# Pharmacy-facilitated medication history program at a community teaching hospital: A pre-post study in an emergency department

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**Purpose.** A study was conducted to compare the accuracy of medication histories compiled by pharmacy technicians with histories obtained through the usual multidisciplinary process.

**Methods.** A retrospective cohort study was conducted at a community teaching hospital from January 2017 through February 2018. Inclusion criteria included patient age of at least 18 years, use of 1 or more medications at the time of admission, and hospital admission through the emergency department. Each electronically documented medication history was assessed for accuracy. The objective was to compare the accuracy of pharmacy technician–collected medication histories to those obtained through the usual multidisciplinary process.

**Results.** Of 215 patients screened, 183 were included in the study: 91 patients whose medication histories were obtained through the usual multidisciplinary process and 92 whose medication histories were collected by pharmacy technicians. Overall, documentation for 1,773 medications listed in medication histories was reviewed. The primary outcome of medication history accuracy occurred 38% of the time with the usual multidisciplinary process and 70% of the time with pharmacy technician collection of medication histories ($P < 0.001$).

**Conclusion.** The study showed that the accuracy of medication histories was improved when histories were obtained by pharmacy technicians instead of via the usual multidisciplinary process.

**Keywords:** emergency department, medication history, medication reconciliation, pharmacy technician

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Medication histories and reconciliation are important in patients' transitions of care. The Committee on Identifying and Preventing Medication Errors estimated in a 2006 report that about 1.5 million preventable adverse drug events occur in the United States annually.[1] Transitions of care are associated with a high level of risk, especially during admission.[1] In addition, potentially avoidable hospital readmissions accounted for approximately $17 billion in Medicare expenditures in 2004.[2]

The medical team uses the medication history as a basis for care decisions. A best possible medication history is a comprehensive medication list, gathered by a member of the healthcare team, of prescription and nonprescription medications that patients are regularly taking.[3] Medication reconciliation is the process of comparing a patient's current medications to newly ordered medications. Comparison of these lists can reveal medication duplications, omissions, and interactions. This process is intended to identify and resolve discrepancies and address the need to continue current medications.[4] One of the Joint Commission's National Patient Safety Goals is to "maintain and communicate accurate patient medication

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information."[4] An element of this goal is to obtain an accurate medication history so that medication reconciliation can be performed. Therefore, starting with the best possible medication history will improve patient care for many reasons, including but not limited to preventing the interruption of a patient's appropriate home medication therapy.

In the emergency department (ED) setting, pharmacy-based medication reconciliation programs have been shown to increase the accuracy of medication lists compiled on admission.[5-10] Collecting the best possible medication histories at admission has posed a major challenge because of time constraints and variability of medication history details collected by individuals of different healthcare disciplines.[5,11] Medication histories obtained by pharmacy technicians have been shown to be more complete and accurate (by 25%-30%) than those performed by physicians or nurses.[5,6] Additionally, it has been reported that pharmacy technicians have the ability to obtain medication histories as accurately as pharmacists.[3] The utilization of both pharmacists and pharmacy technicians to collect medication histories can, in comparison to the usual multidisciplinary process, increase medication accuracy to 95%.[10]

Thus, this article describes a medication history program created and implemented at a community teaching hospital ED in order to increase the quality of medication histories and enable the healthcare team to spend more time focusing on other aspects of medical care. The 3 medication history technicians involved in the study covered pharmacy work shifts Monday through Friday from 1000 to 2330 and on Saturdays and Sundays from 1100 to 1930. The ED's peak admission hours were 1400 to 2300. The study was conducted to determine the accuracy of pharmacy technician–collected medication histories compared to those obtained through the usual multidisciplinary process. The objective was to determine the impact of pharmacy technician involvement in history taking on the accuracy of admission medication histories. The frequency of medication accuracy was assessed by patient and by medication.

