Review of Contemporary Philosophy
ISSN: 1841-5261, e-ISSN: 2471-089X
Vol 23 (2), 2024
Pp 6586 - 6596

Long-Acting Injectable Antipsychotics: Pharmacist-Technician Models for Adherence Monitoring and Relapse Prevention

[1]Dhafer Abdulrahman Nasser AL Shehri,[2]Ahmad Hamed Khalaf Almalki,[3]Fahad Ahmed Alswayd,[4]Hesham Abdulaziz Bin Jumiah,[5]Bandar Saad Abdulrahman Alzaagi

[1] Pharmacist, Riyadh Third Health Cluster - Eradah Complex and Mental Health - Halfway House
[2] Pharmacist Assistant, Riyadh Third Health Cluster - Eradah Complex and Mental Health - Halfway House
[3] Pharmacist, Riyadh Third Health Cluster - Eradah Complex and Mental Health - Department of Pharmacy
[4] Pharmacist, Riyadh Third Health Cluster - Eradah Complex and Mental Health - Department of Pharmacy
[5] Pharmacist Assistant, Riyadh Third Health Cluster - Eradah Complex and Mental Health - Halfway House

Abstract

Long-acting injectable (LAI) antipsychotics have emerged as a valuable treatment option for patients with severe mental illnesses, offering improved medication adherence and reduced risk of relapse compared to oral antipsychotics. However, the effective use of LAI antipsychotics requires close monitoring of adherence and proactive strategies for relapse prevention. This systematic review aims to explore the role of pharmacist-technician models in supporting adherence monitoring and relapse prevention for patients receiving LAI antipsychotics. A comprehensive search of electronic databases, including PubMed, Embase, and CINAHL, was conducted to identify relevant studies published between 2010 and 2023. The search strategy employed a combination of keywords related to LAI antipsychotics, pharmacists, technicians, adherence monitoring, and relapse prevention. A total of 18 studies met the inclusion criteria and were included in the review. The findings highlight the critical roles of pharmacists and technicians in various aspects of LAI antipsychotic management, such as medication education, injection administration, adherence monitoring, and relapse prevention. Key factors influencing the effectiveness of pharmacist-technician models include specialized training, interprofessional collaboration, patient engagement, and technology integration. The review also identifies challenges and barriers to implementing pharmacist-technician models, such as limited resources, inadequate reimbursement, and regulatory constraints. The findings of this review have significant implications for mental health practice, policy, and research, emphasizing the need for innovative strategies to optimize the use of LAI antipsychotics and improve outcomes for patients with severe mental illnesses.

Keywords: antipsychotics, Comprehensive, interprofessional , emphasizing

Received: 04 October 2024 **Revised:** 23 November 2024 **Accepted:** 10 December 2024

Introduction

Severe mental illnesses, such as schizophrenia and bipolar disorder, are chronic and debilitating conditions that require long-term treatment with antipsychotic medications (Correll et al., 2018). However, non-adherence to oral antipsychotic medications is a significant challenge in the management of these illnesses, with estimated rates of non-adherence ranging from 40% to 90% (Semahegn et al., 2020). Non-adherence to antipsychotic medications is associated with increased risk of relapse, hospitalization, and poor functional outcomes (Tiihonen et al., 2017).

Long-acting injectable (LAI) antipsychotics have emerged as a valuable treatment option for patients with severe mental illnesses, offering several advantages over oral antipsychotics (Correll et al., 2018). LAI

antipsychotics are administered by intramuscular injection at intervals ranging from 2 to 12 weeks, providing a sustained release of medication and reducing the need for daily dosing (Kishimoto et al., 2021). By eliminating the need for daily medication adherence, LAI antipsychotics have been shown to improve adherence rates, reduce the risk of relapse, and improve clinical outcomes compared to oral antipsychotics (Kishimoto et al., 2021).

Despite the potential benefits of LAI antipsychotics, their effective use requires close monitoring of adherence and proactive strategies for relapse prevention (Correll et al., 2018). Missed or delayed injections can lead to subtherapeutic medication levels and increased risk of relapse (Kishimoto et al., 2021). Moreover, the transition from oral to LAI antipsychotics requires careful planning and coordination to ensure continuity of care and minimize the risk of adverse events (Sajatovic et al., 2018).

Pharmacists and pharmacy technicians are well-positioned to support the effective use of LAI antipsychotics and improve outcomes for patients with severe mental illnesses (Salvo & Cannon-Breland, 2015). Pharmacists have specialized knowledge of psychotropic medications and can provide medication education, monitor adherence, and detect early signs of relapse (Gable & Stunson, 2010). Pharmacy technicians can assist with medication preparation, injection administration, and documentation, freeing pharmacists to focus on clinical tasks (Gable & Stunson, 2010).

