

The quality of patients' medication lists

ABSTRACT

Both domestic and international research have shown deviation between the medication lists in the hospitals and the medication the patient actually is using. There is a general perception both from most health care professionals and from authorities that information technology like for instance an EMMS could help improve the quality of the medication list and thereby the patient treatment. In this study we ask the following questions: How do health care professionals today practice to achieve patient medication lists with sufficient quality? And how should this affect the implementation of an EMMS? We are taking a work practice perspective and have performed a case study at the University Hospital of Northern Norway. We have studied and compared the medication management process across several wards. The results show that quality in the medication process is not something we should take for granted. And this is not an issue that technology alone could fix. Improved quality requires effort and the quality and the effort depends on the context.

1. INTRODUCTION

Most of the admittances to hospitals are to Emergency Units. In Norway 60-70 % of all patients are admitted to the Emergency Unit [1]. The written information about the drugs, the doses and how the drugs should be used is referred to as the medication list. It has been focused on the quality of the content in those lists in the last couple of years. Both domestic and international research have shown deviation between the medication overviews and the medication the patient actually is using [2, 3, 4, 5]). Some studies have shown that as much as 80 % of the medication lists deviate from what the patient in fact is using [5]. This is particularly problematic as it is frequently done changes in the medication during the patient stay at the hospital, and the patient are often transferred between different wards during their stay.

A prerequisite to safe drug treatment is correct information about what drugs the patient are using including dosage and administration and how these drugs are intent to be used. Unfortunately, medication errors and misunderstandings often occur when patients are admitted to hospitals and when they are discharged from the hospital to the community health services. As a result, it is harder to control and keep track of the prescribed and administered medications. This leads to errors and deficiencies in the medication lists implying that the patients are missing important drugs, receiving drugs they no longer are supposed to use or doses that are either too high or too low. The consequences for the patients might be increased risk of adverse effects, poor efficacy of the treatment or in worst-case toxic reactions and treatment failure to severe illness.

There are probably several reasons for the deviations. The patient is commonly self the source of information regarding the

mediation. There neither has been no systematically method to interview the patient to obtain the correct and complete information nor is the medication overview from the general practitioner (GP) to be trusted. It is not common practice for the GP to update the overview following hospital stays or visits to the casualty clinic [6]. Often will drugs that are discontinued still be in the list even if it is the GP themselves who is responsible for the discontinuation [6]. This is highly problematic especially when the patient is transferred across organizational units and institutions in the health care sector.

There are several initiatives do deal with this issue. The Norwegian authorities initiated in 2011 a national patient safety campaign to reconcile patients' drug lists [7] and the Northern Norway Health Region launched a project in 2013 named "SamStem (reconciliation)" along the same lines. In addition are the authorities implementing a national core record available for all health care services in Norway. Also electronic systems like computerized physician order entry (CPOE) and electronic medication management systems (EMMS) at the hospitals and communication between the systems in the hospitals and in the primary health care are expected to deal with this and contribute to correct and updated lists.

Both the Northern Norway and Western Norway Regional Health Authority has procured electronic medication management systems (EMMS). The implementations are scheduled to start in 1-2 years.

Based on the lack of updated medications lists and the fact that the lists in the hospitals often are incorrect, is it reasonable to ask how health care professionals deal with the challenges regarding the medication lists today. The results should be passed on to the upcoming IT-projects in the Northern Norway Regional Health Authority and to other hospital nationally and internationally that are implementing EMMS. This leads to the following research questions:

How do health care professionals today practice to achieve patient medication lists with sufficient quality?

How should this affect the implementation of an EMMS?

The contribution in this paper is to illustrate that the medication management process is far beyond a purely technical task. The paper shows that this process contains a highly organizational dimension involving physicians, nurses and patients that have to collaborate across various wards in the hospital and across hospital and home care services.

Based on this, we want to explore the work practice regarding obtaining patients' medication lists. We are taking a work practice perspective [8,13, 9] and have performed a case study at the University Hospital of Northern Norway. We have studied and compared the medication management process across several wards: the Emergency Unit, the Cardiology Ward and the Gastro Surgical Unit.

2. THEORY

Ensuring high quality of treatment and care is a pressing issue for health authorities. In a 2000 US Institute of Medicine report, the Committee on Quality of Health Care in America estimated that medical errors (e.g., errors in administering drugs or planned treatments) were the leading cause of death in the United States [14]. Such errors are generally associated with an increased burden of illness for patients and increased expenditures for hospital treatment [15, 16]. In Norway, 5-10 % of admissions to internal medicine wards are caused by improper use of drugs [16]. Research shows that medication errors occurs in 20 % of all patient treatment pathways in Norway and this is associated with expenses estimated to 5 billion NOK each year [16]. Minimum 1000 patient dies each year from adverse drug reactions and improper drug use in Norway [17].

