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Enhancing medication adherence in marginalized and minoritized communities: A brief training approach for pharmacy technicians and community health workers

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ABSTRACT

Background: Medication non-adherence is a pervasive issue, with especially severe consequences for marginalized and minoritized populations. Engaging pharmacy technicians and community health workers (CHWs) to address medication adherence in collaboration with pharmacists could be an effective strategy since they may be better positioned to build trust and rapport with patients compared to pharmacists alone.
Objectives: This study aimed to evaluate and compare the effectiveness of a brief training program for pharmacy technicians and community health workers in improving medication adherence.
Methods: A hybrid model training program, including pre-recorded video lectures to be watched at home followed by an in-person session, was developed and delivered to 19 pharmacy technicians and 109 CHWs, focusing on key skills related to enhancing medication adherence. Participants' knowledge and self-efficacy were assessed using pre- and post-program questionnaires.
Results: The training program yielded significant improvements in participants' knowledge and confidence in performing activities to improve medication adherence. Notably, post-training scores did not differ significantly between pharmacy technicians and community health workers, indicating that both groups achieved similar levels of knowledge and self-efficacy. Furthermore, pharmacy technicians demonstrated significant gains in understanding cultural competence and health disparities.
Conclusion: A targeted, brief training program can significantly enhance the knowledge and self-efficacy of pharmacy technicians and community health workers in addressing medication adherence. Engaging these frontline healthcare workers could be a crucial strategy for improving medication adherence, particularly in marginalized communities. Future research is necessary to assess the impact of this training on patient adherence outcomes.

1. Background

Medication nonadherence is a complex and multifaceted issue that affects individuals from all backgrounds and cultures. One critical factor contributing to medication nonadherence, especially among marginalized and minoritized groups, is cultural beliefs and values that influence perceptions of health and healthcare in general and how people use medications in particular. For example, some cultures may view illness as a reflection of personal weakness or spiritual transgression, leading individuals to question the efficacy of medication or delay seeking treatment.[1] Others may prioritize folk remedies or traditional healing practices over evidence-based therapies, resulting in the substitution of

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alternative therapies for prescribed medications, thus reducing adherence.[2] Moreover, cultural differences in communication styles can create barriers to effective medication counseling, exacerbating nonadherence.[3]

In this context, a cultural emissary like a Community Health Worker (CHW) can play a critical role in improving medication adherence. CHWs are community members trained to provide health education and support, often drawing on their own cultural experiences and insights and shared life experiences with their clients. By establishing trust and rapport with patients, CHWs can address cultural misconceptions and fears related to medications, providing personalized guidance and support to promote adherence.[4] Furthermore, CHWs can help empower patients to take control of their health, promoting self-efficacy and confidence in navigating the healthcare system.[5] Thus, a key aspect of a CHW's role is to bridge the gap between healthcare providers and patients, facilitating effective communication and fostering trust and partnership.[6] By integrating CHWs into healthcare teams, healthcare providers can better understand their patients' cultural contexts and needs, leading to more personalized and effective care.[4,7]

While there is growing evidence that CHWs improve health outcomes among marginalized and minoritized populations,[8,9] there have been efforts to explore alternative workforce strategies, such as having pharmacy technicians take on CHW roles. Several studies have explored the potential of cross-training pharmacy technicians as CHWs to improve patient care and address healthcare barriers, particularly among underserved patient populations. This approach has shown promise, such as in enhancing transitions of care, medication cost reduction, patient education, and medication reconciliation.[10,11] Reviews of this literature showed that pharmacy technicians in CHW roles enhanced relationships between patients and pharmacy personnel and improved linkage to health resources.[12,13] While challenges exist, such as pharmacy technicians adjusting to expanded roles and ensuring sustainability, the potential benefits of cross-training pharmacy technicians as CHWs offer a promising strategy to augment the effectiveness of pharmacists in addressing specific types of drug therapy problems such as poor medication adherence and reducing healthcare disparities in underserved communities. However, there is scant literature about strategies for training pharmacy technicians to learn the skills associated with CHW roles as they provide services to marginalized and minoritized patient populations,[11,14,15] and even fewer with a focus on addressing medication adherence in this patient population.[10]

2. Objectives

This study evaluates a novel pharmacy technician training program for enhancing medication adherence, adapted from an existing Community Health Worker (CHW) curriculum. We compared the effectiveness of this training between pharmacy technician trainees and CHW trainees, focusing on improvements in Medication Therapy Management (MTM) knowledge and self-efficacy in performing key skills for improving medication adherence. The significance of this study is to inform innovative workforce strategies for improving medication adherence and related health outcomes in underserved populations.

3. Methods

3.1. CHW training program description

The University of Florida's CHW training programs, designed to enhance patients' medication use and adherence for high blood pressure and diabetes, have evolved since their inception in 2015. Initially a five-day in-person program, the CHW training now follows a hybrid model comprising six hours of pre-recorded video lectures to be watched at home, followed by a two-day in-person session, including a total of 15 h of in-person classroom sessions.

