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Systematic literature review of the impact of psychiatric pharmacists

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Abstract

Introduction: Pharmacists focusing on psychotropic medication management and practicing across a wide variety of healthcare settings have significantly improved patient-level outcomes. The Systematic Literature Review Committee of the American Association of Psychiatric Pharmacists was tasked with compiling a comprehensive database of primary literature highlighting the impact of psychiatric pharmacists on patient-level outcomes.

Methods: A systematic search of literature published from January 1, 1961, to December 31, 2022, was conducted using PubMed and search terms based on a prior American Association of Psychiatric Pharmacists literature review. Publications describing patient-level outcome results associated with pharmacist provision of care in psychiatric/neurologic settings and/or in relation to psychotropic medications were included. The search excluded articles for which there was no pharmacist intervention, no psychiatric disorder treatment, no clinical outcomes, no original research, no access to full text, and/or no English-language version.

Results: A total of 4270 articles were reviewed via PubMed, with 4072 articles excluded based on title, abstract, and/or full text in the initial pass and 208 articles selected for inclusion. A secondary full-text review excluded 11 additional articles, and 5 excluded articles were ultimately included based on a secondary review, for a final total of 202 articles meeting the inclusion criteria. A comprehensive database of these articles was compiled, including details on their study designs and outcomes.

Discussion: The articles included in the final database had a wide range of heterogeneity. While the overall impact of psychiatric pharmacists was positive, the study variability highlights the need for future publications to have more consistent, standardized outcomes with stronger study designs.

Keywords: patient-level outcome, pharmacist, psychiatry, systematic review

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Introduction

In 2020, approximately 1 in 5 adults in the United States were living with a psychiatric disorder, which translates to approximately 52.9 million individuals.[1] Additionally, an average of

17% of young people experience an emotional, mental, or behavioral disorder.[2] Psychotropic medications make up nearly 20% of the treatment approaches for psychiatric disorders.[3] Therefore, optimizing the safe and effective use of psychiatric medications is paramount. Pharmacists focusing on psychotropic medications and practicing across a wide variety of healthcare settings have significantly improved patient-level outcomes, including attaining therapeutic goals, improving medication adherence, managing adverse effects, and avoiding hospitalizations.[4] In 1996, the Board-Certified Psychiatric Pharmacist (BCPP) credential was established, further demonstrating pharmacists' expertise with appropriate training in managing these disorders.

Abundant evidence exists regarding pharmacist practices and their impact on patient care in psychiatric and neurologic settings. The American Association of Psychiatric Pharmacists (AAPP) Systematic Literature Review Committee developed a methodology to review articles highlighting psychiatric pharmacists' impact on medication-related outcomes. The methodology provides a mechanism to identify newly published literature to continuously add to the current research outcomes, further supporting the impact of psychiatric pharmacists in a systematic approach.

This project aimed to identify, review, and evaluate primary literature published up to December 31, 2022, highlighting the improved patient-level, medication-related outcomes psychiatric pharmacists achieve as a part of the healthcare team.

Methods

A systematic search of literature published from January 1, 1961, to December 31, 2022, was conducted using PubMed. Limiting articles to PubMed ensured that all relevant studies were found in journals that abide by specific quality standards. PubMed also supports complex search queries and can export all results in a structured format; articles dating only as far back as 1961 were returned in the match. Other databases were excluded because the output required to review these additional articles would result in diminishing returns.

The search terms from the previous AAPP literature review[4] were expanded to include disease-state terms associated with all categories of major psychiatric disorders and select major neurologic disorders with psychiatric manifestations that are primarily or secondarily treated with psychotropic medications (Table 1).[4] The search was limited to papers with at least 1 "pharmacist" and 1 "psychiatric" term. Articles were additionally excluded based on article type and title keywords that strongly indicated that the article was not original clinical research. Terms such as "pain" were omitted from the query, such that pain studies were only included when they involved psychiatric comorbidity(ies).

A final search of PubMed was performed on January 10, 2023, with a publication date filter of December 31, 2022. The results from PubMed were loaded into a spreadsheet to track inclusion and exclusion. The author group completed manual reviews of each article and documented inclusion or exclusion on the spreadsheet. Any questionable articles were brought to the group for further discussion. An article was manually excluded if it met any of the following 6 criteria:

1. No pharmacist intervention
2. No treatment of psychiatric disorder
3. No clinical outcomes
4. Not original research
5. No full-text access
6. No English-language version

A second reviewer evaluated at least 5% of excluded articles, predetermined by the authors, to confirm the accuracy and appropriateness of the exclusion. Publications with results describing patient-level outcomes associated with pharmacist provision of care in psychiatric/neurologic settings and/or in relation to psychotropic medications were included. Table 2 lists each study evaluator's characterization and description of the study design and outcome measures. The quadruple aims, which include improved care, reduced healthcare costs, improved patient experience, and improved healthcare provider well-being, were also tracked for included articles to enhance outcomes data.

Results

The Figure depicts the article identification, screening and eligi-bility, and total articles selected. A total of 4270 articles were pulled for review via PubMed. The study authors excluded 4072 articles based on title, abstract, and/or full text in the initial pass, with 208 articles selected for inclusion. The authors completed a second review of 7.5% of the articles, rather than the planned 5%. After a secondary review, 11 articles initially included were excluded, and 5 of 307 articles excluded were included, leaving a final total of 202 articles meeting the inclusion criteria (see Appendix). The top 6 journals by article count were the *Journal of the American Pharmacists Association* (14), the *Mental Health Clinician* (11), the *American Journal of Health-System Pharmacy* (8), the *American Journal of Hospital Pharmacy* (6), the *Annals of Pharmacotherapy* (6), and *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy* (6). Over half of these articles were published in the United States. Patient demographics and other study characteristics are presented in Table 2.

All applicable outcome measures and quadruple aims for each study were included during the study review, resulting

TABLE 1: PubMed search criteria

Pharmacist Terms		
BCPP Pharmacist	Pharmacists	Pharmacy led
Psychiatric Terms		
ADHD	Gender dysphoria	Parasomnia
Addiction	Huntington disease	Parkinson
Agoraphobia	Huntington's disease	Parkinson's
Alcohol use disorder	Hypnotic	Personality disorders
Alcohol withdrawal	Insomnia	Posttraumatic stress
Alzheimer	Intellectual disability	Premenstrual dysphoric
Alzheimer's	LAI	Psychiatric
Anorexia nervosa	LAI-A	Psychiatry
Antidepressant	Long-acting injectable	Psychosis
Antipsychotics	MDD	Psychotic
Anxiety disorder	Major depressive disorder	Psychotropic interactions
Anxiety disorders	Mania	Psychotropics
Anxiolytic	Mental health	Schizoaffective
Attention-deficit hyperactivity	Mental illness	Schizophrenia
Autism	Mental illnesses	Seizure
BCPP	Mood stabilizer	Smoking cessation
Beers Criteria	Movement disorder	Stimulant use
Behavioral health	Narcolepsy	Stimulant withdrawal
Bereavement	Neurocognitive disorder	Substance use disorder
Binge	Neurocognitive disorders	Suicidal
Bipolar	Neurodevelopmental	Suicidality
Bulimia nervosa	Neuroleptic malignant syndrome	Suicide
Buprenorphine	Neurologic	TBI
Catatonia	Neurology	Tardive dyskinesia
Delirium	Obsessive-compulsive	Tobacco cessation
Delusional disorder	Opiates	Tourette
Dementia	Opioid	Tourette's
Depression	PTSD	Transgender
Dysphoric	Panic disorder	Traumatic brain injury
Eating disorder	Panic disorders	Treatment-seeking smokers
Epilepsy	Panic symptoms	Trichotillomania
Extrapyramidal		
Excluded Title Terms		
Case report	Monkey	Placebo
Case series	Monkeys	Rat
Consensus paper	Mouse	Systematic analysis
Consensus statement	Pharmacy education	Systematic review
Mice	Pharmacy student	
Excluded Publication Types		
Bibliography	Lecture	Published erratum
Case reports	Letter	Retracted publication
Comment	Meta-analysis	Retraction of publication
Congress	News	Review
Editorial	Newspaper article	Systematic review
Interview	Preprint	

ADHD = attention-deficit/hyperactivity disorder; BCPP = Board-Certified Psychiatric Pharmacist; LAI = long-acting injectable; LAI-A = long-acting injectable antipsychotic; PTSD = posttraumatic stress disorder; TBI = traumatic brain injury.

in a total percentage exceeding 100 for each of these characteristics. Response to study treatment was the most common outcome measure in 141 total studies (69.5%). Other outcome measures tracked in the order of most to least frequent were medication-based (60 studies), patient experience/adherence (48), resource utilization (47), adverse outcome (24), cost-based (19), time-based (17), and retention/referral (13). Of the studies, 57% had more than 1 applicable outcome measure. Quadruple aims tracked from the most to least frequent were better care (202 studies; 4.5% had negative outcomes), improved patient experience (45), reduced health care costs (27; 3.7% had negative outcomes), and provider well-being (1). Almost one-fourth of the studies (23.8%) had more than 1 applicable quadruple aim.

TABLE 2: Study characteristics

	Studies (%)
Practice Characteristic	
Patient Age Group	
Adults	148 (73.2)
Multiple	26 (12.9)
Seniors (≥ 65 y)	21 (10.4)
Children (< 18 y)	3 (1.5)
Other	1 (0.5)
Unknown	3 (1.5)
Types of Disorders Treated	
Psychiatric	125 (61.9)
Both psychiatric and medical	49 (24.2)
Neurologic	22 (10.9)
Medical	4 (2.0)
Other	1 (0.5)
Unknown	1 (0.5)
Treatment Settings	
Outpatient general	50 (24.8)
Outpatient specialty	42 (20.8)
Community pharmacy	37 (18.3)
Inpatient	36 (17.8)
Primary care	15 (7.4)
Long-term care facility	9 (4.5)
Other	11 (5.4)
Unknown	2 (1.0)
Countries	
United States	114 (56.4)
United Kingdom	15 (7.4)
Canada	9 (4.5)
Australia	8 (4.0)
Thailand	5 (2.5)
Spain	4 (2.0)
Germany	4 (2.0)
Japan	4 (2.0)
The Netherlands	3 (1.5)
Malaysia	3 (1.5)
India	3 (1.5)
Other (1-2 per country)	30 (14.9)
Study Design Characteristic	
Prospective vs retrospective	
Prospective	137 (67.8)
Retrospective	65 (32.2)
Controlled vs open	
Open	119 (58.9)
Controlled	83 (41.1)
Randomized vs nonrandomized	
Nonrandomized	114 (56.4)
Randomized	71 (35.1)
Unknown	17 (8.4)
Comparison	
Comparison group	112 (55.4)
No comparison	44 (21.8)
Pre/post	42 (20.8)
Unknown	4 (2.0)
Outcome measures[a]	
Response	141 (69.8)
Medication-based	60 (29.7)
Patient experience/adherence	48 (23.8)
Resource utilization	47 (23.3)
Adverse outcome	24 (11.9)
Cost-based	19 (9.4)
Time-based	17 (8.4)
Retention or referral	13 (6.4)
Quadruple Aims[a]	
Better care	202 (100.0)
Improved patient experience	45 (22.3)
Reduced health care costs	27 (13.4)
Provider well-being	1 (0.5)

[a]Percentages do not sum to 100% because multiple options could apply to 1 study.

