

Original Publication

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Medication Reconciliation in the Hospital: An Interactive Case-Based Session for Internal Medicine Residents

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Abstract

Introduction: Medication reconciliation is a complex process of creating and maintaining the most accurate medication list for a patient to help guide therapy. Done incorrectly, the process of medication reconciliation can lead to medical error and result in adverse events for patients. Medication reconciliation on inpatient medicine service is often done by internal medicine residents. However, published reports of educational interventions for residents are limited. **Methods:** We created a 1-hour session that was experiential, case based, and targeted to the level of a first-year resident. In total, 31 internal medicine residents completed the curriculum, which involved either a 1-hour classroom group activity or an individual virtual activity. The curriculum was evaluated using standard forms with qualitative feedback regarding learner satisfaction, pre- and postsession confidence survey, and pre- and postsession patient chart audits. **Results:** Qualitative feedback demonstrated residents' positive experiences. There was no significant change in residents' confidence in portions of the medication reconciliation process. One month following the educational intervention, 100% of inpatient charts audited for review of the medication list were accurate, as compared to 67%-83% accuracy prior to the session. **Discussion:** This novel case-based medication reconciliation teaching session, targeted at learners in an internal medicine residency, can easily be implemented at other institutions using the institution-specific electronic health record. The session was well received by residents, and we observed improved accuracy in the medication reconciliation process done by residents.

Keywords

Active Learning, Internal Medicine, Medication History, Medication Reconciliation, Small-Group Learning, Transitions of Care, Case Method

Appendices

- A. Med Rec Lesson Plan.docx
- B. Med Rec Session.pptx
- C. Med Rec Instructions.docx
- D. PCP Note Med List.docx
- E. Pharmacy Med List.docx
- F. STR Med List.pdf
- G. Best-Practice Worksheet.docx
- H. Med Rec Pretest Survey.pdf

All appendices are peer reviewed as integral parts of the Original Publication.

Educational Objectives

By the end of this activity, learners will be able to:

1. Identify the importance of collecting an accurate medication list for patients as they transfer care between facilities (e.g., home, hospital, nursing facility).
2. Identify greater confidence with the steps needed to develop an accurate medication list to include three elements: verification (obtaining the most up-to-date medication list), clarification (determining current dosage, utilization, and adherence), and reconciliation (deciding on required changes and ensuring that this information is available to other treating physicians).
3. Incorporate best practices for the process of medication reconciliation into their own medication reconciliation process.

Introduction

The process of medication reconciliation is fraught with error. Its purpose is to create and maintain the most accurate list possible of all medications a patient is taking and use that list to guide therapy. The rate of discrepancy of medications is estimated to be between 38% and 50% for newly hospitalized patients.^{1,2} Medication errors occur commonly during transfers of care and often cause harm. In an investigation looking at medication changes occurring during the transfer of a patient from nursing home to hospital and from hospital to nursing home, the mean number of medication orders altered per patient on

admission to hospital from nursing home was 3.1 and from hospital to nursing home was 1.3. In total, 20% of those changes led to an adverse drug event.³

Due to the potential for error and resultant patient harm, medication reconciliation has been identified as a National Patient Safety Goal by The Joint Commission⁴ and is a primary initiative through the Massachusetts Coalition for the Prevention of Medical Errors.⁵

The process of medication reconciliation is completed by health care providers at different points of care, including during transitions of care. In the inpatient setting, medication reconciliation happens at patient admission and discharge. In academic medical centers, this process is often completed by residents, yet there is limited published literature regarding educational initiatives to teach residents the skills required to complete an accurate medication reconciliation. A recent systematic review of medication reconciliation curricula indicated a lack of published educational initiatives targeted towards improving trainee knowledge of and experience with the process.⁶ Among the seven studies identified to meet prespecified criteria, four were for medical students, and the remaining three were for residents. Variability among their teaching methods existed; however, the majority (five out of seven) had some component of experiential learning.⁶ Medication reconciliation curricula have also been published in *MedEdPORTAL*, mostly focusing on medical⁷⁻⁹ or pharmacy students.¹⁰ However, there are limited resources for curricula specifically geared towards residents. Although the content may be similar, creating a curriculum that allows residents to build on knowledge and skills already developed during their training has yet to be done. In addition, given that residents have previous practice experience, curricula should be geared towards using practice-based technology, including electronic health records (EHRs), and institution-specific cases to build on previous knowledge and skills.

