

8-2010

# Can We Rely on Electronic Medical Record Systems to Reduce Medication Errors?

Tina Blegind Jensen

*Copenhagen Business School*, [blegind@cbs.dk](mailto:blegind@cbs.dk)

Follow this and additional works at: <http://aisel.aisnet.org/amcis2010>

---

## Recommended Citation

Jensen, Tina Blegind, "Can We Rely on Electronic Medical Record Systems to Reduce Medication Errors?" (2010). *AMCIS 2010 Proceedings*. 353.

<http://aisel.aisnet.org/amcis2010/353>

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2010 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact [elibrary@aisnet.org](mailto:elibrary@aisnet.org).

# Can We Rely on Electronic Medical Record Systems to Reduce Medication Errors?

**Tina Blegind Jensen**  
Copenhagen Business School  
tbj.inf@cbs.dk

**Povl Erik Rostgaard Andersen**  
Aarhus School of Business, Aarhus University  
ros@asb.dk

## ABSTRACT

Expectations to Electronic Medical Record (EMR) systems in healthcare are high when it comes to reducing medication errors and increasing security in the medication process. Studies show that certain types of medication errors are eliminated when introducing EMRs; however, such systems also entail new types of errors. Based on a study in an orthopedic surgical ward in a medium-sized Danish hospital, we investigate what previous types of errors can be reduced by using the EMRs but also what new types of errors may appear. We zoom in on the process of medicine prescription and focus on what new types of errors appear in the interaction between the doctors and the technology. Identifying and understanding the nature of errors that emerge when doctors use EMRs may enable system developers and implementers to better manage implementation and maintenance of future EMR projects and accordingly set up appropriate strategies to prevent medication errors.

## Keywords

Electronic Medical Records, medication errors, doctors, unintended consequences, healthcare

## INTRODUCTION

Medication errors and adverse drug events pose a significant problem for the health sector (Andersen et al., 2001; Bourke et al., 2001). Errors occur as a result of complex medication processes involving many work tasks and processes which are performed by different professional groups in an often busy working environment characterized by frequent interruptions (Andersen et al., 2001; Wears and Berg, 2005). Some medication errors have no consequences, but a number of errors result in adverse drug events which may cause prolonged hospitalization, permanent injury to the patient or, at worst, patient death (Ash et al., 2004; Nielsen et al., 2004).

As more stringent safety and quality requirements are being introduced, hospitals are increasing their focus on drug handling (Mølsted, 2005). For example in Denmark, the Patient Safety Act entered into force in January 2004, and since then health professionals have been under an obligation to report adverse events in the hospital services (Sundhedsstyrelsen, 2006). In 2005, a total of 11,401 adverse events were reported to the Danish Patient Safety database, of which 3,666 events were related to medication. These figures increased to 21,279 adverse events and 6,783 adverse drug events in 2008 (Sundhedsstyrelsen, 2009).

Electronic Medical Record (EMR) systems are implemented in several hospitals as they are expected to support correct medication, i.e. giving the right patient the right medicine, at the right time, in the right way and in the right dose. EMR is seen as a tool with the potential to improve quality and safety in the health sector (Ash et al., 2004; Wears and Berg, 2005), and in particular as a means to reducing the number of medication errors (Kaushal et al., 2003).

EMR will undoubtedly be able to contribute to reducing the number of existing error types. A fully integrated EMR system with instant access to real-time medical data will significantly reduce the number of erroneous decisions made as a result of a lack of information (Ash et al., 2004). Medicine prescription is only recorded in one place, thus providing the healthcare professionals with an overall and updated overview of the patient (Hansen and Frostholt, 2002). However, one may question whether the EMR in itself implies new types of errors (Berger and Kichak, 2004).

The purpose of this paper is to investigate whether we can rely on EMRs to reduce medication errors. Based on an empirical study in an orthopedic surgical ward in a medium-sized Danish hospital, we ask: What previous types of errors can be reduced by using the EMR system? And what new types of errors may appear? We investigate the process of medicine prescription and the interaction between the doctors and the technology. We argue that it is important to deal with the new types of errors that technology may bring to the work practices in healthcare and to the patient security. Identifying and

understanding the nature of errors that emerge when using EMRs may help system developers improve the designs of EMRs and help managers be alert and prepared to set up appropriate strategies to prevent errors.

