

Removal of paper-based health records from Norwegian hospitals: Effects on clinical workflow

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Abstract. Several Norwegian hospitals have, plan, or are in the process of removing the paper-based health record from clinical workflow. To assess the impact on usage and satisfaction of electronic health record (EHR) systems, we conducted a survey among physicians, nurses and medical secretaries at selected departments from six Norwegian hospitals. The main feature of the questionnaire is the description of a set of tasks commonly performed at hospitals, and respondents were asked to rate their usage and change of ease compared to previous routines for each tasks. There were 24 tasks for physicians, 19 for nurses and 23 for medical secretaries. In total, 64 physicians, 128 nurses and 57 medical secretaries responded, corresponding to a response rate of 68%, 58% and 84% respectively. Results showed a large degree of use among medical secretaries, while physicians and nurses displayed a more modest degree of use. Possibly suggesting that the EHR systems among clinicians still is considered more of an administrative system. Among the two latter groups, tasks regarding information retrieval were used more extensively than tasks regarding generating and storing information. Also, we observed large differences between hospitals and higher satisfaction with the part of the system handling regular electronic data than scanned document images. Even though the increase in use among clinicians after removing the paper based record were mainly in tasks where respondents had no choice other than use the electronic health record, the attitude towards EHR-systems were mainly positive. Thus, while removing the paper based record has yet to promote new ways of working, we see it as an important step towards the EHR system of tomorrow. Several Norwegian hospitals have shown that it is possible.

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1. Introduction

Whatever the cause might be, the health care sector in a few, small European countries have achieved a remarkably high degree of penetration of electronic health record (EHR) systems. In Norway more than 90% of primary care physicians and 90% of the

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hospitals have implemented an EHR [1, 2]. Furthermore, an increasing proportion of lab reports, referral and medical discharge letters are exchanged via the National health care network [3, 4]. The propulsion towards increased electronic storage and communication of health data and further integration of EHR systems in clinical workflow is nurtured and closely watched by the Norwegian directorate for health and social affairs in concert with national standardization bodies, the national IT-healthcare industry, health informatics communities in Norwegian universities and the health care sector itself [4].

In a hospital, the health record should be considered both a tool for health personnel and a legal document which use is strictly regulated by law. Implementing an EHR system is a necessary, but not sufficient step towards replacing the legal, paper based health record with an electronic version. To avoid loss of clinically important documents which only exist on paper, these must be reproduced and stored in the EHR. The process of scanning paper health record documents and making these available to clinicians via the EHR is now being enacted at numerous Norwegian hospitals. In a study from the first Norwegian hospital to take this step, physicians reported that removal of the paper-based health record and subsequent total dependence on the EHR system alone had made a few clinical tasks more cumbersome but others more effective. In this study, most physicians were satisfied with the use of the system as a whole, but some physicians reported a negative impact on the performance and the quality of the department's work. Despite some unwanted, negative effects Lærum concluded that the process of removing the paper-based health record was possible without a major negative impact on clinical practice [5].

The effects of introducing an EHR system and removing the paper-based electronic health record might depend on the size of the hospital, nature of work at the department, functionality in the EHR system introduced and preparedness, ability and willingness of the hospital organization to adapt to the changes introduced [6]. Based on an assumption that it is more cumbersome to use an EHR system to introduce organizational changes at larger compared to smaller hospitals we have followed "paperless hospital" projects throughout the Norwegian hospital landscape. We here bring the preliminary results from a survey conducted to explore the use of EHR-systems at selected hospital departments deprived of the paper-based record.

2. Material and methods

2.1. The survey

An adapted version of a questionnaire developed by Lærum et al was used in the study [7]. The main feature of the survey is the description of a set of tasks commonly performed at hospitals (24 clinical tasks for physicians, 19 for nurses, and 23 tasks for medical secretaries). For each task, the respondent is asked to rate the degree of use and performance compared to previous routines. Examples of tasks for physicians are: "Review the patient's problem", "seek out specific information from patient record", "write prescriptions" and "complete sick leave form". Also included in the survey are questions about demographical data, self rated computer experience, availability and problems with computers, detailed user satisfaction, and an assessment of the system as a whole.

The respondents included physicians, nurses and medical secretaries from three medical, one surgical and three dermatology departments from six different hospitals in Norway. At all departments the paper based medical record was removed from clinical workflow, and all three different hospital EHR-systems in Norway was represented. The time since the paper-based medical record had been removed differed among the hospitals. One having eliminated its paper based record in 2001, while others were in the process or just had started working paperless. In total, 64 physicians, 128 nurses and 57 medical secretaries responded. The response rate was 68%, 58% and 84% respectively.

