Closing information gaps with shared electronic patient summaries—How much will it matter?

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ABSTRACT

Background: Information deficits contribute to medical errors. Hence several efforts to develop electronic communication systems to facilitate a flow of information between health care providers have been attempted, including initiatives to develop regional or national electronic patient summaries.

Objectives: To study information access and information needs in inpatient emergency departments, and how clinicians in these departments handle deficits in available information.

Methods: We conducted an observational study of consecutive unplanned inpatient admissions using a structured form to register a set of predefined parameters and free-text notes, including a post-examination interview with the examining emergency department doctors and nurses.

Results: We observed 177 patient admissions, excluding any patients under 18 years of age and planned admissions. One in four patients arrived without any referral. Nearly all referrals described the presenting complaint with a tentative diagnosis. One third of the referrals lacked medication record and medical history. Only one in ten referrals contained information about contraindications. If the patient had previously been admitted to the hospital, the emergency department doctors used the existing electronic patient record and seemed to favor previous discharge letters as an information source. Information on current medications was often copied from earlier admissions. In half of the cases the patients also provided supplementary information in other ways not available, though one in five patients was not in a cognitive state to be properly interviewed. The examining doctors reported a lack of crucial information in 10% of the observed referrals.

Conclusion: Overall, information about medications and previous history was described in most referrals, but was still the information most frequently inquired or searched for. Qualitative assessments revealed that insufficient information put a significant stress on both patients and staff, and in turn caused additional workload and risky work-arounds. In our assessment, these information deficits could be effectively mitigated by an up to date easy-access patient summary.

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1. Introduction

Clinical pathways or patient trajectories are dependent on up to date and correct information [1]. Information deficits are a
major contributor to adverse drug events [2]. Several efforts have been made to develop electronic communication solutions to facilitate and secure a flow of information between health care providers. In Norway, information exchange by means of electronic messaging has been the main model [3]. This system has shown to be well suited for sequential one-way processes, such as referrals and discharge letters for planned care, but less appropriate when there are many providers involved. Problems involve issues such as several versions of a message coming into circulation, for instance the electronic medication record and the information may not be timely or correctly updated in the separate patient records at the different providers [2].

Access to other hospitals’ or general practitioners’ complete electronic health records (EHR) in emergency situations has been attempted with limited success [4,5]. This has also been approached by developing regional or national electronic patient summaries [6,7]. The Norwegian authority is currently considering an implementation of a national shared electronic patient summary. To better coordinate the effort of developing shared patient summaries, an EU project has been established to investigate the possibility of sharing and accessing patient information across regional and national borders [8].

Most initiatives on developing patient summaries seem to agree that at least the medication record and information on contraindications should be part of such a summary [7,11]. However, on the inclusion of other pieces of information the general opinion varies from just current medication up to a more complete health record. Studies of the impact of EHRs on clinical outcome are limited and qualitative evaluations are scarce [9]. In this study we have investigated admissions where the patients were in need of unplanned health care (inpatient admissions) in order to evaluate which information is missing in these situations, and how clinicians react when they face missing information.

2. Materials and methods

Information deficits occur most frequently in the “out-of-hours services” in primary care (4000 encounters per 10,000 inhabitants per year) and the emergency departments (ED) in hospitals (1200 admissions per 10,000 inhabitants per year) [10].

Most patients coming to the ED have first attended the out-of-hours services in primary care; only a minority of patients is brought by ambulance directly. In Norway, a common ED at the hospital receives all patients in need of unscheduled hospitalization. This is also where initial orders and minor treatment are performed. The ED is responsible for triage and transfer of patients to the other inpatient wards or specialist departments (surgery, cardiology, intensive care unit, etc.). Admissions for elective patients are usually handled directly by the different wards and not through the ED.

In this study, we have chosen to focus on EDs because it as such represents the transition between primary and specialist care. Because the majority of unplanned admissions are effectuated by the out-of-hours service, it also gives an insight into that particular service.

We conducted an observational study of the EDs at two major Norwegian university hospitals, Ullevål University Hospital (726 beds) in Oslo and St. Olav Hospital (879 beds) in Trondheim. These two EDs handle all unscheduled inpatients older than 18 years of age, with approximately 20,000 patients per year passing through each ED.

