mhc
MENTAL HEALTH CLINICIAN

LITERATURE REVIEW Open Access

Impact of pharmacists on outcomes for patients with psychiatric or neurologic disorders

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How to cite: Werremeyer A, Bostwick J, Cobb C, Moore TD, Park SH, Price C, et al. Impact of pharmacists on outcomes for patients with psychiatric or neurologic disorders. Ment Health Clin [Internet]. 2020;10(6):358-80. DOI: 10.9740/mhc.2020.11.358.

Abstract

Introduction: Psychiatric and neurologic illnesses are highly prevalent and are often suboptimally treated. A 2015 review highlighted the value of psychiatric pharmacists in improving medication-related outcomes. There is a need to describe areas of expansion and strengthened evidence regarding pharmacist practice and patient care impact in psychiatric and neurologic settings since 2015.

Methods: A systematic search of literature published from January 2014 to June 2019 was conducted. Publications describing patient-level outcome results associated with pharmacist provision of care in a psychiatric/neurologic setting and/or in relation to central nervous system (CNS) medications were included.

Results: A total of 64 publications were included. There was significant heterogeneity of published study methods and data, prohibiting meta-analysis. Pharmacists practicing across a wide variety of health care settings with focus on CNS medication management significantly improved patient-level outcomes, such as medication adherence, disease control, and avoidance of hospitalization. The most common practice approach associated with significant improvement in patient-level outcomes was incorporation of psychiatric pharmacist input into the interprofessional health care team.

Discussion: Pharmacists who focus on psychiatric and neurologic disease improve outcomes for patients with these conditions. This is important in the current health care environment as most patients with psychiatric or neurologic conditions continue to have unmet needs. Additional studies designed to measure pharmacists' impact on patient-level outcomes are encouraged to strengthen these findings.

Keywords: psychiatric pharmacist, neurologic pharmacist, patient-level outcomes, interprofessional team, medication management

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Disclosures: S.H.P. is a paid consultant for Wolters Kluwer Health. Otherwise the authors have no relevant financial or other conflicts of interest to disclose.

Introduction

According to a 2007 Institute of Medicine report, "Pharmaceuticals are the most common medical inter-

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vention, and their potential for both help and harm is enormous. Ensuring that the American people get the most benefit from advances in pharmacology is a critical component of improving the national healthcare system."[1(p13)] Pharmaceuticals that act in the central nervous system (CNS) are often used to treat psychiatric and neurologic disorders. These medications are among the most frequently used pharmaceuticals comprising 47 of the top 200 most commonly used medications in 2019.[2] The CNS medications have demonstrated benefit but also are associated with many complexities, including adverse effects, drug interactions, and frequent necessity of lifelong use that often require careful management to improve patient outcomes, including symptom control and need for hospitalization.

People with severe and persistent mental illness often have multiple co-occurring illnesses, receive inadequate health care, and have poor medication and therapeutic outcomes.[3-7] A Center for Healthcare Strategies analysis[3] shows that Medicaid patients with co-occurring mental illness or substance use disorder (SUD) were 4 to 5 times more likely to be hospitalized than those without. Further, patients with chronic physical health conditions and a concomitant mental illness or SUD experienced 60% to 70% higher health care costs compared to those without a comorbid mental illness.[3] The Center for Healthcare Strategies group[3] offers several potential solutions to address the needs of this complex patient population, including the use of multidisciplinary teams, integrated care for physical and behavioral health needs, and financial incentives to care integration.

Patients with neurologic disorders also have complex medication-related needs. People with epilepsy often are unable to reach freedom from seizures and are subject to premature mortality, often from potentially preventable causes, despite pharmacologic treatment.[8] The global burden of Parkinson disease has steadily grown in recent decades, and patients affected by it experience poor quality of life, frequent hospitalizations, and uncontrolled symptoms despite treatment.[9,10] Overall, there is need for enhancements and optimization in care and medication use for people with psychiatric and neurologic disorders.