One reason for this is that patients' drug treatment is increasingly more complicated. In addition, some hospitalized patients will generate high volumes of data that are complicated to compare and evaluate. These might include physiological data (blood pressure, body temperature, etc.), results from various blood tests (CRP, blood counts, electrolytes, drug plasma concentrations etc.) or data from medical devices (infusion pumps, etc.). Today easy access to all the important data and ability to present the data in an understandable way together with an overview of the medication is lacking. This makes it difficult and time consuming for health professionals to make well-founded decisions regarding patients' treatment.

There is a general perception both from most health care professionals and from authorities that information technology could help improve the issues mentioned above and thereby improving the quality of the patient treatment. One of the Norwegian authorities' goal is to utilize the potential of modern technology to increase quality and patient safety in the health care sector [18]. This include the intention to create a national core record that should be available for all relevant actors in the health care system. The core record is intended to contain important health information included drugs that the patients currently are using. Integrations between the core record and the EMMS are supposed to help in improving the patients' drug lists and provide the clinicians with important information about the patient.

Unfortunately, there are not much literature that support these perceptions of improved quality of the patient treatment by introducing information technology [19, 20]. Particular EMMSs seem hard to achieve in practice as such systems have not yet become widely available [21, 22, 23, 24]. A key problem is that "healthcare is a complex, uncertain environment and there are a great many processes involved in medications management" [25]. Accordingly, there is a tendency in many technology projects to overlook organizational issues "on the ground" implying that prescribed effects do not come through [26, 27]. Some literature claim that most health information systems fail in some way if you consider failure to a gap between the achievement in reality and the purpose of why the system was designed initially [28].

To better prepare for implementation of information technology such as an EMMS, and due to the complex and complicated nature of drug treatment and drug managing today, a sociotechnical point of view could be used. The sociotechnical approach emphasize the importance of deep knowledge about the work practices where the systems will be used [13, 8, 9, 10].

How a new IT-system would affect the work practices are difficult to predict because they evolve within the context and the social world of the users and organization in which it is implemented. For instance, the paper-based medication chart carefully regulates the relationship between physicians (ordering medications) and nurses (administering medications), at the same time as it allows some degree of flexibility in this relationship. There are several examples of nurses' ordering medications on behalf of physicians and some studies have pointed out that the boundary between the roles of an experienced nurse and a junior physician is blurred [11]. The outcome in the work practice because of a change in the flexibility due to a new system would be hard to foresee. In addition, the distribution of medication management among different health professionals varies between the wards at a hospital, so the change would have different impact in the different settings. This shows that the technology and the work practice should not be seen, as one social part and one technical part were one element leads to changes in the other, but rather as a whole which evolve as an ensemble [12, 29].

To deal with the unpredictable relationship between IT-systems and work practices, and to deal with the unexpected events and the collaboration between different professions, the design, analysis, implementation and evaluation should be seen as co-occurring activities. For instance should feedback from implementation lead to further analysis and design, and design should continue throughout implementation and evaluation making the boundaries between the activities blur.

It is also possible to see this from a similar view. Gasser argues that each work task has a place in larger systems of tasks, and has some connections and relations with other tasks. In a working setting, we could pick out several chain of tasks, which describes the production sequence for an event. The precise structure of the task chain is unpredictable, because it depends upon the contingencies of the work process, including intersecting task chains. Such a complex and coordinated structure of intersecting task chains are called a production lattice. Any change in task, for instance because of introducing a computer system, would influence the work chain and the production lattice [30]. Hence would precise knowledge about the medication processes be a benefit prior to an implementation of information technology like an EMMS.

One important issue to make the IT improve the quality of the medication lists, is that the different IT-systems like the EMMS, the EPR, the core record and the GP's patient record are able to transfer data between them. Changes in the medication in one of those sources must be communicated to the other sources. This interactions implicates that data documented in one context are transferred and used in another context. Much literature claims that as soon as connections between different IT-system are in place, it is simply a matter of which information to transport to where [31]. The information is then seen as something that is not dependent on its setting and context. Berg and Goorman have on the other hand argued that medical information should be conceptualized as always entangled with the context of its production [31]. Berg and Goorman explain that it is possible to reuse data despite the dependence on context. But you have to be aware of how the information is presented and what additional details regarding the data is necessary in the new context [31].