Tobacco use disorder and major depressive disorder (MDD) were the most frequently assessed disease states, accounting for 38 and 27 included studies, respectively. All other specified disease states accounted for less than 10 included articles each, while a total of 81 (40.1%) did not specify the disease state being evaluated. In the general outpatient and community settings, psychiatric pharmacists increased smoking cessation response rates through methods such as behavioral counseling and/or nicotine replacement therapy.[5–10] Psychiatric pharmacists improved depression symptom scores in various clinical settings. Inpatients demonstrated reductions in the Hamilton Depression Rating Scale and the Patient Health Questionnaire-9 symptom scores.[11,12] Patient Health Questionnaire-9 scores improved for patients in outpatient general, outpatient specialty, and community pharmacy settings when a psychiatric pharmacist was involved in their care. Patients diagnosed with depression had enhanced medication adherence.[13–16] Patients seeking treatment for multiple disease states, including smoking cessation, depression, post-stroke/transient ischemic attack, and neurological disorders, reported better satisfaction and attitudes.[5,8,10,16–31] Representing 72.8% of authorship, patients in long-term care facilities, outpatient general clinics, inpatient, primary care clinics, and community settings demonstrated improved satisfaction and attitudes when a psychiatric pharmacist was involved in their care.[14,18,24,32–36] In addition, the presence of a psychiatric pharmacist improved the number of patients seen per month, the hours of direct care provided, the number of patient contacts, rehospitalization rates, the number of medications prescribed, and the length of stay.[37–50]

Most of the included studies (83.2%) did not report any Board of Pharmacy Specialties (BPS) certification, including BCPP designation, or other advanced clinical training among the researchers. Some studies without evidence of BPS certification were published before the establishment of BCPP designation. Only 24 (11.9%) articles had at least 1 BCPP mentioned in the body of the paper as a part of the intervention. Eleven (5.4%) included authors with non-psychiatric certifications. The number of BCPPs represented in authorship varied by year, but no trend could be identified. Of the 64 articles from 2020 to 2022, 8 (12.5%) had at least 1 BCPP represented based on details included in the article, and 2 (3.1%) had at least 1 author with a non-psychiatric BPS certification. While BPS may not have been explicitly mentioned in the article, intervention by a

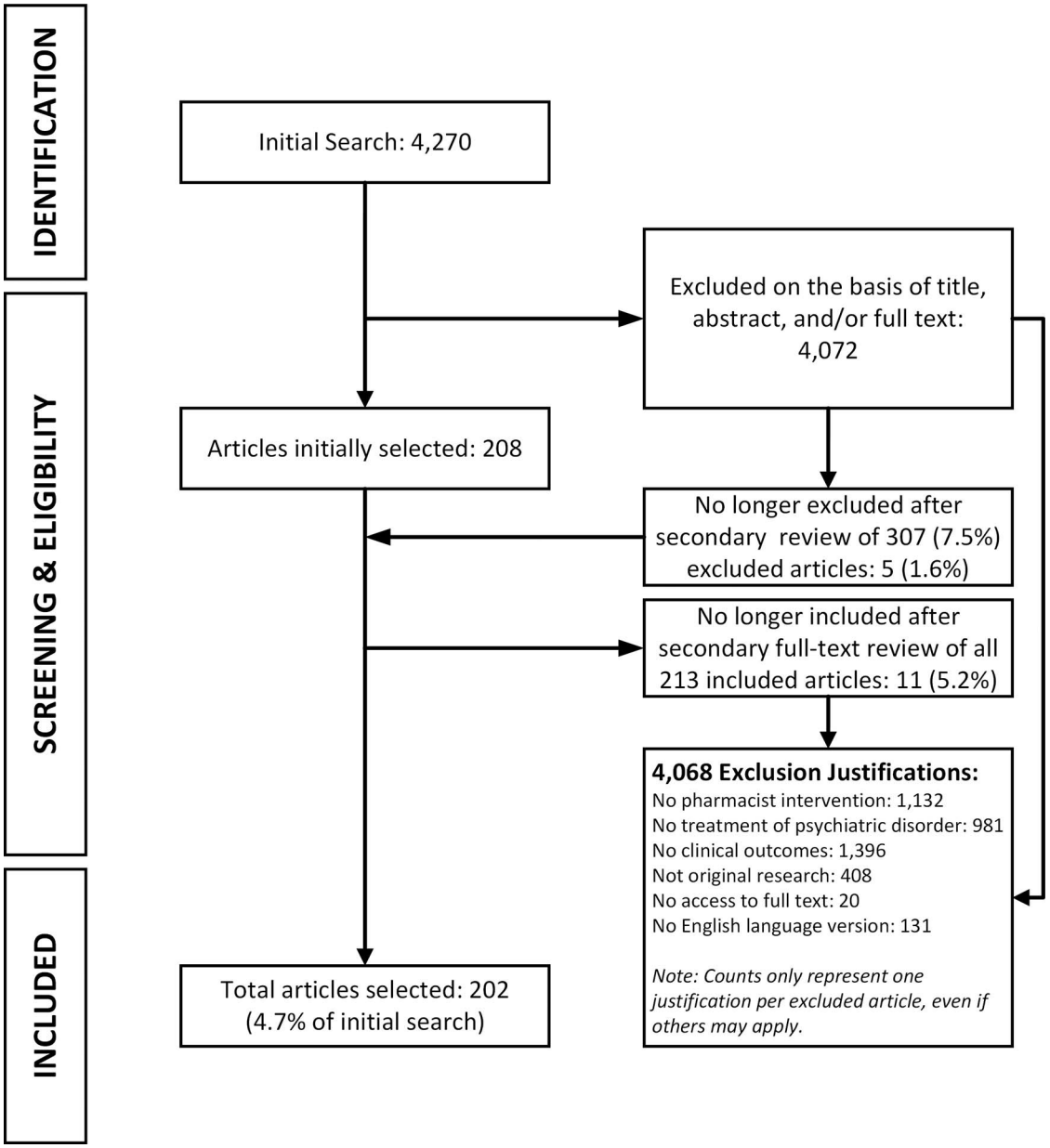

FIGURE: Review flow diagram

"psychiatric pharmacist" was noted based on the description of the pharmacists' training and/or experience, such as completing a psychiatric pharmacy residency or years of experience in the psychiatric setting.

Discussion

With 4270 articles reviewed, this was the most extensive and comprehensive evaluation of primary literature to date, highlighting the impact of psychiatric pharmacists on patient-level outcomes. The database underscores the wide range of clinical settings psychiatric pharmacists practice as well as the varied outcomes measured by their efforts. Additionally, through medication management, quadruple aims for mental healthcare were included such as improved care, reduced costs, patient experience, and provider well-being.

This review largely aligned with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), which aims to improve the reporting of systematic reviews and meta-analyses. However, there were slight deviations, such as not specifying effect measures because of the heterogeneity of the studies included and lack of certainty or confidence assessment except through a 7.5% rereview process. Although a rereview of all the articles would be ideal for verification, the authors only found a small number of articles either incorrectly included or excluded based on the second review.

Figure 1 follows the PRISMA template flow diagram detailing the identification of studies. The evidence identified and included in this report was limited to PubMed and may be considered too restrictive. While excluding non-PubMed studies is a limitation, an analysis showed that 90% (57/63) of the studies identified in the previous AAPP literature review[4] are cataloged in PubMed, and 4 more were from the backfiles of journals that are now indexed. Additional studies may have been found through backward citation searching; however, this was not performed. Title, abstract, or full-text review were all used to exclude articles, but the proportion of articles excluded from each type of review was not quantified. An additional review of the excluded articles performed by a different reviewer on 7.5% of the articles resulted in the inclusion of 1.6% of those previously excluded articles. A total of 20 articles (0.5%) were excluded on the basis of inability to access the full text, which could be seen as a limitation. Reviewers made a reasonable attempt to obtain the full text of each article before marking it for exclusion.

Many of the studies (39, 19.3%) identified in this report were focused on tobacco cessation. This finding could pose a potential bias in the body of evidence as it may not be the most reflective of psychiatric pharmacy clinical practice. None of the tobacco cessation articles specified that a BCPP performed the intervention in the study design. A prior AAPP survey reviewing the current practice of psychiatric pharmacists in the United States[17] found that the psychiatric conditions most commonly managed by BCPPs were depressive disorders, followed by anxiety disorders, bipolar disorders, and schizophrenia, which was not representative of the included articles. While some studies included details, such as pharmacist type, level of experience, or years of training, sufficient detail was not reported in 82.2% of the included studies, which may have offered more opportunities for critical appraisal. Because the body of evidence spanned 7 decades, the results in this report are limited by a lack of context, given how health systems and credentials for psychiatric pharmacists have evolved over time. Many excluded studies focused solely on adherence and economic outcomes, both of which are imperfect extrapolations of patient outcomes. Thus, focusing more on patient-level outcomes in such studies will be more compelling.

Despite these limitations, most outcomes in the articles included showed positive results. This may be a reflection of positive publication bias. Of the studies included, no trends were seen among those with negative outcomes. While the article selection process was not limited by year, the number of results since 1996 dramatically increased, potentially corresponding with the standardization of psychiatric pharmacy residencies with the goal of improving the quality of care provided by psychiatric pharmacists and the creation of the BCPP certification.[51] As the number of BCPPs continues to grow, perhaps it would follow that the positive contributions toward patient care will expand as well. While the focus of the individual studies and the variety of outcomes found is problematic for aggregation, it nevertheless demonstrates the flexibility and wide scope of the BCPP role in patient care.

Only 36 (17.8%) articles reported sufficient detail related to study design, pharmacist training, and collaborators; only 20 of those articles had a duration of 1 year or longer. Also, the practice settings observed in the included articles do not reflect those observed by a prior AAPP survey.[17] Almost half of the respondents in that study practiced in a hospital inpatient setting (47.6%), while some respondents worked in both hospital inpatient and outpatient settings (13.8%). In comparison, only 17.8% of the included articles in this review were based in inpatient settings. Most of the included articles involved a community setting, which was not specifically mentioned as a BCPP practice site in the prior AAPP survey.[17] Ultimately, the benefit BCPPs bring to the healthcare team is useful knowledge. However, insufficient details about the pharmacists, such as residency or fellowship training and years of experience, were provided in the included articles. In some cases, the articles included were published before the establishment of BCPP.

Patient outcome data would be more impactful if derived from randomized controlled trials; however, with the majority of psychiatric pharmacists focusing on direct patient care, time and funding dedicated to randomized controlled trials may be limited. While potentially challenging with institutional review boards, more studies involving vulnerable populations (eg, children and adolescents) could further highlight the role of psychiatric pharmacists in medication management in these specific populations. Additionally, standardizing the outcomes, measures, and reported study characteristics is necessary to improve the ability to aggregate results and replicate studies. By reporting standardized data, areas of opportunity for BCPPs can be identified. Expansion in areas such as provider status and reimbursement could be better supported by data clearly outlining quadruple aims like improved care and reduced cost.