The paper is organized as follows: next we present the theoretical foundation of the use of information technology in healthcare to reduce medication errors. This is followed by a methodology section as well as a presentation and analysis of the empirical findings. We discuss the findings and present five strategies for preventing the new types of errors.

### INFORMATION TECHNOLOGY IN HEALTHCARE TO REDUCE MEDICATION ERRORS

The complex nature of healthcare work leads to a number of medication errors in the clinical work practices (Bourke et al., 2001; Campbell et al., 2006). To give an idea of the nature of errors, table 1 shows the reported medication errors by adverse event category related to a manual medicine prescription process and their distribution in Danish hospitals in 2005 (Sundhedsstyrelsen, 2006):

Adverse event category	Number of adverse events
No medicine	643
Wrong drug	728
Wrong dose	1246
Medicine despite allergy	124
Wrong time	198
Wrong administration route	176
Wrong patient	379
Events in connection with blood transfusion	38
Known complications and side effects	13
Other events	121

**Table 1. Adverse drug events and their distribution in Danish hospitals in 2005**

Medication error reduction is a primary reason for implementing information technologies such as EMR systems in healthcare. Table 2 shows some of the error types which may typically occur in a manual medicine prescription process and that information technologies are expected to reduce (Cohen, 1999):

Error source	Error type
Dictated prescription	Errors in connection with transcription caused by sloppy pronunciation or poor sound quality, e.g. confusion between drugs or patients with similar sounding names
Handwritten prescription	Confusion between drugs with similar sounding names
• Zeroes and decimal points	Illegible decimal points in dose specifications may result in incorrect dose. The same applies to too many or too few zeroes in the dose specification
• Measure and weight units	Incorrectly specified doses are interpreted and may lead to incorrect substitution or incorrect dose
• Abbreviations	Non-standard abbreviations may lead to errors of confusion as a result of ambiguous interpretations
• Ambiguous or incomplete prescriptions	Missing information is interpreted and may lead to a number of errors, depending on which information is missing

- Missing doctor's signature      In case of doubt about the content of the prescription, the person who is to dispense/administer the prescription cannot find the responsible doctor

**Table 2. Error types in the prescription process which an EMR system may reduce**

Whereas the implementation and use of EMRs may reduce certain types of medication errors, numerous studies published in medical informatics journals have described unintended consequences of such health information technologies (McAlearney et al., 2007; Nebeker et al., 2005; Reckmann et al., 2009; Wachter, 2006; Aarts et al., 2007). The study by Nebeker et al. (2005) shows that the implementation of EMRs introduces new types of errors such as problems in drug selection and dosage, and that the system offers minimal decision support for these specific aspects of the medication process. As noted by Ash et al. (2004) and Koppel et al. (2005), EMRs may generate errors such as juxtaposition errors, in which clinicians click on the adjacent patient name or medication from a list and inadvertently enter the wrong order. Examples from a study by Koppel et al. (2005) include a number of problems related to: fragmented system displays that prevent professionals to obtain an overview of patients' medications; pharmacy inventory displays mistaken for dosage guidelines; ignored antibiotic renewal notices placed on paper charts rather than in the system; double dosing and incompatible orders; and inflexible ordering formats that may generate wrong orders. A majority of the healthcare professionals indicates that these errors occur weekly.

The study by McAlearney et al. (2007) also highlights examples of how a fragmented display of a computerized physician order entry (CPOE) system prevents doctors from getting a coherent view of patients' medications. Other problems relate to ignored antibiotic renewal notices that are still on paper charts rather than in the system and a separation of functions that facilitate double dosing. Several of the respondents in the study questioned the appropriateness of the system to reduce medication errors.

In conformity with the findings from previous studies, we argue that it is important to study what new types of errors appear when implementing EMRs. If we know the nature of medication errors, we will be able to set up appropriate strategies to prevent them from occurring. It is also important to emphasize the types of errors that technology may bring to the healthcare practices in order to increase patient safety and not trust blindly in technology as a panacea. Contrary to existing studies, we zoom in on the process of medicine prescription and thus especially focus on the interaction between the doctors and the technology.

## BACKGROUND AND METHODS

This paper is based on an empirical study forming part of a major research project concerning the implementation of an EMR system in an orthopedic surgical ward in a medium-sized Danish hospital (Jensen 2007). The study is explorative in the sense that its purpose is to identify the nature of the new errors following the transition to EMR. It is thus not our intention to calculate the number or frequency of these errors. Our focus is on the process where the doctor prescribes medicine in the EMR system and not on the subsequent dispensing, administration and monitoring of the medicine (we refer to the study by Aarts et al. (2007) for findings on these issues).

