Medication Reconciliation in Continuum of Care Transitions: A Moving Target

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Objective: To study medication discrepancies in clinical transitions across a large health care system.

Design: Randomized chart review of electronic medical records and paper chart medication reconciliation lists across 3 transitions of care.

Settings and participants: Subacute patient medication records were reviewed through 3 transition care points at a large health care system, including hospital admission to discharge (time I), hospital discharge to skilled nursing facility (SNF; time II) and SNF admission to discharge home or long term care (LTC; time III).

Measurements: Medication discrepancies were identified and categorized by the principal investigator and a pharmacist. Discrepancies were defined as any unexplained documented change in the patients’ medication lists between sites and unintentional discrepancies were defined as any omission, duplication, or failure to change back to original regimen when indicated.

Results: We reviewed 1696 medications in the 132 transition records of 44 patients, identifying 1002 discrepancies. Average age was 71.4 years and 68% were female. Median hospital stay was 5.5 days and 14.5 SNF days. Total medications at hospital admission, hospital discharge, SNF admission, and SNF discharge were 284, 472, 555, and 392, respectively. Total medication discrepancies were 357 (time I), 315 (time II), and 330 (time III). All patients experienced discrepancies and 86% had at least 1 unintentional discrepancy. The average number of medications per patient increased at time I from 6.5 to 10.7 (P < .001), increased at time II from 10.7 to 12.6 (P < .0174), and decreased at time III from 12.6 to 8.9 (P < .001). Patients, on average, had 8.1, 7.2, and 7.6 medication discrepancies at times I, II, and III, respectively. Surgical patients had more discrepancies than medical at times I and III (8.94 vs 5.3, P < .019; 8.0 vs 5.8, P < .028). In the unintentional group, cardiovascular drugs represented the highest number of discrepancies (26%).

Conclusion: This study is the first to follow medication changes throughout 3 transition care points in a large health care system and to demonstrate the widespread prevalence of medication discrepancies at all points. Our findings are consistent with previously published results, which all focused on single site transitions. Outcomes of the current reconciliation process need to be revisited to insure safe delivery of care to the complex geriatric patient as they transition through health care systems.

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Numerous studies show that medical errors and quality deficiencies commonly occur at times of transition. 1,2 Transitional care, during which a patient moves between different sites or levels of care, is a complex process fraught with challenges, particularly for the vulnerable geriatric population. 3,4 Moore et al demonstrated that nearly one-half of adult patients discharged from the hospital will have a medication error leading to discontinuity of care, with a significant increase in adverse drug events, rehospitalizations, and costs. 5-7 Astoundingly, Forster et al found that 75% of these transition errors are likely preventable. 5, 6

Medication discrepancy is defined in the literature as an incompatibility in a patient’s documented medication regimen including medication additions, omissions, therapeutic interchanges, dosing
changes and duplications.7–9 These discrepancies are potential medication errors that may lead to adverse drug events.10 Almost 40% of medication errors on admission to the hospital were considered potentially harmful.11

In response to this national concern, The Joint Commission adopted medication reconciliation as a National Patient Safety Goal (2006).12 Medication reconciliation is the process of comparing and merging patients’ medication lists at any point of transition, with the goal of preventing errors.12,13 To date, medication discrepancies have been consistently demonstrated in single transition steps. Specifically, medication discrepancies were found in 54%–67% of patients between community and admission to the hospital, in 46%–70% of patients between hospital and discharge home, in 75% of patients between discharge from hospital to admission into a skilled nursing facility (SNF), and into long term care (LTC) facilities.5–8,14–18 However, no studies have specifically examined individual medication reconciliation profiles for patients as they transition through multiple care sites across the health care system. The purpose of this study was to follow patients’ medication reconciliation through hospitalization and rehabilitation to measure and classify medication changes that occur to assess the effectiveness of the medication reconciliation process as patients transition through a large health system.

Methods

Subacute patients were followed through care transitions at a large health care system operating in the New York metropolitan area. All subjects had transitioned through 2 sites of care during a single acute care admission cycle, including hospitalization and rehabilitation, thus, providing data for 3 transitions: hospital admission to discharge (time I); hospital discharge to skilled nursing facility (SNF) admission (time II); and SNF admission to discharge to LTC or home (time III) across 4 medication reconciliations (hospital admission, hospital discharge, SNF admission, and SNF discharge).