Pharmacists with specialized training and experience in the use and management of CNS medications may be well positioned to optimize use of these medications to improve outcomes in patients with psychiatric or neurologic disorders. A psychiatric pharmacist has specialized experience and training related to psychiatric and neurologic disorders and the use of medications for treatment of patients with these conditions. The most validated way to be recognized as a psychiatric pharmacist is certification by the Board of Pharmacy Specialties (BPS) as a board-certified psychiatric pharmacist (BCPP).[11] To earn board certification, an applicant must be a graduate of an accredited pharmacy program, have a current active license to practice pharmacy, meet experience and training standards (2 to 4 years of postgraduate training and experience) and pass the BCPP examination. There is not a stand-alone board certification for a neurologic pharmacist. Other certifications issued by BPS (eg, board-certified pharmacotherapy specialist [BCPS], board-certified ambulatory care pharmacist [BCACP], board-certified critical care pharmacist [BCCCP]) include brief review content and examination items on neurologic and psychiatric disorders and their treatments.[11-14] Although pharmacists with other BPS certifications aside from the BCPP do not focus extensively on CNS medications, they do receive additional training pertaining to CNS medications and have certified their ability to manage complex pharmacotherapy regimens, which may include CNS medications. BCPP preparation and examination materials also contain a more extensive neurologic focus than any of the other certification areas offered by BPS, including focused review of epilepsy, Parkinson disease, and headache.[15] There is a significant degree of overlap between treatments and even symptoms of psychiatric and neurologic disorders[16] such that expertise with regard to CNS medications often crosses over between what may typically be considered *neurology* and *psychiatry*. Some pharmacists further subspecialize in the treatment of specific psychiatric or neurologic disorders or work in specialty treatment settings. However, there is little available information about training or experience associated with subspecializations such as these. Some pharmacists have approached psychiatric pharmacist designation by practicing with a significant focus on CNS medications and patients with psychiatric and neurologic disorders but have not obtained BPS certification.[17,18] Since 1998, the College of Psychiatric and Neurologic Pharmacists (CPNP) has served as a professional association supporting the education, training, and development needs of pharmacists serving persons with mental illness, SUD, and neurologic disorders and as of April 2020 had more than 2900 members.[19,20] From this point forward, due to the significant overlap in expertise and for brevity, we refer to psychiatric and neurologic pharmacists and/or pharmacists focusing on the use of CNS medications as *psychiatric pharmacists*.

In 2005, Goldstone and colleagues[21] selectively reviewed 28 key studies (date range 1978-2014) and highlighted the value of psychiatric pharmacists as part of the health care team improving medication-related outcomes. Goldstone and colleagues conclude that the clinical and financial benefit of psychiatric pharmacist inclusion within an interdisciplinary team for treatment of psychiatric and neurologic disorders is supported in clinical research studies. They issue a call to action "aimed at ensuring all patients with psychiatric or neurologic disorders have

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access to a standardized, consistent patient care process. . .provided by a psychiatric pharmacist working as a member of the healthcare team. . .”[22(p13)] while also acknowledging the importance of conducting additional studies and collecting outcome data related to the impact of psychiatric pharmacists on patient care. The current article provides an update summarizing the most recent published evidence regarding the impact of practicing psychiatric pharmacists on patient outcomes in various health care settings.

Methods

A list of relevant base search terms was generated by the authors, and it included *psychiatric pharmacy*, *clinical pharmacy*, *clinical pharmacy specialist*, *pharmacy*, *pharmacist*, *advanced practice provider*, *collaborative practice*, *mental health*, and *behavioral health*. A list of disease-state terms associated with all categories of major mental disorders and a selection of major neurologic disorders that have psychiatric manifestations and are primarily or secondarily treated with CNS medications was also generated (Table 1). Pain conditions were not included. Terms were searched in combinations of base terms and disease-state terms in Google Scholar and PubMed with date limits of January 1, 2014, to June 1, 2019. The authors screened the abstracts of the initial results for each set of search terms and collected potentially relevant articles while excluding those that were published in a language other than English; did not describe an active interventional role of a pharmacist; described training exercises, simulations, technician roles, or changes in perceptions/attitudes; were limited to an economics evaluation, commentary, or feasibility study; were published only in abstract or poster form; or described a role of a pharmacist but did not include either a CNS medication, a psychiatric/neurologic disease, or a psychiatric/neurologic pharmacist. Full-text articles were obtained after initial screening. Two authors (C.C. and A.W.) further evaluated each of these articles and excluded review articles, process descriptions without reported outcomes, articles that did not describe a clinical role of a pharmacist (defined as providing active, direct patient care,[22] team-based interventions, and/or population-based care improvements), and articles that only reported numbers or types of pharmacist interventions without associated patient-level outcomes (defined as assessing the benefits/harms directly associated with the patient). A psychiatric pharmacist was defined as any pharmacist with the BCPP certification as well as those pharmacists working in a psychiatry/neurology treatment setting, working with patients with psychiatric/neurologic disorder(s), and/or working with a focus on CNS medication(s). After removal of duplicates, 64 articles were included and are summarized in Table 2.

TABLE 1: Disease-state search terms

Agoraphobia
Alcohol use disorder
Alcohol withdrawal
Alzheimer disease
Anxiety
Attention-deficit hyperactivity disorder
Autism
Bipolar disorder
Catatonia
Delirium
Dementia
Depression
Eating disorder
Epilepsy
Gender dysphoria
Generalized anxiety disorder
Huntington disease
Insomnia
Intellectual disability
Major depressive disorder
Movement disorder
Narcolepsy
Neurocognitive disorder
Neurodevelopmental disorder
Neuroleptic malignant syndrome
Obsessive-compulsive disorder
Opioid use disorder
Opioid withdrawal
Panic attack
Panic disorder
Parkinson disease
Posttraumatic stress disorder
Premenstrual dysphoric disorder
Psychosis
Psychotic disorder
Schizoaffective disorder
Schizophrenia
Seizure
Social anxiety disorder
Stimulant use disorder
Stimulant withdrawal
Substance use disorder
Tardive dyskinesia
Tic disorder
Tobacco use disorder
Tobacco withdrawal