The study is primarily based on observation studies carried out in the orthopedic surgical ward where the practical use of an electronic medicine prescription module in the EMR was observed and mapped. The observation carried out was divided into two steps: First, we observed all medicine prescriptions made by doctors in the ward over a period of three days; second, we conducted two days of observation in the outpatients' clinic where the doctor's work with medicine prescription and other work routines were observed. We were two observers who independently followed the doctors in their daily work.

The observation study was followed up by ten semi-structured interviews (Kvale, 1996) in which we interviewed the doctors about their views on and use of EMR, including the medicine prescription module, in their clinical work. Each interview lasted from 50-70 minutes and were taped and transcribed verbatim. They were supplemented by a focus group interview involving four doctors describing their combined experience of the EMR implementation and use, including their experience with using the medicine prescription module.

The empirical material gathered has been analyzed by comparing the observations and statements from the interviews with the literature to classify the new error types occurring and to construct Table 3 (see findings section). By the use of the empirical data, we were able to outline a typical medicine prescription process using EMR.

**FINDINGS**

The complex nature of clinical work both creates and conceals errors (Ash et al., 2004). Below, we describe a typical medicine prescription process using EMR in the orthopedic surgical ward to identify whether using EMR can result in new errors in the process. The description is mainly based on the observations carried out in the ward, but it was supported and validated by the doctors in connection with the individual interviews and the focus group interview.

**A typical medicine prescription process using EMR**

The doctor finds an available computer and logs on to the system. Once he is logged on to the system, his signature is automatically displayed. The medicine prescription module is initiated, and the doctor finds the patient to which the medicine is to be prescribed, either by searching on the patient’s civil registration number or by selecting the patient from a list of patient names in alphabetical order. The doctor selects ‘New prescription’ and selects/finds the relevant drug for the patient. This is done by selecting the drug in the medicine browser or by searching on the drug name or parts of the name. The drug is selected from a list. The doctor must now check whether the patient in question is allergic to the drug and then select drug strength via a list of drugs in numerical order. Once the doctor has selected strength, an automatic generation of the drug, strength, unit and indication is transferred to the prescription pad. The doctor must then select prescription type, i.e. permanent or single administration, according to a schedule or as required. The doctor must then complete a number of fields, specifying pharmaceutical form, administration route and types as well as administration times and frequency. The doctor can now approve the prescription or select ‘New prescription’ if more drugs need to be prescribed for the patient. Once the prescription is completed and approved, the doctor has to exit this screen and then update the patient’s status sheet to register the prescription in the system, so that it is displayed under ‘Current medication’. This prescription process is outlined in table 3 below.

**The nature of medication errors with EMR use**

During our observation study, we identified a number of error types occurring when using EMR to support medicine prescription. These errors occur in the interaction between the doctor and the EMR system (Ash et al., 2004; Koppel et al., 2005), i.e. errors which occur when the doctor enters and finds information in the system. Table 3 shows new error types in an electronic prescription process:

<b>Process</b>	<b>Action in system</b>	<b>Error type</b>
The doctor logs on to the EMR system	Log on	The previous user has not logged off. The next user does not log on to the system and signs the prescription in another user’s name
The doctor identifies and selects the right patient	Find patient	If the patient is selected from a scroll list, the doctor may select the wrong patient
Drug is selected	Find drug	If the drug is selected from a scroll list, the doctor may select the wrong drug. The same applies to dose, unit and strength  The drug strengths in the medicine browser are displayed in numerical order which is inexpedient and may result in the doctor selecting the wrong dose
The doctor must check for allergies	Check for allergies	The system states which drugs the patient does not tolerate, but no warning is issued, nor in the event of allergic cross-reactions

Process	Action in system	Error type
The doctor must decide and enter: Dose, times, drug type, administration route and type, indication, date and time, quantity per day as well as frequency	Select medicine package/adjust prescription	The doctor can manually modify the package/prescription, which may result in errors in respect of dose, strength etc.
	Double prescription	A warning is issued in the event of double prescription, but the doctor may choose to ignore the warning and complete the prescription
	Drug interaction	Warnings are not graded; the user may become immune to the alarms
	Specify dosage times	The doctor may forget to specify when the medication should stop, which means that the drug administration continues needlessly
The doctor updates the patient status	Update status	Does not take place in the same window as the actual prescription process. The window displaying the status sheet must be activated before the patient's status can be updated, which may result in the doctor repeating the prescription

**Table 3. Prescription process and error types resulting from the use of an electronic medicine prescription system**

The error types mentioned in Table 3 were validated during the interviews and in the focus group interview with the doctors, and we will describe them in more detail below.

