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RESEARCH ARTICLE

Implementation of a shared medication list: physicians' views on availability, accuracy and confidentiality

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Abstract *Background* Physicians, patients and others involved need to have accurate information on patients' current drug prescriptions available, and have that information protected from unauthorized access. During the past decade, many counties in Sweden have implemented regionally shared medication lists within health care. *Objective* The aim of this study was to describe physicians' views on changes in accuracy, availability and confidentiality in the transition from local medication lists to a regionally shared medication list. *Setting* Health care units in four different counties of Sweden after the transition from local medication lists to a regionally shared medication list. The shared medication list was an integrated part of the electronic health record system in the respective counties, but the system and implementation process varied. *Methods* Physicians (n = 7) with experience of transition from local medication lists to a regionally shared medication list were interviewed in a semi-structured manner. Main outcome measure: Physicians' views on changes in information risks, focusing on accuracy, availability and confidentiality. *Results* The transition from local medication lists to a shared medication list increased the availability of information: from being time consuming or not possible to access from other care givers to most information being available in one place. A regionally shared medication list was perceived as having the potential to provide a greater accuracy of information, but not always: the shared medication list was perceived as more complete but with more non-current drugs. On the other hand, a shared medication list implied an increased risk of violating patient privacy, placing greater demands on IT security in order to protect the confidentiality of information. *Conclusion* Physicians perceived a regionally shared medication list to increase the availability of information about current prescriptions and potentially the accuracy but may decrease the confidentiality of information. To implement a shared medication list, we recommend providing clear description of responsibilities and routines for normal activities as well as back-up routines, consider IT-security and data protection early, involve patients to improve the accuracy of the list as well as to monitor and evaluate the implementation.

Keywords Accuracy · Availability · Confidentiality · Information safety · Medication list · Medication reconciliation · Sweden

Impact of findings

- To share a medication list regionally can increase patient safety and does increases the focus on the responsibility for the prescribed drugs.
- Sharing medication lists places greater demands on the confidentiality of information to protect patient privacy.
- With the present outline of the regionally shared medication lists in Sweden several issues remains unsolved.

Introduction

Medication plays an important role in health care and the appropriate use of medications enables treatment, prevention and cure of many diseases. The use of medications and

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Table 1 Sources of information on medication in Sweden. The Swedish name primarily used for the different sources are given in parenthesis. EHR = electronic health record

Sources of information on patients medications	Description	Access
Medication list (Läkemedelslistan)	The list of current ongoing treatment linked with electronic prescribing in the EHR. Originally the medication lists were local and information was not transferred between different health care providers. At the time of the study, many counties in Sweden had implemented a regionally shared EHR including a shared medication list	Health care. Physicians are encouraged to give print-outs to patients
Inpatient drug list (Ordinationslistan/ Utdelningslistan)	A list in the EHR used when administering medications to hospitalized patients	Health care
Multi-dose drug dispensing prescriptions (Dos-recept)	A list of prescriptions for patients with multi-dose drug dispensing, which is a service in which regularly used medications are machine-packed into unit dose bags for each time of administration [11, 47]. Prescribing for these patients is managed in a separate system and information is not linked to the medication list in the EHR	Health care, pharmacies and patients
National prescription repository (Receptdepån/ Receptregister)	A list of patients electronically stored prescriptions used when dispensing prescriptions at pharmacies. Electronic prescriptions are automatically transferred to the prescription repository and stored there for the entire period of validity [48]. If treatment is changed or terminated in the EHR the information is not automatically changed in the prescription repository	Pharmacies and patients. Print-outs are often provided to patients at the pharmacy
The national pharmacy register (Läkemedelsförteckningen)	A historic register over patients dispensed prescriptions during the past 15 months [49]	Patients, health care providers and pharmacies with patient consent

the proportion of people prescribed multiple medications simultaneously have increased [1]. Failures or errors in drug prescribing, adverse drug events and incorrect medication cause much suffering and unnecessary costs [2–5]. Drug-related problems cause at least 5 % of hospital admissions and are the seventh most common cause of death in Sweden [5–7]. A large portion of these drug-related problems can be prevented [8, 9].

