Implementation of an electronic medication system and disregarded power of the record

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Abstract. Though hospitals managers wish to have a unified medication system, physicians continue double registration of prescriptions. The traditions of prescribing both electronically and on paper, as well as the power of the medical record are some of the disregarded elements when introducing a computerized physician order entry system (CPOE). The result is that the explicit goal to eliminate double registrations is not fulfilled. The pattern of prescriptions continues unchanged and CPOE replaces the abandoned paper based medication card. In this case study a symmetric approach reveals how double registrations on one hand are considered a safety problem, but on the other hand double registrations intercept and prevent medication errors.

Keywords. Computerized physician order entry system, CPOE, medication errors, Actor network, evaluation, organisational change, communication.

Introduction

Unintended consequences and errors in the medication process are frequent iatrogenic injuries [1; 2]. In 2004 the National Board of Health in Denmark received 1803 reports of medication errors [3]. Errors due to transcriptions are varying from 11% to 56% [1-3]. Computerized physician order entry (CPOE) is supposed to be able to eliminate those errors, and that it will imply: "medication prescriptions are only written in one place, and all the information about the patient’s medicine will be accessible in one version. This will minimize the medication errors"[4] 2. There is a general agreement that double registration is an important factor in medical errors, and that it can be reduced by CPOE [2; 3; 5; 6]. This paper enlightens two issues in relation to the physicians’ practise of continuing double registration. Firstly it will analyse why physicians continue entering prescriptions in two places when they are expected to use CPOE only for prescriptions. Secondly it will illustrate how double registrations can be used as quality measure in the clinic, where a patient is treated by different physicians.

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1. Research methodology

The study is a case study [7; 8] from a Danish University Hospital. The study analyses, how professional traditions and history interact with the use of CPOE, and how CPOE interact with the medical record, when the combination of paper and computer characterises the daily practise. In this study physicians used a traditional paper based record together with a CPOE which is only used for prescription, dispensing and administration of medication.

Ethnographic methods as observations and interviews were used in this qualitative study [9; 10]. The data collection has moved from an open description to a more selected and focused approach [9; 10]. In the first period the data collection was inspired from grounded theory [11; 12]. Later it was more focused on how physicians use and combine CPOE with different artefacts in their daily work.

Data collection has been conducted in three steeps: Observations, data analysis and semi-structured interviews with physicians and nurses. The observation guide was grounded in ethnographic questions such as “What is the situation?” , “Who participates?” , “What do they do?” , “Where does the act take place?” , “When do they use CPOE?” , “When don’t they use CPOE?” , “What do they use besides CPOE?”. 28 semi-structured interviews were done in 250 hours observations time. An interview guide had been created on basis of the selected themes from the observations [13].

2. Results

Notification of prescriptions has traditionally a twofold purpose to the physicians. The prescription primarily helps the physician’s memory, and act as information source for other physicians involved in the treatment plan. Secondly, the prescription serves as information and guidance for the nurses. Before CPOE implementation physicians used to write prescriptions on a medication card. In addition to this card, they used to dictate prescriptions in the medical record. After the CPOE introduction physicians have kept their practise to record prescriptions in two different and separate systems with two different purposes. Occasionally they include fewer details into the prescription, but apart from this the prescription process is left unaffected by the CPOE.

The question is why the practise has not changed in direction of unified medication, although this had been defined as an explicit goal for the CPOE implementation? One physician explains: "sometimes it is difficult to find out the reason for the prescription, if you don’t have the prescriptions in the record. Therefore, I always enter prescription in the record. I guess it is because you have to explain, why you do as you do". Another physician says: "by dictating prescriptions in the record, I can see the medication when I see the patient again". This quote implies he gets his information about prescriptions from the record and not from CPOE. The physicians tells that prescriptions in the CPOE officially are prevailing. Observations and interviews show that in practise, it is prescriptions in the record which are prevailing in the eyes of the physicians. The physicians argue they need to have coherence between the patient case and prescriptions, and state: "You have to have coherence to the history, so everybody can follow, what has happened to the patient".

Another reason for double prescription might be more tacit. It is the possibility to discover an error, when there is a discrepancy between record and CPOE prescriptions. During field work the author witnessed several situations of this kind. In most of these
cases the prescriptions in the paper record were correct and the prescriptions in the CPOE systems.

Examples from observations

A: Observation note from ward round

The physician on ward round is reading the medical record. He observes there are five prescriptions in the record, but in the CPOE system there are four prescriptions.

B: Observation note from ward round

The physician on ward round is reading the medical record. He observes medication X is prescribed in the record, but in the CPOE system it is not listed as current medicine. A continuation note some days ago specifies how medication X is to be paused for one day and continued the day after. The clarifying remark in the record missing in the CPOE system where it is discontinued but not resumed the day after as scheduled. The physician discovers the deviation error when reading the note in the record.

C: Observation note from ward round

The physician on ward round is reading the medical record. He discovers nausea treatment is not prescribed as a ‘standing order’ in CPOE. In CPOE it is prescribed as ‘medication on demand’. The normal procedure for nausea treatment in connection with chemotherapy is that the first dose is ‘on demand’, and the following doses are ‘standing orders’. The correction from ‘on demand’ to ‘standing order’ was forgotten in this case.

