

ORIGINAL ARTICLE

Poor communication on patients' medication across health care levels leads to potentially harmful medication errors

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Abstract

Objective. General practitioners have a key role in updating their patients' medication. Poor communication regarding patients' drug use may easily occur when patients cross health care levels. We wanted to explore whether such inadequate communication leads to errors in patients' medication on admission, during hospital stay, and after discharge, and whether these errors were potentially harmful. **Design.** Exploratory case study of 30 patients. **Setting:** General practices in central Norway and medical ward of Innlandet Hospital Trust Gjøvik, Norway. **Subjects:** 30 patients urgently admitted to the medical ward, and using three or more drugs on admission. **Main outcome measures.** Discrepancies between the patients' actual drugs taken and what was recorded on admission to hospital, during hospitalization, at discharge, and five weeks after hospital stay. The discrepancies were grouped according to the NCC Merp Index for Categorizing Medication Errors to assess their potential harm. **Results.** The 30 patients used a total of 250 drugs, and 50 medication errors were found, affecting 18 of the patients; 27 errors were potentially harmful, according to NCC Merp Index: 23 in category E, four in category F. Half of the errors originated from an incomplete medication list in the referral letter. **Conclusion.** The majority of the medication errors were made when the patients were admitted to hospital, and a substantial proportion were potentially harmful. The medication list should be reviewed together with the patient on admission, and each patient should carry an updated medication list provided by his or her general practitioner.

Key Words: *Communication, general practice, medication errors, Norway, referral*

Introduction

Physicians' main communication tools across health care levels are the referral letter to the hospital and the discharge summary from the hospital. An important part of this communication concerns the patient's medication.

Medication use is potentially dangerous [1–3]. Polypharmacy is increasing, and makes it harder to keep track of side effects and interactions [4] and of potentially inappropriate drug combinations [5]. The risk of serious consequences, hospitalization, and death due to medication errors increases with patients' age and number of medications [6–8]. Unintended discrepancies between the medication on admission to hospital and at discharge have been found, as the hospital may be poorly informed of the drugs the patient is using [9]. Changes in medication made during hospital stay are not always explained in the discharge

letter, making it difficult for the general practitioner (GP) to follow up the medication as intended [10].

The GP is supposed to monitor the patient's regular medication, but does not always do so [9–12]. Lack of monitoring and keeping track of patients' medication use is a main cause when a patient is given inappropriate drugs [10]. A prevalence of 80% discrepancy was found between self-reported use of prescribed drugs and the medication record in dialysis patients [13]. Poor patient compliance may also add substantially to erroneous medication use [14].

We carried out a study of referrals and discharge letters at a hospital in central Norway in 2009, and found the communication regarding medication use to be largely insufficient, with 40% of referrals lacking information on the patient's medication list [15]. This made it difficult for hospital staff to find out which drugs and dosages the patients used, and we

- The number of medication errors comprised one-fifth of the number of drugs used by the included patients at referral.
- Half of the errors were potentially harmful.
- In patients with a proper medication list in the referral no mistake was made on admission.
- A review of the medication list together with the patient soon after admission and calling home care services could have corrected the majority of the errors.

assumed that medication errors could be the result. The present study is an attempt to further explore the topic. In this study of 30 patients we have followed the patients' medication list from admission throughout the hospital stay and back to the patients' regular GP. The aim of the study was to examine the following questions:

- Does inadequate communication lead to errors in patients' medication on admission, during hospital stay, and after discharge?
- Are the errors potentially harmful?

Material and methods

A total of 30 emergency patients admitted to the medical ward of Innlandet Hospital Trust Gjøvik, Norway, were examined. The patients were included from 7 April until 18 April 2011.

The inclusion criteria were:

- emergency patients admitted to medical ward;
- patients using three or more drugs on admission;
- patients able to understand and answer questions;
- patients not too ill to go through the interview on admission;
- patients having signed an informed consent to participate in the study.

All the patients were interviewed by the first author (KF) on admission or the day after. The interview was held at the bedside after the formalities were finished and without interfering with the decisions in hospital.

We examined:

- how the medication list is communicated on admission;
- what sources are used to construct the medical curve on admission and whether the curve is correct (the medical curve is a one-sheet file in hospital for daily medication and records of the patient's condition);
- if changes in medication during admission are properly described in the medication list in the discharge letter;

- whether the GP had updated the medication list in his/her file five weeks after discharge, according to the discharge letter.