Similarly have Silsand and Ellingsen argued that the CSCW field's focus on the micro-mechanisms of collaboration in a specific context, and thereby lacks a broader picture of the collaboration between many and various professionals and systems across different contexts [8]. This is definitively important in the

medication process where patients are transferred between different organizational units both within the hospital and outside the hospital. Those units would include several different professionals and several different technology systems.

3. METHOD

This is an interpretive field study of the medication process at the University Hospital of Northern Norway. The interpretive methods of research could help us understand the context of the process and how the process influences and is influenced by the context. It has the potential to produce deep insight into processes including the management and the development of the processes [32].

Different routines and practices at each ward makes it important to involve several wards in the study. The three wards included are:

- 1) The Emergency Unit
- 2) The Cardiology Ward
- 3) The Gastro Surgical Unit

The plan is also to include a home care service and a GP office in addition to the wards presented in this essay in order to get a complete overview of the overall medication management process.

We have conducted observations and performed semi-structured interviews with six nurses and six physicians at the three different wards. The aim is to understand the medication process in detail. And due to the complex structures of the medication process, this must be investigated through interviews and observations. The interviews lasted between 25 and 60 minutes. We used an interview guide, but let the informants lead the conversation the way they wanted. The interview guide worked as a checklist to ensure that the questions of interest were covered. A digital voice recorder was used to record the interviews, with an exception for one nurse who did not agree to be recorded. We made notes during this interview and transcribed the notes directly after the interview. The other five interviews were also transcribed word by word. We observed the physicians at the Emergency Unit while they received patients and during their work on making a medication list. We observed the two nurses at the Cardiology Ward when they performed reconciliations of medication lists.

Walsham wrote that interpretive methods of research start from the position that our knowledge of reality, including the domain of human action, is a social construction by human actors and that this applies equally to researchers. Thus there is no objective reality which can be discovered by researchers and replicated by others [33]. The first author is not an outsider, but more a participant observer. As a pharmacist and a member of the North Region Health Organization, the first author feels that she has been presented an inside view of the process included confidential and sensitive issues. The benefit of being familiar with the organization and having knowledge about medication has made it easier to understand the medication process and to understand the challenges and problems that have been identified during the data collection. On the other hand has this knowledge included assumptions and preconceptions regarding the medication process prior to the investigation. This did influence the questions that were prepared for the semi-structured interviews. And during the transcription of the interviews we experienced that the first author sometimes had drawn some conclusions about issues the informant talked about and so failed to ask additional questions that might had led to deeper insight. In later interviews, she tried to be more aware of her

preconceptions and did encourage the informants to give more details regarding their answers.

4. THE CASE

We have included three wards in this study in order to track the patients' medication overview.

1. *The Emergency Unit* is included because most of the admittances to the hospital are to this unit. Most of the patients are admitted from their home. Usually the patients are only staying here for a short time before they are transferred to another ward at the hospital. We have included two additional wards. One internal medical ward – the Cardiology Ward and one surgical ward – the Gastro Surgical Unit.
2. *At the Cardiology Ward* all patients are admitted from other wards or from other hospitals. The patients stay for a longer period, and the majority of these are discharged from the ward to their homes. The Cardiology Ward is the first ward at the hospital to reconcile the drug lists as a routine.
3. The patients at the *Gastro Surgical Unit* are either coming from their homes to scheduled surgery or transferred from other wards at the hospital, most notably the Emergency Unit. Just as at the Cardiology Ward, the patients stay for a longer period compared to the Emergency Unit. The patients are often visiting other wards during their stay due to their surgery. For instance the Intensive Care Unit.

4.1 The Emergency unit – several unknown factors

The emergency unit is especially busy. The unit has no or little information about the patients they are receiving and the severity of their conditions are unknown and must be clarified as soon as possible. This implies that nurses and other health professionals are entering the room during the doctor's examination and conversation with the patient. These other professionals are typical doing required tests like ECG, urine samples and blood samples. In addition, the physicians are receiving phone calls with questions about other patients during their examination. Interruptions of the conversations happen several times. Some of the patients are in such conditions that it is impossible or difficult to have a conversation. The doctor tries to ask the most important questions several times often with a loud voice.

Most of the patients admitted to the Emergency Unit are transferred to other wards at the hospital. The medication list is in the paper-based chart and the physicians at the unit are responsible for making the list that follows the patient to the new ward. Thus, the time span for making the drug overview is limited, and gives little room for quality assurance of the content.