Future systematic literature reviews could re-evaluate or expand upon the search terms used. In the current review, articles were required to use the word "pharmacist" in the indexed content, which may have excluded articles that did not reference pharmacists in any indexed content (eg, title, abstract, keywords). Future reviews could consider additional secondary reviews of excluded articles. Finally, while the quadruple aims are a useful framework, articles studying patient experience, healthcare costs, and provider well-being would have been excluded if they did not also address clinical outcomes (ie, improved care). Future reviews could consider inclusion criteria for the other aims.

The existing data illustrate the varied and impactful roles that psychiatric pharmacists play to benefit patient care as part of the interdisciplinary team. The AAPP Systematic Literature Review Committee will continue to monitor new research as it is performed and published.

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APPENDIX: Included studies sorted by disease state, year, and first author

Multiple disease states

Author, Year, Country	Population	Design/Intervention	Outcomes
Chung B, 2011,[32] US	*N* = 34	Unknown, limited data Pharmacist-provided medication management MDD, anxiety, schizoaffective disorder	Self-reported satisfaction with pharmacist services
Suehs BT, 2011,[52] US	*N* = 105	Retrospective, chart review Pharmacist interventions in state hospital Schizoaffective disorder, bipolar disorder, schizophrenia, MDD	Reduced CGI-severity if implementation of recommendation rate was 80% or more (CGI-S) score ($P = .036$)
Valenstein M, 2011,[53] US	*N* = 118	Randomized control trial Pharmacist interventions in patients with schizophrenia Schizophrenia, schizoaffective disorder, bipolar disorder	Increased medication persistence rate compared with usual care (0.86 vs 0.62) Failed to show differences in secondary outcomes measures, including PANSS, QWB, and CSQ-8
Wang I, 2011,[54] US	*N* = 48	Retrospective analysis Pharmacist medication recommendations Homeless patients with myocardial infarction MDD, bipolar disorder, anxiety	Identified 41 drug therapy problems Reduced mean PHQ-9 score from baseline to end of study (−5.7, $P = .02$)
Furbish SML, 2017,[55] US	*N* = 29	Pharmacist interventions for patients taking BZD Anxiety, sleep disorder	Optimized BZDs during visit (46%) Optimized non-BZDs during visit (59%)
Harms M, 2018,[56] US	*N* = 50	Retrospective, chart review Anxiety, SUD, MDD	Improved change in PHQ-9 at 12 weeks compared with baseline (10; 95% CI = 6.2, 13.8; $P < .001$) Improved change in GAD-7 (8, 95% CI = 3.1-12.9, $P = 0.006$) Improved change in PCL-7 (14.5; 95% CI = 17.3, 46.3; $P = .109$) Completed interventions (336)
Herbert C, 2018,[57] US	*N* = 172	Pharmacist-provided medication management in primary care mental health integration MDD, anxiety	Decreased average PHQ-9 scores (14.5-8.5) Achieved response (46%) Achieved remission (31%) Observed average M-P-R for antidepressant therapy of 0.93 for all patients included
Lindell VA, 2018,[58] US	*N* = 217	Retrospective cohort study Psychiatric clinical pharmacist-provided clinical services vs provider care alone Anxiety, MDD	Failed to observe a statistical difference in the primary outcome[a]
Buist E, 2019,[59] United Kingdom	*N* = 75	Pilot program Pharmacist-led medication management MDD, anxiety	Reduced PHQ-9 or GAD-7 score by 50% (45.3%)
Gonzalvo JD, 2019,[60] US	*N* = 81	Retrospective, open, pre/post, nonrandomized Pharmacist-provided cardiovascular risk reduction clinic for those with serious mental illness Schizophrenia, bipolar disorder, MDD, anxiety	Decreased HbA_{1c} (0.06% per month of follow-up, $P < .001$)
Perepelkin J, 2019,[61] Canada	*N* = 12	Prospective, pre/post comparison Community pharmacist-led mindfulness meditation class Anxiety, MDD	Improved PHQ-9 and GAD-7 scores (9/12 participants) Reduced severity of depression or anxiety (75% of participants)

Multiple disease states (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
AbuNaba'a Y, 2020,[62] Jordan	*N* = 73	Randomized control trial Pharmacist medication review Anxiety, MDD	Showed a significant decline in the number of treatment-related problems for the active group vs control group (0.58 [SD = 0.64], vs 1.78 [SD = 1.13]; $P < .001$)
Alkoudsi KT, 2020,[63] Syria, Jordan	*N* = 118	Retrospective Pharmacist-provided management of anxiety and depression in patients with polycystic ovary syndrome Anxiety, MDD	Showed improvements in anxiety and depression mean scores in both groups[b]
Samaksha PB, 2022,[64] India	*N* = 84	Prospective interventional study Pharmacist-led management of geriatric patients newly diagnosed with depression, bipolar affective disorder, and alcohol dependency syndrome	Provided 155 medication information services to 84 patients Completed counseling (100%) Completed interventions (96%) Provided medication information (83%) Achieved a high rate of acceptance on interventions (95.8%)
Johnson MR, 2014,[65] US	*N* = 107	Prospective, controlled, nonrandomized, single-center Pharmacist based methadone weaning protocol Neonatal abstinence syndrome	Reduced wean time in pharmacist group vs physician group when exposed in utero ($P < .001$) Reduced wean time in pharmacist group when iatrogenic ($P = .096$)
Celestin G, 2022,[66] US	*N* = 21	Retrospective, pre/post comparison Pharmacist-driven neonatal abstinence syndrome management program evaluated	Decreased median duration of treatment (34%, 29 vs 19 days, $P = .84$) Decreased number of titrations (15%) Decreased length of stay (24%) Achieved average cost savings of $60 020 per patient

BZD = benzodiazepine; CGI = Clinical Global Impression Scale; CSQ-8 = Client Satisfaction Questionnaire; GAD-7 = Generalized Anxiety Disorder 7-item; HbA_{1c} = hemoglobin A_{1c}; M-P-R = Merrill-Palmer-Revised Scales of Development; PANSS = Positive and Negative Syndrome Scale; PCL-7 = Posttraumatic Stress Disorder Checklist; PHQ-9 = Patient Health Questionnaire-9; QWB = Quality of Well-Being; SUD = substance use disorder; US = United States.

[a]Patients in the case group had higher baseline PHQ-9/GAD-7 scores, and the frequency of measure values was lower than anticipated, limiting the ability to detect a difference.

[b]Limited detail was provided in the paper.

Attention-Deficit/Hyperactivity Disorder (ADHD)

Author, Year, Country	Population	Design/Intervention	Outcomes
Casey T, 2020,[67] United States	*N* = 914	Prospective study Pharmacist-provided collaborative drug therapy management	Achieved stabilization through the ADHD clinic pharmacists (610 patients)

Anxiety

Author, Year, Country	Population	Design/Intervention	Outcomes
Fortney JC, 2015,[68] United States	*N* = 225	Multisite, pragmatic, randomized effectiveness trial Pharmacist-provided posttraumatic stress disorder management	Reduced scores in the Posttraumatic Diagnostic Scale at 6 and 12 months more in the telemedicine outreach group compared with the usual care group

Bipolar Disorder

Author, Year, Country	Population	Design/Intervention	Outcomes
Mishra A, 2017,[69] India	*N* = 75	Randomized control trial Pharmacist-provided education	Improved medication adherence and quality of life in pharmacist group vs control group (2.06 + 0.15, $P = .001$; vs 13.8 + 0.5, $P < .05$)
Salazar-Ospina A, 2017,[48] Colombia	*N* = 92	Randomized control trial Pharmacist-provided pharmaceutical care using Dader Method	Observed increased risk of hospitalization in control group vs intervention group (HR = 9.03, $P = .042$) Observed increased risk of emergencies in control group vs intervention group (HR = 3.38, $P = .034$)
Salazar-Ospina A, 2020,[70] Colombia	*N* = 92	Retrospective, observational, controlled, comparison group, nonrandomized Telephone-based pharmaceutical care program for adults	Failed to show a difference between the intervention group and control in hospitalization rates after discontinuation of the program (11/43 vs 19/49, $P = .261$)[a] Failed to show a difference between intervention group and control in ED visits (14/43 vs 24/49, $P = .212$)[a]

ED = emergency department; HR = hazard ratio.
[a]Limited detail was provided in the paper.

Dementia

Author, Year, Country	Population	Design/Intervention	Outcomes
Rojas-Fernandez CH, 2003,[35] US	$N = 11$	Nonrandomized, unblinded study Pharmacist-based consultation service	Demonstrated satisfactory treatment responses as shown by a decreased BEHAVE-AD score of 30% or more (9 patients)
Watanabe N, 2012,[31] Japan	$N = 111$	Retrospective, controlled, pre/post, nonrandomized Medication adherence in patients with Alzheimer's disease	Increased medication persistence rate in intervention vs control group (73.1% vs 48.2%, $P = .08$)
Sakakibara M, 2015,[71] Japan	$N = 32$	Pharmacist proposed reduction in medications versus control Outpatient mental health conditions Benzodiazepines	Showed no difference in QOL measures between groups Increased ADL scores in intervention group Decreased ADL scores in control group
Gustafsson M, 2017,[46] Sweden	$N = 429$	Randomized control trial Pharmacist medication review	Reduced drug-related readmissions (18.9% vs 23.0%, $P = .28$)
Gustafsson M, 2018,[72] Sweden	$N = 429$	Prospective, comparison group, secondary analysis of randomized controlled trial Clinical pharmacist performed comprehensive medication reviews	Decreased potentially inappropriate medications ($P = .011$) Failed to show a difference in time to first all-cause emergency department visits (HR = 0.994, $P = .963$) Failed to show a difference in time to institutionalization (HR = 0.761, $P = .389$)
Bravo-José P, 2019,[73] Spain	$N = 35$	Prospective, open, pre/post, single-center, nonrandomized Interdisciplinary team created protocol for antipsychotic use	Decreased antipsychotic use (80%) Decreased antipsychotic dose (20%) Observed no change in neuropsychiatric symptoms
Chen Z, 2021,[74] China	$N = 60$	Randomized controlled trial Clinical pharmacist participation as part of a multidisciplinary team to address sleep problems in patients with Alzheimer's disease vs routine care	Decreased drowsiness in the multidisciplinary team group compared to that in the routine treatment group ($\chi^2 = 4.320$, $P = .038$) Improved sleep quality during the follow-up in the multidisciplinary treatment group ($t = 6.098$, $P < .001$) Improved HAM-D and HAM-A results among family caregivers vs routine treatment ($t = -2.867$, $P = .042$ vs $t = 3.258$, $P = .003$)
Elbeddini A, 2021,[75] Canada	$N = 102$	Chart review Medication reconciliation in patients in geriatric and memory clinic	Deprescribed medications (712, $P = .001$) Improved ADL performance after 3 and 6 months (43 patients) Improved ADL performance after 12 months (68 patients)
Kable A, 2021,[76] Australia	$N = 526$	Prospective, unrandomized, controlled, pre/post comparison study Pharmacist-provided evidence-based bundle of care	Reduced readmission or re-presentation within 3 months in both phases Achieved compliance with 6 strategies applicable for participants in the intervention phase (58%)
Huang CY, 2022,[77] Taiwan	$N = 40$	Prospective, randomized, controlled Pharmacists managed patients in an Alzheimer's disease clinic via counseling and education sheets vs usual care	Improved dementia knowledge score in intervention group (77.5 vs 95.8, $P < .01$) Observed nonsignificant changes in caregiver burden, medication persistence, or adherence

ADL = activities of daily living; BEHAVE-AD = Behavioral Pathology in Alzheimer's Disease Rating Scale; HAM-A = Hamilton Anxiety Rating Scale; HAM-D = Hamilton Rating Scale for Depression; HR = hazard ratio; QOL = quality of life; US = United States.

