Attachment 2

Referenced Research

Research in Social and Administrative Pharmacy 16 (2020) 1398–1400

Contents lists available at ScienceDirect

Research in Social and Administrative Pharmacy

journal homepage: www.elsevier.com/locate/rsap

Comparing medication histories obtained by pharmacy technicians and nursing staff in the emergency department

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A B S T R A C T

Background: An accurate medication history is crucial for maintaining continuity of care. There are numerous opportunities for discrepancies to occur, such as medication omissions, commissions, incorrect dosing, incorrect frequencies, or incorrect formulations. Medication discrepancies may prolong hospital length of stay, increase the number of future emergency department (ED) visits, and increase hospital readmissions. Numerous studies have established the advantages of utilizing pharmacy technicians to complete medication histories. This study aimed to compare the accuracy of obtaining medication histories through pharmacy technicians compared to nursing staff.

Objective: To compare the accuracy of obtaining medication histories through pharmacy technicians compared to nursing staff in the emergency department.

Methods: This was a single-center, retrospective, observational analysis of patients presenting to the ED between December 2018 through January 2019. A pharmacy technician received on-site training on how to properly obtain a medication history and performed medication histories on the days the pharmacy resident was present between 10:00 and 18:00. Medication histories were obtained by nurses on the days the pharmacy technician was not present. All study medication histories were reviewed for discrepancies by the pharmacy resident.

Results: Medication histories conducted by a pharmacy technician (n = 102) resulted in a greater number of accurate medication histories [96 (94.1%) versus 59 (57.8%); $p < 0.01$] when compared to those conducted by nurses (n = 102). A total of seven discrepancies were found in the pharmacy technician group compared to 131 in the nursing group ($p < 0.01$). There was also a statistically significant lower amount of high impact discrepancies in the pharmacy technician group compared to nursing (1 versus 15; $p < 0.01$).

Conclusions: Pharmacy technicians in the ED provided more accurate medication histories when compared to nursing staff, thereby reducing potential medication errors.

Introduction

Medication reconciliation is the comparison of the medications a patient was previously taking to the current medication regimen.[1] The Centers for Medicare & Medicaid Services (CMS) incorporated a measure in 2018 for medication reconciliation stating that an eligible hospital receiving a patient from another setting of care should perform a medication reconciliation. The measure mandates performance of medication reconciliation for more than 50% of transitions of care.[2]

Obtaining the best possible medication history (BPMH) is a crucial aspect of completing a medication reconciliation and in maintaining the continuity of care. A study conducted by Dobrzanski et al. evaluated the nature of hospital prescribing errors and found one of the main causes of errors to be inaccurate medication histories at the time of hospital admission. A total of 587 errors were identified, 27% of which were attributed to inaccurate medication histories.[3] There are numerous opportunities for discrepancies to occur when obtaining a medication history, such as medication omissions, commissions, incorrect dosing, incorrect frequencies, or incorrect formulations. Medication discrepancies may prolong hospital length of stay, increase the number of future emergency department (ED) visits, and hospital readmissions.[4,5] Also, inappropriate inpatient prescribing is likely to occur from inaccurate medication histories which has been associated with increased morbidity, mortality and healthcare costs.[6]

The ED is a pivotal time to obtain a medication history as the majority of hospitalized patients are admitted through the ED.[6] However, there are many barriers to obtaining an accurate medication history and these barriers are often more prevalent in the ED. Possible barriers may include patients with altered mental status (e.g., confusion, impaired memory, psychiatric disorders, intoxication), language barriers, time constraints, and patients using multiple outpatient pharmacies.[7] Outside resources can be utilized, such as contacting the patient's pharmacy, however this may be a time consuming process.

As a result, there is a role for pharmacy personnel to participate in the process of obtaining medication histories. Pharmacy technicians are ideal for this position due to having experience with common medications and they are associated with decreased labor costs when compared with pharmacists and nurses.[8]

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https://doi.org/10.1016/j.sapharm.2020.01.009
Received 14 January 2020; Accepted 16 January 2020
Available online 20 January 2020

Numerous studies have established the advantages of utilizing pharmacy personnel to perform medication histories in the ED. A recent study conducted by Bowman et al. evaluated the differences in medication history errors between pharmacy personnel (pharmacy students, pharmacy technicians, and pharmacists) and nursing staff. The pharmacy personnel group had a significantly lower error rate per medication compared to the nursing group (0.03 versus 0.09; $p = 0.03$).[9] Furthermore, multiple studies have demonstrated this benefit solely utilizing pharmacy technicians. A pre-post study compared medication histories obtained in the ED by nurses to those obtained by pharmacy technicians. The study found that medication histories conducted by pharmacy technicians were accurate 88% of the time compared with 57% of those conducted by nurses ($p < 0.0001$). Medication history errors were made by pharmacy technicians 1.1% of the time versus 8.3% of the time by nurses ($p < 0.0001$)[8]. A similar study also compared the medication history error rate of pharmacy technicians to nurses in the ED. An error was made on 100% of the medication histories obtained by nurses compared to 36% of the medication histories obtained by pharmacy technicians.[10] Furthermore, a study conducted in Canada demonstrated that pharmacy technicians are able to obtain complete medication histories in the ED with as much accuracy as pharmacists. There were no significant differences in the number of medication discrepancies between the two groups ($p = 0.47$).[11]

With increasing importance being placed on obtaining accurate medication histories and the current time-restraints nursing staff face in the ED, alternative options need to be explored. The current literature has established the advantages of utilizing pharmacy technicians to complete accurate medication histories. The aim of this study was to compare the accuracy of obtaining medication histories through the use of pharmacy technicians compared to nursing staff in the ED.

Methods

Study design

This investigation was a single-center, institutional review board (IRB) approved, retrospective, observational analysis of all patients presenting to a community hospital ED between December 2018 and January 2019. Patients were excluded if all of the following criteria were met: unable to provide a medication history, have an unknown preferred pharmacy, and no other resources available to perform a medication history.

Baseline characteristics were collected for both groups including patient age, gender, and number of home medications. Medication history discrepancies were classified into five categories: drug omissions (leaving a medication off that a patient is currently taking), drug commissions (addition of a medication that a patient is not currently taking), an incorrect or missing dose, an incorrect or missing frequency, or an incorrect formulation (e.g., extended release product versus regular). A discrepancy was considered high impact if it involved anticoagulation medications or insulins that could have led to a medication error.

The pharmacy technician received on-site training by a pharmacy resident. Training included how to properly obtain a medication history and updating the electronic medical record. Nurses were informed of the project and educated on the role of the pharmacy technician in the ED. The pharmacy technician obtained medication histories in the ED during the days an emergency medicine pharmacist was present between the hours of 10:00 and 18:00. Resources to obtain the BPMH included patient and or caregiver interviews, outpatient pharmacies, external medical records and external medication insurance claims. The resources utilized were the same for both the pharmacy technician and nursing groups. Medication histories were obtained by the nursing staff on days when the pharmacy technician was not present in the ED. All study medication histories were then reviewed for discrepancies by the pharmacy resident.

Study outcomes

The primary outcome was to determine the difference in the number of accurate medication histories obtained by pharmacy technicians compared to nursing staff in patients presenting to the ED. Secondary outcomes included the total number of medication discrepancies and the number of high impact medication discrepancies.

Statistical analysis

Data analysis was conducted using Student's t-test for continuous data and Chi-Square for categorical data. P values of < 0.05 were considered statistically significant.

Results

Baseline characteristics

A total of 204 medication histories (102 in each group) were evaluated in the study. Baseline characteristics were similar between the groups. There were no significant differences in terms of patient age, gender, or number of home medications. However, there were more patients in the nursing group admitted to the hospital compared to the pharmacy technician group (57.8% versus 45.1%; $p < 0.01$; Table 1).

Primary and secondary outcomes

Medication histories conducted by a pharmacy technician resulted in a greater number of accurate medication histories [96 (94.1%) versus 59 (57.8%); $p < 0.01$] when compared to those conducted by nurses. A total of seven discrepancies were found in the pharmacy technician group compared to 131 in the nursing group ($p < 0.01$). There was also a significantly lower amount of high impact discrepancies in the pharmacy technician group compared to nursing (1 versus 15; $p < 0.01$) (Fig. 1). The majority of discrepancies were drug omissions, followed by drug commissions, incorrect doses, incorrect frequencies, and incorrect formulations (Fig. 2).

Discussion

The importance of obtaining accurate medication histories has been well established throughout current literature. The majority of hospitalized patients are admitted through the ED making it the ideal time and place to obtain a medication history. Medication histories have been routinely obtained by nurses. However, recent literature suggests pharmacy technicians can obtain more accurate medication histories thereby reducing the number of medication discrepancies.

The results of this study are similar to previous studies and demonstrate the benefits of utilizing pharmacy technicians to obtain medication histories in the ED. Multiple studies have demonstrated that pharmacy technicians obtain more accurate medication histories when compared to nursing staff.[7,9,10] In this study, medication histories conducted by a pharmacy technician resulted in a significant reduction in the number of total and high impact medication discrepancies compared to those conducted by nursing staff. The majority of

Table 1
Baseline characteristics.

	Pharmacy technician (n = 102)	Nursing (n = 102)	*p*-value
Mean Age (years) ± SD	63 ± 16.6	65 ± 15.9	0.22
Male, n (%)	34 (33.3)	47 (46.1%)	0.06
Admitted, n (%)	46 (45.1)	59 (57.8)	< 0.01
Mean # of Home Medications, n (%)	8.7 ± 4.3	7.7 ± 4.2	0.119

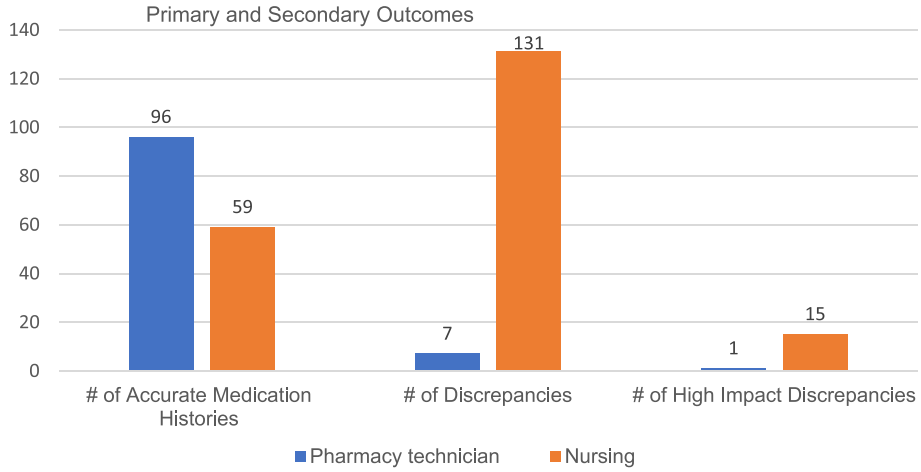

Fig. 1. Primary and secondary outcomes.

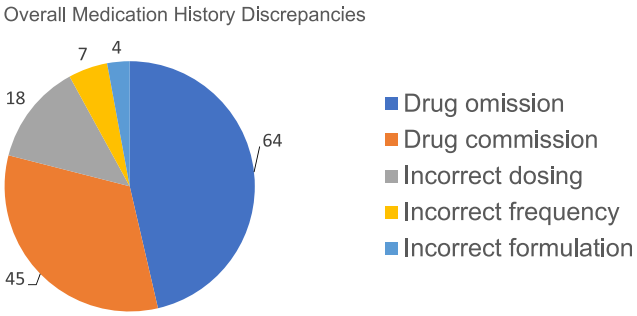

Fig. 2. Overall Medication History discrepancies.

medication discrepancies involved drug omissions and commissions which accounted for over 75% of the medication discrepancies identified in the study.

There were a few limitations associated with this study. First, the study design was not randomized and the data was collected unblinded by the investigator. This was due to the medication histories being evaluated in real time by the pharmacy resident. Also, nurse experience, training, and technique of performing medication histories may have varied. There are multiple outside resources that can be utilized when obtaining a medication history, including but not limited to the patient's: family, pharmacy, primary care physician, and many others. The nursing staff may not have taken advantage of all available resources due to time constraints or familiarity with these resources. Also, the pharmacy resident was the only evaluator which may have limited the validity of the study. Lastly, only one pharmacy technician was utilized in this study therefore limiting the generalizability of the results to other pharmacy technicians.

There was no cost analysis performed with this study. However, with the significant reduction in medication discrepancies, significant cost avoidance can be expected as a result of reducing future medication errors or events. Studies have demonstrated the relationship between medication discrepancies and prolonged hospital length of stay and increased readmission rates which are associated with increased healthcare costs.

Similar to previous studies, the objectives and results are not to criticize the competence of nurses performing medication histories. The intent is to help enhance patient care while also optimizing multidisciplinary workflow for the entire patient care team. Obtaining an accurate medication history can be a very time consuming process, especially in cases where it is necessary to utilize outside resources. For example, calling an outpatient pharmacy for a medication history may take up to 30 min due to the volume of calls these pharmacies receive. This is a considerate amount of valuable time the nursing staff could be spending on other direct patient care activities. Annual ED visits have continued to rise over the years and with the increasing number of patients nurses face an increasing workload. Therefore, finding ways to assist nurses is of upmost importance and pharmacy technicians can fulfill that critical role. Beyond obtaining medication histories, pharmacy technicians have a role to play as pharmacy extenders in the ED to help improve patient care. Pharmacy technicians can assist in resolving automated dispensing system related issues, expediting medications to the bedside, assisting providers in optimizing discharge medication issues relating to affordability, as well as many other tasks as time permits.

Conclusion

Pharmacy technicians in the ED provided more accurate medication histories when compared to those collected by nursing staff, thereby reducing potential medication errors. Utilizing pharmacy technicians to obtain medication histories will also relieve nursing of a time consuming responsibility allowing them to focus on other patient care duties. The results of this study have implications for improving patient care as well as multidisciplinary workflow.

References

1. The Joint Commission Hospital: 2018 national patient safety goals. Available at: www.jointcommission.org/standards_information/npsgs.aspx, Accessed date: 1 August 2018.
2. Department of Health and Human Services. Centers for Medicare & Medicaid Services. Rules and regulations objective 7: medication reconciliation. *Fed Regist.* 2015;80(200):62762–62955.
3. Dobrzanski S, Hammond I, Khan G, Holdsworth H. The nature of hospital prescribing errors. *Br J Clin Gov.* 2002;7:187–193.
4. Johnson JA, Bootman JL. Drug-related morbidity and mortality: a cost-of-illness model. *Arch Intern Med.* 1995;155(18):1949–1956.
5. Bond CA, Raehl CL. Clinical pharmacy services, pharmacy staffing, and hospital mortality rates. *Pharmacotherapy.* 2007;27(4):481–493.
6. Salanitro AH, Kripalani S, Resnic J, et al. Rationale and design of the multicenter medication reconciliation quality improvement study (MARQUIS). *BMC Health Serv Res.* 2013;13:230.
7. Hart C, Price C, Graziose G, Grey J. A program using pharmacy technicians to collect medication histories in the emergency department. *PT.* 2015;40(1):56–61.
8. Irwin AN, Ham Y, Gerrity TM. Expanded roles for pharmacy technicians in the medication reconciliation process: a qualitative review. *Hosp Pharm.* 2017;52(1):44–53.
9. Bowman C, McKenna J, Schneider P, Barnes B. Comparison of medication history accuracy between nurses and pharmacy personnel. *J Pharm Pract.* 2019;32(1):62–67.
10. Markovic M, Mathis S, Ghin H, Gardiner M, Fahim G. A comparison of medication histories obtained by a pharmacy technician versus nurses in the emergency department. *PT.* 2017;42(1):41–46.
11. Johnston R, Saulnier L, Gould O. Best possible medication history in the emergency department: comparing pharmacy technicians and pharmacists. *Can J Hosp Pharm.* 2010;63(5):359–365.

Research in Social and Administrative Pharmacy 14 (2018) 883–890

Contents lists available at ScienceDirect

Research in Social and Administrative Pharmacy

journal homepage: www.elsevier.com/locate/rsap

Use of pharmacy technicians in elements of medication therapy management delivery: A systematic review

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A B S T R A C T

Background: Documented barriers to Medication Therapy Management (MTM) delivery, such as limited time and inefficient workflow may be overcome by utilizing support staff for administrative services. However, it is unknown how pharmacy technicians have been historically utilized to assist pharmacists in MTM-delivery.
Objective: To characterize literature describing pharmacy technicians' participation in actions commonly undertaken in the provision of MTM services.
Methods: In August 2016, a PubMed (MEDLINE) and Journal of Pharmacy Technology search was conducted using the term "pharmacy technician" with services outlined within the MTM Core Elements Version 2.0, and with terms related to administrative actions in the provision of MTM. References were searched using identified studies. Eligible articles described pharmacy technicians' performance and/or assistance in at least one MTM Core Element or related administrative action to the provision of MTM. Data was independently extracted by two researchers; any variation in extraction was reconciled via with discussion until consensus reached. A standardized data extraction template was used.
Results: Forty-four manuscripts were included. Manuscripts were most likely to describe pharmacy technicians' assistance with medication reconciliation (70%), documentation (41%) and medication therapy review (30%). Actions least likely to be described included personal medication record development (5%), physical assessment (5%), follow-up (2%), and medication action plan development (0%). Most articles were written in the United States (73%), or Europe (16%), while the remaining articles were Canadian (11%); no articles were found originating from Asia, Africa, Australia or the Middle East.
Conclusion: Pharmacy technicians are utilized most often to support MTM through assistance in medication reconciliation. Standardized training for pharmacy technicians that delineates administrative support from pharmacists' role of clinical decision making could help pharmacists obtain greater efficiency in MTM delivery.

1. Background

Efficient healthcare delivery is dependent upon effective workflow[1] and competent support staff allow clinicians to focus on patient care.[2] Support staff are utilized very differently among healthcare settings; for example, whereas medical offices commonly utilize specialty trained personnel for an array of purposes, like scribes for documentation, medical assistants for taking vitals, and front desk staff for scheduling, support staff roles in community pharmacies are generally limited to pharmacy technicians and cashiers. Medical offices regularly use support staff to assist prescribers in patient care, whereas pharmacy technicians' roles overwhelmingly consist of assisting pharmacists in medication distribution, without assistance in the provision of cognitive services. One such cognitive service that technicians could possibly assist pharmacists in is Medication Therapy Management (MTM).

Originally created under Medicare Part D, MTM is "a service or groups of services provided by pharmacists to optimize therapeutic outcomes for individual patients".[3] The MTM service model, designated commonly as the Core Elements,[3] is generally accepted throughout pharmacy practice and is supported by most major pharmacy organizations. The five Core Elements of MTM delivery include: (1) medication therapy review, (2) personal medication record development (3), medication related action plan development, (4) intervention and referral, and (5) documentation and follow up.

Variation in MTM's outcomes has rendered the service's usefulness questionable.[4] There are several barriers to MTM delivery that

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https://doi.org/10.1016/j.sapharm.2017.11.012
Received 7 September 2017; Received in revised form 19 November 2017; Accepted 22 November 2017
1551-7411/ Published by Elsevier Inc.

contribute to the variability, including lack of direct access to medical records, poor reimbursement and low service recognition. Furthermore, lack of consistent positive outcomes could in part be due to inefficiencies in how MTM is delivered. In an effort to increase community pharmacies' efficiency in delivering cognitive services, the American Pharmacist Association Foundation published the 2013 implementation guide, *Pharmacy's Appointment Based Model*.[5] While this model aims to build efficiencies in pharmacy workflow in both cognitive-service delivery and filling duties alike, American community pharmacists still face barriers to delivering cognitive service, including time and workflow barriers.[6–8] Time and workflow constraints can partially be attributed to staffing issues,[9,10] in that support staff trained to assist pharmacists in cognitive service delivery are unavailable.

It is possible that MTM's outcomes may become more consistent and pharmacists could overcome time and workflow barriers if support staff (namely, pharmacy technicians) were trained and available to assist pharmacists in cognitive service delivery. However, no comprehensive review of the literature exists in how pharmacy technicians are utilized to assist pharmacists in MTM. Therefore in order to understand how pharmacy technicians have been utilized in the provision of pharmacist-provided cognitive services, the objective of this paper is to characterize existing literature describing pharmacy technicians' participation in actions commonly undertaken in MTM services.

2. Methods

2.1. Search strategy

In August 2016, a PubMed (MEDLINE) literature review was conducted by searching “pharmacy technician” with the term “medication therapy management.” “Pharmacy technician” was also searched with the services appearing in the MTM Core Elements Version 2.0 including: medication therapy review, personal medication record, medication action plan, intervention, referral, and documentation.[3] Then, the term “pharmacy technician” was also searched with action terms commonly related to the timing and provision of MTM, including: follow-up, communication, admission, discharge, patient education, drug therapy problem, motivational interviewing, medication history, disease management, and medication reconciliation. These methods were repeated specifically for a search within the Journal of Pharmacy Technology; this journal was included for specific review as it is a central repository for pharmacy technician literature, is peer-reviewed, and is indexed, but not indexed in PubMed. Lastly, references in manuscripts that met study inclusion criteria were searched and evaluated for inclusion. Data collection was reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

2.2. Study selection

All articles available in English were evaluated, as researchers were only fluent in English. No date restriction was set, and articles were eligible for inclusion regardless of year published. Older a articles were included even if they predated publication of the MTM Core Elements 2.0, as technicians may have performed actions related to the elements without knowledge that they would later become part of the MTM process.

Articles were included if they were descriptions of technicians performing and/or assisting in at least one MTM Core Element or administrative action in the provision of MTM, as described below. Studies were included even if MTM or pharmacist-technician intervention was not the manuscript's primary focus; rather a description of a technician performing at least one of the actions related to MTM's provision, regardless of the actual study intervention, was sufficient for inclusion. A clear description or statement of pharmacy technicians' work was sufficient for inclusion, with the rationalization that the technician performed the action, regardless of the manuscripts' focus. Similarly, manuscripts were not excluded if the intervention took place somewhere other than a community pharmacy (i.e., a hospital or ambulatory care clinic), as technician utilization from one pharmacy setting could possibly be replicated in other pharmacy settings.

Papers were excluded if they described simulations, educational programs, mock cases, opinion papers, editorials or other theoretical scenarios. Articles were also excluded if they were themselves reviews of literature. These articles were excluded because they lacked a real-life patient-care component.

Articles that described work of “student technicians” or “interns” (i.e. persons attending pharmacy school on introductory or advanced practice experiences and/or paid interns) were also excluded, as students and pharmacy interns are usually non-permanent members of support staff and often have different roles than pharmacy technicians. Similarly, only articles that specifically indicated the MTM-related action was carried out by a pharmacy technician were included; if an article lacked specific detail on the actions carried out by a pharmacy technician (i.e., the article described an intervention delivered by a care team and it was impossible to discern the exact function of the pharmacy technician) that article was also excluded, as the technician's work could not be definitively described.

Manuscripts were independently reviewed by three researchers (SG, MN, and SS). If there was any divergence in the three researchers' decision to include or exclude the manuscript, researchers discussed until consensus was achieved.

2.3. Data synthesis

Actions performed by pharmacy technicians were defined via the APhA-NACDS MTM Core Elements 2.0:

- *Medication Therapy Review (MTR):* Identification, assessment and/or characterization of any medication and/or therapy related problems. Descriptions of MRT can also include development of a plan to resolve any identified medication- or therapy-related problems. Plan development centers on synthesizing identified problems into interventions through clinical decision making. Any subsequent descriptions of technicians making therapeutic recommendations independently of pharmacists were included.
- *Personal Medication Record (PMR)*: Development or assistance in development of a patient-centered document detailing the patient's comprehensive medication regimen that the patient would ultimately receive. PMR development actions were distinct from medication reconciliation actions, in that medication reconciliation documents were not intended for patient use.
- *Medication Action Plan (MAP):* Development or assistance in development of a patient-centric document detailing the problems identified during the medication therapy review. This document includes action steps the patient uses to track his/her progress towards resolving identified problems.
- *Intervention:* Working with the patient and/or healthcare team directly to resolve or prevent a medication- or therapy-related problem. Examples included adherence and medication safety education.
- *Referral:* Communicating information to prescribers, healthcare-related services or any other entity outside of the manuscripts' intervention site. Examples include faxing recommendations, mailing care coordination documents, or relaying identified problems to a prescriber.
- *Documentation:* Recording of any information that became part of the patient's permanent (i.e., ongoing) pharmacy or medical record. Examples include documentation in any EMR, pharmacy databases, MTM platforms, or paper documentation. Descriptions of technicians documenting information solely for study purposes that otherwise did not become part of the patient's health record or were

not part of normal provision of health services were excluded from this study's analysis.
- *Follow-Up*: Any patient or caregiver communications after services were delivered. Examples included mailing patients MTM documents or phone-calls to ask about adherence. If a pharmacy technician called a patient after services were delivered to schedule or reschedule a follow-up appointment, that action was counted under recruitment & scheduling, rather than follow-up.

Articles were also reviewed to identify support actions commonly included in the provision of MTM. These actions included:

- *Recruitment & Scheduling:* Identification, approach and/or scheduling/rescheduling of eligible patients for pharmacist-provided cognitive services.
- *Medical History Gathering*: Any methods used to obtain a patient's past medical history (e.g., diagnoses, family history, hospitalizations, labs, etc.) were included in 'medical history gathering'. Examples included technicians accessing electronic medical records, faxing prescribers' offices to solicit information, and interviewing patients. Medical history-gathering was distinct from medication reconciliation in that medication history-gathering did not center on the process of compiling an accurate medication list.
- *Medication Reconciliation*: The process of identifying the most comprehensive accurate list of all medications the patient takes, including the drugs' dosage, frequency, and route.[11] For example, pharmacy technicians could use the pharmacy's fill records, patient interviews, and insurance fill records to complete medication reconciliation. Medication reconciliation is distinguished from medication therapy review in that medication reconciliation focuses on obtaining a list of medications, whereas medication therapy review focuses on reviewing that list for problem identification and resolution.
- *Physical Assessment*: The physical taking or performance of any vitals or lab measurement. Examples include obtaining patients' blood pressure or weight. If a pharmacy technician received a physical assessment result verbally or written from the patient, caregiver or provider rather than physically taking the assessment themselves, that action was categorized as medical history-gathering, rather than physical assessment.

Manuscripts were independently reviewed for data extraction by two researchers (SG and MS) using a standardized data form. Any variation in data extraction was reconciled via discussion until consensus achieved. Data collected on each article included year published and action completed by the pharmacy technician (i.e., a MTM Core Element(s) and/or support action as described above).

If pharmacy technicians performed more than one type of action per article, all actions were included. Articles were also described by their country of origin and finally, were characterized by manuscripts' study design: meta-analysis, systematic review, randomized controlled trial, prospective observational, case-control, cross sectional, or case report.[12] Data from each article was collected in Research Electronic Data Capture, REDCap.

3. Results

Forty-four manuscripts were included in the final analysis (Fig. 1). Manuscripts were most likely to describe *Medication Reconciliation*, with 70% reporting pharmacy technicians' involvement in the reconciliation process. *Documentation* actions appeared in 41% of articles, and *Medication Therapy Review* in 30%. While *Medication Therapy Review* and *Intervention* actions could include creation of plans to resolve identified problems, and/or patient education, these descriptions took place only within specialized centers (e.g. pre-operation wards, poison control centers), and only after direct specialized training and/or pharmacist review. The remaining articles describing instances of *Medication Therapy Review* focused on pharmacy technicians' identification of problems, without reliance on clinical decision making to develop therapeutic plans. The medication related problem most often identified by pharmacy technicians was non-adherence. Other specified problems identified by technicians included drug-drug interactions and record omissions. All problems identified were referred from the technician to the pharmacist for resolution.

Actions least likely to be described included *Medication Action Plan* Development (0%), *Follow-Up* (2%), *Personal Medication Record* development (5%), and *Physical Assessment* (5%) [See Fig. 2].

Nine articles described a pharmacy technician providing an *Intervention.* Manuscripts with pharmacy technician *Interventions* described instances where the technician delivered general verbal or written health-information education not otherwise related to any identified patient-specific medication or therapy related problem. Examples included education related to adherence, disease states, over-the-counter drugs, and general medication safety education. In some instances, technicians were required by their employer to demonstrate competence before they were allowed to deliver such patient education.

Most articles were written in the United States (73%), or Europe (16%), while the remaining articles were Canadian (11%); no articles were found originating from Asia, Africa, Australia or the Middle East (Table 1). Articles' study designs were most likely to be prospective cohorts (39%) or surveys (18%). Found articles were published between 1985 and 2016, with a median publish date of 2013 (IRQ: 2007–2014).

4. Discussion

One of this review's most important findings is that pharmacy technicians have been utilized in components of MTM provision. Similarly, in consistency with U.S. laws, this review found that American pharmacy technicians were able to support pharmacists' cognitive service delivery without compromising the delineation between pharmacist-technician scope of practice as no US study described technicians relying on clinical knowledge to make decisions nor counsel patients.

Although articles were most likely to describe technicians' assistance with medication reconciliation and documentation, very few articles described pharmacy technicians working similarly to prescribers' medical assistants, in that instances of technicians obtaining medical histories and physical assessments were rare. Similarly, recruitment and/or scheduling patients was not prominent. While specialized training is needed to obtain an accurate medical history or take a blood pressure, minimal training is needed to recruit and schedule patients. This could be a potential opportunity for enhancements to MTM logistics.

Previous research reports expansion of technicians' responsibilities as an essential component of implementing community pharmacy cognitive services.[13] Delegating administrative responsibilities to technicians may increase cost-efficiency, free the pharmacist to improve delivery, and improve outcomes, which in theory could increase demand.[14] Unlike pharmacists, physicians and other health care providers have for many years delegated administrative responsibility to support staff as a means to increase efficiency and allow the provider to focus on patient care. For example, while the routine primary care visit takes a physician on average 15–20 minutes[15] an average MTM appointment can take 30–120 minutes. Depending on site, pharmacists may have the luxury of spending most of that time in direct patient care. This is positive, as increased contact with a healthcare provider can increases patients' adherence and satisfaction.[16] However, it is unknown what proportion of the MTM visit is direct patient care, as pharmacist spend additional time on administrative duties that prescribers often do not.

Improving efficiency however cannot come at the expense of

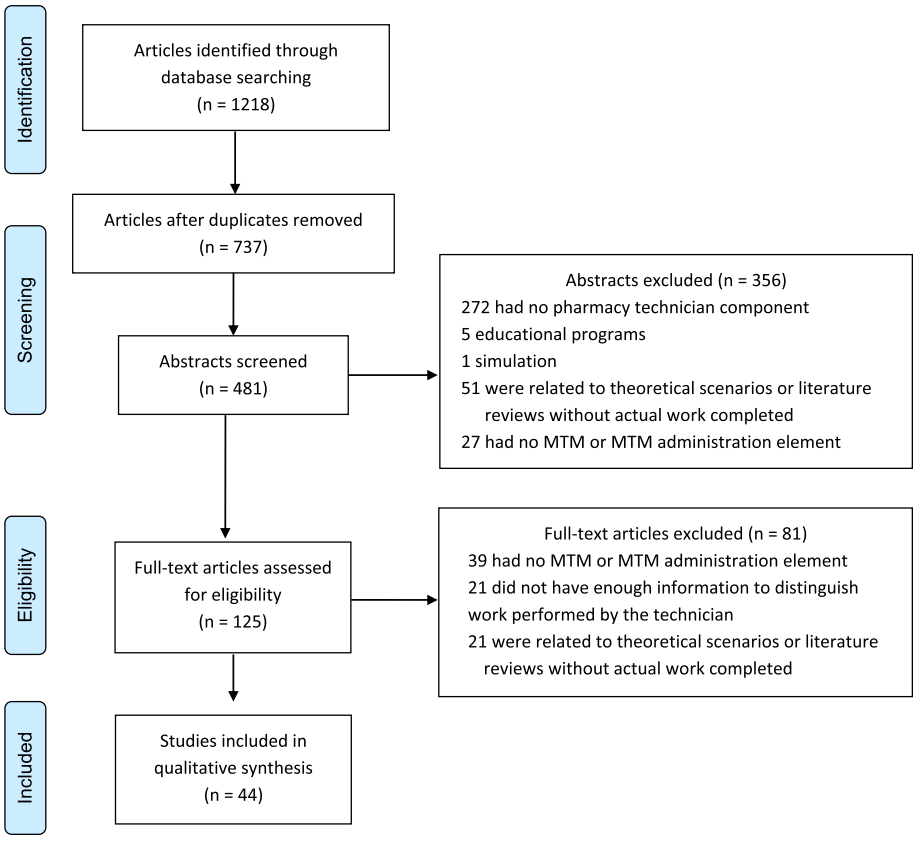

Fig. 1. Flow diagram of included articles.

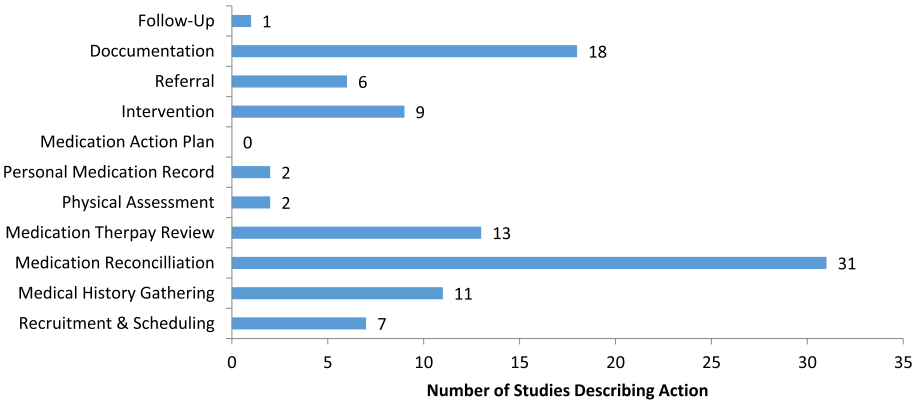

Fig. 2. Actions performed by pharmacy Technicians.

reduced safety. Though previous research suggests community pharmacists positively receive the idea of delegating responsibilities to support staff, pharmacists have had concerns regarding accountability and assurance of support staffs' capabilities.[17] Thus, regulators and pharmacists may hesitate to delegate MTM administrative responsibilities to pharmacy technicians with concerns that technicians may lack training and thus work outside the scope of their abilities. Currently, no national standardized training for pharmacy technicians is required among state boards of pharmacy and while formal certification exists, only 42% of states require pharmacy technicians to be certified.[18] To delineate between the provision of cognitive services and administrative services, any future training for technicians' assistance in MTM should clearly demarcate between pharmacists' and technicians' scope of practice. For example, this review suggests that technicians may be helpful in identification of medication related problems, notably non-adherence, but creating plans to resolve and monitor those problems is beyond technicians' abilities.

The frequency of articles published tended to increase over time, with few articles published between the late 1980s and early 2000s, and the majority published in the mid to late 2000's. This increase over time may be in response to the passage of two key pieces of legislation in the US. First, the 2003 Medicare Prescription Drug, Improvement, and Modernization Act lead to pharmacist payments for MTM. Similarly, the Patient Protection and Affordable Care Act (ACA) passed in 2010 may have increased the regular use of pharmacy technicians' support in pharmacist-provided cognitive service delivery because under the ACA, health systems have a financial incentive to provide value-based services that help meet quality metrics. In order to meet these metrics, health systems may utilize pharmacists in more cognitive delivery services, especially for high-risk and high-utilizing patients.[19] If health systems utilize pharmacists for cognitive service delivery, and rely on the pharmacist to complete his/her own administrative tasks, the health system will suffer an operational loss. Pharmacists are costly medication experts, and by allocating their time to administrative tasks, health systems not only pay more per task completed but also suffer an opportunity cost, as the pharmacist will have less capacity for patient

Table 1
Articles included in analysis.

Year Published	First Author	Title	Actions	Study Type	Region
1985	Polk M[21]	A Health Educator and Provider of Drug and Poison Information.	Medical History Gathering; Intervention	Case Report	United States
1987	Tullio CJ[22]	Minimizing i.v. admixture waste in a 70-bed hospital.	Medication Reconciliation	Pre-Post	United States
1988	Phillips CS[23]	Current and future delegation of pharmacy activities to technicians in Tennessee.	Medication Therapy Review; Intervention; Referral and Communication	Survey	United States
1989	Underhill AL[24]	Technician intervention in use of nonformulary antimicrobial agents in the surgical suite.	Referral and Communication	Prospective Cohort	United States
2000	Skledar SJ[25]	Implementation of a drug-use and disease-state management program.	Recruitment & Scheduling	Case Report	United States
2001	Ervin KC[26]	Data analyst technician: an innovative role for the pharmacy technician.	Recruitment & Scheduling; Medication Therapy Review; Referral and Communication	Mixed Methods	United States
2002	Flynn EA[27]	Comparison of methods for detecting medication errors in 36 hospitals and skilled-nursing facilities.	Medication Therapy Review	Prospective Cohort	United States
2005	Mounts VL[28]	Implementation of a patient medication assistance program in a community pharmacy setting.	Medical History Gathering; Medication Reconciliation; Referral and Communication; Documentation	Prospective Cohort	United States
2006	Murphy JE[29]	The Role of Technicians in Managing Computerized Drug–Drug Interaction Alerts in Community Pharmacies and the Relationship to Pharmacist Managers' Attitudes.	Medication Therapy Review	Survey	United States
2007	Read H[30]	The impact of a supplementary medication review and counseling service within the oncology outpatient setting.	Medication Reconciliation; Medication Therapy Review; Intervention; Documentation	Randomized Control Trial	United Kingdom
2007	Lizer MH[31]	Medication history reconciliation by pharmacists in an inpatient behavioral health unit.	Medical History Gathering; Medication Reconciliation	Prospective Cohort	United States
2007	Scott DM[32]	Assessment of Pharmacy Technicians' Salary, Benefits, and Responsibilities in North Dakota.	Medical History Gathering; Intervention	Survey	United States
2008	Kliethermes MA[33]	Model for medication therapy management in a university clinic.	Personal Medication Record Development	Case Report	United States
2009	Leung M[34]	Best possible medication history for hemodialysis patients obtained by a pharmacy technician.	Medication Reconciliation; Medication Therapy Review; Documentation	Prospective Cohort	Canada
2009	Randolph TC[35]	Expansion of pharmacists' responsibilities in an emergency department.	Medication Reconciliation; Documentation	Case Report	United States
2009	Remtulla S[36]	Best possible medication history by a pharmacy technician at a tertiary care hospital.	Medication Reconciliation; Documentation	Prospective Cohort	Canada
2009	Van den Bemt PM[37]	Medication reconciliation performed by pharmacy technicians at the time of preoperative screening.	Medication Reconciliation; Medication Therapy Review; Development; Intervention; Referral and Communication; Documentation	Pre-Post	Netherlands
2010	Johnston R[38]	Best possible medication history in the emergency department: comparing pharmacy technicians and pharmacists.	Medication Reconciliation	Prospective Cohort	Canada
2010	Friesner DL[39]	Identifying characteristics that allow pharmacy technicians to assume unconventional roles in the pharmacy.	Medication Reconciliation; Intervention	Survey	United States
2013	Smith SB[40]	Pharmacy-based medication reconciliation program utilizing pharmacists and technicians: a process improvement initiative.	Medication Reconciliation	Retrospective Cohort	United States
2013	Van den Bernt PM[41]	Effect of medication reconciliation on unintentional medication discrepancies in acute hospital admissions of elderly adults: a multicenter study.	Medication Reconciliation	Pre-Post	Netherlands
2013	Siemianowski LA[42]	Impact of pharmacy technician-centered medication reconciliation on optimization of antiretroviral therapy and opportunistic infection prophylaxis in hospitalized patients with HIV/AIDS.	Medication Reconciliation	Retrospective Cohort	United States
2013	Svarstad BL[43]	Improving refill adherence and hypertension control in black patients: Wisconsin TEAM trial.	Recruitment & Scheduling; Medical History Gathering; Physical Assessment	Randomized Control Trial	United States
2013	Buck TC[44]	Medication reconciliation and prescribing reviews by pharmacy technicians in a geriatric ward.	Medication Reconciliation; Medication Therapy Review; Referral and Communication; Documentation	Prospective Cohort	Denmark
2013	Brownlie K[45]	Medication reconciliation by a pharmacy technician in a mental health assessment unit.	Medication Reconciliation; Medication Therapy Review	Prospective Cohort	United Kingdom
2014	Kramer JS[46]	A quantitative evaluation of medication histories and reconciliation by discipline.	Medication Reconciliation	Prospective Cohort	United States
2014	Zillich AJ[47]	A randomized; controlled pragmatic trial of telephonic medication therapy management to reduce hospitalization in home health patients.	Medical History Gathering; Medication Reconciliation	Randomized Control Trial	United States
2014	Pavlov A[48]	Inappropriate discharge on bronchodilators and acid-blocking medications after ICU admission: importance of medication reconciliation.	Medication Reconciliation; Documentation	Retrospective Cohort	United States

(*continued on next page*)

Table 1 (*continued*)

Year Published	First Author	Title	Actions	Study Type	Region
2014	Cooper JB[49]	Experience with a pharmacy technician medication history program.	Medication Reconciliation; Documentation	Prospective Cohort	United States
2014	Kern KA[50]	Variations in pharmacy-based transition-of-care activities in the United States: a national survey.	Recruitment & Scheduling; Medication Reconciliation; Intervention	Survey	United States
2014	Irwin AN[51]	Use of a pharmacy technician to facilitate post-fracture care provided by clinical pharmacy specialists.	Medical History Gathering; Medication Therapy Review; Documentation	Prospective Cohort	United States
2014	Sen S[52]	Implementation of a pharmacy technician-centered medication reconciliation program at an urban teaching medical center.	Medication Reconciliation; Documentation	Retrospective Chart Review	United States
2014	Fischer MA[53]	Pharmacy-based interventions to reduce primary medication nonadherence to cardiovascular medications.	Medical History Gathering; Medication Therapy Review; Intervention	Randomized Control Trial	United States
2014	Smith MB[54]	Implementation of the Pharmacy Practice Model Initiative within comprehensive cancer centers.	Medical History Gathering; Medication Reconciliation; Documentation	Survey	United States
2014	Cater SW[55]	A prospective cohort study of medication reconciliation using pharmacy technicians in the emergency department to reduce medication errors among admitted patients.	Medication Reconciliation; Documentation	Prospective Cohort	United States
2015	Hart C[56]	A program using pharmacy technicians to collect medication histories in the emergency department.	Medication Reconciliation; Documentation	Pre-Post	United States
2015	Henriksen JP[57]	Medication histories by pharmacy technicians and physicians in an emergency department.	Medication Reconciliation; Documentation	Prospective Cohort	Denmark
2015	Raghu TS[58]	Using secure messaging to update medications list in ambulatory care setting.	Recruitment & Scheduling; Medication Reconciliation; Documentation	Retrospective Cross Sectional	United States
2015	Chan C[59]	Medication reconciliation in pediatric cardiology performed by a pharmacy technician: a prospective cohort comparison study.	Medication Reconciliation	Prospective Cohort	Canada
2015	Wanbon R[60]	Medication Reconciliation Practices in Canadian Emergency Departments: A National Survey.	Medication Reconciliation	Survey	Canada
2016	Kalich BA[61]	From pilot to practice: a trainee-integrated pharmacy practice model in cardiology.	Medication Reconciliation	Prospective Cohort	United States
2016	Bailey JE[62]	SafeMed: Using pharmacy technicians in a novel role as community health workers to improve transitions of care.	Recruitment & Scheduling; Medical History Gathering; Medication Reconciliation; Medication Therapy Review; Personal Medication Record Development; Intervention; Documentation; Follow-Up	Prospective Cohort	United States
2016	Kuhn H[63]	Proportion of work appropriate for pharmacy technicians in anticoagulation clinics.	Recruitment & Scheduling; Medical History Gathering; Physical Assessment; Documentation	Mixed Methods	United States
2016	Kothari M[64]	Medicines reconciliation in comparison with NICE guidelines across secondary care mental health organizations.	Medication Reconciliation	Survey	United Kingdom

care.