In this report, we describe a curriculum targeting medication reconciliation for internal medicine residents and providing both theoretical and experiential frameworks that was used for both in-session and virtual learning.

Methods

Cambridge Health Alliance is a community-based, safety-net hospital system affiliated with Harvard Medical School. Our internal medicine residency program has 24 trainees who also work on the inpatient wards with seven transitional year interns.

During the 2017-2018 academic year, our institution experienced a preventable adverse event related to medication reconciliation. In response to the event, we performed a needs analysis of our current curriculum to identify a gap in knowledge related to medication reconciliation, particularly concerning obtaining accurate medication lists from outside facilities.

After performing a needs assessment, we reviewed the previous literature and curricula created for medication reconciliation. We noted a few challenges, which helped to guide our ultimate design. In regard to the content, the process of medication reconciliation (1) is highly contextualized and dependent upon individual patient characteristics, (2) has overarching principles that are transferable to any medication reconciliation encounter, (3) is experiential, and (4) requires EHR-specific knowledge and skills to complete accurately. In addition, we noted a paucity of published curricula geared towards residents.

As a result, we focused on creating a session that was (1) experiential, (2) case based, (3) and targeted to the level of a first-year resident. As a prerequisite, each resident was required to complete an institution-specific online learning module about medication reconciliation. Initial learning objectives were based on the needs assessment. The case used for the session was randomly selected from an inpatient ward admission in the month prior to the session.

All residents ($N = 31$) were expected to complete the medication reconciliation curriculum. Given variability in the residents' availability, the case-based session was designed to be implemented in two ways: (1) a 1-hour classroom group activity and (2) an individual virtual activity. Materials were similar for both formats. Both versions utilized the EHR at our institution, which is EPIC, currently the most commonly utilized EHR in the US.¹¹ All the curricular materials described in this report are based upon the EPIC system; however, the curriculum is easily modifiable by substituting another institution's existing EHR for the EPIC interface.

A lesson plan, including a detailed guide to the main points of discussion (Appendix A), was created to guide the facilitator of the 1-hour classroom group activity. An associated PowerPoint presentation (Appendix B) was created to help visually guide the session. The group activity involved working in small groups of four to six residents with at least one third-year resident in each group. If no third-year residents were participating in the session, another resident (preferably one who had advanced in his/her training) could fulfill the role assigned to the third-year. The small groups were given a copy of the case and instructions to complete the assignment (Appendix C). During the small-group activity, residents were given a medication list from the most recent primary care physician outpatient office visit (Appendix D), a list of medications provided by calling the patient's preferred pharmacy (Appendix E), and a list of the patient's current medications from the short-term rehabilitation facility (Appendix F). The short-term rehabilitation facility form (Appendix F) was the original form, used purposefully to recreate a real clinical scenario on the wards where patient documentation is imperfect. Users of the curriculum may choose to use this document or select a medication list from their own institution of a patient admitted from a short-term rehabilitation facility. We recognize that Appendix F may have some elements that are difficult to interpret, requiring participants to triangulate it with other medications lists. This was done to reflect the reality of medication lists from facilities. All the medication lists were obtained prior to the session from a single patient's chart that had been deidentified. The small groups were asked to enter the play environment or testing environment of the EHR (EPIC at our facility), were directed to a fictitious patient account, and were asked to reconcile the patient's medications. Directions for accessing the sample record were included in the instructions for the assignment (Appendix C). The task included (1) obtaining the most accurate medication list, (2) clarifying any discrepancies, and (3) reconciling which medications should be administered given the patient's admitting diagnosis. In each group, the third-year medical resident acted as the observer, monitoring the group's progress, identifying best practices performed by the group, and writing them down in a best-practice worksheet (Appendix G). After each group completed the medication reconciliation, a large-group discussion occurred, sharing each group's identified best practices. During this time, the facilitator identified the major points of emphasis and highlighted them. The session ended with summary points targeted towards the main educational learning objectives.

