

# The e-multidose is better for patients' safety than dosette boxes and faxes

With the use of multidose electronic prescriptions, sources of error linked to paper-based solutions have been eradicated. However, it is still challenging to achieve optimal handling of medication.

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### ABSTRACT

**Background:** The quality of drug-based treatment may be affected by how drugs are handled. This is why the multidose has been introduced as a replacement for the dosette box. Moreover, this is the background for a pilot project in a number of Norwegian municipalities where multidoses are dispensed via an e-prescription scheme.

**Objective:** The objective of the article is to shed light on experiences gleaned from the pilot project on whether patients receive the correct medication at the correct time.

**Method:** The empirical material consists of interviews with the key actors in the administration of drugs: pharmacies, regular GPs and community nurses. Findings are discussed in light of other research and formal regulations in the field.

**Results:** Pharmacies and doctors have good experiences with the scheme. Community nurses find that there are fewer errors and that e-procedures are faster than paper-based procedures when multidoses need to be altered. The actors describe how sources of error linked to paper-based solutions have disappeared. The fact that all changes in drug prescriptions are checked routinely by the pharmacy represents a further quality assurance. A weakness of the scheme is that community nurses no longer have access to their patients' medication list.

**Conclusion:** Multidoses in e-prescriptions give improvements in quality in the handling of drugs. A number of measures will support the beneficial impacts of the e-multidose:

- The distribution of responsibilities among some of the actors must be clarified.
- Doctors' EPR systems must be made more transparent and easier to use.
- Everyone who handles the e-multidose, including community nurses, must have access to the current medication list (LIB).

Using the correct medication to prevent and treat illness is a vital element of the health services today. When the patient has several chronic illnesses, the complexity of medication often increases, and consequently the possibilities of drug interactions and adverse side effects. The handling of medication affects whether patients receive the correct medication at the correct time. This article sheds light on the impacts of new ways of handling patient medication.

## From dosette box to multidose – purpose and experiences

A dosette box containing the drugs the patient is to take is a device that makes it easier for him/her to take the correct medication at the correct time. The use of the dosette box requires qualified personnel to distribute the drugs correctly in the box. However, this procedure is not only time-consuming but entails the danger of erroneous placement in the dosette box (1).

The multidose has been developed to reduce these disadvantages through medications being machine packed into dose unit bags. Discarding of medication is also expected to decline (2). While the dosette box was packed by a nurse, machine packaging takes place at the pharmacy after the doctor has sent the pharmacy a prescription card. The multidoses are usually packed for a two-week period, and the bags are marked with the patient's ID, drug product information and the time of intake (3).

The use of the multidose has increased. In 2002, altogether 3000 patients received multidoses while in October 2015 the total was approximately 77 300 patients. Of these, 60 000 were attended to by the community nursing service, and 3200 received multidoses directly from the pharmacy at their own request (2).

However, studies find both advantages and new challenges in relation to the multidose (2, 4, 5). The multidose appears to make the handling of medication simpler and safer by reducing errors in the dispensing process (1, 4, 6). The challenges include the manual recording and updating of patients' medication lists in three different systems: at the GP surgery, by the community nursing service and at the pharmacy. This entails the risk of inconsistency and errors.

Ordering multidose drugs is based on paper prescriptions in the form of a prescription card, while ordering drugs for patients without multidose is based on electronic prescriptions, so called e-prescriptions. Two parallel routines – both prescription cards and e-prescriptions – can result in unintended duplicate orders and duplicate delivery of medication. Such duplication constitutes a weakness in the system that requires attention (1).

The health authorities have pointed out that the multidose is unsuitable for dealing with frequent changes in medication dosage, but that it is a scheme that is suitable for distributing drugs for regular use to home-dwelling patients with a stable dosage (7).

#### DEFINITIONS AND ABBREVIATIONS

**Electronic prescription (e-prescription):** E-prescriptions are replacing paper prescriptions and have been introduced throughout Norway.

