Evaluation of medication reconciliation in an ambulatory setting before and after pharmacist intervention

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Abstract

Objectives: To determine the accuracy of medication reconciliation in an internal medicine clinic and to evaluate pharmacist interventions targeted at improving the accuracy of medication reconciliation.

Design: Prospective case series.


Patients: 180 adults attending an internal medicine appointment.

Intervention: On patient arrival, a nurse completed the medication reconciliation form. In Phase 1 of the study, a pharmacist randomly selected and reviewed a patient’s medication reconciliation form, interviewed the patient, and verified information if indicated. A total of 90 forms were reviewed and compared to determine baseline medication reconciliation accuracy. Education interventions were held with the medical and nursing staff, targeting areas for improvement. In Phase 2 of the study, 90 additional medication reconciliation forms were reviewed in the same manner. Phase 1 and Phase 2 results were compared to evaluate differences in accuracy after the pharmacist’s education interventions.

Main outcome measures: Accuracy of medication reconciliation forms and number of potentially significant errors at baseline and after pharmacist interventions.

Results: In Phase 1, 14.4% of medication reconciliation forms were correct. The remaining forms contained 190 potentially significant errors. After the education interventions, 18.9% of medication reconciliation forms were correct and the others contained 139 potentially significant errors.

Conclusion: Medication reconciliation accuracy is poor. Although education interventions showed a trend toward improvement, continued education training for staff and patients is needed in addition to other interventions to optimize this process and prevent medication errors.

Keywords: Medication reconciliation, medication safety, medication record, pharmacy services.

Although medications are vital to patient care, they can cause considerable morbidity and mortality. Medication errors cause more than 7,000 deaths annually and account for $3.5 billion in hospital costs. One-third of all adverse drug events occur in the ambulatory care setting. These adverse events are more likely to be fatal than those that occur in the hospital setting, often because the patients are not monitored as closely.

In response to these astounding statistics, health care organizations have advocated improved patient safety through medication reconciliation, which has been shown to reduce medication-related adverse events. Since 2005, the Joint Commission has made medication reconciliation a national patient safety goal. In 2006, the Institute of Medicine’s publication, Preventing Medication Errors, recognized that medication reconciliation is important to help prevent medication errors. Medication reconciliation is also a key component of the Institute for Healthcare Improvement’s 100,000 Lives Campaign.

According to the Joint Commission, medication reconciliation is the process of comparing the medications that the organization is about to provide and the medications that the patient has been taking prior to entry to a new setting with the medications that the organization is about to provide. This process occurs during hospitalizations and at outpatient appointments. The goal of this process is to prevent medication errors such as omissions, duplications, and drug–drug interactions. All prescription and over-the-counter (OTC) medications should be reconciled including sample medications, herbal remedies, vitamins, medicated patches, and respiratory treatments.

Pharmacists have an extensive knowledge of medications and therefore are well suited to compile patient medication lists. In addition, multiple studies have shown that pharmacists are also accurate in completing this process. Further, one study determined that pharmacist-conducted medication histories resulted in a greater reduction in medication errors than other pharmacist activities. Despite this fact, pharmacists are often not the health care professional responsible for medication reconciliation. However, pharmacists can still have a valuable role in collaborating with others to optimize medication safety through medication reconciliation. The American Society of Health-System Pharmacists states that pharmacists should be “responsible for coordination of interdisciplinary efforts to develop, implement, maintain, and monitor the effectiveness of the medication reconciliation process.”

**At a Glance**

**Synopsis:** The medication reconciliation forms of patients attending an internal medicine clinic were reviewed to assess the accuracy of the forms and the number of potentially significant errors at baseline (Phase 1) and following pharmacist intervention (Phase 2). Only 14.4% of medication reconciliation forms were correct in Phase 1. The incorrect forms involved 269 errors, with 190 (70.6%) of the errors categorized as potentially significant. After the education interventions, 18.9% of medication reconciliation forms were correct. In Phase 2, the incorrect forms contained 220 errors, with 139 (63.2%) deemed potentially significant. The category with the greatest reduction in significant errors was missed prescriptions.

**Analysis:** Medication reconciliation provides a venue in which pharmacists can address medication adherence, reasons for nonadherence, and the importance of patients knowing about their medications. The finding that less than 20% of medication reconciliation forms were accurate even after education interventions highlights the need for additional resources and education initiatives to improve the medication reconciliation process. Embracing available technology (e.g., electronic medical record) may be a favorable step toward helping ensure patient safety. An electronic system could improve adherence to the process of medication reconciliation, decrease errors, and minimize time needed to complete the medication reconciliation process. However, to optimize medication reconciliation, patients must take an active role in their care by bringing all medications to their visit and being familiar with their medications and dosage.