The program structure is based on a collaborative model between CHWs and pharmacists.[4] This model delineates four key responsibilities for CHWs: (1) collecting relevant prescription information to identify medication adherence issues, such as obtaining the current medication list from the client's physicians, refill history, and details on how clients use prescribed medications and self-medications like herbal products; (2) collaborating with the pharmacist by sharing this information; (3) implementing a pharmacist-developed care plan to resolve adherence barriers; and (4) conducting periodic client follow-ups. Concurrently, the key roles for pharmacists include (1) reviewing the information gathered by the CHW; (2) evaluating and problem-solving to develop a care plan for resolving adherence barriers; and (3) collaborating with the CHW on the care plan and its implementation.[4]

The live training for CHWs consists of lectures, hands-on practice cases, and small group breakout sessions led by pharmacist trainers. These small group sessions provide CHWs with opportunities to share experiences and apply newly acquired skills to improve medication adherence. Patient case studies featuring student pharmacists as simulated patients are utilized to teach various medication management skills.

3.2. Pharmacy technician program description

The pharmacy technician training program shares a purpose similar to the CHW training, focusing on teaching technicians to support pharmacists by identifying and resolving adherence issues. Fig. 1 illustrates this process, while Table 1 outlines the technicians' and pharmacists' respective roles and responsibilities. The content covered in the live training for pharmacy technicians was nearly identical to that of the CHW training program, although the structure differed. The in-person training for technicians was condensed into one day (11.5 h), supplemented by eight hours of at-home video lectures. Unlike the CHW training, the pharmacy technician program omitted content related to drug formulary tiering and other community pharmacy-specific information, as technicians already have experience working in that practice setting. The training components for pharmacy technicians included (detailed curriculum in Fig. 2):

1. Pharmacotherapy review of hypertension and diabetes
2. Drug Therapy Problems, especially medication nonadherence, and their consequences
3. Health literacy and cultural competency
4. Patient interviewing techniques, including Motivational interviewing skills
5. Identifying medication use practices, including self-medication use
6. Identifying and resolving medication adherence barriers
7. Documentation

The training program incorporated active learning sessions to enhance the skills of the trainees. In the morning session, participants analyzed a case study in groups of six or seven, guided by a pharmacist facilitator, to develop their skills in creating a complete and accurate medication list. Trainees engaged in two additional active learning sessions during the afternoon: the first focused on identifying adherence barriers, while the second concentrated on improving medication use practices and resolving barriers based on a care plan developed by a pharmacist. These interactive sessions allowed the trainees to apply their knowledge and practice their newly acquired skills in a hands-on manner, fostering a deeper understanding of the concepts and techniques required to support patients in maintaining medication adherence.

3.3. Study design

We employed a quasi-experimental design instead of randomly assigning CHWs and technicians to the slightly different program structures. The structure for the technician program, which involved one

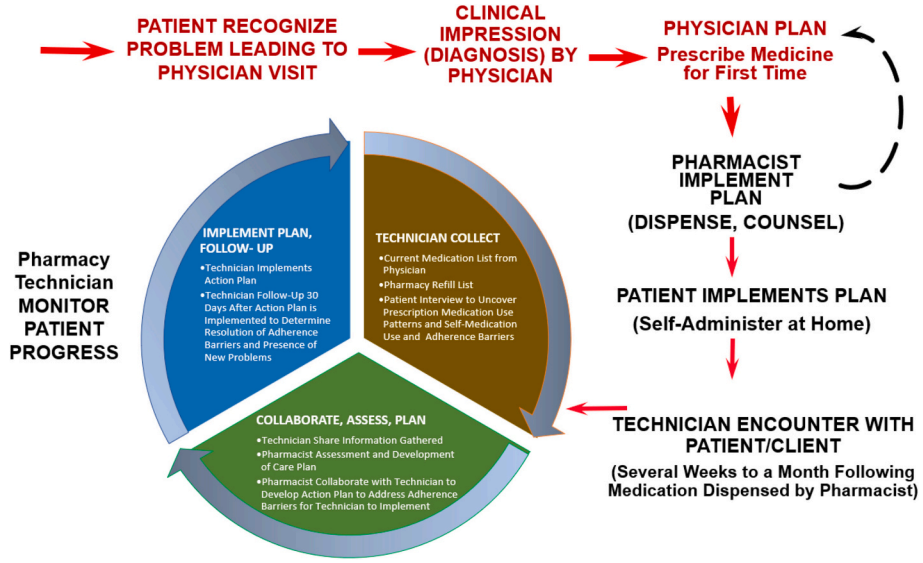

Fig. 1. Pharmacy technician – pharmacist collaboration process.

Table 1
Pharmacy Technician and Pharmacist Roles.