One of the key components to obtaining appropriate drug treatment is access to the required information when needed by physicians, nurses, pharmacists and patients. In Sweden, there are several different sources of information on a patient's medication (Table 1). In the electronic health record (EHR), a specific prescribing module includes a *medication list* as well as an *inpatient drug list*. Each county council makes their own procurement of EHR technology and most county councils have chosen one EHR for both primary and hospital care. Currently, the six most common EHR systems have a market share of 95 %. During the past decade, three quarters of all counties in Sweden have implemented shared medication lists for their health care (hospital, psychiatry, primary care), by sharing EHR system [10]. There is no automatic transfer of information on patients' medications between EHRs in different counties. Pharmacists and patients have access to the *national prescription repository*, including all electronically stored prescriptions in Sweden, which covers approximately 90 % of all prescriptions (the remaining 10 % being paper prescriptions). At pharmacies, prescriptions are dispensed from this prescription repository. The information in the prescription repository is originally intended for pharmacies and not the health care. The authorities have reasoned that due to legal reasons for protection of patient privacy, physicians are not allowed access to the prescription repository, but due to the risks involved with not sharing information the regulation concerning the information in the prescription repository might be changed. *Prescriptions for patients with multi-dose drug dispensing* [11, 12] are primarily handled in a separate system with a separate database and information is not automatically transferred to the medication list in the EHR. In addition, the *national pharmacy register* is a historic register for patients dispensed prescriptions during the past 15 months.

It is vital that information on the patient's current ongoing medication is available and accurate [2, 13–17]. However, in practice, discrepancies occur frequently and can be particularly problematic with patients with multiple

medications, elderly patients, and the transfer of patients between different health care providers [14, 18–21]. The different sources on patients' medications in Sweden are often incorrect and rarely correspond to each other or with the patient's current ongoing medication. It has been shown that 80 % of patients had at least one discrepancy in their EHR *medication list* and that almost 90 % had discrepancies in the list from the *prescription repository* [18], with similar findings in other studies [22–26]. However, all discrepancies may not be clinically relevant. Consequently, physicians as well as patients often lack reliable information regarding current medications [18, 27, 28]. The process of obtaining a complete and accurate list of all the medications from different sources, and communicating that list to all the patient's health care encounters, is called medication reconciliation and is recognized as a method for preventing medication errors [14, 22, 24, 29]. However, this process is seldom straightforward and can often be time consuming depending on the accuracy and availability of information sources.

Management of information security in health care is essential in order to ensure patient safety and integrity [30, 31]. In this study, we use three fundamental aspects to describe information security: *availability* (accessibility of information for an authorized unit), *accuracy* (information being correct, complete and up to date) and *confidentiality* (protection of information from unauthorized access). Patient safety is maintained by information availability and accuracy, whereas patient privacy is maintained by confidentiality of information. Physicians have various opinions concerning their responsibility for performing medication reconciliation, providing an accurate medication list, or reviewing whether the treatment is suitable or appropriate [15, 29, 32]. From a legal point of view, physicians are responsible for their prescribed medication being appropriate in relation to all of the patient's other medications. However, in practice this varies due to several reasons.

In the vast majority of counties in Sweden, medication lists in health care are now shared. There is also ongoing work to plan and prepare the implementation of a nationally shared medication list. Different solutions for sharing or reconciling medication information electronically between providers have been implemented or piloted or are planned in other countries as well [14, 16, 17, 28, 33–37]. Although a shared medication list is often cited as a path to provide safer medication by providing an accurate and complete list of patients' medications, the consequences of a transition from a local to a shared medication list are unclear.

Aim of the study

The aim of the present study was to describe physicians' views of changes in availability, accuracy and confidentiality in the transition from local medication lists to a regionally shared medication list.