After receiving approval from the North Shore-LIJ Institutional Review Board, a retrospective chart review was conducted on patients admitted to 1 of 2 tertiary care hospitals within the health care system, transferred to a SNF for subacute rehabilitation, and ultimately discharged home or to a LTC facility. Subjects were randomly selected via an online random number generator (http://www.randomizer.org/form.htm) from subacute SNF discharges between April 1 and June 30 of 2011. Subjects were excluded if they were not discharged from 1 of the 2 tertiary hospitals within the health system, or if their charts did not contain all 4 medication reconciliation lists at hospital admission, hospital discharge, SNF admission, and SNF discharge. Of the 70 charts pulled by the medical records staff at the SNF, 26 were excluded as the patients had been discharged from hospitals outside of the health system. All charts contained the necessary 4 medication reconciliation lists as these are standards of care for the 2 hospitals and the SNF.

The healthcare system in which this study was conducted requires medication reconciliation on admission to the hospital, and at time of discharge from the hospital. Medication reconciliation data were accessed electronically via a uniform electronic medical record. For the SNF, admission orders are required for every patient and there is a standard hand-written discharge medication reconciliation. The SNF charts were reviewed to obtain epidemiologic patient information (age, sex, comorbid conditions, admission to the medical or surgical service, length of stay in the hospital, length of stay in the SNF), past medical history, admission diagnosis to the SNF, hospital course, and SNF course.

Data from the 4 medication reconciliation lists included total number of medications, total daily doses, and the total number of as needed medications (as needed). The medication reconciliation lists were evaluated for discrepancies using 3 separate transitions of care: hospital admission to hospital discharge (time I), hospital discharge to SNF admission (time II), and SNF admission to SNF discharge (time III).

A thorough review of the literature on medication discrepancies was conducted to identify a validated survey tool for the purpose of this study. The Medication Discrepancy Tool (MDT), published in 2005 by Dr Eric Coleman, had identified a new approach to characterizing medication discrepancies in the care transition process.19 The primary purpose of the MDT was not only to highlight gaps in transition-related medication problems, but, most importantly, to provide a practical approach in solving them. Other researchers, such as Tjia et al, had defined medication discrepancies as unexplained differences among documented medication regimens, including the hospital discharge summary, patient care referral form, and SNF admission orders, whereas the methodology of Stitt et al, classified discrepancies as omissions, additions, duplications, therapeutic interchanges, dosing changes, and route changes.8,16

The goal of this study was to follow patients across multiple transitions of care. Although several authors had studied medication discrepancies at a single transition point (eg, hospital to home), no one tool existed to follow patients across care sites.8–10,18–21 We chose to draw from the approaches used by Coleman, Cornish, Tjia, and Stitt. Tjia specifically addressed medication changes in transition between hospital and skilled nursing facilities, whereas Stitt focused strictly on hospital discharge. Furthermore, since the design of this study was retrospective, we adapted the system level section of Coleman’s MDT tool, which allowed for retrospective chart review, without requiring prospective patient or physician interview, to best categorize discrepancies.19 Finally, we incorporated Cornish et al’s separation of unintentional and intentional discrepancies.11

Specifically, medication discrepancies were defined as any changes between medication reconciliation records that were not clearly supported. The process began with a review of each medication in the reconciliation record at each transition point for all 44 patients by the principal investigator (PI). Any discrepancies were further categorized into medication class, type of change (omission, addition, duplication, or therapeutic interchange), and whether it was considered intentional or unintentional. All medication discrepancies were then reviewed in conjunction with the study pharmacist for final categorization into intentional and unintentional discrepancies. Intentional discrepancies were defined as any changes in medication regimens that were judged by the reviewers to be a deliberate decision made by the medical team, such as omission of furosemide for dehydraion, or addition of a medication such as proton pump inhibitor, opiates, or a bowel regimen. Unintentional discrepancies were changes in the medication regimen that were judged by the reviewers to potentially cause harm, as defined by Cornish.13 Unintentional discrepancies included omission of a bowel regimen on discharge for a patient on opioids; omission of aspirin for a patient with known coronary artery disease; omission of antibiotics from hospital to SNF admission; duplication of medications; and failure to change therapeutic interchanges back to original medications. On the rare instances where the PI and pharmacist’s assessments of discrepancy classifications did not corroborate (3 of the 1002 drug changes, or less than 1%), the decision was made to classify the discrepancy as intentional.