Pharmacy Technician Roles	Community Pharmacist Roles
I. Gathering information about: a. Current medication list from patients' physicians b. Refill information from pharmacy and verify with patients whether other pharmacies have recently dispensed medications to them c. How patients use each prescribed medication as well as use of self-medication, such as over-the-counter, folk remedies, herbals, homeopathic therapies d. Barriers to medication adherence II. Share gathered information with pharmacist III. Implement recommendation included in the care plan developed by the pharmacist to address adherence barriers and other noted problems IV. Periodic follow-up with patients to assess problem resolution and any new problems	I. Reviewing information gathered by pharmacy technicians II. Developing care plans for resolving adherence barriers and other noted problems III. Collaborating with pharmacy technician on implementing recommendations in care plans

day of in-person training supplemented by video lectures, was determined by the preference of community pharmacy owners to release technicians from their work roles in the pharmacy for only one day. The intervention being evaluated was a MTM training program aimed at teaching trainees to improve medication adherence. The objective of the project was to compare and contrast the CHW training program with the program for pharmacy technicians by assessing changes in knowledge and self-efficacy through pre- and post-tests.

3.4. *Participants and study settings*

Community health workers from five Florida organizations participated in the training program, including a managed care health plan (45 CHWs), a federally qualified community health center (19 CHWs), a free healthcare clinic (6 CHWs), a county aging agency (3 CHWs), and an organization serving the healthcare needs of American Indians and other underrepresented populations (36 CHWs). The CHWs had access to patients diagnosed with uncontrolled hypertension who were prescribed at least one antihypertensive medication, including patients identified as having poor adherence based on a Proportion of Days Covered (PDC) below 0.80, a measure widely used to assess medication adherence.[16] In addition to the CHWs, pharmacy technicians from 13 community pharmacies in an urban area of Florida participated in a single in-person training program. All participants, both CHWs and pharmacy technicians, worked in patient care settings that primarily served underrepresented minority groups and underserved areas, highlighting the program's focus on addressing health disparities and improving healthcare access for vulnerable populations.

3.5. *Knowledge and self-efficacy measures*

The effectiveness of the training program was evaluated by assessing improvements in trainees' knowledge and self-efficacy, as shown in Table 2. The knowledge assessment consisted of two components: 13 open-ended questions on medication therapy management (MTM) principles related to medication adherence and eight multiple-choice questions on health disparities and cultural competence. Student pharmacists graded the MTM assessments using a rubric, requiring CHWs to demonstrate a thorough understanding of MTM principles to achieve high scores. The self-efficacy assessment employed a scale ranging from 0 (cannot do at all) to 10 (highly certain can do) across 14 skill areas, allowing trainees to self-report their confidence in applying the learned skills.

To establish content validity for the knowledge and self-efficacy survey instruments, we first conducted a comprehensive literature review to identify relevant domains and items used in previously validated instruments assessing similar constructs. We then convened a panel of eight pharmacy faculty and practitioners to review the initial pool of instrument items. The panel reviewed each item for clarity, relevance, comprehensiveness and representativeness of the intended domains. The panel provided feedback through structured questionnaires and discussions, which informed the necessary revisions to the instruments.

Pre-In Class Homework Pre-Recorded Lecture Videos:

1. Pre-assessment
2. Watch video: Introduction of the program including the Why in terms of Medication Safety (120 min)
3. Watch Video: MTM/Medication Adherence Process (45 minutes)
4. Watch video: Cultural Competency and Health Disparities (60 minutes)
5. Watch video: Effective Communication and Motivational Interviewing (90 minutes)
6. Watch Video: Hypertension and Diabetes Review (60 minutes)
7. Watch Video: Pharmacy ABC's (45 minutes)
8. Watch Video: Encounter Form and Documentation (60 minutes)

Day 1:

Time	Topic	Learning Objectives
7:30-8:00AM	**Breakfast & Registration Sign-In**	
8:00 – 8:15AM **(15 Min)**	**Introductions & Expectations for program**	**Objectives:** • Brief introduction of Facilitators *(5 min)* • Purpose & overview of training program *(5 min)* • Expectations and Requirements of Pharmacy Management *(5 min)*
8:15-8:35AM **(20 min)**	**MTM Pharmacy Technician Process: Step by Step Practice Model**	**Objectives:** • Why do we need a better solution • Describe each major step • Pharmacy Technician Role and Do/Don't • Pharmacist role • Practice Model of Technician and Pharmacist
8:35-9:05AM **(30 Min)**	**The CMR (Comprehensive Medication Review): Personal Med List**	**Objectives:** • What is a Personal Medication List (PML) and why is PML important to conducting an Adherence Workup and CMR • Establishing a Medication List • Discuss Current Medication List provided by Physician(s) and tactics for collecting information from a physician's office • Discuss Rx refill history: Rx history data sources; strengths, weaknesses and gaps • How to create a dialog with patient to learn about Rx and self-medications for establishing a medication list • Level of specificity needed about use of each Rx and Self-Medication within PML, including time of day, proximity to meals, dosage regimen on encounter form • Identifying discrepancies between Physician List, Rx refill history and Patient interview and how to document
9:05-9:35AM **(30 Min)**	**Encounter Form Process**	**Objectives:** • Introduce form • Review different sections • Introduce Jessica Faith patient case & how to use form
9:35-10:35AM **(60 Min)**	**Medication List Breakout sessions**	**Objectives:** • Review Jessica Faith PML • Creating a medication list from physician, pharmacy and patient sources • Practice asking patents questions and probing about meds including Self-medications • Documentation
10:35-10:40AM	**Break**	
10:40-11:10AM **(30 Min)**	**Communication Motivational Interviewing (MI)**	**Objectives:** • Understanding how MI is different from how most people communicate with one another • Applying MI to: (a) Word choice and vocabulary, (b) Patient recruitment, (c) Addressing non-adherence • HTN and Diabetes MI examples • Build rapport with patient and address issues they may have

Fig. 2. Pharmacy technician training program agenda.