Ethical approval

The ethical implications of the study were considered based on the guidelines from the Ethics Committee of South-East Sweden. By advice from the Committee no formal application for ethical approval was recommended due to the nature of the information handled and the respondents included. However, we followed the guidelines from the committee regarding the information to the individuals asked to participate as well as handling of data. The integrity of the respondents was protected by securing that the identity of respondents would not be revealed in handling or presenting the results.

Method

Semi-structured interviews were conducted with physicians (n = 7), who had experienced a transition from local medication lists to a regionally shared medication list (Table 2). The interviews were performed during September-November 2013. Four counties in Sweden were selected in order to include perspectives from different EHR systems and transition processes. All the four counties had shifted from local to regionally shared medication lists during the past decade with a common EHR. A strategic selection was made of physicians from the selected counties, including different disciplines. In total, 12 physicians from the four counties were contacted, informed of the study, and asked to participate. The interviews included questions according to a pre-defined guide (Table 3). All the sections of the guide were covered in the interview, but the order of questions was determined by the participant's responses. Each interview lasted approximately an hour and was conducted either face to face or by phone. With the respondents' permission, all the interviews were recorded and transcribed. A qualitative analysis of manifest content was performed in order to identify physicians' views on changes in information risks, focusing on accuracy, availability and confidentiality [38, 39]. The analysis and categorization of data were performed using the software QSR NVivo 10. Representative quotes were selected and translated from Swedish to English.

Table 2 Characteristics of physicians being interviewed (n = 7). County council is de-identified

Characteristics of respondents (n = 7)	Number of physicians
County Council	
County Council A	
Shared medication lists implemented in the transition from one EHR in primary care and paper records in secondary care to a new shared EHR	3
County Council B	
Shared medication lists implemented in the transition from two separate EHR systems in primary and secondary care, respectively, to a new shared EHR	2
County Council C	
Shared medication lists implemented in connection with an upgrade in the EHR, which was already the same system in primary and secondary health care but with local solutions not sharing information between units before the upgrade	1
County Council D	
Shared medication lists within the municipality implemented in the transition from two separate EHR systems in primary and secondary care, respectively, to a new shared EHR	1
Discipline	
General practitioner (primary care)	4
Internal medicine (secondary care)	1
Geriatrics (secondary care)	1
Psychiatry (secondary care)	1
Gender	
Female	4
Male	3

Results

The medication list of the EHR system was the physicians' primary tool to receive and provide information regarding a patient's medication. Since the EHR was shared regionally, physicians had access to not only the medication list but also the complete health record. The level of dependence or reliance on the medication list differed among physicians: in primary care, the physicians could often ask patients about their current medications; in hospitals, physicians were more dependent on an accurate medication list when seriously ill patients or patients with dementia were hospitalized. The physicians had different views on the reliability of the medication list, from perceiving it to be reliable most of the time, to deeming it completely unreliable. When asked "In general, how has the regionally shared medication list affected patient safety?" most physicians perceived that it had produced an improvement.

Table 3 Interview questions

1. Describe your experience of a transition from local to shared medication list
2. Changes in how you receive and document information on a patient's current medications?
3. Changes in the* accuracy *of information?
4. Changes in which information is used and documented?
5. Changes in the responsibility for information on patients medications?
6. Changes in the* availability *of information?
7. Changes in possibility of events causing problems with availability of information?
8. Changes in the* confidentiality *of information?
9. Changes in the risk of violating patient privacy?
10. Changes in the amount of unnecessary information available to you?
11. Changes in your dialogue with patients regarding their medications?
12. Your view on how a shared medication list has affected patient safety over all
13. Your view on needs for a nationally shared medication list

Information in the questions refers to information regarding patients' medications. For each of the questions 2–11 the physicians were asked to describe their view on their regionally shared medication list currently in use compared with their previous local medication lists, as well as their view on how any changes might have affected patient safety. The terms availability, accuracy and confidentiality were explained during the interview as defined in the study

Availability of information

All of the physicians reckoned that the availability of information on a patient's medication had significantly improved. Previously, it was difficult and time consuming to find the information.