In the interview we reviewed the medication as listed in the referral letter and on the medical curve together with the patient. We asked if the patient took the prescribed drugs and what method they used for remembering the correct drugs. We asked specifically about use of over-the-counter drugs and about who was in charge of the daily medication. When the patients were not in charge of their medication themselves, the home care services or the patient's GP were called for information.

The medication lists in the referral letter and on the medical curve were compared with information obtained from the patient during the interview and eventually from the GP and home care, and a judgment on each patient's actual drugs taken on admission was made. We followed the changes in medication made during the hospital stay until discharge by studying the medical curve, notes made in the electronic files during the stay, and the discharge letter.

We have used the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) Index for Categorizing Medication Errors to evaluate the potential harm of the errors [16]. Our definition of errors is included in the Council's definition (Frame – Figure 1).

The definition of errors was:

- any discrepancy between the patient's actual drugs taken and the medication list in the referral letter or in the medical curve;
- unintended discrepancies between the medical curve and the medication list in the discharge letter.

We have defined errors as potentially harmful when they:

- according to the NCC MERP) Index are in category E–F (Frame); or
- imply known potentially harmful side effects in elderly people or harmful drug–drug combinations [17].

Five to six weeks after discharge we carried out a short telephone interview with the patients' regular GPs. We asked if they had received the discharge letter, and whether there were discrepancies between the medication list in the discharge letter and in the GP's records. We informed the GP about found errors.

Statistics

SPSS version 15 was used for summary data.

National Coordinating Council for Medication Error Reporting and Preventing (NCC MERP)**The Council defines a “medication error” as follows:**

“A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use.”

Index for Categorizing Medication Errors

Category A: No Error

Circumstances or events that have the capacity to cause error

Category B: Error but No Harm

An error occurred but the error did not reach the patient (An “error of omission” does reach the patient)

Category C: Error but No Harm

An error occurred that reached the patient but did not cause patient harm

Category D: Error but No Harm

An error occurred that reached the patient and required monitoring to confirm that it resulted in no harm to the patient and/or required intervention to preclude harm

Category E: Error and Harm

An error occurred that may have contributed to or resulted in temporary harm to the patient and required intervention

Category F: Error and Harm

An error occurred that may have contributed to or resulted in temporary harm to the patient and required initial or prolonged hospitalization

Category G: Error and Harm

An error occurred that may have contributed to or resulted in permanent patient harm

Category H: Error and Harm

An error occurred that required intervention necessary to sustain life

Category I: Error and Death

An error occurred that may have contributed to or resulted in the patient’s death

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Figure 1. Frame: Definition and categorizing of medication error.

Study approval

The study was presented to the Regional Committee for Medical and Health Research Ethics, which judged it to be a quality improvement project not needing formal approval. The Privacy Statement Advisor at Oslo University Hospital approved the study.

Results

During the time of the survey the total number of emergency patients admitted to the medical department was 169, and 70 met the inclusion criteria. In the presence of the first author in the hospital, 38 of the 82 patients admitted met the inclusion criteria. Two did not want to participate and six were already discharged or were unavailable due to examination procedures.

Descriptive data on the 30 included patients are given in Table I.

Six of the patients received weekly medication dispensing from a district nurse in a dosette. In all, 22 of the patients managed their own medication, half of them using the dosette and the other half taking the drugs directly from the medication boxes every day. Two had assistance from their spouses to organize their medication.

Table II shows the total number of medication errors and lists them according to NCC Merp Index for Categorizing Medication Errors (frame):

- the errors resulting from discrepancies between drugs actually taken and the medication list in the referral letter;
- the errors resulting from discrepancies between drugs actually taken and the medication list in the medical curve on admission;

Table I. Characteristics of the 30 emergency patients admitted to the medical ward of Innlandet Hospital Trust Gjøvik, Norway, included in the study.

Sex	Female 12, male 18
Age	44–94 years, median 78.5
Admitted from	GP 19, municipal emergency 9, direct with ambulance 2
Diagnoses	Infectious disease 10, heart disease 9, stroke 4, lung disease 6, abdominal disease 3
Days in hospital	1–16, median 4
Number of drugs on admission	4–15, median 8
Number of medication changes in hospital	0–8, median 2
Number of drugs at discharge	4–15, median 9

Table II. Total number of errors according to NCC MERP Index for Categorizing Medication Errors.¹