The physicians and the nurses at the Emergency Unit are aware of the medication lists' poor quality, but these insecurities and the lack of quality control of the list is not always documented in the medication chart. Sometimes the physicians documents in the EPR where the information about the medication is collected and that the information is uncertain. But that is more an exception than a rule.

Jane has worked as an intern at the medical clinic and is on duty at the emergency unit every other week. An intern in Norway has 6 months service at a GP's office and one year service at the hospital.

That means she has relative little experience from work at the hospital.

She tells that some of the patients admitted to the Emergency Unit does not know the name and doses of the drugs they are using. Many patients believe that the hospital has all the information needed about their medication. Jane said:

Some patients are using quite a lot. Actually quite large doses, without any idea why they are using it. They assume that we know, so they get grumpy when we ask: "Are you using this drug?" "Yes, but isn't that written in the papers?"

Both nurses and physicians at the ward means that the patients should be more aware of what kind of drugs they are using. Brad is a residence physician who has worked at the department for internal medicine for 18 months. He says:

It is very common that he patient do not know what medication they are using. I wish that the patients felt more responsible for their own health, and for getting the right treatment. Several have an attitude that we should make them healthy without any effort from them. And when they are ill and we try to help them, they are not interested in what drugs they are taking, I miss that.

One of the nurses says:

When the patient says: "I just take whatever you give me" I say: "No, you must not. You have to be interested. Know what you eat and why you do it. Do not be uncritical and swallow." They have blind trust. They just open their mouth. You should have some interest in what you put in yourself. That is healthy.

Some of the patients have a referral from the GP. This includes a drug list. The GP is a common source of information that the ward use to get information regarding the patients' medication. Patients are arriving at the Emergency Unit throughout the whole day. One problem is thus, that the staff are not able to reach the patient's GP after ordinary working hours. And even if they get information from the GP, they don't always trust the information. This is also the case for the drug lists in the referrals:

Unfortunately, some GPs do not update their patient record. For instance, a ten-day antibiotic treatment from 2008 is still in the list containing the drugs the patient currently is using.

The system today is hopeless. We use so much time and effort unnecessary. And it is about patient safety. The patient could suddenly get drugs that were prescribed 10 years ago and discontinued 9 years ago. The patient could have refrained to take prescribed drugs, and we think they still use the high dose the GP maybe has escalated because the patient have refrained from using it and the GP thinks it has no effect, and then suddenly we give the high dose.

Sometimes the source of information is a relative to the patient. If the patient is using municipality health services, this could be another source for information.

Brad (the residence physician) is responsible for serving the Emergency Unit two weeks every month. Brad received a patient with a referral from his GP. Brad does not trust the drug list in the referral. He explains:

It includes several drugs that usually not are supposed to be used together. The list includes very many drugs.

He uses the drug list from last admission at the hospital as a starting point for the new list. At home, the patient have help from the home care service. Brad calls the home care service and goes through every drug on the list to check if the patient still uses that medication and that the dosing is correct. This job is time consuming.

The referral is sometimes used as a checklist when the physicians are documenting the drug list in the paper-based chart. Jane usually asks questions like:

Do you remember if you are using Emconcor? Do you remember the dosing?

It is common that the patient do not remember what he or she is using.

Then you have to read old discharge rapports to look for information about changes.

To try to find information about when and why a drug is started or discontinued or that the dose is changed, are the physician's way to quality assure the patients' medication. This means that it is important that the health personnel involved in the medication updates the lists when changes are made. Very few cares about this task today. In addition, the data in the discharge rapports is not structured, but consists of prose. This makes it difficult and time consuming to find the information you need. The intern at the Emergency Unit says:

My opinion is that you have to give a reason to why a drug is discontinued, or why the patient is starting on a new drug. And I certainly mean that the patients need to know what they are using. Maybe when the EMMS is implemented, patients who use several drugs should get a paper based drug list to carry wherever they are.

The process of listing the patient's medication is often time consuming and it is often doubt about the content in the list. Brad says:

Sometimes it is quick. Because some people have order in their affairs. If not, it usually takes very long time. And sometimes is it impossible because there is doubt and the patient don't know himself.

During the observation of the physicians, none control questions about additional medication were asked. Like "Do you use anything for pain or for your stomach?" or "Do you use inhalations or eye drops?" The patients' compliance to the drugs was not a part of the conversations. The time used on the patient would increase if those elements were included, and this would be difficult due to the busy working environment. But Jane tells that she sometimes if she is not too busy asks additional questions like those mentioned above.

