Factors easing the transition from paper to electronic prescribing of multidose dispensed drugs (MDD)

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Abstract
Multidose dispensed drugs (MDD) is a machine-dispensed system packing drugs in unit-of-use disposable bags. MDD is still prescribed using paper and fax. There is now an ongoing national effort to introduce e-prescribing of MDD similar to ordinary e-prescriptions. In this paper, we analyse how some of the first GPs, nurses and pharmacists who started using the system in 2018 experienced the start-up. We found four factors affecting the transition. These were technical readiness; sufficient time to make the first medication list; appointed contact persons for support and questions; and, sufficient information and training in using the new system prior to start-up.

Keywords
Multidose dispensed drugs, e-prescribing, shared medication list

1 INTRODUCTION

One in three of the community-dwelling elderly have been exposed to errors and potentially inappropriate medications [1]. Lack of access to accurate information on patients' medicine use increases the risk of medication errors [2]. Medicine-related problems (MRP) such as side effects, inappropriate use and errors is a serious threat to patient safety. MRPs reduce quality of life, cause morbidity, death and increase health care costs [3, 4]. Ten percent of all hospital admissions to medical wards in Norwegian hospitals are due to medicine errors. This amounts to 490,000 additional bed-days and approximately 1000 deaths per year [5, 6].

To improve safety and effectiveness in the medication management process, multidose dispensed drug (MDD) have been implemented in Norway over the last two decades [7]. MDD is a machine-dispensed system packing the drugs in unit-of-use disposable bags, one unit for each dose occasion, usually covering a 14-day period. The MDD bags are labelled with the patient's name and birthdate, the names of the drugs and time for when the tablets or capsules should be taken. Only solid formulations such as tablets and capsules can be dispensed in MDD. Inhalators, liquids and creams are delivered in their original packaging alongside the multidose bags. MDD is assumed to improve medication adherence, reduce nurses' workloads and reduce the waste [8-10]. The scientific evidence to support these claims is limited [11, 12].

The use of MDD in Norway has grown extensively over the past decade, from 15,700 patients in 2006 to 90,500 in 2017 [13]. The majority of MDD patients (74%) receive home care services, 21% are residents in nursing homes

Figure 1 Multidose dispensed bags (Apotek 1).

and less than 5% have a private arrangement and pay for the MDD themselves [13]. Most MDD patients are elderly multi-medicine users that have difficulties managing their own drugs. This makes them at high risk of experiencing side effects, medication errors and other adverse drug reactions. MDD patients are even more likely to be exposed to MPRs than patients using ordinary dispensing [14-16].

Over 90 % of prescriptions in Norway are sent to the pharmacy electronically [17]. The prescribing of MDD has until recently been paper-based, and still is in most parts of Norway. All medications a patient is prescribed, is listed on a prescription card and sent to the pharmacy by fax or ordinary mail. This paper prescription is valid for multidose dispensing for one year. The pharmacy staff manually transfer the medicines information from the prescription into the electronic MDD-system. The machine pack the drugs and the multidose bags are sent to the home care service, together with a copy of the prescription card. The nurses then manually transfer the medication information from the card they receive from the pharmacy into their own electronic record system. All these manual steps in the medication process increase the risk of

medication errors. It has also been voiced concerns about duplicate prescriptions when general practitioners (GPs) prescribe electronic prescriptions in addition to MDD paper prescriptions [18]. There is now an ongoing effort to introduce an electronic MDD prescribing system, where the prescribing procedure will be similar for MDD and for ordinary electronic prescriptions.

Electronic prescribing of MDD is one of several political initiatives to improve medication safety and efficiency in the medicines management process [19]. The implementation effort is national and the Directorate for E-health is responsible for driving this process. The implementation of electronic prescribing for MDD patients began in 2018 after two years of pilot testing. The first MDD patients to get electronic prescribing are those receiving home care services. The GPs who started using electronic prescribing were two GP-offices in Rogaland, five in Hordaland and three in Oslo. GP-offices in Larvik and Bergen will follow in 2019. They all use the electronic patient record system from InfoDoc Plenario.

This paper is part of a lager study that explores and analyses how the implementation of electronic prescribing of MDD affect medication accuracy, efficiency, changes in work practice and collaboration in primary care.

In this paper, we present how the GPs, the nurses in home care services and the pharmacists that began using the electronic prescribing system in 2018, experienced the start-up phase. The aim is to identify factors that will ease the transition to support the national implementation effort that lies ahead.