Epilepsy

Author, Year, Country	Population	Design/Intervention	Outcomes
Summers B, 1986,[78] South Africa	*N* = 150	Retrospective study Pharmacist-provided care in outpatient neurology clinic	Increased carbamazepine prescriptions with ethosuximide (23% to 39%) Increased carbamazepine prescriptions with sodium valproate (2% to 4%)
McFadyen ML, 1990,[79] South Africa	*N* = 280	Retrospective analysis Pharmacist provided monitoring of antiepileptic drugs	Increased number of well-controlled patients in the first cycle compared with the last cycle (36% vs 60%)
Eshiet UI, 2021,[80] Nigeria	*N* = 46	Open, randomized, controlled, single-blinded, longitudinal and 2-arm parallel prospective study Pharmacist education and counseling	Improved quality of life in epilepsy scores at 3 months ($P = .001$) Improved quality of life in epilepsy scores at 6 months ($P = .001$)
Marawar R, 2021,[81] US	*N* = 58	Retrospective evaluation Medication review with collaboration with a physician	Performed medication reconciliation requiring adding medications (55.3% of encounters) Performed medication reconciliation requiring removing medications (53.2% of encounters)
Pham HT, 2021,[82] Vietnam	*N* = 116	Retrospective, open, pre/post comparison Pharmacist-provided therapeutic drug monitoring for antiepileptic drugs	Patients: Received intervention (52.5%) Experienced adverse drug reactions (> 56%) Pharmacist intervention: Increased effectiveness of therapy (25%, $P < .001$) Increased optimized drug concentrations (14.6%, $P = .018$)

US = United States.

Intellectual Disabilities

Author, Year, Country	Population	Design/Intervention	Outcomes
Ellenor GL, 1977,[37] US	*N* = 208	Retrospective pre/post comparison chart review Pharmacist reviewed patients' charts and pharmacy records and visited patient to evaluate regimen	Reduced antipsychotic use (18%) Reduced antianxiety-antidepressant drug use (50%) Reduced sedative-hypnotic use (58%) Reduced miscellaneous agents (65%) Achieved net savings in drug expenditures of $19 363.25 per year
Berchou RC, 1982,[83] US	*N* = 715	Retrospective chart review at 2 institutions Consultant pharmacist-provided medication use services	Increased single drug antipsychotic regimens (4.9% vs 9.1%) Increased single drug anticonvulsant regimens (2.7% vs 15.1%) Decreased long-term medications (76.1% to 56.8%)
McKee JR, 1994,[84] US	*N* = 446	Retrospective chart review Pharmacist-conducted drug regimen reviews	Decreased medication doses per patient day (16.1 doses/d to 9.8 doses/d) Decreased pharmacy cost per patient day ($2.87 to $2.39) Decreased doses packaged per month by pharmacy (38 162 to 18 139) Saved 1057 hours of nursing time/month
Thayer N, 2021,[85] United Kingdom	*N* = 160	Pharmacist-provided medication reviews for care home residents	Completed 507 interventions including lifestyle risk-related (30.4%), changing medications (17.9%), and stopping medications (12.8%)

US = United States.

Major Depressive Disorder

Author, Year, Country	Population	Design/Intervention	Outcomes
Boudreau DM, 2002,[86] US	*N* = 74	Pragmatic, randomized, controlled trial Clinical pharmacist collaborative care intervention vs usual care	Improved diagnosis of major depression with a structured clinical interview for DSM-IV (53% vs 28%, *P* = .04) Failed to show statistical differences in counseling/psychotherapy, hospitalization, ED visits, and missed work/school
Finley PR, 2002,[13] US	*N* = 220	Nonrandomized allocation pilot program Pharmacist-led management of outpatient psychiatric conditions	Increased adherence rates in intervention compared with control (medication possession ratio 0.81 vs 0.66) Increased medication switch rates (24% vs 5%) Reduced a higher number of PCP visits more than control (39% vs 12%)
Finley PR, 2003,[14] US	*N* = 125	Randomized control trial Pharmacist-provided management of outpatient psychiatric conditions	Achieved a higher adherence rate compared with control (67% vs 48%, OR 2.17)
Bungay KM, 2004,[87] US	*N* = 268	Randomized, controlled Pharmacists intervened on depressed patients in an outpatient setting	Achieved 978 encounters for 268 patients in 6 months Increased encounter time (70.3 min/patient over 6 months)
Capoccia KL, 2004,[88] US	*N* = 74	Randomized, controlled Pharmacists or residents followed up with patients via phone vs usual care	Increased depression scores and QOL at 3 months maintained for 1 year in both groups
Pyne JM, 2010,[89] US	*N* = 395	Randomized control trial Pharmacist-provided medication management	Failed to show a difference in primary outcomes of DFDs Improved QOL outpatient on SF-12 (*P* = .04)
Fortney JC, 2013,[90] US	*N* = 364	Prospective, randomized, controlled, comparative effectiveness trial Pharmacist-provided depression management	Improved response and remission across all times (6, 12, and 18 months)
Marques LA, 2013,[26] Brazil	*N* = 48	Prospective, randomized, controlled comparative trial Clinical pharmacist-provided intervention with pharmacotherapy follow-up	Decreased Modified Beck Depression Inventory scores more in the intervention group vs in the control group (13.5 vs 2.5, *P* = .0275) Decreased Anxiety Inventory scores more in the intervention group than the control group (13 vs 3.5, *P* = .0194) Reduced severe depression more in the intervention group (80% vs 60%) Increased number of patients with only minimal symptoms of depression at 3 months (7 vs 4 patients)
Moore JM, 2013,[91] US	*N* = 4500	Prospective, controlled, randomized matched, pre/post Pharmacist-driven MTM appointments for high-risk patients	Improved cost in intervention group compared to control group (−10.3% or $977 vs 0.7% or $62, *P* = .048) Increased total day supply of medications (73 additional days) Reduced inpatient visits (18.6%) Observed no change in ED visits or adherence
Rubio-Valera M, 2013,[15] Spain	*N* = 179	Prospective, parallel group, randomized, controlled Community pharmacist-driven educational intervention to improve antidepressant knowledge and adherence awareness	Increased probability of adherence at 3 months (78.4% vs 61.9%) Increased probability of adherence at 6 months (60.1% vs 40.2%) Improved quality of life scores (*P* = .038) Failed to improve patient satisfaction or symptom severity

Major Depressive Disorder (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
Aljumah K, 2015,[16] Saudi Arabia	*N* = 220	Randomized control trial Pharmacist consults General outpatient conditions	Improved medication adherence, treatment satisfaction, general overuse beliefs, and specific concern beliefs
DeCaporale-Ryan LN, 2017,[45] US	*N* = 17	Team-based hospital follow-up, including a pharmacist and student pharmacist, in a family medicine practice	Reduced average number of prescribed medications (15.5 to 13.1, $P <$ .01). Identified patients meeting the criteria for depression on CES-D (70.6%) Referred to therapy (23.5%) Identified as having cognitive deficits (41.2%) Completed full neuropsychiatric evaluations (11.8%) Avoided readmission at 30 and 90 days (88.2%)
Bättig VAD, 2020,[49] Germany	*N* = 143	Naturalistic retrospective cohort study Pharmacist-led pilot implementation of pharmacogenomic testing	Demonstrated significantly shorter stays than the control, after correction of the length of hospital stay and the time to genotyping results (36.3 vs 46.6 days; P = .003) Reduced length of stay the most in antidepressant-naïve patients (24.7 vs 50.2 days; $P <$ .001)
Silvia R, 2020,[92] US	*N* = 141	Retrospective, nonrandomized trial Pharmacist provided management	Decreased PHQ-9 score from baseline to follow-up (17.9 to 14.7, $P <$ .001) Reduced time from referral to assessment (31.3 vs. 104.5 days) Observed high patient satisfaction scores in 39 patients in the intervention group (26.8/28)
Marasine NR, 2022,[93] Nepal	*N* = 190	Single-center, open-label, parallel design Pharmaceutical service intervention vs usual care	Improved medication adherence compared with control at 2 and 4 months ($P <$ .001) Failed to show a difference in depression severity or health-related QOL

CES-D = Center for Epidemiologic Studies Depression Scale; DFDs = depression-free days; DSM-IV = *Diagnostic and Statistical Manual of Mental Health*, 4th edition; ED = emergency department; PHQ-9 = Patient Health Questionnaire-9; MTM = medication therapy management; OR = odds ratio; PCP = primary care physician; QOL = quality of life; SF-12 = 12-Item Short Form Survey; US = United States.

Parkinson Disease

Author, Year, Country	Population	Design/Intervention	Outcomes
Schröder S, 2012,[94] Germany	*N* = 235	Open, multicenter, parallel group Community pharmacist-provided care	Improved Parkinson's scale sub scores ($P <$ .05) Improved EuroQol 5-Dimension Questionnaire Index Score ($P <$ .001) Failed to show improvement in prescribers' guideline adherence Reduced inappropriate medications based on Beers List criteria (< 0.01)
Stuijt C, 2018,[36] The Netherlands	*N* = 23	Prospective pilot study Pharmacist-led medication review	Improved medication adherence after the combined unit dose packaging, Parkinson KinetiGraph, and medication review intervention in nonadherent patients Increased medications filled on time (56% to 68%)
Oonk NGM, 2023,[95] The Netherlands	*N* = 152	Cost-utility analysis Community pharmacist-led medication review	Implemented 161 of 260 interventions (62%) Failed to show difference between Parkinson's Disease Questionaire-39 scores

Schizophrenia

Author, Year, Country	Population	Design/Intervention	Outcomes
Hoffmann RP, 1974,[96] US	*N* = 50	Retrospective chart review Pharmacist conducted interview	Self-reported misuse of at least 1 medication (56%)
Bond CA, 1979,[40] US	*N* = 25	Unspecified study design Pharmacist-provided fluphenazine clinic	Reduced average dose of fluphenazine decanoate (32.8 to 20.05 mg) Improved rehospitalization rates Decreased medication-related side effects (1.52/patient vs 0.2/patient) Improved functional capacity
Dorevitch A, 1993,[50] Israel	*N* = 14	Open-label study Pharmacist-led medication management	Decreased rate of rehospitalization Reduced length of stay Decreased total neuroleptic dosage Reduced medication-related side effects Improved compliance
Sathienluckana T, 2018,[97] Thailand	*N* = 30	Prospective, open-label, randomized trial Pharmacist-provided medication management	Improved Wisconsin Card Sorting Test perseverative errors at the end of the study compared with baseline ($P = .003$)
Spann G, 2022,[98] Australia	*N* = 61	Retrospective observational study Pharmacist-provided clozapine adverse effect monitoring	Achieved higher rates of metabolic and ECG monitoring compared with a clinic without a pharmacist (glucose 48% vs. 11%, $P = 0.001$; lipids 61% vs 7.1%, $P = .001$; ECG 15% vs 0%, $P = .001$) Achieved positive trends in weight

ECG = electrocardiogram; US = United States.