We measured the efficacy of our curriculum using a standard evaluation of learner satisfaction. In addition, residents completed a pre- and posttest survey measuring confidence in medication reconciliation tasks (Appendix H) that had been used in previous studies of medication reconciliation curricula.¹² We also performed a random chart audit of inpatient medical records for the month before and the month after this curricular intervention to assess the accuracy of the medication reconciliations done for patients specifically coming from, or going to, a rehabilitation facility. Our hospital risk-management team compiled inpatient charts of patients who had been treated by one of the teaching teams for each of the above months. The list was randomly sorted based on admission dates. Current internal medicine chief residents performed chart audits. Charts were audited to assess accuracy of three components: (1) obtaining the most accurate medication list, (2) reconciling medications appropriately given the clinical context, and (3) ensuring the discharge list was appropriate given the clinical context.

As a variation, residents who were unable to attend the classroom session due to clinical responsibilities were required to complete the assignment virtually. They were asked to review the PowerPoint presentation with annotated slides and then finish the assignment. Completed medication lists were sent directly to us for review. Residents filled out both the pre- and posttest surveys related to confidence (Appendix H) as a form of evaluation.

Results

In total, 16 residents attended the classroom session, and 15 took the session virtually, reaching 100% completion by all internal medicine and transitional year interns. Residents who participated in the classroom session had 100% accuracy on chart review completed during the session. Residents who participated in the virtual learning had 41% accuracy on chart review completed online. Learner satisfaction, as assessed by a program-wide evaluation survey with a qualitative feedback portion, was positive. Residents noted the experiential element as an important aspect, with one resident commenting, “practice-based with EPIC,” and another writing, “examples were very helpful in groups with 3rd year feedback.”

There was no significant change in learners' reported confidence in performing medication reconciliation when surveyed before ($n = 31$) and after ($n = 12$) curriculum delivery. Chart audit performed on six charts demonstrated rates of accuracy for the month prior to the educational session and the month after. Accuracy in all categories reached 100% the first month after the educational session, as seen in the [Table](#).

Table. Pre- and Postsession Chart Review

Chart Audit Question	Chart Audit ($n = 6$)	
	Pre-session Month	Post-session Month
The percentage of charts with the most accurate medication list obtained on admission.	67%	100%
The percentage of charts with the admission medication list accurately reconciled given clinical context.	67%	100%
The percentage of charts with the discharge medication list accurately reconciled given clinical context.	83%	100%

Discussion

We describe a novel case-based medication reconciliation teaching session specifically targeted at learners in an internal medicine residency. This session is experiential and can easily be implemented at other institutions using the institution-specific EHR. The session was well received by residents. Unfortunately, resident confidence did not significantly change from before to after participation in the curriculum. However, in our chart review, we observed an improvement in practice of our residents, with a marked increase in the accuracy of medication reconciliation during both admission and discharge transitions of care following this educational session.

In regard to the educational activities during the session, we noted that group discussion led to improved accuracy of the medication list. Residents who participated in the virtual curriculum did not have the benefit of group discussion. This is likely the reason for discrepant results between the participants in each group. Most errors related to medication reconciliation by the virtual group were due to incorrect obtainment of the most accurate medication list.

In the future, we anticipate that sessions will be held in the classroom setting as a way to provide real-time feedback regarding group medication reconciliation. Results of this are likely limited as the majority of data collected for evaluation purposes came from those who completed the virtual session. Therefore, confidence scale and accuracy of all medication lists were likely more of a reflection of the virtual session rather than the classroom session. Survey responses, including both the program-wide evaluation and the confidence scale, were also voluntary.

We built this curriculum around the EHR at our institution, which is EPIC. Although measures of resident confidence did not significantly change from before to after participation in the curriculum, our sample size was small, and incremental improvement in confidence is unlikely to change with one practice session. There may be a limitation in generalizability of this curriculum at an institution that has a different EHR. However, most EHR systems have a testing or training environment that can be used to replace the portions where EPIC is used in this curriculum. This may require additional coordination with the local IT

department. In addition, we use a real case at our institution, including a short-term rehabilitation medication list that is somewhat difficult to interpret. Although this difficulty could be considered a barrier to the list's use, we kept the list to provide a more consistent version of the reality that residents will encounter in their daily practice. The list's difficulty could then lead to a further discussion of best practices used by residents to obtain an easier-to-read version. Alternatively, institutions deciding to use this curriculum could substitute a patient case scenario and associated medication lists of their own.

In future sessions, we plan to have mandatory confidence surveys as well as program evaluations to ensure a more robust evaluation of the session. We also intend to implement the curriculum as a required first-year resident course at the beginning of the academic year.

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Ethical Approval

Reported as not applicable.

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