**Objectives**

Although medication reconciliation can reduce adverse drug events, accuracy is essential to the process. Inaccuracies may result in inappropriate or suboptimal prescribing and more adverse drug events. To our knowledge, information is available on the accuracy of medication reconciliation but little information reports on how it can be improved. Therefore, this study has multiple objectives. In Phase 1, we sought to determine the baseline accuracy of nurse-conducted medication reconciliation in our clinic. In Phase 2, we planned to assess the effect of pharmacist-provided education interventions to improve the accuracy of medication reconciliation.

**Methods**

This quality improvement study was approved by the University of Tennessee Institutional Review Board (IRB). Informed consent was waived by the IRB because the research presented no more than minimal risk of harm to participants and involved no procedures for which written consent is normally required outside of the research context.

The setting was an internal medicine clinic at an urban safety net hospital in Memphis, TN, that is staffed by medical residents with faculty supervision. The prospective study was conducted in two phases, with Phase 1 evaluating the baseline accuracy of medication reconciliation and Phase 2 reevaluating medication reconciliation accuracy following pharmacist interventions to improve medication reconciliation.

To determine whether disease severity, number of medications, or patient education may have influenced the results, patient-specific information was collected. Patient demographics, number of medications and diseases, and self-reported
education level were collected for each patient in Phase 1 and Phase 2.

**Phase 1**

In our adult internal medicine clinic, the current medication list for each patient is compiled by a nurse. This list is most commonly obtained by interview with the patient or caregiver, surveying past medication reconciliation forms, or through a patient-produced medication profile or prescription bottles.

In the study, the nurse completed medication forms in the standard manner previously described. Following completion of medication reconciliation forms, a pharmacist reviewed randomly selected forms for accuracy. The pharmacist compared each form with the patient’s two previous medication forms and spoke with the patient or caregiver to verify the medication list. The pharmacist asked specific questions, including prompts about any medications that had been added, modified, or omitted from the two previous medication reconciliation forms. If any uncertainty existed, the pharmacist obtained a medication profile from the patient’s pharmacy or pharmacies. Inconsistencies between patient-reported information and pharmacy information were clarified with the patient, with the patient’s answer being accepted as appropriate and recorded on the medication reconciliation form.

The medication profile compiled by the pharmacist was used to evaluate the medication profile compiled by the nurse. Discrepancies were categorized as omitted prescriptions, omitted OTC medications, listed medications that the patient was not taking, incorrect directions, or incorrect strength.

Following the conclusion of Phase 1 data collection, a meeting was held among the investigators, the clinic’s nurse manager, the medical director, and an attending physician. At this meeting, the current process for medication reconciliation and results from Phase 1 data collection were discussed. A consensus was reached on the information that should be recorded on each medication reconciliation form and the errors that should be classified as potentially significant. A potentially significant error was defined as a missing prescription, a missing OTC item that could have been prescribed (e.g., aspirin, calcium, meperidine), a missing OTC item that can cause harm (e.g., nonsteroidal anti-inflammatory drugs), incorrect directions on any prescription taken on a scheduled basis, incorrect strength on any prescription, or a prescription list on a scheduled basis that the patient was not taking. In addition, an education plan that is further described in the **Intervention** section was formulated to address potential obstacles to accurate medication reconciliation.

**Intervention**

Nursing staff attended a pharmacist-led 20-minute group education session during a staff meeting that focused on Phase 1 results, the essential role of the nurse in the medication reconciliation process, the importance of medication reconciliation, content to be included on the medication reconciliation form, and the proper way to record medications on the form. The nursing staff was also provided with the procedure and list of questions that the pharmacist used in obtaining medication lists (Table 1).

To assist in medication reconciliation, the study investigators compiled this list of questions based on common errors found in Phase 1 results. These questions were made available in the areas in which medication reconciliation usually occurred and were given to nurses on an index card to carry in their pockets.

In addition to nursing education, the intervention included a pharmacist-led discussion with the medical staff. The medical residents and attending physicians attended a 10-minute education session during a mandatory meeting. This session reviewed Phase 1 study results, the importance of accurate medication reconciliation, and each physician’s essential role of regularly updating the medication reconciliation form when medication changes were made at a clinic visit.

Another intervention was targeted toward reminding patients to bring their medications to each clinic visit. An automated telephone call, which reminds patients of their upcoming appointment, was modified to encourage them to bring their medications to the appointment.

**Phase 2**

Immediately after completing the education interventions, the pharmacist began evaluating medication reconciliation using the same process described in Phase 1. Discrepancies were evaluated as described in Phase 1.

**Statistical analysis**

Statistical analysis compared patient demographics, number of errors, number of potentially significant errors, types of errors, and number of forms with significant errors between Phase 1 and 2. Unpaired t tests, chi-square tests, and Fisher’s exact tests were used as appropriate to determine whether statistically significant differences existed between the groups. Analy-
sis was performed using StatView for Windows, version 5.0.1 (SAS Institute, Cary, NC). Results were considered significant when \( P \) was less than 0.05.

