Medication discrepancies affecting senior patients at hospital admission

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Inconsistencies between patients' admission orders and home medication regimens may occur.[1-9] The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) recognizes that medication safety is compromised when these discrepancies occur[1] and requires hospitals to develop a process for obtaining complete medication histories from patients and documenting, validating, and transferring that information across the continuum of care.[2]

Currently, there are limited data regarding the type, frequency, and severity of medication discrepancies between the patient's home regimen and the patient's admission orders. Gleason et al.[8] and Cornish et al.[9] have published studies describing the discrepancies that occur when medication histories are obtained by pharmacists and compared with admission orders in the general patient population. No studies specifically investigating the type, frequency, and severity of medication discrepancies for hospitalized senior patients have been published.

We conducted a study to identify the type, frequency, and severity of medication discrepancies in the medication histories of and admission orders for senior patients admitted to a medical intermediate care unit (MIMU).

Methods. A prospective descriptive pilot study was conducted between December 2004 and February 2005 at a community teaching hospital with over 1000 beds after receiving investigational review board approval. Medication histories were taken by pharmacists or senior doctor of pharmacy students (under the direction of a preceptor) within 24 hours of a patient's admission to an MIMU and compared with admission orders to identify discrepancies. In addition to gathering data about home medication use, supplemental information was obtained from the patient's caregiver or current pharmacy, if necessary. Information was documented on a data collection sheet that was designed to standardize the medication reconciliation process.

A convenience sample of patients was included in this pilot study. Patients were included if they spoke fluent English, were at least 55 years old, and were admitted to an MIMU between a Sunday afternoon and a Friday afternoon. Non-English-speaking patients were excluded because of concern for time delays if a translator's services were needed and because they represent a very small segment of the MIMU population. Patients were excluded from the pilot study if they were admitted from a nursing home or if they demonstrated changes in mental status. Nursing home patients were excluded because they were admitted with detailed medication lists. Patients with mental status changes were excluded because they were unlikely to provide accurate medication histories. Mental status changes were defined as changes in mental status diagnosed by a physician at admission, as documented in the patient's chart. In addition, pa-

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tients were excluded if they had a diagnosis of dementia and did not have a reliable caregiver present. Dementia was defined as deterioration of intellectual faculties, such as memory, concentration, and judgment, resulting from an organic disease or a disorder of the brain, such as Alzheimer's disease, and was documented in the patient's chart by a physician.

Medication histories were obtained by pharmacists or students and compared with the patient's admission orders to identify discrepancies. A discrepancy was defined as an inconsistency or difference identified between the two. New therapies or changes in a route of administration were not considered discrepancies if they were consistent with the patient's clinical status and diagnosis documented at admission. Therapeutic interchanges were not considered discrepancies.

Once identified, discrepancies were quantified, classified, and rated based on severity (appendix). Medication discrepancies were classified as an omission; a commission; a different dose, route, or frequency; or a medication change within a medication class.

Severity was rated at the time the medication discrepancy was identified by the pharmacist obtaining the medication history using a modified version of the National Coordinating Counsel for Medication Error Reporting and Prevention (NCCMERP) Index for Categorizing Medication Errors.[10] The severity of each discrepancy was then reviewed and approved by the investigators.

Reconciliation of the discrepancies was attempted via oral or written communication with the prescriber. Discrepancies unlikely to result in harm to the patient were documented on an existing multidisciplinary communication form located in the patient chart. This form includes a section for the prescriber to provide rationale for acceptance or rejection of recommendations and is not a part of the permanent medical record. Discrepancy classification was based on a modified method previously described by Gleason et al.[8]

Discrepancies involving high-risk medications, as identified by the Institute for Safe Medication Practices,[11] such as cardiovascular medications or electrolytes, were orally communicated to prescribers.

Descriptive and statistical analyses were completed using Excel 2000 (Microsoft, Redmond, WA) and SPSS, version 10 (SPSS Inc., Chicago, IL). The Mann-Whitney *U* test was used to analyze the association between discrepancy rates. The a priori level of significance was 0.05.

Results. A total of 219 patients were screened for inclusion, with 63 patients meeting the inclusion criteria. The majority of patients were men (38 [60%]), and the mean ± S.D. age of all included patients was 74 ± 9 years. Pneumonia (10 patients [16%]) or syncope (9 patients [14%]) accounted for the majority of the admitting diagnoses. Forty-nine (78%) patients included in this study had at least four medical conditions in addition to their acute diagnosis, with a mean ± S.D. of 9.0 ± 3.9 medications ordered at admission per patient. These 567 medications comprised the patients' home medications and new medications started at the hospital and included prescription (471 [83%]), nonprescription (28 [5%]), and episodic (57 [10%]) medications. Herbal products ($n = 11$) taken at home were withheld at admission. In addition, 28 patients (44%) included in this study brought a medication list with them to the hospital. Four patients (6%) used mail-order pharmacies. The estimated time required to obtain a patient's medication history was 8 minutes. In addition, pharmacists telephoned each patient's local and mail-order pharmacies 57% of the time to verify home medications (when patients provided questionable information). The time required to call pharmacies for such verification was not recorded. Pharmacists also spent time performing pharmacotherapeutic assessment for each patient. Overall, pharmacists spent an estimated 30 minutes per patient.