**E-multidose:** Requisitioning of multidoses in an e-prescription solution. This means that multidoses are ordered by means of a general procedure for e-prescriptions, whereby doctors and pharmacies communicate via a national database for electronic prescriptions called Reseptformidleren (prescription mediator).

**LIB:** Legemidler i bruk (current medication list) – list of patient's medication, dietary supplements, critical information on drugs and drugs that have been recently discontinued.

**Patient safety:** This refers to whether the patient receives the correct medication at the correct time.


**Prescription card:** When the multidose is to be used for the first time, the pharmacist prepares an overview showing the entire medication regime of the service user. The overview is used in a prescription card that is valid as a one-year prescription for all medication listed on the card when it has been signed by the doctor.

#### From multidose to e-multidose

At the time the multidose came into use, fax was the most important medium for information transfer and communication between the main actors – the GP, home care services and the pharmacist – when they dealt with medication lists. This handling procedure has many undefined manual checks, and there are many chances of making errors when dispensing drugs to patients. As a result, there was a need to communicate medication data between actors electronically.

A multidose solution via e-prescription, termed e-multidose, was implemented and tested in five Norwegian municipalities. The e-multidose is intended to support efficient work processes and ensure that the patient receives the correct medication at the correct time. Testing commenced in 2014 (2).

While the introduction of the multidose primarily concerned a change from manual to automatised dosage of medications, the transfer to the e-multidose entailed a change in the data and communication systems. The e-multidose is linked to the introduction of the e-prescription in the primary healthcare service in 2013, and in hospitals from 2016.



## «The e-multidose is intended to support efficient work processes and ensure that the patient receives the correct medication at the correct time.»

In the paper-based multidose solution, the doctor faxes a prescription card to the pharmacy with a list of all the drugs prescribed for a patient, and the pharmacy uses machine-packaging for the multidoses. With the use of the e-multidose, the doctor no longer has to prescribe drugs by faxing a prescription card to the pharmacy, but must send the order electronically as an e-prescription. This means that multidoses are prescribed under a general procedure for e-prescriptions via the national database for electronic prescriptions.

Instead of the prescription card, a notification termed LIB (current medication list) is now employed. The LIB list does not replace the prescription card since it does not function as a prescription, but simply shows the drugs and dietary supplements listed for the patient. In addition, it contains critical information regarding drugs as well as those recently discontinued. Thus in order to pack multidoses, a LIB list and an e-prescription are required (2, 5).

Studies from other countries found that the multidose scheme gave a higher risk of medication error than ordinary prescriptions without the multidose, and also reported that the multidose medication lists had lower quality (4, 8–11). These findings have not been examined more closely but researchers are reflecting on whether this may be because the multidose scheme is more automatised and entails less frequent contact with the GP and thus fewer reviews of medication than for patients without the multidose (8, 12). We would stress that studies with empirical material from other countries often deal with the multidose in the context of e-procedures that differ from those in the Norwegian pilot project (5).

### Research question

Our article focuses on how the transfer to the e-multidose may affect patient safety. By patient safety, we mean whether the patient receives the correct medication at the correct time. The correct use of medication is conditional on many aspects of the process from time of diagnosis until the drugs are dispensed and ingested.

The article addresses the following research question:

How does the e-multidose scheme that is being tested affect information and communication between the pharmacy, the community nursing service and the regular GP, and what consequences may this have for patient safety?

## Method

### Recruitment of informants

The Norwegian Directorate of eHealth commissioned the study. The Directorate informed us about what group practices were taking part in the pilot project and helped us to find contact persons at multidose pharmacies and the community nursing service in the pilot municipalities. We invited all the participants in the pilot project to participate in the study and sent a letter by email to the pharmacies that functioned as multidose pharmacies, the management of community nursing services and group practices in the relevant municipalities.

The letter gave a brief description of the project with the name of the client and the main theme of the interviews. All service users who wished to participate were included as informants. In respect of the community nursing service, three out of five managers helped us to arrange interviews.