## KEY POINTS

- Collecting the best possible medication histories at the time of hospital or emergency department (ED) admission has posed a major challenge because of time constraints and variability of details collected by different types of clinicians involved in the process.
- Providing specialized training to enable pharmacy technicians to assume a role in collecting medication histories role has been proposed as a way to enable pharmacists to devote more time to other aspects of patient care.
- A study conducted in the ED of a community hospital found that compared with the usual multidisciplinary process, collection of histories by pharmacy technicians improved the accuracy of histories obtained.

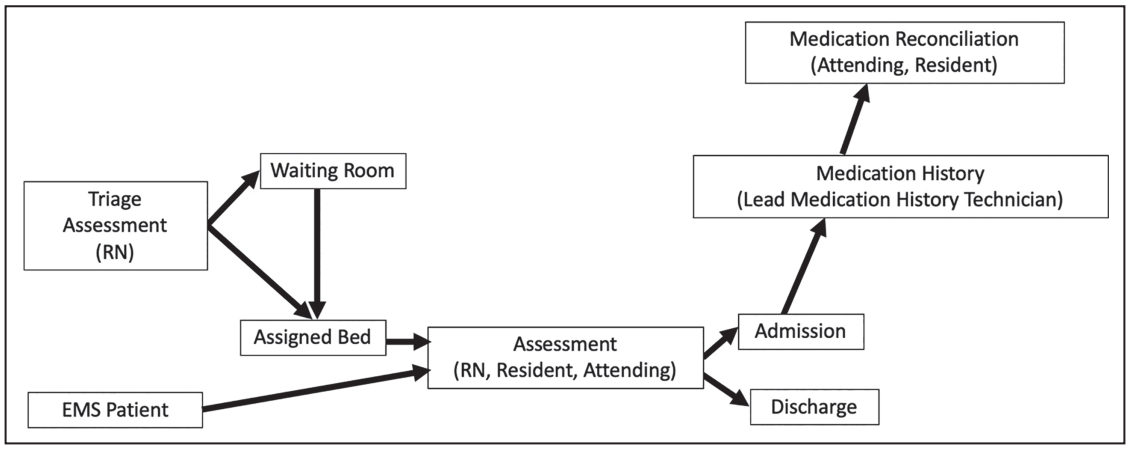
## Methods

A retrospective cohort study was conducted at a community teaching hospital (532 adult beds) after approval by the hospital's institutional research review board. The study cohort included patients hospitalized from January 2017 through February 2018, excluding patients admitted in October 2017 due to a newly implemented electronic health record (EHR) workflow adjustment. In 2016, the 39-bed ED had a total of 58,112 patient visits, with approximately 32% of patients being admitted to the hospital. The majority of the admission medication histories were performed by the nursing department and medical team. In August 2017, the pharmacy department implemented a medication history program in the ED, with 3 medication history technicians covering the peak admission hours (Figure 1). They provided the medical and nursing teams assistance with collecting, clarifying, and documenting the best possible medication histories into the EHR.

The medication history technicians completed a training program that included 1 week of shadowing, passing a competency exam with a score of at least 75 (out of 100), and a minimum of 10 direct observations by a pharmacist. The pharmacy technicians were trained to obtain information from the patient or caretaker if possible, the patient's pharmacy, and/or other sources such as an extended-care facility. They also followed a patient stratification workflow that prioritizes higher-acuity patients such as patients admitted into the intensive care units and ED-boarded patients. For quality assurance, an annual competency exam was administered. In addition to pharmacists reviewing the completed medication histories during normal workflow, audits were performed every 3 months. The medication history technicians were required to maintain a medication history accuracy of at least 95%.

Patients were included in the study if they were admitted through the main community teaching hospital ED and were taking 1 or more medications. Patients were excluded if they were pregnant or less than 18 years of age. Patients were identified by using the ED EHR and the patient list maintained by the medication history program. The list retrieved from the ED EHR for the "pre–medication history group" (patients admitted from January 1, 2017, through June 30, 2017) was narrowed to match the hours the medication history technicians worked with patients in the "post–medication history group" (those admitted from August 1, 2017, through February 28, 2018, excluding October). The 2 lists were then each randomized, reviewed for inclusion criteria, and included into the study (Figure 2).