Home medications. The mean ± S.D. number of prescription medications taken at home by patients was 7.2 ± 4. Patients used a mean ± S.D. of 1.5 ± 1.6 nonprescription medications in addition to their prescription medications. Multivitamins accounted for the majority of nonprescription medications. Fifty-two patients (83%) did not use herbal products.

Medication discrepancies. A medication discrepancy was identified in the medical records of 41 patients (65%) (Table 1). There was a total of 93 medication discrepancies, with a mean ± S.D. of 1.5 ± 1.6 medication discrepancies per patient. In the 41 patients for whom a discrepancy was identified, the mean ± S.D. medication discrepancies was 2.3 ± 1.4 per patient. For patients taking 1–9 medications at home, there was a median discrepancy rate of 1 (range, 0–3) per

Table 1.

Medication Discrepancies Discovered in Records of Hospitalized Senior Patients

Variable	Patients with Medication List at Admission ($n = 28$)	Patients without Medication List at Admission ($n = 35$)
No. (%) patients with discrepancy	20 (71)	21 (60)
Total no. discrepancies	56	37
Mean ± S.D. no. discrepancies per patient (range)	2.0 ± 1.8 (0–7)	1.1 ± 1.2 (0–7)

patient, whereas for patients taking 10–19 medications at home, the median discrepancy rate increased to 2 (range, 0–7) per patient ($p = 0.001$).

Of the 28 patients who had brought medication lists from home, 20 (71%) patients' records had a medication discrepancy. Of those, 56 discrepancies were identified, with 12 (21%) attributed to nonprescription agents such as multivitamins and 44 (79%) represented discrepancies in prescription medications.

Types of medication discrepancies. The majority of medication discrepancies (53 [57%]) were categorized as omissions, and 30 discrepancies (32%) were categorized as a different dose, route, or frequency of a patient's home medication. Of the remaining discrepancies, 6 (6%) were typed as a commission, and 4 (4%) were typed as a medication change within a medication class without clinical explanation or formulary justification for the substitution.

Severity of medication discrepancies. The majority of the 93 medication discrepancies (67 [72%]) were category C errors, indicating that errors reached the patient but were unlikely to cause harm. For example, a home regimen of escitalopram 10 mg (as the oxalate), half of a tablet by mouth once daily, was ordered as escitalopram 10 mg by mouth once daily at admission. However, 24 medication discrepancies (26%) were category D errors, indicating that the discrepancy was severe enough to have necessitated monitoring or intervention to preclude harm. An example of this was seen in an admission order for digoxin 0.25 mg daily for a patient who took only half of a 0.25-mg tablet daily at home. Two discrepancies (2.2%) were categorized as category B errors because the pharmacy intervened before the order was entered in the pharmacy system.

Medications involved in medication discrepancies varied, but the majority of medications involved were classified as vitamins or electrolytes and cardiovascular agents (Table 2).

Reconciliation of medication discrepancies. Although 100% of medication discrepancies were communicated to prescribers, only 40% of recommendations related to medication discrepancies were accepted by prescribers.

Discussion. Medication reconciliation in the records of hospitalized patients begins at admission and must continue through the continuum of care.[2] The results of this investigation support previous findings that the first and foremost step in medication reconciliation is an accurate and complete medication history obtained by pharmacists.[8,9] Gleason et al.[8] and Cornish et al.[9] demonstrated that discrepancies requiring clarification by a pharmacist, identified by the comparison of medication histories taken by pharmacists and admission orders, were observed in the adult population with a rate of 0.5 and 0.9 discrepancy per patient, respectively. However, our study is the first to demonstrate discrepancies requiring clarification by pharmacists in the senior population, with the medical records of 65% of this population demonstrating an average discrepancy rate of 1.5 per patient.

