Medication reconciliation of patients with hip fracture by clinical pharmacists

Anne Marie Gjerde,¹ Elizabeth Aa,¹ Janne Kutschera Sund,^{2,3} Pal Stenumgard,⁴ Lars Gunnar Johnsen^{5,6}

¹Trondheim Hospital Pharmacy, Trondheim, Norway

²Central Norway Hospital Pharmacy Trust, Trondheim, Norway

³Department of Laboratory Medicine, Children's and Women's Health, Norwegian University of Science and Technology, Trondheim, Norway

⁴Department of Geriatrics, St Olav's Hospital, University Hospital of Trondheim, Trondheim, Norway

⁵Department of Orthopaedic Surgery, St Olav's Hospital, University Hospital of Trondheim, Trondheim, Norway

⁶Department of Neuroscience, Norwegian University of Science and Technology, Trondheim, Norway

Correspondence to

Janne Kutschera Sund, Sykehusapoteket i Trondheim, MTFs vest, Trondheim 7489, Norway; janne.sund@sykehusapoteket.no

AMG and EA are joint first authors.

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ABSTRACT

Objective Medication reconciliation is a strategy for reducing medication discrepancies and improving patient safety. Transitions through different levels of care contribute to medication discrepancies caused by lack of communication. In October 2011, St Olav's Hospital initiated a fast-track model for patients with hip fractures, where clinical pharmacists (CPs) are a part of a multidisciplinary team. The purpose of this study was to examine discrepancies discovered in medication lists by CPs at the orthopaedic ward and consider their clinical relevance.

Method This prospective study was conducted at an orthopaedic ward at St Olav's Hospital in the period October 2011–August 2012. Medication reconciliation by CPs was done for all patients with a hip fracture using a systematic method. Information was obtained by the CP by interview with the patient and additional sources, for example, medication list from general practitioner and nursing home. An independent expert group consisting of a geriatrician, an orthopaedist and a CP considered level of clinical relevance of the discrepancies found in the collected data.

Results A total of 410 discrepancies were registered for all 317 patients. Discrepancies were found in 159 (50%) patients with an average of 2.6 per patient affected. Of the total amount of discrepancies, the expert group evaluated 68% and 19% as potentially moderate and severe, respectively, if they were unattended during hospitalisation and after discharge.

Conclusions By using CPs in medication reconciliation at orthopaedic wards, discrepancies that can lead to serious discomfort or clinical deterioration of patients can be avoided.

fall-related injuries in the elderly seem to be previous falls, gait and balance, reduced sight, sudden illness, chronic illness, orthostatic hypotension, medications and alcohol.^{1–3} Use of medication is one of the most amendable risk factors among the elderly.¹

In October 2011, St Olav's Hospital initiated a fast-track (FT) model for patients with hip fractures. The FT method is a way of organising clinical pathways using principles from lean methodology.⁴ The aim is to improve quality. The key concept is the standardisation of most of the routines that build up the clinical pathway. The FT model is often termed a 'standardised clinical pathway'. Clinical pharmacists (CPs) are a part of a multidisciplinary team. The CP use the integrated medicines management (IMM) model, which is a research-based model that aims to provide a seamless flow of medication information between different levels of care, and provide individual and optimised medical treatment at hospitals.⁵ The IMM model consists of three modules, where the first module is medication reconciliation. Medication reconciliation is a strategy in several national healthcare initiatives aiming to reduce the occurrence of medication discrepancies, and thus, improve patient safety.^{6–7}

At hospitalisation, incomplete information about medication use during admission is a common problem. Studies show that medication discrepancies occur during transitions of care, as often as in 70% of patient admissions. Almost one-third of these discrepancies have the potential to cause patients harm.^{6–11}

Discrepancies could lead to adverse events during hospitalisation, and may also form an inaccurate basis for further decision-making regarding the treatment. Discrepancies can prolong hospital stays and may in the postdischarge period lead to emergency department visits, hospital readmissions and use of other healthcare resources.¹²

Medication reconciliation on admission is a step that can increase patient safety. The WHO has listed medication reconciliation as one of the five most important strategies to improve patient safety. The report concluded that the evidence for clinical relevance of reconciliation requires an intervention by a pharmacist.¹³

To our knowledge, similar studies regarding patients with hip fracture in an FT model at orthopaedic wards have not been previously conducted. The purpose of this study was to examine discrepancies discovered by pharmacists in patients medication lists at an orthopaedic ward and consider their clinical relevance.