> "Much better because you can view right away. Previously, you had to find the paper record and if it was at a different clinic you had to order it and it could take several days before you received it. Especially when patients were admitted to the emergency room, you did not have the immediate access as you have now. So there are only benefits."

There was still a risk for events limiting the availability of information, such as system breakdowns. These events were regarded as rare and not as the results of shared medication lists. Nevertheless, when occurring, system breakdowns were problematic and could pose a risk to patient safety due to insufficient back-up routines.

> "But when we had the big system breakdown when we lost all [data], the backup solution did not work either / … / And the nurses did not know what medications to administer to the patients / … / We

had discussions between doctors and nurses to try to remember which medications a patient had and gave those we were sure of. / … / But it was far from safe for patients."

Accuracy of information

The physicians had different views on how the accuracy of information had changed. All the physicians perceived that the lists had become more complete with few to no missing prescriptions. However, most physicians felt that the number of non-current prescriptions had increased.

"I don't think there are many prescriptions missing, rather that somewhat too many prescriptions are remaining."

Most physicians reckoned that the non-current prescriptions in the medication lists were primarily due to incorrect working routines. The physicians believed that if complying with clearly defined working routines when prescribing or changing medication treatments, accuracy would improve substantially. Non-current medications could remain in the medication list if treatment was discontinued or doses altered without the physician performing proper changes in the medication lists. Even if a physician did make changes in the medication list, it could be done in several different ways with the risk of confusion. Sometimes hospital administered medications remained in the medication list after discharge. However, problems with the medication list were not completely new after the transition to a shared list. Furthermore, some problems were perceived as a result from users being unaccustomed to the new EHR.

"If this [medication list] would be managed thoroughly and correctly all the time it would be very good and safe. But unfortunately it isn't really working like that."

"Pretty regularly you read in the record notes that a treatment has been discontinued, but it has not been removed in the medication list"

Confidentiality of information

The physicians perceived that the increased availability of information resulted in an increased risk of violation of patient privacy and that a larger database of information implied an increased risk of unauthorized access of information. Patients had the option to block unauthorized access to their health record or parts of it. Although rare, blockages could sometimes be problematic when physicians perceived they lacked the proper information to practice safe health care.

"With only a click you can view everything with this new system. Of course there is an increased risk of violating a patients' privacy compared with before when it is this easy. Patients have to be informed that they can block information."

The physicians did not experience receiving an excessive amount of information regarding medication: in fact, to practice safe health care all physicians regarded the information provided as necessary. The majority of the physicians had experienced few or no patients who had ever had concerns with a physician being able to access their medication information; quite the opposite, patients were usually surprised to hear that the physician had not always had access to the information.

"I've never experienced that, rather the opposite when we couldn't view [the record]. Then we had to explain to patients that we couldn't view certain information. They expected us to have access to everything. When we had the old system we could not check what had been done at the hospital, but the patients believed we could."

Other aspects

The physicians described other aspects of information risks regarding patients' medications, such as the physicians' unclear responsibility for medication lists, the need for information other than the medication list, patients' own information on current medications and specific issues related to patients with multi-dose drug dispensing.

Responsibility for medication list

All the physicians in the study regarded themselves responsible for the medication list and did not regard that the introduction of a shared medication list had changed that. A greater access to information implied increased possibilities to take responsibility for a patient's entire medication list. In practice, the physicians regarded the responsibility of the medication list as a rather complex matter. Several physicians stated that being responsible for a correct and accurate list was one matter, but to be responsible for that all the prescribed medications were appropriate for the patient was an entirely different matter.

"I feel like I'm responsible. But if an ophthalmologist for example has prescribed an eye drop for the pressure in the eye it's hard for me to take responsibility for that prescription. But it is my responsibility to make sure that the list is correct."

