

Utilization of Pharmacy Technicians to Increase the Accuracy of Patient Medication Histories Obtained in the Emergency Department

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ABSTRACT

Purpose: The purpose of this study is to determine the accuracy of a pharmacy technician–collected medication history pilot program in the emergency department. This was completed by reviewing all elements of the technician activity by direct observation and by verifying the technician–collected medication list through a second phone call by a pharmacist to the outpatient pharmacy.

Methods: This was a retrospective, single-center study conducted from March to April 2015. Four certified pharmacy technicians were trained by a postgraduate year 1 (PGY1) pharmacy practice resident on how to collect, verify, and accurately enter medication histories into the electronic medical record. Accuracy of pharmacy technician–collected medication histories was verified by a pharmacist through observation of their patient interviews, review of technician–completed medication history forms, and by contacting the patient’s outpatient pharmacy.

Results: The pharmacy technician–completed medication histories resulted in an absolute risk reduction of errors of 50% and a relative risk reduction of errors of 77% ($p < .001$) in comparison to medication histories collected by non-pharmacy personnel.

Conclusion: With high accuracy rates, pharmacy technicians proved to be a valuable asset to the medication history process and can enhance patient safety during care transitions. The results of this study further support the Pharmacy Practice Model Initiative vision to advance the pharmacy technician role to improve the process of medication history taking and reconciliation within the health care system.

Key Words—electronic medical record, medication errors, medication history, medication reconciliation, pharmacy technician

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Discrepancies in medication histories and medication reconciliation upon admission are an area in which pharmacy involvement has led to a significant reduction in medication errors.¹ The importance of the medication reconciliation process throughout the continuum of care has been outlined by The Joint Commission as a National Patient Safety Goal.²

Although a majority of hospitals have pharmacy involvement in the medication reconciliation process,

only a small number of pharmacy-based programs involve pharmacy technician–conducted medication histories.³ Traditionally, a physician or nurse is responsible for the collection of a medication history. With increased workloads, time constraints, and patient care activities, their ability to verify an accurate medication list is limited. Recent studies evaluating pharmacy-driven medication history and reconciliation processes have shown significant increases in both the number and accuracy of completed medication reconciliations.^{2,3} These studies

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have shown that pharmacist involvement in medication reconciliation is effective in decreasing medication errors, but issues with availability and approval for the cost of a pharmacist salary makes implementation of such programs difficult. Pharmacy technicians, with their knowledge of medication names and dosages, offer a cost-effective option for filling this need.

The involvement of pharmacy technicians in the medication history process has started to gain popularity and has been shown to reduce medication errors in the reconciliation process.^{1,4-7} The role of pharmacy technicians in this area was recognized in the American Society of Health-System Pharmacists' Pharmacy Practice Model Initiative consensus report.⁸ When the collection of medication histories by pharmacy technicians is compared to collection by nurses and other non-pharmacy personnel, pharmacy technicians have improved accuracy rates.^{3,9}

A pharmacy technician-based medication history program implemented at an urban medical center resulted in decreased discrepancies.¹ In this model, pharmacy technicians collected patient medication histories within 72 hours after admission and verified medication lists with outpatient pharmacies, skilled nursing facilities, or long-term care facilities. The technician-collected medication list was compared to the admission medication list, and medication discrepancies were analyzed. The most frequent type of discrepancy noted was drug omission.¹ The accuracy rate or medication error outcomes for the technician group was not reported. In a second study conducted in a community hospital, pharmacy technicians performed patient interviews and documented medication histories on a standardized home medication order form. This task was completed previously by nurses. The new procedure resulted in greater than 82% reduction in errors per form and per individual drug order compared to baseline rates.⁶ In this study, the home medication list collected by the technician was verified with the patient's outpatient pharmacy only based on the supervising pharmacists' judgment.