11:10-11:25AM **(15 Min)**	**MI Videos**	**Objectives:** • Play videos (6.5 min) • 2nd video about (8 min)
11:25-11:40AM **(15 Min)**	**MI Personal Story**	**Objectives:** • Impact and strength MI can have
11:40-12:10PM **(30 Min)**	**MI practice small groups**	**Objectives:** • **Practice MI case**
12:10-12:40PM	**Lunch**	
12:40-1:25PM **(45 Min)**	**Medication Adherence**	**Objectives:** • Prevalence of adherence issues in HTN and T2DM • Most common adherence issues in HTN and T2DM • Alternate ways to uncover adherence issues: Rx refill history, Objective measures such as drug levels, patient self-report, patient interview • Assessing Health Literacy and why it's important • Discuss DRAW Adherence questions on form • Listening for Patient Concerns and Patient's self-reported Goals • Documenting adherence barriers
1:25-3:05PM **(90 Min)**	**Medication Adherence Breakout sessions**	**Objectives:** • Jessica Faith Case: Asking questions, active listening and probing • Practice adherence questions from encounter form without asking them directly • Identify the medication related problems (MRP) to be tackled • Documentation
3:05-3:10PM	**Break**	
3:10-3:40PM **(30 Min)**	**Care Plan and Documentation**	**Objectives:** • Learning to be clear, concise when speaking with Patient • Communicating with physicians or pharmacists about MRPs
3:40-4:40PM **(75 Min)**	**Care Plan Breakout Session -small groups**	**Objectives:** • Jessica Faith Case: Practice discussing with a pharmacist uncovered MRPs and prioritizing them • Medication reconciliation and finalizing PML • Construct care plan/action plan • Practice discussion with Doctor • Documentation on Encounter form
4:40-5:10PM **(30 Min)**	**Encounter form Process & Flow**	**Objectives:** • Discuss logistics – sending forms to UF, communicating with MTM Center pharmacist, implementing MAP • Discuss follow-up encounters
5:10-6:30PM **(80 Min)**	**Lynda Blake Case Breakout session:**	• Apply all lessons to the Lynda Blake Case
6:30-8:00PM **(90 Min)**	**Working Dinner and Debriefing and Next Steps**	

Fig. 2. (*continued*).

This iterative process aimed to ensure that the instruments were easily understandable to respondents and adequately covered the intended content areas. Further, the study instruments demonstrated good internal consistency reliability, with a Cronbach's alpha coefficient of more than 0.80 for all instruments.

3.6. Statistical analyses

We used a linear mixed-effects model to evaluate the consistency of improvements in knowledge and self-efficacy across the five organizations employing CHWs. In this model, pre- and post-program scores were treated as fixed effects, while the CHWs' organizations were treated as a random effect. To assess consistency, we examined the interaction between time (pre- and post-program) and organization. A significant interaction would indicate variability in improvements across organizations, indicating that data from all training programs should not be pooled for further analyses. Conversely, a non-significant interaction would support pooling the CHWs' data across organizations.

To evaluate the effectiveness of the training program, we calculated a total score for each trainee on the Medication Therapy Management

Table 2
Knowledge and self-efficacy components of pre- and post-test training material.

Assessment	Components	Number of Questions	Type of Question	Number of points per Question
Knowledge Assessment of Principles MTM	• Principles of MTM support services • Scope of the technician within MTM support services • Documentation Requirements • Gathering information pertinent to medications from various resources – the patient, prescription refill records, and the medical record • Identification of medication adherence barriers • Communication skills, including motivational interviewing	13	Open-ended/ short answer	5
Knowledge Assessment	Health Disparities and Cultural Competence	8	Multiple Choice	1
Self-Efficacy of Providing MTM Services	• Ability to identify and enroll patients • Provide MTM support services • Document services	14	Scale ranging from 0 (cannot do at all) to 10 (highly certain can do)	10

(MTM) assessment and the cultural competence and health disparities assessment, both before and after their participation in the program. For each trainee, we determined the magnitude of improvement by comparing their pre-program and post-program scores. An independent *t*-test was used to compare the distributions of improvement scores between the pharmacy technician and Community Health Worker (CHW) groups. Furthermore, we analyzed the pre-program scores separately using independent *t*-tests to assess whether there was a significant difference in baseline knowledge between CHWs and pharmacy technicians before they participated in the training. This analysis helped to establish whether the two groups had comparable levels of knowledge prior to the intervention. Similarly, after completing the training program, we analyzed the post-program scores to evaluate the differences in knowledge between CHWs and pharmacy technicians.

