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 $\pm$ SD, 99.6 $\pm$ 0.55% versus 99.3 $\pm$ 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	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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	<p>Must complete the following advanced training CPE modules:</p> <ul style="list-style-type: none"> • TCT workflow • Business planning • Medication errors • Dosage forms • Calculations • Review of common drug classes 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Must complete workshop training day with supervising pharmacist • Must complete the following written training modules: <ul style="list-style-type: none"> • Medication errors • Validation of script • Dispensing and workflow • Standard operating procedures • Calculations • Must complete a final exam assessment: <ul style="list-style-type: none"> • Written portion • Item checking • Interview 	<ul style="list-style-type: none"> • Training on legal and ethical implications of technician checking
TCT experiential training requirement	<ul style="list-style-type: none"> • Must undertake site-specific verification and system training • Pharmacist must double check all doses for first week 	<ul style="list-style-type: none"> • Practical competency evaluation 	<ul style="list-style-type: none"> • 1000-item error checking practice log 	<ul style="list-style-type: none"> • 1000-item error checking practice log • Exam on 20 items with 14 introduced errors
Quality assurance program	<ul style="list-style-type: none"> • Pharmacist double checks 50 refills per month • Board of Pharmacy can conduct onsite inspections 	N/A	<ul style="list-style-type: none"> • 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.

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