While institutions may discover cost-savings by utilizing pharmacists to the top of their license and free them from administrative responsibilities, delegation of administrative tasks to pharmacy technicians would increase the need for staffing hours, which can be a large overhead cost. Fruthermore, data from the 2015 National Pharmacy Technician Workforce Study suggests that nearly half of pharmacy technicians report stress from their amount of work, and/or being short-staffed[20]; if MTM administrative responsibilities were added without additional technician staffing, the additional responsibilities would most likely compound job stress. Similarly, with recent uncertainty to the future of American healthcare regulation, pharmacy owners and financial officers may be hesitant to invest in technicians to assist pharmacists in anything other than dispensing duties. Future research in operations management should occur not only to maximize technicians' ability in supporting pharmacists' cognitive services like MTM, but also pharmacists' efficiency in delivering these cognitive services.

4.1. Review limitations

This review is limited as some actions normally completed by support staff in healthcare settings other than pharmacies were excluded. For example, actions such as “billing” and “coding” were not included in the search terms. Billing and coding were excluded because the majority of community-pharmacist delivered MTM in America is contingent upon only two MTM platforms, which are integrated into their own documentation systems. In these platforms, pharmacists themselves must contest to the MTM claim submitted. Similarly, due to a lack of provider status under the United States' Social Security Act, pharmacists are ineligible to bill Medicare Part B for their cognitive services, and thus rendering coding and billing processes limited. Furthermore, this review is limited, as only research PubMed indexed or appearing in the Journal of Pharmacy Technology were included; therefore any descriptions of MTM work completed by technicians outside of these areas, such as trade organization websites or periodicals were not included.

Also, while this review included articles originating from outside of the United States, only articles available in English were included. This could explain why no Asian, African or South American articles were included. Similarly, included articles could have originated from nations with vastly various laws regarding pharmacy technicians' roles and scope.

This article is also limited as no inter-rater reliability was evaluated; the decision to include or exclude and article, and the categorization of how the article described pharmacy technicians' actions were made via discussion and consensus only.

Finally, to discourage extrapolation of findings beyond the analysis, the research narrowly defined and applied the definition related to *Documentation*. Many actions completed by support staff in health services are documented within patient charts. For example, recommendations faxed to prescribers (i.e. *Referral*), or a compiled *Medication Reconciliation* list can become permanent part of a patient's medical record, thus fulfilling the criteria to be included in *Documentation*. However, some articles did not describe how documents were kept (e.g., an article did not specify if a medication reconciliation list become part of the patient chart or simply used by the pharmacist and then discarded). If it could not be determined by the article that the action taken by the pharmacy technician became a permanent part of the patient's chart, or that the technician otherwise directly documented some information into the patient's permanent record, the action did not count towards *Documentation*.

5. Conclusion

In support of MTM services, pharmacy technicians have been utilized most often to complete medication reconciliation and documentation, and the occurrence of this utilization has increased over time. No descriptions of large, standardized tech training programs regarding MTM were regularly encountered, nor was evidence suggesting that pharmacy technicians work outside of their scope of practice when assisting pharmacists in MTM-related activities. This review suggests that some technicians may be used in certain settings to assist pharmacists in administrative duties related to the provision of MTM. Future research regarding operations management and technician training may ensure technicians' assistance is both safe and efficient across a variety of care locations.

Disclosure

The authors have no conflicts of interest to declare.

References

1. Cain C, Haque S. Advances in patient safety organizational workflow and its impact on work quality. In: Hughes RG, ed. *Patient Safety and Quality: An Evidence-based Handbook for Nurses.* Rockville (MD): Agency for Healthcare Research and Quality (US); 2008.
2. Choat DE. Office support staff. *Clin Colon Rectal Surg.* 2005;18:267–270.
3. Medication therapy management in pharmacy practice: core elements of an MTM service model (version 2.0). *J Am Pharm Assoc.* 2008;48:341–353.
4. Viswanathan M, Kahwati LC, Golin CE, et al. Medication therapy management interventions in outpatient settings: a systematic review and meta-analysis. *JAMA Intern Med.* 2015;175:76–87.
5. Law LL, Bluml BM. Pharmacy's appointment based model implementation guide for pharmacy practices. . Available from: http://www.aphafoundation.org/sites/default/files/ckeditor/files/ABMImplementationGuide-FINAL-20130923.pdf; 2013 Accessed August, 2017.
6. Herbert KE, Urmie JM, Newland BA, Farris KB. Prediction of pharmacist intention to provide Medicare medication therapy management services using the theory of planned behavior. *Res Soc Adm Pharm.* 2006;2:299–314.
7. Law AV, Okamoto MP, Chang PS. Prevalence and types of disease management programs in community pharmacies in California. *J Manag Care Pharm.* 2005;11:505–512.
8. Hagemeier NE, Murawski MM, Lopez NC, Alamian A, Pack RP. Theoretical exploration of Tennessee community pharmacists' perceptions regarding opioid pain reliever abuse communication. *Res Soc Adm Pharm.* 2014;10:562–575.
9. Ryder PT, Meyerson BE, Coy KC, von Hippel CD. Pharmacists' perspectives on HIV testing in community pharmacies. *J Am Pharm Assoc.* 2013;53:595–600.
10. Lounsbery JL, Green CG, Bennett MS, Pedersen CA. Evaluation of pharmacists' barriers to the implementation of medication therapy management services. *J Am Pharm Assoc.* 2009;49:51–58.
11. United States Department of Health and Human Services. *Agency for Healthcare Research and Quality. Medication Reconciliation.* . 2017; 2017. Available from: https://psnet.ahrq.gov/primers/primer/1/medication-reconciliation Accessed August, 2017.
12. Georgina State University. Literature reviews: types of clinical study designs. . Available from: http://research.library.gsu.edu/c.php?g=115595&p=755213; 2017 Accessed August, 2017.
13. Chui MA, Mott DA, Maxwell L. A qualitative assessment of a community pharmacy cognitive pharmaceutical services program, using a work system approach. *Res Soc Adm Pharm.* 2012;8:206–216.
14. American Pharmacist Association. MTM as team sport. [Podcast]. . Available from: https://drive.google.com/open?id=0BwWHw-ghqNkjWW1SOGpURjFrS0k; 2017 Accessed August, 2017.
15. Mechanic D, McAlpine DD, Rosenthal M. Are patients' office visits with physicians getting shorter? *N Engl J Med.* 2001;344:198–204.
16. Geraghty EM, Franks P, Kravitz RL. Primary care visit length, quality, and satisfaction for standardized patients with depression. *J Gen Intern Med.* 2007;22:1641–1647.
17. Bradley F, Schafheutle EI, Willis SC, Noyce PR. Changes to supervision in community pharmacy: pharmacist and pharmacy support staff views. *Health Soc Care Community.* 2013;21:644–654.
18. National Associations of Boards of Pharmacy. *Survey of Pharmacy Law.* 2017; 2017.
19. Smith M, Bates DW, Bodenheimer TS. Pharmacists belong in accountable care organizations and integrated care teams. *Health Aff.* 2013;32:1963–1970.
20. Desselle SP, Holmes ER. 2015 national pharmacy technician workforce study. *Am J Health Syst Pharm.* 2017;74:981–991.
21. Polk MA. A health educator and provider of drug and poison information. *J Pharm Tech.* 1985;1:62–65.
22. Tullio CJ. Minimizing i.v. admixture waste in a 70-bed hospital. *Hosp Pharm.* 1987;22:994–997 1001.
23. Phillips CS, Ryan MR, Roberts KB. Current and future delegation of pharmacy activities to technicians in Tennessee. *Am J Hosp Pharm.* 1988;45:577–583.
24. Underhill AL, Reno CB, Dougherty FK. Technician intervention in use of non-formulary antimicrobial agents in the surgical suite. *Am J Hosp Pharm.*

1989;46:312–313.
25. Skledar SJ, Hess MM. Implementation of a drug-use and disease-state management program. *Am J Health Syst Pharm.* 2000;57:S23–S29.
26. Ervin KC, Skledar S, Hess MM, Ryan M. Data analyst technician: an innovative role for the pharmacy technician. *Am J Health Syst Pharm.* 2001;58:1815–1818.
27. Flynn EA, Barker KN, Pepper GA, Bates DW, Mikeal RL. Comparison of methods for detecting medication errors in 36 hospitals and skilled-nursing facilities. *Am J Health Syst Pharm.* 2002;59:436–446.
28. Mounts VL, Ringenberg DG, Rhees K, Partridge C. Implementation of a patient medication assistance program in a community pharmacy setting. *J Am Pharm Assoc.* 2005;45:76–81.
29. Murphy JE, Malone DC, Skrepnek GH, et al. The role of technicians in managing computerized drug–drug interaction alerts in community pharmacies and the relationship to pharmacist managers' attitudes. *J Pharm Tech.* 2005;22:155–160.
30. Read H, Ladds S, Rhodes B, Brown D, Portlock J. The impact of a supplementary medication review and counselling service within the oncology outpatient setting. *Br J Cancer.* 2007;96:744–751.
31. Lizer MH, Brackbill ML. Medication history reconciliation by pharmacists in an inpatient behavioral health unit. *Am J Health Syst Pharm.* 2007;64:1087–1091.
32. Scott DM, Halvorson D. Assessment of pharmacy technicians' salary, benefits, and responsibilities in North Dakota. *J Pharm Tech.* 2007;23:148–157.
33. Kliethermes MA, Schullo-Feulner AM, Tilton J, Kim S, Pellegrino AN. Model for medication therapy management in a university clinic. *Am J Health Syst Pharm.* 2008;65:844–856.
34. Leung M, Jung J, Lau W, Kiaii M, Jung B. Best possible medication history for hemodialysis patients obtained by a pharmacy technician. *Can J Hosp Pharm.* 2009;62:386–391.
35. Randolph TC. Expansion of pharmacists' responsibilities in an emergency department. *Am J Health Syst Pharm.* 2009;66:1484–1487.
36. Remtulla S, Brown G, Frighetto L. Best possible medication history by a pharmacy technician at a tertiary care hospital. *Can J Hosp Pharm.* 2009;62:402–405.
37. Van Den Bemt PM, van den Broek S, van Nunen AK, Harbers JB, Lenderink AW. Medication reconciliation performed by pharmacy technicians at the time of preoperative screening. *Ann Pharmacother.* 2009;43:868–874.
38. Johnston R, Saulnier L, Gould O. Best possible medication history in the emergency department: comparing pharmacy technicians and pharmacists. *Can J Hosp Pharm.* 2010;63:359–365.
39. Friesner DL, Scott DM. Identifying characteristics that allow pharmacy technicians to assume unconventional roles in the pharmacy. *J Am Pharm Assoc.* 2010;50:686–697.
40. Smith SB, Mango MD. Pharmacy-based medication reconciliation program utilizing pharmacists and technicians: a process improvement initiative. *Hosp Pharm.* 2013;48:112–119.
41. Van den Bemt PM, Van der Schrieck-de Loos EM, Van der Linden C, Theeuwes AM, Pol AG. Effect of medication reconciliation on unintentional medication discrepancies in acute hospital admissions of elderly adults: a multicenter study. *J Am Geriatr Soc.* 2013;61:1262–1268.
42. Siemianowski LA, Sen S, George JM. Impact of pharmacy technician-centered medication reconciliation on optimization of antiretroviral therapy and opportunistic infection prophylaxis in hospitalized patients with HIV/AIDS. *J Pharm Pract.* 2013;26:428–433.
43. Svarstad BL, Kotchen JM, Shireman TI, et al. Improving refill adherence and hypertension control in black patients: Wisconsin TEAM trial. *J Am Pharm Assoc.* 2013;53:520–529.
44. Buck TC, Gronkjaer LS, Duckert ML, Rosholm JU, Aagaard L. Medication reconciliation and prescribing reviews by pharmacy technicians in a geriatric ward. *J Pharm Pract.* 2013;2:145–150.
45. Brownlie K, Schneider C, Culliford R, et al. Medication reconciliation by a pharmacy technician in a mental health assessment unit. *Int J Clin Pharm.* 2014;36:303–309.
46. Kramer JS, Stewart MR, Fogg SM, et al. A quantitative evaluation of medication histories and reconciliation by discipline. *Hosp Pharm.* 2014;49:826–838.
47. Zillich AJ, Snyder ME, Frail CK, et al. A randomized, controlled pragmatic trial of telephonic medication therapy management to reduce hospitalization in home health patients. *Health Serv Res.* 2014;49:1537–1554.
48. Pavlov A, Muravyev R, Amoateng-Adjepong Y, Manthous CA. Inappropriate discharge on bronchodilators and acid-blocking medications after ICU admission: importance of medication reconciliation. *Respir Care.* 2014;59:1524–1529.
49. Cooper JB, Lilliston M, Brooks D, Swords B. Experience with a pharmacy technician medication history program. *Am J Health Syst Pharm.* 2014;71:1567–1574.
50. Kern KA, Kalus JS, Bush C, Chen D, Szandzik EG, Haque NZ. Variations in pharmacy-based transition-of-care activities in the United States: a national survey. *Am J Health Syst Pharm.* 2014;71:648–656.
51. Irwin AN, Heilmann RM, Gerrity TM, Kroner BA, Olson KL. Use of a pharmacy technician to facilitate postfracture care provided by clinical pharmacy specialists. *Am J Health Syst Pharm.* 2014;71:2054–2059.
52. Sen S, Siemianowski L, Murphy M, McAllister SC. Implementation of a pharmacy technician-centered medication reconciliation program at an urban teaching medical center. *Am J Health Syst Pharm.* 2014;71:51–56.
53. Fischer MA, Choudhry NK, Bykov K, et al. Pharmacy-based interventions to reduce primary medication nonadherence to cardiovascular medications. *Med Care.* 2014;52:1050–1054.
54. Smith MB, Gumpper KF, Riebandt G, Handel EM. Implementation of the pharmacy practice model initiative within comprehensive cancer centers. *Am J Health Syst Pharm.* 2014;71:1647–1660.
55. Cater SW, Luzum M, Serra AE, et al. A prospective cohort study of medication reconciliation using pharmacy technicians in the emergency department to reduce medication errors among admitted patients. *J Emerg Med.* 2015;48:230–238.
56. Hart C, Price C, Graziose G, Grey J. A program using pharmacy technicians to collect medication histories in the emergency department. *Pharm Ther.* 2015;40:56–61.
57. Henriksen JP, Noerregaard S, Buck TC, Aagaard L. Medication histories by pharmacy technicians and physicians in an emergency department. *Int J Clin Pharm.* 2015;37:1121–1127.
58. Raghu TS, Frey K, Chang YH, Cheng MR, Freimund S, Patel A. Using secure messaging to update medications list in ambulatory care setting. *Int J Med Inf.* 2015;84:754–762.
59. Chan C, Woo R, Seto W, Pong S, Gilhooly T, Russell J. Medication reconciliation in pediatric cardiology performed by a pharmacy technician: a prospective cohort comparison study. *Can J Hosp Pharm.* 2015;68:8–15.
60. Wanbon R, Lyder C, Villeneuve E, Shalansky S, Manuel L, Harding M. Medication reconciliation practices in Canadian emergency departments: a national survey. *Can J Hosp Pharm.* 2015;68:202–209.
61. Kalich BA, Cicci JD, Shah S, Reed BN. From pilot to practice: a trainee-integrated pharmacy practice model in cardiology. *N. C Med J.* 2016;77:45–51.
62. Bailey JE, Surbhi S, Bell PC, Jones AM, Rashed S, Ugwueke MO. SafeMed: using pharmacy technicians in a novel role as community health workers to improve transitions of care. *J Am Pharm Assoc.* 2016;56:73–81.
63. Kuhn H, Park A, Kim B, Lukesh W, Rose A. Proportion of work appropriate for pharmacy technicians in anticoagulation clinics. *Am J Health Syst Pharm.* 2016;73:322–327.
64. Kothari M, Maidment I, Lyon R, Haygarth L. Medicines reconciliation in comparison with NICE guidelines across secondary care mental health organizations. *Int J Clin Pharm.* 2016;38:289–295.

Journal of the American Pharmacists Association 60 (2020) e64–e69

Contents lists available at ScienceDirect

Journal of the American Pharmacists Association

journal homepage: www.japha.org

ADVANCES IN PHARMACY PRACTICE

Evaluating advanced pharmacy technician roles in the provision of point-of-care testing

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ARTICLE INFO

Article history:
Received 24 October 2019
Accepted 23 February 2020
Available online 23 March 2020

ABSTRACT

Objectives: Assess the impact of pharmacy technician-supported point-of-care testing (POCT), including sample collection, on the number of cholesterol screenings performed in a community pharmacy setting. Secondary objectives include assessment of provider perceptions and patient satisfaction of POCT when executed by a technician.

Practice description: Thirty-two community pharmacies in 1 regional division of a large community pharmacy chain in Tennessee; 16 participated in a certified pharmacy technician (CPhT) training program, and 16 did not.

Practice innovation: CPhTs supported POCT service delivery limited to the nonprofessional, technical tasks (e.g., sample collection, quality assurance).

Evaluation: The primary objective was evaluated by comparing the total number of screenings for control and intervention sites. Descriptive and inferential statistics were used. Both secondary measures were assessed via anonymous, Likert-type scale questionnaires.

Results: Intervention pharmacies performed 358 screenings, whereas control pharmacies performed 255 screenings (16.8% difference). The patient perception survey found that 94% (149 of 159) of those who received screening with CPhT involvement agreed or strongly agreed that the service was valuable, and 70% (111 of 159) reported that they are likely to follow up with their primary care providers to discuss the results. Furthermore, most patients were in agreement that they were overall satisfied with the screening services provided by the CPhT (94%, 149 of 159), and the CPhT was professional while performing the screening (95%, 151 of 159). The provider perceptions survey on service implementation found that most pharmacy personnel agreed or strongly agreed that CPhTs performing POCT was feasible, appropriate, and acceptable.

Conclusion: This study provided preliminary data that technician-supported POCT may positively impact the number of screenings provided. In addition, provider perceptions were positive, and patients felt satisfied with the studied technician model.

Background

As pressures from the changing health care landscape place pressure on community pharmacy, its practice model continues to evolve. There is an increasing awareness of the value of leveraging pharmacists to provide high-quality patient-centered care.[1-6] It has been previously determined that creating a practice model that supports advanced roles for pharmacy technicians as pharmacist-extenders allows pharmacists to have more opportunity to become effectively engaged in patient care services.[7-9] However, to improve patient care and clinical service delivery effectiveness in the community pharmacy setting, pharmacy technicians must be educated, empowered, and authorized to perform advanced clinical support tasks.[10-13]

Traditionally, pharmacy technicians have been responsible for tasks that do not require professional judgment such as prescription filling, labeling prescriptions, insurance claim billing and adjudication, and inventory management.

Disclosure: The author declares no relevant conflicts of interest or financial relationships.

Previous presentations: American Pharmacists Association Annual Meeting, Seattle, WA March 23, 2019 and at the Research in Education and Practice Symposium, Chapel Hill, NC on May 20, 2019.

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https://doi.org/10.1016/j.japh.2020.02.024
1544-3191/

Key Points

Background:

- Point-of-care testing (POCT) is a service of increasing interest to community pharmacies; however, it is often met with implementation barriers while integrating into the workflow.
- As pharmacy technicians' roles continue to expand, there is a clear opportunity to leverage their support for pharmacist-delivery of POCT services.
- There is limited literature evaluating the technician's role in the provision of POCT.

Findings:

- Preliminary data that technician-supported POCT may positively impact the number of screenings provided.
- Provider and patient perceptions were positive about technician involvement in POCT provision, including sample collection.

In addition to the support from organizations such as the American Society of Health-System Pharmacists and American Pharmacists Association, there is a documentation of technicians effectively assisting with medication therapy management services,[12,14,15-17] performing medication reconciliations,[18,19] administering immunizations,[20,21] and product verification.[22,23] Furthermore, the literature suggests technicians' desire to expand on their daily tasks and report an increase in job satisfaction when duties are expanded.[12]

Point-of-care testing (POCT) is an increasingly popular service offered by community pharmacies, and it provides an excellent opportunity for pharmacists to adopt a greater role in patient care.[24] Although POCT seems to be a likely future for clinical services in community pharmacy, it is often met with multiple barriers regarding workflow, legal regulations, and reimbursements. As technicians' roles continue to advance, there is an opportunity to use them as pharmacist-extenders and assist pharmacists in the provision of POCT services. Nevertheless, current data has only identified areas in which technicians can be used, such as inventory management, workflow organization, and documentation.[25] This study aims to assess the impact of technician-supported POCT, including sample collection, on patient care in the community pharmacy.

Objectives

The primary objective of this study was to assess the impact of advanced pharmacy technician support for pharmacist-provided POCT services, including sample collection, on the number of cholesterol screenings performed in a community pharmacy setting. Secondary objectives included assessment of pharmacists, technicians, and patient perceptions of POCT when executed by a technician.

Methods

In this prospective, quasi-experimental controlled study, certified pharmacy technicians (CPhTs) in 1 regional division of a national grocery-chain pharmacy participated in a 4-hour training program before the implementation of technician-supported POCT. The combined training model was developed by pharmacy leadership and included a home study followed by live components. During the home study, CPhTs watched a set of videos that laid the foundation for operating the POCT device, sample collection, and quality controls. The purpose of the live training was to provide technicians with an opportunity to become comfortable with the analyzer, sample collection, and quality controls before implementation. During the live training, a technical specialist reviewed slides that aligned with the home study and provided a real-time example of how the screenings should take place. In addition, each participant performed sample collection 3 times to become adequately prepared for the upcoming data collection. In total, 29 CPhTs across 16 sites completed the training program and supported POCT during the data collection period. For selection purposes, all pharmacy managers within the division received an e-mail instructing them to recommend any CPhT who wished to participate in the study.

In comparison, 16 similar sites in the same regional division that did not have any CPhT involvement served as the control group. An outline of the procedure was as follows: a CPhT would greet the patients on arrival for testing and provide the necessary paperwork before entering the counseling room to prepare the workspace, complete quality assurance, and perform sample collection. The sample collection included a droplet of blood for measurement of glucose and 40 μL of blood via a capillary tube to assess total cholesterol, low-density lipoproteins, high-density lipoproteins, and triglycerides. Once the results were recorded, the CPhT would inform the patient that the pharmacist would be in shortly to discuss their results and provide any education necessary. Following the interaction, the pharmacy would record his or her discussion and give the paperwork back to the CPhT, who would then document and bill for the POCT. This model differs completely from the current standard of practice in which a CPhT is limited to greeting the patient while the pharmacist completes all other aspects of the interaction.

To assess the primary objective, we compared the total number of screenings for control and intervention sites using an independent-samples *t* test. To determine adequate sample size, an a priori test with α set to 0.05 and power to 80% was performed. It was concluded that to detect a moderate impact, there needed to be 98 pharmacies in each group. Data were collected from February 1, 2019, to March 2, 2019, and were reported via internal reports. The information obtained included the total number of screenings for the intervention and control sites, which was then further broken down by individual sites. Results were analyzed using IBM SPSS Statistics version 25 (Armonk, NY).

Both secondary measures were assessed via anonymous, Likert-type scale questionnaires. Each survey was reviewed by a convenience sample of associates within the large national supermarket chain and revised based on their feedback for content and clarity. The electronic provider perception survey

was created using QuestionPro survey software (SurveyAnalytics, San Francisco, CA). The overarching framework for this survey was an implementation science approach to aid future implementation and scalability of the intervention. The survey was disseminated to all pharmacists at the intervention sites and technicians who participated in the study. Before the assessment, demographics such as age, sex, highest level of education, and years in practice were collected. Using a previously validated implementation science survey, pharmacists and technicians completed the questionnaire to determine the acceptability, appropriateness, and feasibility of technician-supported POCT.[26] Pharmacists distributed the patient satisfaction survey to patients who received a screening provided by a technician. The demographics collected were age, sex, current pharmacy, established primary care physician (PCP), frequency of PCP visits per year, and referral method for the POCT. In addition, the survey collected the following information: overall satisfaction, technician's professionalism, pharmacist's counseling, screening value, and probability of follow up with their PCP based on their results. The surveys were placed into a ballot box and results were analyzed using IBM SPSS Statistics version 25.

Approval for this project was granted by the University of Tennessee Health Science Center Institutional Review Board on January 17, 2019.

Results

Regarding the primary objective, intervention pharmacies performed 358 screenings, and control stores performed 255 screenings, a 16.8% difference in screenings provided ($P > 0.05$). Table 1 provides a breakdown of screenings per site for the intervention pharmacies during the study period (2019) and a comparison with the previous year (2018). Of note, the intervention pharmacies had a range of 3-57 screenings with an SD of 16.1, whereas the control pharmacies had a range of 0-49 screenings with an SD of 14.1.

The provider perceptions survey was distributed to 67 pharmacists and technicians; 53 responses were included, and 4 were excluded because of incomplete answers. Table 2 summarizes participant characteristics. Most respondents were aged 30-40 years (49%, 26 of 53), female (75%, 40 of 53), pharmacists (60%, 32 of 53), obtained a doctorate (49%, 26 of 53), and had been in practice for 5-10 years (28%, 15 of 53). Table 3 summarizes the provider's perceptions of technician-supported POCT for each of the domains (acceptability, appropriateness, and feasibility). This study found that the majority of providers completely agreed or agreed that CPhTs performing POCT both met their approval (98%, 52 of 53) and was appealing (94%, 50 of 53). In addition, the majority of respondents completely agreed or agreed that they liked (98%, 52 of 53) and welcomed (98%, 52 of 53) CPhTs performing POCT. Furthermore, the majority of participants completely agreed or agreed that CPhTs performing POCT seemed fitting (98%, 52 of 53), suitable (96%, 51 of 53), applicable (96%, 51 of 53), and a good match (94%, 50 or 53). Finally, the majority of providers completely agreed or agreed that CPhTs performing POCT seemed implementable (96%, 51 of 53), possible (98%, 52 of 53), and doable (96%, 51 of 53).

A total of 172 patients completed the satisfaction survey, and 13 were excluded because of incomplete questions. Table 4 summarizes participant demographics. The majority of respondents were aged 61–70 years (32%, 51 of 159), female (65%, 104 of 159), had a primary care physician (PCP; 83%, 132 of 159) that they visited 2 (34%, 54 of 159) times per year. As described in Table 5, this study found that 93% (149 of 159) of patients either strongly agreed or agreed that they were overall satisfied with the screening services provided by the CPhT. In addition, the majority of respondents strongly agreed or agreed that the CPhT was professional (94%, 150 of 159) and that the discussion with the pharmacist was helpful and easy to understand (94%, 150 of 159). Furthermore, the majority of participants strongly agreed or agreed that the screening was valuable (93%, 149 of 159) and that they are likely to visit their PCP based on their results (70%, 111 of

Table 1
Number of screenings per site

Site	Intervention pharmacies		Control pharmacies	
	n (2019)	n (2018)	n (2019)	n (2018)
1	15	33	0	11
2	18	8	20	13
3	36	9	15	13
4	3	9	14	14
5	42	18	19	15
6	26	20	4	6
7	9	12	2	7
8	6	13	49	24
9	13	9	8	9
10	58	9	2	7
11	16	19	43	21
12	17	15	28	14
13	20	23	10	19
14	8	13	19	17
15	21	21	16	17
16	50	21	6	16

Table 2
Demographic information of provider perception survey respondents

Characteristics	No. of patients n = 53 (%)
Sex	
Male	13 (24.5%)
Female	40 (75.5%)
Age range	
20–30	11 (20.7%)
30–40	26 (49.1%)
40–50	9 (16.9%)
50–60	3 (5.7%)
≥ 61	4 (7.6%)
Title	
Noncertified pharmacy technician	0 (0%)
Certified pharmacy technician	21 (39.6%)
Pharmacist	32 (60.4%)
Highest level of education	
High school diploma	16 (30.2%)
Associate's degree	4 (7.6%)
Bachelor's degree	7 (13.2%)
Doctorate degree	26 (49%)
No. of y in practice	
0–5	8 (15.1%)
5–10	15 (28.3%)
10–15	11 (20.8%)
15–20	8 (15.1%)
≥ 20	11 (20.7%)

Table 3
Domains assessed in provider perception survey

Domain	No. of patients n = 53 (%)
Acceptability	
Certified pharmacy technicians performing point-of-care tests meets my approval	
Completely agree	39 (73.6%)
Agree	13 (24.5%)
Neither agree nor disagree	0 (0%)
Disagree	0 (0%)
Completely disagree	1 (1.9%)
Certified pharmacy technicians performing point-of-care tests is appealing to me	
Completely agree	40 (75.5%)
Agree	10 (18.9%)
Neither agree nor disagree	2 (3.8%)
Disagree	0 (0%)
Completely disagree	1 (1.9%)
I like certified pharmacy technicians performing point-of-care tests	
Completely agree	39 (73.6%)
Agree	13 (24.5%)
Neither agree nor disagree	0 (0%)
Disagree	0 (0%)
Completely disagree	1 (1.9%)
I welcome certified pharmacy technicians performing point-of-care tests	
Completely agree	39 (73.6%)
Agree	13 (24.5%)
Neither agree nor disagree	0 (0%)
Disagree	0 (0%)
Completely disagree	1 (1.9%)
Appropriateness	
Certified pharmacy technicians performing point-of-care tests seems fitting	
Completely agree	38 (71.7%)
Agree	14 (26.4%)
Neither agree nor disagree	0 (0%)
Disagree	0 (0%)
Completely disagree	1 (1.9%)
Certified pharmacy technicians performing point-of-care tests seems suitable	
Completely agree	36 (68%)
Agree	15 (28.3%)
Neither agree nor disagree	1 (1.9%)
Disagree	0 (0%)
Completely disagree	1 (1.9%)
Certified pharmacy technicians performing point-of-care tests seems applicable	
Completely agree	39 (73.6%)
Agree	12 (22.6%)
Neither agree nor disagree	1 (1.9%)
Disagree	0 (0%)
Completely disagree	1 (1.9%)
Certified pharmacy technicians performing point-of-care tests seems like a good match	
Completely agree	38 (18.9%)
Agree	12 (18.9%)
Neither agree nor disagree	0 (0%)
Disagree	1 (1.9%)
Completely disagree	38 (18.9%)
Feasibility	
Certified pharmacy technicians performing point-of-care tests seems implementable	
Completely agree	37 (69.8%)
Agree	14 (26.4%)
Neither agree nor disagree	1 (1.9%)
Disagree	0 (0%)
Completely disagree	1 (1.9%)
Certified pharmacy technicians performing point-of-care tests seems possible	
Completely agree	38 (71.7%)
Agree	14 (26.4%)
Neither agree nor disagree	0 (0%)
Disagree	0 (0%)
Completely disagree	1 (1.9%)
Certified pharmacy technicians performing point-of-care tests seems doable	
Completely agree	38 (71.7%)
Agree	13 (24.5%)
Neither agree nor disagree	0 (0%)
Disagree	1 (1.9%)
Completely disagree	1 (1.9%)

159). Finally, most participants strongly agreed or agreed that they would recommend this service to family and friends (94%, 150 or 159).

Discussion

This study is the first to evaluate pharmacy technician-supported POCT service delivery, including sample collection. However, this follows a trend of delegating nondispensing tasks, so-called team-based task delegation,[27,28] to pharmacy technicians in hopes to free up pharmacist time to provide more direct patient care.[12] Involving pharmacy technicians in POCT services could play an important role in patient care by increasing access. In 16 supermarket chain pharmacies in Tennessee, trained pharmacy technicians were able to support POCT and provide a total of 358 screenings. Although the total number of screenings for those stores that had technician support was greater than the comparison sites, there was not enough data to infer from screening results whether the improvement occurred because of the study model or by chance. In addition, each of the surveys provided information that both patients and provider perceptions were positive about the studied technician model.

The research team noted pharmacists and technicians enthusiastically embraced the project throughout its implementation. A well-designed training program is critical because technicians entering the project were hesitant and nervous about their new roles. However, their anxiety dissipated as they recognized the simplicity of the POCT process and had a chance to practice their skills. Approximately a 1-month gap was present between training and implementation that proved to be critical. During the follow-up period, technicians seemed confident in their newly learned tasks. However, having the patient present brought forth some of those initial anxieties. Continued coaching and reassurance addressed these anxieties and facilitated implementation escalation. As the screening numbers increased, a clear benefit in technicians' support of pharmacists in the delivery of POCT services was seen.

Outside of the primary results, this study has major implications for technicians. When reviewing the survey results, one could easily conclude that technicians feel that an opportunity to advance their career is appealing, a good match, and doable. Furthermore, the advancement of their job roles

Table 4
Demographic information of patient perception survey respondents

Characteristics	No. of patients n = 159 (%)
Sex	
Male	55 (34.6%)
Female	104 (65.4%)
Age range	
18–30	14 (8.8%)
31–40	17 (10.7%)
41–50	20 (12.6%)
51–60	30 (18.9%)
61–70	51 (32.1%)
71–80	20 (12.6%)
81–90	6 (3.8%)
≥ 91	1 (0.6%)
Do you currently fill prescriptions at Kroger?	
Yes	113 (71.1%)
No	46 (28.9%)
Do you have a primary care physician?	
Yes	132 (83%)
No	27 (17%)
If so, how many times per year do you visit him or her?	
0	2 (1.3%)
1	47 (29.6%)
2	54 (34%)
≥ 3	41 (25.8%)
How were you informed about the opportunity for a cholesterol screening?	
Kroger pharmacy	95 (59.7%)
Employer	6 (3.8%)
Friends and family	15 (9.4%)
Advertisement	37 (23.3%)
Other	6 (3.8%)

Table 5
Domains assessed in provider perception survey

Domain	No. of patients n = 159 (%)
I am overall satisfied with the health screening services provided by the Kroger Pharmacy TECHNICIAN:	
Strongly agree	138 (86.8%)
Agree	11 (6.9%)
Neither agree nor disagree	1 (0.6%)
Disagree	0 (0%)
Strongly disagree	9 (5.7%)
The Kroger pharmacy TECHNICIAN was professional while performing my screening:	
Strongly agree	142 (89%)
Agree	8 (10.7%)
Neither agree nor disagree	0 (0%)
Disagree	0 (0%)
Strongly disagree	9 (5.7%)
The discussion about my screening with the pharmacist was helpful and easy to understand:	
Strongly agree	141 (88.7%)
Agree	9 (5.7%)
Neither agree nor disagree	0 (0%)
Disagree	0 (0%)
Strongly disagree	9 (5.7%)
I felt the screening was valuable:	
Strongly agree	135 (84.9%)
Agree	14 (8.8%)
Neither agree nor disagree	1 (0.6%)
Disagree	0 (0%)
Strongly disagree	9 (5.7%)
On the basis of this health screening, are you likely to visit your primary care physician to follow-up?	
Strongly agree	82 (51.6%)
Agree	29 (18.2%)
Neither agree nor disagree	34 (21.4%)
Disagree	4 (2.5%)
Strongly disagree	10 (6.3%)
I would recommend this service to family and friends:	
Strongly agree	132 (59.7%)
Agree	18 (3.8%)
Neither agree nor disagree	0 (0%)
Disagree	0 (0%)
Strongly disagree	9 (5.7%)

led to an increase in job satisfaction. For example, the technicians became enthusiastic to participate in the study and even created competitions to see who could perform the most screenings. In addition, the ability to support POCT led to an increase in the quality of work-life as technicians performed more than dispensing tasks. Technicians became excited about the possibility of performing the screenings and showed up to work early to ensure they were prepared for those patients who were scheduled at the time of the pharmacy opening. These findings align with current literature that reports technicians desire to advance their careers.[12] However, this study contradicts recent literature that the majority of technicians are not willing to perform finger sticks.[29] Overall, both pharmacists and technicians seem to approve and support this advancement.

On the basis of these results, additional research on this topic should be completed. The studied model should be tested in a larger setting, particularly in states where legislation allows the measurement of technician quality of work-life along with the measures presented in this study. Furthermore, future studies should consider a standardized training program and evaluating technician technique, safety, and outcomes compared with pharmacists. Other implementation outcomes should be studied with the desire to scale this innovation, including measuring the impact of training and other implementation strategies on technician self-efficiency. Finally, a time reinvestment study should be conducted to evaluate how pharmacists are providing more direct patient care with the freed time from delegating tasks to technicians.

As with many pilot studies, there are limitations to this research. In particular, the small sample size of the present study did not allow for the results to be statistically significant. There was also an inability to report store demographics, which limits how the results could be applied to other community pharmacies outside of Tennessee. Furthermore, there was no way to track how many screenings were performed by technicians, as we had to rely on patient satisfaction surveys. The provider survey was adapted from a previously validated implementation outcomes survey instrument but was not evaluated in this study for construct validity or internal consistency reliability; however, this step should be undertaken for larger future studies. Finally, there was no link to which stores the provider perception surveys correlated that would indicate what contributed to those sites that had a high implementation rate.

Conclusion

This study provided preliminary evidence that the implementation of pharmacy technician-assisted POCT may positively impact the number of screenings possible. In

addition, the perception survey confirmed that both pharmacists and technicians consider the implementation of pharmacy technician-assisted POCT to be acceptable, appropriate, and feasible in the community pharmacy setting. Furthermore, patients tend to be overall satisfied with those services that involve a pharmacy technician. Therefore, the studied model holds the potential to improve the efficiency and quantity of POCT in community pharmacies.