Sleep Disorder

Author, Year, Country	Population	Design/Intervention	Outcomes
Lui E, 2021,[99] Canada	*N* = 121	Retrospective chart review Pharmacist-provided insomnia management	Achieved complete abstinence (32%) Observed reduction in dose by $\geq$ 50% (32%)
Masse M, 2022,[100] France	*N* = 960	Prospective, observational Community pharmacist and pharmacy student-conducted interviews on sleep habits and medication	Performed 960 interviews Self-reported at least 1 poor sleep habit (75%) Self-reported 2 or more poor sleep habits (41%) Self-reported getting up at night (77%) Self-reported openness to discontinuing medication (35%)

Substance Use Disorder

Author, Year, Country	Population	Design/Intervention	Outcomes
Hutchinson SJ, 2000,[101] United Kingdom	*N* = 204	Cohort Community pharmacist supervised oral methadone use	Tracked continuous methadone treatment (29%) Reduced self-reported daily opiate injecting (78% to 2%) Reduced overdose (24% to 2%) Reduced drug spending (50 to 4 pounds) Reduced acquisition crimes (13 to 3) Attributed discontinuation of treatment to imprisonment (39%) or sanctions by the prescriber (33%)
Jaffray M, 2014,[102] United Kingdom	*N* = 335	Prospective, comparison group, randomized clinical trial Community pharmacist motivational interviewing of heroin users	Reduced heroin use in both groups ($P < .001$) Observed larger decline in physical health in the intervention group ($P = .046$) Reported motivational interviewing was useful ($P = .047$)
Steineck KJ, 2014,[43] US	*N* = 52	Retrospective, controlled, nonblinded, nonrandomized, case-control chart review Pharmacist intervention and management of methadone taper on opioid withdrawal Pediatric ICU patients	Decreased taper length from 24.7 to 15.0 days ($P = .003$) Reduced opioid infusion duration (3.32 days vs. 1.78 days; $P = .004$) Reduced number of additional opioid doses required ($P = .24$) Decreased length of stay ($P = .023$)
Suzuki J, 2014,[103] US	*N* = 45	Prospective, open, nonrandomized single-group Pharmacist-provided buprenorphine in primary care	Achieved treatment retention at 6 months (55.6%) Improved aberrant urine toxicology results (69.2% vs 31.8%; $P < .01$) Improved craving scores (4.1 vs 0.9; $P < .01$) Improved confidence of PCPs treating opioid dependence (5.3% vs 25.0%)
Smith A, 2021,[104] US	*N* = 150	Single-center, multisite, retrospective, observational cohort study Pharmacist-led substance use disorder management	Combined retention rates as measured by a certified medical assistance for buprenorphine/naloxone and extended-release naltrexone were significant for the intervention group compared to the control group at 1 and 3 months
Yasin H, 2021,[105] Jordan	*N* = 93	Randomized, controlled trial Pharmacist identified treatment-related problems and provided recommendations to treatment team	Identified treatment-related problems (392)[a] Reduced mean number of treatment-related problems at discharge by 2.2 ± 0.85 ($P < .001$)
Binswanger IA, 2022,[106] US	*N* = 325	Multisite, cluster, randomized Community pharmacists intervened in naloxone co-dispensing Naloxone, opioids	Reduced self-reported opioid risk behaviors at 4 months Failed to show reduction in self-reported opioid risk behaviors at 8 months ($P = .052$) Increased patient knowledge
Ehrhard K, 2022,[107] US	*N* = 274	Single-center, retrospective, observational cohort study Pharmacist inclusion on addiction triage team	Improved MAUD/MOUD initiation rates with pharmacist addition vs control (26.3% vs 4%, $P < .0001$)
Skoy E, 2022,[108] US	*N* = 8217	Validation study of Opioid and Naloxone Education Program Community pharmacist-provided preventive screening for opioid misuse and accidental overdose before dispensing prescribed opioid	Identified patients at high risk for opioid misuse (3.9%) Identified patients at risk for accidental overdose (18.3%) Indicated opioid medication use in the past 60 days (31.7%) Delivered 1 or more risk-factor–dependent interventions to 41.1% of patients Dispensed naloxone in pharmacies increased to 6 times the national average
Sze J, 2022,[109] US	*N* = 44	Prospective, unblinded pilot study Pharmacist-driven inpatient naloxone education program	Improved accuracy of completed assessments, indicating enhanced knowledge about naloxone use and administration, following the naloxone education (4.68 vs 3.42, $P = .0016$)

ICU = intensive care unit; MAUD/MOUD = medications for alcohol use disorder/medications for opioid use disorder; PCP = primary care physician; US = United States.
[a]Improved physical health ($P = .035$) and overall sleep status ($P = .048$) in the intervention vs control group.

Tobacco Use Disorder

Author, Year, Country	Population	Design/Intervention	Outcomes
Baluch WM, 1995,[5] US	*N* = nearly 1000	Prospective unblinded study Pharmacist-involved in behavioral modification program	Observed rates of long-term abstinence comparable with the literature rates for community-based group Observed high satisfaction of patients, pharmacists, and physicians
Smith MD, 1995,[8] US	*N* = 40 220	Community pharmacist-provided comprehensive counseling to patients on smoking cessation Nicotine replacement therapy	Improved patient-reported quit rates after treatment (37% vs 62%) Improved patient-reported quit rates 10 months after treatment (33% vs 45%)
Jones TE, 1998,[6] Australia	*N* = 111	Prospective unblinded study Clinical pharmacist-run Stop Smoking Programme that offered nicotine patches and weekly support	Observed 29 successful patients at 3 months Observed 23 remain abstinent at 6 months Observed 19 remain abstinent at 12 months
Maguire TA, 2001,[110] United Kingdom	*N* = 484	Randomized, controlled Community pharmacist-provided structured counseling and follow-up to patients Nicotine replacement therapy	Improved abstinence rates (14.3% vs 2.7%, $P < .001$)
Doescher MP, 2002,[20] US	*N* = 32	Prospective, unblinded NRT coverage with pharmacist-delivered cessation counseling	Received counseling with NRT (81%) Self-reported high satisfaction
Kennedy DT, 2002,[19] US	*N* = 48	Single-center, unblinded Community pharmacist-provided counseling	Patient reported: Obtained abstinence from smoking cigarettes at 12 months (25%) Improved long-term abstinence in women compared with men (33.3% vs 6.7%, $P = .047$)
Zillich AJ, 2002,[7] US	*N* = 21	Prospective, nonrandomized, open label Pharmacist-provided tobacco cessation	Verified abstinence rates at 3 and 6 months (42% and 26%, respectively)
Bauld L, 2009,[111] United Kingdom	*N* = 1785	Observational Community pharmacist-provided tobacco cessation	Failed to improve quit rates compared with specialist-led, group-based services Increased number of patients treated
Dent LA, 2009,[112] US	*N* = 101	Prospective, randomized, comparative, open trial Pharmacist-provided tobacco cessation	Increased smoking cessation rates in face-to-face pharmacist intervention vs a telephone-based pharmacist intervention at 6 months using cotinine levels (28% vs 11.8%, $P = .041$)
Philbrick AM, 2009,[113] US	*N* = 21	Prospective, open, nonrandomized single group Pharmacist-managed smoking cessation clinic	Reduced smoking at 3 and 9 months (47.6%, 52.4%)
Bauld L, 2011,[114] United Kingdom	*N* = 1785	Open Community pharmacist-provided tobacco cessation intervention	Reduced cost compared with group service (2600 vs 4800 pounds/QALY) Failed to show improved quit rates compared with group service (2.8% vs 6.3%, $P = .001$)
Costello MJ, 2011,[115] Canada	*N* = 5182	Open, randomized Community pharmacist-conducted tobacco cessation interventions	Improved self-reported quit rates in patients completing 3 vs 1 session (27.7% vs 18%) Failed to show improved self-reported 7-day point prevalence rates
Khan N, 2012,[21] US	*N* = 346	Prospective Community pharmacist-provided tobacco cessation programming	Improved patient satisfaction[a]
Mardle T, 2012,[116] United Kingdom	*N* = 400	Retrospective analysis Pharmacist-provided tobacco use disorder management	Failed to show improvement in smoking cessation for pharmacists compared to smoking cessation advisors (41% vs 75%) Observed no difference in smoking cessation rates for pharmacists compared with general practitioners (41% vs 62%)

Tobacco Use Disorder (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
Chen T, 2014,[117] US	$N = 1006$	Retrospective, open, comparison group, nonrandomized, cohort Pharmacist-managed telephone tobacco cessation clinic vs standard of care	Improved abstinence at 1 month ($P < .001$) Improved abstinence at 3 months ($P < .001$) Improved abstinence at 6 months (81/503 vs 48/503, $P < .001$)
Shen X, 2014,[118] US	$N = 1437$	Prospective, open, nonrandomized Community pharmacist-led tobacco cessation program	Obtained abstinence rates at 1, 3, and 6 months (29.3%, 23.3%, and 18%, respectively) Remained abstinent (6.1%) Regressed abstinence (17.4%)
Marín Armero A, 2015,[9] Spain	$N = 23$	Open, pre/post comparison Community pharmacist-prescribed nicotine replacement therapy	Achieved full cessation at 1 month (56.52%) Retained cessation at 12 months (43.48%)
Augustine JM, 2016,[119] US	$N = 238$	Retrospective database review Pharmacist-provided telephone-based quit counseling services and smoking cessation pharmacotherapy	Self-reported smoke free at 7-month follow-up (51%) Self-reported smoke free at 13-month follow-up (55%) Failed to show difference in percentages of smoke-free participants at 7 or 13 months, regardless of their first treatment ($P = .06$ and .345, respectively).
Fai SC, 2016,[120] Malaysia	$N = 176$	Pharmacist-provided smoking cessation pharmacotherapy with multidisciplinary team	Achieved abstinence from smoking in intervention group (42.6%)
Gong J, 2016,[121] US	$N = 736$	Prospective, randomized, pragmatic Pharmacist-provided tobacco use disorder management	Improved abstinence from tobacco compared with control group (42.3% vs 38.2%, $P = .097$
Thomas D, 2016,[22] Australia	$N = 586$	Parallel-group, single-blinded, randomized controlled trial Pharmacist based tobacco cessation management	Failed to show a difference in cessation between intervention group and usual care group at 6 months (11.6% vs 12.6%) Failed to show a difference in cessation between intervention group and usual care group at 12 months (11.6% vs 11.2%)
Watanabe F, 2016,[23] Japan	$N = 36$	Prospective Pharmacist-provided tobacco use disorder management	Improved smoking cessation rates at institution A (40.8% to 64.5%, $P = .024$) Improved smoking cessation rates at institution B (42.9% to 100%, $P = .017$)
El Hajj MS, 2017,[122] Qatar	$N = 314$	Prospective, randomized controlled trial of brief smoking cessation counseling in 8 community pharmacies	Improved self-reported abstinence at 12 months (23.9% vs 16.9%)
Forinash AB, 2018,[123] US	$N = 30$	Randomized, open-label, prospective trial Pharmacist-provided tobacco use disorder management	Increased achievement of exhaled carbon monoxide-verified cessation in intervention vs control (57.1% vs 31.3%, $P = .153$)
Li VW, 2018,[124] Canada	$N = 96$	Pilot pre/post comparison study Hospital pharmacist-provided smoking cessation support (counselling and NRT), inpatient follow-up during hospital stay, and 3 month postdischarge follow-up calls	Increased self-reported continuous abstinence (28.6% vs 16.4%, $P = .035$) Increased self-reported 7-day point prevalence abstinence (37.5% vs 18.2%, $P = .009$)
Litke J, 2018,[125] US	$N = 140$	Retrospective Pharmacist provided medication management via telehealth and phone encounters	Achieved tobacco cessation (42%) Reduced tobacco use (39%)
Cheng HM, 2019,[126] Singapore	$N = 74$	Retrospective, single-center Pharmacist-provided counseling for tobacco use disorder	Observed smoking cessation at 2-week follow-up (15.8%) Observed patients with a reduction in the number of cigarettes smoked per day (45.6%) Reduced average number of cigarettes per day (4.1)