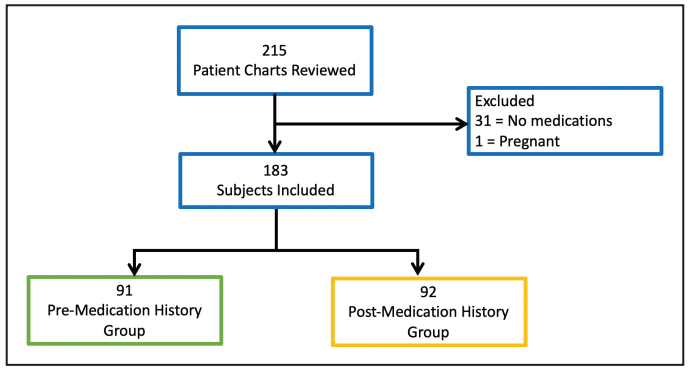
**Figure 1.** Medication history program workflow. EMS indicates emergency medical services; RN, registered nurse.




One pharmacy resident collected data by reviewing each electronically documented medication history and assessing it for accuracy. Accuracy was defined as having no missing or inappropriate medication name, strength, dose, units, route, or frequency (ie, completeness) or questionable strength, units, dose, route, or frequency according to currently manufactured products and directions per package inserts, guidelines, and a Lexicomp (Wolters Kluwer) database (ie, appropriateness). The objective was to compare the accuracy of pharmacy technician–collected medication histories obtained from patients of the community teaching hospital ED with histories collected through the usual multidisciplinary process. The primary outcome was the number and frequency of accurate medication histories. Secondary outcomes were the number and frequency of identified types of medication history errors. Baseline characteristics (age, sex, race, number of medications, and admission diagnosis) were recorded for both groups.

**Statistical analysis.** Sample size for the comparison of 2 proportions was calculated using Fisher's exact test. The minimum sample size for each group was 91. The calculation was performed using a proportion of 60% for medication history accuracy based on a review of literature for the control group and a desired 20% increase in the primary outcome, with a 2-sided $\alpha$ of 0.05 and $\beta$ of 0.20. Categorical variables are reported as frequencies and were analyzed by $\chi^2$ or Fisher's exact test as appropriate. Continuous variables are reported as means with standard deviations and analyzed by Student's *t* test. Statistical analysis was performed using IBM SPSS statistics version 24.0 (IBM Corporation, Armonk, NY), and the level of significance was set at $P < 0.05$.

**Figure 2.** Cohort selection process.




## Results

Information in the records of over 7,000 patients admitted from the ED to the community teaching hospital from January 1, 2017, through June 30, 2017, matched the time and date criteria for inclusion in the pre–medication history program group, and over 2,500 patients admitted from August 1, 2017, through February 28, 2018, who were seen by the medication history technicians and included in the post–medication history group. A randomized list was generated, and after screening of 215 patient charts, 91 patients were included in the pre–medication history arm and 92 patients were included in the post–medication history arm (Figure 2).

Baseline characteristics of the study population are described in Table 1. There was no significant difference in baseline characteristics between the pre–medication history program group and post–medication history program group. The majority of patients were white (72%) and/or female (54%); the average age was 63.1 years. The

**Table 1.** Demographics of Patients Admitted Before and After Medication History Program

| | All Patients (*n* = 183) | Pre–Medication History Group (*n* = 91) | Post–Medication History Group (*n* = 92) | *P* Value |
|---|---|---|---|---|
| Age, mean (SD), y | 63.1 (19.3) | 63.9 (17.8) | 62.3 (20.7) | 0.581 |
| Female, No. (%) | 98 (54) | 49 (54) | 49 (53) | 0.937 |
| Caucasian, No. (%) | 132 (72) | 60 (66) | 72 (78) | 0.063 |
| No. of medications, mean (SD) | 9.7 (6.2) | 9.7 (5.8) | 9.7 (6.6) | 0.997 |
| Admission diagnosis, No. (%) | | | | 0.628 |
| Acute/trauma/allergic reaction | 40 (22) | 18 (20) | 22 (24) | |
| Gastrointestinal | 11 (6) | 6 (6) | 5 (5) | |
| Cardiovascular/circulatory | 27 (15) | 14 (15) | 13 (14) | |
| Bacterial/viral (nonrespiratory) | 16 (9) | 9 (10) | 7 (8) | |
| Oncological | 5 (3) | 3 (3) | 2 (2) | |
| Psychological/neurological | 18 (10) | 10 (11) | 8 (9) | |
| Respiratory/EENT | 34 (18) | 12 (13) | 22 (24) | |
| Other | 32 (17) | 19 (21) | 13 (14) | |