To determine the effectiveness of the training program on each of the 13 questions in the MTM assessment, we conducted a repeated measures analysis of variance. This analysis examined the main effects of group (i.e., pharmacy technicians versus CHWs) and time (i.e., pre-program and post-program), as well as the interaction between group and time. To account for multiple comparisons, we applied a Bonferroni correction to the alpha level, resulting in an adjusted significance threshold of 0.0038. This threshold ensures that any significant differences observed are not merely due to chance when performing multiple statistical tests.

For the 14 self-efficacy items, we conducted a hypothesis test for the difference between two proportions to determine whether a statistically significant difference existed between technicians and CHWs. To examine the differences in self-efficacy between technicians and CHWs prior to and following the training program, we conducted a series of two-sample *t*-tests. Again, we applied the Bonferroni correction to account for multiple comparisons, adjusting the significance level to 0.0036. This conservative approach helps to control for the increased likelihood of Type I errors (false positives) when conducting multiple hypothesis tests simultaneously.

4. Results

Nineteen pharmacy technicians and 109 CHWs completed the MTM training. The pharmacy technicians had an average age of 34.3 years, with 73.7 % being female. Their racial/ethnic composition was 52.6 % Hispanic, 15.7 % Black, and 31.5 % White. The patient population served by these pharmacies was 26.2 % Hispanic or Latino, 29.6 % Black, 9.1 % Two or More races, and 35.1 % White and not Hispanic or Latino. The CHWs were predominantly Hispanic (65.1 %) or Black (27.5 %), with an average age of 36.2 years, and most were female (88.9 %). The racial/ethnic composition of the clients served by the five organizations was 52.4 % Hispanic or Latino, 29.1 % Black, 11.0 % American Indian, and 7.5 % White.

We employed a linear mixed-effects model to evaluate whether the score improvements from pre- to post-program were consistent across the five organizations employing CHWs. The analysis revealed a significant main effect of time, with post-program scores being significantly higher than pre-program scores ($p < 0.001$), indicating an overall performance improvement associated with the training. The random effect of organization was minimal, and there was no significant interaction between time and organization, suggesting that the extent of improvement was similar across the five training programs. As a result, CHWs from all five organizations demonstrated comparable improvements, supporting the decision to pool data from the different training programs for further analyses.

When examining differences between pharmacy technician and CHW performance for each of the 13 MTM knowledge questions about medication adherence, a repeated measures analysis of variance (ANOVA) was conducted. The analysis showed a significant main effect of time (i.e., pre-program versus post-program) ($p < 0.001$, $\eta^2 = 0.58$), indicating that both groups improved their scores from pre-training to post-training, with a large effect size. Additionally, the interaction between group (i.e., pharmacy technicians versus CHWs) and time was significant ($p < 0.005$, $\eta^2 = 0.13$), suggesting that the extent of improvement from pre-training to post-training differed between pharmacy technicians and CHWs, with a medium effect size. Post-hoc comparisons using the Bonferroni correction revealed that CHWs had higher pre-training scores than pharmacy technicians for the concepts covered in seven of the 13 questions ($p < 0.0038$, Cohen's d ranging from 0.65 to 1.12), indicating medium to large effect sizes (see Table 3). However, post-training scores were not significantly different between pharmacy technicians and CHWs ($p > 0.0038$, Cohen's d ranging from 0.02 to 0.28), indicating small effect sizes and that both groups achieved similar levels of knowledge after completing the training program.

Significant differences were found in the pre-test and post-test scores between pharmacy technicians and CHWs regarding their knowledge of health disparities and cultural competency ($p < 0.05$). The pre-test scores showed a statistically significant difference, with pharmacy technicians scoring an average of 61.3 % and CHWs scoring an average of 76.0 % ($p < 0.05$, Cohen's $d = 0.88$), indicating a large effect size. The post-test scores also revealed a significant difference, with pharmacy technicians achieving an average score of 73.8 % compared to 78.0 % for CHWs ($p < 0.05$, Cohen's $d = 0.32$), indicating a small to medium effect size. Additionally, an independent t-test was conducted to compare the improvement in scores from pre-test to post-test between the two groups. The analysis indicated that the increase in scores was significantly different, with pharmacy technicians showing a greater improvement of 12.5 % compared to 2.0 % for CHWs ($p < 0.05$, Cohen's $d = 1.47$), indicating a large effect size). These findings suggest that while CHWs had a higher baseline knowledge and maintained their advantage post-training, the training program had a more substantial impact on improving pharmacy technicians' knowledge of health

Table 3
Performance on MTM Practices Knowledge Assessment.