References

1. Morrison CM, Glover D, Gilchrist SM, et al. A program guide for public health: partnering with pharmacists in the prevention and control of chronic diseases. Available at: https://www.cdc.gov/dhdsp/programs/spha/docs/pharmacist_guide.pdf. Accessed June 5, 2019.
2. Barlas S. CMS to test enhanced medication therapy management model: aims for greater use of pharmacists, cost savings, and better outcomes. *P T*. 2016;41(7):423–441.
3. Cardosi L, Hohmeier KC, Fisher C, Wasson M. Patient satisfaction with a comprehensive medication review provided by a community pharmacist. *J Pharm Technol*. 2018;34(2):48–53.
4. Gibson ML, Hohmeier KC, Smith CT. Pharmacogenomics testing in a community pharmacy: patient perceptions and willingness-to-pay. *Pharmacogenomics*. 2017;18(3):227–233.
5. Hohmeier KC, Loomis B, Gatwood J. Consumer perceptions of and willingness-to-pay for point-of-care testing services in the community pharmacy. *Res Social Adm Pharm*. 2018;14(4):360–366.
6. National Governors Association. The expanding role of pharmacists in a transformed health care system. Available at: https://naspa.us/wp-content/uploads/2015/08/NGA-TheExpandingRoleOfPharmacists.pdf. Accessed October 7, 2019.
7. Hohmeier KC, Desselle SP. Exploring the implementation of a novel optimizing care model in the community pharmacy setting. *J Am Pharm Assoc (2003)*. 2019;59(3):310–318.
8. Napier P, Norris P, Braund R. Introducing a checking technician allows pharmacists to spend more time on patient-focused activities. *Res Social Adm Pharm*. 2018;14(4):382–386.
9. Andreski M, Myers M, Gainer K, Pudlo A. The Iowa new practice model: advancing technician roles to increase pharmacists' time to provide patient care services. *J Am Pharm Assoc (2003)*. 2018;58(3):268–274.e1.
10. Schultz JM, Jeter CK, Martin NM, Mundy TK, Reichard JS, Van Cura JD. ASHP statement on the roles of pharmacy technicians. *Am J Health Syst Pharm*. 2016;73(12):928–930.
11. Kirk LM. APhA2017 house of delegates: opportunities for collaboration. *J Am Pharm Assoc (2003)*. 2017;57(4):426–428.
12. Mattingly AN, Mattingly 2nd TJ. Advancing the role of the pharmacy technician: a systematic review. *J Am Pharm Assoc (2003)*. 2018;58(1):94–108.
13. Moya A, Unni E, Montuoro J, Desselle SP. Engaging pharmacy technicians for advanced clinical support tasks in community pharmacies: a cluster analysis. *J Am Pharm Assoc (2003)*. 2019;59(4S):S32–S38.e1.
14. Powers MF, Bright DR. Pharmacy technicians and medication therapy management. *J Pharm Technol*. 2008;24(6):336–339.
15. Lengel M, Kuhn CH, Worley M, Wehr AM, McAuley JW. Pharmacy technician involvement in community pharmacy medication therapy management. *J Am Pharm Assoc (2003)*. 2018;58(2):179–185.e2.
16. Hohmeier KC, McDonough SLK, Rein LJ, Brookhart AL, Gibson ML, Powers MF. Exploring the expanded role of the pharmacy technician in medication therapy management service implementation in the community pharmacy. *J Am Pharm Assoc (2003)*. 2019;59(2):187–194.
17. Gernant SA, Nguyen MO, Siddiqui S, Schneller M. Use of pharmacy technicians in elements of medication therapy management delivery: a systematic review. *Res Social Adm Pharm*. 2018;14(10):883–890.
18. Irwin AN, Ham YY, Gerrity TM. Expanded roles for pharmacy technicians in the medication reconciliation process: a qualitative review. *Hosp Pharm*. 2017;52(1):44–53.
19. Fabiilli NA, Powers MF. Roles for pharmacy technicians in medication reconciliation during transitions of care. *J Pharm Technol*. 2017;33(1):3–7.
20. Hohmeier KC, Powers MF. Pharmacy technicians and immunizations. *J Pharm Technol*. 2011;27(3):111–116.
21. McKeirnan KC, Frazier KR, Nguyen M, MacLean LG. Training pharmacy technicians to administer immunizations. *J Am Pharm Assoc (2003)*. 2018;58(2):174–178.e1.
22. Adams AJ, Martin SJ, Stolpe SF. "Tech-check-tech": a review of the evidence on its safety and benefits. *Am J Health Syst Pharm*. 2011;68(19):1824–1833.
23. Frost TP, Adams AJ. Tech-check-tech in community pharmacy practice settings. *J Pharm Technol*. 2017;33(2):47–52.
24. Rodis JL, Thomas RA. Stepwise approach to developing point-of-care testing services in the community/ambulatory pharmacy setting. *J Am Pharm Assoc (2003)*. 2006;46(5):594–604.
25. Keller EK, Kelling SE, Bright DR. Pharmacy technicians and point of care testing. *J Pharm Technol*. 2015;31(4):143–148.
26. Weiner BJ, Lewis CC, Stanick C, et al. Psychometric assessment of three newly developed implementation outcome measures. *Implement Sci*. 2017;12(1):108.
27. True G, Stewart GL, Lampman M, Pelak M, Solimeo SL. Teamwork and delegation in medical homes: primary care staff perspectives in the Veterans Health Administration. *J Gen Intern Med*. 2014;29(Suppl 2):S632–S639.
28. Altschuler J, Margolius D, Bodenheimer T, Grumbach K. Estimating a reasonable patient panel size for primary care physicians with team-based task delegation. *Ann Fam Med*. 2012;10(5):396–400.
29. Doucette WR, Schommer JC. Pharmacy technicians' willingness to perform emerging tasks in community practice. *Pharmacy (Basel)*. 2018;6(4):113.

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Journal of the American Pharmacists Association xxx (2019) 1–6

Contents lists available at ScienceDirect

Journal of the American Pharmacists Association

journal homepage: www.japha.org

ADVANCES IN PHARMACY PRACTICE

The Optimizing Care Model: A novel community pharmacy approach to enhance patient care delivery by leveraging the technician workforce through technician product verification

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ARTICLE INFO

Article history:
Received 24 February 2019
Accepted 16 July 2019

ABSTRACT

Objectives: To explore initial outcomes of the Optimizing Care Model's impact on patient care through technician product verification after the first 3 months of implementation, including the model's impact on pharmacist workday composition, rates of patient care services delivered, and rates of product selection errors not identified during final product verification.
Setting: Fourteen chain and independent community pharmacies licensed and located in Tennessee.
Innovation: The Optimizing Care Model is an innovative approach to community pharmacy practice aiming to foster a new patient-centered care delivery model that expands clinical service delivery through task delegation to pharmacist extenders.
Evaluation: A quasiexperimental 1-group pretest–posttest design was used. Study sites self-reported data from 3 months before and 3 months after implementation of the intervention.
Results: Overall pharmacist time spent delivering patient care services increased significantly on implementation of the Optimizing Care Model (25% vs. 43%; $P < 0.001$), and time spent performing dispensing-related activities decreased significantly (63% vs. 37%; $P = 0.02$). There was a total increase in quantity of clinical services delivered to patients from baseline, but data from initial study outcomes did not reach statistical significance. At least 1 new clinical service provided under a collaborative practice agreement had been implemented by all 14 sites (100%) as of Spring 2018. Total undetected error rates were significantly less in the Optimizing Care Model phase compared to the traditional model (0.063% vs. 0.085%; $P < 0.001$).
Conclusion: Initial results of the Optimizing Care Model demonstrate improved patient care through increased clinical service delivery versus the traditional model. Undetected error detection rates were low in both models, but lower in the Optimizing Care Model. The Optimizing Care Model may represent a novel approach to improving care for patients while creating efficiencies through a staff delegation model, providing pharmacists the opportunity to further evolve their practice and advance clinical care for patients.

A variety of patient-centered clinical services are increasingly provided by community pharmacies, improving accessibility of preventive and chronic care management, medication optimization programs, and acute care services, and improving completeness of patients' health records. Opportunities granted via expanding scope of practice and legal authority are also on the rise—most notably, collaborative practice agreements (CPAs) and statewide protocols that allow pharmacists to more fully leverage their skillset as medication and patient care experts.

Leveraging the value of community pharmacy care is supported by an ever-growing evidence base of improved outcomes for patients with chronic and acute conditions,[1-4] leading to increased demand for these services by both governmental organizations and patients alike.[5-10] Pharmacists are reporting a willingness to take on these new roles.[11,12]

Disclosure: The authors declare no relevant conflicts of interest or financial relationships.
Funding: National Association of Chain Drug Stores.
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https://doi.org/10.1016/j.japh.2019.07.009
1544-3191/

Key Points

Background:

- A pharmacist's time in a community pharmacy that includes technician product verification may be further optimized to facilitate integration of more direct patient care and clinical services through a restructured operational design and delegation model.

Findings:

- Initial findings from the first 3 months of this project indicate that the Optimizing Care Model increases clinical care delivery while maintaining dispensing accuracy levels seen in the traditional model.
- Pharmacist time in direct patient care services significantly increased, and total quantity of services offered increased.
- Undetected product selection errors remained low in both models, but were statistically significantly less in the Optimizing Care Model.

Despite the growing demand, willingness, and opportunity to deliver patient care services in the community pharmacy setting, at least some potential in doing so remains unrealized. Several barriers exist to widespread patient service implementation and scalability, such as lack of viable payment models, competing efficiency priorities, and staffing challenges.[4,11,13-16] The Optimizing Care Model is a new approach to community pharmacy practice that aims to foster a new "patient-centered care delivery model" that expands clinical service delivery and fosters collaboration across health settings through task delegation. Specifically, the model places pharmacists primarily in direct patient care roles, and a key component of the model involves team-based task delegation of all technical steps of medication distribution, including the product verification step, to optimize workflow such that pharmacist time can be reinvested in patient care delivery. Initial research on this model has demonstrated its use in community pharmacy to be safe and effective in increasing pharmacists' ability to provide patient care[17] and is further evidenced by 5 decades of health-system research on models related to delegation of final product verification to free up pharmacist time to deliver direct patient care.[18] Research also suggests that technicians are willing to embrace emerging new roles.[19]

The combination of such a new community pharmacy practice model with the growing legal authority to participate in new patient care services under CPAs may have a synergistic effect on patient care.[20-24]

Objectives

The primary objective of the present study was to explore initial outcomes of the Optimizing Care Model's impact on patient care after the first 3 months of its implementation in Tennessee. This paper reports on the model's impact on pharmacist workday composition, rates of patient care services delivered, and rates of product selection errors not identified during final product verification.

Methods

Trial design

A quasiexperimental 1-group pretest–posttest design was used. Study sites self-reported data from 3 months before and 3 months after implementation of the intervention. Data collection with the use of standardized forms occurred weekly via an online survey that included pharmacist time allocation, clinical service delivery, and undetected error rates. To ensure intervention and reporting fidelity, the project manager and university researcher met regularly to review data submissions from sites. If reporting was delayed or entered incorrectly, the project manager provided additional coaching to those sites. A local hardcopy of the collection forms was kept on file for use by Tennessee Board of Pharmacy (TNBOP) inspectors.

The preliminary study duration, November 2017 to March 2018, includes baseline data collection and 3 months of the model's implementation. The "continuation" phase is currently ongoing with full project completion expected in 2020 (Figure 1). Project oversight includes TNBOP and University of Tennessee Health Science Center (UTHSC) Institutional Review Board, with data collection and reporting parameters set by the TNBOP.

Participants and recruitment

Chain and independent community pharmacies licensed and located in Tennessee were eligible to enroll in the study. All pharmacies involved in the Optimizing Care Model had a "2-step" verification workflow, which separated data entry verification from product selection verification, as well as product selection error-prevention technology during the filling and verification process (e.g., barcode scanning, image verification, robotic filling machines).

The Tennessee Pharmacists Association (TPA) deployed a questionnaire to support the site application and review process, which included the number of pharmacists and certified pharmacy technicians at the practice site, the presence or willingness of the staff at the practice site to implement CPAs in practice, daily workflow and script volume, and geographic and demographic practice information.

An a priori power analysis was conducted. The number of prescriptions required to reach a power of 0.8 was estimated to be 7079 before and the same number after the intervention with a type I error (alpha) of 0.05 (typical requirement), assuming an error rate of 0.006[17] among technicians, and allowing ±0.003 difference in error rate between pharmacists and technicians (i.e., 99.7% accuracy rate in pharmacists).

Intervention

The Optimizing Care Model is an innovative approach to community pharmacy practice aiming to foster a new patient-centered care delivery model that expands clinical service delivery and fosters collaboration across health

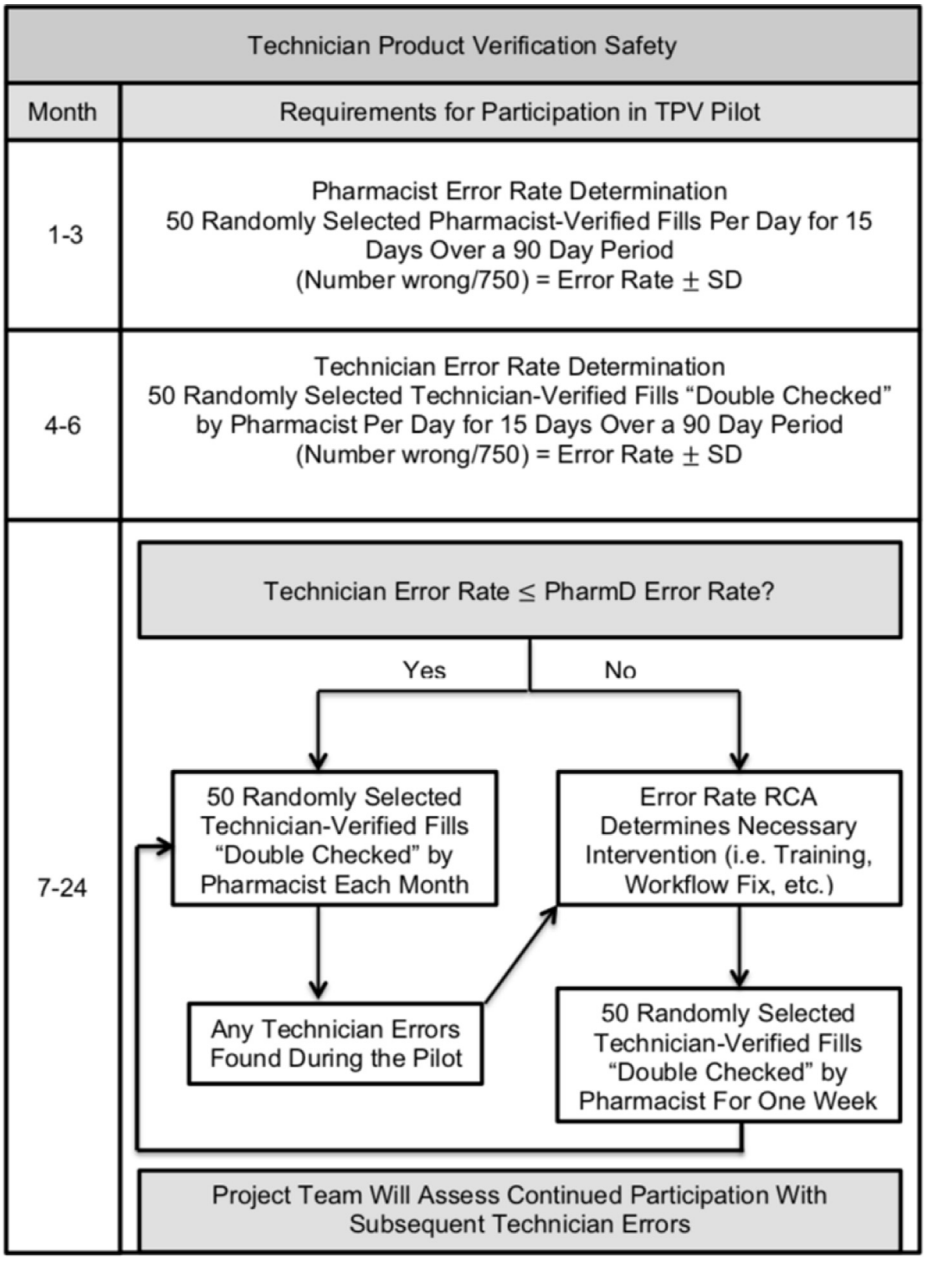

Figure 1. Optimizing care model in Tennessee project overview.

care settings through task delegation.[25] Specifically, the model places pharmacists primarily in direct patient care roles, including providing MTM, point-of-care testing, counseling, vaccinations, and other tasks that may be described as practicing at the "top of their license." The ultimate goal of the Optimizing Care Model is to increase patient access to clinical care delivered in the community pharmacy setting.

To facilitate the transition of pharmacist duties to clinically oriented tasks, the Optimizing Care Model delegates the product verification step of medication distribution workflow to a technician who had undergone training specific to medication product selection to reallocate pharmacist time to provide direct patient care. After pharmacist verification of data entry and prospective drug utilization review, a pharmacy technician filled the prescription by selecting the corresponding medication, counting the specified quantity, and packaging in an appropriate vial. Subsequently a product-verifying technician would verify that the product selected, quantity counted, and packaging selected were correct. This model operated only when a trained certified pharmacy technician verifier was on duty with a certified pharmacy technician serving as product filler. When the model was not in operation, product verification responsibilities were performed by a pharmacist.

The Optimizing Care Model was implemented and assessed as a pilot program under TNBOP rule 1140-01-.15. The pilot was approved by the Board in Fall 2017. Although a previously approved rule permitted technician product verification for inpatient institution-based pharmacy practice settings, community pharmacy–based technician product verification was not permissible until the launch of the pilot project. The approved pilot:

- Permitted a certified pharmacy technician with advanced training in product verification to deliver the final verification of medication products (excluding compounds and controlled substances).
- Empowered certified pharmacy technicians to screen patients and refer eligible patients to pharmacists for additional care and services.
- Used a new pharmacy practice model to free up more time and increase patient access to pharmacist-provided services, such as those authorized by prescribers under CPAs.

Training

Training was developed by the TPA and a researcher from UTHSC, which included on-demand webinars and an online "mock" final verification evaluation to assess competence on the detection of medication product selection errors. Completion of the required webinars, final verification evaluation, and their corresponding questions took technicians approximately 2.5 hours to complete. All technicians involved were also required to shadow pharmacist verification for 2 hours and complete 5 hours of pharmacist supervised final verification before the live practical examination. Sites were further encouraged to create organization-specific training to help pharmacists overcome unique pharmacy workflow challenges during implementation and scaling.[25]

Outcomes

The Optimizing Care Model's impact on clinical activities, time allocation, error detection, and collaborative practice agreement (CPA) implementation were collected. Baseline data collection of undetected product selection errors occurred through an audit of 50 randomly selected pharmacist-verified prescriptions per day, on 15 days over a 90-day period before initiation of the verification technician procedures. On days when auditing occurred, self-reported clinical activities and time allocation were also reported. During implementation of the Optimizing Care Model, the designated pharmacist would again audit 50 randomly selected technician-verified fills per day, on 15 days over a 45-day period, to ensure accuracy and to gather information on corresponding patient care activity outcomes. Undetected errors were classified as administrative-related, safety-related, or other errors. Administrative-related errors included extra or insufficient quantity of medication. Safety-related errors included wrong drug, dose, or dosage form. A final category capturing all other non–safety-related errors was termed "other." These errors included not printing duplicate labels when indicated, not dispensing with easy-open cap, and gabapentin dispensed without double-counting initials (listed as a controlled substance in Tennessee).

Table 1
Optimizing Care Model workday composition impact

Task	Mean self-reported pharmacist workday task composition (% of time)				*P* value
	Before		After		
	Mean	SD	Mean	SD	
Direct patient care	25%	0.32	43%	0.32	< 0.001
Dispensing	63%	0.51	37%	0.51	0.02
Management	5%	0.09	9%	0.09	< 0.001
Other	8%	0.17	13%	0.17	< 0.001

Direct patient care services included time allocation and quantity of services delivered before and after intervention. Workday composition included 4 categories: dispensing, direct patient care, management, and other. Direct patient care services included delivery of comprehensive medication therapy management (MTM; i.e., comprehensive medication review), targeted MTM (i.e., targeted medication review), and other. Vaccines were not reported as an outcome of the implementation phase because of overlap with flu season and concerns about confounding the data.

Statistical methods

All the analyses were based on paired pre- and post-intervention comparisons. Outcomes including error rates and time allocation were calculated for each participating technician and pharmacist and compared based on paired chi-square tests or paired *t* tests. The site variable was adjusted in the analysis as a cluster variable with the use of regression models. A *P* value of 0.05 was considered to be significant in statistical comparisons. All analyses were done with the use of Stata version 15.1 (Statacorp, College Station, TX).

Results

Nine chain and 5 independent pharmacies were enrolled with approval from the TNBOP to participate: 3 in western Tennessee, 6 in middle Tennessee, and 5 in eastern Tennessee.

Overall pharmacist time spent delivering patient care services increased significantly on implementation of the Optimizing Care Model (25% vs. 43%; $P < 0.001$), and time spent performing dispensing-related activities decreased significantly (63% vs. 37%; $P < 0.05$; Table 1).

Clinical services were reported as average number of services provided per reporting period (Table 2). There was a total increase in clinical services delivered to patients from baseline, but this did not reach statistical significance (1.38 vs. 3.2; $P = 0.2$).

At least 1 new clinical service through a CPA had been implemented by all 14 sites (100%) as of spring 2018. CPA categories included Tennessee Medicaid's MTM program (as part of a patient-centered medical home), naloxone prescribing (CPA required by state regulations), and Clinical Laboratories Improvement Amendments–waived influenza/*Streptococcus* point-of-care testing and treatment. All participating sites implemented naloxone prescribing due to its ease of implementation (CPA with Chief Medical Officer of the Tennessee Department of Health) and potential

Table 2
Optimizing Care Model clinical service impact

Patient care outcome	Clinical services				*P* value
	Before		After		
	Mean	SD	Mean	SD	
Total patient care service units[a]	1.38	2.82	3.20	11.28	0.2

[a] Single visit for comprehensive medication review, targeted medication review, or other direct patient care service (e.g., screening, disease state management, point-of-care testing).

positive impact on opioid overdose deaths. Pharmacies were able to utilize technicians to flag and triage eligible patients (e.g., patients on more than 50 morphine milligram equivalents opioid) for a pharmacist to provide life-saving education and training related to naloxone use and administration.

All 14 sites reported at least 750 audited prescriptions in both baseline and implementation arms. A total of 12,917 prescriptions were audited at baseline, and 12,748 during the implementation period. Total undetected error rates were significantly less in the Optimizing Care Model phase than in the traditional model (0.55% vs. 0.25%; $P < 0.001$; Table 3). When comparing undetected errors by subcategory, there were no significant differences between safety or administrative undetected error rates.

Discussion

This study presents preliminary evidence that the Optimizing Care Model increases the time that pharmacists spend delivering clinical services in community pharmacy while maintaining dispensing accuracy rates. This adds to a growing body of evidence for novel models of pharmacy operational design, providing opportunity for the pharmacist to provide more patient care through delegation of technical tasks to trained and qualified technicians.[17,18,26-29] This study also provides initial findings on how this model can positively affect CPA implementation into community pharmacy workflow.

A key feature of the Optimizing Care Model's implementation in Tennessee was the requirement to deliver a portion of patient care activities under a newly implemented CPA at the pharmacy. At the conclusion of the implementation phase (first 3 months), all sites were either implementing or providing patient care under a CPA, corresponding with the increased time that pharmacists had for both direct patient care delivery and operations management. Regarding the latter, a key driver of CPA implementation is relationships with local prescribers.[30-32] These collaborative relationships are catalyzed by time-intensive demands in which pharmacists in a traditional model may be unable to engage, such as relationship initiation, trust building, and openness and bidirectionality of communication.[32] Despite the Optimizing Care Model, several barriers to CPA implementation were still identified, including a lack of independent physicians in the area (major health systems tend to have pharmacists already embedded) and number of pharmacists on staff during a typical work day (without overlap, pharmacists must remain in the pharmacy and cannot work out of medical offices, which is required for some services' billing).

A core component of the Optimizing Care Model was the delegation of technical tasks to trained and qualified pharmacy technicians. For the past half-century, the growth in pharmacist-provided direct patient care services has paralleled the increasing delegation of technical duties of the medication distribution process to pharmacy technicians.[26,33-35] Importantly, this final product verification step does not involve the use of professional judgement as in earlier workflow steps. The earlier workflow steps always require the expertise of a registered pharmacist, such as in the case of data verification, whereby a pharmacist assesses medication appropriateness and correct data entry based on the original prescription, performs a prospective and drug utilization review, and provides or plans for MTM. The results shown here provide further credence to the concept that when pharmacist time is freed up from technical duties there is a corresponding increase in new and expanding of established patient care services.[17,26,35,36]

This study builds on similar work in other states.[17,37] However, some limitations to the study include a short study duration and that all pharmacies were located in a single state in the southeast. To address the duration limitation, phase 2 of the Optimizing Care Model pilot in Tennessee will include 24 months of data and more pharmacies. Vaccination delivery was also not assessed. This was because the seasonal variations in vaccine delivery would make interpretation difficult for in a pre–post quasiexperimental design. Application of these results should be taken into consideration with the results from similar projects ongoing across the United States, including Iowa and Wisconsin.[17,37]

Conclusion

Initial results of the Optimizing Care Model demonstrate improved patient care through increased direct patient care service delivery compared with the traditional model. Undetected error detection rates were low in both models, but lower in the Optimizing Care Model. The Optimizing Care Model may represent a novel approach to pharmacy workflow, providing pharmacies the opportunity to further advance clinical care for patients.

Table 3
Optimizing Care Model accuracy impact

Intervention timeline	Total Rx	Undetected error rates			
		Undetected safety error rate	Administrative undetected error rate	"Other" undetected error rate	Total undetected error rate
Before	12,917	0.085%	0.22%	0.24%[a]	0.55%[a]
After	12,748	0.063%	0.13%	0.06%[a]	0.25%[a]

[a] $P < 0.001$.

Acknowledgments

The authors thank Michael Andreski, Associate Professor of Social and Administrative Pharmacy, Drake University College of Pharmacy, Megan Myers, PharmD, New Practice Model Project Manager, Iowa Pharmacists Association, and Erica Martin, BS, Manager, Practice and Population Health Initiatives, Pharmacy Society of Wisconsin.

References

1. Cranor CW, Bunting BA, Christensen DB. The Asheville Project: long-term clinical and economic outcomes of a community pharmacy diabetes care program. *J Am Pharm Assoc (2003)*. 2003;43(2):173–184.
2. Carter BL, Barnette DJ, Chrischilles E, et al. Evaluation of hypertensive patients after care provided by community pharmacists in a rural setting. *Pharmacotherapy*. 1997;17(6):1274–1285.
3. Papastergiou J, Folkins C, Li W, et al. Community pharmacist–administered influenza immunization improves patient access to vaccination. *Can Pharm J*. 2014;147(6):359–365.
4. Blalock SJ, Roberts AW, Lauffenburger JC, et al. The effect of community pharmacy–based interventions on patient health outcomes: a systematic review. *Med Care Res Rev*. 2013;70(3):235–266.
5. Morrison CM, Glover D, Gilchrist SM, et al. *A program guide for public health: partnering with pharmacists in the prevention and control of chronic diseases*. National Center for Chronic Disease Prevention and Health Promotion; 2012. Available at: https://www.cdc.gov/dhdsp/programs/spha/docs/pharmacist_guide.pdf. Accessed August 14, 2019.
6. National Association of Chain Drug Stores. Face-to-face with community pharmacies. Available at: https://www.nacds.org/pdfs/about/rximpact-leavebehind.pdf. Accessed February 4, 2019.
7. Barlas S. CMS to test enhanced medication therapy management model: aims for greater use of pharmacists, cost savings, and better outcomes. *P T*. 2016;41(7):423.
8. Cardosi L, Hohmeier KC, Fisher C, et al. Patient satisfaction with a comprehensive medication review provided by a community pharmacist. *J Pharm Technol*. 2018;34(2):48–53.
9. Gibson ML, Hohmeier KC, Smith CT. Pharmacogenomics testing in a community pharmacy: patient perceptions and willingness-to-pay. *Pharmacogenomics*. 2017;18(3):227–233.
10. Hohmeier KC, Loomis B, Gatwood J. Consumer perceptions of and willingness-to-pay for point-of-care testing services in the community pharmacy. *Res Social Adm Pharm*. 2018;14(4):360–366.
11. Dulaney K, Hohmeier K, Fisher C, et al. Exploring pharmacists' perceptions regarding influenza and streptococcal testing within a chain pharmacy. *J Am Pharm Assoc (2003)*. 2018;58(4):438–441.
12. Rutter P, Ramsbottom H, Fitzpatrick R. Community pharmacist perceptions of delivering post-hospital discharge medicines use reviews for elderly patients. *Int J Clin Pharm*. 2017;39(1):33–36.
13. Lounsbery JL, Green CG, Bennett MS, et al. Evaluation of pharmacists' barriers to the implementation of medication therapy management services. *J Am Pharm Assoc (2003)*. 2009;49(1):51–58.
14. Blake KB, Madhavan SS. Perceived barriers to provision of medication therapy management services (MTMS) and the likelihood of a pharmacist to work in a pharmacy that provides MTMS. *Ann Pharmacother*. 2010;44(3):424–431.
15. van de Pol JM, Koster ES, Hövels AM, et al. How community pharmacists prioritize cognitive pharmaceutical services. *Res Social Adm Pharm*. [e-pub ahead of print]. https://doi.org/10.1016/j.sapharm.2018.09.012.
16. van de Pol JM, Geljon JG, Belitser SV, Frederix GW, Hövels AM, Bouvy ML. Pharmacy in transition: a work sampling study of community pharmacists using smartphone technology. *Res Social Adm Pharm*. 2019;15(1):70–76.
17. Andreski M, Myers M, Gainer K, et al. The Iowa new practice model: advancing technician roles to increase pharmacists' time to provide patient care services. *J Am Pharm Assoc (2003)*. 2018;58(3):268–274.
18. Adams AJ, Martin SJ, Stolpe SF. "Tech-check-tech": a review of the evidence on its safety and benefits. *Am J Health Syst Pharm*. 2011;68(19):1824–1833.
19. Doucette W, Schommer J. Pharmacy technicians' willingness to perform emerging tasks in community practice. *Pharmacy*. 2018;6(4):113.
20. Adams AJ. Toward permissionless innovation in health care. *J Am Pharm Assoc (2003)*. 2015;55(4):359–363.
21. Adams AJ, Klepser M, Klepser D. Physician–pharmacist collaborative practice agreements: a strategy to improve adherence to evidence-based guidelines. *Evid Based Med Public Health*. 2015;1:e923.
22. Weaver KK. Policy 101: statewide protocols increase patient access to public health services. *Pharmacy Today*. 2016;22(7):57.
23. Adams AJ, Weaver KK. The continuum of pharmacist prescriptive authority. *Ann Pharmacother*. 2016;50(9):778–784.
24. National Association of Chain Drug Stores. Technician talking points. Available at: https://www.nacds.org/pdfs/pharmacy/2018/Technician-Talking-Points-w-Evidence.pdf. Accessed February 4, 2019.
25. Hohmeier KC, Desselle S. Exploring the implementation of a novel optimizing care model in the community pharmacy setting. *J Am Pharm Assoc (2003)*. 2019;59(3):310–318.
26. Mattingly AN, Mattingly TJ. Advancing the role of the pharmacy technician: a systematic review. *J Am Pharm Assoc (2003)*. 2018;58(1):94–108.
27. Hickman L, Poole SG, Hopkins RE, et al. Comparing the accuracy of medication order verification between pharmacists and a tech check tech model: a prospective randomised observational study. *Res Social Adm Pharm*. 2018;14(10):931–935.
28. Keresztes JM. Role of pharmacy technicians in the development of clinical pharmacy. *Ann Pharmcother*. 2006;40(11):2015–2019.
29. Wilson DL. Review of tech-check-tech. *J Pharm Technol*. 2003;19(4):159–169.
30. Zillich AJ, McDonough RP, Carter BL, Doucette WR. Influential characteristics of physician/pharmacist collaborative relationships. *Ann Pharmacother*. 2004;38(5):764–770.
31. Smith MG, Ferreri SP. A model to inform community pharmacy's collaboration in outpatient care. *Res Social Adm Pharm*. 2016;12(3):529–534.
32. Bardet JD, Vo TH, Bedouch P, et al. Physicians and community pharmacists collaboration in primary care: a review of specific models. *Res Social Adm Pharm*. 2015;11(5):602–622.
33. Francke DE. Hospital pharmacy technicians. *Am J Health Syst Pharm*. 1968:259.
34. Gaither CA, Schommer JC, Doucette WR, et al. *Final report of the 2014 National Sample Survey of the Pharmacist Workforce to Determine Contemporary Demographic, Practice Characteristics and Quality of Work-Life*. Presented at Pharmacy Workforce Center, Alexandria, VA. April 8, 2015.
35. Gernant S, Nguyen MO, Siddiqui S, et al. Use of pharmacy technicians in elements of medication therapy management delivery: a systematic review. *Res Social Adm Pharm*. 2017;14(10):883–890.
36. Miller RF, Cesarz J, Rough S. Evaluation of community pharmacy tech-check-tech as a strategy for practice advancement. *J Am Pharm Assoc (2003)*. 2018;58(6):652–658.
37. Pharmacy Society of Wisconsin. Advancing community pharmacy quality: leveraging tech-check-tech (TCT) to expand patient care services in community pharmacies. Available at: http://www.pswi.org/Resources/Tech-Check-Tech-Toolkits. Accessed February 4, 2019.

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Pharmacy technician–administered vaccines in Idaho

Pharmacy-based immunizations have increased vaccination rates in the United States.[1] Pharmacy technicians have historically played significant roles in the vaccination workflow, further enhancing the efficiency and cost-effectiveness of care.[2] In March 2017, Idaho became the first state to enable pharmacy technicians to administer vaccines under the supervision of an immunizing pharmacist. In this model, pharmacists must still provide the clinical aspects of immunization delivery. Specifically, pharmacists must provide the drug utilization review necessary to ensure the right patient is receiving the right vaccine, and pharmacists must deliver the patient counseling required for all new medications.

For an Idaho technician to administer a vaccine, he or she must hold a national certification from the Pharmacy Technician Certification Board or National Healthcareer Association. In addition, the certified technician must "successfully complete a course on appropriate vaccine administration techniques by an Accreditation Council for Pharmacy Education (ACPE)-accredited provider" and hold a current certification in basic life support.[3]

To date, at least 1 ACPE-accredited training program has emerged specifically to train technicians on vaccine administration. The program includes 6 total hours of instruction (2 hours of self-study and 4 hours of live training).[4] This program is more narrowly focused than the common 20-hour training offered to pharmacists, omitting content on immunology and vaccine schedules and focusing primarily on the actual administration step and related needle safety.

While Idaho's law took effect in March 2017, the Idaho State Board of Pharmacy had granted a waiver to enable a subset of technicians to begin vaccinating before the law's effective date. A cohort of 25 technicians were trained in December 2016 and administered 431 vaccines by February 11, 2017.[4] The first vaccine administered by a technician in Idaho received considerable attention in the pharmacy trade press.[5] This article and related ones were shared broadly across multiple social media platforms, and the responses to it were mixed, though generally negative.[6] Many technicians commented that they felt underpaid to perform such a task. Some pharmacists raised concerns about liability and job security.

We believe these concerns miss the mark. Safety should be the primary consideration. With proper training, pharmacy technicians can safely vaccinate patients, and access to immunizations for patients can be improved. Just as other professions with similar educational backgrounds to those of technicians routinely vaccinate under the supervision of a physician, involving pharmacy technicians to a greater degree in the vaccination process can increase efficiency, which may improve patients' experience. Further, we believe that team-based care works best when all members of the pharmacy team are enabled to practice at the top of their education and training.[7] While Idaho may have been first, we do not believe it will be the only state that allows technicians to administer vaccines in the near future.

1. Schuchat A. letter to pharmacists (September 28, 2015). www.pharmacist.com/sites/default/files/files/CDC%20letter%20to%20pharmacists%20vaccinators.pdf (accessed 2017 May 26).
2. Powers MF, Hohmeier KC. Pharmacy technicians and immunizations. *J Pharm Technol*. 2011; 27:111-6.
3. Adams AJ. Advancing technician practice: deliberations of a regulatory board. *Res Soc Adm Pharm*. Epub ahead of print. 2017 Feb 16.
4. McKeirnan K, Frazier K, Bertsch T. Training pharmacy technicians to deliver immunizations: phase 1. http://c.ymcdn.com/sites/www.wsparx.org/resource/resmgr/northwest_pharmacy_convention_presentations/2017/Saturday/Technician_Forum.pdf (accessed 2017 May 26).

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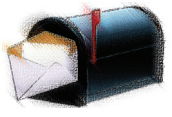
The Letters *column is a forum for rapid exchange of ideas among readers of* AJHP. *Liberal criteria are applied in the review of submissions to encourage contributions to this column.*

The Letters *column includes the following types of contributions: (1) comments, addenda, and minor updates on previously published work, (2) alerts on potential problems in practice, (3) observations or comments on trends in drug use, (4) opinions on apparent trends or controversies in drug therapy or clinical research, (5) opinions on public health issues of interest to pharmacists in health systems, (6) comments on ASHP activities, and (7) human interest items about life as a pharmacist. Reports of adverse drug reactions must present a reasonably clear description of causality.*

Short papers on practice innovations and other original work are included in the Notes *section rather than in* Letters. *Letters commenting on an* AJHP *article must be received within 3 months of the article's publication.*



Letters should be submitted electronically through http://ajhp.msubmit.net. The following conditions must be adhered to: (1) the body of the letter must be no longer than 2 typewritten pages, (2) the use of references and tables should be minimized, and (3) the entire letter (including references, tables, and authors' names) must be typed double-spaced. After acceptance of a letter, the authors are required to sign an exclusive publication statement and a copyright transferal form. All letters are subject to revision by the editors.

Continued from page 2033

5. Salazar D. Albertsons produces first pharmacy tech in nation to administer immunization (April 18, 2017). www.drugstorenews.com/article/albertsons-produces-first-pharmacy-tech-nation-administer-immunization (accessed 2017 May 26).
6. Reddit. Idaho first state to allow pharmacy technician delivered immunization (February 5, 2017). www.reddit.com/r/pharmacy/comments/5s7m3q/idaho_first_state_to_allow_pharmacy_technician (accessed 2017 May 26).
7. Adams AJ. Toward permissionless innovation in health care. *J Am Pharm Assoc.* 2015; 55:359-62.

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The authors have declared no potential conflicts of interest.

Keywords: immunizations, pharmacy technicians

DOI 10.2146/ajhp170158

NACDS NATIONAL ASSOCIATION OF CHAIN DRUG STORES

Enhance Access to Patient Care: Optimize Use of Pharmacy Technicians for Technical and Administrative Tasks

As demonstrated throughout the COVID-19 pandemic, pharmacies play an integral role providing access to care for patients, including the medically vulnerable and underserved, in communities throughout the country. With people relying more and more on their trusted local pharmacies for essential healthcare services, the ability to delegate technical and administrative tasks to pharmacy technicians has never been more critical.

Recognizing the important role that pharmacists play in providing a growing number of clinical care services such as immunizations, testing services, health screenings, and numerous other basic healthcare services, many states have modernized their laws to empower pharmacists to optimize use of their pharmacy technician staff to perform tasks that do not otherwise require pharmacists' professional judgement. These critical policy changes have served to free up pharmacists to focus on meeting patient demand for providing expanded healthcare services now broadly available at pharmacies across the country.

I. Many States Have Increased or Eliminated Antiquated Pharmacist to Pharmacy Technician Ratios Altogether

Ratios limiting the number of pharmacy technicians that a pharmacist can supervise at one time prevents pharmacies from maximizing the use of pharmacy personnel to provide more care to patients. Notably, the National Association of Boards of Pharmacy (NABP) has long supported the complete elimination of the pharmacist to technician ratio. Eliminating restrictive pharmacy technician ratios enables the deployment of more efficient and effective care models that allow different pharmacies to best serve unique needs of their patients and communities.

Ratio	
No ratio *(23 states + DC)*	AK, AZ, DE, DC, HI, ID, IL, IA, KY, ME, MD, MI, MO, NH, NM, OH, OR, PA, RI, UT, VT, WA*, WI, WY
8:1 *(1 state)*	IN
6:1 *(3 states)*	CO, FL, TX
4:1 *(9 states)*	GA, KS, MA, MN, MT, ND, SC, VA, WV
3:1 *(7 states)*	AL, AR, CT, MS, NE, NV**, SD
2:1 *(6 states)*	LA, NJ, NY, NC***, OK, TN
1:1 *(1 state)*	CA

*
WA ratio set per "pharmacy manager's discretion"
**NV allows up to 8:1 in a "non-dispensing pharmacy"
*** NC allows a pharmacist to supervise more than 2 technicians if the pharmacist-manager receives written approval from the Board

II. Expanded Duties for Pharmacy Technicians

The ability for pharmacists to spend time providing clinical care depends heavily on their ability to delegate more tasks to pharmacy technicians. When pharmacy technicians are allowed to perform the technical and administrative tasks in a pharmacy that do not require a pharmacist's professional judgement, pharmacists can focus on providing more clinical care to their patients.

Pharmacy Technician Duties	**States that Allow**
Broadly Allow Pharmacists to Delegate Activities *(10 states)*	DE, ID, KS, LA, MN, NC, ND, OH, WA, WI
Technician Product Verification *(9 states)*	AZ, CO, ID, IA, ND, SD **, TN**, WV, WI
Administering Immunizations *(Permanent authorization; 18 states)*	AL, AR, CO, IA, ID, IN, KY, LA, MO, NC, ND, NH, NV, RI, UT, WA, WI, WY
Accept Telephone Prescriptions *(27 states)*	AZ*, AR*, CT*, DE*, DC*, FL*, ID, IL, IN*, IA, KY*, LA, ME, MA, MI, MS*, MT*, NH, OR*, RI, SC, SD, TN, TX, UT, VA*, WI
Transfer Prescriptions (*17 states)*	AZ, CO, ID, IN, IA, ME, MA, MI, NV, NH, NC, RI, SC, SD, TN, TX WY
Clarifying Prescriptions *(At least 9 states)*	DE, FL, ID, IL, IA, MI, NH, RI, TX

*Refills only
**Pilot project

Journal of the American Pharmacists Association xxx (2018) 1–7

Contents lists available at ScienceDirect

Journal of the American Pharmacists Association

journal homepage: www.japha.org

RESEARCH

The Iowa new practice model: Advancing technician roles to increase pharmacists' time to provide patient care services

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ARTICLE INFO

Article history:
Received 28 April 2017
Accepted 4 February 2018

ABSTRACT

Objectives: Determine the effects of an 18-month pilot project using tech-check-tech in 7 community pharmacies on 1) rate of dispensing errors not identified during refill prescription final product verification; 2) pharmacist workday task composition; and 3) amount of patient care services provided and the reimbursement status of those services.

Design: Pretest-posttest quasi-experimental study where baseline and study periods were compared.

Setting and participants: Pharmacists and pharmacy technicians in 7 community pharmacies in Iowa.

Outcome measures: The outcome measures were 1) percentage of technician verified refill prescriptions where dispensing errors were not identified on final product verification; 2) percentage of time spent by pharmacists in dispensing, management, patient care, practice development, and other activities; 3) the number of pharmacist patient care services provided per pharmacist hours worked; and 4) percentage of time that technician product verification was used.