Abbreviation: EENT: eye, ear, nose, and throat.

**Table 2.** Medications Listed in Medication Histories and Accuracy of Collected Data

| | | Accuracy of Medication History Data | |
|---|---|---|---|
| Medication Class or Therapeutic Group[a] | Total (*n* = 1,773) | Accurate (*n* = 1,476) | Inaccurate (*n* = 297) |
| Antibiotics/antifungal/antiviral | 34 | 29 (85) | 5 (15) |
| Antidepressant/anxiolytic/psych/antiepileptic | 167 | 132 (79) | 35 (21) |
| Cardiovascular/anticoagulant/antiplatelet | 329 | 279 (85) | 50 (15) |
| Inhaler/nebulizer | 110 | 101 (92) | 9 (8) |
| Gastrointestinal/PPI | 74 | 60 (81) | 14 (19) |
| Sedative/hypnotic/opioid | 108 | 84 (78) | 24 (12) |
| Oral diabetes medication | 36 | 30 (83) | 6 (17) |
| Insulin | 31 | 31 (100) | 0 |
| Chemotherapy/biologic | 10 | 9 (90) | 1 (11) |
| Hormones | 63 | 55 (87) | 8 (13) |
| Lipid agents | 74 | 61 (82) | 13 (18) |
| Ophthalmic | 27 | 27 (100) | 0 |
| OTC/complementary medicine/vitamins | 491 | 392 (80) | 99 (20) |
| Other | 219 | 186 (85) | 33 (15) |

Abbreviations: OTC, over the counter; PPI, proton pump inhibitor.
[a]Medication classes and therapeutic groups are as defined by authors.

patients had an average of 9.7 home medications.

There was a significant increase in the proportion of patients with accurate medication histories, as well as the proportion of medications listed in histories, in the post–medication history group. Accurate medication histories were obtained from 38% of patients in the pre–medication history program group and 70% of patients in the post–medication history group ($P < 0.001$), whereas accurate medication history was collected for 73% of medications used by patients in the pre–medication history group and 93% of medications used by those in the post–medication history group ($P < 0.001$).

Of the 1,773 medications reviewed, the most common home medications were categorized in the cardiovascular/anticoagulant/antiplatelet group or OTC/complementary medicine/vitamins group (Table 2). Within the 297 inaccurate medication histories identified, there were 345 errors: 268 in the pre–medication history group and 77 in the post–medication history group. The most frequent types of medication history errors involved listing of

**Table 3.** Numbers and Types of Medication History Errors Identified Before and After Program Implementation

| Error Type | Total (*n* = 345) | Pre–Medication History Group (*n* = 268) | Post–Medication History Group (*n* = 77) | *P* Value |
|---|---|---|---|---|
| Name | 3 (1) | 1 (0.3) | 2 (3) | 0.126 |
| Strength | 123 (36) | 83 (31) | 40 (52) | <0.001 |
| Dose | 190 (55) | 166 (62) | 24 (31) | <0.001 |
| Units | 7 (2) | 6 (2) | 1 (1) | >0.999 |
| Route | 9 (3) | 4 (1) | 5 (6) | 0.029 |
| Frequency | 13 (4) | 8 (3) | 5 (6) | 0.175 |

[a]All data are number (percentage).

inaccurate strengths (36%) and/or doses (55%) (Table 3). There were significant between-group differences with regard to inaccurate medication strength, dose, and route. Strength errors accounted for 52% of all the medication history errors in the post–medication history group, compared to 31% of errors in the pre–medication history group ($P < 0.001$), whereas dose-related errors made up the majority of all errors identified in the pre–medication history group (62%), compared to 31% of errors in the post–medication history group ($P < 0.001$). Meanwhile, the frequency of route-related errors was significantly higher in the post–medication history group compared to the pre–medication history group (6% and 1%, respectively; $P = 0.029$).