**Results**

Medication reconciliation forms were evaluated in 90 patients in both Phase 1 and 2. Patient demographics were similar between the Phase 1 and 2 groups, with no statistically significant differences in any category (Table 2).

In Phase 1, 14.4% of medication reconciliation forms were correct. The remaining incorrect forms had a total of 269 errors, with 190 (70.6%) of those categorized as potentially significant. After the education interventions, 18.9% of medication reconciliation forms were correct. The incorrect Phase 2 forms contained 220 errors, with 139 (63.2%) deemed potentially significant. The category with the greatest reduction in significant errors was omitted prescriptions.

The mean number of errors per patient was \( 3.0 \pm 2.7 \) in Phase 1 and \( 2.4 \pm 2.3 \) in Phase 2 (\( P = 0.14 \)). The most common types of errors were omitted prescriptions, omitted OTC medications, or incorrect directions (Table 3).

Overall, 72 (80%) medication reconciliation forms in Phase 1 and 60 (67%) medication reconciliation forms in Phase 2 involved potentially significant errors (\( P = 0.04 \)). The most common type of potentially significant error was an omitted prescription (Table 4). Examples of significant errors are shown in Table 5.

**Discussion**

The results of this study highlight inaccuracies in medication reconciliation. Across different levels of care and patient groups, studies have reported medication discrepancy rates occurring in 53% to 98% of all patient medication profiles.\(^{16-23}\) Our finding of 85.6% and 81.1% of records with discrepancies in Phase 1 and Phase 2, respectively, corresponds to these previous studies. Although our Phase 2 results showed a trend toward improvement, which may have resulted in statistical significance with a larger population studied, the results were less favorable than desired. This may be a reflection of the brevity or inadequacy of our education sessions. However, it may reflect underlying issues in this medication reconciliation process such as insufficient staff or time to devote to medication reconciliation. Barriers to accurate medication reconciliation are complex and not easily resolved.

Many patient barriers exist to accurately gathering a medication profile. Patients may not realize the importance of medication reconciliation, believing their physician is already aware of their medications.
of their medications. Also, patients may not bring their medications or a medication list to clinic appointments, and they may not be familiar with the medication names or doses. In a study by Makaryus and Friedman,21 less than 30% of patients discharged from the hospital could accurately list their discharge medications. This unfamiliarity with medications may not be limited to medications at the time of discharge. Low health literacy and education level, which is common in this patient population, may further complicate the process.25 Patients may use multiple pharmacies, which can hinder efforts to obtain a complete medication list. Also, patients may not take the medication as prescribed and may be reluctant or unwilling to admit this to their health care provider.

Challenges also are present for the personnel responsible for medication reconciliation. Completing medication reconciliation for every patient substantially adds to the workload, and staff may be subsequently pressed for time. The staff may be unclear about the importance of medication reconciliation or the extent of their role in the process. Also, because thousands of medications are on the market, the staff may be unfamiliar with many medication names or usual doses.

Because pharmacists have extensive training related to medications, they may be best suited to perform medication reconciliation. Pharmacists are proficient at recognizing medication names and normal doses. Also, as one pharmacist investigator noted during the study, performing medication reconciliation often leads to opportunities for providing patients with medication-related education, including proper use, inhaler techniques, and the need for medications. Medication reconciliation provides a venue in which pharmacists can address adherence, reasons for nonadherence, and the importance of patients knowing about their medications.

Regardless of the reason for suboptimal results, less than 20% accuracy in medication reconciliation is unacceptable. This study highlights the need for additional resources and education initiatives to improve the medication reconciliation process. Embracing available technology such as an electronic medical records may be a favorable step toward helping ensure patient safety. By streamlining the process and eliminating transcription, an electronic system can improve adherence, decrease errors, and minimize time needed to complete the medication reconciliation process.26,27 However, for optimal medication reconciliation, patients must also take an active role in their own care by bringing all medications to their visit and being familiar with their medications and dosages.

Limitations

This study has several limitations. Medication reconciliation was examined in a small number of patients attending one clinic. These results may not reflect current practices at other institutions or at other clinics within our system. Also, the classification of potentially significant versus nonsignificant errors was subjective. Because discrepancies were brought to the attention of the physician and corrected, this study was not able to determine whether any medication discrepancy would have caused harm.

In addition, the pharmacist interventions intended to address many potential barriers to accurate medication reconciliation. As a result of the brief interval between the interventions and reevaluation, these results can only assess the effect of the intervention with nursing staff. An extended period of time is needed to allow for patient education and medical staff interventions to cycle through the process.

Conclusion

Medication reconciliation is an important process to help prevent medication errors. Now that it has become part of routine care, the process should be examined in more detail. Inaccuracies in compiling medication profiles may counteract the potential safety benefits of medication reconciliation. More studies are needed to focus on how this process can be optimized to fully achieve the potential patient safety benefits.

References