Results: There was no significant difference in overall errors (0.2729% vs. 0.5124%, $P = 0.513$) patient safety errors, (0.0525% vs. 0.0651%, $P = 0.837$), or administrative errors, (0.2204% vs. 0.4784%, $P = 0.411$). Pharmacist's time in dispensing significantly decreased, (67.3% vs. 49.06%, $P = 0.005$), and time in direct patient care, (19.96% vs. 34.72%, $P = 0.003$), increased significantly. Time in other activities did not significantly change. Reimbursable services per pharmacist hour, (0.11 vs. 0.30, $P = 0.129$), did not significantly change. Non-reimbursable services increased significantly, (2.77 vs. 4.80, $P = 0.042$). Total services significantly increased, (2.88 vs. 5.16, $P = 0.044$).

Conclusion: Pharmacy technician product verification of refill prescriptions preserved dispensing safety while significantly increasing the time spent in delivery of pharmacist provided patient care services. The total number of pharmacist services provided per hour also increased significantly, driven primarily by a significant increase in the number of non-reimbursed services. This was mostly likely due to the increased time available to provide patient care. Reimbursed services per hour did not increase significantly mostly likely due to lack of payers.

Numerous studies have shown that pharmacists can improve patients' clinical and financial outcomes of medication therapy.[1-9] Tremendous effort has been put forth in recognizing the pharmacist as an important health care provider in optimizing the medication use process. Efforts include defining pharmaceutical care and medication therapy management (MTM) and the pursuit of provider status for pharmacists under the Social Security Act.[1,10-12]

In 2009, the Iowa Pharmacy Association (IPA) organized the New Practice Model Task Force after a group of Iowa pharmacy leaders met to discuss a perceived lack of progression in Iowa to a MTM model in community pharmacy practice. Previous research suggests that the greatest challenges and barriers for pharmacists in providing MTM services in the community setting are lack of insurance companies paying for MTM services, pharmacists having inadequate time to provide services, and low payment for MTM services.[13] A 2012 study by Morrell et al. found that for Iowa pharmacists the lack of availability of pharmacists' time, insufficient staffing levels, and high levels of dispensing activities were the most frequently reported barriers to the provision of MTM services.[14]

The task force was charged with creating a new practice model for community pharmacy. The primary goal of the new practice

Disclosure: The authors declare no conflicts of interest or financial interests in any product or service mentioned in this article.

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https://doi.org/10.1016/j.japh.2018.02.005
1544-3191/

Key Points

Background:

- Pharmacists are important health care providers, optimizing the medication use process with medication therapy management (MTM).
- Lack of availability of pharmacists' time, insufficient staffing levels, and high levels of dispensing activities were the most frequently reported barriers to the provision of MTM services in Iowa.

Findings:

- Having pharmacy technicians verifying the filling of other pharmacy technicians instead of pharmacists resulted in no significant change in the rate of any errors or the rate of patient safety errors during an 18-month study.
- While a sizeable portion of the pharmacists' time was spent in dispensing activities at baseline, at the end of an 18-month study, pharmacists had significantly decreased their time spent in dispensing and significantly increased the amount time in direct patient care.
- The total number of services provided per hour of pharmacist time significantly increased over the span of the study. Non-reimbursed services per pharmacist hour increased significantly, but reimbursed services per hour did not significantly increase.
- The total number of patient services provided by pharmacists increased from 23 to approximately 41 for a traditional 8-hour work shift.

model was to address previously identified barriers to providing patient care services in Iowa. Because of economic concerns, the task force was challenged to propose changes that would not require significant increases in pharmacist staffing. In Iowa, community pharmacists offer a variety of clinical services, such as administering immunizations according to protocol, providing MTM and disease state education services, and administering prescribed medications.[15-17] At the time this study was implemented, reimbursement for patient care services in Iowa was primarily limited to immunization administration through prescription drug insurance benefits and MTM services through online billing platforms. Sustainable payment for all pharmacy services is a secondary long-term goal of the task force.

To increase time for pharmacist-provided patient care services, dispensing tasks have been delegated to pharmacy technicians. One existing model, tech-check-tech (TCT), has been a safe and effective strategy to allow for growth of clinical pharmacist services in health systems.[18-24] In hospital-based studies, verification error rates were statistically similar or better with TCT compared to pharmacist product verification, and accuracy rates with TCT ranged from 98.91% to 99.94%. In 2011, the Iowa Board of Pharmacy (IBOP) approved the use of TCT with certified pharmacy technicians in hospital and "closed door" long-term care pharmacy settings.[25] The current definition of TCT in Iowa is when "one or more certified pharmacy technicians are qualified to safely check the work of other certified pharmacy technicians and thereby provide final verification of drugs which are dispensed for subsequent administration to patients in an institutional setting."[26] Literature review by the task force at the time found no previous published research into the use of TCT in community pharmacies in the United States. The task force decided to pursue evaluation of the intervention of using certified pharmacy technicians to verify the accuracy of the final prescription product (i.e., TCT) in community pharmacy practice.

The task force presented a proposal to the IBOP for an 18-month pilot project that was approved in March 2014 and commenced on June 2, 2014. Working with the IBOP to refine the pilot project resulted in a mutual decision to initiate TCT in community pharmacies for refill prescriptions only. Similar to current hospital TCT practices in Iowa, a certified technician was only allowed to check products filled by another certified pharmacy technician.

Several research goals were established to measure the impact of the pilot on areas of interest to the task force and IBOP. These goals included 1) protecting patient safety by maintaining or decreasing the rate of dispensing errors that were not identified upon verification; 2) assuring that time saved by TCT primarily shifted to patient care services and not to other activities or to reducing pharmacist hours; and 3) increasing the number of patient care services that were provided during the time reallocated to patient care. One study[27] was found that discussed the rate of dispensing errors not identified upon pharmacist verification of filled prescriptions. The IBOP determined a baseline measurement of the rate of dispensing errors not identified upon pharmacist verification would be required, as the study was deemed outdated and was not performed in Iowa.

Objectives

The objectives of this study were to determine the effects of an 18-month TCT project in 7 community pharmacies on 1) rate of dispensing errors not identified during refill prescription final product verification; 2) pharmacist workday task composition in 5 areas of practice (dispensing, management, patient care, practice development, and other activities); and 3) amount of patient care services provided and the reimbursement status of those services.

Methods

This study used a 1-group pretest–posttest design. The population was community pharmacies in Iowa, and the intervention was TCT. This study was designed within the parameters and timeline of the approved pilot project set forth by the task force and IBOP and subsequently approved by the Drake College of Pharmacy and Health Sciences Institutional Review Board. The study evaluated the effect of the intervention on rate of dispensing errors, pharmacist workday composition, and patient care services implemented and their reimbursement status.

Intervention

Pharmacists completed all prospective drug utilization reviews for each prescription refill. During the first week of

implementation all TCT prescriptions were double-checked by the pharmacist. Sites proceeded with TCT if overall error rates during this week were no greater than 1 standard deviation higher than the baseline aggregate average of all the pharmacies. If the error rate was greater than allowed, additional training was undertaken, and additional prescription double-checks were performed. Data for all measures were collected only on days when TCT was being used. Most sites used TCT primarily on weekdays, but some sites also implemented TCT on weekends as staffing allowed. Iowa's statutory definition of TCT only allows a trained, certified technician to check the work of another certified pharmacy technician. Therefore, student pharmacists and interns were not allowed to participate in the TCT process.

Quarterly reports were required by the IBOP. These reports included aggregate and individual pharmacy reporting of each of the measures. Interim analysis comparing the quarter being reported to baseline measures was also required to determine whether patient safety was being protected and pharmacist patient care activities were increasing.

Recruitment and training

Community pharmacies that were members of IPA were invited to participate in the pilot study. To be eligible, they needed to 1) currently provide or be prepared to provide patient care services, 2) sign a letter of commitment to provide resources and training for their staff members and to participate in project meetings, 3) agree to submit data via an online survey monthly, and 4) have at least 2 certified technicians and 1 pharmacist.

Technicians in Iowa must be nationally certified within 1 year of employment and registered with the IBOP. Only certified technicians were allowed to fill or verify the prescription products. The requirements for the "checking technician" were to have worked 2000 hours as a pharmacy technician, 1000 of which were required to be in the study site, and to complete 6 hours of online instruction on prescription dispensing and the TCT process. Pharmacists were required to complete 2 hours of online instruction on the TCT process and implementation. Training for both pharmacists and pharmacy technicians was developed by the Collaborative Education Institute with guidance from the task force and was approved by the IBOP. In addition to online training, staff members were required to complete an on-site review of site specific policies and procedures regarding TCT.

Study measures

Verification error measure

The verification accuracy measure was based on published literature that defined errors as wrong drug, wrong strength, wrong quantity, incorrect label on container, data entry errors, and other filling errors.[27,28] Because pharmacists completed all data entry reviews, data entry and label errors were not included in the study. The task force made a consensus decision to track the following filling errors: wrong drug, wrong strength, wrong quantity, the number of prescriptions where the type of medication vial cap (safety cap or non-safety cap) was not correct, and other errors. The task force also determined by consensus that not all dispensing errors presented a probable risk to patient safety and that some were primarily administrative in nature. Errors were defined and categorized as potential patient safety errors (wrong drug, wrong strength) or administrative errors (wrong amount, safety cap error) and other errors. The research team categorized "other" errors by potential for patient harm. The IBOP accepted these definitions as consistent with the board's role of protecting patient safety.

Baseline measurements were determined for each site. Each site double-checked 50 refill prescriptions per day for 15 weekdays to determine the rate of dispensing errors not identified on pharmacist final product verification. During each month of the 18-month study period, all sites had a pharmacist double-check 50 refill prescriptions that were filled through the TCT process.

Workday composition

Pharmacists reported the number of minutes of time spent in dispensing, management, patient care, practice development, and other activities. The pharmacists were asked to estimate the number of minutes that they spent in each of these activities during a work shift. Baseline measurements were determined for each pharmacy with pharmacists tracking their time during a 15-weekday baseline period. During the study period, information was collected during a 5-day data collection period each month and was separate from the period when verification errors were measured. Each pharmacist who was working during the 5-day data collection period was asked to track and record the minutes spent in each activity at the end of each shift, and these were then aggregated and reported. The researchers determined the percentage of the pharmacists' day spent in each activity by dividing the number of minutes in each activity by the total minutes spent in all categories. Activity definitions were determined by consensus of the task force (Appendix A).

Pharmacist services

Pharmacists self-reported the number and reimbursement status for 13 defined categories of patient care services (Appendix B). The services were modified from a list used during the Advanced Pharmacy Practice Experience rotations for students at Drake University and The University of Iowa. When a service was provided, it was recorded and classified as reimbursable or non-reimbursable, depending on the availability of reimbursement. Baseline measurements were determined for each pharmacy, with pharmacists recording their services during the same 15-weekday baseline period when pharmacist workday composition tasks were being recorded. For this baseline measurement, pharmacists tracked the number of hours worked, services provided, and reimbursement status of each service.

Each month during the study period, sites submitted the number of hours that pharmacists worked and the number of services provided during the same 5-day period as workday composition was measured. Services were reported as the number of services per pharmacist work hour to accommodate differing levels of staffing and operating hours between the sites. This measure was calculated by dividing the number of times a service was provided by the number of hours the pharmacist worked.

Intervention fidelity

Pharmacies reported the number of days that TCT was used during each month. Intervention fidelity was determined by

Table 1
Rates of dispensing errors detected after the verification process at baseline and during the 18-mo study period

Mean error rates ± SD	Baseline[a]	18-mo study period[b]	*P* value[c]
Prescriptions checked	5565	5950	—
Administrative[d]	0.2204% ± 0.2078%	0.4784% ± 0.6873%	0.411
Patient safety[e]	0.0525% ± 0.0942%	0.0651% ± 0.1280%	0.837
Overall	0.2729% ± 0.2304%	0.5124% ± 0.8178%	0.513

[a] Dispensing errors were measured after pharmacists conducted the verification process.
[b] Dispensing errors were measured after technicians conducted the verification process.
[c] Comparison of baseline and 18-mo study period, paired *t* tests.
[d] Administrative errors (e.g., wrong amount, safety cap error).
[e] Potential patient safety errors (e.g., wrong drug, wrong strength).

the percentage of time TCT was used, which was calculated by dividing the days TCT was used by the number of days theoretically possible each month. The pharmacies were not able to always use TCT because of staffing fluctuations and the staffing requirements to participate in the project.

Each site had a pharmacist who was responsible for coordinating data collection and submission. The researchers provided suggested data collection instruments that could be modified by sites to better fit their daily workflow. Information collected was standard across sites. All data were submitted monthly, using Qualtrics online surveys. The researchers monitored submissions and sent reminder notices to the pharmacies that had not submitted required data in a timely manner. The IBOP required data collection and submission as a condition of participation for pilot sites.

Data analysis

Comparisons were made between baseline measurements and 18-month aggregate data using paired samples *t* tests. Relationships between intervention fidelity and changes in patient care services provided were evaluated using Pearson r correlation. All analysis was performed using SPSS statistical software, and an a priori alpha value of 0.05 was used in all analysis.

Results

Seven pharmacies were approved by the IBOP for participation in the pilot program. Participating pharmacies were from 3 regional chain (6/7) pharmacies in urban (5/7) counties as defined by the U.S. Census Bureau. They filled an average of 40,299 (±20,414) prescriptions per year.

When assessing dispensing errors, there were no statistical differences in the means for administrative (0.2204% ± 0.2078% vs. 0.4784% ± 0.6873%; $P = 0.411$), patient safety (0.0525% ± 0.0942% vs. 0.0651% ± 0.1280%; $P = 0.837$) or overall errors (0.2729% ± 0.2304% vs. 0.5124% ± 0.8178%; $P = 0.513$), when baseline results were compared with the 18-month study period (Table 1).

The mean amount of time that the pharmacists spent in dispensing activities significantly decreased (67.30% ± 13.48% vs. 49.06% ± 15.08%; $P = 0.005$). Mean direct patient care time significantly increased (15.96% ± 3.11% vs. 34.72% ± 12.00%; $P = 0.003$). Mean pharmacists' time in the other measured activities did not show significant changes (Table 2).

The mean amount of reimbursable services per pharmacist hour did not significantly change (0.1101 ± 0.1840 vs. 0.3534 ± 0.3485; $P = 0.129$). Mean non-reimbursable services per pharmacist hour were significantly higher (2.771 ± 3.7967 vs. 4.8016 ± 2.5590; $P = 0.042$) for the aggregated results for the full 18 months of the study. Mean total services provided per patient hour were significantly higher (2.8807 ± 3.9680 vs. 5.1550 ± 2.7672; $P = 0.044$) for the aggregated results for the full eighteen months of the study (Table 3).

Intervention fidelity was 59.66% over the duration of the study. The mean intervention fidelity was 57.96%, with a range of 83.38%-31.04%. The most common reason for not using TCT was insufficient technician staffing or technician absences. There was no significant correlation between the amount of time TCT was used and changes in pharmacist services provided per hour ($P = 0.58$).

Discussion

The goal of the task force was to implement an intervention to increase the time that pharmacists have available to work directly with patients. Using the TCT process with a specially trained and experienced certified pharmacy technician to verify the accuracy of the final prescription product was the intervention implemented. The intent of this research was to determine if using the TCT intervention would result in a portion of the pharmacists' workday moving from dispensing prescription products to providing a greater amount of patient

Table 2
Composition of pharmacist tasks

Mean self-reported pharmacist workday task composition ± SD[a]	Baseline	18-mo study period	*P* value[b]
Dispensing	67.30% ± 13.48%	49.06% ± 15.08%	0.005
Direct patient care	15.96% ± 3.11%	34.72% ± 12.00%	0.003
Management	9.19% ± 2.30%	8.28% ± 2.85%	0.076
Practice development	3.46% ± 5.05%	5.11% ± 3.66%	0.106
Other activities	4.10% ± 5.70%	2.82% ± 3.40%	0.229

[a] Refer to Appendix A for activity definitions.
[b] Comparison of baseline and 18-month study period, paired *t* tests.

Table 3
Self-reported patient care services delivered by pharmacists

Services per pharmacist hour ± SD	Baseline	18-mo study period	*P* value[a]
Reimbursable[b]	0.1101 ± 0.1840	0.3534 ± 0.3485	0.129
Not reimbursable[c]	2.771 ± 3.7967	4.8016 ± 2.5590	0.042
Total	2.8807 ± 3.9680	5.1550 ± 2.7672	0.044

[a] Comparison of baseline and 18-mo study period, paired *t* tests.
[b] Reimbursement available when service provided.
[c] Reimbursement not available when service provided.

care services, all while maintaining a high level of patient safety. At the time of the implementation of the project, there was no previous research on TCT in community pharmacies to provide comparisons. There was some information about the effectiveness of pharmacists in verifying filled prescriptions in community pharmacies. The literature lacked descriptions of the composition of pharmacist workday and descriptions on the rate of pharmacist provision of patient care services. The lack of previous information lead to extensive baseline measurements to better describe the current practices in these pharmacies. Dispensing errors were defined by consensus of the task force and the researchers, and these were similar to the error descriptions used in 2 earlier studies.[27,28]

Prescription verification

Pharmacists demonstrated a very low error rate during final product verification. The rates were similar to 2 studies that examined the verification error rate in community pharmacies. When the process changed to having TCT, there were no significant changes in the rate of any errors. In the last 6 months of the study, no verification errors were identified, suggesting that the process was stable and effective. These findings suggest TCT can be performed safely by certified pharmacy technicians with at least 1 year of full-time experience in addition to specific training on the TCT process. This finding has the potential to lead to significant changes in the roles of both pharmacy technicians and pharmacists in community pharmacy practice. The use of TCT could result in expanded opportunities for pharmacists to become more involved in patient care. Redeployment of pharmacists from prescription verification to patient care activities would allow patients to receive the benefits that have been seen in previous research but have been difficult to implement in community practice due to time constraints.

Pharmacist activities

At baseline, a sizeable portion of the pharmacists' time was spent in dispensing, with a 4.21:1 ratio of time in dispensing to time providing direct patient care. At the end of the study, pharmacists had significantly shifted their workday with the ratio of time in dispensing to time in patient care decreasing to 1.41:1. Time spent in all other activities remained stable throughout the study period. This finding suggests that one of the major objectives of the task force, increasing the amount of time available for pharmacists to provide direct patient care services, had been achieved.

The number of total services provided per hour of pharmacist time significantly increased (2.8807 ± 3.9680 vs. 5.1550 ± 2.7672; $P = 0.044$). Another perspective is that the total number of patient services provided by pharmacists in an 8-hour work shift increased from 23 to approximately 41. This finding suggests that increasing the time available for pharmacists to provide patient care will lead to an increase in the number of services provided. When services were examined for reimbursable status, there was a significant increase (2.771 ± 3.7967 vs. 4.8016 ± 2.5590; $P = 0.042$) in the non-reimbursed services provided per pharmacist hour. A statistically insignificant increase (0.1101 ± 0.1840 vs. 0.3534 ± 0.3485; $P = 0.129$) was found in the amount of reimbursed services provided per pharmacist hour. This suggests that while increased provision of non-reimbursable services is dependent on increasing the time available for service provision, there may be other factors that could determine the amount of reimbursable services provided. Pharmacists were likely providing more services without consideration of reimbursement status. A service could be either reimbursable or non-reimbursable dependent on the patients' willingness to pay or the patients' insurance provider providing payment. The reimbursement status of a service is often not under the control of the pharmacists providing them. This could explain why reimbursed services did not increase significantly compared to non-reimbursed services. Examination of the individual services did not identify any significant increase in one type of service. Rather, the increase in overall services seemed to be due to incremental increases in multiple pharmacy services across the pharmacies. While not directly measured, pharmacies anecdotally reported that the amount of time pharmacists spent with individual patients increased.

Intervention fidelity

It was thought that pharmacies that used TCT more often would see greater changes than pharmacies who used TCT less frequently. The expected relationship was not found. While not directly measured, the lack of a consistent effect may be due to differing levels of service provision at the initiation of the study. Some of the pharmacies were already providing a higher level of services at the start of the study and did not have as large an increase as others who initially provided fewer services. Pharmacists who entered the study with recent training or experience in providing patient care might have been more efficient in providing services than pharmacists whose training and experience were not as extensive. The ability of pharmacists to provide these services was not measured at any point during the study; therefore, comparisons between pharmacists or pharmacies were not possible.

Because of these results, the IPA has supported the introduction of legislation to allow TCT into select community pharmacy practice settings; IPA has also recommended changing the term *TCT* to *technician product verification*. The intent of this expansion is to increase access to pharmacist-provided patient care services.

Future directions for this research include adding pharmacies with a greater diversity in size and ownership characteristics to determine if TCT can be used safely and effectively in a variety of practice settings. Future investigations will also include the addition of new prescriptions and the ability for technicians to verify prescriptions filled by students and interns to allow investigation of a fully implemented TCT practice model. At the time of this report, studies are under way to evaluate these possible future directions. Finding similar results for refill prescriptions in other practice settings and with full implementation including new prescriptions could lead to significant changes in pharmacy practice in Iowa. Studies are also under way in several other states to determine the applicability of these findings to pharmacy practice in those states. Similar findings in these states could possibly suggest that TCT in community pharmacy practices could become a common method to allow pharmacists to perform an increasing number of patient care services.

Limitations

There are several limitations to this research. There is a limited amount of previous research into the accuracy of pharmacist verification of prescriptions; therefore, it is difficult to state with certainty that the TCT process is as effective as pharmacist verification. While there is information in the literature about the effectiveness of TCT in hospitals, the process of dispensing medications is different in community pharmacies. In hospitals, most doses are dispensed in unit dose systems and are subject to additional verification before administration to the patient; therefore, direct comparisons with this literature are difficult. The amount of time spent by pharmacists in patient care activities and the number of services provided was self-reported, which could possibly lead to social desirability bias. Because the results were similar between pharmacies, this is likely not a significant limitation. While the number of pharmacist-provided patient care services was measured, the time spent on each service was not measured; therefore, the full measure of the effect on service provision cannot be determined. Immunization services may be seasonal in nature; therefore, the changes found may have been because of expected seasonal variation, as the 15-day baseline period was not during the period where increased immunization services would have been expected. The intrinsic interest that pharmacists had for providing patient care was not measured, and it could have affected the amount of patient care services provided. The findings are applicable to similar pharmacies within Iowa; however, because of differences in pharmacy practice acts and technician training requirements in other states, the findings might not be fully applicable to similar pharmacies in other states.

This research may not be applicable to higher-volume pharmacies and large chain pharmacies because the pharmacies in the study were small chain or independent pharmacies. Another limitation is the lack of a full examination of the economic impact of these changes. A general assumption is that increases in patient care, especially reimbursed services, would increase revenue to more than offset possible increases in operating and staff costs resulting from the workplace redesign. Lack of consensus about how to measure both costs and revenue in addition to the sensitive nature of financial data limited the ability to study these factors.

Conclusion

TCT of refill prescriptions was found to be a safe and effective intervention to increase the time available for pharmacists to provide patient care services. The rates of dispensing errors that were not found upon technician verification of the filled prescription were similar to those when pharmacists performed the verifications. Pharmacists reinvested the majority of time freed by TCT to provide patient care. The number of all pharmacist services provided per hour also increased, mostly likely because of the increased time available to provide patient care. These results successfully addressed the goals of the pilot project of maintaining dispensing accuracy, redistributing pharmacist time spent in dispensing to clinical responsibilities, and increasing the number of pharmacist-provided patient care services.

References

1. Bluml BM. Definition of medication therapy management: development of profession wide consensus. *J Am Pharm Assoc*. 2005;45:566–572.
2. Moore JM, Shartle D, Faudsker LF, Matlin OS, Brennan TA. Impact of a patient-centered pharmacy program and intervention in a high-risk group. *J Man Care Pharm*. 2013;19:228–236.
3. Touchette DR, Masica AL, Dolor RJ, et al. Safety-focused medication therapy management: a randomized controlled trial. *J Am Pharm Assoc*. 2012;52:603–612.
4. Isetts BJ, Schondelmeyer SW, Artz MB, et al. Clinical and economic outcomes of medication therapy management services: the Minnesota experience. *J Am Pharm Assoc*. 2008;48(2):203–211.
5. Wittayanukorn S, Westrick SC, Hansen RA, et al. Evaluation of medication therapy management services for patients with cardiovascular disease in a self-insured employer health plan. *J Manag Care Pharm*. 2013;19(5):385–395.
6. Fox D, Ried LD, Klein GE, Myers W, Foli K. A medication therapy management program's impact on low-density lipoprotein cholesterol goal attainment in Medicare part D patients with diabetes. *J Am Pharm Assoc*. 2009;49:192–199.
7. Brummel A, Lustig A, Westrich K, et al. Best practices: improving patient outcomes and costs in an ACO through comprehensive medication therapy management. *J Manag Care Pharm*. 2014;20:1152–1158.
8. Viswanathan M, Kahwati LC, Golin CE, et al. Medication therapy management interventions in outpatient settings: a systematic review and meta-analysis. *J Amer Med Assoc Intern Med*. 2015;175(1):76–87.
9. Fera T, Bluml BM, Ellis WM. Diabetes ten city challenge: final economic and clinical results. *J Am Pharm Assoc*. 2009;49(3):383–391.
10. American Pharmacist Association. Provider status: what pharmacists need to know. Available at: http://www.pharmacist.com/provider-status-what-pharmacists-need-know-now. Accessed August 3, 2017.
11. Balick R. Provider status legislation reintroduced in the Senate. Available at: https://www.pharmacist.com/article/provider-status-legislation-reintroduced-senate. Accessed August 15, 2017.
12. Bonner L. Provider status legislation reintroduced in the U.S. House of Representatives. Available at: https://www.pharmacist.com/article/provider-status-legislation-reintroduced-us-house-representatives. Accessed August 15, 2017.
13. American Pharmacists Association. *Medication therapy management digest: Pharmacists emerging as interdisciplinary health care team members*. Washington, DC: American Pharmacists Association; 2013.
14. Morrell T, Schmitz N, Andreski M, Kjos A, Gainer K. Embracing challenges in a complex environment: a study of pharmacists' workload dynamics and provision of MTM. Presented at the 159th Annual Meeting of the American Pharmacists Association, New Orleans, LA, March 11, 2012.
15. Iowa Board of Pharmacy. Iowa Administrative Rules. Collaborative drug therapy management. Available at: https://www.legis.iowa.gov/docs/iac/rule/09-18-2013.657.8.34.pdf. Accessed August 15, 2017.

16. Iowa Board of Pharmacy. Iowa Administrative Rules. Vaccine administration by pharmacists. Available at: https://www.legis.iowa.gov/docs/iac/rule/02-17-2016.657.8.33.pdf. Accessed August 15, 2017.
17. Iowa Board of Pharmacy. Iowa Administrative Rules. Individuals qualified to administer. Available at: https://www.legis.iowa.gov/docs/iac/rule/09-24-2008.657.8.32.pdf. Accessed August 15, 2017.
18. Becker MD, Johnson MH, Longe RL. Errors remaining in unit dose carts after checking by pharmacists versus pharmacy technicians. *Am J Hosp Pharm*. 1978;35(4):432–434.
19. Woller TW, Stuart J, Varabel R, Sents B. Checking of unit dose cassettes by pharmacy technicians at three Minnesota hospitals. *Am J Hosp Pharm*. 1991;48(9):1952–1956.
20. Spooner SH, Emerson PK. Using hospital pharmacy technicians to check unit dose carts. *Hosp Pharm*. 1994;29(5):433–437.
21. Ness JE, Sullivan SD, Stergachis A. Accuracy of technicians and pharmacists in identifying dispensing errors. *Am J Hosp Pharm*. 1994;51(3):354–357.
22. Ambrose PJ, Saya FG, Lovett LT, Tan S, Adams DW, Shane R. Evaluating the accuracy of technicians and pharmacists in checking unit dose medication cassettes. *Am J Health Syst Pharm*. 2002;59(12):1183–1188.
23. Reed M, Thomley S, Ludwig B, Rough S. Experience with a "tech-check-tech" program in an academic medical center. *Am J Health Syst Pharm*. 2011;68(19):1820–1823.
24. Adams AJ, Martin SJ, Stolpe SF. Tech-check-tech: a review of the evidence on its safety and benefits. *Am J Health-Syst Pharm*. 2011;68:1824–1833.
25. Iowa Board of Pharmacy. Iowa Administrative Rules. Available at: https://www.legis.iowa.gov/law/administrativeRules/chapters?agency=657. Accessed August 15, 2017.
26. Iowa Board of Pharmacy. Iowa Administrative Rules. Definitions. Available at: https://www.legis.iowa.gov/docs/iac/rule/10-05-2011.657.40.2.pdf. Accessed August 18, 2017.
27. Flynn E, Barker K, Carnahan B. National observational study of prescription dispensing accuracy and safety in 50 pharmacies. *J Am Pharm Assoc*. 2003;43(2):191–200.
28. Friesner D, Scott D, Rathke A, Peterson C, Anderson H. Do remote community telepharmacies have higher medication error rates than traditional community pharmacies? Evidence from the North Dakota Telepharmacy Project. *J Am Pharm Assoc*. 2011;51(5):580–590.

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Appendix

Appendix A
Pharmacist workday composition definitions

Category	Definition/Guide
Dispensing activities	Entering prescriptions into computer, physically filling prescriptions, checking filled prescriptions, obtaining refills from prescriber, insurance communications, compounding, medication synchronization tasks (documenting what was filled, preparing refills, filling and checking medicine packs and nursing home unit dose packaging)
Business management activities	Inventory management including pulling outdated or expired medication, scheduling, personnel management functions (scheduling, hiring, evaluations, and payroll), financial activities, business marketing and promotions, DME billing, Outcomes and Mirixa management (including billing for services and reconciliation for services provided), LTC medication inspections, and ordering supplies for established clinics
Patient care	Prescription counseling, MTM activities (including writing up patient notes), physical assessments, over-the-counter recommendations, DUR activities, medication reviews, charting, medication synchronization appointments with patient, hospice team meetings, LTC medication reviews, attending rounds, answering patient and provider questions
Practice development	Educating and training staff members to deliver patient care, meeting with health care providers and payers to establish and promote services, attending meetings to discuss pharmacy services, setting up new immunization clinics
Other	Any activities that are performed that do not fit the above categories (e.g., precepting or teaching opportunities)

DME, durable medical equipment; LTC, long-term care; MTM, medication therapy managment; DUR, drug utilization review.

Appendix B
Pharmacy service categories

Service	Definition/Guide
Prescription counseling	Any discussion points covered in OBRA '90 counseling rules.
Drug therapy problems identified through dispensing DUR	Problems found and addressed during workflow including contacting prescriber and patient; separate from a scheduled appointment
Drug information requests	Information about OTC or Rx medications from patients or providers, separate from counseling process (i.e., medications patient is not taking but just asking about)
Patient education services	Disease state education, device training (e.g., insulin pens, diabetes meters, inhalers)
Immunizations	Includes discussion about vaccines, benefits, disease prevention and administration of vaccine in this category
Injection administration	Nonimmunization administration
Patient screening and testing	Health screening
MTM services	MTM services can be done within workflow or by appointment
MTM: current medication list and history collection	For example, setting up a new patient at the pharmacy during workflow or during part of a scheduled MTM appointment
MTM: medication reconciliation	For example, providing a medication list to hospital upon admission or reviewing list from hospital upon discharge or updating medication list through scheduled MTM appointment
MTM: patient follow-up	Examples include adherence checks, following up on new medications, and follow-up MTM appointment
MTM: patient interview	Information collected during an MTM appointment
MTM: consultation with provider	Mark this category for consults that result from problems found during medication reviews, not DUR problems found during workflow
Other: please write on back	Describe on survey

OBRA '90, Omnibus Budget Reconciliation Act; DUR, drug utilization review; OTC, over-the-counter; Rx, prescription; MTM, medication therapy management.

Journal of the American Pharmacists Association 58 (2018) 652–658

Contents lists available at ScienceDirect

Journal of the American Pharmacists Association

journal homepage: www.japha.org

ADVANCES IN PHARMACY PRACTICE

Evaluation of community pharmacy tech-check-tech as a strategy for practice advancement

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ARTICLE INFO

Article history:
Received 11 May 2018
Accepted 28 June 2018
Available online 29 August 2018

ABSTRACT

Objective: The purpose of this study was to design, pilot, and evaluate a community "tech-check-tech" (TCT) program as a strategy for pharmacy practice advancement.
Setting: Community pharmacy with both mail order and outpatient pharmacy services.
Practice description: The policies, technician training requirements, prescription eligibility requirements, and quality assurance measures necessary for the pilot were developed. The TCT workflows and procedures were integrated into the existing prescription dispensing framework at a pilot site. An analysis of pharmacist and technician checking accuracy was conducted with a 4-week data collection period for each role. To determine TCT technician accuracy, the TCT technician performed the first product verification check after the prescription was filled by a pharmacy staff member. If the TCT technician found an error, they documented the error and returned the prescription to the filling technician for correction. If the prescription was filled correctly, the TCT technician passed the prescription to a pharmacist for final verification. The pharmacist documented any incorrect prescriptions that the TCT technician verified. Pharmacist accuracy was measured through direct pharmacist observation. Direct observation was also used to measure and record pharmacist and technician prescription checking time. The data were then used to evaluate pharmacist time savings as a result of community TCT, while ensuring prescription dispensing accuracy.
Practice innovation: TCT was piloted in a community pharmacy.
Evaluation: An analysis of pharmacist and technician checking accuracy was conducted with a 4-week data collection period for each role. To determine TCT technician accuracy, the TCT technician performed the first product verification check after the prescription was filled by pharmacy staff. If the TCT technician found an error, they documented the error and returned the prescription to the filling technician for correction. If filled correctly, the TCT technician passed the prescription to a pharmacist for final verification. The pharmacist documented any incorrect prescriptions that the TCT technician verified. Pharmacist accuracy was measured through direct pharmacist observation. Direct observation was also used to measure and record pharmacist and technician prescription checking time. This data was then used to evaluate pharmacist time savings as a result of community TCT, while ensuring prescription dispensing accuracy.
Results: A TCT workflow was piloted successfully in the community pharmacy setting. Technicians were at least as accurate as pharmacists, as validated with statistical analysis (99.95% [95% CI 99.89%–99.99%] versus 99.74% [95% CI 99.61%–99.87%]), and patient safety was maintained. Time studies allowed for the quantification of potential pharmacist time savings (23 days per year) resulting from the implementation of a community TCT program.
Conclusion: This study demonstrates the feasibility of a TCT program in the community pharmacy setting.

Disclosure: The authors declare no conflicts of interest or financial interests in any product or service mentioned in this article.
Previous presentations: The results of this study have been presented at the ASHP Midyear Clinical Meeting (poster presentation), Las Vegas, NV, December 6, 2016; Pharmacy Society of Wisconsin Educational Conference, Madison, WI, April 5, 2016; and Great Lakes Pharmacy Residency Conference, West Lafayette, IN, April 29, 2016.
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https://doi.org/10.1016/j.japh.2018.06.018
1544-3191/

Key Points

Background:

- Studies dating back to the 1970s have demonstrated that technicians are at least as accurate as pharmacists in performing the technical work of checking unit dose medications.
- Removing the technical work of checking drug and quantity from the pharmacist's responsibilities would subsequently allow for increased time for clinical activities in the community setting.

Findings:

- Technicians were at least as accurate as pharmacists during the final product verification step in the community pharmacy dispensing workflow.
- Patient safety was maintained in the community "tech-check-tech" program.
- This study demonstrates the feasibility of a "tech-check-tech" program in the community pharmacy setting.

Community pharmacists are well positioned to provide accessible health care services as part of the interdisciplinary patient care team. It has been documented that when pharmacists are engaged in patient care in the community setting, access to care is improved, physician time is saved, and clinical and economic outcomes are enhanced.[1]

However, community pharmacists continually report a lack of time to focus on patient care activities and services. A 2009 survey of community pharmacists found that the majority would like to at least double the amount of time they are able to dedicate to such tasks.[2] A recent study performed in Iowa by Kjos and Andreski found that lack of availability of pharmacists' time, insufficient staffing levels, and high levels of dispensing activities were the most frequently reported barriers to provision of medication therapy management (MTM) services.[3]

Advancing the role of pharmacy technicians would allow increased pharmacist availability for patient care tasks. The process of "tech-check-tech" (TCT) has been previously studied and documented within the inpatient pharmacy workflow.[4-10] However, at the time of this study, there were no publications exploring the applicability of TCT within the community pharmacy setting.

Background

In numerous health systems across the country, pharmacy technicians are delegated nonclinical dispensing functions to allow for the growth of clinical pharmacy services in the inpatient setting. Studies dating back to the 1970s have demonstrated that technicians are at least as accurate as pharmacists in performing the technical work of checking unit dose medications.[6-10] In this setting, the pharmacist performs a prospective order review before the order is sent to the centralized distribution areas for filling. Thus, all clinical review is completed before the inpatient TCT technician checks a qualifying dose. Bar codes are affixed to all medications, and scanning is required by the dispensing technician and the health care professional administering the dose to the patient. This provides a safeguard against dispensing the wrong medication.

At the University of Wisconsin (UW) Health, the first TCT program began in April 2004. The Wisconsin Pharmacy Practice Act does not permit TCT; therefore, a variance was obtained from the Wisconsin Pharmacy Examining Board (PEB) to allow technicians to check unit dose medications for unit dose cassettes. This variance requires that pharmacists check at least 10% of these doses, and technicians must maintain an accuracy rate of 99.8%. The implementation of TCT for unit dose cassettes decreased the time pharmacists spent checking medication carts by 94.5%, reducing the number of interruptions in pharmacist workflow and increasing the amount of time spent on patient care activities.[10] Since 2004, pharmacy technicians have checked more than 2,000,000 doses and continue to maintain the required accuracy rate.

TCT could provide a feasible and safe product verification alternative in the community setting as well. This nonclinical task is ideal for delegation to pharmacy technicians and would eliminate the need for the final product check by the pharmacist. Removing the technical work of checking drug and quantity from the pharmacist's responsibilities would subsequently allow for increased time for clinical activities. Therefore, TCT has great potential to be successfully implemented in community pharmacies.

Objective

The purpose of this study was to design, pilot, and evaluate a community TCT program as a strategy for pharmacy practice advancement.

Setting

This study was conducted at an outpatient community pharmacy, where a majority of prescriptions are mailed or delivered to patients. The UW Health community pharmacy dispensing workflow (Figure 1) has similar safety checks to the inpatient medication distribution process. The community pharmacist reviews prescriptions for clinical appropriateness and appropriate transcription into the pharmacy dispensing software prior to product dispensing. A technician is responsible for dispensing and filling the prescription, followed by a final pharmacist check for medication filling accuracy before transferring the prescription to the patient.

Practice innovation

Due to the nature of this study, it was determined to be exempt from review by the UW Health Institutional Review Board.

Development of the TCT Pilot Program Structure

A project team of key stakeholders within the pharmacy department was formed to ensure that all operational, technological, and personnel considerations were appropriately

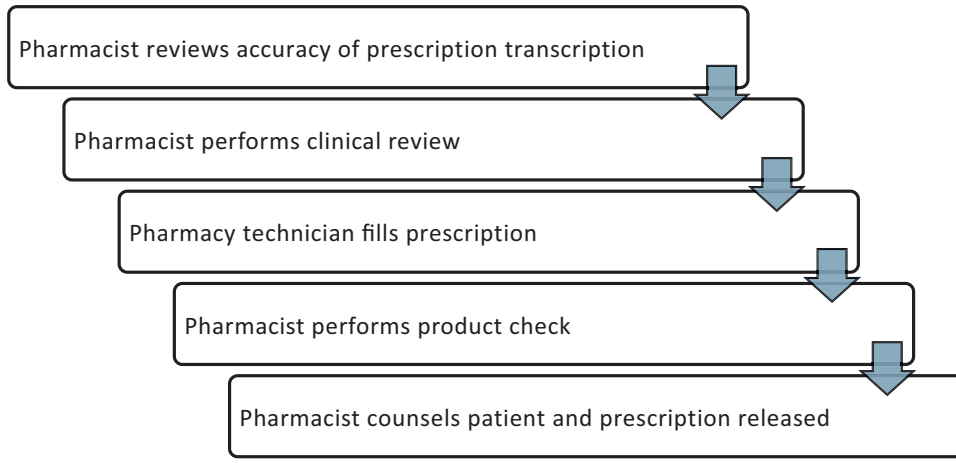

Figure 1. Current community pharmacy workflow.

planned and properly addressed throughout the project. Four members were selected based on areas of expertise and supervision and experience with existing inpatient TCT programs. This study was structured in the same manner as the inpatient TCT study.[10]

To be eligible to participate in the pilot program, a pharmacy technician was required to meet the following requirements:

- Pharmacy Technician Certification Board (PTCB) certification
- Graduate from an accredited technician training program or at least 3 years' experience as a pharmacy technician
- Employment at a UW Health pharmacy for at least 1 year
- Full-time employment status
- Ability to pass didactic testing, competency evaluations, and a validation period required before independent checking as approved by the PEB

Three technicians were interested and qualified for inclusion in the pilot, and they were required to complete both didactic and practical training. The first component was the completion of an in-house self-learning manual. This manual contained a review of common community pharmacy terminology, a primer on TCT, background on the community pharmacy workflow, common pharmaceutical abbreviations and conversions, and basic pharmaceutical calculations. After completion of the training manual, the technicians were required to achieve 90% or greater on an examination covering the material from the manual.

After passing the didactic training, technicians shadowed and trained with a pharmacist for an average of 16 hours. During this time, a pharmacist trainer and the technician trainee followed a standardized checklist to review dispensing workflows, prescription handling requirements, and common errors that occur during the prescription filling process. The pharmacist evaluated each technician's understanding of these objectives and provided both oral and written feedback daily. Once the pharmacist determined that the technician could complete the product check step in a safe and efficient manner, they would formally attest to the completion of practical training. All 3 qualified pharmacy technicians successfully completed both didactic and practical training requirements and participated in the study. In addition, 6 pharmacists participated in the study. Pharmacist participation was based on the existing pharmacist rotation schedule for the study location.