Tobacco Use Disorder (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
Beaupre LA, 2020,[127] Canada	$N = 103$	Prospective, controlled, nonrandomized, pre/post comparison study Pharmacist offered individualized evidence-based intervention and collected visit, duration, and intervention data	Self-reported 7-day point prevalence abstinence at 6 weeks in the pharmacist group compared to control group (19% vs 4%, $P = .04$). Improved 7-day point prevalence abstinence at 6 months (33% vs. 4%, $P < .001$)
Condinho M, 2021,[128] Portugal	$N = 1\ 35$	Prospective Community pharmacists consulted with patients	Increased smoking cessation in those who participated in pharmacist consultations and telephone sessions ($\chi^2 = 59.994$, $P < .001$, $\chi^2 = 17.845$, $P < .001$)
Gobarani RK, 2021,[129] Australia	$N = 690$	Prospective, cluster randomized controlled trial Pharmacist-provided tobacco cessation	Failed to show a difference in smoking cessation rates at the 6-month follow-up Failed to show a difference in readiness to quit scores Failed to show a difference when comparing quit rates with baseline readiness to quit scores
Lertsinudom S, 2021,[130] Thailand	$N = 532$	Retrospective Community pharmacists counseled patients on smoking cessation	Increased self-reported abstinence from smoking (28.8%; 153/532) Reduced mean cigarettes smoked per day (15.3 to 1.9, $P < .001$) Reduced exhaled CO levels (11.7 to 7.2 ppm, $P < .001$)
Onda M, 2021,[131] Japan	$N = 24$	Retrospective, randomized, controlled Community pharmacist-led structured smoking cessation program	Improved quit rates (45.5% vs 18.2%)
Tse SS, 2021,[132] US	$N = 19$	Single-center, prospective, nonrandomized, open, comparison Pharmacist-led tobacco cessation	Achieved smoking cessation at least once (42%)
Asayut N, 2022,[133] Thailand	$N = 156$	Controlled Community pharmacists used PharmQuit to assist in smoking cessation	Improved smoking cessation rates and number of cigarettes smoked per day Failed to show difference between PharmQuit vs standard of care
Cameron CR, 2022,[134] US	$N = 129$	Retrospective, observational, single-center, cohort study Pharmacist-led tobacco cessation in patients with cancer	Increased smoking cessation rates in pharmacy group compared with control (44.8% vs 27.5%)
Guthrie AR, 2022,[135] US	$N = 143$	Retrospective chart review, nonrandomized, comparison group Pharmacist-led chart review	Improved mean change in cigarette use (-7.9 vs -5.4, $P = .15$)
Hartman-Filson M, 2022,[136] US	$N = 52$	Prospective Pharmacist trained shelter staff to conduct smoking cessation training	Reduced smoking (40%) Reduced smoking and increased quitting attempts in those who used medication
Park SK, 2022,[137] South Korea	$N = 1\ 517\ 901$	Cohort Pharmacists counseled patients with NRT vs expert counseling with NRT vs expert counseling with varenicline	Increased QALYs in pharmacist + NRT group (32 842) Increased cost savings ($26 689 958) Improved ICER in pharmacist + NRT vs Expert + varenicline (27 247 USD per QALY vs. 4074 USD per QALY)
Phillips LCE, 2022,[138] Canada	$N = 35$	Pragmatic, mixed-method, randomized Community pharmacist-led smoking cessation program	Improved quit rates in the intensive vs abbreviated group (36% vs 22%) Increased discounted life years gained (11.6) Reduced incremental cost per additional quit in intensive vs abbreviated group ($1000 vs $1296 per life year gained)

CO = carbon dioxide; ICER = incremental cost-effectiveness ratio; NRT = nicotine replacement therapy; QALY = quality-adjusted life-year; PP = point prevalence; US = United States.
[a]Average quit rate at the end of 6 months (25%).

Medical Disease With Psychiatric Comorbidity

Author, Year, Country	Population	Design/Intervention	Outcomes
Malone M, 2005,[139] US	*N* = 142	Prospective, open, nonrandomized Pharmacist performed clinical assessments, provided drug information to lifestyle challenge participants	Reduced weight in per protocol group (100.9 to 97.3 kg at 10 weeks and 95.9 kg at 20 weeks) Observed change in weight in intention to treat compared with per protocol analysis at 10 weeks (2.5% gain to 12.2% loss vs 5.9% gain to 17.1% loss) Improved vitality, general health, perceived health, binge eating scale scores, BDI scores in per protocol analysis
Taveira TH, 2008,[140] US	*N* = 297	Retrospective, cohort analysis Pharmacist-provided CV risk reduction clinic	Failed to observe a difference in risk reduction for diabetes in those with or without a mental health diagnosis
Hansen RA, 2009,[141] US	*N* = 314	Randomized control trial Pharmacist-provided medication management Heart failure, depression	Observed no difference in patients with depression vs those without depression in adherence to heart failure medications
Hohmann C, 2009,[142] Germany	*N* = 255	Prospective Community pharmacist-managed transitions of care poststroke/TIA	Failed to show change in SF-36 Failed to show change in percent of patients on anticoagulants Improved patient satisfaction scores
Hohmann C, 2010,[143] Germany	*N* = 255	Controlled, nonrandomized, prospective Pharmacists reviewed medication records, counseled patients, intervened on drug related problems	Observed lower decline in vitality scores at 12-months intervention vs control group (1/8 vs 7/8) Failed to observe change in HRQOL between groups
Pyne JM, 2011,[144] US	*N* = 249	Single-blinded, randomized clinical, effectiveness trial Pharmacist-provided depression management in patients with HIV	Improved response and remission rates in the intervention group vs usual care at 6 months Improved response and remission rates not observed at 12 months
Taveira TH, 2011,[145] US	*N* = 88	Randomized clinical trial Pharmacist-provided medication management for patients with diabetes and psychiatric comorbidities	Improved number of patients achieving an $HBA_{1c} < 7\%$ in the pharmacist-led arm vs standard of care (29.6% vs 11.9%, OR 3.6, 95% CI = 1.1, 12.3)
Carrión JA, 2013,[146] Spain	*N* = 447	Prospective, nonrandomized, controlled, comparison group Pharmacist interventions in patients with hepatitis C	Increased adherence and sustained viral response rates through multidisciplinary support programs
Ummavathy P, 2015,[147] Malaysia	*N* = 162	Single-blinded, randomized control trial Pharmacist-provided counseling in patients with cancer and psychiatric comorbidities	Improved depression severity with each counseling session
Milkovich SA, 2017,[148] US	*N* = 100	Retrospective chart review Certified diabetes educator RN-and pharmacist-based diabetes clinic	Reduced mean HBA_{1C} more in intervention group compared with control group
Kanwal F, 2018,[149] US	*N* = 242	Randomized controlled trial Pharmacist-involved in off-site depression collaborative care with depression care manager and psychiatrist	Completed a 12-month follow-up (82.8%) Increased likelihood to report depression treatment response remission and more depression free days in intervention group compared with usual care
Mohd-Sidik S, 2018,[12] Malaysia	*N* = 1060	Prospective, multicenter, randomized controlled trial Pharmacist counseling	Improved mean scores of self-esteem in the 1st, 2nd, and 3rd follow-ups after counselling ($P < .0001$) Reduced depression and anxiety scores after the 1st, 2nd, and 3rd follow-ups after counselling ($P < .05$)
Byrd KK, 2020,[150] US	*N* = 453	Prospective, open, nonrandomized, pre/post comparison Community pharmacist-conducted MTM, monitored refills, and addressed therapy-related problems	Improved retention in care

Medical Disease With Psychiatric Comorbidity (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
Foster MG, 2022,[151] US	*N* = 10	Chart review Pharmacist-led tobacco cessation	Self-reported reduction in cigarettes per day Self-reported abstinence
Losada-Camacho M, 2022,[152] Bogata	*N* = 144	Randomized study Pharmacist management in patients with depression and epilepsy	Decreased depression symptoms in the women with epilepsy assigned to the advanced model with pharmacy involvement

BDI = Beck Depression Inventory; CV = cardiovascular; HBA_{1c} = hemoglobin A_{1c}; HRQOL = health-related quality of life; MTM = medication therapy management; OR = odds ratio; RN = registered nurse; SF-36 = 36-Item Short Form Survey; TIA = transient ischemic attack; US = United States.