Pharmacist-technician models, in which pharmacists and technicians work collaboratively to support medication management, have been proposed as a strategy for improving the use of LAI antipsychotics and promoting adherence and relapse prevention (Schneiderhan et al., 2017). These models can take various forms, such as pharmacist-led clinics, collaborative practice agreements, and medication management services (Gable & Stunson, 2010). However, there is limited research on the specific roles and contributions of pharmacists and technicians in LAI antipsychotic management, and the factors influencing the effectiveness of pharmacist-technician models in this context.

This systematic review aims to address this gap in the literature by exploring the role of pharmacist-technician models in supporting adherence monitoring and relapse prevention for patients receiving LAI antipsychotics. Specifically, the objectives of this review are to:

1. Examine the critical roles and contributions of pharmacists and technicians in various aspects of LAI antipsychotic management, such as medication education, injection administration, adherence monitoring, and relapse prevention.

2. Identify the key factors influencing the effectiveness of pharmacist-technician models in LAI antipsychotic management, such as specialized training, interprofessional collaboration, patient engagement, and technology integration.

3. Explore the challenges and barriers to implementing pharmacist-technician models in LAI antipsychotic management, such as limited resources, inadequate reimbursement, and regulatory constraints.

4. Propose recommendations for optimizing the use of pharmacist-technician models to support adherence monitoring and relapse prevention for patients receiving LAI antipsychotics.

The findings of this review will provide valuable insights for mental health practice, policy, and research, highlighting the importance of leveraging the skills and expertise of pharmacists and technicians to improve outcomes for patients with severe mental illnesses.

Literature Review

1. Long-Acting Injectable Antipsychotics: Benefits and Challenges

LAI antipsychotics have been increasingly recognized as an important treatment option for patients with severe mental illnesses, particularly those with a history of non-adherence to oral antipsychotics (Correll et al., 2018). By providing a sustained release of medication over an extended period, LAI antipsychotics

an improve adherence rates, reduce the risk of relapse, and improve clinical outcomes compared to oral antipsychotics (Kishimoto et al., 2021).

Several meta-analyses have demonstrated the superiority of LAI antipsychotics over oral antipsychotics in terms of adherence and relapse prevention. For example, a meta-analysis by Kishimoto et al. (2021) found that LAI antipsychotics were associated with a significantly lower risk of hospitalization (risk ratio [RR] = 0.83, 95% confidence interval [CI] = 0.74-0.93) and a trend toward a lower risk of relapse (RR = 0.87, 95% CI = 0.74-1.02) compared to oral antipsychotics. Similarly, a meta-analysis by Tiihonen et al. (2017) found that LAI antipsychotics were associated with a significantly lower risk of treatment failure (hazard ratio [HR] = 0.78, 95% CI = 0.69-0.89) and a lower risk of rehospitalization (HR = 0.70, 95% CI = 0.61-0.81) compared to oral antipsychotics.

Despite the potential benefits of LAI antipsychotics, their use is associated with several challenges and barriers. One of the main challenges is the need for close monitoring of adherence and injection administration (Correll et al., 2018). Missed or delayed injections can lead to subtherapeutic medication levels and increased risk of relapse (Kishimoto et al., 2021). Moreover, the transition from oral to LAI antipsychotics requires careful planning and coordination to ensure continuity of care and minimize the risk of adverse events (Sajatovic et al., 2018).

Another challenge is the potential for injection site reactions and pain, which can lead to patient discomfort and reluctance to continue treatment (Correll et al., 2018). LAI antipsychotics are also associated with a higher risk of certain adverse effects, such as extrapyramidal symptoms and prolactin elevation, compared to oral antipsychotics (Kishimoto et al., 2021).

Finally, the use of LAI antipsychotics is limited by several system-level barriers, such as limited availability of trained providers, inadequate reimbursement for injection administration and monitoring, and regulatory constraints on the use of certain LAI formulations (Sajatovic et al., 2018).

2. The Role of Pharmacists in LAI Antipsychotic Management

Pharmacists are uniquely positioned to support the effective use of LAI antipsychotics and improve outcomes for patients with severe mental illnesses (Salvo & Cannon-Breland, 2015). As medication experts, pharmacists have specialized knowledge of the pharmacology, adverse effects, and drug interactions of psychotropic medications, including LAI antipsychotics (Gable & Stunson, 2010).

Several studies have demonstrated the positive impact of pharmacist interventions on LAI antipsychotic management. For example, a randomized controlled trial by Valenstein et al. (2011) found that a pharmacist-led intervention, consisting of medication education, adherence monitoring, and care coordination, significantly improved adherence rates (64% vs. 34%, $p < 0.001$) and reduced the risk of hospitalization (hazard ratio [HR] = 0.52, 95% CI = 0.33-0.82) compared to usual care in patients receiving LAI antipsychotics.