A pre-post study was conducted at a community medical center emergency department comparing medication histories collected by nurses to histories collected by pharmacy technicians. Pharmacy technicians received on-site training from a postgraduate year 1 (PGY1) pharmacy practice resident. Technicians collected medication histories by contacting a patient's outpatient pharmacy, nursing home, or primary physician. Pharmacy technicians had an accuracy rate of 88% compared to the nurses who had an accuracy rate of 57%.⁹ Similar results were found in

a community hospital where pharmacy technician-collected medication histories were compared to nurse-collected medication histories.³ Pharmacy technician accuracy was 95% versus nurse accuracy at 45.8%. Rates of medication reconciliation were also higher in the pharmacy technician group, with 92.8% of patient's charts being reconciled versus 44.2% in the nurses group.³ However, in these studies, pharmacy technician accuracy was only verified by a review of the electronic record for the presence of all required medication order elements (drug, dose, route, frequency, formulation). This does not address the possibility of technician process-generated errors such as transcription errors and errors of omission.

At our institution, non-pharmacy personnel such as a registered nurse or licensed practitioner complete the medication history after a patient or caregiver interview. Anecdotal reports by the non-pharmacy personnel indicated a busy workflow and a lack of time to contact a patient's outpatient pharmacy to verify the medication history. The results from a previous, prospective evaluation at our institution closely matches the results reported by Tam et al, where it was noted that 67% of inpatients have at least one error found on the admission medication history.¹⁰ In this study, after the collection of the medication history by nursing personnel, the patient's pharmacies, nursing home, or primary care provider was contacted by either a pharmacy practice resident or pharmacy student to verify the medication history. The results of the study showed that of the 100 patient medication histories included, 65 histories had at least one discrepancy. The most frequent discrepancies were omissions of medications the patient was currently taking (53%) and the inclusion of medications the patient was not taking (15%). The results of this study highlight the need for a more efficient and accurate medication history process within our institution.

The purpose of this study is to determine the accuracy of a pharmacy technician-collected medication history pilot program in the emergency department. This was completed by reviewing all elements of the technician activity by direct observation. In addition, to further identify any errors generated by the technician-collected home medication list, a second phone call was made by a pharmacist to the outpatient pharmacy.

METHODS

Study Setting

The study was conducted at St. Joseph's Regional Medical Center in Paterson, New Jersey, after approval of the hospital's Institutional Review Board. St. Joseph's Regional Medical Center

is 651-bed nonprofit academic medical center and designated level 2 trauma center. The emergency department had approximately 158,000 patient visits in 2014, of which about 15% are admitted to the hospital. The pharmacy department operates 24 hours a day, 7 days a week, with pharmacists deployed throughout the hospital; services to pediatrics and critical care are provided via pharmacy satellites. The department comprises over 120 employees, including 7 clinical pharmacists, 4 PGY1 residents, 42 pharmacist full-time equivalents (FTEs), and 41 certified pharmacy technician FTEs. All pharmacy technicians are required to be certified.

Inclusion and Exclusion Criteria

Patients who were included were at least 21 years of age and were admitted to the hospital through the emergency department. All patients included were taking chronic medications at home. Patients were excluded if their outpatient pharmacy or prescription information could not be verified. The emergency department electronic medical record (EMR) was used to identify patients being admitted to the institution.

Study Design

The study was conducted from March 17, 2015 until April 10, 2015. Four certified pharmacy technicians were trained by a PGY1 Pharmacy Resident on how to collect, verify, and accurately enter medication histories into the EMR. The technicians were selected based on their communication skills, community pharmacy experience, and their desire to interact with patients. Three of the 4 technicians were bilingual and able to speak fluent Spanish, and one of the technicians was a certified medical translator. The training included a discussion on the importance of an accurate medication history, medication reconciliation, and transitions of care as well as completion of an online technician medication history continuing education program. Technicians were taught effective communication skills for a patient interview, specific methods to verify a medication list, and how to appropriately and accurately document a medication history in the EMR. Technicians were required to observe 3 medication histories that were completed by a resident pharmacist. The technicians were then directly observed by resident pharmacist as they completed 5 medication histories. Medication histories were obtained through convenience sampling while the technicians were present on Monday through Friday from 10:00 a.m. until 8:00 p.m.

After each patient interview, pharmacy technicians documented each medication history on a medication history form (**Appendix**). The following information was recorded: names of all prescription and over-the-counter medications, vitamins, herbals, and formulation. The route, dose, and frequency of each medication were recorded along with the date and time of the last dose taken. Allergy information, including specific reactions was also recorded. The technician assessed each patient's overall compliance to their medication regimen by asking how often medication were taken (never takes, sometimes takes, takes most of the time, and always takes). The patient's outpatient pharmacy information, specifically the name and telephone number, was recorded on the form.