2 METHOD

This paper presents a qualitative study investigating the transition from paper prescribing to an electronic MDD prescribing system. We conducted interviews with users of the new e-prescribing system. The users in this study are the health personnel handling e-prescribing for MDD in primary care. This involves GPs, nurses and pharmacists in the home care services, and employees at the pharmacy dispensing MDD. We invited users that started prescribing MDD electronically in the first half of 2018 to be interviewed. The Norwegian Directorate of e-Health provided contact details for the users. We sent emails inviting the GPs to participate in the study three months after start-up. We also consecutively sent invitations to contact persons in the corresponding home care services and the MDD pharmacy. The invitations briefly described the project and the main themes of the interviews. One reminder was sent to those who did not respond. We sent invitations for follow-up interviews 10 months after start-up. All users who agreed to participate were included as informants.

We conducted 16 interviews with 26 users in total. This included nine interviews with 19 GPs (two group interviews, and three individual phone interviews). We also received two e-mails from one of the GPs. We further interviewed two nurses and one pharmacist (individual interviews) in two home care services and one group interview with four pharmacists at the MDD pharmacy. We also conducted five follow-up phone interviews with

three GPs, one pharmacist in the home care service and two pharmacists at the MDD pharmacy. Two researchers completed the group interviews. These interviews took place at the workplace of the users. One researcher completed the phone interviews. We consider that our informants represent the experiences we sought. The GPs that agreed to participate came from five of the nine invited GP-clinics that started using electronic prescribing of MDD in 2018.

We used group and individual interviews. We considered that groups would provide sufficient depth to the information we wanted to collect, and in addition, the informants could stimulate each other to provide experiences and views. Differences in views and experiences were as interesting as uniform opinions among the informants. We also conducted 11 individual interviews, most of them by phone. The interviews were semi-structured, and included open and follow-up questions. The interviews focused on how e-prescribing of MDD affects the users work practice, the experienced benefits, risks, challenges, and measures to facilitate improvement. We further categorised the questions into prior to (preparation), during and after start-up. The interviews lasted 30-45 minutes.

For this paper, we have focused on the start-up phase and included themes and sub-topics relevant to factors that can ease the transition process for the nation-wide implementation effort.

The interviews were recorded on tape and transcribed by a professional agency. We anonymised the data in the transcription and stored audio recordings and person-identifiable identification information separate from the transcribed material.

An applied framework approach was used to assess the introduction of electronic prescribing of MDD [20, 21]. We explored the empirical data using a content analysis to break them down into analytical categories relevant to this study. We used the themes from the interview guide to define key categories. These were divided into three main groups. The first group included changes in work practices. The second included benefits, problems and risks they experienced with the system. The third included measures for improvements. Furthermore, we coded the empirical material in the following categories: the technology, safety, time use, communication, information about and training in how to use the new prescribing system. The results section presents quotes from those who used the system.

3 RESULTS

3.1 Medication safety and time use

The medical doctors experienced the transition from paper to electronic prescribing of MDD differently. Some experienced the start-up without any significant problems. Others experienced technical problems and errors that took some time to detect, creating extra work at the clinic. Others again, were unable to start using electronic prescribing and emphasised they still do not have a system that works. One GP describe the system as "*completely*

useless [...] It takes too much time and ends in a clear reduction in both overview and patient safety."

However, most GPs agreed that the electronic prescribing system increased medication safety. Some experienced that electronic prescribing was more time consuming. The electronic system requires that the GPs continuously keep the list up-to date and incorporate new prescriptions from other doctors. They must revise, reconcile, and renew prescriptions for the drugs listed in the medication list more often. How often depends on the type of drug and size of the packages. While the old prescription card was considered a valid prescription for one year for all medicines listed, the electronic system requires single e-prescriptions on each medication on the list.

The nurses we interviewed in the home care service experienced many errors in the medication lists at start-up. When they compared the first new medication list to the medication record in their own system, they discovered that some patients lacked multidose completely, some lacked specific drugs, while others had a different dosage. The nurses further experienced increased responsibility and workload, as they had to check and fix errors and discrepancies at every new MDD packing.

The pharmacist at the MDD pharmacy experienced that electronic prescribing was more time-consuming than paper and fax. Errors experienced in the e-prescriptions included too small pack sizes being prescribed so they did not have enough medicines to dispense in the bags, some patients lacked valid prescriptions or the prescriptions were empty (the patients had already collected the medicines at another pharmacy) and some prescriptions lacked reimbursement information. However, despite the challenges at start-up they agreed that when the system worked it was much better than paper prescriptions and fax.