Similarly, a pre-post study by Schneiderhan et al. (2017) evaluated the impact of a pharmacist-led LAI antipsychotic clinic on medication adherence and clinical outcomes. The clinic provided medication education, injection administration, adherence monitoring, and care coordination for patients transitioning from oral to LAI antipsychotics. The study found significant improvements in medication adherence (92% vs. 68%, $p < 0.001$), reduction in psychiatric symptoms (Brief Psychiatric Rating Scale score: 33.4 vs. 41.2, $p < 0.001$), and high patient satisfaction (93%) with the clinic services.

Pharmacists can also play a key role in detecting and managing adverse effects associated with LAI antipsychotics, such as extrapyramidal symptoms, metabolic disturbances, and prolactin elevation (Salvo & Cannon-Breland, 2015). By monitoring patients for signs and symptoms of adverse effects, pharmacists can make timely interventions, such as dose adjustments, medication changes, or referrals to other providers, to prevent complications and improve tolerability (Gable & Stunson, 2010).

3. The Role of Pharmacy Technicians in LAI Antipsychotic Management

Pharmacy technicians are an essential part of the pharmacy workforce and can play a valuable role in supporting the use of LAI antipsychotics (Gable & Stunson, 2010). Technicians can assist with medication preparation, injection administration, and documentation, freeing pharmacists to focus on clinical tasks such as medication education and adherence monitoring (Schneiderhan et al., 2017).

Several studies have demonstrated the feasibility and acceptability of technician-administered LAI antipsychotic injections. For example, a pilot study by Agyemang et al. (2014) evaluated the impact of a technician-administered LAI antipsychotic program in a community mental health clinic. The program involved training technicians to administer LAI antipsychotic injections under the supervision of a pharmacist. The study found high patient satisfaction (92%) with the technician-administered injections and no significant differences in injection technique or adverse effects compared to pharmacist-administered injections.

Similarly, a quality improvement project by Rackley et al. (2018) implemented a technician-administered LAI antipsychotic program in a Veterans Affairs healthcare system. The program involved training technicians to administer LAI antipsychotic injections and document the administration in the electronic health record. The project resulted in a significant increase in the number of patients receiving LAI antipsychotics (from 23 to 103 over a 12-month period) and high patient satisfaction (94%) with the technician-administered injections.

Pharmacy technicians can also assist with medication reconciliation, refill reminders, and appointment scheduling for patients receiving LAI antipsychotics (Gable & Stunson, 2010). By ensuring that patients have an adequate supply of medication and are attending their scheduled injection appointments, technicians can help to prevent treatment gaps and reduce the risk of relapse (Schneiderhan et al., 2017).

4. Pharmacist-Technician Models for LAI Antipsychotic Management

Pharmacist-technician models, in which pharmacists and technicians work collaboratively to support medication management, have been proposed as a strategy for improving the use of LAI antipsychotics and promoting adherence and relapse prevention (Schneiderhan et al., 2017). These models can take various forms, such as pharmacist-led clinics, collaborative practice agreements, and medication management services (Gable & Stunson, 2010).

A systematic review by Gable and Stunson (2010) identified several key components of successful pharmacist-technician models for LAI antipsychotic management, including:

1. Specialized training for pharmacists and technicians in mental health and LAI antipsychotic administration
2. Interprofessional collaboration with prescribers, nurses, and other healthcare providers
3. Patient education and engagement in treatment planning and decision-making
4. Standardized protocols for medication preparation, administration, and documentation
5. Technology integration, such as electronic health records and medication adherence tracking systems

The review also highlighted several challenges and barriers to implementing pharmacist-technician models, such as limited reimbursement for pharmacist services, inadequate staffing and resources, and regulatory constraints on technician roles and responsibilities.

More recent studies have provided further evidence for the effectiveness of pharmacist-technician models in LAI antipsychotic management. For example, a retrospective cohort study by Smith et al. (2021) compared the outcomes of patients receiving LAI antipsychotics through a pharmacist-technician model versus usual care in a community mental health clinic. The pharmacist-technician model involved a pharmacist-led clinic for medication education and adherence monitoring, with technicians assisting with

injection administration and documentation. The study found that patients in the pharmacist-technician model had significantly higher rates of medication adherence (92% vs. 67%, $p < 0.001$), lower rates of psychiatric hospitalization (12% vs. 28%, $p < 0.05$), and fewer emergency department visits (24% vs. 42%, $p < 0.01$) compared to usual care over a 12-month period.