Following the completion of each medication history in the emergency department, the pharmacy technician verified the medication list by contacting the patient's outpatient pharmacy. If the outpatient pharmacy was closed at the time of admission, the technician contacted the pharmacy the following business day. If appropriate, the medication list could also be verified by contacting the patient's nursing home, long-term care facility, or outpatient clinic in addition to viewing a recent discharge summary if the readmission was within the 7 days. Technician accuracy was verified by a pharmacist through observation of their patient interviews and review of technician completed medication history forms. In addition, the patient's outpatient pharmacy was contacted a second time by the pharmacist to verify the accuracy of the medication list obtained by the technician and to correct any errors in the electronic medical record.

Outcomes

The primary outcome of this study was to evaluate the accuracy of a pharmacy technician-based medication history program in the emergency department. The secondary outcomes included a comparison of accuracy rates between pharmacy technician-collected medication histories and non-pharmacy personnel-collected medication histories. The types of medication errors as well as specific drug classes with errors were identified. The individual accuracy rates of each pharmacy technician involved in the medication history program were determined in order to assess the training process.

Data Collection

Data on baseline characteristics for each patient were collected including age, gender, number of chronic

Table 1. Baseline characteristics (*N* = 100)

Characteristic	<i>n</i> (range) or %
Average age, years (range)	66 (35-98)
Male	54%
Average no. of home medications (range)	8 (1-26)
Admission to ICU	10%

medications, and admission to specific patient care area (intensive care unit or non-intensive care unit) (Table 1). The results were compared to the baseline error rate that was found from the previous study conducted at our institution, assessing the accuracy rate of non-pharmacist personnel completing medication histories.

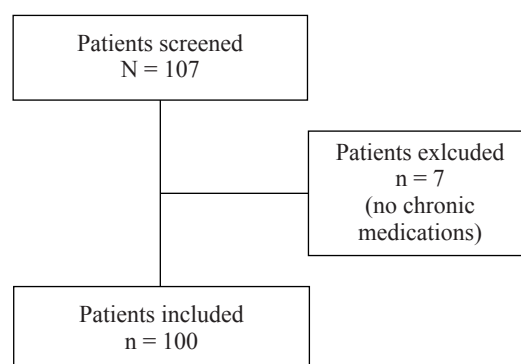
The pharmacist contacted the patient's outpatient pharmacy after the medication history was verified by the technician and recorded any errors. Medication errors were classified into the following types: drug omission (missing drug), incorrect drug (misspellings and duplications included), incorrect or missing frequency, incorrect or missing dose, incorrect or missing formulation, incorrect or missing route, and incorrect or missing allergy.

Statistical Analysis

Assuming an anticipated effect size of 0.5, a sample size of 64 patients was needed in order to provide 80% power with an alpha value of 0.05 or less. Sample size was determined using the previous study conducted at the institution that assessed the accuracy of non-pharmacy personnel completing medication histories. The difference in medication history accuracy rates between pharmacy technicians and non-pharmacy personnel was assessed in a 2-sided Student's *t* test. An analysis of variance was used to compare the accuracy rates between each pharmacy technician involved in the medication history program. All statistics were calculated using SPSS Statistics, Version 22 (SPSS, Inc., Chicago, IL).

RESULTS

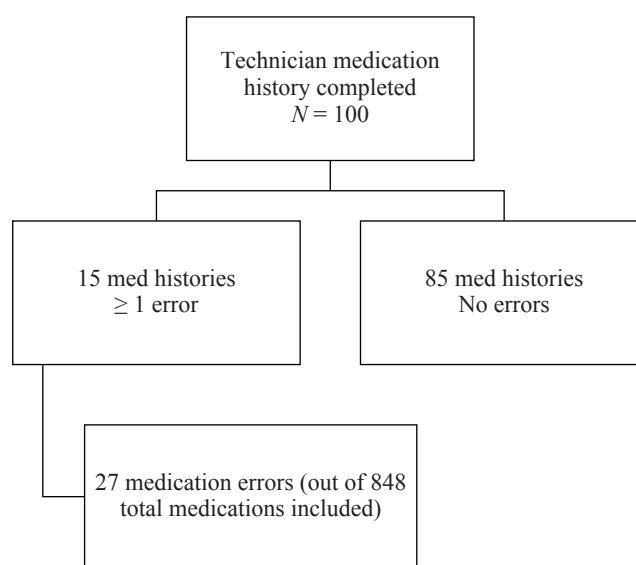
A total of 107 patients were screened and 100 (93.5%) patients were included in the study (Figure 1). Seven patients were excluded because they were not on chronic medications at home. The average age of the patients was 66 years (range, 35-98). The patients were taking, on average, 8 medications (range, 1-26) at home. There were slightly