Evaluation of product check accuracy

Both pharmacist and technician verification accuracy were evaluated to compare the accuracy between the 2 cohorts. To demonstrate statistical significance, an accuracy rate of 99.8% was used as the threshold. At least 5000 prescriptions per cohort were required for the evaluation of both groups to demonstrate statistical significance at the level of $P < 0.05$.

To power the study adequately, a community dispensing pharmacy with a high volume of prescriptions was used as the pilot site. Other considerations included the ease of incorporating TCT into existing workflows and space requirements. As a result, the pharmacy performing mail and delivery services was selected. Four weeks of data analysis were completed for each cohort, as this site averaged approximately 350 to 375 prescriptions daily (Monday through Friday).

All prescriptions were eligible to be checked by a technician within the community TCT pilot, except for compounded medications. To conduct the pilot within the confines of state law, a workflow was developed to evaluate the product checking accuracy of a technician, while maintaining the final pharmacist product check (Figure 2A). This workflow also allowed for the measurement of technician checking accuracy for study purposes.

After the prescription was dispensed by the filling technician, it was sent to the TCT technician. The TCT technician would review the dispensed product to verify the accuracy of dispensed product, patient, quantity, and dosage form. After TCT verification, a final product review was performed by the pharmacist to ensure accuracy before prescription transfer to the patient. The pharmacist performing the final prescription verification also performed the accuracy evaluation for the TCT technicians. This was documented at the time of the first pharmacist check as shown in Figure 2A.

To evaluate pharmacist verification accuracy, the primary investigator reviewed all prescriptions verified by a pharmacist during the study period (Figure 2B). Any identified errors

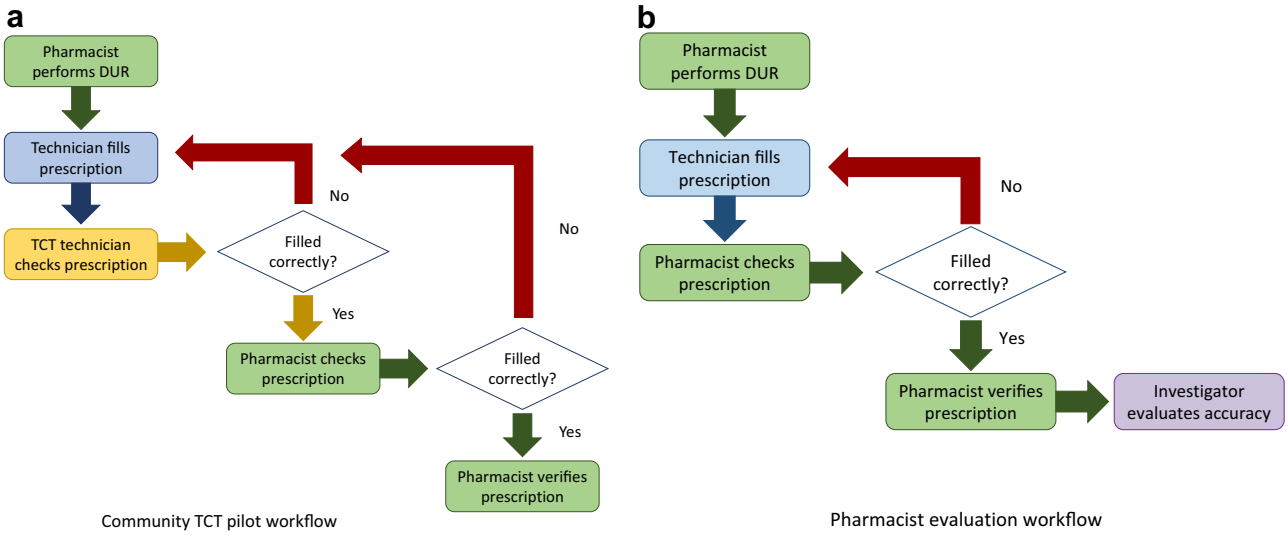

Figure 2. Study workflows.

were collected on a standardized documentation form, including the prescription number, type of error, and a description of the error.

During the accuracy evaluation, errors were introduced to ensure that the number of errors needed to demonstrate a statistically significant accuracy rate was achieved for both cohorts (technicians and pharmacists). False patient profiles were created to avoid introducing an error that might not be caught and potentially reach a patient. These false patient profiles were developed with common names, disease states, and other demographic information to sufficiently blind pharmacists and technicians and to avoid bias. False prescriptions corresponding to the patients' disease states were created, and a fake prescription benefit management plan was entered for the patients.

A pharmacy technician within the study pharmacy location, but not involved in the TCT workflow, was entrusted to fill and insert the introduced prescriptions into the queue for the TCT technician or pharmacist to check. Errors were introduced at a rate of approximately 1 in every 400 (0.025%) prescriptions; this was also based on the 99.8% accuracy rate required for inpatient TCT. The same types of errors and rate of error introduction were used for both groups. Types of errors introduced were wrong drug, wrong strength, wrong quantity, and wrong patient monograph.

Measurement of product check time requirements

A time study was performed during the accuracy evaluation for both pharmacist and technician groups. The primary investigator manually measured and recorded the time it took for the pharmacist to verify the prescription. The same measurements were recorded to evaluate the time required for the TCT technician to perform the product check step. The start time was the point when the technician or pharmacist scanned the prescription label. The stop time was defined as the time when the TCT technician closed the prescription verification screen after checking the product and the time when the pharmacist verified the prescription.

As there was no baseline average verification time, there was no basis to power this component of the study and no robust statistical analysis could be performed on the data. The primary investigator recorded a similar number of observations for both groups, and both sets of data were then annualized using the site's average prescription volume. This allowed for the determination of the amount of pharmacist time that could be reallocated from the technical task of product check to patient care activities.

Classification of identified errors

Upon the conclusion of the accuracy evaluation periods for both cohorts, the severity of any identified errors was evaluated. A standardized medication error categorization index from the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) was used.[11] To score the errors, the primary investigator created a survey that was administered to the project team. The team was blinded to which group committed the error, and it evaluated each error as if it had reached the patient. Once the survey was complete, the project team then discussed the results and reached consensus on any items for which survey scores differed.

Evaluation

Accuracy evaluation

The accuracy results from both phases of the pilot are shown in Table 1. Pharmacists committed 15 errors in 5571 prescriptions verified, whereas technicians committed 4 errors

Table 1
Technician and pharmacist accuracy and time metrics

Measure	Technician	Pharmacist
Total prescriptions checked	7538	5571
Total errors	4	15
Wrong drug	1[a]	0
Wrong strength	1	1
Wrong quantity	1[a]	9
Wrong patient monograph	1	3
Other error	0	2
Number of introduced errors caught	18 (90%)	10 (73%)
Errors made on refilled medications	2	7
Average checking time	8.77 seconds (n = 287[c])	7.10 seconds (n = 225[c])
Checking time, annualized	230 hours	186 hours
Accuracy rate	99.95%[b]	99.74%[b]
95% confidence interval	99.89%-99.99%	99.61%-99.87%

[a] Also missed by verifying pharmacist.
[b] Statistically significant.
[c] Number of prescriptions for which checking time was measured.

in 7538 prescriptions checked. Thus, the accuracy rate for pharmacists was 99.74% (95% CI 99.61%–99.87%), and the accuracy rate for the TCT technicians was 99.95% (95% CI 99.89%–99.99%). This difference was statistically significant.

Table 1 also provides a breakdown of error types for each group. Two of the technician errors were missed by the verifying pharmacist as well. The most common pharmacist error was incorrect quantity (60% of errors). Other pharmacist errors included a missing medication vial, where the patient would have received the medication monograph but not the medication itself. There was not a difference in the number of errors for new versus refilled prescriptions in either cohort. In the pharmacist group, 7 errors were made on refills; in the technician group, 2 of the 4 errors were refills. Four of the pharmacist errors were introduced errors; 2 of the technician errors were introduced. One technician error (wrong strength) was a controlled substance. No errors were made on injectable products. In addition, technicians caught 18 of 20 (90%) introduced errors, while pharmacists caught 10 of 14 errors (73%).

Error classification

Each error was evaluated to determine severity using the NCC MERP taxonomy. Because the errors were evaluated as if they had reached the patient, they were automatically classified as Category C or higher. The highest score for all errors was Category E, where the error may have contributed to or resulted in temporary harm to the patient and required intervention. Pharmacists had 3 Category E errors (25% of pharmacist errors) and no Category D errors, while the TCT technicians had 1 Category D error (25% of technician errors) and 1 Category E error (also 25% of errors). Table 2 displays the error severity by cohort.

Time study

The average time for pharmacists to perform the product check step was 7.10 seconds, while technicians had an average of 8.77 seconds. Annualized, 186 hours (23 days) of pharmacist time would be spent on the product check step (Table 1).

Discussion

As the health care landscape continues to change, the pharmacy profession must adjust to ensure that pharmacist resources are used in a value-based manner. Reimbursement is shifting to quality and clinical outcomes, making this an increased area of focus and importance in health care. As pharmacists become increasingly involved in patient care services and integrate into the care team, the demands on their time are also increased. However, pharmacists in many states are still required by law to perform the final product dispensing step, limiting their ability to devote time to clinical services without adding additional resources.

The technical task of final product check does not require a pharmacist's expertise, and it is an ideal task for delegation to technicians. As TCT has well-documented benefits in terms of freeing up pharmacists' time in the inpatient pharmacy setting, this study was designed to pilot and analyze the potential impact of a similar program in the community pharmacy setting.

Historically, technician qualifications, training, documentation, and quality assurance measures have been components of the PEB's variance requirements for inpatient TCT programs. Thus, mirroring relevant aspects of inpatient TCT programs was an important consideration throughout the development of the community TCT pilot structure. To demonstrate the potential validity of community TCT and to obtain PEB approval, similar processes and requirements were established to increase acceptance of this program by the PEB.

Integrating the TCT technician into the workflows at the pilot site required significant analysis of current workflows and continuous communication with key stakeholders at the pharmacy. Allocating space for the TCT technician was one of the more challenging aspects of implementation. However, if TCT were approved by the PEB, this would allow for reallocation of pharmacist workstation space in the filling areas as they would be able to spend more of their time on cognitive, patient care activities outside of the dispensing workflow.

Project investigators also considered various eligibility criteria for prescriptions checked by the TCT technicians during the pilot. This included controlled versus noncontrolled substances, oral versus injectable, and refills versus all prescriptions as potential qualifying conditions. Regulatory and documentation requirements were considered for Schedule II–V medications. Because the community pharmacy sites can dispense high-cost injectable and specialty medications, there are handling and storage requirements to which the pharmacy must adhere. It was determined that both new and refilled prescriptions would be part of the pilot, as a pharmacist must still perform a drug utilization review when prompted by alerts, such as a new drug-drug interaction, for refilled medications. All prescriptions would be included in the pilot to reach 5000 prescriptions within a reasonable time frame and for ease of workflows at a pilot site. However, data were collected to allow for analysis of error rates based on any of the aforementioned types of prescriptions.

Maintaining patient safety is the primary goal in any TCT program. This study demonstrated that technicians were at least as accurate as pharmacists during the final product verification step in the community pharmacy dispensing workflow. These results are similar to what other researchers

Table 2
Error severity

Error severity	Technician	Pharmacist
Category C: reached the patient but did not cause patient harm	2	12
Category D: required monitoring to confirm that it resulted in no harm to the patient and/or required intervention to preclude harm	1	0
Category E: may have contributed to or resulted in temporary harm to the patient and required intervention	1	3

have identified when studying TCT in the community setting.[12] When evaluating potential outcomes for the errors committed by both cohorts, the most likely outcome was considered. For example, if a prescription for metformin is filled with a quantity of 30 instead of the prescribed 60 tablets, the most common outcome is that the patient would run out of medication early and call the pharmacy, and the error would be corrected. This would be scored as Category C, as no harm would be likely. There was no difference in the error severity between the groups. In fact, pharmacists had more Category E errors (3 versus 1 for technicians)—the highest category of error that occurred in this study. In any pharmacy, this result may be attributable to increased focus on the task because of fewer distractions and outside demands on the technicians' time. When pharmacists are performing product verification, they are frequently balancing competing priorities, such as patient consultations and incoming telephone calls. In addition, pharmacists were only slightly more efficient at the product check step as demonstrated by the time study. This is likely attributable to the experience of the pharmacists, whereas technicians had only been in the TCT pilot role for a few days during the time study.

The component of this study that evaluated verification times between pharmacists and technicians was necessary to determine potential pharmacist time reallocation to clinical activities. For purposes of community TCT programs, the intent is to ensure patient safety and product accuracy, not for technicians to check prescriptions as quickly as a pharmacist. This study demonstrated that 23 days of pharmacist time could be reallocated annually if the program were implemented; however, the study was not designed or powered specifically to evaluate time savings. Because the electronic pharmacy system is not amenable to robust data reporting, time data could not be extracted, and the study was a manual one. In turn, this limited the number of observations and led to reporting and tracking of the time data by overarching category (pharmacist and technician) instead of on the individual level; this also limited the depth of comparison and data analysis that could be performed on the time study records.

Throughout the study, there was the potential for the Hawthorne effect. Individuals were aware that they were being observed, which could lead to behavior modification such as increased vigilance when checking prescriptions. However, this effect was identical for each cohort as both knew they were being monitored; therefore, any impact was negligible.

The time study component measured only the time the study subject was actively performing product check. If a pharmacist or technician was interrupted or took a break, the time study also paused. The methods of the study did not account for environmental considerations such as stress or distractions. Because pharmacists are solely focused on performing final product verification during the shift observed, and are not pulled away for counseling, the researchers assumed that these environmental considerations were consistent between the two groups.

In addition, the primary investigator was evaluating the pharmacist final check and was looking specifically for errors. This was also the case for the pharmacists' evaluation of technician accuracy, which was intended to be equally rigorous. The objective for both groups was to be hypervigilant to collect accurate data and ultimately to avoid patient harm.

Finally, this was a single-site pilot in a mail-order pharmacy. As such, these results might not be generalizable to all community pharmacy sites. As the TCT workflows themselves would be generalizable to all sites in the organization, the process is likely to be effective across all these pharmacies. However, appropriate and site-specific TCT training with qualified technicians as performed in this pilot would be required in any community pharmacy.

The permanent implementation of a community TCT program at UW Health is dependent on the inclusion of TCT in the Pharmacy Practice Act. At the time of publication, a request for permission to implement a statewide, multiple-site community TCT pilot program has been submitted for PEB consideration. The pilot site from this study will also serve as a site if the larger pilot is approved.

Conclusion

This study demonstrates the feasibility of a TCT program in the community pharmacy setting. Trained and validated technicians were at least as accurate as pharmacists at the product check step as validated by statistical analysis. Therefore, patient safety is maintained in a community TCT program, and it may be a valid tool to increase pharmacist time available for patient care activities.

References

1. Helling DK, Johnson SG. Defining and advancing ambulatory care pharmacy practice: it is time to lengthen our stride. *Am J Health-Syst Pharm.* 2014;71:1348–1356.
2. Schommer JC, Doucette WR, Gaither CA, et al. Final report of the 2009 National Pharmacist Workforce Survey. Available at: https://www.aacp.org/article/2009-national-pharmacist-workforce-study. Accessed April 27, 2018.
3. Morrell T, Schmitz N, Andreski M, et al. *Embracing challenges in a complex environment: a study of pharmacists' workload dynamics and provision of MTM.* New Orleans, LA: Annual Meeting of the American Pharmacists Association; March 11, 2012.
4. Becker MD, Johnson MH, Longe RL. Errors remaining in unit dose carts after checking by pharmacists versus pharmacy technicians. *Am J Hosp Pharm.* 1978;35:432–434.
5. Grogan JE, Hannan JA, Haight RA. A study of accuracy of pharmacy technicians working in a unit dose system. *Hosp Pharm.* 1978;13:194–199.
6. Woller TW, Stuart J, Vrabel R, Senst B. Checking of unit dose cassettes by pharmacy technicians at three Minnesota hospitals. *Am J Hosp Pharm.* 1991;48:1952–1956.
7. Klammer GA, Ensom RJ. Pharmacy technician refill checking: safe and practical. *Can J Hosp Pharm.* 1994;47(3):117–123.
8. Spooner SH, Emerson PK. Using hospital pharmacy technicians to check unit dose carts. *Hosp Pharm.* 1994;29(5):433–437.
9. Ambrose PJ, Saya FG, Lovett LT, Tan S, Adams DW, Shane R. Evaluating the accuracy of technicians and pharmacists in checking unit dose medication cassettes. *Am J Health-Syst Pharm.* 2002;59:1183–1188.

10. Reed M, Thomley S, Ludwig B, Rough S. Experience with a "tech-check-tech" program in an academic medical center. *Am J Health-Syst Pharm*. 2011;68:1820–1823.
11. Types of Medication Errors. National Coordinating Council for Medication Error Reporting and Prevention. 2001. Available at: http://www.nccmerp.org/types-medication-errors. Accessed April 27, 2018.
12. Frost TP, Adams AJ. Tech-check-tech in community pharmacy practice settings. *J Pharm Technol*. 2016;33(2):47–52.

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Journal of Pharmacy Technology
1–6

DOI: 10.1177/8755122516683519
journals.sagepub.com/home/pmt
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Tech-Check-Tech in Community Pharmacy Practice Settings

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Abstract

Objective: The benefit of a tech-check-tech (TCT) practice model in institutional settings has been well documented. To date, few studies have explored TCT beyond institutional settings. This article summarizes the existing evidence in community pharmacy–based TCT research with respect to dispensing accuracy and pharmacist time devoted to direct patient care. **Data Sources:** A literature review was conducted using MEDLINE (January 1990 to August 2016), Google Scholar (January 1990 to August 2016), and EMBASE (January 1990 to August 2016) using the terms "tech* and check," "tech-check-tech," "checking technician," and "accuracy checking tech*". Bibliographies were reviewed to identify additional relevant literature. **Study Selection and Data Extraction:** Studies were included if they analyzed TCT and were conducted in a community pharmacy practice site, inclusive of chain, independent, mass merchant, supermarket, and mail order pharmacies. Studies were excluded if the TCT practice model was conducted in an institutional or long-term care setting. Survey data on theoretical models of TCT in community pharmacy practice settings were also excluded. **Data Synthesis:** Over the past 14 years, 4 studies were identified indicating TCT has been performed safely and effectively in community settings. The studies demonstrate that trained community technicians perform as accurately as pharmacists and that TCT increased the amount of pharmacist time devoted to clinical activities. In the 2 studies that reported accuracy rates, pharmacy technicians performed at least as accurately as pharmacists (99.445 vs 99.73%, $P = .484$; 99.95 vs 99.74, $P < .05$). Furthermore, 3 of the studies reported gains in pharmacist time, with increases between 9.1% and 19.18% of pharmacist time for consultative services. **Conclusions:** The present studies demonstrate that TCT can be safe and effective in community pharmacy practice settings, with results similar to those found in institutional settings. It is anticipated more states will explore TCT in community settings in the years ahead as a strategy to improve patient care.

Keywords

tech-check-tech, pharmacy technicians, clinical pharmacy

Background

Pharmacists are increasingly being recognized as providers of direct patient care services. To enable pharmacists to practice in this capacity, facilities are exploring a variety of technology supports and new practice models to liberate pharmacists from traditional nondiscretionary dispensing roles. Tech-check-tech (TCT) is one such practice model. TCT enables a specially trained pharmacy technician to perform final verification on a product for which prospective drug utilization review had been previously performed by a pharmacist, or for medications under the control of an ordering prescriber such as those in an automated dispensing system. TCT is not a new concept; published evidence on its safety and benefits dates back to at least 1978.[1]

TCT has been well validated in institutional pharmacy settings. A systematic review of 11 studies demonstrated that pharmacy technicians perform as accurately as pharmacists in final verification duties (99.6% vs 99.3%, respectively) in institutional settings.[2,3] In fact, pharmacy technicians statistically outperformed pharmacists in 6 of the 11 studies reviewed. Moreover, these studies demonstrate that pharmacists were able to devote more time to direct patient care services, with a range of 10 hours per month to 1 hour per day.[2] Additional institutional TCT studies have been published since the aforementioned systematic review, all with similar results.[4,5] These newer TCT publications have reported even greater pharmacist time savings, ranging from 50 hours per month to 5.75 hours per day.[4,5]

Recently, several states have initiated dialogue on expanding TCT to community pharmacy practice settings.[6-8] The previously published TCT review noted this as a future

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research direction but highlighted several important challenges with extrapolating TCT beyond institutional settings.[2] For example, institutional settings make frequent use of unit dose products, whereas community pharmacies primarily fill from bulk containers. Institutional settings typically provide medications as a single dose or daily dose, whereas community pharmacies frequently dispense in 30- or 90-day supplies. Institutional settings frequently dispense medications to other health professionals for administration, thus serving as a third independent check. Community pharmacies, by contrast, traditionally dispense product directly to the patient or caregiver for self-administration. Thus, there are important differences between institutional and community practice settings that may theoretically make TCT more difficult to achieve while maintaining safety. Recent advancements in technology and widespread adoption of barcode scanning may help overcome these challenges, however.

This article aims to summarize the existing evidence in community pharmacy TCT research, specifically with respect to dispensing accuracy between pharmacy technicians and pharmacist, and the impact on the amount of pharmacist time devoted to direct patient care services. In addition, the structure of existing community pharmacy–based TCT studies with respect to pharmacy technician education and training requirements as well as quality assurance activities are also described.

Methods

Different database sources were searched—MEDLINE (January 1990 to August 2016), Google Scholar (January 1990 to August 2016), and EMBASE (January 1990 to August 2016)—using the terms "tech* and check," "tech-check-tech," "checking technician," "pharmacy technician," "accuracy," and "accuracy checking tech*". The bibliographies of all identified articles were examined to identify additional relevant literature both in and outside the United States. In addition, the authors contacted representatives of national pharmacy professional and trade organizations in the United States to identify any unpublished research or works in progress. Studies were excluded from the analysis if they only contained survey data on theoretical TCT community practice models.

Each author independently reviewed the identified studies and characterized the practice setting in which TCT was performed. Studies were included for further analysis if they were conducted in a community pharmacy practice setting, inclusive of chain, independent, mass merchant, supermarket pharmacies, and mail order settings. Studies were excluded if they were not in the English language or if the TCT practice model was conducted in an institutional or long-term care setting.

Results

The search strategy identified 4 studies on actual TCT models that were conducted in community pharmacy practice settings or in mail order settings.[9-13]

One study performed in a community pharmacy in the United Kingdom by Jones and Rutter in 2002 involved just one pharmacy technician.[9] The participating technician undertook training on the "legal and ethical implications of technician checking." The technician was presented 1000 prescriptions to review, and each prescription was subsequently checked by a pharmacist to identify any errors that the technician missed. The technician then underwent a structured exam of 20 prescriptions—including 14 introduced errors—by the researchers. During the 1000 prescription-checking period, the technician correctly identified 13 errors, but missed one. The missed error was an incorrect quantity of a lactulose prescription, but the investigators noted that the error had actually been initially committed by the labeling pharmacist. The technician achieved a 100% on the exam with introduced errors. No data were presented that indicated how this distribution of pharmacist work activities changed following the implementation of the TCT model, though the investigators indicated this was an area for future research. Overall the authors from the United Kingdom put forth 3 take home points:

- "Introducing checking technicians in community practice is feasible
- Patient safety is not compromised
- The dispensing process became safer"[9]

The second study identified was conducted in Iowa by Andreski and colleagues as a poster presentation at the American Pharmacists Association meeting in 2016.[10,11] In 2013, legislation was signed into law granting the Iowa Board of Pharmacy the legal authority to approve a renewable pilot project on TCT in community pharmacy settings.[6] In 2014, the Iowa State Board of Pharmacy approved the first phase of such a pilot program, which included 7 different community pharmacies. The Iowa State Board of Pharmacy later granted approval for phase 2, which encompassed 10 additional community practice sites throughout the state. Participating pharmacies included both chain and independent stores. To participate in the study, a technician needed to hold national certification, have at least 2000 hours of experience, and be in good standing with the Board. Such technicians were able to perform final verification on a refill product that was prepared by another technician for which prospective drug utilization review had been previously performed by a pharmacist. In addition to the baseline training requirements, participating technicians were required to pass advanced continuing pharmacy education modules on the

following topics: TCT workflow, business planning, medication errors, dosage forms, calculations, and a review of common drug classes. Pharmacists were required to double-check all prescriptions verified by the technician during the first week of implementation. As an ongoing quality assurance measure, participating technicians were also subjected to 50 unannounced refill checks by a pharmacist monthly.[10,11]

Currently, the first phase of Iowa study has been presented as an abstract at the American Pharmacists Association 2016 Annual Meeting, and separately as a public presentation at several national conferences.[10,11] According to these public resources, pharmacists conducted 5565 refill checks to establish a baseline error rate for comparison to the final verification technicians. After 18 months of data collection and 5950 TCT refill checks had been performed, the investigators reported there was no statistical difference in accuracy rates between pharmacists and technicians (99.73% vs 99.445%, $P = .484$). Nearly all errors (88%) missed by technicians were administrative in nature, such as not including a safety cap when requested, and unlikely to result in patient harm. The results of a subgroup analysis showed there was no statistical difference between pharmacists and technicians in administrative error rates or patient-safety error rates. The investigators also sought to determine the clinical impact of the TCT model. The first year of data collection demonstrated a 18.72% net decrease in pharmacist time spent in dispensing-related activities (from 67.3% to 48.58%, $P = .004$) and a 19.18% net increase in pharmacist time spent providing patient care services (from 15.9% to 35.08%, $P = .002$).[10,11]

The third study was conducted in 2014-2015 as an evaluation of a demonstration project hosted by the Pharmaceutical Society of New Zealand on behalf of the Health Workforce NZ.[12] The demonstration project was conducted in 7 community pharmacies and 4 hospital pharmacies to assess the feasibility and the impact of utilizing pharmacy accuracy checking technicians (PACTs). For the purpose of this article, only the results found in the community pharmacies have been reported here. The New Zealand practice model permits a technician with a PACT certification to perform the final verification on a new or refill product that was prepared by another technician for which clinical assessment has been previously performed by a pharmacist. The PACT certification training includes a workshop day, written learning modules, and a final assessment exam. In addition, in order to complete the certification, trainees must complete an on-site experiential training of a 1000-item checking log. The supervising pharmacist also completed a continued competency report monthly for the PACT and verified the technician worked the minimum of 8 hours each month as a measure of quality assurance.[12]

The New Zealand study measured the error rate of technicians from the experiential on-site 1000-item checking log.[12] The investigators reported that PACT trainees identified the same amount of all types of dispensing errors compared to the pharmacists at baseline, and they noted that technicians did not commit any errors in which an incorrect brand was listed on the prescription label (whereas pharmacists had committed this error). Technicians similarly did not commit any errors in which a prescription was given to an incorrect patient, or a prescription was inappropriately bagged. The investigators also sought to determine whether PACTs affect the time available for pharmacists to perform direct patient care services. The results of the PACT initiative showed a decrease in the amount of the community pharmacist's time spent checking prescriptions from 32% (16% to 49% range) to 18.8% (7% to 53% range), and an increase in the daily clinical activities of community pharmacists from 8% (0% to 23% range) to 13.3% (0% to 46% range). The investigators also presented feedback from PACTs that indicated it was too soon to fully evaluate the time freed up for clinical services, as major changes in workflow take time to fully realize the gains.[12]

The last study identified was a demonstration project conducted by the University of Wisconsin Health mail order facility.[13] While a mail order facility may differ from a traditional community pharmacy setting in terms of volume and technology, this study was included because a mail order facility does not have the safeguards that a hospital pharmacy does, such as quantity and unit dose packaging as described previously, and thus this study provided another comparison for outpatient TCT. To participate in the study, a technician needed to be employed full time, hold Pharmacy Technician Certification Board certification, and either graduate from an accredited technician training program or have 3 years of work experience. Three pharmacy technicians meeting this inclusion criteria achieving a minimum of 90% on a didactic exam and practical competency evaluation were selected to participate. These technicians were able to perform final verification on a prescription product that was prepared by another technician for which prospective drug utilization review had been previously performed by a pharmacist. Investigators determined that at least 5000 prescriptions checked by technicians would be needed to ascertain statistical significance. Pharmacists conducted 5571 prescription checks to establish a baseline error rate and average verification time for comparison to final verification technicians. The participating technicians performed 7538 final verifications. The accuracy rate between pharmacists and technicians was reported at 99.74% with a 95% confidence interval [99.61, 99.87] versus 99.95% with a 95% confidence interval [99.89-99.99], respectively, which the investigators reported as a statistically significant outcome in favor of technicians ($P < .05$). The average prescription verification time of pharmacist was 7.1 seconds, compared to that of pharmacy technicians at 8.77 seconds. The investigators reported that the new practice model could save pharmacists 11 150 minutes—or 23 work days—per year.[13]

Discussion

The evidence base for TCT in community pharmacy practice settings is not as robust as that in institutional settings, yet the available evidence demonstrates similar results: no reported difference in the rates of dispensing errors, similar training and checking requirements, and the TCT model frees community pharmacists for more comprehensive patient services. In all 4 studies, technicians performed at least as accurately as pharmacists, with explicit accuracy rates published in 2 studies (99.445 vs 99.73%, $P = .484$; 99.95 vs 99.74, $P < .05$).[10,13] These results are comparable to the previous systematic review on institutional pharmacy TCT (mean ± SD, 99.6 ± 0.55% versus 99.3 ± 0.68%).[2] By comparing the dispensing errors between the community and institution settings, the results show that TCT can be successful regardless of setting. This is likely because product verification is product verification, regardless of quantity and packaging (bulk containers vs unit dose packaging).

Furthermore, 3 of the reviewed studies reported on the gains in clinical time by pharmacists, ranging from 5.3% to 19.18% of the pharmacists' workday.[10,12,13] This, too, is comparable to the institutional pharmacy TCT with reported gains of 10 hours of pharmacist time per month devoted to direct patient care to 1 additional hour per day.[2] This suggests that community pharmacy TCT can be a critical strategy to increase clinical pharmacist staffing.

The 4 studies identified since 2002 were hosted in 3 countries: the United States, the United Kingdom, and New Zealand. It is little surprise that limited research is available in the United States. At the time of writing this article, only North Dakota currently allows TCT outright in community pharmacy settings; Iowa allows it only under a research waiver approved by the Board of Pharmacy pursuant to specific enabling legislation.[6] Simply put it is not easy to study a model that is prohibited in nearly all states.[14] While a research waiver is an important tool to enable an opportunity to safely conduct research, not all states allow such waivers, and the need for a research waiver in the first place may serve as a barrier to prevent research on the TCT model.

It is surprising that only a single study from 2002 was identified in the United Kingdom.[9] The country has a Nationally Recognized Framework for Final Accuracy Checking of Dispensed Items for Pharmacy Technicians, which was published in 2007. An online search revealed there are multiple training programs for accuracy checking pharmacy technicians, and many related job postings specifically for accuracy checking technicians.[15-17] Furthermore, a qualitative study of opinions on technician roles had a sample that included 136 accuracy checking technicians.[18] Thus, this type of model seems to be gaining traction in the United Kingdom, but corresponding publications were not identified. Perhaps the model has become so accepted in practice that in-depth research seemed unnecessary; of note, no reports of compromised safety of such a model were identified despite the apparent widespread adoption.

It is anticipated in the years ahead that more states will consider expanding their TCT laws to cover community practice settings. Freeing pharmacists for more advanced care will be critical as the role of pharmacists expands into areas such as point-of-care testing, prescriptive authority, and other advanced services.[19,20] Currently, discussions on community pharmacy TCT are under way in at least Arizona, Idaho, Iowa, South Dakota, and Wisconsin.[6-8] As states wrestle with the decision of how to structure TCT programs, a key question will be what education and training tech-checkers should have. The studies as stated here required technicians to be nationally certified, have a minimum level of practice experience, complete advanced didactic training, and successfully complete a validation period prior to participating in a TCT model. A summary of the education and training requirements of the reviewed studies is provided in Table 1. These requirements dovetail nicely with those previously reported on for institutional settings.[2] It will be important for states pursuing TCT to ensure that participating technicians are appropriately trained for this role. Such training requirements will ensure the safety and effectiveness demonstrated in studies will continue to be achieved in practice.

Evidence from the currently reported studies coupled with the near 40-year track record in institutional settings might give regulatory boards enough information on the safety and benefits of TCT in order to approve this model. Some states may consider pursuing research waivers to assemble additional evidence in their own states in order to build the political will necessary to support a full rollout of this model. Future areas for research that may further professional support of TCT include answering the following questions: (1) What is the impact of this practice model on workplace satisfaction for pharmacists and technicians? (2) What is the impact on pharmacy staff productivity and staff turnover? (3) How are technicians rewarded for providing this advanced service? (4) What specific services or activities do pharmacists perform with their liberated time under a TCT model? (5) What patient care outcomes are achieved from these advanced pharmacist services?

Limitations

Each of the 4 studies has important limitations. First, only one is currently published in the peer-reviewed literature, and even that article is classified by the journal as "research in progress." Second, each study time period is for a limited time duration, and the error rates reported may thus be influenced by the honeymoon effect and the excitement technicians have in their new short-term advanced role. Third, as Adams and colleagues previously noted, it would

Table 1. Structure of Community Pharmacy–Based Tech-Check-Tech (TCT) Programs.

	Study			
	Andreski et al[11]	UW Health[10]	Watt[12]	Jones[9]
Baseline technician training requirements	• Must be registered with the state Board of Pharmacy and hold national certification (eg, Pharmacy Technician Certification Board [PTCB]) • Must have at least 2000 hours of practice experience • Must have no disciplinary charges/sanctions	• Must hold a PTCB certification • Must be a graduate of an accredited technician training program or at least 3 years work experience • Must have full-time employment status	N/A	N/A
TCT didactic training requirement	Must complete the following advanced training CPE modules: • TCT workflow • Business planning • Medication errors • Dosage forms • Calculations • Review of common drug classes	• Must complete one-on-one practical training day and a review of all sections in the training manual with pharmacist • Must complete a final exam with a minimum of 90% accuracy	• Must complete workshop training day with supervising pharmacist • Must complete the following written training modules: • Medication errors • Validation of script • Dispensing and workflow • Standard operating procedures • Calculations • Must complete a final exam assessment: • Written portion • Item checking • Interview	• Training on legal and ethical implications of technician checking
TCT experiential training requirement	• Must undertake site-specific verification and system training • Pharmacist must double check all doses for first week	• Practical competency evaluation	• 1000-item error checking practice log	• 1000-item error checking practice log • Exam on 20 items with 14 introduced errors
Quality assurance program	• Pharmacist double checks 50 refills per month • Board of Pharmacy can conduct onsite inspections	N/A	• Must complete a minimum of 8 hours of checking each month • Must pass a monthly continued competency evaluation by supervising pharmacist	N/A

be ideal to measure error-detection capabilities as opposed to error rates or accuracy rates.[2] Accuracy rates do not necessarily account for the ability of an individual to detect an error since a sample that is free of error may result in a 100% accuracy rate for a technician independent of their true capabilities. Comparing the error-detecting capabilities of individuals by using controlled same-sample studies would be ideal, but is impractical in practice, as each of the

studies were implemented in real-world practice sites. Last, the gains in clinical time by pharmacist tend to rely on self-reporting process of the study participant, which may be naturally prone to error in estimation.

Conclusion

TCT in community pharmacy practice settings has been conducted for at least 14 years. Four studies demonstrated that TCT in community pharmacy settings can achieve similar results to the institutional settings with little or no differences in dispensing error rates and allowing pharmacists more time to devote to direct patient care services. It is anticipated more states will explore TCT in community settings in the years ahead as a strategy to improve patient care.

Authors' Note

The views expressed in this article are those of the authors alone and do not necessarily reflect those of their respective employers.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: Dr Adams formerly served as Vice President of the National Association of Chain Drug Stores, an organization that provided funding to support the Iowa tech-check-tech study referenced herein.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

1. Becker MD, Johnson MH, Longe RL. Errors remaining in unit dose carts after checking by pharmacists versus pharmacy technicians. *Am J Hosp Pharm*. 1978;35:432-434.
2. Adams AJ, Martin SJ, Stolpe SF. "Tech-check-tech": a review of the evidence on its safety and benefits. *Am J Health Syst Pharm*. 2011;68:1824-1833.
3. Wilson DL. Review of tech-check-tech. *J Pharm Technol*. 2002;19:159-169.
4. Reed M, Thomley S, Ludwig B, Rough S. Experience with a "tech-check-tech" program in an academic medical center. *Am J Health Syst Pharm*. 2011;68:1820-1823.
5. McKee J, Zimmerman M. Tech-check-tech pilot in a regional public psychiatric inpatient facility. *Hosp Pharm*. 2011;46:501-511.
6. Iowa Pharmacy Association. Tech check tech. http://www.iarx.org/tct. Accessed August 14, 2016.
7. Arizona Board of Pharmacy. March 16, 2016 meeting minutes. https://pharmacy.az.gov/sites/default/files/2016-03-16%20minutes_0.pdf. Accessed August 14, 2016.
8. Idaho State Board of Pharmacy. April 8, 2016 meeting minutes. https://bop.idaho.gov/board_meeting/2016-06-02_Minutes_April_7-8_2016_final.pdf. Accessed August 14, 2016.
9. Jones W, Rutter PM. The introduction of a checking technician programme in community pharmacy and its impact on pharmacist activities. *Int J Pharm Pract*. 2002;10(suppl):R90.
10. Wisconsin Department of Safety and Professional Services. Pharmacy Examining Board. May 25, 2016. http://dsps.wi.gov/Documents/Board%20Services/Agenda%20Materials/Pharmacy/2016/20160525_PHM_Open_Session.pdf. Accessed August 14, 2016.
11. Andreski M, Myers M, Pudlo A. Changes in pharmacy practice due to a change in prescription refill processing: the Iowa New Practice Model. Poster presented at: American Pharmacists Association 2016 Annual Meeting; Baltimore, MD.
12. Quigley and Watts Public Health Specialists. Evaluation of the pharmacy checking technician demonstration site project. http://www.health.govt.nz/system/files/documents/publications/evaluation-pharmacy-accuracy-checking-technicians-demonstration.pdf. Accessed August 14, 2016.
13. Pharmacy Society of Wisconsin. Advancing community pharmacy quality: leveraging tech-check-tech (TCT) to expand patient care services in community pharmacies. http://dsps.wi.gov/Documents/Board%20Services/Agenda%20Materials/Pharmacy/2016/20160407_PHM_Additional_Material.pdf. Accessed August 14, 2016.
14. Adams AJ. Toward permissionless innovation in health care. *J Am Pharm Assoc (2003)*. 2015;55:359-362.
15. National Health Service Pharmacy Education & Development Committee. Nationally recognised framework for final accuracy checking of dispensed items for pharmacy technicians. http://www.nhspedc.nhs.uk/pdf/SupportStaff/Nationalframework07v9.pdf. Published October 2007. Accessed August 14, 2016.
16. University of East Angila. Pharmacy Technician Programmes. Accuracy checking pharmacy technician. http://eoenhspharmacytech.uea.ac.uk/pharmacy-technicians/accuracy-checking-pharmacy-technician. Accessed August 14, 2016.
17. Indeed. Accuracy Checking Technician. http://www.indeed.co.uk/Accuracy-Checking-Technician-jobs. Accessed June 14, 2016.
18. Bradley F, Schafheutle EI, Willis SC, Noyce PR. Supervision in community pharmacy. Final report to Pharmacy Research UK. http://www.pharmacyresearchuk.org/waterway/wp-content/uploads/2014/01/Supervision-in-Community-Pharmacy-Full-Report-070114.pdf. Revised July 2013. Accessed August 14, 2016.
19. Adams AJ, Weaver KK. The continuum of pharmacist prescriptive authority. *Ann Pharmacother*. 2016;50:778-784.
20. Klepser ME, Adams AJ, Klepser DG. Antimicrobial stewardship in outpatient settings: leveraging innovative physician-pharmacist collaborations to reduce antibiotic resistance. *Health Secur*. 2015;13:166-173.

Research in Social and Administrative Pharmacy 16 (2020) 978–981

Contents lists available at ScienceDirect

Research in Social and Administrative Pharmacy

journal homepage: www.elsevier.com/locate/rsap

Further insight into how pharmacists ascribe value to technician certification and how that value might be further enhanced

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ABSTRACT

Background: National pharmacy technician certification in the U.S. is believed to hold a valuable place in promoting technician competence, but the views of pharmacists from varying settings and positions could help further clarify how certification could be optimized.

Objective: The aims of this study were to determine differences among pharmacists in how they view certification, the level of value they ascribe to certification, and how they might make further improvements in the certification process.

Methods: A self-administered survey was constructed and delivered in Qualtrics XM in spring of 2019 to a random sample of pharmacists in 4 U.S. states chosen for high proportions of both certified and non-certified pharmacy technicians and for their differences in technician regulation and scope of practice. Analysis employed a host of bivariate tests then summative backward elimination regression analyses in consideration of Type II error and in that the approach taken was to acquire a "gestalt" of events rather than test individual hypotheses.

Results: Pharmacists' opinions on the impact of certification varied by their job position, their practice setting, and sometimes their sex and work status. Pharmacists in clinical and in supervisory positions saw the positive impact of certification in different ways than did staff pharmacists. Certain groups would like to see more support for certification from their employers, while others aim for more support from certification vendors, and some pharmacists would like to see more content on "soft skills" in the certification process. Certification is seen as most beneficial to technicians in the hospital setting.

Conclusions: The results of this study suggest differences among pharmacists in their perceptions of the value of certification and what might be done to further enhance that value. The results of this study will hopefully provide some clarification and direction for certification vendors, policymakers, educators, and pharmacy leaders.