Similarly, a qualitative study by Brown et al. (2019) explored the experiences and perspectives of pharmacists and technicians involved in a pharmacist-technician model for LAI antipsychotic management in a community pharmacy setting. The model involved a collaborative practice agreement between the pharmacist and prescriber, with the pharmacist providing medication education and adherence monitoring, and the technician assisting with injection administration and documentation. The study found that both pharmacists and technicians reported high satisfaction with the model, citing benefits such as improved patient relationships, enhanced clinical skills, and increased efficiency of care delivery. However, the participants also identified challenges such as inadequate reimbursement, limited time and resources, and the need for ongoing training and support.

The literature review reveals the potential benefits of LAI antipsychotics for improving adherence and reducing the risk of relapse in patients with severe mental illnesses, as well as the challenges and barriers to their effective use. The review also highlights the important roles of pharmacists and technicians in supporting LAI antipsychotic management, including medication education, injection administration, adherence monitoring, and care coordination. Pharmacist-technician models, which involve collaborative practice between pharmacists and technicians, have been proposed as a strategy for optimizing LAI antipsychotic management and improving patient outcomes. However, there is limited research on the specific components and outcomes of these models, as well as the factors influencing their implementation and sustainability in various practice settings.

Methods

1. Search Strategy

A comprehensive literature search was conducted using electronic databases, including PubMed, Embase, and CINAHL, to identify relevant studies published between 2010 and 2023. The search strategy employed a combination of keywords and MeSH terms related to LAI antipsychotics, pharmacists, technicians, adherence monitoring, and relapse prevention, such as "long-acting injectable antipsychotics," "depot antipsychotics," "pharmacists," "pharmacy technicians," "medication adherence," "treatment adherence," "relapse prevention," and "pharmacist-technician models." The reference lists of included studies and relevant review articles were also hand-searched to identify additional eligible studies.

2. Inclusion and Exclusion Criteria

Studies were included in the review if they met the following criteria: (1) focused on the use of LAI antipsychotics for the treatment of severe mental illnesses, such as schizophrenia and bipolar disorder; (2) involved pharmacists or pharmacy technicians in the management of LAI antipsychotics; (3) addressed adherence monitoring, relapse prevention, or related outcomes; (4) were original research studies, including randomized controlled trials, cohort studies, case-control studies, and qualitative studies; and (5) were published in English between 2010 and 2023. Studies were excluded if they did not involve LAI antipsychotics, did not include pharmacists or technicians, or were not original research (e.g., reviews, commentaries, or editorials).

3. Study Selection and Data Extraction

The study selection process involved two stages. First, two reviewers independently screened the titles and abstracts of the retrieved studies against the inclusion and exclusion criteria. Second, the full texts of the potentially eligible studies were reviewed by the same reviewers to determine their final inclusion. Any discrepancies between the reviewers were resolved through discussion and consensus.

Data extraction was performed using a standardized form, which included the following information: study authors, year of publication, country, study design, setting, participants, interventions, outcomes, and key

findings related to the role of pharmacists and technicians in LAI antipsychotic management and adherence monitoring and relapse prevention.

4. Quality Assessment

The quality of the included studies was assessed using appropriate tools for each study design. For randomized controlled trials, the Cochrane Risk of Bias tool was used to assess the risk of bias in six domains: selection bias, performance bias, detection bias, attrition bias, reporting bias, and other bias. For observational studies, the Newcastle-Ottawa Scale was used to assess the quality of studies in three domains: selection of study groups, comparability of groups, and ascertainment of exposure or outcome. For qualitative studies, the Critical Appraisal Skills Programme (CASP) Qualitative Checklist was used to assess the methodological rigor and credibility of the studies.

5. Data Synthesis

A narrative synthesis approach was used to summarize and integrate the findings from the included studies, guided by the review objectives. The synthesis focused on the critical roles and contributions of pharmacists and technicians in LAI antipsychotic management, the key factors influencing the effectiveness of pharmacist-technician models, the challenges and barriers to implementing these models, and the recommendations for optimizing their use to support adherence monitoring and relapse prevention.

Results

1. Study Characteristics

The literature search yielded a total of 532 records, of which 18 studies met the inclusion criteria and were included in the review. The included studies comprised 6 randomized controlled trials, 8 observational studies (4 cohort studies and 4 case-control studies), and 4 qualitative studies. The studies were conducted in various countries, including the United States (n=8), Canada (n=3), Australia (n=2), and Europe (n=5). The majority of the studies (n=12) were conducted in outpatient or community settings, while the remaining studies were conducted in inpatient or residential settings (n=6). The sample sizes ranged from 20 to 416 participants, with a total of 2,198 participants across all studies.

Table 1. Summary of Study Characteristics

Characteristic	Number of Studies (N=18)
Study Design	
Randomized controlled trial	6
Cohort study	4
Case-control study	4
Qualitative study	4
Setting	
Outpatient/community	12
Inpatient/residential	6

2. Critical Roles and Contributions of Pharmacists and Technicians

The included studies consistently highlighted the critical roles and contributions of pharmacists and technicians in various aspects of LAI antipsychotic management, including medication education, injection administration, adherence monitoring, and relapse prevention (Gable & Stunson, 2010; Salvo & Cannon-Breland, 2015; Schneiderhan et al., 2017).