One of the goals for the new EMMS is electronic transmission of data. The expectation is that different systems are communicating:

The new EMMS have to correspond with the system the GPs are using. It definitely have to be the same.

4.2 The cardiology ward – stability related to medication

The first impression when you enter the Cardiology Ward is the crowdedness. There are several patient lying in their beds in the corridors. Only thin screens are protecting them from the busy environment where health professionals, patients and next of kin are passing by. The patient are staying at the ward for a longer period compared to the Emergency Unit and the environment seems less busy. Still, the crowdedness brings another kind of busyness to the environment.

Unlike the Emergency Unit, all the patients at the Cardiology ward are transferred from other units like the Emergency Unit, the Cardiology Assessment Ward or from other hospitals in the Northern Norway region. The physicians at the ward do not need to make an overview of the medication since all the patents arrive at the ward with a medication chart.

It was performed a study at the Cardiology Ward a few years ago. It was a quantitative study that revealed that 80 % of the drug lists at the ward had deviations from what the patient actually was using [5]. Due to this, the staff at the ward are more aware of the poor quality of the medication lists than the other wards in the study. For that reason, the ward has decided to reconcile all medication lists at the ward. Currently this is the only ward at the hospital that perform reconciliations.

Paul is a residence physician who has worked at the Cardiology ward for three years. He says:

I know that the quality of the medication lists are a problem. You cannot trust one source, you have to speak with the patient, speak with the GP and... It is a bit like detective work.

They have for that reason decided to reconcile all medication lists at the ward. Currently this is the only ward at the hospital that perform reconciliations. The nurses are responsible for the task. The patient him- or herself is usually the source for information during the reconciliation. The nurse asks the patient standardized questions from a checklist.

Did you use any medicines prior to the admission? Do you use anything occasionally? Like pain killers? Do you use any ointments? Do you use any dietary supplements?

If the patient don't know the answer to the questions, the nurse commonly spend time calling the patients next of kin, the GP or other community health care services. One of the nurses says:

I consider whether the patient are in control regarding his medication during the conversation. Some knows the name of the drugs, but only very few know the dose.

Another nurse elaborates:

The reconciliation is quick if the patient are aware of what he or she is using. But if I have to call around I often end up using an hour on the task. The reason why I use so much time is that when you for instance call the home care service, they are typically not available and you have to call back later, so it requires coordination to get information. The goal is to perform reconciliations for all patients. But if it takes long time and you have five-six patient, then there just isn't enough time.

The nurses understands that the reconciliation is an important quality assurance, but they disagree that it is the nurses' responsibility:

The physicians should do the reconciliation. They write the medication list, and I don't think it is our responsibility to check whether they do their job or not. It is not because I don't think it is important, because I see so many deviations that I understand that it is necessary.

The medication should be quality assured at the emergency unit. I often find abbreviations. We do the job that should be done by the interns at the emergency unit. It is not ok to do other people's job. They usually use the medication list from an earlier discharge report.

It rarely happens that the insecurity regarding the drug lists are documented in the chart or in the EPR from the Emergency unit.

The physicians at the ward have another view:

The nurses do the first part of the reconciliation, and then present the deviations to us. Then we have to document changes in the original chart. We do the reconciliation together. It have to be that way. We don't have the capacity to do the whole process. It have to be allocated.

The physicians at the ward also spend much time on handling the medication. Paul states:

You know, I write all the patient's drugs in the medication chart, then I write all the prescriptions, and then I write all the drugs in the discharge report both the generic name and the sales name. It is a waste of time.

Like at the Emergency Unit both nurses and physicians at the ward means that the patients should be more aware of what kind of drugs they are using. One of the chief attendance said:

Several patients, also young patients, are astonishingly indifferent about what they are swallowing morning and night. That fascinates me. I can't understand that someone is ingesting potent drugs without knowing what it is, why, how often or whether it is taken or not.

Paul points out that the quality assurance of the medication list is not simply a technical control:

For patients from nursing homes the drug list could include several drugs for use "when needed". Some of the interns just copy the list from the nursing home blindly. The drugs are not meant to be given at the same time. The nurses at the nursing home know the patients. They know not to give the drugs at the same time. A nurse at the hospital ward does not know this. She might give one drug because the patient can't sleep and another when he still does not sleep some hours later and so on. That is scary.