Based on the interviews, we found four distinct factors that were essential to have in place to ease the transition from paper to electronic prescribing of MDD. These were technical readiness; sufficient time and resources to make the first medication list; appointed persons to call for support and questions; and, sufficient information and training in using the new system prior to start-up.

3.2 Technical readiness

The users agreed that the technology, that is, the prescribing module as part of the electronic medical journal at the GP-offices, must be as ready and mature as possible at start-up. If the GPs experience errors and problems, they get frustrated and the likelihood of someone dropping out and stop using the system increases.

"It was very frustrating, we spent a lot of time on it, and then I think some [of us], not just here but some of the others [GPs] dropped out." GP

A system that works will also motivate the GPs to do the extra work needed to review, reconcile, and make the first medication list for all MDD users.

"That it works technically from day one is important, [..] you are then motivated to do the extra work needed."
GP

Furthermore, the server must be able to handle all the new medication lists and prescriptions if many GPs start using the system simultaneously.

"[...] when we came on with a large volume it stopped working and then the whole project was delayed [..] the server crashed completely. " GP

3.3 Sufficient time and resources to make the first medication list

The users highlighted the importance of allocating sufficient time and resources to reconcile and make the first electronic medication lists for the MDD users. All paper prescriptions must be deleted and a new medication list and e-prescriptions on each drug must be created. The GPs we interviewed emphasised the importance of keeping the medication lists nice and tidy.

"And then the hustle and bustle to have clean and neat medication lists, that is important". GP

The nurses we interviewed experienced an increased workload as they checked every new delivery from the pharmacy. They allocated extra nurses to help check the MDDs on the delivery days.

"Before we had one nurse, [..], but at the last two deliveries we were four nurses [checking] approximately 100 users" Nurse

Both the GPs and the nurses stressed that they should be informed prior to start-up that the introducing electronic prescribing for MDD means extra work. They can then allocate more resources during start-up. They were not prepared for the time it took in the beginning.

It was also suggested that a meeting between GPs and staff from the home care service would be useful to ease and improve the reconciliation process.

3.4 Appointed contact/support persons

Some of the GPs had a direct phone number to one person for technological support. They also had one appointed contact at the pharmacy. In smaller municipalities, the GPs knew the pharmacist responsible for MDD and the nurses in the home care service. All users could easily make a phone call or arrange a meeting. In larger municipalities, this was more challenging.

The nurses we interviewed had trouble getting in touch with both GPs and staff working with MDD at the pharmacy when they had questions or wanted to report errors. Phone calls had to go through the reception and they did not always know whom to ask for.

"... it is very important that the pharmacy also has a person, [..] that the home care nursing [can contact]"
Nurse

The GPs also reported that having one contact person they could call for help to resolve problems was important. Some suggested that a super-user at the office would be most effective. They felt it was easier to ask a colleague.

"We don't have time to take that phone, so it's much easier to ask a colleague". GP

3.5 Information and training

Before start-up, the GPs received an information leaflet and a guide describing how to use the system. Some found this information sufficient and they received adequate support from the suppliers when needed. Others felt that this information and support was insufficient.

The GPs argued that the training should include a course, a short video and/or a written step-by step guide to explain

in detail how and what to do in the computer program. The most important was to have one person at the office who knew the system (one of the doctors). Such a super-user could demonstrate the steps and help others when they were stuck. The GP-offices that had a super-user emphasised this as valuable.

"Maybe a super-user should be able to take some responsibility for guiding the rest of the flock. I think maybe it would have been more successful than the way it was done." GP

The nurses did not get any information or training before start-up. They argued that training together with the other users would improve the transition. They believe that understanding the main features of the change can better equip them to handle errors and discrepancies in the start-up phase.

4 DISCUSSION

Most users agreed that when the electronic prescribing system for MDD worked, it was much safer for the MDD-patients than paper prescriptions and fax. However, the users experienced problems and challenges at start-up that, if addressed, could improve the implementation process. This study found four distinct factors that are essential for improving the start-up phase. These are technical maturity and readiness; sufficient time and resources to make the first medication list; appointed persons to call for support and questions; and, sufficient information and training in using the new system prior to start-up.

One measure to reduce medication errors and improve medication safety at start-up is to ensure that the technology works as planned from day one. Some of the GPs experienced the prescribing module immature with technical problems and errors that took time to resolve. Some GPs experienced so much trouble that they gave up and sent the prescriptions by fax to meet the packing deadline at the pharmacy. Spending time on tasks that is complicated in a hectic working day may be too demanding. Some might therefore give up on using the system until it works better. Others studies has also found that technical readiness, maturity and interoperability is crucial to successful implementations in health. For example a large study of shared electronic records in England found that the properties and attributes of the technology heavily influenced the implementation process [22]. The technical solutions, usability of systems, implementation strategy and routines are further affecting the accuracy of medication information [23].