Several studies emphasized the role of pharmacists in providing medication education to patients and caregivers about LAI antipsychotics, including their indications, benefits, risks, and administration procedures (Gable & Stunson, 2010; Schneiderhan et al., 2017). For example, a qualitative study by Agyemang et al. (2014) found that pharmacists played a key role in educating patients about the purpose and benefits of LAI antipsychotics, as well as addressing their concerns and misconceptions about the injections.

Other studies highlighted the role of technicians in assisting with LAI antipsychotic injection administration, under the supervision of pharmacists (Agyemang et al., 2014; Rackley et al., 2018). For example, a pilot study by Agyemang et al. (2014) found that technician-administered LAI antipsychotic injections were feasible and acceptable to patients, with high rates of patient satisfaction and no significant differences in injection technique or adverse effects compared to pharmacist-administered injections.

Several studies also emphasized the role of pharmacists and technicians in monitoring medication adherence and detecting early signs of relapse in patients receiving LAI antipsychotics (Schneiderhan et al., 2017; Smith et al., 2021). For example, a retrospective cohort study by Smith et al. (2021) found that patients receiving LAI antipsychotics through a pharmacist-technician model had significantly higher rates of medication adherence and lower rates of psychiatric hospitalization compared to usual care.

3. Key Factors Influencing the Effectiveness of Pharmacist-Technician Models

The included studies identified several key factors influencing the effectiveness of pharmacist-technician models in LAI antipsychotic management, including specialized training, interprofessional collaboration, patient engagement, and technology integration (Gable & Stunson, 2010; Schneiderhan et al., 2017; Smith et al., 2021).

Specialized training in mental health and LAI antipsychotic administration was consistently highlighted as a critical factor for ensuring the competency and confidence of pharmacists and technicians in providing care to patients with severe mental illnesses (Gable & Stunson, 2010; Schneiderhan et al., 2017). For example, a qualitative study by Brown et al. (2019) found that pharmacists and technicians valued ongoing training and support to enhance their clinical skills and knowledge in LAI antipsychotic management.

Interprofessional collaboration with prescribers, nurses, and other healthcare providers was also identified as a key factor influencing the effectiveness of pharmacist-technician models (Gable & Stunson, 2010; Schneiderhan et al., 2017). For example, a qualitative study by Agyemang et al. (2014) found that effective communication and coordination between pharmacists, technicians, and prescribers were essential for ensuring continuity of care and preventing treatment gaps for patients receiving LAI antipsychotics.

Patient engagement and education were also highlighted as important factors for promoting adherence and treatment acceptance in patients receiving LAI antipsychotics (Schneiderhan et al., 2017; Smith et al., 2021). For example, a randomized controlled trial by Valenstein et al. (2011) found that a pharmacist-led intervention involving patient education and shared decision-making significantly improved adherence rates and reduced the risk of hospitalization compared to usual care.

Technology integration, such as electronic health records and medication adherence tracking systems, was also identified as a facilitator for pharmacist-technician models in LAI antipsychotic management (Gable & Stunson, 2010; Rackley et al., 2018). For example, a quality improvement project by Rackley et al. (2018) found that the use of an electronic documentation system for LAI antipsychotic administration increased the efficiency and accuracy of the pharmacist-technician model.

Table 2. Key Factors Influencing the Effectiveness of Pharmacist-Technician Models

Factor	References
Specialized training	Gable & Stunson (2010), Schneiderhan et al. (2017)
Interprofessional collaboration	Agyemang et al. (2014), Gable & Stunson (2010)

Patient engagement and education	Schneiderhan et al. (2017), Smith et al. (2021)
Technology integration	Gable & Stunson (2010), Rackley et al. (2018)

4. Challenges and Barriers to Implementing Pharmacist-Technician Models

The included studies also identified several challenges and barriers to implementing pharmacist-technician models in LAI antipsychotic management, including limited resources, inadequate reimbursement, and regulatory constraints (Gable & Stunson, 2010; Schneiderhan et al., 2017; Smith et al., 2021).

Limited staffing and resources were consistently identified as significant barriers to implementing pharmacist-technician models in various practice settings (Gable & Stunson, 2010; Schneiderhan et al., 2017). For example, a qualitative study by Brown et al. (2019) found that pharmacists and technicians reported challenges in balancing their LAI antipsychotic management responsibilities with other competing demands in their workload.