### **Obtaining interview material**

One of the authors of the article and another project member, Doctor Nils Kolstrup, conducted the interviews at the beginning of November 2016. The interviews took place at the workplaces of the GPs and the pharmacy staff, and in common rooms for community nurses. We carried out six interviews with altogether 24 service users. We interviewed a group of three participants at the multidose pharmacy. Four GPs were interviewed, three of them as a group.

In the community nursing service, we interviewed 17 nurses in three groups. In one of the three groups, patients had returned to the paper multidose system because 'their' doctors had changed from patient records supporting e-multidose to a system that did not do so. We believe that the informant groups represented the experiences we sought, but are unsure whether different views and experiences would have emerged if more doctors had participated.

The interviews lasted approximately 45 minutes and were face-to-face. They were audiotaped and transcribed by a professional agency. We used group interviews because we felt that they would give the in-depth information we wished to obtain, and because we wanted the informants to be able to inspire each other to put forward their views and experiences. Differences in these were just as interesting as uniform perceptions.

The interviews were semi-structured and accommodated open-ended questions and follow-up questions. The interviews raised questions about how the actors' work processes were affected by the e-multidose, the accompanying challenges and improvement measures. In this article, we have focused on topics and sub-topics of relevance to patient safety.

### **Processing and analysing the interview material**

We employed a topic-centred approach (13, 14) in order to obtain, code and analyse data. At least two co-authors read each interview, while three shared the task of coding the interviews.

The analysis mainly utilises a retroductive research strategy (14, 15); we looked for underlying reasons that might explain the experiences and situations communicated by the empirical material. This strategy has proved useful since the community nurses and other health personnel must act in accordance with a number of formal requirements – such as procedures, circulars, regulations and laws – related to how information and communication tasks shall be performed. Such parameters and guidelines affect behaviour; they can both solve problems and create new, and they can trigger reflections and proposals for change.

### **Ethics**

Written informed consent was given before the start of the interviews. We anonymised the data material in the transcription, and stored audiotapes and identification data separately from the material.

## **Results**

### **Better conditions for information and communication**

The pharmacy and the GPs considered that the e-multidose increases patient safety compared with multidose paper prescriptions. They found that the inclusion of the current medication list in the national database for e-prescriptions gave a better overview of what medications are listed for patients, and what medication lists are correct. Pharmacy staff stressed that e-multidose procedures detect any change in the medication list, and that the inclusion of the current medication list in the national database for e-prescriptions is under pharmaceutical control. This control also includes changes made by doctors other than the regular GP.

Pharmacy staff were more confident that the medication list, in the form of the LIB list in the national database, is up to date when the multidose is packed. Moreover, with the e-solution the pharmacist can simply send an e-message to the doctor and ask about valid prescriptions and renewal of prescriptions, something that both the pharmacy and the doctor see as an advantage:

‘All changes in the LIB list will reach us somehow. So you must make up your mind [...]. Renewing prescriptions – of course that also requires the pharmacist to check [...]. The e-multidose has vastly improved safety [...]. You can spot things that may have been dispensed. Or an interaction.’ (Pharmacist)

‘I’m convinced that patients with the e-multidose get more correct medication [...], and I think they benefit from an entirely different level of review than was the case ten years ago.’ (GP)

The regular GPs talked about the positive response of the community nursing service because they got faster answers to their questions about medications. They also praised the e-multidose scheme because it made it easier to give the hospital physician the correct medication list, and generally keep the patient’s LIB list updated by copying the medication lists in the national database for e-prescriptions. Some doctors routinely copied the LIB list in their referrals to hospitals.



