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Do Orthogeriatric Inpatients Have a Correct Medication List? A Pharmacist-Led Assessment of 254 Patients in a Swedish University Hospital

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Abstract

Introduction: Comorbidities and polypharmacy complicate the treatment of geriatric patients with acute orthopedic injuries. A correct medication history and an updated medication list are a prerequisite for safe treatment of these debilitated patients. Published evidence suggests favorable outcomes with comanaged care. The aim of this study was to assess the accuracy of the inpatient medication lists generated at admission and investigate the efficacy of a dedicated ward-based pharmacist to find and correct mistakes in these lists. **Methods:** A total of 254 patients were enrolled. The ward-based pharmacist performed the assessment regarding the accuracy of the medication list generated at admission by the method of medication reconciliation. Number of discrepancies and types of discrepancy were noted. **Results:** The 254 patients (176 women) had a mean age of 85 years (standard deviation 7.4 years, range 42-100 years). The most common reason for orthopedic admission was hip fracture. The mean number of discrepancies was 2.1 for all patients (range 0-13). Omission of a prescribed drug was the most common mistake. Fifty-six (22%) of the 254 assessed patients had a correct medication list. **Discussion:** The many discrepancies in our study may have several explanations but highlight the difficulties in taking a correct medication history of patients in a stressful environment with an extremely high workload. Moreover, electronic medication lists create challenges. Implementing new electronic tools for health care requires feedback, redesign, and adaptation to meet various needs of the users. **Conclusion:** In conclusion, orthogeriatric patients have an unsatisfactory high number of discrepancies in their medication lists. Clinical pharmacists can accurately identify many of these mistakes.

Keywords

medication reconciliation, orthogeriatric, discrepancies, pharmacist, medication list

Introduction

One-third of patients with geriatric hip fracture present with 1 comorbidity and 17% with 2 or more comorbidities.[1] Complications are common and include postsurgical delirium, renal and heart failure, infection, deep venous thrombosis, pulmonary embolism, and death. A multidisciplinary approach in the treatment of geriatric patients with acute orthopedic injuries is gaining popularity internationally. Published evidence suggests favorable outcomes of patients with hip fracture treated with comanaged care models.[2-5] Studies show fewer complications, shorter hospital stay, more frequent discharges to preinjury homes, and decreased mortality.[3,4,6-8] Orthogeriatric patients often have a long list of medications for cardiovascular, pulmonary, diabetic, and renal comorbidities. Over the past years, the patient population with hip fracture has changed dramatically regarding comorbidities, with a 2-fold increase in patients taking 4 or more medications (40% of patients) and a 2- to 4-fold increase in patients with cardiovascular or renal disease.[9] These patients are often admitted to hospital from the emergency department, and several studies have shown the difficulty in taking a correct medication history and creating a reliable medication list in this setting.[10-13] An up-to-date inpatient medication list containing all the medications the patient is currently using is an essential step in optimizing the patient for surgery.

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The orthopedic department at our hospital reorganized its 4 wards in 2012. One ward was designated for orthogeriatric patients (ie patients older than 75 years of age), with at least 2 other comorbidities (eg, diabetes, hypertension, cardiovascular, or respiratory disease) AND an acute orthopedic injury. An internal medicine specialist and an orthopedic surgeon mutually cared for the patient. We employed a ward-based clinical pharmacist (first ever on a ward in Sweden) to address pharmaceutical problems in our geriatric patients. The pharmacist continuously assesses the patient's medication orders, possible pharmaceutical interactions, and supports the internal medicine specialist and the orthopedic surgeons working on the ward in their pharmaceutical decision-making processes. It was initially obvious to the pharmacist that the medication list contained both mistakes and discrepancies, and we therefore decided to quantitatively assess this problem among our geriatric trauma patients. The aim of this study was to assess the accuracy of the inpatient medication list generated at admission at the orthopedic emergency department.