> "You can work with a limited part and be really skilled at it, but maybe it is not appropriate for you to be responsible for the big picture. But at the same time there is a risk that while you focus on your part the patient dies because of something completely different. You have to have someone taking responsibility for the whole."

Need for other forms of information

Even though the list of current medications was the primary source for information, other forms of information was also valued, regularly used and recorded, e.g. additional notes in the EHR in order to clarify the adjustments or changes physicians made in the medication list, discharge notes or a medication report describing changes over time and reasons for them. In depth and more explanatory information was perceived to be very valuable to physicians rather than just reading a list of current medication. Even with an almost complete medication list, several physicians had trouble achieving a proper overview of changes in medications that occurred over time.

> "Even if you have the medication list and everything is included in the computer system it can be really hard to follow changes in the medication treatment. The medication report is facilitating, although it is time consuming to write."

Patients information on current medications

The physicians regarded that patients often lacked a reliable source of information concerning their current medications, both before and after transition to the shared medication list. According to the physicians, it was more common that patients used the list of electronically stored prescriptions from the pharmacy (*prescription repository* print-outs) as their source rather than the medication list from the EHR. This was perceived as a significant problem by several physicians as this list of electronically stored prescriptions differed from the medication list, and may include non-current prescriptions, duplicate prescriptions, non-current dosing instructions, as well as lack information on ongoing treatments. To understand which medications they actually were taking, the physicians regarded it as important to have a good dialogue with patients regarding their current prescriptions; their dialogue with the patient had not changed with a shared medication list.

> "I rarely meet a patient who has a printed medication list. I think it's very bad with these lists from pharmacies with stored prescriptions. If there are any treatment where all iterations of a prescription have been dispensed it's not included in the list even if the treatment might be ongoing and vice versa. I usually print the medication list for patients so that they have a current list."

> "The largest concern is the patient's own handling of medications at home. Perhaps you haven't told your doctor that you've stopped taking a medication, and then we might increase the dose to get the wanted effect from a medication the patient's isn't taking. And then if they are admitted to a hospital they could be administered too high a dose of a medication they haven't been taking at home."

Patients with multi-dose drug dispensing

During the interviews, all physicians raised issues specifically regarding patients with multi-dose drug dispensing. In primary care, medications for these patients were prescribed in a separate prescribing database not connected to the EHR. However, hospital physicians could use the medication list only in the EHR to administer medications to hospitalized patients and not the multi-medication drug database. As a result, it occurred that medications from an outdated and inaccurate medication list were administered.

> "It happens almost every week that we do not find out that a patient has multi-dose drug dispensing until the patient has been hospitalized for several days. There is a place where it should be documented."

Views regarding a nationally shared medication list

All physicians experienced a need for a nationally shared medication list, e.g. when treating patients from other counties, in cases with suspicion of medication abuse, or in the case of patients with multi-dose drug dispensing. Several physicians also wished that a nationally shared medication list would be integrated or connected with the pharmacies prescription repository, so that physicians themselves could change or remove electronically stored prescriptions in accordance with changes in the treatment. Most physicians believed a nationally shared medication list would further increase patients' safety, if the technical solution and implementation were carried out correctly and smoothly.

> "It depends on how it is linked to our system. If it is something new where I have to add information I don't think it will work. Because it will be another system you have to work with. But if there is an automatic link it might work."

Discussion

A regionally shared medication list was found to increase the availability of the information of current prescriptions and potentially the accuracy, but may decrease the confidentiality of information.

Physicians experienced that the transition from a local to a shared medication list had resulted in a significant improvement in availability. A regionally shared list was considered as having the potential to increase accuracy; yet in reality, that had not always been the case. Although the medication list was more complete, many physicians experienced an increased amount of non-current prescriptions. The major problems and risks seem to arise when physicians work in different ways when using the same shared list. Some issues may be related to users being unaccustomed with a particular EHR system, rather than the fact that it is a shared list. The specific technical solutions, usability of systems, implementation strategy and routines were regarded as affecting the accuracy of information in the medication lists. This view is in line with previous findings that regionally shared lists reduce a number of missing medications, but non-current medications remain a significant problem [40].