**Figure 1.** Enrollment

more males (54%) included in the study, and a majority (90%) of the patients were admitted to non-intensive care unit patient care areas.

Primary Outcome

Of all the pharmacy technician-completed medication histories, there were no errors identified in 85 of the 100 patient medication histories, amounting to an accuracy rate of 85%. One or more errors were found in 15 of the 100 medication histories completed by pharmacy technicians. One hundred patients had 848 medications recorded, of which there were 27 total medication errors (Figure 2). This amounted to an error rate of 3% of all medications recorded.

**Figure 2.** Primary outcome.

Secondary Outcomes

The specific types of medication errors were identified (Figure 3). Errors in drug omission were the most common (25.9%), followed by incorrect or missing frequency (22.2%), incorrect or missing dose (22.2%), incorrect or missing formulation (14.8%), and incorrect drug (14.8%). There were no errors identified in the incorrect or missing route category or allergies category. Errors based on specific drug

class were also identified (Figure 4). A majority of the errors occurred in the over-the-counter class, with 14 of the 27 errors (51.9%). The asthma/chronic obstructive pulmonary disease medication class had 3 of the 27 errors (11.1%). There were minimal errors found in all other drug classes identified.

The individual accuracy rates were determined for each of the 4 technicians involved in the medication history program to assess the effectiveness of the

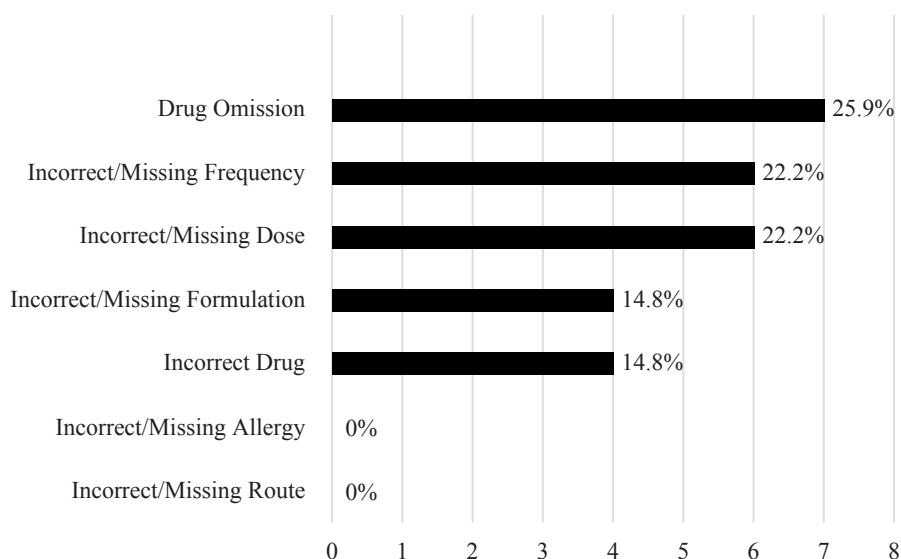


Figure 3. Technician medication entry errors by type ($n = 27$)

