information in the medication records in their own EHR systems, thus creating problems because the medication message was designed to automatically generate the medication information from the EHR. In such cases, the information content of those messages the nurses received was incorrect.

The nurses also stated that they had to manually enter the medication changes in the medication module in the EHR, as they were not able to import the medication information electronically. Furthermore, they expressed concern that this manual transfer of information had the potential to cause errors and could be a safety hazard.

The possibility to review whether the patient really needed all the recorded medication was emphasized as an advantage using the messaging system:

GP: So I discover now when I'm going to sort the regular medication; oh, were there so many. Is it really necessary? So I start to pare it down a little. I repeatedly find this when I get the overview of the medication records, that there's perhaps no

need for all the medicines. So we help each other to ask some critical questions.

After discharge from the hospital, both the medication and dialogue messages were used to ensure that the GPs had received information about medication changes. The nurses sent dialogue messages to the GPs and asked if the medication lists were correct, and in some cases, errors were detected.

Being able to exchange medication information by using the messaging system had two implications for the reevaluation of medication management by nurses and GPs. First, communicating by messages enabled well-founded questions and answers about the medication. They expressed that they had more time to think things through compared to talking to someone on the phone, which required prompt answers.

> Nurse: . . . when you call, the GP hasn't got the time to think about what you are really asking. And then you maybe get a little hasty answer that really is not very well thought through. But if you send an e-message, they have the opportunity to maybe think it over and discuss it with someone else. And then you have, I experienced, more concrete and better answers.

Second, the GPs stated that they were now able to initiate new treatments immediately by sending medication messages to notify the nurses about changes in medication as a result of a patient encounter, and they experienced that there was no delay in starting the treatment.

Discussion

We have identified that the use of the messaging system led to improved medication information as information became more accessible and the nurses and GPs were more easily connected and could more easily communicate. We found that the messaging system improved the medication information quality because it enabled reconciliation, the detecting of errors, and the reevaluation of medication. However, our study also showed that the messaging system caused problems and errors in the medication information. Furthermore, we will discuss the results in view of the ideas of clinical collaboration and communication, as well as from a sociotechnical perspective.

Creating actions that lead to changes in the object of business, or in this case the patients' health or safety, requires a system for communicating and exchanging information, which is particularly important since the home care nurses and GPs are separated in time and space. The current study shows that nurses and GPs experienced that the messaging system offered summarized information that streamlined and targeted their interaction and supported their clinical communication. Both home health care nurses and GPs used the messaging system to request actions and accept requests, both of which

constitute the order phase, executing actions, and discussing the results of actions which is the result phase, all of which are in accordance with Tanges' transaction model.[23] However, the concept *order phase* used in Tanges' model can be perceived as being too narrow. Therefore, we propose that this should instead be called the *inquiring phase* because our findings show that the nature of this phase is to also search or ask for information and opinions, which can act as decision support and not merely to give and/or receive orders.

The documentation and access to medication information improved, thereby contributing to the detection of medication information errors. Through their exchange of information and dialogue, reconciliation of the medication records and a thorough evaluation of the patients' medication were initiated. It was due to the fact that the messaging system offered the opportunity to discuss the medication in a timely and appropriate manner that the possibility of a mutual understanding of the patient's problems and needs was generated.[21] We also found that in nonurgent situations, asynchronous communication was the most efficient way of communicating because the nurses and GPs were not unnecessarily interrupted; it worked well with the work processes, helping to generate more time to reevaluate and ensure the quality of medication information. In particular, the use of the dialogue message was perceived to be useful because this enabled a discussion of the medication, which facilitated the tailoring of the correct treatment and care for the patient, while also intervening before any harm could occur. This can be viewed as a successful transaction in which the clinical communication led to changes in the care of the patient.[23] As a result, we claim that through the use of the messaging system in their collaborating and communicating effort, nurses and GPs accumulated new knowledge and insight into their patients' medications and that this increased patient safety. However, our findings show that the use of phone calls and personal meetings persisted when there was a need for instant changes to medication. So to obtain successful transactions in urgent situations, synchronized communication was used because it allowed immediate answers and decisions. The reason for this was not necessarily because of technological deficiencies but that the formal routines when sending messages included no requirement to answer until after 3 days.

We also identified that use of the messaging system could be counterproductive and a threat to patient safety, which according to Tange's model could therefore be viewed as an unsuccessful transaction.[23] This was not due to the technology itself, but rather to the lack of updating by health care providers, thus resulting in the persistence of any errors in the medication records. This is in accordance with a study that indicated that the health care professionals did not always assume responsibility for updating the patients' medication records.[43] Medication information errors in the messages also created an extra workload because nurses and GPs had to correct each others' errors by sending new messages back and forth. In addition, when receiving messages, the

medication changes could not be electronically imported to the medication record, but instead had to be manually entered. From a sociotechnical perspective, this is an example of an insufficient integration of the health care providers, technology, and inadequate functionality.[21] According to the nurses and GPs, this could have resulted in errors and omissions, which is supported by the findings from a study that showed that manual transcription posed a threat to the accuracy of medication records.[44] Both the insufficient integration between the nurses and GPs and the inadequate technology are examples of elements that can lead to unsuccessful transactions, which could ultimately result in no change or in a deterioration of the patients' health or safety. This indicates that the means for collaboration and communication should also be taken into account when considering the concept of transaction.

Despite the problems related to the updating of medication records and the technology involved, the advantages of the messaging system used were experienced as being greater compared to not having it. The nurses and GPs changed their routines and work processes, thereby reconstructing the collaboration and clinical communication about medication information when using the messaging system.[21] Furthermore, it was neither the health care providers nor the technology alone, but rather the interplay between them, which changed the clinical communication and collaboration in a way that improved and, in some respects, aggravated patient safety. This is in line with the sociotechnical perspective, which emphasizes the importance of recognizing that technology is not a stand-alone component, but it is how it is designed, put into practice, and applied by people that decides how it works and what the outcomes will be.[19]

Limitations of the Study

The timing of the interviews may have influenced the results because the messaging system was not fully developed for the hospitals and had not been implemented. This might have affected the results regarding fragmented and inaccessible medication information. In addition, the messaging system had been used for only a year in both municipalities, which might not have been long enough to properly establish the use of the messaging system. Nevertheless, a year could be perceived as a long time, and large numbers of messages had been sent, particularly in municipality A, so this was probably not an interfering factor. However, our study did identify a lack in functionality that needs to be further developed, and it is possible that this could have influenced the participants in a negative way to some degree. On the other hand, the novelty effect could have influenced the participants in a positive way, with further studies revealing whether the interest in using the messaging system decreases over time.

We have examined the use of a messaging system from the perspective of the nurses and GPs although the clinical impact of the use of the messaging system has yet to be established.

Conclusion

Our study shows that the introduction of the messaging system has changed the clinical communication and collaboration between the nurses and GPs, as the medication information is more visible and accessible at the point of care. The nurses and GPs have moved from being disconnected to being connected, and it has been reported that the quality of the medication information is higher. There is still a need for developments to be made to optimize the functionality of the messaging system; however, according to the nurses in home care and GPs, using a messaging system in clinical communication and collaboration about medication information represents an improvement from earlier practice, and thereby a step toward increased patient safety.

Authors' Note

The article has not been presented at a meeting.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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