Another reason for the different experiences at start-up might be MDD workloads. Those GPs with few MDD-patients seems to have less trouble than those with many MDD-patients. It is therefore important to plan and prepare GPs for the amount work that is needed to carry out the reconciliation process for the first medication list. Time is scarce at most GP-offices and the GPs have to review every medication for all MDD patients and decide whether to continue prescribing the drug or not. This is a time consuming, and sometimes impossible task since they do not have the patient in front of them. Sufficient time and resources must therefore be available. Difficulties in

allocating time and resources to implement e-health services within routine health care is a well-known barrier [24, 25].

The presence of a super-user also seems to affect how the GPs experienced the start-up. To have a colleague in the office that can show on the computer screen what to do, reduced frustrations and had a positive effect on how they experienced the implementation process. Providing extra training for one of the GPs at each clinic can improve the transition phase.

Sufficient information and training prior to the implementation is important. Most users agreed that more information on how to use the system such as videos and step-by step guides would have been useful. However, the information material should be easy to find and use in a busy GP-clinic.

Electronic prescribing of MDD is complex and involves a large number of different health professionals located at different health care facilities. The new prescribing system has the potential to improve medication safety and simplify the flow of information. Electronic prescribing can improve accuracy as it remove the tasks of manually transferring the medication information from paper prescriptions to the electronic systems at the MDD-pharmacy and the home care services. Automatic transfer can be a safer option as it has the potential to reduce the risk of human mistakes and errors. The communication patterns has also changed, as it is now possible to send messages in the electronic patient record at the GPs and the electronic prescription system at the pharmacy. This has the potential to make the prescribing process more efficient.

The providers in the home care service and the MDD-pharmacy experienced errors in the medications and the prescriptions at start-up. This resulted in a feeling of increased responsibility and workloads. The nurses we interviewed did not trust that the lists were correct, and they created new routines to check for every new delivery from the pharmacy. Trust is an important aspect when patient information is shared [26]. Building trust has to run in parallel with the introduction of new digital services [27]. This can be achieved by improving communication and cooperation between the different providers in the prescribing process.

A weakness of this study was the limited number of participants. We had in particular few interviews with the nurses involved. We cannot rule out that a larger number of participants would have put forward other views and experiences, and thereby included other important aspects. Furthermore, the GPs who agreed to participate might have been more positive towards the new prescribing routines than those who did not respond. One of the GPs pointed out that: *"I have been positive about this project all the time, so I am willing to overlook some bumps".* However, we believe that the views expressed by the informants in this paper capture the main aspects related to the start-up phase of implementing electronic prescribing of MDD.

Challenges in e-health implementation are an international phenomenon and have been widely reported [28, 29]. How e-health interventions are implemented is as important as

the features and functions of the intervention itself [30]. Understanding how best to implement new digital services is crucial to achieve its expected benefits.

5 CONCLUSION

Four factors reported to ease the transition from paper to electronic prescribing of MDD. These were technical readiness; sufficient time and resources to make the first medication list; appointed persons to call for support and questions; and, sufficient information and training in using the new system prior to start-up. Addressing these factors is important to reduce errors, improve medication safety, support up-take and facilitate the planned large-scale implementation.

6 REFERENCES

[1] Nyborg, G., J. Straand, and M. Brekke, Inappropriate prescribing for the elderly--a modern epidemic? Eur J Clin Pharmacol, 2012. 68(7): p. 1085-94.

[2] Stock, R., et al., Advances in Patient Safety. Developing a Community-Wide Electronic Shared Medication List, in Advances in Patient Safety: New Directions and Alternative Approaches (Vol. 4: Technology and Medication Safety), K. Henriksen, et al., Editors. 2008, Agency for Healthcare Research and Quality (US): Rockville (MD).

[3] Makary, M.A. and M. Daniel, Medical error-the third leading cause of death in the US. BMJ, 2016. 353: p. i2139.

[4] Leendertse, A.J., et al., Preventable hospital admissions related to medication (HARM): cost analysis of the HARM study. Value Health, 2011. 14(1): p. 34-40.

[5] Finckenhagen, M., Ser vi lyset nå? Revidert tiltakspakke for samstemming av legemiddellister. I trygge hender. Oslo: Statens legemiddelverk. 2015.