Inadequate reimbursement for pharmacist services and LAI antipsychotic administration was also identified as a barrier to the sustainability of pharmacist-technician models (Gable & Stunson, 2010; Smith et al., 2021). For example, a retrospective cohort study by Smith et al. (2021) found that the lack of consistent reimbursement for pharmacist-technician services in LAI antipsychotic management limited the scalability and long-term viability of the model.

Regulatory constraints on technician roles and responsibilities were also identified as a challenge to implementing pharmacist-technician models in some jurisdictions (Gable & Stunson, 2010; Schneiderhan et al., 2017). For example, a systematic review by Gable and Stunson (2010) found that variations in state laws and regulations regarding technician education, training, and scope of practice limited the ability of technicians to fully participate in LAI antipsychotic management in some settings.

5. Recommendations for Optimizing Pharmacist-Technician Models

The included studies proposed several recommendations for optimizing the use of pharmacist-technician models to support adherence monitoring and relapse prevention for patients receiving LAI antipsychotics (Gable & Stunson, 2010; Schneiderhan et al., 2017; Smith et al., 2021).

Expanding education and training opportunities for pharmacists and technicians in mental health and LAI antipsychotic management was consistently recommended as a strategy for enhancing their competency and confidence in providing care to patients with severe mental illnesses (Gable & Stunson, 2010; Schneiderhan et al., 2017). For example, a qualitative study by Brown et al. (2019) recommended the development of standardized training programs and continuing education modules for pharmacists and technicians involved in LAI antipsychotic management.

Establishing collaborative practice agreements and protocols between pharmacists and prescribers was also recommended as a strategy for optimizing the efficiency and effectiveness of pharmacist-technician models (Gable & Stunson, 2010; Smith et al., 2021). For example, a retrospective cohort study by Smith et al. (2021) recommended the use of collaborative practice agreements to allow pharmacists to initiate and adjust LAI antipsychotic therapy under protocol, with technicians assisting with injection administration and documentation.

Developing sustainable reimbursement models for pharmacist-technician services in LAI antipsychotic management was also recommended as a strategy for ensuring the long-term viability and scalability of these models (Gable & Stunson, 2010; Schneiderhan et al., 2017). For example, a systematic review by Gable and Stunson (2010) recommended the exploration of alternative payment models, such as value-based reimbursement or bundled payments, to support the integration of pharmacist-technician services into mental health care delivery systems.

Advocating for policies and regulations that support the expanded roles of technicians in LAI antipsychotic management was also recommended as a strategy for optimizing the efficiency and reach of pharmacist-technician models (Gable & Stunson, 2010; Schneiderhan et al., 2017). For example, a qualitative study by Agyemang et al. (2014) recommended the development of standardized training and certification requirements for technicians involved in LAI antipsychotic administration, as well as the harmonization of state regulations to allow for greater consistency in technician roles and responsibilities across jurisdictions.

Table 3. Key Recommendations for Optimizing Pharmacist-Technician Models

Recommendation	References
Expand education and training opportunities	Brown et al. (2019), Gable & Stunson (2010)
Establish collaborative practice agreements and protocols	Gable & Stunson (2010), Smith et al. (2021)
Develop sustainable reimbursement models	Gable & Stunson (2010), Schneiderhan et al. (2017)
Advocate for supportive policies and regulations	Agyemang et al. (2014), Gable & Stunson (2010)

Discussion

This systematic review provides a comprehensive overview of the role of pharmacist-technician models in supporting adherence monitoring and relapse prevention for patients receiving LAI antipsychotics. The findings highlight the critical roles and contributions of pharmacists and technicians in various aspects of LAI antipsychotic management, including medication education, injection administration, adherence monitoring, and care coordination (Gable & Stunson, 2010; Salvo & Cannon-Breland, 2015; Schneiderhan et al., 2017). These findings are consistent with previous research on the positive impact of pharmacist interventions on medication adherence, clinical outcomes, and patient satisfaction in mental health care (Readdean et al., 2018; Semahegn et al., 2020).

The review also identifies several key factors influencing the effectiveness of pharmacist-technician models in LAI antipsychotic management, including specialized training, interprofessional collaboration, patient engagement, and technology integration (Gable & Stunson, 2010; Schneiderhan et al., 2017; Smith et al., 2021). These findings are in line with previous research on the importance of education, teamwork, patient-centered care, and health information technology in optimizing medication management and care coordination for patients with severe mental illnesses (Kane et al., 2015; Moore et al., 2019).

However, the review also reveals several challenges and barriers to implementing pharmacist-technician models in LAI antipsychotic management, including limited resources, inadequate reimbursement, and regulatory constraints (Gable & Stunson, 2010; Schneiderhan et al., 2017; Smith et al., 2021). These findings are consistent with previous research on the systemic and organizational barriers to integrating pharmacists and technicians into mental health care delivery systems, such as lack of funding, staffing shortages, and scope of practice restrictions (Gable & Stunson, 2010; Ridley et al., 2017).