2.2. Analysis

We used SPSS 12.0 for windows for statistical analysis of the survey. The analyses of the questionnaire were performed separately for each question, using the nonparametric analysis Kruskal-Wallis or Mann-Whitney U. Correlations were calculated using Spearman's Rank Order Correlation.

3. Results

3.1. Some physicians reported diminished efficiency compared to the situation before the paper-based health record was removed.

In general, respondents from the 3 dermatology departments reported lower degree of use than the other departments. The dermatology departments belonged to three large university hospitals that also had implemented a different EHR-system than the other hospitals participating in the survey. When inquired about change of ease compared to previous routines the dermatology departments scored considerable lower at least for certain tasks. For instance, while the EHR-system among physicians in all departments were used routinely to both review the patient's problems and seek out specific information from the patient records, more than 50% of the respondents from the dermatology departments reported a negative impact on the performance of their work compared to previous routines (figure 1). In contrast, only a small proportion of the non-dermatology respondents from other hospitals reported a decrease for either task. This difference was, as far as we can tell from the survey, not due to differences in computer skills or access to and problems with computers. Also, the various EHR systems had to a large degree the same functionality supported.

3.2. Large differences between physicians, nurses and medical secretaries with regard to EHR-use

Even though a detailed comparison can not be made due to different tasks and the nature of the work, the overall impression was that medical secretaries used the EHR system far more than both physicians and nurses. When asked about use, the median response by medical secretaries was always or most of the occasions for 19 of 23 tasks. Also, when asked to rate the performance of completing the tasks compared to previous routines, medical secretaries overall responded highest.

As for physicians, the results indicated a difference between tasks regarding *generating* information and tasks regarding *retrieving* information. While the EHR system was used extensively to retrieve information, they were generally utilized to a limited degree when it came to generate and store information. The main exception being entering daily notes, where 85% reported to use the EHR system always or most of the occasions. Still, despite varying degree of use, for most tasks the majority of physicians were positive to the change of ease of performing tasks compared to previous routines. However, as we have seen, exceptions exist.

Nurses were the group that reported the lowest degree of use. Still, we noticed the same tendency as for physicians. Tasks regarding information retrieval were used more than tasks regarding generating and storing information. For example, tasks regarding obtaining various tests results were used routinely. In contrast, only 23% reported to use the EHR-system more than half of the occasions to keep a list of short notes about each patient. Still, despite reporting a modest degree of use, nurses generally were positive to the changes imposed by the EHR-system.

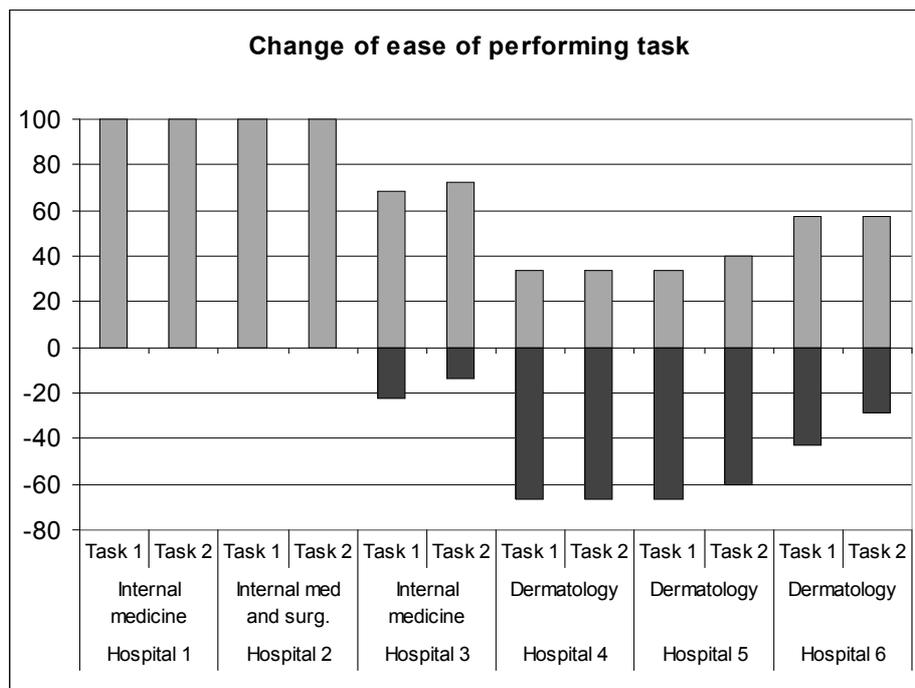


Figure1: Change of ease of performing the tasks compared to previous routines. The positive part of the bar represents percentage of respondents that reported an increase in performance, the negative part percentage that reported a decrease. Task 1: Review the patients' problems. Task 2: Seek out specific information from the patient records