Patients and Methods

Patients

In the orthogeriatric ward at Uppsala University Hospital, 254 consecutive patients were prospectively enrolled after admission. Although the ward is designated for patients aged older than 75 years, 8 patients younger than 75 years were admitted, most probably because of lack of beds in other wards at this busy university hospital. However, these patients were those with an acute orthopedic injury, and they had the same medication reconciliation done by our pharmacist. Because we focused on the accuracy of the orders in the charts, we chose to include all 254 patients.

Study Setting

At our hospital, all inpatient medications are distributed according to orders in the electronic medication list within the electronic notes system (Cambio COSMIC). The medication list describes the actual time of distribution, the dose and form of the drug, and whether this is a standing order or something to ask for as needed (ie pro re nata [prn]). This list is created upon admission to the orthopedic emergency department by the doctor on call (usually the orthopedic registrar) and has replaced previous paper medication lists. The medications are listed after taking a medication history from the patient. The patients in this age-group often carry a printed list of prescriptions from the national electronic system for multidose dispensed (MDD) medications (prescribed, and not over the counter, medications). Patients with MDD receive their prescribed medications in automatically prepacked pouches for each administration period for 2 weeks at a time. The MDD is widely used in Sweden for patients in nursing homes and for many patients receiving home care to ease the handling of medications. The current list of medications for a patient in the MDD system can be printed available to all doctors with an up-to-date password. Other patients who handle their own medications may carry their own notes, and further information of medication can be found in the notes system from previous visits to in- or outpatient clinics. Upon generation of the medication list, the admitting doctor's task is to retrieve this information, terminate medication orders considered unnecessary, and prescribe drugs for ongoing treatment. Terminated medications are clearly marked as terminated in the electronical system, as the admitting doctor has to approve or disapprove of previous medications.

Assessment of Medication Lists

The electronic medication lists of all 254 inpatients were assessed following admission. The admitting orthopedic surgeon was unaware of this assessment.

The assessment of the accuracy of the medication list generated by the admitting surgeon was done by the pharmacist working on the ward by a medication reconciliation that included interviewing the patients and relatives applying paper medication lists brought in by patients, assessing packages of medications brought in, using the previous prescriptions in the system, using previous medication lists in the hospital's electronic computerized patient note system, and employing the printed medication list from the MDD system if used by the patient. The average pharmacist review took 30 minutes (range 5-90 minutes) and was typically performed in the early postoperative phase or within the first days of inpatient care for nonsurgically treated patients.

The inpatient medication list generated at the emergency department by the admitting orthopedic surgeon was compared with the outcome of this assessment. The number of discrepancies and the types of discrepancy in the electronic medication list were noted, that is, omitted and committed drugs, incorrect distribution times, and duplicate drug orders. Omitted drugs were defined as drugs that the patient was actually taking but that were not on the inpatient list. Committed drugs were drugs on the list, but the patient had stopped taking these medications. Duplicates were generic drugs under different names.

Statistics

The descriptive results are reported as mean $\pm$ standard deviation (SD).

Ethical Considerations

The study was approved by the local ethics committee (2013/259).

Results

The 254 patients (176 women) had a mean age of 85 years (SD 7.4 years, range 42-100 years). The most common reason for orthopedic admission was hip fracture (50%, neck of femur and intertrochanteric femur fracture), followed by fracture of the proximal humerus (15%), pubic rami fractures (9%), and

Table 1. Number of Errors in 254 Medication Lists, N.

Omitted standing drug	114
Omitted as needed drug	46
Committed drug	138
Prescription not activated	71
Duplication	20
Wrong distribution time	53
Dosing error	73
too low	*45*
too high	*28*
Standing/pro re nata mismatch error	16
Wrong formulation	4
Total errors	535

vascular compromise of the lower extremities due to atherosclerosis (7%).

An MDD list was available for 128 of the 254 patients. Twenty-two of the patients without MDD had no electronic prescriptions at all, most likely because they had a private general practitioner (GP) not using the electronic patient notes system. The other 104 patients had previous electronic prescriptions accessible through the patient notes system.