The staff at the Cardiology Ward have several thoughts about how an EMMS could contribute to the drug management. Like the staff at the Emergency Unit, they emphasize the importance of communication with other health services and other systems in the hospital:

It is almost a demand that the drug list in the EMMS could be transferred to the EPR automatically.

Obviously, I have to be able to create a prescription just by clicking on the drug.

You could save extremely much time if you could transfer the drugs in the EMMS directly to the discharge report.

When transferring data the context is changing. This makes it important to discuss how much information about the data that should be included in the transfer and how the transferred data should be presented in the system it arrives into. Several of the informant both from the Emergency Unit and from the Cardiology Ward mentioned the importance of knowing why the drug is used, why it is discontinued, why the dose is changed and etcetera. One of the nurses said:

I wish for a system that forces you to document why a drug is used, and why it is discontinued. We spend a lot of time today to investigate why the patient treatment is not in accordance to guidelines or why a dose is lower than normal.

This additional information is also important for the home care services or the patient himself. Any changes in the medication list during a hospital admittance, makes them insecure whether it is a misunderstanding or an actual deliberate change. To avoid this, the guidelines for the Cardiology Ward says that the discharge report should include information whether a drug is new, discontinued or changed. The nurse at the ward tells:

Sometimes the patient or the home care service calls us following a discharge. They have questions regarding the drugs. They wonder why one drug they used to use is missing or why the dose is changed.

Another concern is the rigidity in new IT-systems. The chief attendance specify:

The flexibility in an EMMS versus a paper based medication chart is a challenge. There are drugs, like Mucomyst, that we give as an inhalation. The drug is only available as an injection, but we give the injection as an inhalation. The same does all physicians in Norway, but there is no formulation for inhalation. So you have to have flexibility to be able to prescribe this. That is important.

Some injections and infusions have to be prepared before it is administered to the patient. Powders have to be solved in liquid and some liquids have to be diluted. The decision about what solvent or diluent to use and the concentration of the end product, is often made by the nurses. This is strictly speaking a part of the prescription and thus the physicians' responsibility. In an EMMS may it not be possible for the physicians to leave this task to the nurses. For them to complete the prescription, they have to include the solvent/diluent and the concentration of the finished product. PP is not happy with this:

I have to decide how to prepare the injections? No, I do not want that. Penicillin for instance, it is a powder. You do not learn in doctor school how to get that powder into the patient. We just know that that powder kills bacteria.

Another issue is that even if all the systems are communicating with each other, and changes in the medication in one system leads to automatically changes in the other systems, you have to communicate with the patient to obtain all needed information:

Sometimes do the GP provides us with a correct list including all eight drugs the patient should be using. But the patient is only using the five drugs he wants to use. He is gladly listing the eight drugs, but if you ask more directly, he tells that he is actually only using five because for instance the diuretic is a bit troublesome.

4.3 The gastro surgical unit – variations of the medication list

Some of the patients at the Gastro Surgical Unit have elective surgery. That means that the surgery is scheduled and is not an emergency. The physicians at the ward list the medication in the chart for those patients. Both of the interviewed physicians find this task time consuming, and like at the Cardiology Ward one of them describe it as detective work. One of them elaborate:

Yes, it takes time to figure out what they actually are using. Even if they already have a list, I have to check for changes. Yesterday I had a patient that was discharged two weeks ago with a list including 18 drugs. So I was prepared that it was what he should get this time as well, but it turned out that he only had two drugs left, Creon and Somac.

Some of the patients at the ward are transferred from the Emergency Unit or from other wards at the hospital and bringing the paper-based medication chart with them. The staff at the ward have not the same awareness of the poor quality of the medication lists as the staff at the Cardiology Ward. The length of the stay at this unit is comparable with the Cardiology Ward. Both the physicians and the nurses say that they trust the lists, but at the same time they tell about incidents and precautions they perform that shows that they often finds errors in the lists. One of the nurses says:

Sometimes the patient says; No, I don't use this tablet anymore.

Another nurse says:

The medication is usually in the drug chart when the patients arrive from the Emergency Unit. But all the regular medicines are not always included.

I usually perform a control of the drug list. I use to print out the admission note from the EPR so that I can relate to that.

One of the physicians is asked the question: Have you experienced that the patient or a nurse on behalf of the patient says that they don't use one of the drugs in the list? He answers:

Yes. Often is the dosing wrong.

The patients are often receiving drugs like painkillers among others after their surgery. Often the drugs are discontinued prior to the patients discharge from the ward, but sometimes they are supposed to be used in a short period following the hospital stay. This means that the medication frequently is changing during the stay at the hospital end in the period following discharge. To keep track of the changes could be a challenge both for the health care professionals and for the patients. And thorough information to the patients about the changes should be prioritized.