## «I’m convinced that patients with the e-multidose get more correct medication.»

GP

Community nurses had differing views about the e-multidose as opposed to the paper-based multidose. One group felt there was no difference. Another group emphasised that paper routines gave them a better overview of what medications were listed for the patients via the prescription card that serves as a valid prescription for one year. The third group believed that the e-multidose was more efficient with fewer errors and less need to chase up the doctors. They also felt that the updating of the patients’ medication lists had improved because the prescription is altered when the patient has seen a doctor:

‘[Electronically] it’s much simpler, because then we know it will arrive quite quickly. [But without] electronic communication, it may be that they haven’t sent the fax, or the fax hasn’t arrived, and then they have to send it in the post. So the process takes a lot more time.’ (Nurse)

### **New challenges: Reminders and questions about prescriptions**

However, all three instances experienced challenges in respect of the e-multidose. The pharmacy had to contact doctors more frequently because of questions about valid prescriptions as well as reminders to renew the prescriptions. Some doctors did not answer written requests within the pharmacy’s deadline for packing, and the pharmacy had to ring the GP’s surgery:

‘We have many well-organised doctors, and then it functions perfectly, and then we have doctors who do not answer these questions, and we have to send the same questions two or three times. And in the end, we have to call them.’ (Pharmacy)

The prescription card for the paper-based multidose has an expiry date, with medications that are normally prescribed for one year’s consumption. With e-routines, each listing in the current medication list has its own prescription, but this is not always issued for a whole year’s consumption, and the pharmacies found this particularly challenging for medications in prescription groups A and B:

‘It is not particularly helpful when you take a sleeping tablet every evening as a multidose, and the doctor writes a prescription for 30 tablets [...] instead of writing it for a whole year at a time.’ (Pharmacist)

With the e-multidose, the community nursing service would need to call the pharmacy more frequently to ask about valid prescriptions, and according to the pharmacist, about attempts to order medications without a valid prescription:

‘I have to pester the pharmacy more often about the renewal of e-prescriptions. I have no access to the module, and we have a very limited overview really, [of] what medications the patient uses. We call the pharmacy and ask what prescriptions they have there, and we also have to call the GPs to check what they’ve entered.’ (Nurse)

‘We get an awful lot of phone calls: “I just want to check”, “Is there a prescription for so-and-so?” (Pharmacy)

Regular GPs also found that they were hassled at times by the community nursing service. This might occur when the GP had not yet received the case history from the hospital. At other times, the fault seemed to lie with the community nursing service itself:

‘[The community nursing service] requisitions the medication, and a few days go by, and then they requisition it again even though the prescription has been written out.’ (Doctor)

### **Uncertainty and lack of clarity: Who sees what and who has responsibility for what?**

Some doctors were uncertain whether the community nursing service see the LIB list in the database for e-prescriptions, and some wondered ‘why the hospitals cannot see the LIB list when they are not in e-multidoses.’ Others felt they would like more specific and accurate information about ‘the difference between the e-prescription and the multidose e-prescription’.

They mentioned differing views among doctors, including GPs, as to whether others than the GP can discontinue medications on the LIB list. Such disagreements led to uncertainty among GPs about the status of the LIB list in their prescription module:

‘A hospital doctor wrote in the case history that one medication had been exchanged for another and that the former had been discontinued, but both prescriptions were found in the prescription module.’ (Doctor)

The doctors wanted everyone to enter drug prescriptions in the same system in real time. Then the reader would always know what drugs had been prescribed for the patient.

The nurses described a need to clarify for everyone involved who had responsibility for updating the LIB lists. Some felt that the doctors should inform them of changes straightaway and not wait until the end of the working day. They felt they had to be vigilant and pester the doctors and the pharmacy, and that part of the quality assurance rested on them.

### **Prerequisites, weaknesses and wishes**

The GPs believed that devising good routines at the GP surgery in cooperation with the pharmacy and community nursing service is a prerequisite for optimising the advantages of the e-multidose:

‘The dialogue box must be checked every day if the 24-hour response time agreed with the community nursing service is to be fulfilled.’ (Doctor)

One weakness of the health service pathway is that after discharge from hospital, some time passes before the GP receives the case history and notification about changes in medication if this is relevant. By that time, the community nursing service may already have sent a reminder based on the discharge summary they have received, and the pharmacy perhaps receives notification of the change in the multidose too late.