The mean number of discrepancies was 2.1 (SD 2.1) for all patients. The MDD group had 2.3 discrepancies, whereas the group without MDD had only 1.6 discrepancies. The number of discrepancies for all patients ranged from 0 to 13.

Fifty-six (22%) of the assessed patients had a correct medication list with no discrepancies, 152 (60%) patients had 1 to 3 discrepancies, 33 (13%) patients had 4 to 6, 11 (4%) patients had 7 to 9, and 2 (1%) patients had 10 or more between the electronic medication list and the gold standard pharmacist-assessed medication list.

The 254 patients had 535 errors in the medication lists (Table 1). Of the drugs the patients were currently taking, 160 were omitted; 138 drugs that the patients had stopped taking had been added as active prescriptions in the medication lists (committed). The most common duplication error was paracetamol under different brand names, creating a clear risk of a too high daily dose. In addition, 3 duplication errors with generic cardiovascular drugs (angiotensin-converting enzyme inhibitors) prescribed under different brand names were found. We also found a high proportion of prescriptions that were not activated in the system, that is, they could be seen in the system (able to read prescriptions, but not able to access for active administration, which is due to a technical issue in our system) but were not accessible to the nurse for administration of the drugs.

The cardiovascular, vitamin/mineral, and gastrointestinal drugs were the most common drug classes among the omitted standing drugs (10%-20% of all omissions; Table 2). Particularly noteworthy is that omissions of analgesics made up 9% of all omissions, with some omitted narcotic painkillers as well. Among the ''as-needed/prn'' medications, omitted narcotic drugs (sleeping pills and narcotic analgesics) comprised 20% of all omissions. The cardiovascular drug omissions were 13% of the standing drug omissions and 15% of the as-needed drug omissions. Drugs were only considered omitted if not in the medication list as either ''as-needed'' or ''standing'' orders.

Table 2. Medication Omissions by Drug Class, n (%).

Drug class	Omissions (standing)	Omissions (as needed)
Cardiovascular	15 (13%)	7 (15%)
Endocrine	8 (7%)	0
Vitamins/minerals	16 (14%)	2 (4%)
Ophthalmologic	10 (9%)	2 (4%)
Antiplatelet/anticoagulant	9 (8%)	0
Psychiatric	5 (4%)	1 (2%)
Respiratory	2 (2%)	0
Gastrointestinal	19 (17%)	4 (9%)
Narcotic	3 (3%)	9 (20%)
Analgesics	10 (9%)	2 (4%)
Others	17 (15%)	19 (41%)
Total (n)	114	46

Discussion

We have shown that the electronic medication lists made up at admission for the orthopedic ward at Uppsala University Hospital contain many discrepancies compared to the medications that patients actually use. The ultimate goal when administrating medications should be the ''five rights'' for achieving medication safety: right drug, right dose, right route, right time, and right patient.[14] Clearly, we fall short of reaching this goal, a problem shared by others and possibly a general problem in this field.[12,15,16]

The treatment of orthogeriatric frail patients is a difficult task for a single speciality and for a single profession. Not surprisingly, several publications have shown an improvement in the care of orthogeriatric patients with a multidisciplinary approach. Patients seem to have fewer complications, have a better outcome, return to preinjury living status, and have a lower mortality rate.[3,4,6-8] An extension of the multidisciplinary approach is to designate resources that specifically focus on orthogeriatric patients' medications during the acute care phase. At our institution, we have taken the approach to employ a ward-based pharmacist whose main goal is to improve pharmaceutical care of our patients. In this study, we show that this approach can detect and prevent many potentially harmful mistakes in the pharmaceutical care of patients. The study included only the actual number of medication list errors and did not assess the potential harm from such errors.

For several reasons, the ''correct'' order for current medications for a patient on any given day is often difficult to determine. Patient factors (eg, old age, dementia, patients visiting several doctors in different specialties, and variability in patient compliance) influence medicine intake. In our country, and many others, different information technology (IT) solutions, patients consulting in both the private and the public sector, and other administrative factors may complicate efforts to obtain

correct information. For these reasons, a structured mode of gathering information about the actual medication is essential.