The doctor can prescribe medicine from a computer to which the previous user is still logged on, which means that the prescription is not signed by the prescribing doctor. A number of lists in the system may cause juxtaposition errors, i.e. the doctor unintentionally selects the patient, drug, strength or unit immediately above or below the one he intended to select. In the medicine browser, the drugs are listed in numerical order and not by strength, which means that here a juxtaposition error may have serious consequences. One doctor said: "They should introduce a safety feature with maximum drug doses".

Errors may also occur in connection with the drugs which the patient is allergic to. The system does not issue a warning, but only displays the drugs in another field in the system and this means that the doctor can prescribe drugs to which the patient is allergic. Double prescriptions may also occur if the doctor ignores the warning issued by the system and goes on to approve the double prescription. During the interview, a doctor said: "Sometimes you find that once you have completed the entire prescription, the prescription is not displayed on the screen and then you repeat the prescription process and then the prescription is displayed. The next day, the drug suddenly appears twice. That's dangerous. If you are prescribing heart medicine, you can actually end up killing the patient". This may appear if the doctor forgets to refresh the display.

In connection with drug interaction, the warnings are not graded. The doctor may thus become 'immune' to the alarms and ignore them. Finally, the doctor may forget to specify when the medication should stop, which means that the drug administration continues needlessly.

A prescription is not visible in the system until the doctor has updated the patient's status sheet. The status sheet is displayed in another window which can be seen on the screen. However, the doctor must activate this window before the status sheet can be updated. This will just be a source of irritation to the experienced EMR system user, but it may lead to an inexperienced user making a double prescription.

In the EMR system, medication information is structured into fields. Entering data in many different fields and in many different screens may result in a poor overview and reduce the user's focus (Ash et al., 2004; Campbell et al., 2006). It takes longer to complete separate fields than to enter a continuous text. Information scattered over several fields is more difficult to read, and interrelationships and errors are more difficult to detect. The information often becomes more detailed and structured and may be ergonomically tiresome. It may contribute to reducing the doctor's attention, and 'steal' time from his clinical work (Grimsmo, 2006; Koppel et al., 2005). Two of the doctors mentioned these aspects during the individual interviews: "It takes a long time to enter the drug with the right times and doses." Another doctor said: "Yes, it takes considerably longer, but it is also a much more precise tool, which means that it is to a greater extent the doctor who directly decides what to give and what not to give the patient." And, finally, one doctor lists some of the benefits of the EMR system: "The advantage of abolishing the paper-based patient records is the precision achieved by entering the medicine to be given to the patient ourselves".

As mentioned above, this study concerns new error types which may occur in the interaction between the doctor and the EMR system in the medicine prescription process. The literature (Ash et al., 2004) describes another group of error types: Those related to derived effects and to errors occurring during the communication and coordination process. In other words, changes in the work processes resulting from the use of EMR. This topic has not been treated systematically in the empirical study forming the basis of this paper. In a focus group interview held in a medical ward at another hospital, we learned about a source of error relating to the communication and coordination process. Nurses are seldom present during the actual prescription registration in the EMR system, because the doctor performs this independently. This means less control overall.

## DISCUSSION

The study showed that the doctors' routines in connection with EMR differ, in a number of ways, from the traditional routine where the doctor dictated the prescription which was then transcribed by a secretary (Campbell et al., 2006). The doctor now has to work with a computer-based system and enter the prescription in the system, specifying, e.g., administration dose, time and frequency (Ash et al., 2004; Schousbo and Tandrup, 1999). The EMR system does, however, ensure that the doctor complies with his legal obligations. From a legal point of view, a medicine prescription must contain certain information about drug name, strength, volume, dose, administration type, indication, medication start and stop times as well as the doctor's signature (Andersen and Dalhoff, 2002), which is exactly the information required by the EMR system before a prescription can be approved.