Introduction

Support for further advances in the scope of practice and professionalism in pharmacy technicians continues to grow.[1] This has come with the realization that for pharmacist practice to be more patient-centric and embrace models such as medication therapy management (MTM), there must be a certain level of comfort in delegating more responsibilities to technicians.[2] Additional y, initial evidence suggests that delegating many proposed roles to technicians has come with no compromise, often even improvements in patient safety, let alone improvements in efficiency and success in re-engineering practice to more effectively serve clients.[3–5]

The ability to delegate is seen as an advancement in the practice of pharmacists, ultimately affording them more autonomy to effectively design their own practice.[6] Delegation natural y becomes easier and more prevalent when the persons to whom you are delegating inspire greater confidence for the supervisor to do so.[7] While pharmacists have shown increasing favor toward delegating more responsibility to technicians, one factor impeding further delegation is the lack of standards for education, training, and even entry into practice for technicians.[8] While not itself a panacea, certification by a national vendor (Pharmacy Technician Certification Board or National Healthcareer Association) has been recognized as one mechanism to bolster standardization and has been implicated in greater technician professionalism, commitment, self-identity, and some level of job skills, knowledge, and competence.[9] Variations in the extent to which pharmacists who practice in different settings and who hold different types of administrative positions in organizations might impact how certification is viewed and how policy is adjudicated (eg, whether certification is required for entry or for advanced-level designation), in addition to how the certification process might be better communicated/marketed and even improved so as to benefit these national vendors and to benefit managers, educators, and policymakers. Thus, the aims of this study were to determine differences among pharmacists in how they view certification, the level of value they ascribe to certification, and how they might make additional improvements in the certification process.

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https://doi.org/10.1016/j.sapharm.2019.11.005
Received 24 October 2019; Accepted 5 November 2019
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Methodsu

Thel studyl methodsl werel deemedl exemptl froml full evaluationl andl approvedl forl conductl byl thel principal investigator'sl Institutional ReviewlBoardl(IRB).l

Surveyiandisamplingi

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Analysisi

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Resultsu

Respondenticharacteristicsi

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Resultsiofibivariateitestingi

Perceptionsi ofi the impacti ofi certificationi andi otheri factorsi oni techniciani competencei

Respondentsl workingl fewerl thanl 20lhl perl weekl oftenl reportedl higherl perceptionsl ofl impactl byl certificationl onl variousl skil sl andl competencies,lsuchlaslwithlregardltolmedicationlpreparation,lmedicationl orderl entry,l interpersonal communication,l andl ethical decision-making.l Inl creatingl al summaryl ofl thosel items,l thatl trendl continued,l thoughlbarelylachievinglstatistical significance.lThelrolelofl respondentl sexlplayedla largerlrole.lInlnearlyleverylcase,lfemalelpharmacistslperceivedl al greaterl impact.lStatistical differenceslwerelobservedlonlspecificlitemsl suchl asl impactl onl sterilel compounding,l non-sterilel compounding,l prescriptionl orderl entry,l qualityl assurancel activities,l problem-solving/innovativeness,l communication,l interpersonal communication,l timel management,l andl acceptingl responsibility,l inl additionl tol al significantl differencel onl al compositel ofl thel 21lskil s.lTherelwerelalsolsignificantldifferenceslaccordingltolthelrespondent'sljobltitle/l position.l Quitel often,l postl hocl analysisl froml al onel wayl ANOVAl revealedl al statistical yl higherl perceptionl ofl impactl byl certificationl byl clinical pharmacists.l Forl somel ofl thel skil sl evaluated,l thosel inl staffl positionslratedlthelimpactloflcertification lowerlthanlthoselrespondentslinlmanagerial orlownerlpositions.lThislincludedlimpactloflcertificationl onl medicationl preparation,l sterilel compounding,l timel management, leadership,l andl abilityl tol acceptl organizational change.lInlevaluatingl thel compositel measurel (ofl al 21lskil sl areas),l therel wasl al statistical differencel betweenl clinical pharmacistsl (highestl meanl perceptions),l thenl managerslorlowners,lthenlstafflpharmacists.lRespondentlpracticel settinglwaslwitnessltolthelgreatestlnumberloflsignificantldifferences.lInl nearlylal cases,lthelperceptionlofl impactlofl certificationlwaslstatistical y lowerl forl respondentsl froml independentl communityl pharmacy.l Forlmanylofl thel21litemslthereliwerelotherlsignificantldifferences,lbutl theseldidlnotlholdlconstantlthroughout.lHospital pharmacistslperceivedl al higherl impactl ofl certificationl onl manyl ofl thel individual skil sl including l medicationl orderl entry,l medicationl preparation,l sterilel compounding,l supervisionl ofl otherl technicians,l tech-check-tech,l qualityl assurance,landlmathematical computational skil s.lOnlthelcompositelofl items,ltherelwaslalsolalstatistical difference,lwithlpostlhoctestslshowingl highestlperceptionslofl impactlbylhospital pharmacists,lfollowedlbylbothl chainlandl“all otherlsetting”lrespondents,lthenlfollowedlbylrespondentsl fromlindependentlcommunitylpharmacy.lInlconsideringlrace/ethnicityl ofl respondents,l andl inl dichotomizingl race/ethnicityl asl White/l Caucasianl versusl al other,l therel werel significantl differencesl onl justl twol ofl thel 21l competencies,l andl nothingl approachingl statistical differencelonlthelcompositelmeasure.l

Perceptionsiofitheiutilityiofiputativeichangesionithe impactioficertificationi

Therel werel al numberl ofl statistical differencesl acrossl variousl respondentlcharacteristics,lbutltheylwerelfewerlandlnotlaslconsistentlaslwaslthelcaselwithlimpactlofl certificationlonlcompetence.lRespondentslinlalsupervisorylpositionlindicatedlalgreaterlneedlforlmorelsupportlfroml certificationl vendors,l yetl thosel inl al staffl positionl indicatedl al greaterl needl forl morel supportl byl thel employingl organization.l Thosel inl al supervisorylpositionlalsolplacedlalgreaterlpremiumlonlmorelexaminationl contentlonl“softlskills”lsuchlas leadership,lcommunicationlandlethical decision-making.l Thosel inl al supervisoryl positionl werel alsol morel favorableltowardlthelneedlforlalgreaterlnumberloflspecialtylcertifications.l Thosel inl staffl positionsl perceivedl al higherl needl forl morel contentl onl technical knowledgel andl skil s,l whilel thosel inl al supervisoryl positionl perceivedlalhigherlneedlforlbetterlintegrationloflthelcertificationlprocesslwithlvocational education/training.l

Therelwerelnoldifferenceslamonglrespondentslinlregardltolmakingl

thel examinationl morel difficultl orl makingl morel stringentl thel requirementsl tol bel eligiblel tol sitl forl thel certificationl examination,l withl responseslindicatinglrelatively littlelagreementltowardlthelneedlforleitherl ofl thesel interventions.l Withl regardl tol practicel setting,l communityl independentl pharmacistslsawlalgreaterlneedlforladditional supportlfroml thel employerl forl technicianl certification.l Onl thel otherl hand,l hospital pharmacistslsawlalgreaterlneedlforlmorelsupportlfromlthelcertificationl organizationsl (ie,l PTCBl &l NHA).l Bothl chainl andl independentl communityl pharmacistsl indicatedl al greaterlneedlforl morel contentl onl softl skil sl tol comprisel thel certificationl examinationl thanl didl hospital pharmacists.l

Therel werel essential yl nol significantl differencesl acrossl differentl race/ethnicl groups,l sex,l orl workl statusl (ful -timel versusl part-time)l inl perceptionsl ofl whatl thingsl thatl mightl bel donel tol makel certificationl evenlmorelimpactful.l

Overalliattitudesitowardicertificationi

Respondentsl inl hospital pharmacyl agreedl thatl techniciansl withl experiencelarelmore likelyltoleveragelcertification.lFemalelrespondentsl andl thosel froml bothl hospital andl chainl pharmacyl settingsl indicatedl thatl theyl werel more likelyltolmakelhiringldecisionslbasedluponlwhetherlaltechnicianlislcertified.lHospital pharmacistslwerelmore likelyltol indicatel thatl technicianl certificationl shouldl bel requiredl forl advancedl statusl andl alsol werel more likelyltolindicatel thatl certifiedl techniciansl makel fewerl mistakes,l butl were less likelyl tol indicatel thatl certifiedl techniciansl hadlmorelcommitmentltoltheirlemployer.lChainlpharmacistl respondentslwerelmore likelyltolindicatelthatlcertifiedltechnicianslwerel betterl preparedl tol deal withl organizational change.l Pharmacistsl inl supervisorylpositionslwerelmore likelyltolindicatelthatltechnicianslwithl experiencel arel ablel to leveragelcertification,l thatl theyl arel betterl preparedl tol acceptl newl roles,l andl helpl tol promotel al strongerl organizational culture.l Femalel respondentsl werel more likelyl tol indicatel thatl certificationl assistsltechniciansl whol arel newl tol thel field,l thatlcertifiedl techniciansl makel fewerl errors,l thatl theyl feel morel comfortablel delegatingl tol al technicianl whol isl certified,l andl thatl techniciansl whol arel certifiedlarelmorelinnovativelinlprovidinglcustomerlservice.lInlalcompositel measurel ofl thel 13l items,l respondentl practicel settingl andl sexl werel significant,l withl higherl meanl perceptionsl comingl froml hospital andlfemalelpharmacists.l

Multivariateianalysesi

Backward-eliminationlmultiplelregressionlanalyseslwerelperformedl onlcompositelscoreslandlcertainlotherlvariables.lInlregardltolthelcompositel scorel onl perceptionl ofl thel impactl ofl certification,l significantl predictorslinlorderloflthelrexplanatorylpowerl(changelinlcoefficientlofl determination,l orl r^2)l werel respondentl position,l gender,l workl statusl (part-versusl ful -time),l andl practicel setting,l withl al total ofl 19.7%l ofl variancel explained.l Onl thel questionl ofl whetherl certificationl impartsl thelsame level oflbenefitlregardlessloflsettingl(servinglaslthelderivedl variable),lsignificantlinlthelmodel werelrespondentlsettinglandlposition,l withlaltotal ofl13.9%loflthelvariancelexplained.lTakinglthelcompositelofl otherlattitudinal itemslinlregardltolthelbenefitslofl certificationl (aslthel dependentl variable),l thel significantl predictorsl inl descendingl orderl ofl explanatorylpowerlwerelposition,lsetting,landlsex,lwithlsupervisorylandl clinical pharmacistslhavinglhigherlmeanlattitudes;lhospital pharmacistsl havingl higherl meanl attitudes;l andl femalesl havingl higherl meanl attitudes.lAltotal ofl21.8%lofl thelvariancelwaslexplainedlinlthislanalysis.l

Discussionu

Thislstudylexaminedldifferenceslinlpharmacists'lattitudeslinlregardl tol technicianl certificationl andl factors/actionsl thatl mightl bel takenl tol evenlfurtherlitslimpactlinlthelU.S.lnational landscapelofl preparinglthel technicianlworkforce.lPharmacistlrespondentslsawlalpositivelimpactlofl certificationlonltechnicianlcompetence.lThoselwhol worklpart-timelhadl morel positivel perceptionsl ofl certification'sl impactl onl technicianl competence.l Thisl mightl bel duel tol thesel pharmacistsl inl thel communityl settinglbeinglmore likelyltol“float”lwithoutlaldesignatedlstorelandlrelyl morel onl techniciansl withl thel knowledgel basel acquiredl froml thel certificationl process,l whereasl thosel workingl ful -timel mightl bel accustomedltolseeinglthelsameltechnicianslonlalroutinelbasislandlperhapsl mightlnotldistinguishltheirlperformancelfroml onel tol thel nextl quitelasl much.[14] Pharmacistslinlclinical andlsupervisoryl positionsl viewedl certificationlevenlmorel favorablylthanldidlstafflpharmacistslwithlrespectl tolalnumberloflskills.lThelpharmacistslinlsupervisorylpositionslreportedl al greaterl impactl onl skil sl suchl asl professionalism,l decision-making, leadership,landlsupervisinglotherltechnicians.lGivenlthelrolelofl clinical pharmacists,l andl recentl evidencel ofl greaterl technicianl involvementl withl assistingl theml tol executel theirl jobl responsibilities,l thisl resultl mightl notl bel thatl surprising.[15] Additional y,l pharmacistsl inl managerial/supervisory,lorlownershiplpositionslmightlseelthesel sortslofl skillsl aslgermanelto largerlorganizational goalslandlcompany-widelprocesses,l thuslcontributinglmoreltowardlthelcompany'slimagelandlorganizational culturel ofl qualityl andl seeingl certificationl asl onel componentl ofl thatl image.[16] Hospital pharmacistsl sawl greaterl impactl ofl certificationl inl facilitatingltechnicianlcompetencelinlnearlyleverylskill arealevaluated,l andlperhapslthislislduel tolthelnaturelofl pharmacyltechnicianlworklinl thelhospital settinglbeinglmoreldiversifiedlinlresponsibilityandlhavingl tol cal morel frequentlyl uponl thel typesl ofl knowledgel andl skil setsl evaluatedlinlthislstudy.[17] Femalelrespondentslwerelalsolmorelpositivel aboutl thel impactl ofl certificationl onl competence,l andl givenl thatl thisl trendlwaslratherlpersistent,lrequireslfurtherlstudy.l

Respondentslwerelfairlylconsistentlinlevaluatinglputativelchangesltol makelcertificationlevenlmorelimpactful.lRespondentslinlalsupervisoryl positionl indicatedl al greatl needl forl supportl froml certificationl organizations,lyetlstafflpharmacistslsawlalgreaterlneedlforlsupportlforlcertificationlfroml theirlemployers.lInlfurtherlcol aboratinglattitudeslaboutl thel impactl ofl certificationl inl general,l respondentsl inl al supervisoryl positionl alsol stressedl thel needl forl thel certificationl processl tol includel morelcontentland/orlexperiencelinlsoftlskillslsuchlas leadership,lethical decision-makingl andl communicationl asl wel asl betterl integrationl ofl certificationl withl otherl typesl ofl education/trainingl (eg,l vocational education).lStafflpharmacists,lonlthelotherlhand,lsawlalgreaterlneedlforl morelcontentlonltechnical knowledgelandlskillslsdirectlylrelatedltoljobl tasks.l Pharmacistsl froml thel communityl independentl settingl sawl al greaterlneedlforlmorelemployerlsupport,lwhilelthoselfromlhospitalslsawl al greaterl needl forl morel supportl froml employers.l Again,l thesel resultsl mightl notl bel thatl surprisingl givenl these’l pharmacistsl placel inl theirl organization.[18]

Respondentsltypicallylbelievedlthatlthelbenefitslofl certificationlarel mostlreadilylapparentlinlhospital practice.lThislwaslespecial ylthelcasel forlclinical pharmacists.lPharmacistslworkinglinlindependentlcommunityl pharmacyl believel certificationl tol be lessl impactful,l there,l andl would likel tol seel morel contentl onl communicationl skil sl andl innovativenesslinlcustomerlservice.l

Hospital pharmacistsl andl femalel pharmacistsl werel more likelyl tol makelalhiringldecisionlbasedluponlwhetherlaltechnicianlhaslacquiredl certification,landlhospital pharmacistslwerelalsolmore likelyltolindicatel thatl certificationl bel mandatedl tol obtainl anl advancedl practicel designation.lPharmacistslinlalsupervisorylrolelwerelmore likelyltolsupportl thelnotionslthatltechnicianslwithlexperiencelarelbetterlablelto leveragel certificationl andl thatl certificationl helpsl promotel al strongerl organizational culture.lAdditional y,l theyl believel thatl certifiedl techniciansl arel morel innovativel inl providingl customerl service.l Takenl together,l thesel resultslwouldlsuggestlthatlfemalelpharmacistslandlthoselinlsupervisoryl positionslperhapslseelalgreaterlrolelthatlcertificationlplayslinlpromotinglthelprofessional self-identitylofltechnicians,lalphenomenonlincreasinglyl studiedlandlsupportivelofltheglgrowthlandldevelopmentlseenlhistoricallyl inlotherloccupations.[19,20]

Studyilimitationsi

Several study limitationsl mustl bel takenl intol consideration.l Thel surveyl wasl administeredl tol pharmacistsl inl onlyl fourl U.S.l states.l Thel responselratelachievedlwaslpositivelin lightloflevidencelsuggestinglthatl surveyl responsesl amongl pharmacists,l particularlyl thosel executedl throughlemail,larelotherwiselquite low.[21] However,lthelresponsel ratel was lowl enoughl tol precludel generalizationl tol otherl pharmacists.l Although lthel skil setsl andl attitudinal itemsl inl thel surveyl werel derivedl froml the literature,ltherel waslnol wayl tol discernl theirl contentl orl constructl validity.l Therel werel myriadl statistical testsl conducted,l whichl inflateslalphalerror.lThelmultivariatel tests largelylconfirmedlstatistical differencesl andl trendsl observedl inl bivariatel testing.l Thel approachl takenl waslto providelanloveral ,lorlsummativelpicturelofl attitudeslratherlthanlemploylstatistical testinglto confirmlspecificlhypotheses.l

Conclusionu

Thisl studyl examinedl differencesl amongl pharmacistsl inl theirl ascribinglvaluetolcertificationlandlinlvariouslputativelactionslthatlcouldl evenlfurtherlenhancelthatlvalue.lPharmacistslinlsupervisorylrolesl andl clinical pharmacistsl seel thel valuel ofl certificationl andl whatl couldl bel donel tol furtherl enhancel thel certificationl processl differentlyl thanl dol staffl pharmacists.l Hospital pharmacistsl ascribel greaterl impactl ofl certificationl onl technicianl competencel thanl dol pharmacistsl inl otherl settings,landlmanylagreelthatlcertificationlmightlbelmorelvaluablelinlthel hospital thanl inl thel independentl communityl setting,l evenl whilel independentl communityl pharmacistsl agreedl thatl theirl employerl shouldl dol morel tol supportl thel certificationl process.lThel resultsl ofl thisl studyl wil hopeful ylprovidelsomelclarificationlandldirectionlforlcertificationl vendors,lpolicymakers,leducators,landlpharmacy leaders.l

Acknowledgementu

Thel researchl investigatorsl expressl theirl appreciationl tol thel Pharmacyl Technicianl Certificationl Boardl (PTCB)l forl theirl financial supportlofl thislstudy.lTherelarelnolconflictslofl interestltoldeclare.l

Referencesu

1.l AdamslAJ.lAdvancingltechnicianlpractice:ldeliberationsloflalregulatorylboard.l*ResiSociAdmiPharm.i*2018;14(1):1–5.
2.l AlkhateeblFM,lShieldslKM,lBrodel-ZaugglK,lBryanlA,lSnell J.lCredentialinglofl pharmacyltechnicianslinlthelUSA.l*IntiJiPharmiPract.i*2011;19(4):219–227.
3.l AndreskilM,lMyerslM,lGainerlK,lPudlolA.lThellowalnewlpracticelmodel:ladvancingltechnicianrolesltolincreaselpharmacists'ltimeltolprovidelpatientlcarelservices.l*JiAmiPharmiAssoc.i*2018;58(3):268–274.
4.l ReddylA,lLesterlCA,lStonelJA,lHoldenlRJ,letlal.lApplyinglparticipatoryldesignltolalpharmacylsystemlintervention.l*ResiSociAdmiPharm.i*2018.lhttps://doi.org/10.1016/j.sapharm.2018.11.012.l
5.l HohmeierlKC,lDessellelSP.lExploringlthelimplementationloflalnovel optimizinglcarelmodel inlthelcommunitylpharmacylsetting.l*JiAmiPharmiAssoc.i*2019.lhttps://doi.org/10.1016/j.japh.2019.02.006.l
6.l BarneslE,lBullocklA,lAllenlN,lHodsonlK.lCommunitylpharmacists'lopinionslonlskill-mixlandldelegationlinlEngland.l*IntiJiPharmiPract.i*2018;26(5):398–406.
7.l OvergaardlN,lLoisellelM.lAuthorityldelegation.lScientonomy.l*J Sci Sci.i*2016;1(1):11–18.
8.l MonelMM.lOptimizinglthelcontributionslofltechnicianslinlpharmacylpractice—-movinglthelpharmacylprofessionlforward.l*AmiJiHealthiSystiPharm.i*2017;74(17)1333-135.l
9.l WheelerlJS,lGraylJA,lGentrylCK,lFarrlGE.lAdvancinglpharmacyltechnicianltraining andlpracticelmodelslinlthelUnitedlStates:lhistorical perspectives,lworkforceldevelopmentslneeds,landlfuturelopportunities.l*ResiSociAdmiPharm.i*2019.lhttps://doi.org/10.1016/j.sapharm.2019.l
10.l Dessel elSP,lHohmeierlKC,lMcKeirnanlKC,lSultanilM.lThelvaluelandlpotential integrationloflpharmacyltechnicianlnational certificationlintolprocesseslthatlhelplassurelalcompetencelworkforce.l*Pharmacy.i*2019.lhttps://doi.org/10.3390/pharmacy7040147.l
11.l Provo,lUtahlwww.qualtrics.com;l2015.l
12.l Dil manlDA,lSmythlJD,lChristianlLM.l*Internet,iMailiandiMixed-ModeiSurveys:iThei TailorediDesigniMethod.ithirdied.*lHoboken,lNJ:lJohnlWileylandlSons,lInc;l2009.l
13.l SchreiberlJB.lNewlparadigmslforlconsideringlstatistical significance:lalwaylforward forlhealthlserviceslresearchljournals,ltheirlauthors,landltheirlreadership.l*ResiSociAdmiPharm.i*2019.lhttps://doi.org/10.1016/j.sapharm.2019.05.023.l
14.l TraulsenlJM,lDruedahl LC.lShiftinglperspectives—planninglforlthelfutureloflthepharmacylprofessionltakinglcurrent laborlmarketltrendslintolconsideration.l*ResiSociAdmiPharm.i*2018;14(12):1189–1194.
15.l FeralT,lKanel KT,lBolingerlML,lFinklAE,lIheasirimlH.lClinical supportlrolelforlalpharmacyltechnicianlwithinlalprimarylcarelresourcelcenter.l*AmiJiHealthiSystiPharm.i*2018;75(3):139–144.
16.l DonabedianlA.lThelqualityloflcare—howlcanlitlbelassessed?l*JiAmiMediAssoc.i*1988;260(12):1743–1748.
17.l Dessel elSP,lHolmeslER.lResultslofl thel2015lnational certifiedlpharmacyltechnicianlworkforcelsurvey.l*AmiJiHealthiSystiPharm.i*2017;74(13):981–991.
18.l ShikazelD,lArabilM,lGregorylP.lCommunitylpharmacists'lattitudes,lopinions,landbeliefslabout leadershiplinlthelprofession:lanlexploratorylstudy.l*CaniPharmiJ.i*2018;151(5):315–321.
19.l GregorylPAM,lAustinlZ.lConflictlinlcommunitylpharmacylpractice:lthelexperiencelofpharmacists,ltechnicianslandlassistants.l*CaniPharmiJ.i*2016;150(1):32–41.
20.l WilenskylHL.lThelprofessionalizationlofleveryone?l*AmiJiSociol.i*1964;70(2):137–158.
21.l HardiganlPC,lPopovicilI,lCarvajal MJ.lResponselrate,lresponseltime,landleconomiclcostslofl surveylresearch:lalrandomizedltrial oflpracticinglpharmacists.l*ResiSociAdmiPharm.i*2016;12(1):141–148.l

Exploratory Research in Clinical and Social Pharmacy 2 (2021) 100036

Contents lists available at ScienceDirect

Exploratory Research in Clinical and Social Pharmacy

journal homepage: www.elsevier.com/locate/rcsop

Systemization of a pharmacy technician career ladder in a multi-hospital system

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ARTICLE INFO

Article history:
Received 2 March 2021
Received in revised form 17 May 2021
Accepted 16 June 2021

Keywords:
Pharmacy technician
Career ladder
Pharmacy promotion
Human resources

ABSTRACT

Purpose: Hospital consolidation into larger, systemized health systems has enabled system-wide standardization of promotion processes, including pharmacy technician career ladders. However, whether system standardization affects the job satisfaction or outcomes of pharmacy technicians is unknown. The purpose of this project was to assess pharmacy technician perceptions and outcomes after systemization of a pharmacy technician career ladder.
Methods: Pharmacy technician satisfaction scores and outcomes (promotion and turnover rates) were assessed in an eight-hospital health system before and after systemization of a pharmacy technician career ladder.
Results: Two hundred and forty-nine pharmacy technicians were employed during the pre-intervention ($n = 104$) and post-intervention ($n = 145$) time periods. One hundred and twenty-three of 145 (84.83%) pharmacy technicians completed a job satisfaction survey after implementation of the system-wide technician career ladder. Overall satisfaction for the career ladder averaged 3.8 ± 0.61 or between neutral to positive satisfaction. There was no difference in total satisfaction regardless of teaching (3.8 ± 0.59) or community hospital (3.8 ± 0.63) location ($p = 0.53$) or stratifying by Pharmacy Technician status. A total of 50 pharmacy technicians were hired during the study period, either during the pre-implementation ($n = 36$) or post-implementation ($n = 14$) time periods. Time to the first promotion averaged 1.73 ± 1.00 years in the pre-implementation period and 1.36 ± 0.55 years in the post-implementation period ($p = 0.20$). Technician voluntary turnover was similar between the time periods.
Conclusion: In conclusion, the standardization of a systems-level pharmacy technician promotion ladder from a single hospital to a systems-level was associated with positive job satisfaction and similar promotions and turnover rates as the historic, single hospital-based promotion ladder.

1. Introduction

Pharmacy technicians perform essential roles helping to maintain effective, quality operations within a pharmacy department.[1–4] The evolving pharmacy practice model toward increased patient care has necessitated that pharmacy technicians evolve to provide enhanced support for non-clinical duties.[2] Tech-check-tech programs are a notable example of the advancing role of pharmacy technicians to provide innovative functions that allow pharmacists to provide enhanced patient care by decreasing the time needed for distributive oversight.[5] These advanced functions have allowed for the creation of pharmacy technician career ladders to motivate pharmacy technicians to pursue professional development and cultivate advanced job functions and leadership skills.[2–4,6–8] Pharmacy technician career ladders have shown other positive attributes, including reduced pharmacy technician turnover and more positive views of salary, coworker relationships, and resource utilization.[9] This increased job satisfaction then leads to further strengthening advanced pharmacy practice models.[10]

Most pharmacy technician career ladders are developed and standardized to a single hospital to maximize the needs of each hospital's unique systems. However, consolidation of the healthcare system has increased the need for standardized procedures amongst hospitals, including pharmacy technician career ladders.[11] The positive effects of pharmacy technician career ladders may be tempered by the potential loss of autonomy and erosion of professional benefits gained by a career ladder that is uniquely tailored to an individual hospital.[12] Houston Methodist is an eight-hospital nonprofit health system that consists of an academic medical center located in the Texas Medical Center and seven community hospitals within the Greater Houston Area. For many years, each hospital had maintained its own

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http://dx.doi.org/10.1016/j.rcsop.2021.100036

unique pharmacy technician career ladder pathway. However, the systemization of Houston Methodist necessitated a systems-level pharmacy technician career ladder. This provided a unique opportunity to understand better how to develop a standardized pharmacy technician career ladder across a large and diverse health system. The objective of this study was to describe a standardized, health-systems approach for a pharmacy technician career ladder and assess pharmacy technician attitudes and outcomes after the systemization of an existing career ladder.

2. Methods

2.1. Study design and setting

Houston Methodist pharmacy consists of 319 pharmacists and 273 pharmacy technicians across eight hospitals. The standardized pharmacy technician career ladder plan was finalized in April 2015 with a three-year rollout plan. The revised job descriptions were approved in November 2016 with full implementation of the pharmacy technician career ladder starting in January 2017. For this project, the periods after full implementation (January 2017–December 2019) were compared to a time period before starting the intervention (January 2013–December 2015). This study was approved by the Houston Methodist Research Institute Institutional Review Board (IRB) as a quality-improvement initiative exempt from IRB approval.

2.2. Creation and description of the systemized pharmacy technician career ladder

The vision for the system-wide pharmacy technician career ladder was to provide standardized job descriptions and promotion pathways across the health system without compromising the benefits observed from prior ladders. The implementation of the pharmacy technician career ladder occurred over three years (2015–2018). Stage one was to identify inconsistencies between job descriptions and job titles at each hospital and requirements for promotion. The task was coordinated by the Houston Methodist System Pharmacy Council, consisting of hospital directors of pharmacy within the health system. The Council reviewed facility-specific pharmacy technician job descriptions for each career ladder level and consolidated them into singular system-wide descriptions for each level. The consolidated job descriptions delineated the primary job responsibilities within the technician roles and further specified uniform experience requirements for hiring and promotion. The standardized pharmacy technician career ladder was approved by Houston Methodist System Pharmacy Council in November 2016 (Table 1).

2.3. Pharmacy technician promotions and turnover before and after systemization of the pharmacy technician career ladder

Pharmacy technician data was obtained from the Methodist Administrative Resource System Human Resources (HR) Department. Data included institution affiliation, entry job code, hire date, promotion date, gender, and age range. Employee termination or voluntary leave dates were provided when applicable. Promotion and turnover rates for pharmacy technicians were calculated before and after systemization of the pharmacy technician career ladder.

Using concepts from the theory of reasoned action (TRA), a satisfaction questionnaire was designed to measure current employee perceptions toward a system pharmacy technician career ladder and appraise predictive intent and employee motivation for advancement (Table 2).[13] The TRA represents a theoretical construct within social psychology to explain the specific behaviors of individuals based upon delineated motivational factors.[14] Questionnaire domains and statements were designed to align with the TRA's key concepts: behavior, behavioral intention, attitude, behavioral belief, evaluation, subjective norm, normative beliefs, and motivation to comply. The survey was grouped into four domains: leadership and career advancement (three questions), societal expectations (three questions), experience and skill-based (two questions), and incentivized motivation (two questions). Each domain of two to three questions was first averaged to obtain the domain scores. The average of these scores was then calculated to acquire an overall satisfaction score. The survey questions were created by the principal investigator (ND) with input from pharmacy personnel involved in the pharmacy technician program. The questions were first beta-tested with senior-level pharmacy technicians or Pharmacy Technician IIIs to assure understanding of the concepts involved in each question. Then, after modifications based on feedback from the beta-testing, the survey was distributed to all technicians via a confidential Qualtrics survey.

2.4. Study endpoints

The primary endpoint was to assess the perceptions of pharmacy technicians toward career advancement through the pharmacy technician satisfaction survey. Secondary endpoints pertained to pharmacy technician turnover, promotion, and voluntary leave details pre-and post-systemized career ladder implementation.

2.5. Data collection

The 10-question satisfaction survey was constructed with Likert scale format via an online platform and distributed to the pharmacy technician staff employed at each facility via a confidential, anonymous survey.

Table 1
Pharmacy technician standardized career ladder job descriptions.

Characteristic	HMS[a] Pharmacy Technician Job Level			FSR[b] Pharmacy Technician Job Level			
	I	II	III	I	II	III	IV
High school diploma/general equivalency degree	Yes	Yes	Yes	Yes	Yes	Yes	Yes
≥2 years of college	Preferred	Preferred	Preferred	No	No	No	No
Pharmacy technician or intern license	Yes	Yes	Yes	No	Yes	Yes	Yes
ACPE[c] intravenous certification	Yes	Yes	Yes	No	No	No	No
Tech-check-tech certification	No	No	Yes	No	No	No	No
Minimum number of years hospital experience	0–1	2	Promotion only	0	2	4	6
Above-average performance to meet promotion Criteria	No	Yes	Yes	No	Yes	Yes	Yes
Pass tech-check-tech examination	No	No	Yes	No	No	No	No
Proficient in work areas	<3	≥3	≥5	<7	≥7	≥7	≥7
Trains new staff	No	Yes	Yes	No	No	No	Yes
Participation in quality improvement projects	Yes	Yes	Yes	No	Yes	Yes	Yes
Assists with pharmacy programs/technology	No	Yes	Yes	No	No	Yes	Yes
Assists with pharmacy operations workflow	No	No	Yes	No	No	Yes	Yes

[a] HMS = Houston Methodist System.
[b] FSR = Fort Sanders Regional.
[c] ACPE = Accreditation Council for Pharmacy Education.

Table 2
Theory of reasoned action domains with questions (all questions were answered on a 5-point Likert scale bounded by Strongly Disagree (1) to Strongly Agree (5)).

Leadership and career advancement
1. Employment at a location with potential for career advancement is important during consideration of available job opportunities.
2. A pharmacy technician career ladder motivates me to qualify for promotion.
3. I prefer an employment position that is perceived as a leadership role at my institution.
Societal expectations
4. I would like for work peers to perceive me as a responsible, trustworthy individual.
5. Most people that I work with would agree that I enjoy roles with increased responsibility and expectations.
6. It is expected of me that I participate in a pharmacy technician career ladder.
Experience and skill-based
7. Years of employment will likely contribute to promotion consideration by pharmacy management.
8. I feel that I receive adequate opportunities for training to support advancement within the pharmacy technician career ladder.
Incentivized motivation
9. Pharmacy technicians would not want to participate in a career ladder without an increase in pay rate and/or employee benefits.
10. Once I reached my desired career level, I lose motivation to progress further with responsibilities and leadership roles without an associated increase in hourly pay rate.

A three-week timeframe was established for completion of the survey, open to respondents from January 24th through February 14th of 2020. Employee response confidentiality was maintained through the survey's design not to include questions that solicit employee identification.

2.6. Statistical analysis

The Shapiro-Wilk normality test dictated nonparametric analysis of continuous data with the Wilcoxon rank-sum test or Mann-Whitney *U* test. The chi-squared test or Fisher's exact test was utilized for the analysis of categorical variables. Statistical analyses and tests were conducted with Stata/SE (version 15.1, College Station, Texas) or SAS (version 9.4, Cary, North Carolina). A *p*-value less than 0.05 was considered significant.

3. Results

3.1. Baseline demographics

Two hundred and forty-nine pharmacy technicians were employed during the periods, including pre-intervention ($n = 104$) and post-intervention ($n = 145$) time periods. The distribution of technician levels and demographics is shown in Table 3.

3.2. TRA survey

One hundred and twenty-three of 145 (84.83%) pharmacy technicians completed the satisfaction survey after implementation of the system-wide technician career ladder. Responses were split evenly between the academic medical center and community hospital settings. Respondents included Pharmacy Technician I ($n = 21$; 17.07%), Pharmacy Technician II ($n = 71$; 57.72%), and Pharmacy Technician III ($n = 31$; 25.20%). Overall satisfaction for the career ladder averaged 3.8 ± 0.61, or between neutral to positive satisfaction. All domains averaged above-neutral satisfaction. Domain satisfaction was highest for societal expectations (4.12 ± 0.66), followed by leadership and career advancement (4.07 ± 0.81), experience and skill-based (3.51 ± 1.15), and incentivized motivation (3.49 ± 1.04). There was no difference in total satisfaction regardless of academic (3.8 ± 0.59) or community hospital (3.8 ± 0.63) location ($p = 0.53$) or stratifying by Pharmacy Technician I (3.84 ± 0.64), Pharmacy Technician II (3.69 ± 0.63), or Pharmacy Technician III (4.00 ± 0.50) status ($p = 0.06$). Pharmacy technician survey results were similar by technician levels for all domains, except leadership and career advancement ($p = 0.01$). Survey scores were 4.1 ± 0.85 for Pharmacy Technician I, decreased to 3.9 ± 0.84 for Pharmacy Technician II, and increased to 4.4 ± 0.60 for Pharmacy Technician III. Controlling for multiple comparisons, leadership scores were significantly higher for Pharmacy technician IIIs compared to Pharmacy technician IIs ($p = 0.0030$).

Table 3
Pharmacy technician baseline demographics.

Characteristic, no. (%)	Pre-Intervention ($n = 104$)	Post-Intervention ($n = 145$)	P-Value
Age, years[a]			
18–25	0 (0.00)	5 (3.45)	0.07
26–35	47 (45.19)	72 (49.66)	0.49
36–40	17 (17.31)	23 (15.86)	0.92
40+	39 (37.50)	45 (31.03)	0.29
Gender			
Male	53 (33.65)	42 (28.97)	<0.001
Community institutions			
Pharmacy Technician I	24 (23.08)	28 (19.31)	0.47
Pharmacy Technician II	28 (26.92)	70 (48.28)	0.001
Pharmacy Technician III	8 (7.69)	0 (0.00)	0.001
PRN employees	17 (16.35)	0 (0.00)	<0.001
Academic medical center			
Pharmacy Technician I	22 (21.15)	43 (29.66)	0.13
Pharmacy Technician II	0 (0.00)	4 (2.76)	0.11
Pharmacy Technician III	0 (0.00)	0 (0.00)	N/A
PRN employees	5 (4.81)	0 (0.00)	0.01

[a] Represents age range at the time of initial hire.

3.3. Career advancement and employee turnover

A total of 50 pharmacy technicians were hired during the study period, either during the pre-implementation ($n = 36$) or post-implementation ($n = 14$) time periods. The time to the first promotion averaged 1.73 ± 1.00 years in the pre-implementation period and 1.36 ± 0.55 years in the post-implementation period ($p = 0.20$). Thirteen of 50 pharmacy technicians also progressed to a second promotion to Pharmacy Technician III, 11 in the pre-implementation period and 2 in the post-implementation period. The time to the second promotion was 2.94 ± 1.00 years in the pre-implementation period and 2.01 ± 0.00 years in the post-implementation period ($p = 0.22$).

Technician voluntary turnover was similar between the two time periods. In the pre-implementation period, 9 of 36 (25.00%) hired pharmacy technicians voluntarily left their employment compared to 3 of 14 (21.43%) hired technicians during the post-implementation period ($p = 0.76$).

4. Discussion

The systemization of healthcare has necessitated that pharmacy technician promotion pathways developed by single hospitals also be systemized to allow for a consistent promotion pathway between the institutions. Pharmacy technician promotion pathways have been shown to reduce pharmacy technician turnover and result in more positive views of salary, coworker relationships, and resource utilization.[9] For many years, hospitals within our health system maintained an autonomous pharmacy technician promotion pathway unique to each hospital. In 2016, we implemented a system-wide pharmacy technician promotion pathway amongst the eight hospitals within our health system. During the development of the system-wide promotion pathway, some concern was expressed whether the quality of the promotion pathway would diminish as each hospital would not have the ability to tailor the promotion pathway to the unique attributes of the individual hospital. However, the

systemization allowed for more flexible use of the pharmacy technician workforce and allowed a systems-level approach to operationalizing the program. To answer this question, we assessed pharmacy technician job satisfaction after implementing a systems-level promotion pathway and promotion and voluntary pharmacy technician departures before and after implementation of the system-wide promotion pathway. The average job satisfaction scores for the new program were consistent amongst all three promotion levels of pharmacy technicians and averaged neutral satisfaction or greater. In addition, the time to promotion was comparable in the new system, and voluntary pharmacy technician departures were also similar. Thus, the rollout of the new promotion pathway did not seem to diminish the success of prior programs. Strengths of this study include a multi-year evaluation and a large number of pharmacy technicians assessed during the time period.

We were able to identify one prior study that described the development and benefits of a pharmacy technician career ladder (Table 1).[9] The ladder was implemented at a 575-bed community hospital and consisted of four stages with specific skills required to advance to each stage. Similar to our study, pharmacy technicians expressed positive job satisfaction with implementing the ladder, and advanced technicians were assigned select tasks traditionally done by licensed pharmacists before implementation. This allowed for pharmacists to commit to enhanced clinical activities due to the time savings. Our plan incorporated many facets of pharmacy technician professional activities not available when the prior ladder was developed, such as pharmacy technician certification for sterile products. However, both models demonstrate benefit and can be used as a model for other systems or hospitals interested in developing a pharmacy technician career ladder.

This study has certain limitations. This was a non-randomized study, and thus our findings could be reflective of biases amongst pharmacy technicians employed within our health systems. Second, we were not able to survey pharmacy technicians prior to implementation of the system-wide career ladder, and it is plausible that job satisfaction may have been higher prior to implementation. Pharmacy technicians were studied for promotions and turnover during the entire study period. Thus, technicians hired at a later date had a shorter evaluation time.

5. Conclusion

In conclusion, the standardization of a systems-level pharmacy technician promotion ladder from a single hospital to a systems-level was associated with positive job satisfaction and similar promotions and turnover rates as the historic, single hospital-based promotion ladder. We feel this ladder could be used for other hospitals or health systems interested in developing a standardized promotion pathway.

Funding

This research study was awarded by the American Society of Health-System Pharmacists Foundation 2019 New Practitioner Leadership Development Research Grant.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The research study authors would like to acknowledge the support of the Houston Methodist Human Resources Department for the approval of this study and the acquisition of data.