For patients with intact cognitive functioning, a list of prescribed medications that can be verified by the patient at admission is an encouraging start. For patients with impaired cognitive function, verifying the electronic records with relatives or a health care professional becomes more important. Hence, a nationwide single computerized prescription database has been suggested as the optimal solution for these patients. While waiting for the perfect IT solution, other measures are needed.

The pharmacist in our department used all available information to produce the actual current medication list, that is, the gold standard medication list as described by Pippins et al.[16] The medication reconciliation was conducted daytime on the ward. With this method, we found that only 22% of the patients had a correct medication list. This was a worse result than reported by Unroe et al who found 1 or more discrepancies in 23% of medication lists[12] but better than the study by Caglar et al in which 87% of emergency department medication lists had at least one error.[15]

The many discrepancies in our study may have several explanations. In addition to the innate difficulties of taking a correct patient medication history in a stressful and demanding work environment, the computer systems themselves create challenges. First, the medication list in our electronic patient system is sometimes hard to master, and prescriptions can be difficult to perform even with the best intentions. Within the system, previous prescriptions can relatively easily be activated when creating the new list upon admission. This event introduces the risk of transferring errors from previous lists. If the previous prescription was done with the wrong administration times or the wrong formulations, the subsequent prescription will be wrong. Activating medications without a proper up-to-date medication history from the patient will likely perpetuate errors. Another potential reason is the difficulties in login access to the national electronic MDD system. The MDD system is a valuable tool that provides details of medications, doses, and administration times. However, the information still has to be transferred manually into the inpatient's medication list. The annoyance of accessing, printing, and then manually transferring the information between the systems may explain why the patients with MDD had 2.3 discrepancies compared to 1.6 in patients not enrolled in the MDD system. The admitting physician possibly used printed older versions of ApoDos orders rather than going through the exertion of accessing current data.

Previous research has concluded that errors not only occur at admission to hospital but also at discharge and transfer within the hospital. Two studies on medication reconciliation at discharge have shown a lower rehospitalization rate in the intervention groups (3% vs 10%)[17] and readmission at 30 days (10% vs 38%).[18] Medication changes are sometimes performed without informing the patients. In this respect, 1 study showed that less than half of the patients were informed about medication changes at discharge, and only 12% who had their preadmission medication stopped had actually been given written information to stop taking the medication at discharge.[12] Our hospital has now implemented a written discharge letter that contains ongoing medication and in-hospital medication changes. Adding a structured medication report like this to the discharge letter has been shown to have a dual effect: increases adherence to the discharge medication and reduces medication errors.[19] The emergency department is a recognized high-risk setting for prescription errors.[15] Pharmacists can accurately identify and correct many of these mistakes in a similar fashion as in this study.[10,11] We describe the actual accuracy of the inpatient medication list but have little information about the rationale behind the admitting physician's decisions to discontinue medications. Some of these decisions are certainly debatable and may be correct although they may be listed as errors in this study.

Implementing new electronic tools for health care requires redesign and adaptation to meet the needs of the users, that is, doctors and nurses. Often these systems are the result of technicians and software engineers creating software that is theoretically appealing but dysfunctional in a clinical setting. In our hospital, the monitoring, modification, and improvements in the system have not been as fast as required to help the daily users of the system. The present findings provide a forceful argument for modifications and improvements in the system to facilitate clinical work. A previous study also demonstrated that clear computerized doctor order entries in plain language (vs Latin) facilitate interprofessional communication and subsequently increases patient safety.[14]

In conclusion, orthogeriatric patients have an unsatisfactory high number of discrepancies in their medication lists. The reason for these discrepancies is multifactorial and includes difficulties obtaining a correct history of drug treatment in the emergency department setting in combination with complex IT solutions. A ward-based clinical pharmacist that provides medication reconciliations is a viable means of improving patient outcomes.

Declaration of Conflicting Interests

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