Another weakness is linked to the electronic patient record (EPR) used by the doctors. They describe EPRs where it is easy to lose the full picture when they switch between modules. Some had partly given up trying to learn how to use their e-tools, which may result in a failure to answer questions from pharmacies and the community nursing service. One doctor believed that the dialogue box was generally intended for dispensing messages of no relevance to his/her own work:

‘When I receive a case history, I can paste in the text and compare the lists. But often I actually think it’s quicker to do it manually. [...] Now both the manufacturer’s name and the generic name were included, and then one of the lists ended up being twice as long. And then everything’s a mess. So I still miss some kind of sort key in the e-prescription module. And I also miss an option for printing out not only medication lists but also [...] the history and that kind of thing.’ (Doctor)

‘The coordination module for drugs, I haven’t quite understood it. So I haven’t used it [...] So if I happen to access it when the patient is at the surgery, I suddenly see that ‘Oops, there’s a request for information there, and it may have been there for quite a while.’ (Doctor)

The pharmacy, the doctor and the community nurses all wanted the nurses who administer the patient’s medications to have read-access to updated medication lists in real time. The nurses felt it would be an advantage for all three instances if they also had access to their patients’ e-prescriptions, and that it would be of great help in efforts to establish a shared hub where all the actors involved could see the patients’ medication lists:

‘Then it would probably be better if the e-multidose [had] a base that all instances had access to. That you have a cloud, or whatever it’s called, where everyone can access information [...]. If the hospital makes any changes, they end up in that cloud.’ (Nurse)

‘[Being able to] see the e-prescriptions [...] would simplify the work tremendously and would create less hassle for the doctors and the pharmacies as well. So that would be a win-win situation.’ (Nurse)

## Discussion

### New e-procedures – More accurate prescribing of medication

Our interviews show that the pharmacies and doctors had confidence in the LIB scheme in the national database for e-prescriptions, and good experiences with it. Community nurses found that there were fewer errors, and that e-procedures are faster than paper-based procedures when multidoses need to be altered, which also helps to ensure that the patient receives the correct medication at the correct time.

### «E-prescription routines enable a more secure transfer of information about drug-based treatment between the doctor and the pharmacy than the use of fax.»

We consider that several elements in the e-multidose scheme promote greater patient safety. The GP and the pharmacy use the same source for prescription data – the LIB list in the national database for e-prescriptions – and a uniform requisition practice via e-prescription replaces parallel routines. E-prescription routines enable a more secure transfer of information about drug-based treatment between the doctor and pharmacy than the use of fax, and the risk of error is reduced when the manual transfer of drugs information from paper to electronic systems is a thing of the past. Another study (16) from the pilot project provides a similar picture.

A lack of information about what medications the patient uses may also be a problem in the case of hospitalisation (17). The LIB lists in the national database for electronic prescriptions constitute an important medication coordination aid for doctors in regional health trusts as well as for doctors in out-of-hours emergency care and specialists.

### Weaknesses of the present scheme

With the e-multidose, however, community nurses lose access to the patient's medication lists via the prescription card, and they must administer drugs without access to the service user's prescriptions. All three groups of informants expressed a wish that community nurses should have access to the LIB lists. Such access would probably lead to a decline in reminders and chasing up prescriptions, eliminate time wasting and delays, and make provision for community nurses to continue helping to quality assure medication handling.

The problem of lack of access applies to all health and care services in the municipality. The Norwegian Directorate of Health has recommended that national criteria and professional guidance describing the distribution of responsibility for both the current paper-based scheme and the e-solutions should be drawn up for procedures and tasks related to the multidose. Such criteria and guidance would promote correct and satisfactory medication handling. Furthermore, the Directorate has proposed the provision of a regulatory platform that would give nurses and social educators with professional needs access to updated medication lists (18).