In all three examples the physician becomes aware of a medication error by discovering a discrepancy between the record and CPOE. This happens when the physician is reading the patient record and not when he is looking into the CPOE system. In the first two examples medication is registered in the record but missed in the CPOE. In example B the record note clarifies the prescription plan. This information is not in the CPOE. In example C the physician observes that the patient receives chemotherapy and should have nausea treatment as standing order and not as medication on demand as prescribed in CPOE. These three examples illustrate how physicians discover medication errors, when reading the patient history in the medical record and comparing the record information with the current prescriptions in the CPOE.

3. Discussion

This study has found that despite the explicit goal to unify medication prescriptions the physicians have not changed their way to carry out prescriptions in parallel (paper and CPOE). There are two major reasons why physicians have not changed this habit:
• Missing compliance between the linear computerized order entry process on the one hand, and a non-linear, paper-based, even messy workflow in the clinical environment
• The power hidden in artefacts and local value, routines, and conventions.

The missing compliance is due to the designers’ need to simplify workflow complexity [14]. Figure 1 illustrates how designers often comprehend the medication process. In their eyes medication is a direct single stringed process [4]. There is no relation between the prescription and other patient-related information. The prescription process is isolated from overall patient assessment and diagnosis. This process model goes directly from physician to nurse to the patient.

In practice prescription is not an isolated process. In medical practice prescription is not unambiguous. It is divided in two, and it is an element in a long sequence of action patterns. For a physician prescriptions have different meanings and functions depending on the situation and context [14-17]. The prescription has a double purpose. It passes information to the nurses, and it also provides information to the prescribing physician and his colleagues. In Figure 2 the real medication process is illustrated in a simplified model. At ward round the physician and the staff nurse discuss the patient case and make a treatment plan. Then the physician prescribes medication in the record and in CPOE. The record prescription is information to himself and his colleagues. The CPOE prescription is an one-way information route directed to the nurses. If a prescription needs to be executed the staff nurse gives a message or a note to the nurse, who looks after the patient. He or she will then carry out the order. Figure 2 illustrates how different artefacts and several people are involved in the prescription process.

The hidden power in the medical record is a result from long traditions. Different physicians cooperate sequentially when treating a patient. The medical record supports the physician memory and act as a communication mediator between the numerous physicians involved in the treatment process [16]. The structure of patient information in the medical record is a working practise, physicians have acquired in generations
“You can read from the description, why there was a change and what kind of change.” one of the physicians explains. Therefore the record has a very high priority in physicians’ mind. This is reinforced by the tradition where the record belongs to the physician. The record is where physicians can demonstrate their professional skills to their peers. This power and influence of the record is left out in the idea of CPOE. In an actor network perspective the strength and power of an actor (or actant as Latour calls it) depend on the relations they constitute in a network [19; 20]. This explains why the medical record and prescriptions are strongly related.

The role of the medical record and the local traditions is forgotten or neglected when discussing workflow in relation to CPOE. In the view of designers the record appears as a black box, where there is input and output, whereas in reality the record is shaped in a long process of negotiations and configurations. Viewed as a black box it contains and hides a complex network of traditions, rules, values and power [21].

When CPOE is introduced the hidden power of the record emerges by the way physicians do not change the way they use the record. Changes in prescription patterns are not realized just because the management dictates it. Changes depend on the associations between actors. The association between physicians and the medical record makes the record a powerful artefact. This is one of the more implicit or tacit reasons for continuing the practise of double prescription. The record contains value and gives power to the physicians because it is their property and embraces the whole history of a patient.

A main rationale for CPOE is to eliminate double registrations. In this view double registration is a reason for errors. A more symmetric approach would insist on a balanced view. Examples from this case demonstrate that the prescriptions in CPOE are invalid. This study indicates that double registration is not an unambiguous problem. In different cases double registration may constitute informal and tacit quality control. When physicians compare the record notes and CPOE prescriptions they occasionally discover discrepancies which give rise to further examinations.

This study illustrates how prescriptions in the record are more accurate and up to date than prescriptions in CPOE. Although the CPOE is, officially, the right place for prescriptions, the prescriptions in the record is more reliable. CPOE prescriptions are considered secondary by the physicians and therefore they tend to be less invalid. The division of a prescription reflects the relation between the record and the medication card. The record has maintained or even strengthened its position as the prevailing information source for the physicians.

The effort to unify prescriptions has failed because physicians have a deep intrinsic motivation to keep information in the record valid. The record is where physicians demonstrate expertise and get appraised by peers. The CPOE and the previous medication card play a more compulsory role and act as communicating system with nurses. This fundamental difference in the roles and understanding of the record and CPOE is not addressed in the design or implementation of CPOE and this might one of the reasons it hasn’t changed. Even when authorities have decided, that CPOE must be the primary source, prescriptions in the record still are the most valid. Power is not a cause to act – power is a result of acts [20]. The power of the record and the way it interacts in practise is a result of negotiations, traditions and values – the appraisal of colleagues counts more than rules or evaluation from authority.
4. Conclusion

This study shows that double registration helps physicians to discover medical errors, when they compare prescriptions in CPOE with the record. The prescription pattern is continued. The record is the prevailing tool for physicians to communicate to each other and to comprehend and form a patient case. This entails to ensure that the information in the record is complete. Physicians regard CPOE as a tool for nurses and it is not valued as high as the record. Therefore physicians continue to make two prescriptions – one for their peers in the record and one for nurses in the CPOE system. This hidden value and power of the record and the complex prescription process has been neglected in design and implementation of CPOE.

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Reference