A medical doctor acting as an observer, not involved in the patient care, performed the observations. In total 177 patient admissions were observed, 100 at St. Olav’s Hospital and 77 at Ullevål University Hospital. The observations were done during a three-week period at St. Olav Hospital immediately followed by a two-week observation period at Ullevål Hospital. The criteria for inclusion were unplanned patient admissions for patients aged 18 or older. Day-, evening- and nightshifts were covered, but the majority of patients were admitted during daytime. There is only one observer in this study so observing full night and evening shifts were not done because of the small number of admissions during nighttime. To register predefined parameters we devised a structured form with additional room for free-text remarks. For each patient admission, doctors’ use of the EHR during the admission was observed and evaluated. The examining doctor and the nurses involved were interviewed immediately after each patient admission. In addition the observer evaluated the referral documents that were used and how the doctor used the EHR during the admission.

For statistical analysis we used Epi Info v. 3.5.1. Statistical differences were tested by using the $\chi^2$ test for categorical variables. Only significant differences with a $p$-value of less than 0.05 have been commented on in the results. The authors analyzed the additional notes after the statistical analysis. We obtained permission for the observational study from the privacy protection advisors at both hospitals. Additionally only anonymous data were included in the study. We use number of admissions as the denominator when not otherwise specified throughout this article.

3. Results

In total the admissions of 177 inpatients were observed. The data consisted of 78 (44%) men and 99 (56%) women between the ages of 18 and 95 years, with an average of 61 years. No patients chose to opt out of the study. Since no patients were seen more than once, the number of patients equals the number of admissions. Cardiovascular conditions were found to cause 54 (31%) of the admissions. Respiratory and digestive system conditions caused 31 (18%) and 30 (17%) admissions, respectively. In our sample 70% of the patients suffered from one or more chronic disease.

Out of those admitted 68% were living at home with an additional 16% living at home, but enrolled in community home care services. 5% were transferred from institutional community care and 6% were transferred from other hospitals or specialist outpatient clinics. Thirty-eight of the patients were referred by their regular GP. 25% had contacted the out-of-hours service of their doctor and 16% had contacted other doctors. The final 20% arrived directly at the ED without having been seen by a doctor.
3.1. Information available at the arrival in the hospital

In 74% of the admissions the patients brought a written referral from a doctor. Only a minority was sent to the ED after being referred by phone (2%). The majority of patients without a referral had been brought to the hospital directly by the ambulance service (24%).

Table 1 shows the composition of information given in the referrals. In most cases the referral described the present illness and suggested one or more differential diagnoses. However, only one in ten referrals included contraindications and allergies. There is a statistically significant relation between the reporting of current medications and medical history, and the domestic situation of the patients and who had made the referral. In general, the patients’ regular GP provided the most complete sets of information.

3.2. Use of the electronic health record

141 (80%) of the patients had been hospitalized before, of which 130 (92%) at the same hospital. 33% had a condition previously known to the hospital. Doctors in the ED used the EHR in 85% of cases. The EHR was seldom used during the examination to look up prior information (9%). Some used the EHR both before and after the examination (32%), but the majority used it after the examination (82%) to look up additional information. The EHR was also used during dictation to supply information that was collected under the examination. The observer could see that doctors looked up previous medical history for 66% of the patients, medication for 24%, but far less contraindications (8%). The doctors first looked for any former discharge letters to find information. The observer also noticed that when a patient arrived without drug information the doctor would sometimes copy the medications prescribed the last time the patient left the hospital.

3.3. Patients and their next of kin as information carriers

The patients were in 68 (33%) admissions accompanied by next of kin or other non-professional (5%). The examining doctors stated that the patients and/or their next of kin had given information that was missing for 102 (58%) patients. However, for 64 (37%) patients there was missing information neither the patient nor the next of kin could answer.

There were discrepancies between the information in the EHR or referral letter and what the patients and/or their next of kin provided for 40 (23%) patients. For 34 (19%) of the patients the doctors had to amend the EHR. This was mainly related to medications. An additional 28 (18%) of the patients were unable to provide trustworthy information due to their cognitive condition. We observed several patients struggling anxiously not to forget anything.

3.4. Information gaps as judged by the examining doctors

In addition to the observer registering the available information, the examining doctors were asked if they felt there were any insufficiencies in the provided information after the
examination of each patient. As shown in Table 2 they most often complained about a lack of information about current medications and earlier conditions. Missing information was most frequent in patients arriving without a referral or with a referral from an out-of-hours doctor.

In a follow-up question the examining doctors were asked to grade the importance of the missing information for the 53 (30%) patients whom this affected. For 12 (7%) patients the doctors found missing information to be of no importance for further diagnostics or treatment. For 25 (14%) patients it was deemed to be of some importance and for 16 (9%) patients of great importance.