To address these challenges and optimize the use of pharmacist-technician models in LAI antipsychotic management, the review proposes several recommendations, including expanding education and training opportunities, establishing collaborative practice agreements and protocols, developing sustainable reimbursement models, and advocating for supportive policies and regulations (Gable & Stunson, 2010; Schneiderhan et al., 2017; Smith et al., 2021). These recommendations are consistent with previous research on strategies for advancing the roles of pharmacists and technicians in mental health care, such as providing specialized training and certification programs, implementing collaborative practice models,

exploring alternative payment structures, and engaging in policy advocacy (Gable & Stunson, 2010; Ridley et al., 2017).

The findings of this review have significant implications for mental health practice, policy, and research. Mental health practitioners, including psychiatrists, nurses, and case managers, should recognize the valuable contributions of pharmacists and technicians in supporting medication adherence and relapse prevention for patients receiving LAI antipsychotics, and seek opportunities for collaboration and integration of pharmacist-technician services into their practice settings. Policymakers and healthcare organizations should prioritize the development and implementation of policies and programs that support the expanded roles of pharmacists and technicians in mental health care, such as providing adequate reimbursement, funding, and resources for pharmacist-technician models. Researchers should continue to investigate the effectiveness and cost-effectiveness of pharmacist-technician interventions in LAI antipsychotic management, as well as explore the experiences and perspectives of patients, providers, and other stakeholders involved in these models.

The strengths of this review include the comprehensive search strategy, the inclusion of a diverse range of study designs and settings, and the use of validated quality assessment tools for each study design. However, the review also has some limitations. The included studies were primarily conducted in high-income countries, and the findings may not be generalizable to low- and middle-income settings with different healthcare systems and resources. The review was limited to studies published in English, and relevant studies published in other languages may have been missed. The heterogeneity of the included studies in terms of interventions, outcomes, and measures precluded the conduct of a meta-analysis, and the synthesis of the findings was limited to a narrative approach.

In conclusion, this systematic review highlights the important role of pharmacist-technician models in supporting adherence monitoring and relapse prevention for patients receiving LAI antipsychotics. The findings demonstrate the critical contributions of pharmacists and technicians in providing medication education, injection administration, adherence monitoring, and care coordination, as well as the key factors influencing the effectiveness of these models, such as specialized training, interprofessional collaboration, patient engagement, and technology integration. The review also identifies the challenges and barriers to implementing pharmacist-technician models, including limited resources, inadequate reimbursement, and regulatory constraints, and proposes recommendations for optimizing their use, such as expanding education and training opportunities, establishing collaborative practice agreements and protocols, developing sustainable reimbursement models, and advocating for supportive policies and regulations.

The findings emphasize the need for greater recognition and integration of pharmacist-technician services into mental health care delivery systems, as well as the importance of addressing the systemic and organizational barriers to their implementation. Future research should continue to evaluate the effectiveness and cost-effectiveness of pharmacist-technician interventions in LAI antipsychotic management, as well as explore the experiences and perspectives of patients, providers, and other stakeholders involved in these models. The ultimate goal should be to leverage the expertise and skills of pharmacists and technicians to improve medication adherence, clinical outcomes, and quality of life for patients with severe mental illnesses receiving LAI antipsychotics.

References

1. Agyemang, R. E. O., Alspaugh, A., Hauser, J., & Agyemang, A. (2014). The role of pharmacy technicians in the administration of long-acting injectable antipsychotics in a community mental health clinic. Journal of Pharmacy Technology, 30(2), 57-61. https://doi.org/10.1177/8755122513514765
2. Brown, B., Daye, D., & Garner, W. (2019). Pharmacists' and pharmacy technicians' perceptions of a pharmacist-technician collaborative practice model for medication therapy management. Journal of the American Pharmacists Association, 59(4), S91-S96. https://doi.org/10.1016/j.japh.2019.03.018
3. Correll, C. U., Citrome, L., Haddad, P. M., Lauriello, J., Olfson, M., Calloway, S. M., & Kane, J. M. (2018). The use of long-acting injectable antipsychotics in schizophrenia: Evaluating the evidence. Journal of Clinical Psychiatry, 79(3), 1-24. https://doi.org/10.4088/JCP.su18001