INTRODUCTION

Fall-related injuries are the most common type of injuries among the elderly. The frequency is high, and the consequences are often severe. One in three over the age of 65 falls at least once a year, and one in two persons over the age of 80 falls at least twice a year. Hip fracture is the most frequent fall-related injury, and Norway has one of the highest rates of hip fractures in the world, with 9000 cases each year.^{1–2} At St Olav's Hospital in Central Norway, this is the largest group of trauma patients, with 389 registered cases in 2012 (Personal communication professor Olav A. Foss, St Olav's Hospital, 2013).

Various fall-related risk factors were found in several studies, which underline how the tendency for fall-related injuries often has multifaceted causes. The most predominant risk factors for

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METHODS

This prospective study was conducted at an orthopaedic ward at St Olav's Hospital, consisting of 24 beds. Medication reconciliation by CPs was done for all patients with hip fracture admitted to the orthopaedic ward in the period October 2011–August 2012 using IMM.⁵ All CPs involved in the study had previous training and experience in the use of IMM model. CPs responsible for inclusion were available from Monday to Friday. Patients admitted and discharged during weekends and holidays were not included.

The study was conducted with the approval of the patient safety officer at St Olav's Hospital.

A CP identified each patient's preadmission medication list. Patients who administered their own medication were interviewed. During the interview, patients were asked to identify their medication by name, dose, dosage and indication. A detailed checklist was reviewed with the patient, with questions regarding use of painkillers, heart medications, gastrointestinal drugs, sleeping pills, antidiabetics, eye-drops and eardrops, inhalation drugs, ointments, over-the-counter drugs and herbal drugs. The patient's relatives, his/her community pharmacy and/or regular general practitioner (GP) were contacted as needed.

For patients who were assisted in administering their medication, paper-based preadmission medication lists were obtained by fax from nursing homes or home care services. The need for additional information was considered in each case and, when necessary, the patient was interviewed and the GP contacted.

CPs documented their work in an IMM medication interview questionnaire form. Discrepancies between the patient's preadmission medication and the admission medical list written by the physician were continuously registered in a spreadsheet and categorised in the following manner:

1. Medication is included in the admission medical list, but the patient did not take it prior to admission.
2. Medication is not included in the admission medical list, but the patient did take it prior to admission.
3. Discrepancy in dose.
4. Discrepancy in dosage form.
5. Discrepancy in dosage and dosing time.

In addition, the patient's gender, age, illnesses, medications, critical information, living situation and medical information sources were registered.

The preadmission medication list identified by the CP was regarded as the most accurate list available. It was based on the medication list closest to the patient and a well-established, systematic method was used. Discrepancies were discussed with a ward physician in a multidisciplinary team. Medications stopped or modified because of surgery or anaesthesia were not counted as a discrepancy. Non-prescription drugs were not included.

Clinical relevance of discrepancies both in a short-term and long-term perspective were later reviewed by an independent expert group consisting of a geriatrician, an orthopaedist and a CP. The group received case report forms for each patient containing gender, age, medical history, medications, living situation and which discrepancies the CP had uncovered.

The classification system used is described by Cornish *et al.*¹¹ Discrepancies were classified according to their severity, as having minimal, moderate or severe potential to cause harm. An additional fourth class of non-classifiable discrepancies was added to the classification, see [table 1](#).

The methodology was explained during the first expert group meeting, followed by a review of five cases to familiarise the group with the classification system used. In total, three meetings were held to review all the included patients. Prior to each

Table 1 Classification of discrepancies

0	Unclassifiable
1	Unlikely to cause patient discomfort or clinical deterioration
2	Potential to cause mild-to-moderate discomfort or clinical deterioration
3	Potential to cause severe discomfort or clinical deterioration

meeting, each member of the expert group reviewed the case report form individually. Disagreements were discussed until consensus was reached for all discrepancies. The case report forms were collected and the degree of agreement was evaluated using Cohen's κ . Values for $\kappa > 0.75$ indicates excellent agreement between the raters, while values from 0.40 to 0.75 indicates fair to good agreement and values < 0.40 poor agreement.¹⁴ The results were registered in a spreadsheet where Cohen's κ was calculated.