On the face of it, EMR may seem to cause extra work for the doctor, and some of the tasks to be performed in the system may be considered office work. EMR may interrupt smooth working relations and established communication routines (Campbell et al., 2006), and the doctor has to work harder to get a patient overview. The doctor needs quick access to relevant data about the patient in question. At the same time, the doctor must be able to enter a maximum of information in as short a time as possible. Free text communication is considered the most efficient way of coordinating the work related to a difficult task (Ash et al., 2004; Nielsen et al., 2004).

The study shows that EMR may result in new medication errors related to the interaction between the doctor and the EMR system. It would be possible to prevent these error types by introducing a number of measures. First, better training of users is required. In line with Ash et al. (2004), we argue that users should get extensive training in using the system and they should be better informed about what typical errors may occur in the medicine prescription process. Training of professionals could be provided before the implementation of the system, at the ward as part of the daily practices, and as follow-up sessions.

Second, it is useless to train professionals extensively if the EMR system technically fails to live up to security measures. Both developers and vendors should provide technical reliable systems. They should be clearer about the limitations of their systems and the system development should be better adapted to hospital routines. It can be fruitful to engage healthcare professionals in the design and customization phase of the system development to a larger extent than what is often the case.

A third strategy, which is related to the previous point, is to build user-friendly interfaces. It is highly critical if the doctors make a double prescription because of poor interfaces that are not intuitive to a clinical environment (Campbell, 2006). However, a well designed front-end is not very useful if the back-end design is poor so the technical design of the system needs to be in place.

Fourth, the implementation of a decision support system in the form of computer-based information, warnings and tools to support the electronic medication process are also part of strategies that may prevent new medication errors. A Danish study shows that EMR with an active decision support system reduces the occurrence of errors. However, at the same time, the study points out that both EMR and decisions support systems in themselves may result in errors as they may trigger an

overdose of reminders and alarms (Rabøl et al., 2005; Rabøl et al. 2006). This should be discussed among designers and users.

Fifth, we argue that an EMR implementation should be considered as a change project where the whole organization is to be involved. Studies show that learning to use a new system is time consuming and requires a lot of energy and effort (Jensen, 2007). It is therefore important to support the organizational members so that they more easily become familiar with the system and to provide an ongoing monitoring of the safety of the systems during implementation.

When implementing EMR, one should pay attention to the errors caused by EMR in addition to the errors which it prevents (Koppel et al., 2005). Reckmann et al. (2009) suggest developing a standardized nomenclature of CPOE-related prescribing errors. This will enhance the monitoring of errors and it will be easier to set up appropriate strategies for preventing them (Grimsmo, 2006).

The findings presented here pertain to a single case study in a Danish healthcare setting where a specific EMR system was used. Although we compare our observations with findings from existing literature to validate our conclusions, further research is needed to discuss in more detail if other types of errors exist in other contexts where different systems are used or where organizational and professional dynamics are different. With an awareness of the issues raised in this paper, we argue that managers in healthcare should be alert and prepared to set up appropriate strategies to prevent them.

## CONCLUSION

This study singles out new error types introduced by EMR related to the interaction between the doctor and the technology in the medicine prescription process. It will only be possible to prevent errors through better and more training of users, improved user interfaces, an active decision support system and by becoming familiar with using the system over time. Future studies should focus on this, and strategies should be prepared for preventing new error types to ensure the best possible result from using EMR. Identifying and understanding the nature of errors that emerge when using EMRs may enable system developers and implementers to better manage implementation and maintenance of future EMR projects and set up appropriate strategies to prevent errors.