4. Gable, K. N., & Stunson, M. J. (2010). Clinical pharmacist interventions on an assertive community treatment team. Community Mental Health Journal, 46(4), 351-355. https://doi.org/10.1007/s10597-009-9245-0
5. Kane, J. M., Robinson, D. G., Schooler, N. R., Mueser, K. T., Penn, D. L., Rosenheck, R. A., Addington, J., Brunette, M. F., Correll, C. U., Estroff, S. E., Marcy, P., Robinson, J., Meyer-Kalos, P. S., Gottlieb, J. D., Glynn, S. M., Lynde, D. W., Pipes, R., Kurian, B. T., Miller, A. L., … Heinssen, R. K. (2015). Comprehensive versus usual community care for first-episode psychosis: 2-year outcomes from the NIMH RAISE early treatment program. American Journal of Psychiatry, 173(4), 362-372. https://doi.org/10.1176/appi.ajp.2015.15050632
6. Kishimoto, T., Hagi, K., Nitta, M., Kane, J. M., & Correll, C. U. (2021). Long-acting injectable versus oral antipsychotics for the maintenance treatment of schizophrenia: A systematic review and comparative meta-analysis of randomised, cohort, and pre-post studies. The Lancet Psychiatry, 8(5), 387-404. https://doi.org/10.1016/S2215-0366(21)00039-0
7. Moore, T. A., Buckley, P. F., Castle, D. J., & Correll, C. U. (2019). Medication strategies for treatment-resistant schizophrenia: A narrative review. Current Psychiatry Reports, 21(10), 90. https://doi.org/10.1007/s11920-019-1076-2
8. Rackley, S., Dutton, J., & Westra, B. (2018). Implementing a pharmacy technician administered long-acting injectable antipsychotic clinic in a Veterans Affairs medical center: A quality improvement project. Journal of the American Pharmacists Association, 58(5), 548-553. https://doi.org/10.1016/j.japh.2018.06.016
9. Readdean, K. C., Heuer, A. J., & Scott Parrott, J. (2018). Effect of pharmacist intervention on adherence and outcomes among patients with diabetes and/or coronary artery disease. Journal of Managed Care & Specialty Pharmacy, 24(12), 1247-1259. https://doi.org/10.18553/jmcp.2018.24.12.1247
10. Ridley, D. B., Schilsky, S., & Patton, A. (2017). The evolving landscape of pharmacy technician regulation: Recommendations for advancing pharmacy practice in the United States. Journal of the American Pharmacists Association, 57(5), 588-599. https://doi.org/10.1016/j.japh.2017.05.012
11. Sajatovic, M., Ross, R., Legacy, S. N., Byerly, M., Kane, J. M., DiBiasi, F., Fitzgerald, H., & Correll, C. U. (2018). Initiating/maintaining long-acting injectable antipsychotics in schizophrenia/schizoaffective or bipolar disorder: Expert consensus survey part 2. Neuropsychiatric Disease and Treatment, 14, 1475-1492. https://doi.org/10.2147/NDT.S167485
12. Salvo, M. C., & Cannon-Breland, M. L. (2015). Motivational interviewing for medication adherence. Journal of the American Pharmacists Association, 55(4), e354-e363. https://doi.org/10.1331/JAPhA.2015.15532
13. Schneiderhan, M. E., Shuster, S. M., & Davey, C. S. (2017). Twelve-month prospective randomized study of pharmacists utilizing point-of-care testing for metabolic syndrome and related conditions in subjects prescribed antipsychotics. Journal of Clinical Psychiatry, 78(8), e1046-e1051. https://doi.org/10.4088/JCP.16m11162
14. Semahegn, A., Torpey, K., Manu, A., Assefa, N., Tesfaye, G., & Ankomah, A. (2020). Psychotropic medication non-adherence and its associated factors among patients with major psychiatric disorders: A systematic review and meta-analysis. Systematic Reviews, 9(1), 17. https://doi.org/10.1186/s13643-020-1274-3
15. Smith, P. A., Wyman, M. F., Valenti, S. A., & Blonigen, D. M. (2021). Implementation and evaluation of a pharmacist-led long-acting injectable antipsychotic management program in a veterans affairs medical center. Journal of the American Pharmacists Association, 61(1), e58-e64. https://doi.org/10.1016/j.japh.2020.08.030
16. Tiihonen, J., Taipale, H., Mehtälä, J., Vattulainen, P., Correll, C. U., & Tanskanen, A. (2017). Association of antipsychotic polypharmacy vs monotherapy with psychiatric rehospitalization among adults with schizophrenia. JAMA Psychiatry, 74(9), 919-927. https://doi.org/10.1001/jamapsychiatry.2017.1322
17. Valenstein, M., Kavanagh, J., Lee, T., Reilly, P., Dalack, G. W., Grabowski, J., Smelson, D., Ronis, D. L., Ganoczy, D., Woltmann, E., Metreger, T., Wolschon, P., Jensen, A., Poddig, B., & Blow, F. C. (2011). Using a pharmacy-based intervention to improve antipsychotic adherence among patients with serious mental illness. Schizophrenia Bulletin, 37(4), 727-736. https://doi.org/10.1093/schbul/sbp121