## Discussion

Previous studies have shown that pharmacy technicians trained in collecting medication histories are able to accurately collect the best possible medication histories.[5-9,11] The results reported here show that a well-trained pharmacy technician can obtain accurate medication histories in the ED setting. Additionally, the study results demonstrated that technician collection of medication histories are more accurate than those obtained through the usual multidisciplinary process. A 32% increase in accuracy in the amount of inaccurate medication histories was observed in the post–medication history arm compared to the pre–medication history arm. This increase in accuracy showed the impact of a good medication history training program and the value of having past pharmacy experience. The medication history training program enables standardization of how histories are collected, which is one step in ensuring that the best possible medication histories are obtained. Previous pharmacy experience ensures familiarity with different medications and sources to obtain further medication information. Both are particularly useful in an environment such as an ED, where patients may not be as stable as patients in other settings.

In addition to increasing accuracy, the medication history technicians also provided further medication adherence information as part of their standardized workflow. The medication history technicians were trained to collect other information such as last medication fill date, quantity of medication filled, and time and date of last dose taken. This additional information may be an added value to patient safety because the healthcare team can use it to assess medication adherence and incorporate it into medication reconciliation. In all settings, but particularly the ED setting, this may also allow the medical team to accurately assess if a chief complaint was caused by a medication-related adverse drug event or reaction.

When looking at the number of medication history errors where strength, dose, units, route, and frequency were assessed, there were more errors in the pre–medication history program group vs the post–medication history group. These errors impact the medication reconciliation process downstream, both in the ED setting and when a patient is admitted to a hospital. The accuracy of the medication history will impact whether or not patients are started or continued on the correct medications and at the right strengths, doses, routes, and frequencies and if there were any omissions. This is critical in different scenarios, such as when high-risk medications, drugs with a narrow therapeutic index, antiepileptic seizure medications, etc are involved. The decrease in medication history errors in the post–medication history group may indicate a lower chance of having medication-related events due to inaccurate medication reconciliation.

When looking at the inaccurate medication histories, it was interesting to find that inaccurate medication strength and/or dose were the most common types of errors in both the preimplementation and postimplementation groups. This may be due to documentation habit, medication history collection training gaps, and/or functions of the EHR. In the pre–medication history program group, the practice of inputting "oral daily" in the directions rather than specifying a dose (eg, number of tablets, total milligrams) was observed. With regards to medication strengths, both EHRs from which study data were collected provided users with the option to choose home medications without the associated medication strength. For example, a member of the healthcare team could choose "lisinopril" rather than "lisinopril 5 mg" in both EHRs. The combination of the EHR having a medication option

without a strength and the system accepting the inaccurate entry as valid could explain the high rate of medication strength errors.

An important limitation was the assumption that the information documented in the EHR under the pharmacy technician's name was entered by the technician, given that another user could have modified and/or edited the original technician entry. Also, due to the retrospective chart review–based nature of the study, true medication history accuracy could not be determined due to the complexity and dynamic status of patients' home medication histories; rather, only selected components of a medication history, such as drug name, strength, dose, units, route, and frequency, could be reviewed for accuracy. However, due to ongoing quality assurance initiatives and the rigors of the medication history technicians' training, having a complete and appropriate medication list may also imply that it is the best possible medication history. Furthermore, we recommend that a prospective and real-time accuracy check of medication histories be conducted to evaluate medication histories collected by pharmacy technicians. Also, it would be interesting to study the severity of medication history errors resulting from collection of histories by pharmacy technicians vs other healthcare professionals.

## Conclusion

The study showed that the accuracy of medication histories was improved when histories were obtained by pharmacy technicians instead of via the usual multidisciplinary process.

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## Disclosures

The authors have declared no potential conflicts of interest.

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