## REFERENCES

1. Andersen, S.E., Christensen, H.R., Hilsted, J.C. (2001) Medicineringsproblemer og risikostyring. *Ugeskrift for Læger*, 163, 39, 5361.
2. Andersen, S.E. and Dalhoff, K.P. (2002) Medicinhåndtering i et juridisk perspektiv. *Ugeskrift for Læger*, 164, 40, 4651.
3. Ash, J., Berg, M., and Coiera, E.. (2004) Some unintended consequences of information technology in health care: The nature of patient care information system-related errors, *Journal of the American Medical Informatics Association*, 11, 2, 104-112.
4. Berger, R.G. and Kichak, J.P. (2004) Computerized physician order entry: helpful or harmful? *Journal of the American Medical Informatics Association*, 11, 100-103.
5. Bourke, J.L., Bjelbak-Olesen, I., Nielsen, P.M. et al. (2001) Enstrengt medicinhåndtering. På vej mod øget sikkerhed, *Ugeskrift for Læger*, 163, 39, 5356.
6. Campbell, E.M., Sittig, D.F., Ash, J.S. et al. (2006) Types of unintended consequences related to computerized provider order entry, *Journal of the American Medical Informatics Association*, 13, 5, 547-556.
7. Cohen, M.R. (1999) Medication errors, *American Pharmaceutical Association*.
8. Grimsmo, A. (2006) Elektronisk resept - uten bivirkninger? *Tidsskrift Norge Lægeforening*, 126, 1740-1743.
9. Hansen, J., and Frostholt, N. (2002) Elektronisk patient medicinering (EPM). *Evaluation report*, Frederiksberg Hospital.
10. Jensen, T.B. (2007) IS adoption from a user perspective: a case study of how health care professionals experience and make sense of an electronic patient record adoption. *PhD thesis*. Department of Business Studies, Aarhus School of Business, University of Aarhus
11. Kaushal, R., Shojania, K.G., and Bates, D.W. (2003) Effects of computerized physician order entry and clinical decision support systems on medication safety. *Archives of Internal Medicine*, 163, 1409-1416.



12. Koppel, R., Metlay, J.P., Cohen, A., Abaluck, B., Localio, A.R., Kimmel, S.E. et al. (2005) Role of computerized physician order entry systems in facilitating medication errors. *Journal of the American Medical Association*, 293, 10, 1197-1203.
13. Kvale, S. (1996) *InterViews: An introduction to qualitative research interviewing*, Hans Reitzels Forlag, Copenhagen.
14. McAlearney, A.S., Chisolm, D.J., Schweikhart, S., Medow, M.A. and Kelleher, K. (2007) The story behind the story: physician skepticism about relying on clinical information technologies to reduce medical errors, *International Journal of Medical Informatics*, 76, 836–842.
15. Mølsted, H. (2005) Forkert medicin trods digitale patientjournaler, *Ingeniøren*, November 11.
16. Nebeker, J.R., Hoffman, J.M., Weir, C.R., Bennett, C.L. and Hurdle, J.F. (2005) High rates of adverse drug events in a highly computerized hospital, *Archives of Internal Medicine*, 165, 10, 1111–1116.
17. Nielsen, H.K., Larsen, M.L., Ratchke, J. et al. (2004) Enstrenget medicin håndtering. Overholdelse af formalia - overførsels- og ophædningsfejl ved medicinering. *Ugeskrift for Læger*, 166, 33, 2800.
18. Rabøl, L.I., Hellebek, A., Pedersen, B.L. et al. (2005) Beslutningsstøtte til elektronisk medicinordination, *Dansk Selskab for Patientsikkerhed, Dansk Lægemiddel Information*, Copenhagen.
19. Rabøl, L.I., Anhøj, J., Pedersen, A. et al. (2006) Beslutningsstøtte til elektronisk patientmedicinering: reduceres forekomsten af medicineringsfejl? *Ugeskrift for Læger*, 168, 48, 4179-4184.
20. Reckmann, M.H., Westbrook, J.I., Koh, Y., Lo, C., and Day, R.O.(2009): Does computerized provider order entry reduce prescribing errors for hospital inpatients? A systematic review, *Journal of the American Medical Association*, 16, 5, 613- 623.
21. Schousbo, P.L. and Tandrup, O. (1999) Ordentlige medicinoptegnelser, *Ugeskrift for Læger*, 161, 31, 4389-4392.
22. Sundhedsstyrelsen (2006) Årsrapport 2005 - dansk patientsikkerhedsdatabase, *Dansk Patient Sikkerheds Database*, Copenhagen.
23. Sundhedsstyrelsen (2009) Årsrapport 2008 - dansk patientsikkerhedsdatabase, *Dansk Patient Sikkerheds Database*, Copenhagen.
24. Wachter, R.M. (2006) Expected and unanticipated consequences of the quality and information technology revolutions, *Journal of the American Medical Association*, 295, 23, 2780–2783.
25. Wears, R.L. and Berg, M. (2005) Computer technology and clinical work: still waiting for Godot, *Journal of the American Medical Association*, 293, 1261-1263.
26. Aarts, J., Ash, J. and Berg, M. (2007) Extending the understanding of computerized physician order entry: implications for professional collaboration, workflow and quality of care, *International Journal of Medical Informatics*, 76, 1, 4–13.