We observed that as the number of home medications increased, the medication discrepancy rate increased. The patients included in our study had numerous diseases, with most patients having at least four medical conditions, in addition to their acute diagnosis, at admission. The senior patient, on average, also took more than seven medications at home. A common practice of senior patients, encouraged by health care professionals, is to carry a list of their home medications. Almost half of the patients included in this study brought a medication list with them to the hospital. However, most of these patients' medical records had a medication discrepancy. Patients' medication lists often did not include the strength or frequency of their medications. Because of this and the fact that patients may not keep these lists up-to-date or may have omitted certain essential nonprescription medications, we caution health care providers to avoid merely copying information from medication lists brought in by patients without validating the list's accuracy and completeness with the patient.

The majority of medication discrepancies were omissions of medications without a clinical explanation. The next most common discrepancy involved a different dose, route, or frequency. This is consistent with the data reported by Gleason et al.[8] and Cornish et al.[9] Twenty-eight percent of discrepancies involved vitamins or electrolytes; this is consistent with the findings of Gleason et al.[8] Cardiovascular agents (including β-blockers and antiarrhythmics), thyroid agents, and central nervous system agents (such as memantine and olanzapine) together accounted for 31% of discrepancies in our study.

The severity of medication discrepancies was determined at the time the discrepancy was discovered using a modified version of the NCCMERP Index for Categorizing Medication Errors Algorithm.[10] To avoid bias, speculation of the potential severity of medication discrepancies, if continued throughout

Table 2.

Medications Involved in Discrepancies ($n = 93$)

Medication Class	No. (%) Discrepancies
Vitamins or electrolytes	26 (28)
Cardiovascular agents	20 (22)
Inhalers	8 (9)
Antihyperlipemics	6 (6)
CNS agents[a]	5 (5)
Antidepressants	4 (4)
Thyroid agents	4 (4)
BPH agents	3 (3)
GI agents	3 (3)
Diuretics	2 (2)
Other	12 (13)

[a] CNS = central nervous system, BPH = benign prostatic hyperplasia, GI = gastrointestinal.

and beyond hospitalization, was not attempted. The majority of the medication discrepancies identified in this study were classified as category C (72%), indicating that the discrepancy reached the patient but was unlikely to cause harm, or category D (26%), indicating that the discrepancy reached the patient and could have necessitated monitoring or an intervention to preclude harm. JCAHO states that organizations should specify the expected time frame for a medication history and reconciliation to occur.[2] The severity ratings reported in this study were based on whether a discrepancy reached the patient and was identified within 24 hours of the patient's admission. The promptness of a 24-hour timeline for obtaining medication histories and reconciliation may have accounted for the decreased severity of medication discrepancies compared with those observed by Gleason and colleagues.[8]

All discrepancies detected in our study were communicated to prescribers by pharmacists. Pharmacist interventions to address the discrepancies mainly consisted of written communication on a patient-specific multidisciplinary document that was not part of the permanent medical record. While this mechanism of communication between health care professionals is used hospitalwide, knowledge of the study and purpose of the medication discrepancy interventions was limited. This may account for the low acceptance rate (40%) of interventions attempted. All oral recommendations (those involving high-risk medications) were accepted.

Clarifying medication lists with mail-order pharmacies was cumbersome because of the delay in accessing a pharmacist and the need for submission of patient-release documentation, as required by mail-order pharmacies. Although we had only four patients who used mail-order pharmacies, this could be a major limitation when verifying patients' home medications hospitalwide if more patients use mail-order pharmacies.

The results described were limited to the specific population included in this study (senior patients age 55 years or older without dementia or mental status changes at admission) and should be used cautiously in generalization to the greater population.

Conclusion. Medication discrepancies were frequently present in the medical records of senior patients at hospital admission and despite the use of home medication lists. Omissions and incorrect dose, route, or frequency accounted for the majority of medication discrepancies.

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Appendix—Classification of medication discrepancies

Severity[10,a]

Category A: No error, but capacity to cause error

Category B: Error that did not reach the patient; therefore, no harm

Category C: Error that reached the patient but unlikely to cause harm

Category D: Error that reached the patient and could have necessitated monitoring and/or intervention to preclude harm

Category E: Error that could have caused temporary harm

Category F: Error that could have caused temporary harm requiring initial or prolonged hospitalization

Category G: Error that could have resulted in permanent harm

Category H: Error that could have necessitated intervention to sustain life

Category I: Error that could have resulted in death

Type[8]

Omission: Omission of a medication without documented clinical explanation for the omission

Commission: Commission of a medication at admission without documented clinical explanation for the initiation

Different dose, route, or frequency: Different dosage, route, or frequency of a medication than what the patient reports taking before hospitalization is ordered at admission; differences are not explained by changes in the patient's clinical status at admission

Medication change within a medication class: Different medication from what the patient reports taking at home but within the same medication class without documented clinical explanation or formulary justification for the substitution

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[a] Medication discrepancies from orders that were written in a patient's chart and entered into the pharmacy system were considered errors that reached the patient.

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