Disease State Not Specified

Author, Year, Country	Population	Design/Intervention	Outcomes
Evans RL, 1976,[153] US	*N* = 22	Retrospective chart review Medication history Conditions in outpatient specialty clinic	Completed an average of 5.4 visits per patient Increased dose (10 medications) Decreased dose (16 medications) Added medication (10 medications) Discontinued medication (15 medications)
Dugas JE, 1978,[154] US	*N* = 66	Retrospective 2-year review Pharmacist-led medication management and lithium education	Observed nurse and pharmacist as co-therapists to be realistic, appropriate and effective Improved compliance and outcomes through providing medication at the time and place of healthcare appointments
Rosen CE, 1978,[38] US	*N* = 281	Nonrandomized comparison study Pharmacist-provided medication management for outpatient psychiatry conditions	Increased average number of patients seen/month compared with psychiatrist (180 vs 101) Increased mean number of contacts/month (222 vs 118) Increased hours of direct care/month (87.29 vs 58.17)
Rosen CE, 1978,[39] US	*N* = 304	Comparison study Pharmacist-provided medication monitoring for outpatient medication health conditions	Observed higher average number of unique patients compared with psychiatrist (194 vs 110) Increased number of contacts per patient (1.29 vs 1.15) Increased number of contacts (250 vs 127) Increased hours of direct care (100.17 vs 61.92)
Gray DR, 1979,[41] US	*N* = 19	Retrospective analysis Pharmacist-provided medication management for outpatient psychiatric conditions	Reduced the total number of drugs, number and severity of adverse effects, and drug use problems
Dobbs JH, 1981,[155] US	*N* = 50	Retrospective, chart review Pharmacists compared pharmacists' drug histories compared with physicians' drug histories	Recorded information not previously recorded by physicians in 24/50 charts (48%)

Disease State Not Specified (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
Stimmel GL, 1982,[156] US	*N* = 100	Retrospective analysis Pharmacist-provided medication management for outpatient psychiatric conditions	Failed to observe a difference in the appropriateness of prescribing for anticholinergics Improved mean scores for neuroleptics and antidepressants compared with physicians
Cardoni AA, 1983,[42] US	*N* = 15	Retrospective analysis Pharmacist-provided care for outpatient psychiatric conditions	Decreased combination of psychotropics Increased use of fluphenazine decanoate Decreased number of psychotropics per patient on discharge compared with admission
Saklad SR, 1984,[157] US	*N* = 31	Retrospective, pre/post Pharmacists implemented clinical pharmacy service in acute psychiatric setting	Recorded total drugs/patient (33.9%) Recorded number of antipsychotic drugs/patient (38%) Recorded number of anticholinergics/patient (53.2%) Recorded number of doses/patient/d (42.4%)
Ahrens TN, 1988,[158] US	*N* = 385	Prospective Pharmacist based AIMS monitoring Chronic hospitalized psychiatric patients	Identified 77 patients meeting "probably TD" (20.1%)
Wolf-Klein GP, 1989,[159] US	*N* = 140	Retrospective study Pharmacist monitored compliance with weekly counseling sessions	Addressed medication was in an unacceptable form (28%) Addressed same drug prescribed by more than one physician in their community (78%) Addressed when patients did not understand the physician instructions (50%) Addressed patients' improper medication habits despite physician advice (85%)
Bransgrove LL, 1994,[160] US	*N* = 50	Retrospective chart review Pharmacist based AIMS and EPS monitoring IM antipsychotics	Observed abnormal movements in 8 patients (16%) Observed higher frequency of EPS in the haloperidol IM group compared with the fluphenazine IM group
Dorevitch A, 1996,[18] Israel	*N* = 109	Prospective Pharmacist consults Inpatient psychiatry	Accepted recommendations (88.2%)
Furniss L, 2000,[161] United Kingdom	*N* = 330	Prospective trial Pharmacist-led medication review	Reduced drugs prescribed Improved drug cost savings Reduced deaths during the intervention period (4 vs 14) Failed to show reduction in deaths in the overall study period (26 vs 28)
Stoner SC, 2000,[162] US	*N* = 83	Single-center Pharmacist based MSAS, AIMS, and Dyskinesia Identification System Condensed User Scale Antipsychotics	Proposed interventions in 130 patients (54%) Accepted interventions (80%) Showed positive clinical outcomes (90%)
Canales PL, 2001,[11] US	*N* = 93	Prospective Pharmacist consults Inpatient	Improved scores on the Brief Psychiatric Rating Scale and the Clinical Global Impression Scale in the intensive psychiatric pharmacy services group Improved HAM-D scores in the intensive psychiatric pharmacy services group (65%) Failed to show change in MMSE between groups

Disease State Not Specified (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
van Eijk ME, 2001,[163] The Netherlands	*N* = 190	Randomized, controlled Pharmacists participated in individual or group visits focusing on anticholinergic use vs control	Reduced highly anticholinergic medication use in individual intervention arm (26%; 95% CI = 4%, 48%) Reduced highly anticholinergic medication use in group intervention arm (45%; CI = 8%, 67%) Increased less anticholinergic agent use in individual intervention arm (40%; 95% CI = 6%, 83%) Increased less anticholinergic agent use in group intervention arm (29%; 95% CI = 7%, 79%)
Brophy GM, 2002,[164] US	*N* = 109	Randomized, double-blind Pharmacists administered phenytoin or placebo	Reduced average duration of phenytoin treatment (13.4 vs 7.6 days) Improved number of patients receiving prophylaxis for 7 days or less (35% vs 65%) Improved cost savings ($28 000)
Bultman DC, 2002,[27] US	*N* = 59	Prospective Community pharmacist monitored antidepressant therapy Antidepressants	Reported pharmacist asked about medication concerns (70%) Reported pharmacist encouraged patients (53%) Reported pharmacist listened to concerns (54%) Reported pharmacist was helpful in solving problems (32%) Reported feeling better (57%) Reported medication did not bother them (40%) Reported missing doses, adding doses, or stopping medication (83%)
Adler DA, 2004,[165] US	*N* = 507	Randomized control trial Pharmacist-provided depression management	Observed pharmacist intervention to be equally effective in subgroups traditionally considered difficult to treat (chronic depression and dysthymia) Improved mBDI outcomes in patients taking antidepressants (−6.3-point change vs −2.8, *P* = .01) Improved the rates of antidepressant use in primary care patients
Rickles NM, 2005,[28] US	*N* = 63	Randomized, controlled, unblinded, mixed experimental design 3 monthly telephone calls with pharmacist-guided education and monitoring vs usual care (education and monitoring)	Obtained significant and positive effect on patient feedback, knowledge, medication beliefs, and progress perceptions Reduced number of missed doses at 6 months
Crockett J, 2006,[166] Australia	*N* = 106	Parallel group, controlled Community pharmacist-managed depression	Failed to show significant change in attitude to drug treatment Maintained adherence rates compared with usual care (95% vs 96%) Improved K10 score (4 vs 4.7)
Caballero J, 2008,[167] US	*N* = 125	Chart review Pharmacist consults	Achieved high rate of accepted recommendations (90%) Decreased HAM-A and HAM-D scores (52% and 56%)
Patterson SM, 2010,[168] United Kingdom	*N* = 334	Randomized, controlled Pharmacists reviewed clinical and prescribing information and consulted providers versus usual care	Reduced inappropriate psychoactive prescriptions at 12 months (20% vs 50%) Observed no change in fall rate

Disease State Not Specified (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
Davis TD, 2011,[169] US	$N = 360$	Randomized Pharmacists participated in collaborative care telehealth clinic	Improved response rates in minorities vs Caucasians in the intervention vs usual care group ($\chi^2 = 8.2$ $P = .004$; OR 6.2, $P = .009$)
Lizer MH, 2011,[170] US	$N = 20$	Prospective, controlled, nonrandomized, single-center, pre/post Pharmacist-provided patient management	Failed to show change in adherence measures from baseline to 6 months Improved scores in the World Health Organization QOL Brief Version and physical and psychological health domains
Swain LD, 2012,[30] US	$N = 56$	Prospective, case series Pharmacist medication reconciliation Outpatient, general	Performed 192 recommendations Recommended to discontinue a medication (29%) Recommended to add a medication (24%) Recommended to change a dose (23%) Recommended therapeutic substitutions (20%) Recommended therapeutic monitoring (4%)
Bruhn H, 2013,[171] United Kingdom	$N = 232$	Prospective, randomized, controlled, comparison group Pharmacists completed medication review and prescribing vs review and making recommendations	Improved depression scores in patients with chronic pain in intervention groups ($P = .022$) Improved anxiety scores in patients with chronic pain in intervention groups ($P = .007$)
Kersten H, 2013,[172] Norway	$N = 87$	Randomized, controlled, single-blinded trial Pharmacist-initiated reduction of anticholinergic drug scale score after multidisciplinary drug reviews	Reduced median ADS score by 2 units in the intervention group ($P < .0001$)
Cobb CD, 2014,[33] US	$N = 154$	Retrospective, open, nonrandomized, single-group Pharmacist-provided comprehensive medication management General outpatient medical conditions	Saved an average of $586.55/patient ($90 484; ROI 2.8)
Schneiderhan ME, 2014,[173] US	$N = 120$	Prospective, multisite, controlled, comparison group, randomized trial Pharmacist-led point of care testing for metabolic syndrome in patients prescribed antipsychotics	Failed to show improvement in metabolic syndrome, abdominal obesity, dyslipidemia, hypertension, and diabetes at 12 months
Dhital R, 2015,[174] United Kingdom	$N = 326$	Parallel group, multicenter, randomized, blinded, controlled Community pharmacist-driven brief intervention on alcohol use	Failed to show difference in AUDIT scores (−0.57, $P = .28$) Failed to reduce participants meeting criteria for hazardous or harmful drinking (OR 0.87, $P = .61$)
DiPaula BA, 2015,[175] US	$N = 12$	Retrospective Pharmacist-led buprenorphine in outpatient psychiatric clinics	Observed high attendance rate (91%) Observed low diversion rate via urine toxicology screens positive for buprenorphine (98%) Observed low diversion rate via urine toxicology screens positive for buprenorphine and negative for opioids (88%)
Paquin AM, 2015,[44] US	$N = 501$	Retrospective, secondary data analysis Pharmacists conducted phone calls to older adults after discharge	Reduced hospital readmission rates in intervention group vs comparison group 1 vs comparison group 2 (25% vs 37.1% vs 34%, respectively)

Disease State Not Specified (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
Phimarn W, 2015,[176] Thailand	*N* = 68	Cross-sectional Community-pharmacist provided depression counseling to students	Improved CES-D scores for both group and individual counseling ($P < .001$)
Doyle D, 2016,[177] US	*N* = 502	Multicenter Pharmacist consults and interventions Primary care disease states	Reduced total medications across all sites combined (5.5%) Reduced Beers list medications across all sites combined (14.8%)
Kanwal F, 2016,[178] US	*N* = 263	Prospective, randomized, controlled effectiveness trial Pharmacist-provided depression management in patients with HIV	Increased self-report of treatment response in intervention group vs usual care (19% vs 13%) Increased self-report of remission (12% vs 6%) Showed no difference in total number of depression-free days in intervention vs usual care (50.9 vs 50.7)
Parikh M, 2016,[179] US	*N* = 114	Retrospective review Pharmacist-provided medication management for outpatient psychiatric conditions in primary care	Increased number of patients who reached therapeutic goal (60%)
Louzon P, 2017,[47] US	*N* = 1005	Phase 2 study Pharmacist directed sedation Inpatient, academic center	Reduced hours of patient exposure to continuous sedation Reduced continuous infusions of sedatives (46%) Reduced ICU and total hospital length of stay
Moga DC, 2017,[180] US	*N* = 50	Parallel-arm, randomized control trial Pharmacist-provided medication therapy management	Improved scores in medication appropriateness index in intervention vs control (change of 3.6 [1.1] vs change of 1.0 [0.9], $P = .04$)
Pardo D, 2017,[181] US	*N* = 168	Single-center, pre/post intervention, retrospective chart review Pharmacist prior authorization consults for co-prescribing opioids and benzodiazepines Inpatient, VA	Achieved approval of 136 out of 168 consults (80.1%) Reduced co-prescribing (34.6%)
Badr AF, 2018,[182] US	*N* = 197	Biphasic, pre/post Pharmacist medication recommendations	Reduced prescribing of sedative/hypnotic orders in 97 patients (25%)
Bingham J, 2018,[183] US	*N* = 20	Pilot study Pharmacist-delivered risk assessment Conditions managed in outpatient specialty clinic	Increased Duke physical scores at follow-up Reduced anxiety, depression, and anxiety-depression scores at follow-up
Gibu M, 2018,[184] US	*N* = 81	Retrospective, open, nonrandomized, pre/post cohort Pharmacist-provided outpatient psychiatric medication management	Performed 152 interventions Reduced average encounters in psychiatric emergency services (300/month to 237/month, $P = .041$)
McMillan SS, 2018,[34] Australia	*N* = 295	Prospective, pre/post comparison Community pharmacist-led medication support program	Improved perceptions of illness ($P < .002$) Improved mental health domain of QOL ($P < .001$) Improved concerns about medication ($P = .001$) Improved global satisfaction with medication ($P < .001$)
Mooney EV, 2018,[185] US	*N* = 104	Prospective Community pharmacist-administered long-acting injectable medications Antipsychotics	Patient reported: Satisfied with level of privacy (98%) Liked convenience of scheduling an appointment (86%) Trusted the pharmacist to administer the medication (96%)