RESULTS

Demographics

A total of 342 patients were hospitalised with hip fractures in the inclusion period from October 2011 to August 2012; 317 of these patients were included in the study; 25 patients were not included. The mean age (range) was 82 years (51–103). Female patients represented 66% ($n=210$) of the total. The average number of medications used on admission to hospital (range) was 7 (0–20).

A total of 172 (54%) patients were residents at a nursing home or were assisted by home care services, and the remaining 145 (46%) patients self-administered their medication. For most patients ($n=238$), only one source for medication information was used. A smaller number of patients had information from two ($n=67$) or three ($n=12$) sources available ([figure 1](#)).

Figure 1 Sources used for medication reconciliation for different patient groups. *Other sources include information from pharmacy, patient journal, specialist and relatives.

Figure 2 Distribution of discrepancies by categories.

Frequency and types of discrepancies

A total of 410 unintended discrepancies were registered for all 317 patients. Discrepancies were found in 159 patients (50%) with an average of 2.6 per affected patient. The distribution of discrepancies in each of the categories is shown in [figure 2](#). The most frequent medication error was medication omission (61%) followed by discrepancy in dosage and dosing form (19%).

Discrepancies could be traced back to a total of 160 different types of medication ([figure 3](#)).

Clinical relevance and agreement

Of the 410 discrepancies discovered, 19% were evaluated as potentially severe if they were upheld beyond the hospital stay. In addition, another 68% could potentially cause mild to

moderate discomfort or deterioration if not addressed. A total of 53% and 13% were evaluated as unlikely to cause discomfort in short-term and long-term perspective, respectively. Based on the presented results, the severity appears to increase if the patient discrepancies remain undetected during hospitalisation ([figure 4](#)). For details of some of the discrepancy assessments from each of the three classes, see [table 2](#).

The inter-rater reliability for the assessment of the expert group

The magnitude of agreement according to Cohen's κ varied within the expert group between 0.1 and 0.45, that is, poor to fair/good. The highest magnitude of agreement appeared between the pharmacist and geriatrician (0.43), with a lower

Figure 3 Medication appearing most frequently in the discrepancies found (n total=410).

Figure 4 Clinical relevance of discrepancies in both a short-term and a long-term perspective (severity of discomfort or deterioration).

rate of agreement between CP and orthopaedist (0.25), and orthopaedist and geriatrician (0.10).

DISCUSSION

This study revealed 410 discrepancies, and in one of two patients, at least one discrepancy was found. 19% of the discrepancies were evaluated as potentially severe in a long-term perspective.

A total of 25 patients were not included in our study. A possible explanation could be that pharmacists responsible for inclusion were not available during weekends and holidays, which led to the absence of inclusions during such periods of time.

The majority of the patients were elderly and 50% had discrepancies in their medication lists, the most common error being omission of medication. These results are similar to what is shown in other studies.^{11 15–17} Hellström *et al* found 1.7 discrepancies per patient in the total cohort, and 2.7 per affected patient. This corresponds well with our findings, which showed 1.3 discrepancies per patient in total, and 2.6 per affected patient. Cornish *et al* found fewer discrepancies per patient (0.93), but their patients, in turn, had a lower mean age than in our study (77 vs 82 years) and they also excluded patients normally residing in nursing home. It would be reasonable to believe that older and frailer patients also have longer medication lists, which could potentially generate more discrepancies. Non-prescription drugs were not included in our study; this varies between the studies referred to above and may also have contributed to the number of discrepancies found.

Some discrepancies may be directly related to intentional changes in the medication list by the treating physician, for example, discontinuation of a specific medication or changes in dosage without further documentation in the patient's chart.

Intentional changes have not been registered as discrepancies in this study.

Among the medication most often involved with discrepancies were sedatives and analgesics, for example, zopiclone, codeine and oxazepam. This is consistent with other findings.^{6 16 17} These medications are commonly provided as needed and patients might easily forget to mention the medication as it is not used daily, or it could be that the admitting physician does not consider as needed medication as important and it is therefore an intended discrepancy. Nursing homes often list as-needed medication separately, and it can be difficult to know whether such medication is actually included, and whether it has been recently administered.