Several physicians never trusted the medication list, whereas others usually trusted the list, but it is not clear whether this was a result of differences in accuracy between medication lists, differences in physicians' perceptions, or a combination of both. If the medication list is perceived as more accurate and complete than it actually is, a false sense of security results.

The physicians' responsibility for the accuracy and completeness of the medication list and the appropriateness of medication treatment were perceived in different ways and were unclear, in agreement with previous findings [15, 32] and similarly found for medication reconciliation [29]. The responsibility of the medication list might be affected by the system for reimbursement [41]. The shared medication list in the present study does not in itself result in any formal changes in the responsibility for medications, but the shared list is a tool that enables increased possibility for prescribers to take a greater responsibility.

One risk with a transition to a shared system is that the type or content of information might change. The implementation of a shared EHR for primary and secondary care has resulted in staff documenting information in a less summarized manner than previously, in a form of 'data' rather than 'knowledge' [10, 32]. As a consequence, physicians had access to more information but perceived it as more difficult to find the information needed. Although time consuming, a more descriptive medication report was perceived as valuable, in line with previous findings [42]. Another risk is that an increased amount of information available to physicians would result in less communication with the patients regarding which medications they are taking, including non-prescription medications. We could not confirm these potential risks but they should be investigated further. To improve patient safety, the involvement of patients in the medication process is regarded as a key strategy [24]. To achieve a collaborative relationship between patient and provider concerning medication treatment, it seems necessary to share information regarding current medication via a common medication list.

When aiming at improving patient safety, it is important to consider information security as well. Mutual trust between the staff and patient is crucial to achieve patient safety and assumes proper protection of patient privacy [31]. However, it is important that the legislation protecting patient safety is reasonable and clear, and is adjusted to modern health care and utilized information technology. In our study, physicians experienced that most patients primarily perceived the benefits of medical information being shared between care providers. However, some patients do not want to share information concerning their mental health, sexual health and gynecological problems in a shared health record system [43]. The risks of unauthorized access of information increase with the number of users and the larger amount of information stored at one place [35]. Shared lists make greater demands on IT security for both internal and external confidentiality, and also a greater demand on analyzing and monitoring information risks [30, 35].

Although the physicians overall perceived the regionally shared medication list as an improvement in patient safety due to the increased availability and to some extent improved accuracy, some issues remained unsolved: the medication list still not being linked with the prescription repository, not including information on dispensing, most often not being the information source used by the patients, not being shared across county borders, and did not automatically include prescriptions for patients with multi-dose drug dispensing. Furthermore, the issue of non-prescription medications remains. Although, it is possible for physicians to manually enter information on over-the-counter medications being used by the patient, this is seldom done. A greater involvement of the patient to improve the accuracy of the list might increase the information available to health care professionals regarding the use of non-prescription medications.

Inaccurate or unavailable medication lists may result in medication errors such as inappropriate prescribing (e.g. drug-drug interactions or duplicate therapy), or wrong medications being administered at hospitals, nursing homes or taken at home [44, 45]. Physicians' unawareness of patients' co-medication has been described as an important

cause of medication errors [25]. Information technology has an important part to play in reducing medication errors by making the necessary information available when needed [2, 3, 13]. However, designing information technology to support, and not interfere, with the clinical work is a major challenge. When planning, implementing and evaluating health information technology such as a shared medication list, it is important to consider a holistic view with the different aspects affecting the outcome: i.e. technique, users, and organization [46].

All physicians agreed that a nationally shared medication list would be useful, but only if the technical solution were sufficient, fit their process, be implemented properly and the responsibilities clarified. Physicians expected similar changes of information as with the transition to the regionally shared medication list. However, with the nationally shared medication list being planned in Sweden (NOD, Nationell ordinationsdatabas), different counties would still have separate EHR systems, but information on medications would be shared through a common database that would also be linked to the prescription repository used at pharmacies.