		NCC MERP Index for categorizing Medication Errors				
		B	C	D	E	F
Admittance: Errors in ML in RL compared with ADT	n = 2 insulin no dose travoprost eye drops missing	n = 9 glucosamine 400 mg × 3 was discontinued phenylpropanolamine 50 mg × 3 missing acetylcystein 500 mg × 2–3 missing penicillin v missing hydroxyzine missing escitalopram was discontinued diazepam 5 mg × 1 missing zopiclone 7.5 mg missing	n = 2 paroxetine too high dose prednisolone 5 mg missing	n = 8 acetylsalicylic acid 75 mg × 1 was discontinued trimethoprim 100 mg × 1 missing nabumetone 1000 mg × 1 was discontinued amlodipine too high dose gabapantin 300 mg × 3 was discontinued sotalol too high dose triotropium bromide 18 missing salmeterol/fluticasone 50/500 × 2 missing	n = 4 ibuprofen 400 mg × 1–2 missing digitoxin too high dose spironolactone too high dose furosemide too high dose	
Curve: Errors in ML in curve compared with ADT	n = 1 salmeterol/fluticasone inhal. No dose	n = 15 (8 from RL) oxazepam 10 mg missing paracetamol 1 g × 4 missing pantoprazole was discontinued diclofenac 50 mg × 0–3 missing calcium 500 mg × 1 missing prednisolone 10 mg too low dose	n = 1 (paroxetin from RL)	n = 16 (7 from RL) calcium 500 mg × 2 was discontinued gabapentin 300 mg × 3 missing lercanidipine 5 mg × 1 was discontinued metoprolol 25 mg too high dose montelukast 10 mg × 1 missing	n = 1 (ibuprofen from RL)	
Discharge: Errors in ML in DL			n = 1 budesonide depot too high dose	n = 6 diazepam 5 mg × 3 not continued haloperidol 1 mg × 2 not continued metformin 500 mg 2 + 1 + 2 missing insulin dose reduced but not written amlodipine/valsartan/ hydrochlorthiazide 5/160/12.5 missing salmeterol/fluticasone 50/500 × 2 inhal. missing		

Notes: ¹A–D no harm, E–I with harm. Drugs in same category are only written once. Total number of errors in the curve includes the errors coming from referral letter. Total of 30 emergency patients admitted to the medical ward of Innlandet Hospital Trust Gjøvik, Norway. There were no errors in categories A, G, H, or I. See the NCC MERP frame for detailed information. ML = medication list; RL = referral letter; ADT = actual drug taken.

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Box I. Patient number 2.

88-year-old woman with heart failure, living at home, home care services 1 hour/week. Ten regular drugs, medication in dosette. Eleven days in hospital for acute urinary tract infection.

- Submitted by her GP.
- Several errors in medication list (ML) in the referral letter.
- This ML is used as information for ML in the medical curve.
- She also brings a correct ML from home care services. This ML was not used for information in hospital.

The ML in referral letter is missing trimethoprim 100 mg, phenylpropranolamine 50 mg × 3 and zopiclone 7.5 mg. It says wrongly that she takes acetylsalicylic acid 75 mg and glucosamine 400 mg × 3. These were discontinued some time ago.

Acetylsalicylic acid may harm her because she has a hiatus hernia (category E). Missing trimethoprim 100 mg given prophylactically for chronic urinary tract infection may worsen this problem (category E). It is also important to recognize a sleeping problem in old people admitted to hospital (category C). Glucosamine was discontinued again in hospital.

After 6 weeks the GP had no objections to the ML in discharge letter except to discontinue haloperidol 0.5 mg x 2 that was started in hospital.

- the errors resulting from discrepancies between the medical curve and the medication list in the discharge letter.

The total number of errors regarding medication listed during these 30 patients' hospital stay was 50, affecting 18 patients; 27 errors were potentially harmful, 23 in category E, four in category F. None of the errors was considered lethal; 25 of the errors originated from the referral letter, 18 from the medical curve made on admission, and six from the discharge letter. Of the 50 errors, 22 were corrected during hospitalization; six errors were corrected by the GP and four by the home care service after discharge. Eight errors in category E and one in category F were not corrected, due to an insufficient discharge letter (six) and medication list not updated by the GP after discharge (three).

Our interview with the patients gave additional information on their drugs actually taken in 12 cases, and calling the GP or district nurse gave new information on five patients. Compliance seemed to be good in these patients, who claimed to take their medication accurately.

The hospital's source of information on the patients' medication was the medication list in the referral letter in 20 cases, previous hospital file or file

at the outpatient clinic in seven, the home care services in one case, and the patient in two cases. Six patients were carrying a medication list from their GP, district nurse, or hospital ambulatory care; of these four were not updated. Five patients brought no information at all about medication use on admission to hospital. Thirteen patients with a proper, updated medication list in the referral letter had no errors in the curve on admission.