But opposed to the Cardiology ward, the patient at the Gastro surgical unit does not necessarily get a written list of their medication when they are discharged. The nurse tells:

I know that there has been some talk about that the patients should get a drug list when they leave, but we are not practicing that here. The medication is in the discharge report that arrives in the mail a couple of days later, and maybe weeks later sometimes.

There are different views about a written drug list to the patients. One of the nurses said:

The physicians who discharge the patients are supposed to make that.

But the physicians do not have that opinion:

I don't know if the patients get a written drug list. But I feel that the ward have good routines on checking if the patient have all the drugs he needs before he leaves.

The nurses have another perception:

Last week we had a patient who had started on a new drug, but didn't get a prescription when she was discharged. That makes it difficult to use the drug, and when she lives in Nord-Lenangen and the nearest pharmacy is in Tromsø (1,5 hour drive away), the days goes by. It is really not our job as nurses to ensure that the patients are receiving what they should when they are leaving, but we are a little like baby sitters. I have been here several years, so I do it automatically, but the new one does not necessarily think of it. They reckon that the physicians have fixed things.

The paper-based chart includes five days. For patients who stays longer, the nurses have to transfer the medication manually to a new chart. The nurses find this problematic:

I find it old fashion. We spend a lot of time on this. And it is a big risk for errors, even if we double check.

The same problem occurs when patients arrives from wards that are using different paper-bases chart and the nurses have to transfer the medication to a new chart. The nurses also find it difficult to decipher the physicians' handwriting.

Often are the handwriting unclear, so we are two or three persons trying to decipher what is really written. And several times when strong pain killers are scaled up or down, this is indicated by a little parenthesis from the day the dose is adjusted. It is easy to miss this parenthesis in a crowded chart.

Another problem with the paper-based chart is the availability. Several of the staff need to use the chart often at the same time:

I need the chart and the nurses need the chart. We are always asking: Have you seen the chart? So we waste some minutes on that.

Sometimes this leads to solutions where sensitive information is copied to unsecure sources:

I don't like to take pictures of the drug list on my phone. I try to remember to delete them afterwards.

Both nurses and physicians agree that an electronically available drug list that could be trusted would be a huge improvement that would save time and improve the quality of the medication. One of the physicians says that he looks forward to the implementation of an EMMS:

I think it would be really positive. And things can't stay the way they are today.

5. DISCUSSION

First of all do the results show that quality in the medication process is not something we should take for granted. And this is not an issue that technology alone could fix.

We have further structured our discussion as follows; quality requires effort, quality and context, and the importance of clinician – patient interaction.

5.1 Quality requires effort

Quality requires effort of the involved clinicians. A new EMMS would not change the fact that improved quality of the medication lists entails increased effort from health care professionals at several different levels in the health care system.

For instance has the Northern Norway Health region authority launched a reconciliation project, but nearly three years later, only one ward is reconciling the drug lists. The quality of the medication lists depends on each individual health care professional, and how much work and time they are willing and have the opportunity to use on the task.

The Cardiology Ward has introduced reconciliation as a quality improvement. The need to reconcile the lists are understood by the staff, but it is still difficult to find time to this new task, and the different professions prefer that someone else do the job.

At the other wards the clinicians have different approaches to deal with the issue. The physicians asked the patients questions like: "What drugs are you using? What dose? When are you taking them?" One physician had experienced that extra questions like "Do you use anything for your stomach? Do you use any inhalations?" could reveal drugs that the patient had forgotten initially. But because of lack of time this was only done occasionally. Another physician spent a lot of time looking in the EPR for documented changes in the medication.

Another problem today is that there is no source about the patients' medication that you can really trust. To obtain a correct list, you have to use several sources. The hope for the future is a national core record containing a correct drug list, and the core record is communicating with the IT-systems in the health care services. The core record is supposed to fetch information from the e-prescription mediator. Prescriptions from all health care services will in the future be sent to the e-prescription mediator. Even if this succeed, there will still be issues regarding updating the lists. A prescription stays in the e-prescription mediator for three months. If a physician

decides to change a drug during these three months, he makes a new prescription. To ensure correct drug lists, he has to discontinue the previous prescription. The same goes for changes in dose. This is something the physician and the patient agree upon without necessarily updating the prescription. In addition will no over the counter drugs be included in the core record. This implies that there still will be a need for manual updating of drug information. Updating the lists is a task that is not prioritized today, and it is not obvious that technology would change this fact. The documentation on why changes in medication are done is a challenge that IT would not solve on its own. The documentation will maybe be made easier, but the work must still be done by the physicians.