Statistical Methods

Mean, standard deviations, medians, minimum, and maximum values for continuous data such as age and total number of discrepancies were computed. Frequencies and percentages were used for categorical data including sex, discharge diagnosis, comorbidities,
and medication list discrepancies. Weighted proportions were calculated for these discrepancies. Medication discrepancies were classified into subcategories as defined by Tjia et al (Figure 1). Analyses were conducted using SAS v. 9.2 (Cary, NC) and Microsoft Excel 2007 (Microsoft, Redmond, WA) to graphically display the data.

**Results**

Of the 1696 medications reviewed, 1002 drug discrepancies were identified among the 132 transitions reviewed (44 subjects × 3 transitions) who fit the inclusion criteria. Average age was 71.4 (range: 41–91), 68% were female, and 77% were hospitalized for surgery while 23% were hospitalized on a medical floor. The median stay in the hospital was 5.5 days, followed by a 14.5 day stay in the SNF.

The total number of medications documented at hospital admission, hospital discharge, SNF admission, and SNF discharge were 284, 472, 555, and 392, respectively. The total number of medication discrepancies were 357 (time I), 315 (time II), and 330 (time III). All subjects (100%) were found to have at least 1 medication discrepancy, and 86% contained at least 1 unintentional discrepancy. When analyzing average number of medications per patient at each transition, time I increased from 6.5 to 10.7 (P < .001), time II increased from 10.7 to 12.6 (P < .0174), and time III decreased from 12.6 to 8.9 (P < .001).

In terms of site transition, there were no significant differences among the 3 transition times for intentional or unintentional discrepancies. Average number of overall discrepancies per patient was 8.1, 7.2, and 7.6, respectively; average number of intentional discrepancies was 7.1, 6.3, and 6.3; average number of unintentional discrepancies was 1.0, 0.9, and 1.3 (Figure 2). Surgical patients had more discrepancies than medical patients at transition times I and III (8.94 vs 5.3, P < .019; 8.0 vs 5.8, P < .028, (Figure 3). Looking at overall discrepancy type, the most common was additions (45%), followed by omissions (38%), dosing changes (12%), exchanges (5%), duplications (<1%), and route changes (<1%).

Among intentional discrepancies, 31% occurred with gastrointestinal (GI) medications (80, 100, and 86, respectively) and 20% among vitamins, minerals, and supplements (76, 56, and 40, respectively, Figure 1). In the unintentional group, cardiovascular drugs (26%) represented the highest number of discrepancies at the three transitions (12, 10 and 13, respectively) followed by GI medications (21%) with 4, 6, and 18, and vitamins (12%) with 6, 6, and 5 (Figure 1).

**Discussion**

Medication reconciliation is difficult to implement, as evidenced by the Joint Commission’s revision of this requirement for hospital accreditation in 2010 under National Patient Safety Goal 03.06.01.22-23 Transitions of care in elderly patients create the “perfect storm,” as prescription drug use in geriatric patients has increased dramatically, putting seniors at highest risk for medication-related adverse events.24,25 These patients are more likely to suffer from multiple coexisting chronic conditions requiring polypharmacy, transient or permanent cognitive impairment, loss of functional status, as well as lower health literacy.26-29 This is particularly true today, as the dynamics of physician prescribing patterns have drastically changed with the increasing assortment of medications available and the ease of prescribing through ubiquitous computerized systems. Indeed, the patient’s medication list has become a moving target for the multitudes of physicians and settings of care provision.

This study found that changes in medication regimens as patients transition through the healthcare system were extremely common. Each patient had an average of 7.5 medication changes per transition, with 100% of patients having at least 1 change in medications between the time they entered the hospital and were discharged from the SNF. We also found that the addition of medications was absolute, with 100% of the patients leaving the SNF with more medications than upon initial admission to the hospital. No documentation accounting for these changes was found in the medication reconciliations records.