3.3. Generally positive attitude towards EHR-systems

Despite considerable differences in both use and perceived change of ease at the different hospitals, most of the respondents were positive when asked about the overall impact of the system at the various departments. However, when asked about

system-specific user satisfaction, respondents were much more satisfied with the part handling regular electronic data than scanned document images (Wilcoxon Signed Rank Test; $p < 0,001$).

4. Discussion

In this report we have presented preliminary results from a survey among Norwegian hospital departments working without the paper based medical record. The results show considerable differences both between professions and hospitals. While the medical secretaries display extensive usage for most tasks, physicians and nurses generally report high usage in tasks regarding retrieving information. Tasks they have to perform using the EHR system since the paper based medical records no longer is available. The reasons for this are not clear. However, a possible reason might be that the functionality offered by the EHR systems in Norway to date is more directly relevant for medical secretaries than physicians and nurses. So, while working with the EHR-system is directly relevant to the job of medical secretaries, it is mere a support for the main task of physicians and nurses. That is, curing and caring. Thus, despite the ambitions, our results suggest that to date the EHR-systems is still more of an administrative system than a system supporting the main jobs of clinicians. Hence, in line with Lærum et.al [8], our results do not indicate any major change of routines compared to the days of the paper based medical record. The lack of an electronic medical chart in the EHR systems, a function much wanted by clinicians, is a possible explanation.

As for the different hospitals, we observed large differences in use and perceived change of ease of performing the different tasks. Still, even though the three departments that displayed lowest degree of both use and satisfaction use a different EHR system than the others, we argue that pointing the blame to the system is too simplified. Instead, we argue in line with Berg [7] that the introduction of EHR-systems, and likewise removing the paper based medical record, should be seen as a mutual transformation process where the technology and the organization influence each other. Thus, we do not rule of the technology as an influencing factor, but argue that focusing solely on the system will lead to inferior explanations. A possible reason for the differences between hospitals might be the time that has elapsed since going paperless and the pre-paperless situation. For one of the hospitals in this study, a similar investigation was carried out in 2002 [3, 6]. Comparison of these data with data obtained in this study clearly shows that both physicians' and nurses' use of EHR have increased. The majority of the remaining hospitals in our survey had just embarked on the process of becoming paperless.

The three hospital departments that displayed the lowest degree of use were dermatology departments from large university hospitals. There may be several reasons for this, one being that they use a different EHR system than the other hospitals. The observed difference might also be due to differences in the nature of the medical work, and of the speed at which the EHR-systems were implemented. For more than five years the university hospitals had been using EHR in parallel with a paper based record, suggesting the department had adapted their routines to take advantages from the strengths of the paper record as well as those of the computerized system. When the paper-based medical record subsequently was withdrawn, this was felt as a loss amongst the clinicians. A contrasting situation was found in the hospital with the

greatest degree of EHR use, where the transition went straight from a paper-based record to a paper-deprived EHR-system. In this hospital, users of the EHR-system perceived that they had gained a novel important tool. Thus, the situation before removing the paper-based health record may be more important than the time since implementing an EMR, and may also to some degree explain why one of the hospitals that most recently implemented an EHR and went paperless displayed the highest overall degree of use. Supporting this view, recently gathered qualitative data from one of the hospitals point to word of mouth as an important influencing factor for use of mandatory functionality amongst clinicians. Still, another factor might be that the dermatology departments typically have more patients with complicated case-histories, and thereby have greater need of historical data. Thus, having to work more with scanned images that is regarded as more cumbersome than regular electronic data.

5. Conclusion

Even though the intention of achieving higher efficiency, quality and new ways of delivering health care remains to be fulfilled, our results lend support to the conclusion that removal of the paper-based health record is feasible. The results obtained from the university hospital departments are however worrying and warrants more thorough analyses.

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