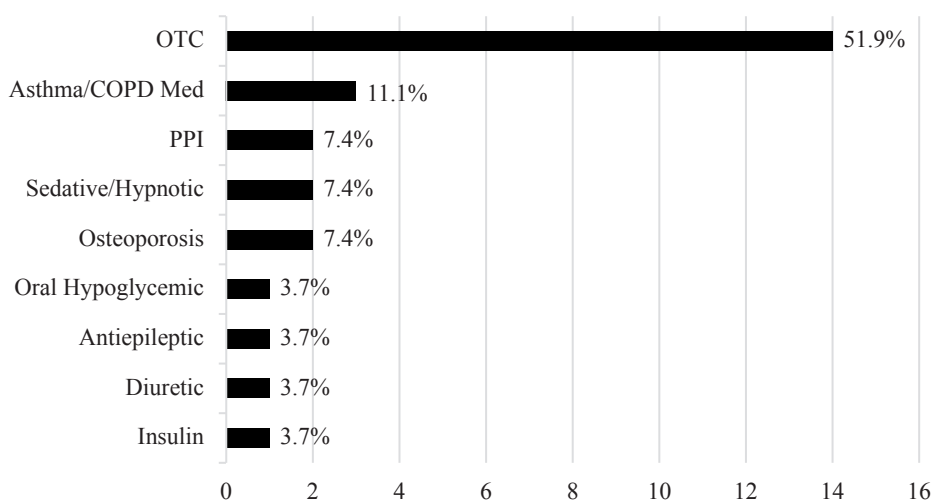


Figure 4. Technician medication entry errors by drug class ($n = 27$).

COPD = chronic obstructive pulmonary disease; OTC = over the counter;

PPI = proton pump inhibitor

education process. A majority of the technicians had an accuracy rate of 90% or greater, which was the overall goal for the pilot program. When comparing the accuracy rates among the 4 pharmacy technicians, there was no difference found (87% vs 90% vs 95% vs 98%; $p = .426$).

Fifteen of the 100 medication histories completed by pharmacy technicians had at least one discrepancy, leading to an error rate of 15% for the pharmacy technician-completed medication histories. The previous error rate for non-pharmacy personnel-completed medication histories was 65%. The pharmacy technician completed medication histories resulted in an absolute risk reduction of errors of 50% versus nursing completed medication histories. A relative risk reduction of errors of 77% ($p < .001$) was found compared to nurse-completed medication histories.

DISCUSSION

Obtaining an accurate and complete medication history is a necessary step in the medication reconciliation process during a patient's hospital admission. The results of our study further support the use of pharmacy technicians in the medication history collection process. Compared to non-pharmacy personnel, pharmacy technicians had an absolute risk reduction of 50% in medication history errors. Recent literature has shown a clear advantage of pharmacy involvement in the medication reconciliation process and, more specifically, the involvement of pharmacy technicians collecting accurate medication histories in comparison to nurses.^{3,9} Accurate and comprehensive medication histories can decrease risks for medication errors and adverse drug events during the hospital stay and postdischarge, as the admission medication list is often used to create the discharge medication list.

Although the pharmacy technician-completed medication history process was time intensive, this method resulted in improved accuracy. The average time to complete each medication history was approximately 30 minutes. This included interviewing the patient or caregiver, contacting the patient's outpatient pharmacy and entering the admission medication history into the electronic medical record. For the purposes of our study, a pharmacist verified each step completed by the technicians. We included this to establish technician accuracy at our institution.

For institutions considering the technician model, once technician accuracy is established, we suggest removing routine pharmacist verification of technician collected home medication list for several reasons. The

home medication lists are reviewed by licensed independent practitioners to generate orders that are then verified by pharmacists. Pharmacy technicians have been shown to have similar accuracy rates compared to pharmacists. One study conducted in a community hospital compared pharmacist-collected medication histories to pharmacy technician-collected medication histories and found no significant difference in terms of discrepancies involving prescription drugs or over-the-counter medications.¹¹

There are several limitations to consider with this study. First, the design of the trial was not randomized and a matched control group was not used to assess the accuracy rate on non-pharmacy personnel-collected medication histories. A second limitation is the short time period (24 days) in which the pilot program was conducted. Although the time period of the study allowed us to recruit the necessary patients to power the study, the admission patterns and the work flow for the technicians may vary during different times of the year. Although our data was not blinded to the investigators, we did not anticipate significant bias to impact our analysis due to the objective data elements being collected. Our study only included patients who were admitted through the emergency department. Although this may be viewed as a limitation, a majority of our institution's admissions are through the emergency department.