Question	Pharmacy Technicians ($n = 19$)		CHWs ($n = 109$)	
	Pre-Program Mean	Post- Program Mean	Pre-Program Mean	Post- Program Mean
What are the questions in the DRAW tool[c] and the suggested response?	0.4	4.2[a]	0.0	5.0[a]
When examining a medication profile and refill history, what are the red flags to look for	2.0[b]	3.7	2.3[b]	4.0[a]
What does SBAR[c] stand for regarding communicating with other healthcare professionals	1.3 [b]	4.5[a]	1.7[b]	4.9[a]
What does the PDC tell you and not tell you?	0	4.5[a]	0.4	4.6[a]
What is an interview strategy to help patients remember OTCs, herbal, dietary supplements, and home remedies they use?	0	3.0[a]	0.3	3.8[a]
What are the strengths and weaknesses of a patient-provided medication history	0.7[b]	4.4[a]	2.4[b]	4.6[a]
Provide an example of an open-ended "why" question without using the word why.	0.7[b]	3.6[a]	1.6[b]	4.3[a]
What contribution to your developing a personal medication list and care plan would you expect a participating pharmacist to do?	1.3	2.5	1.1	2.4[a]
What are the strengths and weaknesses of a pharmacy refill record	0.6[b]	4.5[a]	2.3[b]	4.7[a]
What information would you gather during a follow-up to the initial CMR interview	0.8	2.4[a]	1.7	3.3[a,c]
What are the strengths and weaknesses of a patient's medical record base/ medication history	0.4[b]	3.4[a]	2.7[b]	4.7[a]
List the ways to determine medication adherence	0.5[b]	4.1[a]	1.6[b]	3.4[a]
List the four key steps to sharing expertise with the patient	0.2	2.5[a]	0.0	3.1[a]

[a] Post-training score is greater than pre-training score ($p < 0.0038$); scores ranged from 0 to 5 points.
[b] Pre-training -program score for pharmacy technicians is different compared to CHWs ($p < 0.0038$); scores ranged from 0 to 5 points.
[c] Drug Adherence Workup (DRAW) tool, Situation, Background, Assessment, Recommendation (SBAR) communication, Comprehensive Medication Review (CMR).

disparities and cultural competency.

To assess the differences in self-efficacy between pharmacy technicians and CHWs, a series of two-sample *t*-tests were conducted for each of the 14 activities, with the Bonferroni correction applied to adjust for multiple comparisons (adjusted significance level: 0.0036). The results showed that pre-program self-efficacy for pharmacy technicians was significantly higher compared to CHWs for seven of the 14 activities, including identifying eligible patients, explaining the purpose of the service to patients, gathering patient data from physicians, gathering prescription data from pharmacies, determining health literacy of patients, explaining the service to others within the organization, and documenting information in encounter forms for pharmacist review ($p < 0.0036$, Cohen's d ranging from 0.68 to 1.23), indicating medium to large effect sizes). However, post-program, there were no significant differences in reported self-efficacy between pharmacy technicians and CHWs for any of the 14 activities (Cohen's d ranging from 0.02 to 0.31), indicating small effect sizes (see Table 4).

5. Discussion

Our CHW training program was developed based on the premise that an interprofessional team comprising CHWs and pharmacists can enhance the effectiveness of identifying and resolving medication adherence issues, especially among minority populations where culturally-determined beliefs shape medication-use decisions. As Segal et al.[4] explained, this approach holds promise because CHWs are typically embedded within the communities they serve, sharing life experiences with their clients. These shared experiences may enable CHWs to uncover medication use practices that pharmacists may not discover independently, as the pharmacist-patient relationship is often not as authentic. For many minority patients, establishing an authentic relationship requires shared experiences, which CHWs can provide through their community embeddedness. While pharmacists may be tempted to believe they can develop cultural competence in a way that CHWs often can, pharmacists often lack the shared lived experiences necessary to establish genuine rapport and trust with patients from marginalized communities.[4]

This collaborative model between pharmacists and CHWs assumes that CHWs are unlicensed laypeople and, similarly to pharmacy technicians, are not independent providers. As such, they do not employ independent clinical judgment and limit themselves to performing activities following a care plan developed and overseen by pharmacists. In the United States, about half of the states offer a certification program for CHWs, with some using the state's department of health as the credentialling authority, whiles others use independent credentialing bodies or CHW associations. Generally, states do not require certification to practice as a CHW and they are not licensed as health care providers.[17,18] In the U.S., organizations employing CHWs have the discretion to define the roles of CHWs as well as the supervision and oversight of their work.

Thus, a collaborative model between CHWs and pharmacists where CHWs take on roles to improve medication adherence presents some ethical and regulatory challenges. We strongly recommend that a collaborative agreement between CHWs and pharmacists be devised, clearly delineating the specific roles and responsibilities of CHWs as well as the role of pharmacists in supervising CHWs in the performance of those activities, similar to those described by Segal et al.[4] Likewise, a similar approach is strongly recommended for collaborations between pharmacy technicians and pharmacists, as described in Table 1.

Based on the findings of a project called SafeMeds,[10] we realized that pharmacy technicians might have the potential to assume many or all of the roles associated with CHWs in addressing medication adherence issues, particularly if they can establish authentic, trusting relationships with patients.[4] SafeMeds demonstrated that pharmacy technicians, who were trained to perform CHW functions, effectively supported care transitions from hospitals to home for medically complex and underserved patients residing in high-poverty areas.[10] The technicians were selected partially based on their residency within the same communities as the patients they served, which aligns with the principle of shared life experiences facilitating rapport and trust-building between healthcare providers and clients.