Boxes 1–3 give examples of medication errors made.

Discussion

Our exploratory case study of 30 patients and their medication lists during their admittance to, stay in, and discharge from a medical ward at a district central hospital showed that inadequate communication about patients' medication across the levels of the health care system leads to numerous and potentially harmful medication errors. Compared with the number of drugs used by the patients on admission, the level of medication errors was 20% (50/250): 27 errors were in categories E and F indicating that these errors may have serious consequences.

Box II. Patient number 8.

86-year-old man with atrial fibrillation and heart failure. Living alone with responsibility for the medication himself. Using 14 regular drugs.

He stayed in hospital for five days for treatment of heart failure.

- Submitted by a GP at the out-of-hours municipal emergency unit.
- The GP found a medication list (ML) in his file there and let it follow the referral letter.
- The patient stated this to be the true medication. In the interview he added acetylcystein 500 mg × 2 (category C).
- This ML was used for the medical curve, but 2 of the drugs in the list were not transferred onto the curve: doxazosin 4 mg (category E) and montelukast 10 mg (category E).

Montelukast and acetylcystein were reinforced during the time in hospital and doxazosin was continued by the GP after five weeks. The information on medication at referral was close to correct, but two important drugs were not transferred to the medical curve on admission.

To omit these three forgotten medications might have worsened the patient's condition, but he was able to see to it being corrected.

Box III. Patient number 21.

78-year-old man, with COPD and rheumatoid arthritis. Living and managing alone. Nine regular drugs, uses a dosette. Stays three days in hospital for treatment of pneumonia.

- Submitted by his GP's locum.
- Medication list (ML) in the referral letter is taken from GP's file.
- The patient stated this to be correct except for prednisolone 5 mg missing (category D).
- In hospital his previous hospital file is used for information even if there is a close to correct ML in referral letter.

Lercanidipine 5 mg (category E) and pantoprazole 20 mg (category C) had been discontinued some time before admission, Lercanidipine because of hypotension and pantoprazole because of dyspepsia. Both drugs were given during hospital stay. Lercanidipine was discontinued at discharge due to hypotension.

The information on medication at referral was close to correct, but was not used.

Ipratropium bromide inhalation (category E) and zopiclone (category C) are missing during hospitalization but were reinforced by the GP at the first consultation.

The present study was carried out not to give reliable prevalence data on medication errors, but to explore how inadequate communication on medication use across health care levels leads to medication errors and to describe why and when they occur. The process of admission to and arrival at the hospital seems particularly to facilitate such errors. We have not found any previous research describing exactly this problem.

The study describes what happened to the medication of 30 patients admitted to a general medical ward in central Norway. The number of patients studied is too small to give a proper quantification of the problem, and this is the main limitation of the study. The interviews with the patients indicated good compliance but this was not explored further in this study. Even so we assume that our patients are representative of patients meeting the inclusion criteria and the results are believed to be transferable. Critically ill patients were not included in the study. As such patients are less able to give information on their drug use, they are probably even more vulnerable to medication errors.

Only two of the 30 patients themselves carried a complete, updated medication list written out by their GP. Five patients brought no information at all regarding their medication when coming into hospital. A survey from 2009 showed that Norwegian GPs give their patients a written medication list less often compared with several other European countries; only 20% say they do so [18]. Our study supports this and illustrates how important it is for GPs to keep their patients' medication lists updated at all times. Patients with a complete, updated medication list in the referral letter had no errors made in the curve on admittance. As long as an online solution does not exist, every patient should carry a written and updated medication list, so that this crucial information is available whenever needed. The medication list is also an important communication tool between GP and patient. When updating the list, the GP should take the opportunity to review the

medication with the patient, to check compliance, ask about side effects and discuss the patient's understanding of the drugs in use.

The study also highlights the importance of thoroughness concerning the medical curve on admission and of obtaining reliable information if the medication list in the referral letter is missing or is incomplete. In order to reduce medication errors the missing information should be obtained from the home care services or the GP's office and through reviewing the medication with the patient.

The importance of an accurate medication list is brought up in a nationwide patient security campaign in Norway from 2011–2013 [19]. A proper quantification of the problems is necessary to make physicians acknowledge the problem, politicians bring it up, and patients demand secure and transparent medication lists, in order to reduce medication errors.

Funding

The Norwegian Committee on Research in General Practice has funded three months for the first author to carry out the study.

Declaration of interest

The authors report no conflict of interest. The authors alone are responsible for the content and writing of the paper.

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