References

1. Kelly W. *Pharmacy: What it is and how it works. 4th ed.* Routledge. 2018.
2. Shane R. Advancing technician roles: an essential step in pharmacy practice model reform. Am J Health Syst Pharm 2011;68(19):1834–1835.
3. Zellmer WA, McAllister EB, Silvester JA, Vlasses PH. Toward uniform standards for pharmacy technicians: summary of the 2017 pharmacy technician stakeholder consensus conference. Am J Health Syst Pharm 2017;74(17):1321–1332.
4. The consensus of the pharmacy practice model summitAm J Health Syst Pharm 2011;68 (12):1148–1152.
5. Adams A, Martin S, Stolpe S. "Tech-check-tech": a review of the evidence on its safety and benefits. Am J Health Syst Pharm 2011;68(19):1824–1833.
6. ASHP multi-hospital health-system pharmacy executives leadership symposium: Forecasting the future of pharmacy: A five-year planAm J Health Syst Pharm 2016;73(4): 247–253.
7. Ivey MF, John W. Webb lecture. Expanding the pharmacy enterprise: leadership needed. Am J Health Syst Pharm 2009;66(18):1652–1659.
8. Vermeulen LC, Kolesar J, Crismon ML, et al. ASHP foundation pharmacy forecast 2018: strategic planning advice for pharmacy departments in hospitals and health systems. Am J Health Syst Pharm 2018;75(2):23–54.
9. Strozyk W, Underwood D. Development and benefits of a pharmacy technician career ladder. Am J Health Syst Pharm 1994;51(5):666–669.
10. Manasse H, Menighan T. Pharmacy technician education, training, and certification: call for a single national standard and public accountability. Am J Health Syst Pharm 2011;68 (10):869–870.
11. Moses H, Matheson D, Dorsey E, George B, Sadoff D, Yoshimura S. The anatomy of health care in the United States. JAMA 2013;310(18):1947.
12. Rastegar D. Health care becomes an industry. Ann Family Med 2004;2(1):79–83.
13. Jove AM, Fernandez A, Hughes C, et al. Perceptions of collaboration between general practitioners and community pharmacists: findings from a qualitative study based in Spain. J Interprof Care 2014;28(4):352–357.
14. Sutton S. Health behavior: psychosocial theories. Int Encycl Soc Behav Sci 2001:6499–6506.

Attachment 2

NACDS Pharmacy Technician Requirements Across the States

NACDS NATIONAL ASSOCIATION OF CHAIN DRUG STORES

Pharmacy Technician Requirements Across the States

The information in this document is for informational purposes only. It should NOT be construed or relied upon as legal advice, guidance or counsel. You should consult your attorney regarding the content or interpretation of the information herein prior to use. NACDS assumes no responsibility or liability for any errors or omissions in the content of these documents.

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
AL	An individual, other than an intern, extern, or an assistant pharmacist, who performs pharmacy functions under the direct supervision of a licensed pharmacist. *AL Practice of Pharmacy Act 34-23-130(2)*	3:1 *AL Admin. Code 680-X-2-.14(3)*	No	No *AL Admin. Code 680-X-2-.14(3)*	Pharmacy technicians may assist pharmacists in the preparation of compounds. *AL Practice of Pharmacy Act 34-23-151(b)*
	Comments:	**Comments**: At least one technician must be certified by Board approved organization. *AL Admin. Code 680-X-2-.14(3)*	**Comments**:	**Comments**: Not required for all techs, but 1 tech on duty must be certified. *AL Admin. Code 680-X-2-.14(3)*	**Comments:** Technicians may not: • communicate information requiring professional judgment; • document receipt of controlled substance into inventory; • accept oral prescriptions; • prepare a copy of or read a prescription to another person; • dispense without pharmacist verification; • counsel patients; or

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					• perform any task that requires a professional judgment or violates state or federal law. *AL Admin. Code 680-X-2-.14(4)*
AK	A supportive staff member who works under the immediate supervision of a pharmacist. *AK 08.80.480(26)* Individuals who assist in performing manipulative, nondiscretionary functions associated with the practice of pharmacy; and supportive staff members assigned to work in the dispensing area of a pharmacy, including a cashier or a bookkeeper must be licensed as a technician. *AK 12 AAC 52.230(a)*	None	Yes *AK12 AAC 52.230(e)*	No	Pharmacy technician may assist in the preparation of sterile pharmaceuticals, including parenteral medications with appropriate training. *AK 12 AAC 52.230(f)*
	Comments:	**Comments**:	**Comments**: Training requirements to be completed per pharmacist in charge. Sterile compounding requires 40hrs of training.	**Comments**: Board recognizes certification programs as alternatives to CE requirements. *AK 12 AAC 52.340*	**Comments:** Pharmacy technicians may not: • receive an oral prescription • consult with a prescriber or patient; • interpret a prescription drug order;

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
			AK 12 AAC 52.230(e-f)		• determine the product required for a prescription; • interpret data in a patient medication record system; • make a final check. *AK 12 AAC 52.210*
AZ	A person who is licensed pursuant to this chapter. *AZ Pharmacy Act 32-1901(72)* Licensure requirements listed under *AZ Admin. Code R4-23-1101*	None	Yes *AZ Admin. Code R4-23-653; R4-23-1101(2)(b)*	Yes *AZ Admin. Code R4-23-1101(2)(c)*	Pharmacy technicians may: 1. Record on the original prescription order the serial number of the prescription medication and date dispensed; 2. Initiate or accept verbal or electronic refill authorization from a medical practitioner or medical practitioner's agent and record, on the original prescription order or by an alternative method approved by the Board or its designee, the medical practitioner's name, patient name, name and quantity of prescription medication, specific refill information, and name of medical practitioner's agent, if any; 3. Record information in the refill record or patient profile; 4. Enter information for a new or refill prescription medication

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					as required under A.R.S. § 32-1964; 5. Type and affix a label for the prescription medication. A pharmacist or graduate or pharmacy intern working under the supervision of a pharmacist shall verify the accuracy of the label as described under R4-23-402(A)(11); 6. Reconstitute a prescription medication, if a pharmacist checks the ingredients and procedure before reconstitution and verifies the final product after reconstitution; 7. Retrieve, count, or pour a prescription medication, if a pharmacist verifies the contents of the prescription medication against the original prescription medication container or by an alternative drug identification method approved by the Board or its designee; 8. Prepackage drugs in accordance with R4-23-402(A); and 9. Measure, count, pour, or otherwise prepare and package a drug needed for hospital inpatient dispensing, if a pharmacist verifies the accuracy, measuring, counting, pouring,

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					preparing, packaging, and safety of the drug before the drug is delivered to a patient care area. If a technician completes drug compounding training program, he may assist in compounding with pharmacist verification. Perform a final technology-assisted verification of product if the pharmacy technician is qualified under R4-23-1104.01(D); and If technology-assisted verification is performed, type and affix a label for the prescription medication. A pharmacist or graduate or pharmacy intern shall verify the accuracy of the label as described under R4-23-402(A)(12). *AZ Admin. Code R4-23-1104(A)*
	Comments:	**Comments**: Number of persons allowed in a pharmacy is limited to three if pharmacy is 300 sq. feet. One additional person allowed for	**Comments**: Technicians must complete employer based training. *AZ Admin. Code R4-23-1105(B)*	**Comments**: Passed the PTCB or another Board-approved pharmacy technician examination. *AZ Admin. Code R4-23-1102(2)(c)*	**Comments:** A technician may not perform duties reserved for pharmacists, graduate interns or pharmacy interns.

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
		each additional 60 sq. ft. *AZ Admin. Code R4-23-609*			*AZ Admin. Code R4-23-1104(D);* *AZ Admin. Code R4-23-402;* *AZ Admin. Code R4-23-653*
AR	Those individuals, exclusive of pharmacy interns, who assist the pharmacist in pharmaceutical services. *AR BReg 03-00-0001(a)*	3:1 *AR BReg 03-00-0007(a)(1)*	No	No	A pharmacy technician may: • pack and pour medications; • type and affix labels; • Select and replace medications on shelves; • data entry; • obtain prescriber authorization for prescription refills; • prepackage and label multi-dose and unit-dose packages of medication; • pick doses unit dose cart fill for a hospital or for a nursing home patient; • nursing unit checks in a hospital or nursing home; • record patient medication information for later validation. A pharmacy technician may assist with reconstituting, withdrawing and adding injectable products to be

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					administered to a patient with proper training. *AR BReg 03-00-0005(b)* Immunization: Yes per https://www.arkleg.state.ar.us/Acts/FTPDocument?path=%2FACTS%2F2021R%2FPublic%2F&file=407.pdf&ddBienniumSession=2021%2F2021R
	Comments:	**Comments**: Graduate intern does not affect the ratio. *03-00-0007(a)(2)*	**Comments**: Required only for tasks related to reconstitution of prefabricated non-injectable medication, bulk compounding, and/or preparation of parenteral products. *AR BReg 03-00-0005(c)(2)(A)(i)*	**Comments**:	**Comments:**
CA	An individual who assists a pharmacist in a pharmacy in the performance of his or her pharmacy related duties, as specified in Section 4115. *CA Bus & Prof § 4038(a)*	1:1 *CA Bus & Prof § 4115(f)(1)*	Yes *CA BReg 1793.6(a)-(c)*	Yes *CA Bus & Prof § 4202(a)(4)*	A pharmacy technician may perform: Packaging, manipulative, repetitive, or other nondiscretionary tasks only while assisting, and while under the direct supervision and control of, a pharmacist. The

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					pharmacist shall be responsible for the duties performed under his or her supervision by a technician. *CA Bus & Prof § 4115(a)* "Nondiscretionary tasks" include: • removing the drug or drugs from stock; • counting, pouring, or mixing pharmaceuticals; • placing the product into a container; • affixing the label or labels to the container; • packaging and repackaging. *CA BReg 1793.2*
	Comments:	**Comments**: 1:1 for first pharmacist; 2:1 for each subsequent pharmacist. *CA Bus & Prof § 4115(f)(1)*	**Comments**: Any ASHP training program, any training program by the federal armed services which applicant has certificate for, or any other course that provides at least 240 hours of instruction covering	**Comments**: Certification must be from a pharmacy technician certification program accredited by the NCCA that is approved by the Board. *CA Bus & Prof § 4202(a)(4)*	**Comments:**

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
			criteria identified by the Board. *CA BReg 1793.6(a)-(c)*		
CO	An unlicensed person who performs those functions set forth in paragraph (b) of subsection (31) of this section under the supervision of a pharmacist. *CO PracAct 12-42.5-102(30)*	6:1 *CO PracAct 12-42.5-119(1)*	No	Yes. This new law goes into effect on October 1, 2019, and requires pharmacy technicians practicing in Colorado on or after March 30, 2020, to obtain a certification or provisional certification from the State Board of Pharmacy (Board). An applicant for certification by the Board must pass a criminal history record check **and provide proof of certification by a board-approved, nationally-recognized organization that certifies pharmacy technicians.** To allow time to meet the requirements, the Board may grant a one-time provisional certification of up to 18 months to an applicant who has not satisfied certain requirements for certification. Finally, the law includes a sunset date of September 1, 2021. Source	"Practice as a pharmacy technician" means engaging in any of the following activities involved in the practice of pharmacy, under the supervision and delegation of a supervising pharmacist: • Receiving and initially inputting new written, facsimile, or electronic orders; • Preparing, mixing, assembling, packaging, labeling, or delivering a drug or device; • Properly and safely storing drugs or devices; • Maintaining proper records for drugs and devices; • Transferring prescriptions; • Gathering, documenting, and maintaining proper clinical and nonclinical information from patients;

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					• Replenishing automated dispensing devices without the need for pharmacist verification as long as the pharmacy technician uses bar code technology that checks the accuracy of the medication or a second pharmacy technician performs the verification; and • Other activities as authorized and defined by the board by rule. "Practice as a pharmacy technician" does not include activities or services described in subsection (38.5)(a) of this section that are performed by employees or personnel of a practitioner dispensing drugs to patients pursuant to section 12-280-120(6) or of a registered other outlet, which practitioner or other outlet does not store, compound, dispense, or deliver controlled substances. *CO PracAct 12-42.5-103(38.5)*

	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	Comments:	**Comments**: If three or more pharmacy technicians are on duty, at least one must be certified by a nationally recognized certification board, possess a degree from an accredited pharmacy technician training program, or have completed five hundred hours of experiential training in duties. *CO PracAct 12-42.5-119(1)*	**Comments**: If three pharmacy technicians are on duty, at least one must be certified by a nationally recognized certification board, possess a degree from an accredited pharmacy technician training program, or have completed five hundred hours of experiential training in duties. *CO PracAct 12-42.5-119(1)*	**Comments**: If three pharmacy technicians are on duty, at least one must be certified by a nationally recognized certification board, possess a degree from an accredited pharmacy technician training program, or have completed five hundred hours of experiential training in duties. *CO PracAct 12-42.5-119(1); CO PracAct 12-42.5-119(1)*	**Comments:**
CT	An individual who is qualified according to the standards of an institutional pharmacy, a care-giving institution or a correctional or juvenile training institution, or, in the case of a pharmacy, by standards established by the Department of Consumer Protection, to perform, under the direct supervision of a pharmacist, routine functions in the dispensing of drugs which do not require the use of professional judgment.	2:1, can be 3:1 *CT BReg 20-576-36*	Yes *CT BReg Sec. 20-576-37(a)*	No	Technician may communicate with a prescriber for renewal authorization as long as: • the supervising pharmacist is aware that authorization is being requested; • the authorization requested is identical to the original prescription and there is no change in the prescribed drug, its strength, form, quantity, dose, route of administration or in any

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	CT PracAct 20-571(20) **Certified Pharmacy Technician**: Person holding an active certification from PTCB, or any other equivalent pharmacy tech certification approved by BoP. *CT BReg 20-576-32(c)*				other element of the prescription; and • all refill authorizations obtained by the pharmacy technician are reviewed by the supervising pharmacist to insure that there is no change in the prescription. *CT BReg 20-576-35*
	Comments:	**Comments**: 3:1 if the third technician is certified and the supervising pharmacist has not provided notice to the pharmacist manager that the pharmacist refuses to supervise three pharmacy technicians; otherwise, the ratio cannot exceed 2:1. *CT BReg 20-576-36(a)(2A)*	**Comments**: Pharmacy technicians must complete initial training as determined by the pharmacist manager prior to the performance of tasks. Technicians must register with the Department no more than thirty days after the start of such training. *CT BReg Sec. 20-576-37(a)*	**Comments**: Technicians must be registered or certified. *CT PracAct 20-598a(a)* Board recognizes PTCB, ExCPT, and other certification. Technicians who have PTCB certification automatically qualify to register. *CT PracAct 20-598a(c)*	**Comments:** Pharmacy technicians shall not: • receive oral prescriptions; • consult with patients; • clarify a prescription; • interpret clinical data; • perform consultations; • verify a prescription; • determine therapeutic equivalents. *CT PracAct Sec. 20-576-39*
DE	An individual who is not registered as an intern with the Board of Pharmacy or a certified pharmacy technician.	None	Yes *DE BReg 2500-19.1.1*	No	Any pharmacy technicians may carry out any pharmacy-related duty assigned to them by their supervising pharmacist except

	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	24 Del.C. §§ 2502(22) **Certified Pharmacy Technician**: A person who is certified PTCB or other entity approved by the Board of Pharmacy. *24 Del. C §§ 2502(3);* *DE BReg 2500-19.1.2*				for those activities specifically excluded by 24 Del.C. §§ 2507(b) and 2502(19). *DE BReg2500-19.2.2* Only **certified pharmacy technicians** may: • reconstitute oral solutions; • contact prescriber for refill authorization or other information of a non-clinical nature; • assist with compounding. *DE BReg 2500-19.1.2*
	Comments:	**Comments**: There must be one fully trained technician available to assist in the pharmacy at the pharmacist's request. *DE BReg 2500-3.0*	**Comments**: Pharmacist in charge responsible and must document when completed. Training must include: minimum of 10 hours of didactic training on various topics. *DE BReg 2500-19.1.1.2*	**Comments**: Certified technicians must be certified by PTCB or other national technician certification exam approved by the Board of Pharmacy. *DE BReg 2500-19.1.2* A pharmacy technician completing a training program approved by the Board certification program may perform as a certified technician. However, approval is limited and is not	**Comments:** Pharmacy technicians shall not: • certify a prescription; • perform drug utilization reviews; • provide drug information requiring clinical or technical knowledge; • counsel patients; • receive new verbal prescription orders without recorded backup; • contact a prescriber concerning prescription

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
				transferrable to another facility. *DE BReg 2500-19.1.2.1*	drug order interpretation or therapy modification. *24 Del.C. §§ 2507(b)*
DC	"Registered pharmacy technician" means a person who is registered with the Board as a pharmacy technician. *DC Code 3-1207.51(4)*	None	Yes *DC Code 3-1207.52(b)(2)(B)*	Yes *DC Code 3-1207.52(b)(2)(A)*	A registered pharmacy technician may provide technical pharmacy-related services, as defined through rulemaking, that do not require professional judgment regarding the preparation and distribution of drugs if the technical services are provided under the direct supervision of a pharmacist licensed under this chapter. *DC Code 3-1207.55(a)*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	Comments:	**Comments**:	**Comments:** Board approved national, regional, or state program; accredited school program; Board approved employer based program that includes 160 hours of training. Programs must meet ASHP guidelines. *DC Code 3-1207.52(b)(2)(B)*	**Comments:** A current certification from PTCB, NHA, or another national or state certifying organization approved by the Board. *DC Code 3-1207.52(b)(2)(A)*	**Comments:** A registered pharmacy technician shall not provide the following services: • drug regimen review; • clinical conflict resolution; • prescriber contact except authorization of refills; • therapy modification; • patient counseling; • dispensing process validation; • vaccination or immunization administration; • receive verbal orders; • any activity required by law or regulation to be performed only by a pharmacist; • any activity for which professional pharmaceutical judgment is required. • . *DC Code 3-1207.55(b)*
FL	Registered Pharmacy Technicians (RPT): are those technicians who are duly registered with the board	6:1, and up to 8:1 for non-dispensing pharmacies or dispensing pharmacies with a physically	Yes *FL Rule 64B16-26.351*	No	Delegable Tasks - Delegable tasks are those tasks that are performed pursuant to a pharmacist's direction, without the exercise of the pharmacy technician's own judgment and

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	pursuant to Section 465.014(2), *FL Rule 64B16-27.400* Must be registered, be 17 years of age or older, and complete a Board approved training program. *FL PracAct 465.014(1)*	separate area from medications *FL Rule 64B16-27.410(1)*			discretion, and which do not require the pharmacy technician to exercise the independent professional judgment that is the foundation of the practice of the profession of pharmacy. Jan 2020 *FL Rule 64B16-27.420(1);* *FL PracAct 465.014(1)*
	Comments:	**Comments**: 3:1 for sterile compounding. *FL Rule 64B16-27.410(4)* 6:1 for duties not involving sterile compounding. *FL Rule 64B16-27.410(5)* 8:1 for non-dispensing pharmacies or dispensing pharmacies with a physically separate area from medications. *FL Rule 64B16-27.410(6)*	**Comments**: Technicians must complete a Board approved course, which includes ASHP accredited courses. *FL Rule 64B16-26.351(1)* Board approved employer based training with 160hrs of training accepted. *FL Rule 64B16-26.351(2)*	**Comments**:	• prepare a copy of a

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					• receive therapy or blood product procedures in a permitted nuclear pharmacy; • engage in any other act that requires the exercise of a pharmacist's professional judgment. *FL Rule 64B16-27.420(2)*
GA	"Registered Pharmacy technician" are registered and provide nonjudgmental technical services related to preparation of drugs under pharmacist supervision. *GA PracAct 26-4-5(32);* *GA Rule 480-15-.01(g)* "**Certified pharmacy technician**" means registered technician who has either successfully passed Board approved certification program, employer training program, PTCB certified, or certified by nationally recognized certifying body. *GA Rule 480-15-.01(b)*	4:1 **HB316** moves the number of pharmacy technicians a pharmacist may supervise from 3:1 to 4:1. *GA PracAct 26-4-82(d);* *GA Rule 480-15-.03(d)(1)*	No	No	

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	Comments:	**Comments**: Any time a pharmacist directly supervises 4 techs, 2 must be certified; any time a pharmacist directly supervises 3 techs, 1 must be certified. No certification required for techs in pharmacies at any time during which pharmacist directly supervises one or two pharmacy technicians. Certification entails passing a Board approved certification program, a Board approved employer's training and assessment program, or have been certified by PTCB. *GA PracAct 26-4-82(d); GA Rule 480-15-.03(e)*	**Comments**: Required for certified technicians. *GA Rule 480-15-.01(b)*	**Comments**: Required for certified technicians. *GA Rule 480-15-.01(b)*	**Comments:** Pharmacy technicians may not: • accept verbal orders; • transfer orders; • perform patient counseling; • decide to fill a refill; • final verification; • weigh, measure or compound without verification; • give a completed prescription without verification; • reconstitute without verification; • enter order without verification; • provide drug information not approved by the pharmacist; • review patient record for therapeutic appropriateness. *GA Rule 480-15-.05*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
HI	A non-licensed individual, other than a pharmacy assistant, who assists the pharmacist in various activities under the immediate supervision of a registered pharmacist. *HI BReg 16-95-2*	None	No	No	A pharmacy technician may perform: • typing of prescription labels, drug packaging, stocking, delivery, record keeping, pricing, documentation of third party reimbursements, and preparing, compounding, storing, and providing medication; • mixing drugs with parenteral fluids (with proper knowledge). *HI BReg 16-95-86*
	Comments:	**Comments**:	**Comments**:	**Comments**:	**Comments:**
ID	An individual authorized by registration with the Board to perform routine pharmacy support services under the supervision of a pharmacist. *IDAPA 27.01.01.12(05)*	None	No	Yes *IDAPA 27.01.01.040(04)*	A pharmacist may assign to and allow performance by a technician only those functions performed in pharmacy operations that are routine, under a pharmacist's supervision, that do not require professional judgment and with adequate training. *IDAPA 27.01.01.303* Technicians may: • accept verbal prescriptions;

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					• consult with the prescriber; • consult with a prescriber; • administer vaccines; • accuracy checking; • check PMP. *IDAPA 27.01.01.115*
	Comments:	**Comments**: The ratio of pharmacists to student pharmacists and technicians may not exceed one (1) pharmacist for every six (6) student pharmacists and technicians in total in a telepharmacy practice setting. *IDAPA 27.01.01.607*	**Comments**:	**Comments**: Must have and maintain certified pharmacy technician status through PTCB, NHA, or their successors unless qualified for a continuous employment exemption. *IDAPA 27.01.01.040(04);* *IDAPA 27.01.01.042*	**Comments:** Technicians may not: • perform prospective drug review; • provide patient consultation; *IDAPA 27.01.01.400*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
IL	Any person over 16 years of age, with a high school equivalency, and has not committed a crime may register as a pharmacy technician. *225 ILCS 89/9* **Certified Pharmacy Technician** is one who has completed an approved technician training and passed an exam certified by the NCCA. *225 ILCS 85/9.5*	None	Yes *225 ILCS 85/17.1*	No	A pharmacy technician, under the supervision of a pharmacist, may assist in: • dispensing process; • offering counseling; • receiving new verbal prescription orders; • having prescriber contact concerning prescription drug order clarification. *225 ILCS 85/9*
	Comments:	**Comments**:	**Comments**: Pharmacy and PIC must train all technicians or obtain proof of prior training. *225 ILCS 85/17.1* For certified technicians, PIC must verify that tech has successfully completed training program and successfully completed an	**Comments**: Technicians must graduate from a pharmacy technician training program approved by a nationally recognized accrediting body or have documentation from PIC where employed verifying successful completion of training program. Must successfully pass exam accredited by NCCA, which include PTCB and ExCPT. *68 Ill. Adm. Code 1330.220(4) & (5)*	**Comments:** A pharmacy technician may not: • engage in patient counseling; • drug regimen review; • clinical conflict resolution. *225 ILCS 85/9*

	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
			objective assessment. *225 ILCS 85/9.5*		
IN	An individual who: • works under the direct supervision of a pharmacist licensed under this article; • performs duties to assist a pharmacist in activities that do not require the professional judgment of a pharmacist. *IN PracAct 25-26-19-2*	8:1 *IC 25-26-13-18.5*	Yes *856 IAC Rule 1-35-4(3)*	Yes *IN PracAct 25-26-19-5(7)(C)*	A licensed pharmacy technician may transfer a prescription electronically or by fax to another pharmacy (unless prohibited by federal law) if the pharmacies do not share a common data base IC 25-26-13-24.8 (b)-(c) A pharmacy technician may perform many technical functions associated with the practice of pharmacy. *856 IAC Rule 1-35-5*
	Comments:	**Comments**:	**Comments**: Must complete training program conducted by a pharmacy or educational organization or an employer based training program. *856 IAC Rule 1-35-4(3);*	**Comments**: Successfully passed a certification examination offered by PTCB or another nationally recognized certification body approved by the board. *IN PracAct 25-26-19-5(7)(C)*	**Comments:** Pharmacy technicians may not: • provide advice to the patient; • consult with prescriber; • dispense drug information; • receive verbal prescriptions other than refills from prescriber; • perform final verification on drug, strength and labeling.

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
			IN PracAct 25-26-19-5(7)(A) & (7)(B)		*856 IAC Rule 1-35-5;* *IN PracAct 25-26-19-8* In 2020, Indiana passed legislation authorizing pharmacy technicians the ability to administer flu vaccines pursuant to a prescription or drug order. **IC 25-26-13-31.7** **Administration of influenza immunization by pharmacy technician** *(a) Subject to rules adopted under subsection (c), a pharmacy technician may administer an influenza immunization to an individual under a drug order or prescription.* *(b) Subject to rules adopted under subsection (c), a pharmacy technician may administer an influenza immunization to an individual or a group of individuals under a drug order, under a prescription, or according to a protocol approved by a physician.* *(c) The board shall adopt rules under IC 4-22-2 to establish requirements applying to a pharmacy technician who*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					administers an influenza immunization to an individual or group of individuals. The rules adopted under this section must provide for the direct supervision of the pharmacy technician by a pharmacist, a physician, a physician assistant, or an advanced practice registered nurse. (d) The board must approve all programs that provide training to pharmacy technicians to administer influenza immunizations as permitted by this section. Gov. Eric Holcomb (R) signed into law HB 1468 **House Bill 1468 - Various health matters - Indiana General Assembly, 2021 Session** Permits pharmacists, pharmacy students and pharmacy technicians to administer the COVID-19 vaccine pursuant to a prescription, protocol or standing order in addition to the 11 other vaccination categories listed in statute.

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
IA	Pharmacy technician" or "technician" means a person who is employed in Iowa by a licensed pharmacy under the responsibility of an Iowa-licensed pharmacist to assist in the technical functions of the practice of pharmacy. *IA Code 155A.3(33);* *IAC 657-3.1 (155A)* "**Certified pharmacy technician**" or "certified technician" means an individual who holds a valid current national certification and who has registered with the board as a certified pharmacy technician. *IAC 657-3.1 (155A)*	None	Yes *IAC 657-3.17 (155A)*	Yes *IAC 657-3.5 (155A)*	A pharmacist may delegate any technical functions to pharmacy technicians, but only under supervision. Pharmacist may additionally delegate any nontechnical functions to pharmacy support persons (see definition in comments) *IA Code 155A.33* Under the supervision, a **certified pharmacy technician** may: • perform repetitive tasks related to processing prescriptions; • accept refill authorizations; • contact prescribers to obtain prescription refill authorizations; • process patient information; • data entry; • inspect drug supplies; • affix required labels; • prepackage or label multi-dose and single-dose packages; • perform drug compounding; • accept new prescription orders.

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					IAC 657-3.22(1)
	Comments: "Pharmacy support person" means a person, other than a licensed pharmacist, a registered pharmacist intern, or a registered pharmacy technician, who may perform nontechnical duties assigned by the pharmacist under the pharmacist's supervision, including but not limited to delivery, billing, cashier, and clerical functions. *IAC 657-3.1 (155A)*	**Comments**:	**Comments**: All pharmacies must have written policies for training appropriate to the practice of pharmacy. Pharmacies must document training and keep records for duration of employment and make available for inspection. *IAC 657-3.17 (155A)*	**Comments**: Technicians must provide proof of certification by national technician certification authority approved by the board. National certification acquired through successful completion of any NCCA-accredited pharmacy technician certification program and examination fulfills the requirement for certification. *IAC 657-3.5 (155A)* Final rule of the Board of Pharmacy amends and adopts regulations under 657 IAC 3 and 6 to require registration of pharmacy technicians before beginning a technician training program. The rule also aligns the pharmacy technician renewal period with the national certification period and the process for other licenses and registrations, adds a $15 fee for written verification of registration, and expands the delegation of nonclinical pharmacy functions	**Comments:** Technician Product Verification authorized under 657—40.1(155A) et. seq. https://www.legis.iowa.gov/docs/iac/chapter/657.40.pdf

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
				to pharmacy technicians. In addition, the rule prohibits requiring a supervising pharmacist to delegate functions to a pharmacy technician against their professional judgment, requires technicians to report any criminal conviction or disciplinary action within 30 days, and adds provisions on the online application process. The rule is effective May 12, 2021. http://bnaregs.bna.com/?id=ia_5373	
KS	An individual who, under the direct supervision and control of a pharmacist, may perform packaging, manipulative, repetitive or other nondiscretionary tasks related to the processing of a prescription or medication order and who assists the pharmacist in the performance of pharmacy related duties, but who does not perform duties restricted to a pharmacist. *KS Stat. 65-1626(pp)*	4:1 *K.A.R 68-5-16(b)*	Yes *K.A.R 68-5-15(c)*	Yes *KS Stat. 65-1663(a)*	Technician may perform packaging, manipulative, repetitive or other nondiscretionary tasks related to the processing of a prescription or medication order. Technicians assist the pharmacist in the performance of pharmacy related duties. *KS Stat 65-1626(pp)*

	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	Comments:	**Comments**: May be 3:1 if at least two of the pharmacy technicians have a current certification issued by the pharmacy technician certification board or a current certification issued by any other pharmacy technician certification organization approved by the board. *K.A.R 68-5-16(b)*	**Comments**: Training program meeting requirements designed for practice site. The pharmacist-in-charge shall permit a pharmacy technician to perform tasks authorized by the pharmacy act only if the pharmacy technician has successfully completed, within 180 days employment, a training course that was designed for the pharmacy in which the tasks are performed. *K.A.R 68-5-15(c)*	**Comments**: Every person registered as a pharmacy technician shall pass one or more examinations identified and approved by the board within the period or periods of time specified by the board after becoming registered. *KS Stat. 65-1663(a)*	**Comments:**
KY	"Pharmacy technician" means a natural person who works under the immediate supervision or general supervision if otherwise provided for by statute or administrative regulation, of a pharmacist for the purpose of	None	No	No	A **certified pharmacy technician** under supervision initiate or receive calls from prescriber related to refills as long as the information communicated does not relate to the refill authorization. *KY BReg 201 KAR 2:045(Sec 2)*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	assisting a pharmacist with the practice of pharmacy. *KY PracAct 315.010(20)* A "**certified pharmacy technician**" is an individual who has successfully completed the National Certification Examination administered by the PTCB and has successfully completed the Nuclear Pharmacy Technician Training Program at the University of Tennessee. *KY BReg 201 KAR 2:045(Sec 1)*				
	Comments:	**Comments**:	**Comments**:	**Comments**: Must successfully complete exams administered by either PTCB or NHA. *KY BReg 201 KAR 2:045(Sec 2)*	**Comments:**
LA	"Pharmacy technician" means an individual who assists in the practice of pharmacy under the direct and immediate supervision of a licensed pharmacist and is certified to do so by the board. *LAC 46:LIII § 901*	2:1 *LAC 46:LIII § 907(A)(2)*	Yes *LAC 46:LIII § 903(B)(5)*	Yes *LAC 46:LIII § 905(A)(5); LAC 46:LIII § 909*	Pharmacy technician candidates and pharmacy technicians may assist the pharmacist by performing those duties and functions assigned by the pharmacist while under his direct and immediate supervision. *LAC 46:LIII § 907(A)*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	Comments: *Pharmacy Technician Candidate*: An individual not yet certified as a pharmacy technician by the board who is: (a) an individual who possesses a valid registration and is working under the supervision of a pharmacist for the purpose of obtaining practical experience for certification as a pharmacy technician by the board; or (b) an individual who possesses a valid registration and is awaiting examination. *LAC 46:LIII § 901*	**Comments**: The ratio of technicians to pharmacists on duty may be increased to three to one if no technician candidates are on duty at the same.	**Comments**: Must demonstrate successful completion of nationally-accredited and board-approved pharmacy technician training program; 600 hours practical experience required in pharmacy. *LAC 46:LIII § 903(B)(5)*	**Comments**: Technicians must achieve a passing score on a board-approved certification exam. *LAC 46:LIII § 905(A)(5)* Final rule amends regulations under LAC 46:LIII, Chapter 9, to remove the requirement that pharmacy technicians licensed and practicing in another state obtain a pharmacy technician candidate registration and allow those licensed and practicing in another state to apply for a pharmacy technician certificate. The rule requires such applicants to demonstrate completion of a board-approved pharmacy technician certification examination and at least one year of practice in the state of initial licensure. **The rule is effective April 20, 2020.**	**Comments:** Pharmacy technicians shall not: • process verbal prescription order until it is reduced to writing and initialed by technician and pharmacist; • interpret prescription orders (a technician may translate prescription orders); • compound high-risk sterile preparations; • counsel patients. *LAC 46:LIII § 907(C)*
ME	A person employed by a pharmacy who works in a supportive role to, and under the direct supervision of, a licensed pharmacist. *ME PracAct §13702-A*	None	Yes *ME BReg Ch. 7, Sec 2*	No	A pharmacy technician may: • accept new prescriptions; • receive transfers of non-controlled drugs; • prescription data entry;

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					• prescription drug selection from inventory; • count, package and label drugs. *ME BReg Ch.7, Sec. 1-A*
	Comments:	**Comments**:	**Comments**: Pharmacy to develop training and ensure technicians are trained. Training must delineate functions of the technicians. *ME BReg Ch. 7, Sec 2*	**Comments**:	**Comments:** A pharmacy technician may not: • clinically evaluate a patient profile; • perform patient counseling; • make decisions that require professional training of a pharmacist; • sign any federally-required controlled substance or inventory form. *ME BReg Ch. 7, Sec 5(3)(A)*
MD	Individual who is registered with the Board of Pharmacy to perform certain delegated pharmacy acts. *MD Code, Health Occupations, § 12-101(w); COMAR 10.34.34.02(9)*	None	Yes *MD Code, Health Occupations, § 12-205; § 12-6B-02*	Yes *MD Code, Health Occupations, § 12-101; § 12-6B-02*	Tasks may be delegated to technicians as long as they are non-judgmental and appropriate to the training and experience of the technician. *MD Code, Health Occupations, § 12-307; MD Code, Health Occupations, § 12-6B-06* "Delegated pharmacy acts" means "an activity that

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					constitutes the practice of pharmacy delegated by a licensed pharmacist…by regulations adopted by the Board." *MD Code, Health Occupations, § 12-101*
	Comments:	**Comments**:	**Comments**: Training must be approved by the Board. *COMAR 10.34.34.06*	**Comments**: Must be certified by a national pharmacy tech certification program, have passed a board-approved exam, and completed a tech training program approved by the Board of Pharmacy. *COMAR 10.34.34.07*	**Comments:** A pharmacy technician may not: • dispense without supervision; • be onsite without supervision; • provide information for safe use of drugs; • delegate duties; • provide therapy management; • administer flu vaccine; • provide the final verification; • clinically evaluate patient; • patient consultation; • accept new prescriptions; • accept transferred prescription; • independently compound prescriptions; • administer medications;

	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					• accept returns. *MD Code, Health Occupations, § 12-6B-06; COMAR 10.34.34.03*
MA	An individual, who is registered by the Board and who performs pharmacy duties under the direct supervision of a pharmacist. *247 CMR 2.00* **Certified pharmacy technician**: a tech that is registered by board & certified by a board-approved certifying body. *247 CMR 2.00; 247 CMR 8.04*	4:1 *247 CMR 8.06(3)*	Yes *M.G.L.A. 112 § 24C;* *247 CMR 8.02(5)*	No	A **certified pharmacy technician** may perform the following duties: • relay to patient a pharmacist's "offer to counsel"; • request refill authorizations; • prescription transfers for controlled substances; • assist in transport and handling of Schedule II controlled substance. *247 CMR 8.04(2);* *247 CMR 8.05(2)(b)*
	Comments:	**Comments**: 4:1 provided that at least one is certified and one is an intern or two are certified. 3:1 if only one is certified or an intern. *247 CMR 8.06(3)*	**Comments**: Technicians must complete board approved training program unless they certify that they have 500 hours employment as a tech trainee; NACDS tech training program approved.	**Comments**: Technicians must achieve a Board-approved passing score on either a Board-approved examination administered by the employer that covers specific knowledge based areas or a Board-approved national technician examination. *247 CMR 8.02(6)*	**Comments:** A technician may not: • administer controlled substances; • perform drug utilization review; • conduct clinical conflict resolution; • contact prescribers; • provide patient counseling; or

	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
			Approved training programs include ASHP, US Armed Services, programs with minimum of 240 hours of theoretical and practical instruction, with 120 hours of theoretical training or any other program approved by the Board. *247 CMR 8.02(5)*	ExCPT is an officially approved program by the Board.	• perform final dispensing process validation. *247 CMR 8.02(3)(d)* A **certified pharmacy technician**, pharmacy technician or pharmacy technician trainee may not handle any hydrocodone-only extended release medication that is not in an abuse deterrent form. *247 CMR 8.05(3)*
MI	Required to hold a health profession subfield license under this part to serve as a pharmacy technician. *M.C.L.A. 333.17707(6)* "Temporary pharmacy technician license" requires working to complete exam and a Board-approved program *M.C.L.A. 333.17739b* Limited pharmacy technician is employed on or before 12/22/2014 and has since been continuously employed by that pharmacy. Must provide	None	Yes *M.C.L.A. 333.17739a*	Yes *M.C.L.A. 333.17739a(1)(d)*	A technician may: • assist in the dispensing process; • transfer prescriptions; • prepare or mix intravenous drugs for injection; • contact prescribers concerning prescription drug order clarification; • receive verbal orders for prescription drugs, except orders for controlled substances. *M.C.L.A. 333.17739(1)* A licensed pharmacy technician may also engage in

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	documentation showing minimum of 1,000 hours during the 2-year period immediately preceding application. *M.C.L.A. 333.17739c*				reconstituting dosage forms under the delegation and supervision of a licensed pharmacist. *Mich. Admin. Code R. 338.3665*
	Comments:	**Comments**:	**Comments**: Must complete a Board approved program. *M.C.L.A. 333.17739a(1)(d)(iv)* Board-approved programs include APCE accredited, completed at a licensed school, and employer-based. *Mich. Admin. Code R. 338.3655(1)*	**Comments**: Must submit proof of passing any of the following: PTCB, ExCPT, any other nationally recognized exam approved by the Board, or employer-based exam approved by the Board. *M.C.L.A. 333.17739a(1)(d); Mich. Admin. Code R. 338.3651(b)(ii)*	**Comments:** Cannot handle transfer or receive verbal orders for controlled substance prescriptions. *M.C.L.A. 333.17739*
MN	A person not licensed as a pharmacist or registered as a pharmacist intern, who has been trained in pharmacy tasks that do not require the professional judgment of a licensed pharmacist. A pharmacy technician may not perform tasks specifically	4:1 *M.S.A. 151.102 Subd.1*	Yes *MN Rules 6800.3850 Subp. 1h*	No	A pharmacy technician may assist a pharmacist in the practice of pharmacy by performing tasks that are not reserved to, and do not require the professional judgment of, a licensed pharmacist. *M.S.A. 151.102 Subd.1;*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	reserved to a licensed pharmacist. *M.S.A 151.01 Subd. 15a*				*MN Rules, part 6800.3850, Subp.2*
	Comments:	**Comments**: 4:1 as long as one technician is certified by PTCB or another national certification body approved by the Board. *M.S.A. 151.102 Subd.1* PIC may petition the board for authorization to allow a pharmacist to supervise more than three pharmacy technicians *M.S.A. 151.102 Subd.2*	**Comments**: Must complete one of the following types of training programs: offered by a board-approved, accredited school; accredited by a board-approved, national organization that accredits technician training programs; provided by a US Army or Public Health Service; or employer-based training. *MN Rules, part 6800.3850, Subp. 1h*	**Comments**:	**Comments:**
MS	"Supportive personnel" or "pharmacist technician": Those individuals utilized in pharmacies whose responsibilities are to provide nonjudgmental technical services concerned with the preparation and distribution of	3:1 *Miss. Admin. Code 30-20-3001: XL(4); Miss. Admin. Code 30-20-3001:VIII(C)(5)*	No	Yes *Miss. Admin. Code 30-20-3001:XL(3)(C)*	A Pharmacy technician may: • pack medications; • affix labels; • enter information into the pharmacy computer. • obtain prescriber authorization for prescription refills;

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	drugs under the direct supervision and responsibility of a pharmacist. *MS PracAct § 73-21-73(kk)*				• bulk reconstitution of prefabricated non-injectable medication. • bulk compounding. • prepare parenteral. *Miss. Admin. Code 30-20-3001: XL(4)* Pharmacy technicians may assist pharmacists in compounding. Duties shall be consistent with the training received. *Miss. Admin. Code 30-20-3001:XXXI*
	Comments:	**Comments**: Support personnel used solely for clerical duties such as filing prescriptions, delivery and general record keeping not included in the ratio. *Miss. Admin. Code 30-20-3001: XL;* *Miss. Admin. Code 30-20-3001:VIII*	**Comments**:	**Comments**: Pharmacy technicians renewing registration must successfully passed PTCB or a Pharmacy Technician exam approved by the Board. *Miss. Admin.* *Code 30-20-3001: XL(3)(C)*	**Comments:** Technicians shall not: • communicate drug information to patients; • accept by oral communication a new prescription of any nature; • prepare a copy of a prescription or read a prescription to another person; • provide a prescription or medication to a patient without a pharmacist's verification.