One method to increase medication history accuracy would be to utilize SureScripts, a prescription data mining service, at our institution. SureScripts connects pharmacies, health care providers, and benefit managers to ensure the sharing of secure and correct patient prescription information. However, Medicaid and cash prescriptions filled in the state of New Jersey are unable to be tracked by this method. This limits access to prescription information for many of our patients. Optimal use of this program could have improved accuracy by non-pharmacy personnel and reduced time required by technicians to complete the medication history.

The pharmacy technicians were able to verify prescription medications by contacting the patient's outpatient pharmacy, which is likely the reason for higher accuracy rates in this group. However, the technicians were unable to verify over-the-counter medications as information about specific dosages and frequencies is not available at retail pharmacies. This may be the reason why a majority (51.9%) of the errors occurred in this drug class. These errors may not necessarily be clinically relevant during a patient's hospital course, as over-the-counter medications and herbal supplements are often stopped, but

they may be relevant upon discharge as the admission medication list is used to create the discharge medication list. There were minimal errors found in all other drug classes identified. Our criteria for error were quite stringent; misspellings and duplications were considered an “incorrect drug” error in order to be consistent with electronic prescribing standards. All categories necessary for a prescription, including the specific and correct name, formulation, dose, route, and frequency, must all be included to generate a valid prescription compatible with e-prescribing and regulatory standards. Additionally, by including all of this information, orders can be more easily transcribed via computerized physician order entry during the admission medication reconciliation process.

Based on information collected during the patient interviews, all 100 patients filled their prescriptions at one pharmacy. No patients had prescriptions filled via mail order pharmacy. The use of mail order pharmacy and multiple pharmacies would likely require more time for technician verification of all medications. Additionally, none of the patients included were on sample medications or study medications. This would also require more time for technicians to verify with physicians’ offices. The additional time required for these scenarios would need to be anticipated and built into the workflow when creating technician positions for a medication history program.

Many patients included in our study spoke Spanish as their primary language. Although our institution has a translation phone line, we found that utilizing bilingual technicians allowed us to easily overcome communication barriers within this specific patient population. At the time of the study, only one of the participating technicians was a certified medical translator. The other technicians, experienced in retail pharmacy, were instructed to use the language lines if needed to translate complex medical conditions beyond the home medication list. In order to ensure accuracy of medical terminology when developing pharmacy technician medication history programs, it would be prudent for all bilingual technicians involved to receive training and certification in medical translation if translation is highly utilized.

The results of our study are consistent with other study findings in that the pharmacy technicians have an improved accuracy in their collection of medication histories when compared to non-pharmacy personnel.⁹ We anticipate that these results will raise awareness of the role pharmacy technicians may play in collecting accurate and complete medication

histories for each patient who is admitted to the hospital in order to prevent medication errors. Time constraints, patient confusion, poly-pharmacy, poor health literacy, use of multiple pharmacies, and unfamiliarity with medication names and doses can make the collection of a comprehensive medication history difficult. Having a dedicated position for the collection and verification of a medication history for all patients admitted to the hospital would allow for a comprehensive and accurate medication history to be obtained. Certified pharmacy technicians with good communication skills and familiarity with common medication brand and generic names and dosages are an optimal choice to meet this demand.

CONCLUSION

The results of this study show that pharmacy technicians significantly improved medication history accuracy when compared to non-pharmacy personnel. By collecting admission medication histories, pharmacy technicians will enable nurses and physicians to practice at the top of their license. With high accuracy rates, the pharmacy technicians are a valuable, cost-effective asset to the medication history process leading to enhanced patient safety during care transitions.

ACKNOWLEDGMENTS

The authors have no conflicts of interest.

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APPENDIX

Medication History Form

Patient's Name: _____ Gender: _____ Date of Birth: _____

MR#: _____ Admission Date: _____

Room#: _____ Insurance (are you able to get your medications?): _____

Outpatient Pharmacy: _____ Telephone: _____

Chronic Medical Conditions:

Drug Allergy	
Name of drug	Type of Reaction

Name of Drug and Formulation	Dose and Route	Frequency	Time/date last dose taken	Compliance (never takes, sometimes, most of the time, always takes)

- ☐ Verified with outpatient pharmacy
☐ Verified by different source: _____
☐ Updated in EMR