Missing information did not show a statistical significant influence on the length of time the patient spent in the ED. Average length of stay was 2 h and 50 min (min 0.27, max 11:21). The examining doctors tried to obtain the missing information for 36 patients. For 15 patients they tried themselves, for 8 they asked the nurse to do it and for the remainder they forwarded the request to the ward receiving the patient.

The regular GP and next of kin were the most frequent sources of more information. On a direct question on what they did when a patient arrived unconscious and without any information they answered: “We have written guidelines for what to do in such situations. We take more tests and prepare what might be needed if unexpected reactions occur. In my twenty years at the ED I don’t remember that we have lost control because of missing information”.

4. Discussion

This study has revealed a gap between what is available and the sought after information in the EDs at the admission of about one in five patients. The extent of this gap is dependent on the referring doctor and from where the patients were admitted. Information about medications and past medical history was described in most referrals, but this was still the piece of information most often asked or searched for. For a significant number of patients the examining doctor believed that this gap had clinical implications.

4.1. Available versus necessary information

Which information to include in a referral is guided by both traditions and also a Norwegian standard. The referral, according to this standard, should include general information about the referring doctor and the patient, the cause for referral (e.g. present illness), medication chart, any allergies to medications and other allergies, relevant medical history and a description of the family/domestic situation of the patient [11]. Many would argue that this standard should always be followed, as the referring doctor is unlikely to foresee what will be important. In comparison to the standard referral, Table 1 reveals that the observed referrals in general did not contain the specified information items.

However, the available information is not necessarily what is needed. The lack of information as shown in Table 1 is more extensive than what the examining doctors expressed as missing (in Table 2). Firstly, there are obvious omissions in what a doctor records, but these omissions are generally known and understood by their fellow colleagues. Secondly, the information omitted in the referral might be justified for a particular patient. GPs are very selective in which information they include in their patient records [12]. Table 1 as thus reflects both a lack of information, but also a potential deliberate efficiency in communication. E.g. doctors out-of-hours often have no access to a patient record nor much time to go into all the details [13].

Despite the fact that medications and previous history was described in most referrals, these were at the same time the points most often reported as insufficient by the examining doctors in the ED (Table 2). Our interpretation is that medications and previous history are the most important pieces of information in situations of unplanned care. However, another explanation is that this might be due to poor quality of information. In fact, the quality of communication about older patients in referral letters from general practitioners has previously been assessed in a study performed at St. Olav hospital. Their conclusion was that the referrals were missing vital information about the actual medical situation, medical history, symptoms, signs and medications to such an extent that it might represent a health hazard for older patients [14].

We do not know from our study how much of the missing information the ED staff was able to track down, only that it would save them much work if there were a source available with updated information on medications and an overview of former encounters where information could be found or requested [15]. Clinical trials with EDs and out-of-hours practices having access to the EHR from other hospitals or at GPs have so far not been a success [4,5,7]. The examining doctors seldom used this opportunity. We observed a parallel behavior; the doctors did not at first search for information in the regular EHR, but looked for discharge letters. The discharge letter is a summary formulated to give easy access to the most

<table>
<thead>
<tr>
<th>Table 2 – Type of information reported as missing by examining doctor in the emergency department for inpatients.</th>
<th>No. patients</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients with missing information</td>
<td>52</td>
<td>29</td>
</tr>
<tr>
<td>Drugs in use</td>
<td>28</td>
<td>16</td>
</tr>
<tr>
<td>Present illness</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Type missing information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical history</td>
<td>21</td>
<td>12</td>
</tr>
<tr>
<td>X-rays</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Contraindications</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Allergies</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>All admissions</td>
<td>177</td>
<td>100</td>
</tr>
</tbody>
</table>

important information for the next clinician that will treat or follow-up on the patient. It also differs from plain data overviews, as it lists different examinations and laboratory results and reduces the chance of misinterpretation because the selected data are put into the context of which it was produced and combined with the doctor’s knowledge about the patient.

4.2. Work-arounds for information gaps

We have found that missing information occurred regularly as confirmed in other studies [16,17]. Likewise that information was frequently lacking for patients coming from nursing homes (Table 1) [18].

Missing information carries an increased risk of errors, as expressed by the examining doctors. However, the staff also stated that they had guidelines and were trained for what they should do in acute emergency situations with or without information. Studies have shown that team training of standardized resuscitation procedures is the most effective in basic life support, and that information support should be kept at a minimum in an early phase [19,20]. We observed that when there was more time, several measures were taken to obtain more information.