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					Miss. Admin. Code 30-20-3001: XL(4)
MO	Any person who assumes a supportive role under the direct supervision and responsibility of a pharmacist and who is utilized according to written standards of the employer or the pharmacist-in-charge to perform routine functions that do not require the use of professional judgement in connection with the receiving, preparing, compounding, distribution, dispensing of medications. *20 Mo. Code of State Regulations 2220-2.700(1)*	None	No	No	Automated filling systems may be stocked or loaded by a pharmacy technician under the direct supervision of a pharmacist. *20 Mo. Code of State Regulations 2220-2.950(2)*
	Comments:	**Comments**:	**Comments**:	**Comments**:	**Comments:** 20 CSR 2220-2.995 Board Approved Pilot and Research Projects Final rule of the Department of Commerce and Insurance, State Board of Pharmacy, amends regulations under 20 CSR 2220-6.055 to allow pharmacy technicians and intern

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					pharmacists to assist pharmacists with nondispensing activities outside of a pharmacy. The rule also establishes standards for such activities. **The rule is effective Aug. 30, 2020.** Final rule of the Department of Commerce and Insurance, State Board of Pharmacy, adopts regulations under 20 CSR 2220-2.710 establishes standards for the supervision of pharmacy technicians and intern pharmacists. The rule also establishes standards for the use of technology when supervising such technicians and interns. **The rule is effective Aug. 30, 2020.**
MT	"Pharmacy technician" means an individual who assists a pharmacist in the practice of pharmacy. *MT Pharmacy Practice Act 37-7-101* "Authorized agent" means a designated person authorized access by an authorized user. An authorized agent for a pharmacist must be a	4:1 *MT BoP Regs 24.174.711(1)*	Yes *MT BoP Regs 24.174.704*	Yes *MT BoP Regs 24.174.702*	A pharmacy technician may: • remove and pour a stock bottle, with subsequent pharmacist verification; • type and affix labels with final review by the registered pharmacist; • enter prescription information into an automated system under the supervision of a pharmacist;

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	pharmacy intern or certified pharmacy technician. *MT BoP Regs 24.174.701(2)*				• maintain prescription records; • prepackage unit dose drugs for internal distribution, with final check by supervising pharmacist; • accept verbal orders for refills; • act as agent in charge for less than 30 minutes when pharmacist is not present; • compounding with verification by the supervising pharmacist. *MT BoP Regs 24.174.705*
	Comments:	**Comments**: The 4:1 technician to pharmacist ratio may be revised by the board for good cause. Pharmacy must obtain prior written approval. *MT BoP Regs 24.174.711(1)*	**Comments**: Training must include practical and didactic education for that practice site. Board approval is necessary for the training program. *MT BoP Regs 24.174.704*	**Comments:** Certified PTCB or other board approved certifying entity (ExCPT mentioned in BoP Reg 24.174.701) *MT BoP Regs 24.174.702*	**Comments:** A pharmacy technician may not perform tasks which require the exercise of the pharmacist's independent professional judgment, including but not limited to, patient counseling, drug product selection, drug interaction review or drug regimen review. *MT BoP Regs 24.174.703(1)*
NE	Pharmacy technician means an individual registered under sections 38-2890 to 38-2897.	3:1	Yes	Yes	A pharmacy technician shall only perform tasks which do not require professional judgment

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	(Sections explained under training and certification) *NE Pharmacy Practice Act 38-2836*	*Neb.Rev.St. § 38-2866.01*	*NE Board of Examiners in Pharmacy Regs Title 175, Chapter 8-006.01D*	*NE Pharmacy Practice Act 38-2890(1)*	and which are subject to verification to assist a pharmacist in the practice of pharmacy. *NE Practice Act 38-2891(1)*
	Comments:	**Comments**: A pharmacist may supervise any combination of pharmacy technicians and pharmacist interns at any time up to a total of three people. *Neb.Rev.St. § 38-2866.01;* Outdated rules specify - 3:1 ratio as long as no more than two individuals are pharmacy technicians. Pharmacies participating in scientific studies based on improved patient care may request an increase in ratio by application to the Board.	**Comments**: PIC in charge of and responsible for training, supervision, and practice of pharmacy technicians. *NE Board of Examiners in Pharmacy Regs Title 175, Chapter 8-006.01D*	**Comments:** All technicians must register and be certified by a state or national certifying body which is approved by the board. *NE Pharmacy Practice Act 38-2890(1)*	**Comment**s: Pharmacy technicians may not: • receive verbal prescriptions; • provide patient counseling; • perform any evaluation or necessary clarification of a medical order that are not strictly clerical in nature; Supervise or verify other technicians, Interpret or evaluate patient's record; • release confidential information; • perform professional consultations; and Drug product selection. • receive a refill authorization issued by the prescribing practitioner 38-2870 (4) *NE Practice Act 38-2891(2)*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
		NE Board of Examiners in Pharmacy Regs Title 172, Chapter 128-012.01			
NV	"Pharmaceutical technician" means a person who performs technical services in a pharmacy under the direct supervision of a pharmacist and is registered with the Board. *NV Pharmacy Practice Act 639.0113*	3:1, and up to 8:1 in a "non-dispensing pharmacy" *NV BoP Regs NAC 639.250(2)&(4)* *Non-Dispensing Ratio:* Final rule of the Board of Pharmacy expanded the ratio up to 8:1 in a "non-dispensing pharmacy" "nondispensing pharmacy" and clarifies supervision requirements for telepharmacies, remote sites, satellite consultation sites, and nondispensing pharmacies. **The rule i s effective Oct. 30, 2019.**	Yes *NV BoP Regs NAC 639.240(e)(2)*	No *NV BoP Regs NAC 639.240(e)(6)*	Pharmacy technicians may: • remove drugs from stock; • count, pour, or mix drugs; • place drugs in containers; • affix labels to containers; • package and repackage drugs. A pharmaceutical technician under the direct and immediate supervision of a pharmacist may administer immunizations under the conditions prescribed in NAC 639.2971 if he or she has received training required by NAC 639.2973 and the continuing education required by NAC 639.2974. https://bop.nv.gov/uploadedFiles/bopnvgov/content/Resources/ALL/2020-09-11.BoP%20Emergency%20Reg

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					ulations%20re%20Vaccinations%20FILED.pdf *NV Pharmacy Practice Act 639.1371(3)(c)*
	Comments:	**Comments**:	**Comments**: If technician is from out of state, training not required as long as experience requirements are met. *NV BoP Regs NAC 639.240(e)(2)*	**Comments:** PTCB and ExCPT are accepted. *NV BoP Regs NAC 639.240(e)(6)*	**Comments:**
NH	"Registered pharmacy technician" means a person employed by a pharmacy who can assist in performing, under the supervision of a licensed pharmacist, manipulative, nondiscretionary functions associated with the practice of pharmacy and other such duties and subject to such restrictions as the board has specified. "**Certified pharmacy technician**" means a registered pharmacy technician who has	None	Yes *NH BoP Regs Ph. 803.01(4)*	No	Registered pharmacy technicians may: • process refill request orders; • retrieve files; • count, weigh, measure, pour, and reconstitute prescriptions; • enter prescription data without supervision provided Board approved training. *NH BoP Regs Ph 807.02*

	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	become and who maintains national certification by taking and passing an exam recognized by the board for the purpose of certifying technicians. *NH BoP Regs Ph. 802.01*				Registered **certified pharmacy technicians** may: • accept oral prescriptions; • transfer prescriptions; • communicate verbally or in writing patient information not requiring professional judgment; • data entry without supervision; • reduce to writing a prescription left on a recording; • compound sterile and non-sterile drugs with training; • stock dispensing machine or other stock location. *NH BoP Regs Ph 807.03*
	Comments:	**Comments**:	**Comments**: Must have 80 hours of on the job training and be registered with Board within 15 days of employment. *NH BoP Regs Ph.803.01(4)*	**Comments:** Only required for certified pharmacy technician; must pass a nationally recognized certification exam recognized by the board. *NH BoP Regs Ph. 803.01(4)(e)*	**Comments:**
NJ	"Pharmacy technician" means an individual registered with	2:1	No	No	Pharmacy technicians may: • retrieve files;

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	the Board and who works under the immediate personal supervision of a pharmacist in compliance with N.J.A.C. 13:39-6.15. For purposes of this definition, interns, externs, cashiers, stocking and clerical help are not pharmacy technicians. *NJ BoP Regulations 13:39-1.2*	*NJ BoP Regulations 13:39-6.15(d)*			• enter prescription data; • collect demographic information from patients; • transcribe scanned prescriptions; • label preparations; • count, weigh, measure, pour, and compound prescriptions of drugs including controlled substances; • accept authorization from patients or prescribers for refills. *NJ BoP Regulations 13:39-6.15(a)*
	Comments:	**Comments**: Increased ratio allowed if pharmacy establishes a defined job description, technician receives training prior to performing duties, and the technician is certified by PTCB or other Board approved certification program. *NJ BoP Regulations 13:39-6.15(e)*	**Comments**:	**Comments:** Not required unless ratio exceeds 2:1; PTCB or board approved certification program. *NJ BoP Regulations 13:39-6.15(e)(2)(i)*	**Comments:** Pharmacy technicians may not: • receive new verbal prescriptions; • interpret a prescription or medication order for therapeutic appropriateness; • verify dosage and directions; • engage in prospective drug review; • provide patient counseling; • monitor prescription usage;

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					• override computer alerts without first notifying the pharmacist; • transfer prescriptions from one pharmacy to another pharmacy; • violate patient confidentiality. *NJ BoP Regulations 13:39-6.15(b)*
NM	"Pharmacy technician" means a person who, under the supervision of a licensed pharmacist, performs repetitive tasks not requiring the professional judgment of a pharmacist, including assisting in various technical activities associated with the preparation and distribution of medications. *NMAC 16.19.22.7(C)* **"Certified pharmacy technician"** means a pharmacy technician who has completed the training and certification, completed a board approved certification exam, is registered by the board and maintains	None	Yes *NMAC 16.19.22.9(A)*	Yes *NMAC 16.19.22.9(D)*	Pharmacy technicians may: • prepare, mix, assemble, package and label medications; • process routine orders of stock supplies; • prepare sterile products; • fill a prescription that entails counting, pouring, labeling or reconstituting medications; • perform tasks assigned by the supervising pharmacist that do not require professional judgment. *NM Pharmacy Practice Act 61-11-11.1(B)*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	current board approved certification. *NMAC 16.19.22.7(C)(1)* "Non-certified pharmacy technician" means a pharmacy technician who is in the process of completing the training and education and is registered by the board of pharmacy. *NMAC 16.19.22.7(C)(2)*				
	Comments:	**Comments**: The permissible ratio of techs to pharmacist on duty TBD by PIC. Also, BOP reserves right to impose ratio if circumstances so dictate. *NMAC 16.19.22.10*	**Comments**: PIC must ensure technician has completed a comprehensive training. *NMAC 16.19.22.9(A)*	**Comments**: Technicians required to obtain board approved certification within one year of registration. *NMAC 16.19.22.9(E)* Board accepts PTCB or ExCPT certification *(source: BoP website)*	**Comments:**
NY	No definition of technician; considered "unlicensed persons"	2:1 *NY BoP Regs Chapter I. Part 29.7(21)(ii)(a)*	No	No	Unlicensed persons may assist pharmacists by: • receiving written or electronic prescriptions; • typing prescription labels; • entering and retrieving data; • getting and returning drugs from stock;

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					• getting files from storage and locating prescriptions; • counting dosage units of drugs; • placing dosage units of drugs in appropriate containers; • affixing the prescription label; • preparing manual records of dispensing for the signature or initials of the pharmacist; • delivering completed prescriptions to the patient. *NY BoP Regs Chapter I. Part 29.7(21)(i)*
	Comments:	**Comments**:	**Comments**:	**Comments:**	**Comments:** Unlicensed persons shall not: • receive oral prescriptions from prescribers; • interpret and evaluate a prescription; • make determinations of therapeutic equivalency; • measure, weigh, compound or mix ingredients; Sign or initial any record of

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					dispensing; counsel patients. *NY BoP Regs Chapter I. Part 29.7(21)(ii)(b)*
NC	"Pharmacy technician" means a person who may, under the supervision of a pharmacist, perform technical functions to assist the pharmacist in preparing and dispensing prescription medications. *Pharmacy Practice Act, NC Gen. Stat. § 90-85.3(q2)* "**Certified pharmacy technician**" means a pharmacy technician who (i) has passed a nationally recognized pharmacy technician certification board examination, or its equivalent, that has been approved by the Board and (ii) obtains and maintains certification from a nationally recognized pharmacy technician certification board that has been approved by the Board. *Pharmacy Practice Act, NC Gen. Stat. § 90-85.3(b1)*	2:1 *Pharmacy Practice Act, NC Gen. Stat.. § 90-85.15A(c)*	Yes *Pharmacy Practice Act, NC Gen. Stat. § 90-85.15A(a2)*	No	Under the supervision of a pharmacist, perform technical functions to assist in preparing and dispensing prescriptions. *Pharmacy Practice Act, NC Gen. Stat. § 90-85.3(q2)*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	Comments:	**Comments**: Ratio may increase with written Board approval. Additional technician(s) must be certified. *Pharmacy Practice Act, NC Gen. Stat. § 90-85.15A(c)* See additional guidance from BoP applicable to tech ratio waiver requests for 3:1 or 4:1, vs requests for 5:1 or more *http://www.ncbop.org/PDF/PT_Ratio_Guidance_5to1or_greater_Apr2021.pdf*	**Comments**: The pharmacist-manager must provide a comprehensive training program for a technician, to be completed within 180 days of employment. *Pharmacy Practice Act, NC Gen. Stat. § 90-85.15A(a2)*	**Comments:**	**Comments:**
ND	"Pharmacy technician" is registered by the Board and assists in the technical services of preparing medications for final dispensing by a licensed pharmacist. *ND BoP Reg 61-02-07.1-02(1)* "Pharmacy technician in training" is enrolled ND technician program or in on	4:1 *ND BoP Reg* 61-02-07.1-04	Yes *ND BoP Reg 61-02-07.1-03(1)*	Yes "If a competency examination is developed by the national association of boards of pharmacy to foster transfer of registration between states, this will be accepted in lieu of certification." *ND BoP Reg 61-02-07.1-03(2)*	Technicians may perform any services assigned by PIC in preparation of pharmaceuticals to be dispensed. The pharmacist is legally responsible for all the pharmacy technician's activities and services performed. Pharmacy technicians may assess a patient receiving a refilled prescription, on the need

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	the job training under supervision of pharmacist. *ND BoP Reg 61-02-07.1-02(2)*				of the patient or the patient's agent, to have a consultation with the pharmacist or pharmacy intern about the prescription. *ND BoP Reg 61-02-07.1-05* Immunizations: SB 2779, permitting the Board of Pharmacy to adopt rules to establish requirements to allow a pharmacy technician to administer a drug under the immediate supervision of a pharmacist, was signed on March 25, 2021. Also in North Dakota. On March 25, 2021, SB 2779, permitting the Board of Pharmacy to adopt rules to establish requirements to allow a pharmacy technician to administer a drug under the immediate supervision of a pharmacist, as an emergency measure.

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	Comments:	**Comments**:	**Comments**: Prior to registration, technician must complete an ASHP accredited academic program or an ASHP accredited employer based program. *ND BoP Reg 61-02-07.1-03(1)*	**Comments:** Prior to registration, a technician must obtain a certificate by a national certification body approved by the Board. *ND BoP Reg 61-02-07.1-03(2)*	**Comments:** The pharmacy technician may not: • evaluate the patient's profile; • consult with patients; • make decisions that require a pharmacist's professional education; • engage in the practice of pharmacy, except as authorized by a licensed pharmacist, as permitted by North Dakota law and rules adopted by the board. *ND BoP Reg 61-02-07.1-06*
OH	"Qualified pharmacy technician" means a person who is under the personal supervision of a pharmacist. *ORC 47-4729.42*	None	Yes *OAC 4729-4-03*	Yes *OAC 4729-4-02*	A qualified technician may assist a pharmacist in the compounding and dispensing of drugs. *OAC 4729-16-03(E)*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	Comments:	**Comments**:	**Comments**: A pharmacy technician training program must be of appropriate breadth and depth, clearly addressing the competencies for a technician to safely and effectively work in that particular setting. *OAC 4729-4-03*	**Comments:** Exams by a NCCA accredited program or Board approved employer based training exam are accepted. *OAC 4729-4-02*	**Comments:** Pharmacy technicians may not: • package or label any drug; • prepare or mix any intravenous drug to be injected into a human being. *ORC 4729.42(2)*
OK	"Pharmacy technician", "Technician", or "Rx Tech" means a person who has been issued a permit by the Board to assist the pharmacist and perform nonjudgmental, technical, manipulative, non-discretionary functions in the prescription department under the pharmacist's immediate and direct supervision. *OK BoP Regs 535:15-13-3*	2:1 *OK BoP Regs 535:15-13-5(c)*	Yes *OK BoP Regs 535:15-13-13*	No	Only specified for hospital settings. *OK BoP Regs 535:15-5-7.4*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	Comments:	**Comments**: A pharmacy intern working in the pharmacy will not affect or change this ratio. *OK BoP Regs 535:15-13-5(d)*	**Comments**: Applicants must complete Phase I training before applying for technician permit. Must have permit before performing authorized duties. *OK BoP Regs 535:15-13-13(a)(3)(A)* Pharmacy manager responsible for the development and/or implementation of a technician training program. Minimum standards for training programs set out in the Board approved "Pharmacy Technician Training Guidelines". *OK BoP Regs 535:15-13-13(a)(3)*	**Comments:**	**Comments:**
OR	"Pharmacy technician" means a person licensed by the State Board of Pharmacy who assists the pharmacist in the practice of pharmacy pursuant to rules of the board.	None	Yes *OR State Board Regs 855-025-0025(6)*	Yes *OR State Board Regs 855-025-0012(1)*	Technicians may: • Pack medications for dispensing; • reconstitute medications; • affixing labels; • data entry;

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	OR State Board Regs 855-006-0005(20) **"Certified Pharmacy Technician"** means a person licensed by the State Board of Pharmacy who assists the pharmacist in the practice of pharmacy and has completed the specialized education program *OR State Board Regs 855-006-0005(2)*				• initiate or accept oral or electronic refill authorization; • prepackage and label multi-dose medications; record patient or medication information; *OR State Board Regs 855-025-0040*
	Comments:	**Comments**:	**Comments**: PIC must outline, and each Pharmacy Technician or Certified Oregon Pharmacy Technician must complete initial training that includes on-the-job and related education that is commensurate with the tasks to be performed. *OR State Board Regs 855-025-0025(6)(a)*	**Comments:** Must pass PTCB exam or ExCPT. *OR State Board Regs 855-025-0012(1)*	**Comments:** Technicians may not: • Accept oral prescriptions; • receive or transfer without the prior verification; • dispense without pharmacist verification; • counsel patients; • perform tasks requiring professional judgment. *OR State Board Regs 855-025-0040(3)*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
PA	An unlicensed person working in a pharmacy to assist a pharmacist in the practice of pharmacy in accordance with § 27.12 (relating to practice of pharmacy and delegation of duties). *PA BoP Regulations 49-27.1*	None	None	No	Pharmacy technicians may: • carry containers of drugs in and around the pharmacy; • count pills and put them in a container; • type or print labels; • maintain records which are related to the practice of pharmacy; • assist the pharmacist in preparing and reconstituting parenteral products and other medications; • enter prescription, drug order or patient information in a patient profile. *PA BoP Regulations 49-27.12(d)(2)*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	Comments:	**Comments**:	**Comments**:	**Comments:**	**Comments:** A pharmacy technician may not: • accept or transcribe an oral order or telephone prescription; • enter or be in a pharmacy if a pharmacist is not on duty; • perform any act within the practice of pharmacy that involves discretion or independent professional judgment; • perform a duty until the technician has been trained and the duty has been specified in a written protocol. *PA BoP Regulations 49-27.12(d)(3)*
RI	Individual who meets minimum qualifications established by the Board, which are less than those established by the Act as necessary for licensing as a pharmacist; and works under the direction and supervision of a licensed pharmacist. *RI Dept of Health Rules and Regulations 31-2-8:1.90*	None	None	No	A Pharmacy Technician I may request refill authorizations via voice mail. **A Pharmacy Technician II may**: • request refill authorizations with pharmacist approval; • receive new and changes to prescriptions; and

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					• be in the pharmacy without a pharmacist present in order to prepare medications and to perform other duties. *RI Dept of Health Rules and Regulations 31-2-8:24.14-17*
	Comments: There shall be two levels of licensure, Technician I and Technician II. Technician II is licensed by the Board as a Pharmacy Technician and who is also currently certified by PTCB or other national certifying organization as may be approved by the Board. *RI Dept of Health Rules and Regulations 31-2-8:1.90*	**Comments**:	**Comments**:	**Comments:** Only required for Pharmacy Technician II applicants. *RI Dept of Health Rules and Regulations 31-2-8:24.13.5*	**Comments:** Technician I may not perform: • drug utilization review; • clinical conflict resolution; • prescriber contact for prescription clarification; • patient counseling; • receive new prescription drug orders; or • conduct prescription transfers. Pharmacy Technician II may not: • perform drug utilization review; • clinical conflict resolution; therapy modification; • patient counseling; or • dispensing process validation.

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					RI Dept of Health Rules and Regulations 31-2-8:24.14-17
SC	"Pharmacy technician" means an individual other than an intern or extern, who assists in preparing, compounding, and dispensing medicines under the personal supervision of a licensed pharmacist and who is required to register as a pharmacy technician. *SC Pharmacy Practice Act 4-43-30(42)* **"Certified pharmacy technician"** means an individual who is a registered pharmacy technician and who has completed the requirements provided for in Section 40-43-82(B). *SC Pharmacy Practice Act 40-43-30(54)*	4:1 (changed by 2017 HB 3824) *SC Pharmacy Practice Act 40-43-86(B)(4)(b)*	Yes *SC Pharmacy Practice Act 40-43-82(B)(1)(a)*	No *SC Pharmacy Practice Act 40-43-82(B)(1)(b)*	A supervising pharmacist may authorize a **certified pharmacy technician** to: • receive and initiate verbal telephone orders; • conduct one-time prescription transfers; • check a technician's refill of medications in an institutional setting; or • check a technician's repackaging of medications from bulk to unit dose in an institutional setting. *SC Pharmacy Practice Act 40-43-82(C)*
	Comments:	**Comments**: At least two technicians must be state-certified. If a pharmacist supervises only one or two pharmacy technicians, these technicians are	**Comments:** Board approved training programs in a formal academic setting. *SC Pharmacy Practice Act 40-43-82(B)(1)(a)*	**Comments:** Only required when pharmacist is supervising more than 2 technicians. Certification if worked for 1000 hours under the supervision of a licensed pharmacist and passed the National Pharmacy Technician	**Comments:**

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
		not required to be state-certified. *SC Pharmacy Practice Act 40-43-86(B)(4)(b)*		Certification Board exam or a Board of Pharmacy approved exam and has maintained current certification. *SC Pharmacy Practice Act 40-43-82(B)(1)(b)*	
SD	"Registered pharmacy technician," a person registered by the board who is employed by a pharmacy to assist licensed pharmacists in the practice of pharmacy by performing specific tasks delegated by and under the immediate personal supervision and control of a licensed pharmacist, as permitted by the board. *SDCL 36-11-2(22A)*	3:1 *SD 20:51:29:19*	Yes *SD 20:51:29:11*	Yes *SD 20:51:29:06*	At the discretion of the supervising pharmacist, a pharmacy technician may: • perform repetitive tasks related to processing prescriptions; • accept prescription refill authorizations; • contact prescriber to obtain prescription refill authorization; • collect patient information; • inspect drug supplies; • assist pharmacist with the preparation of medications for administration. *SD 20:51:29:21*
	Comments:	**Comments**:	**Comments**: Board approved program offered by accredited school, board approved program offered by national	**Comments:** Must pass a board-approved pharmacy certification examination accredited by the NCCA *SD 20:51:29:06*	**Comments:** A pharmacy technician may not: • provide final verification; • Conduct prospective drug use review;

	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
			organization that accredits technician programs, program offered by US Army or Public Health Service, or Board approved employer based programs are accepted. *SD 20:51:29:11*		• accept new oral prescription orders; • open, keep open, or provide pharmaceutical services from a pharmacy without a pharmacist being present. *SD 20:51:29:21*
TN	Pharmacy technician" means an individual registered by the Board as a pharmacy technician who is an employee of a federally qualified health center participating in this program and is being supervised by a pharmacist at the central pharmacy; *TN PracAct 63-10-204(38);* *TN BoP Reg 114013-.02(9)* **Certified pharmacy technician** means an individual who is certified by a national or state agency that offers a certification program that is recognized by the board. *TN BoP Reg 1140-01-.01(8)*	2:1 *TN BoP Reg 1140-02-.02(7)(a)*	None	No	A pharmacy technician may, in the presence of and under the supervision of a pharmacist, perform those tasks associated with the preparation and dispensing process. *TN BoP Reg 1140-02-.02(4)* **Certified pharmacy technicians** may also: • receive new or transferred oral medical and prescription orders; • receive and transfer copies of oral prescription orders; • verify the contents of unit dose carts prepared by other registered technicians. *TN BoP Reg 1140-02-.02(5)*

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	Comments:	**Comments**: Ratio may be increased to 4:1 by PIC based upon public safety considerations. Additional technicians must be certified. PIC may request a modification of the ratio from the Board. *TN BoP Reg 1140-02-.02(7)(a)*	**Comments**:	**Comments:** The board may utilize any national certification or licensure examination or contract any qualified examination agency to prepare and administer its licensure examination or examinations, and the board shall establish by rule the minimum score necessary to pass any licensure or certification examination or examinations required by the board. *TN PracAct 63-10-306(i)*	**Comments:**
TX	Individual registered with the Board as a technician and whose responsibility in a pharmacy is to provide technical services that do not require professional judgment regarding preparing and distributing drugs and who works under the direct supervision of and is responsible to a pharmacist. *TX Pharmacy Act 551.003(32); 22 Tex. Admin Code 291.72(38)* Pharmacy technician trainee is registered with the Board and	6:1 *(A)Except as provided in subparagraph (B) of this paragraph, the ratio of on-site pharmacists to pharmacy technicians and pharmacy technician trainees may be 1:6, provided the pharmacist is on-site and a maximum of three of the six are pharmacy technician trainees. The ratio of pharmacists to*	Yes *22 Tex. Admin Code 297.6*	Yes *22 Tex. Admin Code.297.3(C)(1)*	A)Pharmacy technicians and pharmacy technician trainees **may not perform** any of the duties listed in subsection (c)(2) of this section. (Duties which may only be performed by a pharmacist are as follows: (A)receiving oral prescription drug orders for controlled substances and reducing these orders to writing, either manually or electronically; (B)interpreting prescription drug orders;

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
	is authorized to participate in a pharmacy's technician training program. *22 Tex. Admin Code 291.72(38)*	*pharmacy technician trainees may not exceed 1:3.* *Source: https://texreg.sos.state.tx.us/public/regviewer$ext.RegPage?sl=R&app=1&p_dir=&p_rloc=385120&p_tloc=&p_ploc=&pg=1&p_reg=385120&ti=22&pt=15&ch=291&rl=32&issue=12/11/2020&z_chk=*			(C)selecting drug products; (D)performing the final check of the dispensed prescription before delivery to the patient to ensure that the prescription has been dispensed accurately as prescribed; (E)communicating to the patient or patient's agent information about the prescription drug or device which in the exercise of the pharmacist's professional judgment, the pharmacist deems significant, as specified in §291.33(c) of this title; (F)communicating to the patient or the patient's agent on his or her request information concerning any prescription drugs dispensed to the patient by the pharmacy; (G)assuring that a reasonable effort is made to obtain, record, and maintain patient medication records; (H)interpreting patient medication records and

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					performing drug regimen reviews; (I)performing a specific act of drug therapy management for a patient delegated to a pharmacist by a written protocol from a physician licensed in this state in compliance with the Medical Practice Act; (J)verifying that controlled substances listed on invoices are received by clearly recording his/her initials and date of receipt of the controlled substances; and (K)transferring or receiving a transfer of original prescription information for a controlled substance on behalf of a patient.) (C)**Pharmacy technicians and pharmacy technician trainees may perform only** nonjudgmental technical duties associated with the preparation and distribution of prescription drugs, as follows:

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					(i)initiating and receiving refill authorization requests; (ii)entering prescription data into a data processing system; (iii)taking a stock bottle from the shelf for a prescription; (iv)preparing and packaging prescription drug orders (i.e., counting tablets/capsules, measuring liquids and placing them in the prescription container); (v)affixing prescription labels and auxiliary labels to the prescription container; (vi)reconstituting medications; (vii)prepackaging and labeling prepackaged drugs; (viii)loading bulk unlabeled drugs into an automated dispensing system provided a pharmacist verifies that the system is properly loaded prior to use; (ix)loading prepackaged containers previously verified by

State	Definition of a Technician	Tech: Pharmacist Ratio	Training Requirements	Certification Requirements	Specific Duties Technicians May/ May Not Perform
					a pharmacist or manufacturer's unit of use packages into an automated dispensing system in accordance with §291.33(i)(2)(D)(III) of this subchapter; (x)compounding non-sterile prescription drug orders; and (xi)compounding bulk non-sterile preparations. (D)In addition to the duties listed above in subparagraph (C) of this paragraph, pharmacy technicians may perform the following nonjudgmental technical duties associated with the preparation and distribution of prescription drugs: **(i)receiving oral prescription drug orders for dangerous drugs and reducing these orders to writing, either manually or electronically;** (ii)transferring or receiving a transfer of original prescription information for a dangerous drug on behalf of a patient; and

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					(iii)contacting a prescriber for information regarding an existing prescription for a dangerous drug. https://texreg.sos.state.tx.us/public/regviewer$ext.RegPage?sl=R&app=1&p_dir=&p_rloc=385120&p_tloc=&p_ploc=&pg=1&p_reg=385120&ti=22&pt=15&ch=291&rl=32&issue=12/11/2020&z_chk= The board shall adopt rules that permit a pharmacy technician and pharmacy technician trainee to perform only nonjudgmental technical duties under the direct supervision of a pharmacist. *TX Pharmacy Act 568.001(b)* Pharmacy technician employees and trainee employees licensed in Texas may remotely access a Class A, Class C, or Class E pharmacy engaged in centralized prescription drug or medication order processing's data base in order to process prescription or medication drug orders.

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					22 TAC §291.123 Pharmacy technicians and technician trainees may perform data entry remotely in Class A pharmacies where the supervising pharmacist has the ability to immediately communicate directly with the technician/trainee. *22 TAC §291.32*
	Comments:	**Comments:** Ratio may be 4:1 provided the pharmacist is on-site and at least one of the four is a pharmacy technician. The ratio of pharmacists to technician trainees may not exceed 1:3. Ratio may be 5:1 if pharmacy dispenses no more than 20 different prescription drugs *22 Tex. Admin Code 291.32(d)(3)*	**Comments:** Technicians and technician trainees shall complete initial training as outlined by PIC in a training manual. *22 Tex. Admin Code 297.6(a)*	**Comments:** PTCB or other Board approved exam, including ExCPT. *22 Tex. Admin Code 297.3* Board will consider petitions for exemption on a case by case basis. *22 Tex. Admin Code.297.7(a)*	**Comments:**

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UT	"Licensed pharmacy technician" means an individual licensed with the division, that may, under the supervision of a pharmacist, perform the activities involved in the technician practice of pharmacy. *UT Pharmacy Practice Act 58-17b-102(33)*	None	Yes *UT Pharmacy Practice Act 58-17b-305.1*	Yes *UT Administrative Code R156-17b-303c(4)*	A pharmacy technician may : • receive written prescriptions; • take refill orders; • enter and retrieve data; • prepare labels; • Retrieve medications from inventory; • count and pour into containers; • place medications into patient storage containers; • affix labels; • compounding; • counsel for over-the-counter drugs and dietary supplements under the direction of the supervising pharmacist; • accept new prescriptions left on voicemail for a pharmacist to review. • Administer immunizations and emergency medications pursuant to delegation by a pharmacist Source • receive a new prescription drug order under certain conditions

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					and to take refill authorizations Source *UT Administrative Code R156-17b-601(1)*
	Comments:	**Comments:** The PIC or DMPIC responsible to ensure that pharmacy does not operate with a ratio that would result in an unreasonable risk of harm to public health, safety, and welfare. *UT Administrative Code R156-17b-603(3)(r)*	**Comments:** Applicant for licensure must submit evidence that the applicant is enrolled in a training program approved by the division. *UT Pharmacy Practice Act 58-17b-305.1*	**Comments:** Must pass Utah Pharmacy Technician Law and Rule Examination with a minimum score of 88 percent) and PTCB or ExCPT with a passing score as established by the certifying body. *UT Administrative Code R156-17b-303c(4)*	**Comments:** The pharmacy technician shall not: • receive new prescriptions; • clarify prescriptions; • perform drug utilization reviews. *UT Administrative Code R156-17b-601(3)*

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VT	A pharmacy technician is an individual who performs tasks relative to dispensing and only while assisting and under the supervision and control of a licensed pharmacist. *26 V.S.A. § 2022(13);* *VT Admin Rules of the Board of Pharmacy 20-4-1400:5.1* **Certified pharmacy technician** means an individual who is: registered with the Board; who has obtained and maintains current certification and who has a minimum of 2,000 hours experience as a registered pharmacy technician.	None	Yes *VT Admin Rules of the Board of Pharmacy 20-4-1400:6.5*	No	A pharmacy technician, under the supervision of the pharmacist, may: • receiving requests for refills of current prescriptions; • process of medical coverage claims; • perform inventory; • perform cashier duties. *VT Admin Rules of the Board of Pharmacy 20-4-1400:5.5(a)*
	Comments:	**Comments:** The pharmacist-manager shall be assisted by a sufficient number of pharmacists and pharmacy technicians as may be required to competently and safely provide pharmacy services.	**Comments:** The pharmacist-manager implement technician training manual. NCPA, NACDS and other approved training manuals may be used as guides. *VT Admin Rules of the Board of Pharmacy*	**Comments:** Grandfather provisions apply for technicians who are registered since July 2014 and technician currently engages in task reserved for certified technicians. *VT Admin Rules of the Board of Pharmacy 20-4-1400:5.9*	**Comments:** A pharmacy technician may not assist in: • dispensing process; • drug utilization review; • clinical conflict resolution; • prescriber contact; • patient counseling; • prescription transfer; • receipt of new prescriptions.

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		VT Admin Rules of the Board of Pharmacy 20-4-1400:6.4	*20-4-1400:6.5*		*VT Admin Rules of the Board of Pharmacy 20-4-1400:5.5(b)*
VA	No formal definition for "technician". Pharmacy technician trainee defined as someone enrolled in an approved technician training program and is performing duties restricted to pharmacy technicians for the purpose of obtaining practical experience. *18 VAC 110-20-10*	4:1 *18 VAC 110-20-270(B)*	Yes *Code of Virginia § 54.1-3321(B); 18 VAC 110-20-111*	Yes *Code of Virginia § 54.1-3321(B)*	A pharmacy technician may perform: • entry of prescription information; • preparation of prescription labels or patient information; • removal of drugs from inventory; • counting, measuring, or compounding of the drug to be dispensed; • packaging and labeling of the drugs; • stocking or loading of automated dispensing devices; • acceptance of refill authorization. *Code of Virginia § 54.1-3321(A)*

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	Comments:	**Comments:** At pharmacist discretion but no more than 4 technicians at one time. *18 VAC 110-20-270(B)*	**Comments:** Accredited Training Required – Effective July 2020; However, certification is not required to register as a technician until July 1, 2022. (https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+HB1304ER+pdf) *Code of Virginia § 54.1-3321(B)*	**Comments:** NHA or PTCB *Code of Virginia § 54.1-3321(B)*	**Comments:** The following acts shall be performed by pharmacists: • review of a prescription… for its completeness, validity, safety, and drug-therapy appropriateness, including, but not limited to, interactions, contraindications, adverse effects, incorrect dosage or duration of treatment, clinical misuse or abuse, and noncompliance and duplication of therapy; • receipt of an oral prescription from a practitioner or his authorized agent • conduct of a prospective drug review and counseling • Provision of information to the public or to a practitioner concerning the therapeutic value and use of drugs in the treatment and prevention of disease • Communication with the prescriber, or the prescriber's agent, involving any modification other than refill authorization of a prescription or of any drug therapy, resolution of any

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					drug therapy problem, or the substitution of any drug prescribed • Verification of the accuracy of a completed prescription prior to dispensing the prescription • Any other activity required by regulation to be performed by a pharmacist. *Code of Virginia § 54.1-3320(A)*
WA	"Pharmacy technician is (a) A person who is enrolled in, or who has satisfactorily completed, a commission-approved training program designed to prepare persons to perform nondiscretionary functions associated with the practice of pharmacy; or (b) a person who is a graduate with a degree in pharmacy or medicine of a foreign school, university, or college recognized by the commission. *WA RCW 18.64A.010(6)*	Pharmacy Manager's discretion *WA BoP Regs Chapter 246-901-130(1)* *Amended Effective 9/14/19*	Yes *WA BoP Regs Chapter 246-901-030(1)*	Yes *WA BoP Reg Chapter 246-901-060*	"Pharmacy technicians" may assist in performing, under the supervision and control of a licensed pharmacist, manipulative, nondiscretionary functions associated with the practice of pharmacy and other such duties and subject to such restrictions as the commission may by rule adopt. *WA RCW 18.64A.030* **Immunization Administration:** The Washington State Pharmacy Quality Assurance Commission has clarified that pharmacy technicians may administer medications under the delegation and supervision of a pharmacist. They have developed Guidance for Technician Administration.

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					https://www.doh.wa.gov/Portals/1/Documents/2300/G003-PharmacyTechnicianAdministrationProcedure.pdf
	Comments:	**Comments:**	**Comments:** Must complete formal academic technician training program approved by the board or on-the job technician training program approved by the board. *WA BoP Regs Chapter 246-901-030(1)*	**Comments:** Must pass a board-approved exam certified by NCCA. *WA BoP Reg Chapter 246-901-060(2)*	**Comments:**
WV	"Pharmacy Technician" means a person registered with the board to practice certain tasks related to the practice of pharmacist care as permitted by the board. *WV Practice Act Section 30-5.4(56)*	4:1 *WV BoP Reg l5-7-5.3*	Yes *WV BoP Reg 15-7-3(B)(3)*	Yes *WV BoP Reg 15-7-3(B)(3)*	The duties of a registered pharmacy technician or pharmacy technician trainee may include, but are not limited, to the following: • the placement, receipt, unpacking and storage of drug orders; • maintenance of the work area and equipment in a clean and orderly condition;

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					• the ordering and stocking of all pharmacy supplies; • the checking of all prescription and non-prescription stock for outdates and the processing of outdated returns; • the operation of the cash register. *WV BoP Reg 15-7-5.2* Final rule of the Board of Pharmacy amends regulations under 15 WVCSR 7 to add pharmacy technician duties that may be performed under direct or indirect supervision and establish provisions on nuclear pharmacy technician endorsement and scope of practice. The rule also defines "cashier" and "medication reconciliation." **The rule is effective April 10, 2020. The new duties are:** 5.2.s. under the direct supervision of a licensed pharmacist, a pharmacy technician may perform the following: 5.2.s.1. Perform pharmacy technician product verification

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					where no clinical judgment is necessary and the pharmacist provides the final verification; 5.2.s.2. Complete a list of a patient's current prescription and nonprescription medications to provide for medication reconciliation; 5.2.s.3. Supervise registered pharmacy technicians and pharmacy technician trainees; 5.2.s.4. Medical records screening; and 5.2.s.5. Additional duties approved by the board
	Comments:	**Comments:** A ratio of no more than four pharmacy technicians and/or pharmacy technician trainees per on-duty pharmacist operating in any pharmacy shall be maintained. This ratio shall not include pharmacy interns. *WV BoP Reg l5-7-5.3*	**Comments:** Must complete 20 hour training program. *WV BoP Reg 15-7-3(B)(3)*	**Comments:** Must pass ExCPT or PTCB. *WV BoP Reg 15-7-3(B)(3)*	**Comments:** A pharmacy technician or pharmacy technician trainee may not: • receive verbal prescription drug orders and reduce these orders to writing; • interpret and evaluate prescription drug orders; • select drug products; • interpret patient medication records; • deliver the prescription to the patient prior to pharmacist final check; communicate information about the prescription drug;

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					• receive or place a call for a transferred prescription. *WV BoP Reg 15-7-5.1*
WI	Pharmacy technician means a non-pharmacist or non-pharmacist intern who, under the general supervision of a pharmacist who regularly coordinates, directs and inspects the activities of the pharmacy technician, assists the pharmacist in the technical and nonjudgmental functions related to the practice of pharmacy in the processing of prescription orders and inventory management. Does not include ancillary persons such as clerks, secretaries, cashiers or delivery persons,	No ratio (New in Jan 2020)	None	None	Wisconsin AB 4: Certified and trained pharmacy technicians who are supervised by a pharmacist to administer any vaccine per ACIP to patients age 6 and older. Technicians must complete a 2-hour vaccine training course and be CPR or BLS trained. Any pharmacist, pharmacy student, or pharmacy technician trained in immunization to administer injectable diphenhydramine or epinephrine to a patient experiencing an adverse vaccine event without needing a protocol, patient-specific prescription, or to complete the non-vaccine injection training (as typically required for a

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	who may be present in the pharmacy. *WI Pharmacy Examining Board Regulations Chapter 7.015(!)*				pharmacist to administer an injectable medication). A pharmacist may delegate technical dispensing functions to a pharmacy technician, but only under the general supervision of the pharmacist. *WI Pharmacy Examining Board Regulations Chapter 7.015(2)* Delegate-check-Delegate Final Rules March 1, 2020. Phar 7.21 Delegate-check-delegate. https://docs.legis.wisconsin.gov/code/admin_code/phar/7/21
	Comments:	**Comments:** *WI Pharmacy Examining Board Regulations Chapter 7.01(3)*	**Comments:**	**Comments:**	**Comments:** A pharmacy technician may not: • drug utilization reviews; • make alternate drug selections; • participate in final drug regimen screening; • administer any prescribed drugs; • provide patient counseling. *WI Pharmacy Examining Board Regulations Chapter 7.015(3)*

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WY	**Ratio Eliminated May 2020** http://bnaregs.bna.com/?id=wy_6551				