The most commonly changed medications were GI medications (such as antacids, acid reducers, and stool softeners) and dietary supplements (vitamins and minerals), accounting for over 40% of overall changes. Gastric acid blockers (proton pump inhibitors and H2 antagonists) were commonly carried over from the hospital to the SNF and through their final discharge, even if patients did not have a history of gastro-esophageal reflux disease or peptic ulcer disease. Dietary supplements were added, changed, and omitted frequently in the hospital; one-half of patients were taking them when admitted, while 76% were discharged taking them. Patients admitted for surgical service were more likely to leave the hospital with a “cocktail” of dietary supplements.

As was found in prior publications, unintentional discrepancies occurred with similar frequency in our study at each transition site, and cardiovascular medications had the greatest percentage of unintentional discrepancies (27%). Unroe et al reported 31% of cardiovascular
medication errors at time of hospital admission and 27% at time of discharge from the hospital.9 Likewise, Gleason and his colleagues documented 29% potential cardiovascular medication errors at time of admission to the hospital.14 These discrepancies may be secondary to the adjustment required by the hospital formulary drug list. Our study did not systematically address therapeutic interchanges mandated by the hospital system. However, we did observe that therapeutic changes were generally not further adjusted upon discharge to resume the patient’s initial home regimen, potentially leading, once again, to avoidable medication errors. As in Unroe’s study, we found that patients discharged from the surgical service were more likely to have discrepancies than patients on the medical service.9

The purpose of this study was not to study the appropriateness of specific medications, but rather to explore the existence of medication discrepancies in general during transitions of care. Thus, we did not utilize the Beers criteria or the Medication Appropriateness Index to justify the use of a particular medication.30,31

Because of the retrospective nature of the study, we could not obtain a “gold standard” hospital admission medication list confirmed by all possible sources (eg, the primary care physician, pharmacy and the family) for each medical record. The retrospective nature of this study was an obvious limitation, as one could not determine with absolute certainty if medication discrepancies occurred intentionally or unintentionally. However, the PI and the pharmacist were in complete independent agreement in categorizing the type of discrepancy for each of the 1002 medication changes reviewed. In addition, our discrepancy averages, as well as the percentage of discrepancy types, were consistent with the majority of previously published findings.

Several studies have shown that the process of medication reconciliation, especially when reviewed by a pharmacist and via electronic medical records, may decrease medication discrepancies.12,20,32–35 Improving communication between health care providers across settings and between providers and patients is essential for effective health care transitions. Patients do not always understand or correctly interpret information and instructions they receive from their physicians.36,37 Furthermore, low health literacy, which affects more than one-third of American adults, and correlates highly with poor health outcomes, is a large component of the potential miscommunications.38

Fig. 2. Average number of discrepancies per patient across transitions. Time I, hospital admission to discharge; Time II, hospital discharge to subacute rehabilitation; Time III, subacute rehabilitation to subacute discharge.

Fig. 3. Average number of discrepancies for surgical vs medical patients across transitions. Time I, hospital admission to discharge; Time II, hospital discharge to subacute rehabilitation; Time III, subacute rehabilitation to subacute discharge.
In this study, the proportion of unintentional discrepancies representing potential harm was found to be consistent across transitions of care. This finding is not entirely surprising, since elderly patients transitioning from hospital to SNF to home present similar challenges in every care setting. Regardless of their initial hospital presentation, they have multiple coexisting morbidities, leading to polypharmacy, regardless of site of care. The addition of mandatory presentation, they have multiple coexisting morbidities, leading to medication discrepancies. In addition, to date, there is no consensus on an ideal tool to be used by health systems across care sites. These issues represent a national challenge for the U.S. health care system.

Conclusions

Today, medication reconciliation remains the most important means of decreasing or eliminating medication errors. However challenging, the health care system of the future must strive to facilitate seamless transitions of care. There is a clear need to change the culture of prescribing to evidence-based methods and to decrease rampant medication changes to simplify medication regimens for patients.

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