Our study demonstrates the effectiveness of training programs in enhancing the knowledge and self-efficacy of pharmacy technicians and CHWs in addressing medication adherence. Before the training, both groups performed poorly on the initial assessment of knowledge about MTM practices related to adherence, although technicians performed more poorly than CHWs. Thus, these findings highlight a significant knowledge gap among pharmacy technicians and CHWs about this topic area prior to the training program. After completing the training program, both pharmacy technicians and CHWs showed substantial improvements in their understanding of these topics and performed similarly on the knowledge assessment, thus underscoring the value of providing targeted education about improving medication adherence.

Pharmacy technicians demonstrated a substantial improvement in knowledge about health disparities and cultural competency, as shown by the significant increase in their post-program scores. This finding is

Table 4
Self-Efficacy for Activities/ Tasks Related to MTM.

Self-Efficacy Item	Technician Pre-Program Score	Technician Mean Change	CHW Pre-Program Score	CHW Mean Change
ID & Enroll Patients				
Identify a Patient that is eligible for MTM Service	5.00 ± 3.91[1]	4.18 ± 3.76	3.65 ± 3.17	5.19 ± 3.74
Explain the purpose of the MTM Service to a patient	5.31 ± 2.89[1]	3.17 ± 2.79	3.73 ± 3.73	5.35 ± 3.75
Motivate a Patient who is not interested in MTM Service	4.33 ± 3.01	3.73 ± 2.87	3.40 ± 3.20	4.84 ± 3.53
Provide Services				
Gather necessary patient-specific data from the treating physicians for MTM encounter form	5.75 ± 3.00[1]	2.64 ± 3.04	4.05 ± 3.16	4.62 ± 3.69
Gather necessary prescription data from the pharmacy for MTM encounter form	6.50 ± 2.96[1]	2.54 ± 3.33	4.43 ± 3.43	5.24 ± 3.65
Determine the level of literacy using a validated system	5.42 ± 2.56[1]	2.91 ± 1.92	4.24 ± 3.41	3.59 ± 3.58
Ask the right questions to identify medication use practices for prescribed medications	5.08 ± 2.22	3.82 ± 2.04	5.30 ± 3.52	4.84 ± 3.22
Ask the right questions to uncover barriers that affect the use of prescribed medications	4.50 ± 2.43	4.36 ± 2.77	4.35 ± 3.12	4.30 ± 3.42
Ask the right questions to identify medication use practices involving self-medication	4.36 ± 2.2.99	4.20 ± 3.01	4.89 ± 3.43	4.32 ± 3.51
Perform a medication reconciliation to establish complete and accurate medication list	4.75 ± 2.71	3.54 ± 3.27	4.89 ± 3.39	4.27 ± 3.96
Apply motivational interviewing techniques to improve medication use practices	5.04 ± 2.70	3.73 ± 2.90	4.72 ± 3.37	4.46 ± 3.23
In collaboration with the pharmacist, verbally communicate recommendations to patient	5.17 ± 2.73	3.18 ± 2.79	4.40 ± 3.27	3.76 ± 3.41
Explain MTMS to others within your organization	4.25 ± 2.31[1]	4.50 ± 2.17	2.67 ± 2.94	5.57 ± 3.19
Document Services				
Appropriately document information on the encounter form for pharmacists to review	5.67 ± 2.84[1]	3.64 ± 2.80	4.54 ± 3.35	5.24 ± 3.12

[1] Difference in self-efficacy was different at pre-program between technicians and CHWs ($p < 0.0033$) based on *t*-tests.

consistent with previous research indicating that targeted training can improve the cultural competence of pharmacy technicians.[14,19] In contrast, CHWs, who often have more direct experience working with diverse patient populations, showed relatively strong pre-program performance on the knowledge assessment about health disparities and cultural competence, given their experience and prior training, which often emphasizes these topics.[20] However, CHWs did not show a significant change in their post-program assessment performance. This may be explained by the fact that the questions we asked covered broader topics about health disparities and cultural competence rather than specific cultural beliefs and values about medications that were taught during the training program. Furthermore, the relatively smaller improvement in CHWs' scores may reflect their already high level of competence in these areas before the training program. Finally, the CHWs who participated in the MTM training program were experienced CHWs and had previously completed employer-provided programs on social determinants of health and cultural competence. In contrast, while many pharmacy technicians are also certified and have completed prior training programs, technicians often lack exposure to classroom instruction on social determinants of health and topics related to communicating with patients using active learning and empathy, health literacy and cultural competence, building trust with patients, empowering patients to manage their health, and navigating healthcare and social service systems. These topics are commonly found in CHW training programs.[15,20,21]

The training program significantly improved self-efficacy among pharmacy technicians and community health workers (CHWs) across all the skill areas. While pharmacy technicians reported higher self-efficacy for half of the skill areas before the training program compared to CHWs, both groups reported similar levels of self-efficacy after finishing the training program.