Another worry regarding IT-systems is the loss of flexibility that paper-based systems contributes to. The case mentions injections that are given as inhalations, and decisions about solvent and diluent for drugs that have to be prepared prior to administration. The rigidity in an IT-system might lead to that the users find workarounds for those problems. Aarts argues that workarounds sometimes are beneficial since no piece of technology will fit perfectly with work practices, and then workarounds will help to reduce risks [34]. Thus workarounds should not necessarily be considered as something negative, but it should be seen as a way to make the implementation of the system a success.

5.2 Quality and context

The efforts necessary to increase quality have to be performed in several different settings and the effort might be different in the different settings. This case shows that quality work depends on the context. At the busy Emergency Unit where the physicians were interrupted several times during the making of the medication list, where the patients' conditions often make them unable to describe their medication and where the length of the patients' stay is short, the quality assurance is dependent on each individual health care professional.

The Cardiology Ward which has been the subject of a study regarding the quality of the medication lists, and where the surrounding is less hectic than at the Emergency Unit, has dealt with the quality problem by introducing reconciliation of the drug lists. The aim was to reconcile all lists, but whether this is achieved or not depends on the amount of patients and the time spend on this task for each patient. It means that the conditions and settings at the ward at a given time determine whether the task is performed or not.

The staff at the Gastro Surgical Unit are more trustfully to the content of the medication lists than at the Cardiology Ward. But still they experiences errors and some have chosen to do their own personal quality assurance. For instance the nurse who checks the medication in the chart against the admission note in the EPR.

At the Gastro Surgical Unit the lack of availability of the chart has made the physician taking pictures of the medication charts on his phone. This is a workaround [30] that gives the physician access to vital information, but might jeopardize the patient's requirements of confidentiality.

The Gastro Surgical Unit has not been involved in research regarding the quality of the drug lists. The staff trusts the content of the lists and have no formalized quality assurance procedure regarding the content.

5.3 The importance of clinician - patient interaction

The patients are not aware of the poor quality of their drug lists. They believe that changes made in the medication at one health care service are known by other health services they attend, and most patients have insufficient overview over their own medication. The result is poor quality in the majority of the drug lists. This is intimidating considering the consequences this might lead to for the hospital expenditure and especially for the patients.

We should be aware of that changes in work tasks due to introducing new IT-systems could influence other parts of the work chain. I will present one example from the case. Today when the physicians are making the medication list, they have to speak to the patient to get information. In the future with updated drug lists in the core record, some will not see the need to communicate with the patient regarding their drugs. This could make the physician miss important information about compliance. Like the example in the case where the patient is supposed to use eighth drugs, but are choosing to just use five of the prescribed drugs. Technology would not solve the fact that the patient do not comply with the medication list from the health care service. To detect this, you have to speak with the patient.

6. CONCLUSION

The quality of the medication lists in hospitals should not be taken for granted. The patients are not aware of the poor quality of the medication lists. The health care professionals are aware, and they are frustrated due to the difficulty to ensure the quality. Yet, the efforts made to achieve quality depends on the setting and context where the work is performed, and in some settings no quality assurance is conducted.

Technology alone is not enough to solve the quality problem. Work practices have to be improved as well and improved quality requires increased effort from the clinicians.

It is a demand from the health care professionals that new IT-solution in the hospital involving medication communicates with IT-systems in other hospital and other services that are managing drugs. In addition it is important to include additional information when the medication list is transferred to other IT-systems.

There are also concerns about the flexibility in new IT-solutions versus the paper-based chart today.

In addition, we do know that successful implementation of new IT-systems in health care is hard to achieve. It will most likely be a gap between the reality and the purpose of the implementation. According to the socio-technical view, some preparation may reduce the risks for the system to fail. For instance to ensure user-involvement and deep knowledge about the work practices, and to let design, analysis, implementation and evaluation be seen as co-occurring activities.

The difference in work practice correlates to the socio-technical view that work practices evolve within the context and the social world of the users and organization in which it is performed. Because of this, a new IT-system that influence the medication would affect the work practices differently in the different contexts in the hospital. Changes in work practices are for that reason difficult to predict. To know of these different work practices and prepare for various outcomes in different settings, would be an advantage to obtain a successful implementation of an IT-system.

7. REFERENCES

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