Sweden is among the leading countries in terms of electronic prescriptions with more than 90 % of the prescriptions stored electronically in a prescription repository [33]. One might think that this would mean complete access to information on current prescriptions, but due to legal reasons, prescribers are not allowed to access the prescription repository in its present form. As a result, prescribers are still bound to use local or regional medication lists in their EHR. Internationally, there are different approaches to reduce problems with unavailable or inaccurate information regarding patients' medications, e.g. shared medication lists or electronically gathering communicating information for medication reconciliation [14, 16, 17, 28, 33–37]. In the US, a shared medication list improved the accuracy [17], and a similar implementation in Austria was perceived as having the potential to improve patient safety [16]. In addition to initiatives to make medication lists or other health information available in a county or nation, there are initiatives to share information across nation borders. Within the EU, the project epSOS (European Patients Smart Open Services) has been ongoing since 2008 with the objective to develop, test and validate technical specifications to secure interoperability for patient summaries and electronic prescriptions [33]. Implementing shared systems for health information has turned out to be more challenging, complex and expensive than expected. The major issues are usually not related to technology, but rather strategies and management [36].

Strengths and weakness of this study

A weakness of this study was the limited number of interviews due to a short time frame for conducting the study. We cannot rule out that a larger number of respondents could have brought up other aspects or perspectives. However, the authors believe that the changes described by the physicians captured the primary aspects of availability, accuracy and confidentiality and would not have changed substantially with more interviews. The aim of the present study was not to quantify the risks, nor was it to compare different solutions, but to describe and highlight the information risks that may change in conjunction with a transition to a shared list. Furthermore, the study focused on the physicians' subjective opinions and did not measure actual changes per se.

Traditionally, information risks are described in terms of the fundamental aspects availability, confidentiality and integrity. In this study, we chose to use the aspect of information accuracy rather than integrity as the former captures in a better way the properties of information essential for studying medication list information. Accuracy in this study comprises aspects of information quality and that the information is up to date and complete, whereas integrity primarily concerns preventing loss, distortion or unintentional changes of information.

Future studies

To further validate the findings of the present study, to identify more aspects and also expand questions about responsibilities, a larger study should be conducted, including more physicians, different disciplines and regions. Future studies should compare different solutions for sharing medication information. There is a need for studies related to the implementation of a nationally shared list: how should it be integrated and implemented to best achieve the goal of complete and shared medication information? What are the consequences for information security and patient safety? What is the patients view on shared information on medications?

Based on the present study as well as previous research and experiences, the authors suggest nine recommendations for the implementation of a shared medication list (Table 4). To be adopted, results and recommendations should be disseminated to decision makers, health care leaders including IT-departments, professionals and system vendors through for example interdisciplinary workshops besides written guidelines.

Table 4 The authors' recommendations for the implementation of a shared medication list

1. Determine the needs of future users and allow the working process to direct technical solutions, and not vice versa
2. Provide a clear description of the responsibility for the accuracy and appropriateness of the medication list
3. Provide clear routines for how changes in the medication list should be accomplished
4. Provide clear information of the completeness of the lists: what is and what is not included in a medication list
5. Provide back-up routines for system-breakdowns and make sure they are known and practiced
6. Consider IT security and data protection early in order to protect confidentiality of information without jeopardizing patient safety
7. Involve the patients to improve the accuracy of the list and allow the medication list to be their source of information as well
8. Test the technique in a small scale before implementing it in full scale
9. Monitor and evaluate the implementation

Conclusion

Physicians perceived a regionally shared medication list to increase the availability of information about current prescriptions and potentially the accuracy but may decrease the confidentiality of information. To implement a shared medication list, we recommend providing clear description of responsibilities and routines for normal activities as well as back-up routines, consider IT-security and data protection early, involve patients to improve the accuracy of the list as well as to monitor and evaluate the implementation.

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