Our training approach differs from several initiatives where pharmacy technicians have been cross-trained to take on CHW roles. For example, one initiative cross-trained pharmacy technicians as CHWs through a 13-week course focused on CHW core competencies offered by the State of Idaho, which did not specifically address medication adherence.[15] Similarly, pharmacy technicians in Missouri completed a 16-week CHW training curriculum that included an 8-week didactic component on patient education, building relationships with clients, regulations affecting healthcare resources, and understanding chronic disease states, followed by an 8-week shadowing of CHWs.[11] In Iowa, a small number of pharmacy technicians completed a 16-week CHW training curriculum.[14] While these initiatives, where pharmacy technicians undergo extensive CHW training, offer several advantages over the short, targeted training on medication adherence used in our study, the longer CHW training curriculums lack targeted applications for addressing medication adherence.

Our program employed a flipped classroom approach, where participants viewed pre-recorded video lectures prior to attending in-person, case-based interactive sessions. This blended learning strategy has been recognized as an effective pedagogical method in healthcare education.[22] It is particularly suitable for training pharmacy technicians and community health workers (CHWs), as it enables them to apply theoretical concepts to practical, real-world situations they may encounter in their respective settings. The interactive, hands-on nature of our training aligns with evidence suggesting that such methods, including case-based learning and practical sessions, are more effective than traditional didactic approaches alone.[23,24] Furthermore, the integration of pre-recorded lectures within a flipped classroom model has been shown to be at least as effective as, or more effective than, traditional classrooms in terms of academic performance and student satisfaction.[25]

This study has several limitations that should be acknowledged. Firstly, the number of trainees was relatively small, which may limit the generalizability of the findings. Additionally, the study relied on self-reported assessments of self-efficacy in performing a skill or task, which could be subject to various response biases such as social desirability bias and recall bias. While very similar in terms of content covered, the training programs for pharmacy technicians and CHWs were not identical in duration and structure (i.e., CHW training 21 h and technician training 19.5 h), potentially influencing the measured outcomes.

Furthermore, since the training curriculum used for pharmacy technicians was based on a curriculum developed for CHWs, the pharmacy technicians might have interpreted the content of the pre-recorded videos and other training materials differently due to their different

foundational training compared to CHWs. Our approach of adapting the training program developed for CHWs for use among pharmacy technicians should be further explored to identify the optimal training approach for pharmacy technicians. While our findings showed the training program to be effective in improving knowledge and self-efficacy for both groups, it is possible that further customization of the program content is needed specifically for pharmacy technicians. For example, although pharmacy technician knowledge about health disparities and cultural competence improved after completing the training program, additional improvements on these topics could potentially be achieved through supplementary at-home exercises and in-person case studies focusing on these topics. Thus, while our study findings suggest that the training was effective for technicians, we recommend that future research continue to explore the design of a standardized curriculum syllabus focusing on medication adherence to identify the optimal programmatic structure as well as content tailored specifically for pharmacy technicians.

Furthermore, the study did not account for potential confounding variables such as trainees' prior experience, education level, or other demographic factors that could impact the results. We did not assess long-term retention of knowledge and skills, which limits understanding of the training programs' sustained impact. Future research should address these limitations by including larger, more diverse samples, standardizing training content, incorporating longer follow-up periods to evaluate the enduring effects of the training, and assessing the impacts of the training program on improving medication adherence in actual patients. The study instruments used to assess knowledge and self-efficacy demonstrated good reliability and validity. However, the CHWs' knowledge about health disparities and cultural competence did not significantly increase after participating in the training program. This was likely because the health disparities and cultural competence assessment questions covered broader topics rather than focusing specifically on how culturally-determined beliefs and values shape medication use behaviors, which was addressed in the training. Additionally, a possible ceiling effect for measurable improvement in this study measure might have also contributed to this finding. For future program assessments, we recommend adding items to the knowledge scale that specifically measure the understanding of cultural beliefs and values related to medication use.

6. Conclusion

In conclusion, our study demonstrates the effectiveness of a short, targeted training program in enhancing the knowledge and self-efficacy of pharmacy technicians and CHWs in addressing medication adherence. Despite the limitations in the study's methodology, this study provides valuable insights into the potential of targeted training programs to improve the knowledge and confidence of pharmacy technicians and CHWs in supporting patients with medication adherence. Future research should explore the further development of a standardized and validated training programs. We also recommend conducting a comparative study of CHW-based training vs. a pharmacy technician-specific program, which could help define the optimal training model. Further, we recommend studying the long-term impact of such training programs on patient outcomes and the potential for integrating targeted medication adherence training into existing CHW and pharmacy technician curricula.

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CRediT authorship contribution statement

Richard Segal: Writing – review & editing, Writing – original draft, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Michelle L. Zeigler:** Writing – review & editing, Project administration, Methodology, Investigation. **Jordan L. Wallace:** Writing – review & editing, Methodology, Investigation, Formal analysis, Data curation. **Folakemi T. Odedina:** Writing – review & editing, Conceptualization.

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.

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