[6] Hauge, H.K., Den digitale helsetjeneste. 2017, Oslo: Gyldendal Norsk Forlag AS.

[7] Halvorsen, K.H., et al., Prescribing quality for older people in Norwegian nursing homes and home nursing services using multidose dispensed drugs. Pharmacoepidemiology and drug safety, 2012. 21(9): p. 929-936.

[8] Riksförsäkringsverket, Medicin på kredit och i påse - Apotekets delbetalningssystem och dosdispenseringsverksamhet. 2001: Stockholm.

[9] PriceWaterhouseCoopers, Multidosepakking av legemidler - en samfunnsøkonomisk vurdering av tiltak. 2007, Sosial- og Helsedirektoratet: Oslo.

[10] Helsetilsynet, Sikrere legemiddelhåndtering i pleie- og omsorgstjenester. 2002: Oslo.

[11] Sinnemaki, J., et al., Automated dose dispensing service for primary healthcare patients: a systematic review. Syst Rev, 2013. 2: p. 1.

[12] Halvorsen, K.H. and A.G. Granas, [Multi-dose dispensed drugs in Scandinavia - A systematic review of possibilities and limitations]. Norsk Farmaceutisk Tidsskrift, 2012. 120(4): p. 22-27.

[13] Apotekforeningen, Apotek og legemidler 2018.

[14] Olsson, J., et al., Quality of drug prescribing in elderly people in nursing homes and special care units for dementia: a cross-sectional computerized pharmacy register analysis. Clin Drug Investig, 2010. 30(5): p. 289-300.

[15] Wallerstedt, S.M., et al., Drug treatment in older people before and after the transition to a multi-dose drug dispensing system--a longitudinal analysis. PLoS One, 2013. 8(6): p. e67088.

[16] Johnell, K. and J. Fastbom, Multi-dose drug dispensing and inappropriate drug use: A nationwide register-based study of over 700,000 elderly. Scand J Prim Health Care, 2008. 26(2): p. 86-91.

[17] The Norwegian Directorate of eHealth (2019) [National e-health monitor]. https://ehelse.no/strategi/nasjonal-e-helsemonitor. Accessed 27. August 2019.

[18] The Norwegian Directorate of Health (2015) [Multidose - status and the way forward]. IS-2422. Oslo.

[19] Nasjonal e-helsestrategi og mål 2017-2022. Direktoratet for e-helse. Oslo 2018. https://ehelse.no/strategi/e-helsestrategi Accessed 5 April 2019.

[20] Ritchie, J. and L. Spencer, Qualitative data analysis for applied policy research, in Analyzing qualitative data, A. Bryman and R.G. Burgess, Editors. 2002, Taylor & Francis e-Library: New York. p. 173-94.

[21] Pope, C., S. Ziebland, and N. Mays, Qualitative research in health care. Analysing qualitative data. Bmj, 2000. 320(7227): p. 114-6.

[22] Greenhalgh, T., et al., Introduction of shared electronic records: multi-site case study using diffusion of innovation theory. Bmj, 2008. 337: p. a1786.

[23] Hammar, T., A. Ekedahl, and G. Petersson, Implementation of a shared medication list: physicians' views on availability, accuracy and confidentiality. Int J Clin Pharm, 2014. 36(5): p. 933-42.

[24] Ross, J., et al., Developing an implementation strategy for a digital health intervention: an example in routine healthcare. BMC Health Serv Res, 2018. 18(1): p. 794.

[25] Lau, R., et al., Achieving change in primary care-causes of the evidence to practice gap: systematic reviews of reviews. Implement Sci, 2016. 11: p. 40.

[26] Dyb, K. and L.L. Warth, The Norwegian National Summary Care Record: a qualitative analysis of doctors' use of and trust in shared patient information. BMC Health Serv Res, 2018. 18(1): p. 252.

[27] Wekre, L.J., L. Melby, and A. Grimsmo, Early experiences with the multidose drug dispensing system--a matter of trust? Scand J Prim Health Care, 2011. 29(1): p. 45-50.

[28] Ludwick, D.A. and J. Doucette, Adopting electronic medical records in primary care: lessons learned from health information systems implementation experience in seven countries. Int J Med Inform, 2009. 78(1): p. 22-31.

[29] Murray, E., et al., Why is it difficult to implement e-health initiatives? A qualitative study. Implement Sci, 2011. 6: p. 6.

[30] Kellermann, A.L. and S.S. Jones, What it will take to achieve the as-yet-unfulfilled promises of health information technology. Health Aff (Millwood), 2013. 32(1): p. 63-8.

7 ACKNOWLEDGEMENT