Disease State Not Specified (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
Chavez B, 2019,[186] US	*N* = 248	Retrospective Pharmacist consultation Depression BZD, antidepressants, mood stabilizers	Improved treatment rates for individuals with depression Decreased benzodiazepine use Increased use of SSRIs and mood stabilizers
Heins K, 2019,[187] US	*N* = 110	Community pharmacist-provided CMM for clinic patients	Increased enrollment (23% to 69%) Increased number of patients prescribed clozapine (78 to 100) Increased duration of therapy (267.4 to 598.7 days)
Maryan S, 2019,[188] US	*N* = 22	Retrospective chart review Pharmacist-provided clozapine therapy management with psychiatrist in patients with schizophrenia	Decreased number of antipsychotics in pre-pharmacist to post-pharmacist analysis (−0.27 + 0.65) Decreased number of psychotropics (−0.18 + 0.41) Decreased HBA_{1C} (−0.04% + 0.25%) Decreased clozapine dose (−7.96 + 19.58 mg) Decreased total cholesterol (−15.73 + 42.31 mg/dL)
Shilpa HSS, 2019,[189] India	*N* = 109	Prospective interventional study Clinical pharmacist-initiated interventions on deprescribing due to inappropriate BZD and Z-drug use	Deprescribed or discontinued BZDs (30.69%) Reduced cost after deprescribing BZDs, (Z = 5.465, $P < .001$)
Stuhec M, 2019,[190] Slovenia	*N* = 24	Prospective, open, pre/post comparison, nonrandomized, single-site study Pharmacist-led interventions on QOL in nursing home patients	Reduced mean number of medications per patient (12.2 vs 10.3 ($P < .05$) Reduced the number of potentially inappropriate medications and drug–drug interactions Improved QOL improved on the EQ-5D VAS ($P < .05$)
Raynsford J, 2020,[191] United Kingdom	*N* = 66	Chart review Medication intervention for general practice surgeries	Performed interventions (104) Clarified discharge information (12/104) Reviewed high-dose and multiple antipsychotic deprescribing (18/104) Corrected errors (10/104) Investigated adherence issues (16/104) Followed up with missing health checks (22/104) Answered queries from surgery staff (23/104)
Watkins VA, 2020,[192] US	*N* = 42	Retrospective Community pharmacist driven health coaching program	Reduced number of prescriptions per patient (7.2 to 6.2; $P = .02$) Improved blood pressure (systolic 130.8 to 125.7 mmHg; $P = .04$ and diastolic 76.9 to 73.7 mmHg; $P = .04$)
Ahmed S, 2021,[193] Canada	*N* = 46	Retrospective cohort analysis Pharmacist-provided pharmacogenomics profiling Patients with a mental health–related disability	Improved medication effectiveness scores before and after prescription changes (8.39 [SD = 1.22] to 2.30 [SD = 1.01]; $P \leq .001$)
Butala N, 2021,[194] US	*N* = 390	Prospective quality improvement study Psychiatric pharmacist-driven TD screening service	Increased number of AIMS screenings attempted for high-risk individuals (85.1%) with 46 patients (61.3%) completed
Hefazi E, 2021,[195] US	*N* = 151	Retrospective review Pharmacist-driven discharge medication reconciliation	Observed greater mean number of discrepancies in patients with at least 1 psychotropic medication at discharge ($P < .001$) Observed greater number of pharmacist interventions in patients who had at least 1 psychotropic medication upon discharge ($P = .005$) Failed to show change in 30-day readmission rates
Lowrie R, 2021,[196] United Kingdom	*N* = 24	Retrospective Pharmacist-led homeless outreach engagement nonmedical independent prescribing perscriptions	Failed to show a difference in ED visits (92% in both groups) Failed to show reduction in hospitalizations in intervention vs control (92% vs 75%)

Disease State Not Specified (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
Margulis A, 2021,[197] US	*N* = 111	Retrospective, open, pre/post comparison, single-center, nonrandomized study Pharmacist involvement (none, partial, and consistent) in reviewing antiretroviral medications in psychiatric hospital	Increased number of appropriate ARV regimens initiated in partial pharmacist involvement compared to no pharmacist (62% vs 32%; *P* = .01) Increased number of appropriate ARV regimens in consistent pharmacist involvement compared to partial pharmacist involvement (84% vs 62%; *P* = .036) Improved appropriate prophylaxis initiated in consistent pharmacist involvement vs partial vs no involvement (57% vs 50% vs 11%, respectively)
Papastergiou J, 2021,[24] Canada	*N* = 213	Prospective, single-blind, randomized, controlled Community pharmacist-provided depression treatment	Improved depression, generalized anxiety and disability measures Improved treatment satisfaction
Sahr M, 2021,[198] US	*N* = 24	Pilot study Pharmacist-provided tobacco cessation	Self-reported vape-free and nicotine-free at 12 weeks in the NRT + behavioral support arm vs vape-taper + behavioral support arm vs self-guided arm (42.9% vs 75% vs 77.8%) Self-reported vape-free and nicotine-free at 6 months in the NRT + behavioral support arm vs vape-taper + behavioral support arm + self-guided arm (42.9% vs 75% vs 44.4%)
Stuhec M, 2021,[199] Slovenia	*N* = 224	Retrospective, observational, pre/post comparison Pharmacist-provided recommendations as a part of an interdisciplinary medical team	Performed 315 recommendations for 224 patients Accepted recommendations (93.7%) Decreased drug-related problems (93.8%)
Accomando M, 2022,[200] US	*N* = 139	Retrospective review Pharmacist vs non-pharmacist identified discrepancies completing medication reconciliation	Identified discrepancies (298) with no longer taking and omission being most common (33% and 32%, respectively)
Bawazeer G, 2022,[201] Saudi Arabia	*N* = 80	Nonrandomized, controlled study Pharmacist-led deprescribing inappropriate medications for elderly patients	Observed patient acceptance with deprescribing was the lowest with tricyclic antidepressants (50%)
Chulasai P, 2022,[202] Thailand	*N* = 273	Open, parallel-group, randomized, clinical Community pharmacist-provided smoking cessation counseling and Quit with US intervention	Improved smoking abstinence (58.4% vs 30.9%, *P* < .001)
Farag M, 2022,[203] Australia	*N* = 134	Retrospective, cohort Pharmacist vs no pharmacist at Mental Health Hospital in the Home programs	Increased medication reconciliation completion (87% vs 29%) Increased accurate adverse drug reaction list (97% vs 58%) Increased accurate discharge medication list (74% vs 45%) Increased accurate medication profile (99% vs 68%) Increased medication chart review (99% vs 0%)
Light J, 2022,[204] US	*N* = 412	Retrospective, cross-sectional study Pharmacist-led medication reconciliation	Decreased likelihood of patient visiting outpatient comprehensive psychiatric emergency program within 30-days (*P* = .012) Decreased odds of psychiatric relapse within 30 days by 1.9
McDuffie AC, 2022,[205] US	*N* = 50	Retrospective chart review Pharmacist-provided tobacco cessation counseling	Increased 30-day point prevalence abstinence in pharmacist group compared with PCP group (22.2% vs 9.4%, *P* = .23) Increased patient satisfaction regarding discussion of medications used to quit smoking (100% vs 65.6%, *P* = .004)

Disease State Not Specified (continued)

Author, Year, Country	Population	Design/Intervention	Outcomes
Mertens V, 2022,[206] Belgium	*N* = 37	Prospective, unblinded Clinical pharmacist completed comprehensive geriatric assessment, including abbreviated MMSE, GDS-4 for depression, and systemic check for STOPP/START criteria	Formulated average of 7.7 recommendations to optimize medication use per patient
Oliveira J, 2022,[207] Portugal	*N* = 148	2-stage observation study Pharmacist-led medication reconciliation	Identified 560 clinically sound intentional discrepancies with 95 mild, 100 moderate, and 29 severe medication errors
Pals H, 2022,[208] US	*N* = 60	Retrospective chart review Pharmacist-led buprenorphine management for opioid use disorder	Provided care to 28/60 patients Achieved same-day induction for most patients requesting urgent access
Sacarny A, 2022,[209] US	*N* = 2237	Randomized control trial Pharmacist initiated email alert to practitioners with patients recently prescribed opioids and BZDs	Failed to detect a difference in patients' receipt of opioids (adjusted difference 1.1 days, *P* = .81) Failed to detect a difference in patients' receipt of BZDs (adjusted difference −0.6 days, *P* = .30) Failed to detect a difference in patients' receipt of opioids and BZDs together (adjusted difference −0.1 days, *P* = .41)
Steel A, 2022,[210] United Kingdom	*N* = 34	Multidisciplinary residential home quality improvement project Multidisciplinary team, including pharmacist to provide comprehensive geriatric assessment and mental health review	Reduced admissions for those reviewed and a reduction in overall admission costs (75%) Reduced polypharmacy by an average of 2 medications per resident across the 3 sites Increased cardiopulmonary resuscitation decisions (63%) Increased advance care planning discussions (76%)
Vaillancourt R, 2022,[211] US	*N* = 38	Retrospective review Medication review of patients interested in using, or already using, medical cannabis when prescribed for insomnia or comorbid conditions	Reduced or discontinued prescription medications for sleep (39%) Self-reported improvement in sleep or related condition (71%) Self-reported adverse effects from medical cannabis use (21%)

ADS = Anxiety and Depression Scale; AIMS = Abnormal Involuntary Movement Scale; ARV = antiretroviral; AUDIT = Alcohol Use Disorders Identification Test; BZD = benzodiazepine; CES-D = Center for Epidemiologic Studies Depression Scale; CMM = comprehensive medication management; ED = emergency department; EPS = extrapyramidal symptoms; EQ-5D VAS = EQ visual analog scale; GDS-4 = Geriatric Depression Scale; HAM-D = Hamilton Depression Rating Scale; HbA_{1c} = hemoglobin A_{1c}; ICU = intensive care unit; IM = intramuscular; mBDI = modified Beck Depression Inventory; MH = mental health; MMSE = Mini-Mental State Examination; MSAS = Modified Simpson-Angus Scale; NRT = nicotine replacement therapy; OR = odds ratio; PCP = primary care physician; QOL = quality of life; ROI = return on investment; SSRIs = selective serotonin reuptake inhibitors; STOPP/START = Screening Tool of Older Persons' Prescriptions/Screening Tool to Alert to Right Treatment; TD = tardive dyskinesia; US = United States; VA = Veterans Affairs.