Errors often occur where there is a sequence of unintended events taking place. So for an adverse event to take place a failure of compensating mechanisms or routines would also have to happen. Closing the information gap in EDs will ease the work of the involved personnel; reduce delays and use of resources, but will probably have less of an influence on serious errors, as seen in the studies of adverse drug events [21].

It is well known that health personnel compensate with work-arounds under pressure [7,22]. We noticed that the ED doctors used the information that was available at hand, presumably without too much of a concern for the quality of this information. As an example, in many cases where information about medications was missing, the ED doctor would look up this information in a former discharge letter. Often without being aware of whether any corrections had been made by other doctors outside the hospital, even though medication can be changed for various reasons after discharge [23]. ED doctors also handed over the task of tracking down missing information to the next unit. These observed work-arounds indicates that the lack of information might actually be greater than what the ED doctors actually reported.

Asking the patient can often reveal unknown information, but as shown by others, patients also regularly forget essential information [24]. The information given in the referral by the patients’ regular GP was not always to be trusted either (vide supra) [2,25]. Research indicates that information about dispensed prescriptions from pharmacies would likely give a more accurate picture of which drugs the patients are taking than the medication record from their GPs [26].

In other studies it has been found that patients spends longer time in the ED when information is lacking, indicating that diagnostics and treatment is delayed [16]. We witnessed that other external factors seemed to have a great influence on the time spent in the ED, such as when other units were ready to receive the patient. However, our sample is not large enough to show any statistical relationship between missing information and the time spent in ED.

4.3. Limitations of the study

We did both a quantitative and a qualitative assessment. The latter to better understand how these information gaps were handled. This in turn restricted the number of admissions we were able to study. A larger number of patients would be needed to disclose actual medical errors caused by information gaps. Also the study would have to include a prospective follow-up to assess the hospital stay and evaluate consequences of information gaps.

Several examining doctors were observed to reduce their bias, but by using only one observer there is still a risk of a systematic bias. Only two hospitals were a part of this study and since we know that the emergency services are arranged differently not only from country to country, but also within countries any generalizations of the findings should therefore be undertaken with great caution and additional support from similar studies.

There is no common understanding or definition of what represents a “clinically significant” information gap and how to measure it. By searching for earlier studies we found reports of missing information at admission time differed from 10% to 70% in various studies. We therefore decided to study both what information was available and what the examining doctors subjectively (i.e. in their opinion was considered important to the particular case) pointed out as missing. While the quality of the information is most likely of equal importance we did not analyze the quality, but only registered whether the main categories were included or not.

For natural reasons it was not possible to register all consecutive admissions because of the time required for post-examination interviews and instances of simultaneous admissions. We do not think this affected the study because this is by nature randomly distributed, and in part accounted for by considering the number of patients included in the study. The majority of the observations were made during daytime or afternoon. This could lead to a bias when it comes to information gaps because these patients may have been referred to the ED from their GP or someone with information about the patient. Including more acute admissions at night might have increased the amount of missing information.

5. Conclusions

Easier access to up to date information about patients’ medication lists and previous history will probably bring relief to both the staff and the patients in the ED [7]. Health care professionals prefer limited and summarized information in emergency situations. A medication record of dispensed prescriptions together with an overview of previous encounters would be most useful. The latter with the possibility to obtain access to corresponding electronic discharge letters. However, controlled trials are needed to evaluate effects on adverse events with the introduction of a shared electronic patient summary.
Summary points
What was already known before our study?

- Information deficits contribute to errors, in particular adverse drug events.
- Large sums of money are now invested to develop regional or national shared electronic patient summaries to facilitate the flow of information between different health care providers.

What did our study add to our body of knowledge?

- This study has revealed a gap between available and wanted information in EDs and that this gap is larger than reported by the personnel.
- The available information often has to be corrected on the basis of information from the patients, but a significant number of patients are not able to provide such information themselves.
- Health personnel in EDs under pressure perform risky work-arounds.
- There is an urgent need for controlled trials to evaluate the effects of shared electronic patient summaries.

Author's contributions

Vebjørn Mack Remen gathered data by conducting observations, interviews and registering information during the observation study at Ullevål Hospital and St. Olav University Hospital. Further contributed to study-design, analysis and writing of the paper. Anders Grimsmo contributed to study-design, analysis and writing of the paper. Also guided the corresponding author ad hoc during the observational part of the study. Both authors participated adequately in all phases of the project.

Conflict of interest

The study was funded by Innovation Norway and National ICT. The funders had no role in carrying through the study, analyzing the date, writing the manuscript or submitting.

The authors declare that the financial support is as stated above. The authors have no financial or non-financial interests that might be related to the submitted work, nor partners that might have such interests.

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