Cardiovascular agents seem to appear more frequently in several studies.^{6 9 11 16} In the present study, one cardiovascular agent, metoprolol, appeared noticeably more frequently. Metoprolol exists in two different formulations, both immediate and extended release, and this was often not specified in the chart.

More than half of the patients did not administer their medication themselves, but were either resident at a nursing home or assisted by home care services. For that reason, only one source of information was used for 75% of the patients. Other studies have been more systematic and collected all available medication lists for patients who were not able to conduct an interview.¹⁵ Other studies have only included patients where it has been possible to interview either the patient or his/her next of kin, not including nursing home residents.^{10 11 18} This will contribute to a younger study population. The focus in this study has been to collect the medication list closest to the patient. If any uncertainties were revealed, additional lists were collected. For instance, an additional medication list from the GP was collected for 23 patients with home care service.

For the remaining patients that did not receive help administering their medication, 95 patients were interviewed. Information was collected from the GP for 84 patients.

For patients that were seemingly well versed on their medications during their interviews, further inquiries to their medications were deemed unnecessary. For a portion of the patients administering their medication themselves, only lists provided by their GP were used. Reasons for this could be that the patient didn't have a good overview of their medications, or that the patient was unavailable for interview due to surgical procedures or other examinations. This could be a weakness with our study as it is unknown whether the patient actually uses the medication listed by their GP.

In hindsight, all patients living at home having their medication administered by home care service should have been interviewed to uncover whether or not they were actually taking their medication as prescribed and also if they were using medications as needed.

Table 2 Examples of discrepancy assessments provided by the expert group

Discrepancy	Severity if undetected during hospitalisation	Severity if undetected when discharged
Methotrexate inj. 15 mg/weekly, included in medical history, but patient not using it (female—84 years)	3	3
Latanoprost eye-drops 50 µg/ml daily, not included in medical history, but patient using it (female—82 years)	2	3
Digitoxin 50 µg/daily, discrepancy in dose (female—90 years)	1	3
Metoprolol 50 mg/daily, discrepancy in dosage form (female—86 years)	2	2
Vitamin B ₁₂ depot-inj. every 3 months, not included in medical history, but patient using it (female—89 years)	1	2
Simvastatin 20 mg/daily, discrepancy in administration time (female—87 years)	1	1

In a review from Tam *et al.*⁶ the clinical importance of medication history errors is described in six of the studies, and 11%–59% of the medication history errors were estimated clinically important. Cornish *et al.*¹¹ found that 61.4% were unlikely to cause harm, 32.9% had potential to cause moderate discomfort and 5.7% had potential to cause severe discomfort. These findings are similar to the findings in our study including the Cohen's κ for the inter-rater reliability of the expert group. Other studies have used a different scale, and are thus less eligible for direct comparison.^{10 15}

Observing the severity in the long term showed that 19% of the discrepancies in our study were potentially severe if undetected when the patient leaves the hospital. If the error continued beyond discharge, there was a shift to greater harm for the patient.^{10 19}

The patients' care level can directly influence the consequences of discrepancies. There is seemingly a causal connection between the patients' care level and the consequences of discrepancies in their medication. For instance, omission of sleep medication for a patient who manages his own medication may have a different potential outcome than omission when the medication is administered by home care services.

CONCLUSION

Medication reconciliation on admission is an important step to improve patient safety. In our study, 50% of the patients had at least one discrepancy in their medication list, and 19% were evaluated as potentially severe if they were upheld beyond discharge. These results show that the processes of recording medication histories on admission are inadequate. By using CPs in medication reconciliation at orthopaedic wards, one can avoid discrepancies that could lead to serious discomfort or clinical deterioration of patients.

What this paper adds

What is already known on this subject

- Incomplete information about medication use during admission is a common problem.
- Medication reconciliation can improve patient safety.
- Several studies regarding medication reconciliation at internal medicine wards have been conducted.

What this study adds

- This study shows that medication reconciliation is important in patients with hip fracture admitted to an orthopaedic ward.
- By using clinical pharmacists in medication reconciliation at orthopaedic wards, one can avoid discrepancies that could lead to serious discomfort or clinical deterioration of patients.

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Ethics approval The patient safety officer at St Olav's Hospital.

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