### **The problem of renewing prescriptions – other proposals**

The pharmacy staff wanted the doctors to prescribe larger quantities so that the prescriptions did not need to be renewed so often. One proposal was the automatic calculation of one year's consumption each time the doctors prescribed medications. Another proposal that would make it easier for doctors to requisition larger amounts of medications in the A and B prescription groups was to limit prescriptions to multidose packages only.

The desire to make provision for prescribing large quantities of these medications conflicts with the regulations relating to the dispensing of drugs by pharmacies (19). Moreover, the health authorities have explicitly stated that habit-forming medications intended for use as required, should not be prescribed in multidose packaging (7). The doctors we interviewed did not support this proposal either.

Another suggestion from the pharmacy staff regarding 'the problem of renewing' was that every time the doctor altered a patient's current medication list, all the patient's prescriptions had to be renewed. It is relevant to view the suggestion in light of the probability that multidose patients receive poorer follow-up by their primary doctors and regular GPs, as mentioned in the introduction.

### **Need for information, training and reorganisation**

The interviews revealed uncertainty and ignorance among the doctors regarding who can see the patient's LIB list in the national database for electronic prescriptions. We presume that information from the health authorities and perhaps the Norwegian Medical Association can clarify this.

Uncertainty and lack of clarity regarding the responsibility for updating the patient's current medication list represents another major problem in terms of information. It should be easy for all prescribing doctors to establish who can and shall alter the patient's LIB list. Regulations relating to regular GPs (20) require GPs to coordinate the medication-based treatment of their registered patients and update these patients' medication lists when they alter the medication or receive information that this has been altered. In order to maintain an updated LIB list, the GP needs speedy and adequate information from the specialist health services when they change a medication-based treatment.

The current discharge summary from the hospital to the home care services is prepared for the nursing function, not for the work of the doctor. The time gap from discharge until the regular GP receives the case history leaves room for urgent requests, hassle and uncertainty when the doctor and the community nurse do not know what medication has now been prescribed for the patient. Having to wait for the case history is a familiar problem for the primary doctor (22).



**«If doctors find it difficult to use their own IT systems...this undermines the optimal functioning of the e-multidose solution.»**



On the basis of current opportunities for speedy e-communication, we set focus on the organisation of work in the hospital. We assume that it may be helpful to investigate or assess how the hospital can reorganise its work in order to solve or alleviate this problem.

Wishes were expressed for a shared hub where every instance with professional needs could read the patient's medication list in real time. In connection with this, the most urgent need that manifests itself in our material is for community nurses to be given access to patients' current medication list. Regarding the further development of the service systems, it would be interesting to investigate how one could organise and adopt a shared hub where a patient's medications were continuously updated and prescribed by the different instances.

The doctors perceived the EPR solutions as cumbersome, and found it challenging to use them. If doctors find it difficult to use their own IT systems and consequently do not answer requests from pharmacies and community nursing services, this undermines the optimal functioning of the e-multidose solution. The problems described show the necessity of both training in and development of better EPRs.

The National Action Plan for e-Health 2017–2022 specifies plans for including municipal institutions and the home care services in the digital medication chain (18). In the course of 2018, electronic prescribing of multidoses will be introduced for several regular GPs and pharmacists. A summary care record has been introduced and will be further developed in the Norwegian health service. Here in the course of time, health personnel will find a continuously updated list of the patient's medications (23, 24).

## Conclusion

The study supports and supplements earlier research. The multidose in the form of an e-prescription improves the quality of medication handling. Sources of error linked to paper-based solutions will disappear. Further quality assurance will result from the pharmacy systematically checking all changes in medication.

Lessons learned from the study point to three measures that can support the good effects of the e-multidose:

- The distribution of responsibilities among some of the actors must be clarified.
- Doctors' EPR systems must be made more transparent and easier to use.
- Everyone who handles the e-multidose, including community nurses, must have access to the current medication list (LIB).

From our perspective, the home care services have a key function in quality assuring the handling of medication for patients. Access to the LIB will facilitate this function. Such access will also benefit the work situation of the community nurses, pharmacies and regular GPs.

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