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a]

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Inpatient		
Treatment setting: Psychiatry wards in a university hospital in Germany[c] **Study design:** Prospective, controlled trial to assess the effect of pharmacist-led medication reviews on medication safety of psychiatric inpatients. Psychiatric inpatients were allocated in control (September 2012 to March 2013) or intervention group (May 2013 to December 2013). In the intervention, comprehensive medication reviews performed by 2 clinical pharmacists on admission, discharge, and postdischarge N = 269 psychiatric inpatients[24]	Between-group differences in: • MAI change from admission to discharge • MAI change from admission to 3-mo follow-up • Unsolved DRPs per patient after completion of the study protocol	• Adjusted effect of the intervention on the patient MAI score was an improvement of 1.4 points (95% CI: 0.8 to 2.1, $P < .001$) at discharge • MAI improvement difference remained at follow-up (1.2 points, 95% CI: 0.6 to 1.9, $P < .001$) • Adjusted effect of the intervention on the number of unsolved DRP of 1.8 (95% CI: 1.5 to 2.1, $P < .001$) fewer unsolved DRPs per patient compared with controls
Treatment setting: Psychiatry wards in a university hospital in Germany[c] **Study design:** Prospective open trial to examine the effect of a multidimensional intervention on adherence compared to control group. The intervention included individualized psychiatric medication and disease information with subsequent telephone calls after discharge and medication review targeting simplification of the medication regimen N = 264 psychiatric inpatients taking at least 1 psychotropic medication[25]	Between-group differences in: • Change in MARS from baseline to 3 mo postdischarge • Change in DAI from baseline to 3 mo postdischarge	• Adjusted effect of 1.33 points (95% CI: 0.73 to 1.93) MARS improvement in intervention vs controls • Adjusted effect of 1.93 points (95% CI: 1.15 to 2.72) DAI improvement in intervention vs controls
Treatment setting: Tertiary care academic medical center psychiatry unit in the United States[d] **Study design:** Prospective quality-improvement study to evaluate seasonal influenza vaccine assessments and provide pharmacist interventions to improve compliance with influenza vaccinations. A clinical pharmacist identified patients with incomplete vaccine nurse-documented assessments/administrations and provided education to nursing staff. N = 1413 psychiatric inpatients[26]	IMM-2 IPFQR compliance rate; target rate 100%	*Increase in IMM-2 IPFQR compliance rate (55% in the year prior to program implementation; 99% in the year of program implementation)*
Treatment setting: Acute male inpatient mental health ward in the United Kingdom[d] **Study design:** Descriptive service evaluation of a PMEG with a naturalistic, pre-post methodology. Pharmacist-led group sessions focused on antipsychotics, drugs used for bipolar disorder, and antidepressants and concluded with a group knowledge quiz. Six medicine groups were held during a period of 11 wk. N = 44[27]	• Feasibility and acceptability of PMEG • Feasibility of the outcome measure based on number of completions • Patients' experience and attitudes toward taking medicines via modified version of the medicines-related questions of the CQC UK national inpatient survey of mental health trusts • DAI-10 pre vs post PMEG service implementation	• *Service feasibility and acceptability as indicated by:* ° *All 6 scheduled medicine groups took place* ° *35 Attendees* ° *24 Completed outcome measures* • *Increased agreement that staff adequately explained medication information postintervention vs pre (55% agreement vs 29%)* • *Lower percentage of individuals with a negative attitude toward psychotropic medications postintervention vs pre (24% vs 35%)*

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: Adult inpatient psychiatric unit in the United States[d] **Study design:** Retrospective chart review cohort study to evaluate impact of pharmacist-led PMEG program on hospital readmission rates and to identify patient factors associated with psychiatric readmission. Pharmacist-led PMEG among attenders vs nonattenders. Biweekly group sessions (45-60 min) centered on 5 main patient-initiated psychotropic medication topics N = 583 inpatients[28]	• 90-d Psychiatry readmission • 12-mo Psychiatry readmission • Time to psychiatry readmission • Medical hospitalization within 12 mo • ED visit for psychiatric reasons	• *No difference in 90-d or 12-mo rehospitalization or time to psychiatric readmission* • Significant reduction in ED visits for psychiatric reasons among patients who attended 2 PMEGs vs those who attended 1 PMEG ($P = .0433$)
Treatment setting: State psychiatric hospital in the United States[d] **Study design:** Descriptive analysis from chart review of lithium-related negative patient outcomes from 1 y prior to 2 mo post-pharmacist-delivered educational intervention for medical staff. The educational intervention included lithium pharmacology, pharmacokinetics, pharmacodynamics, and case discussions based on patient scenarios encountered during the preintervention period. n = 13 staff; n = 167 inpatients taking lithium[29]	• No. of cases of lithium concentration ≥1.5 mmol/L • Reported lithium-related adverse events	• *Reduction in cases of lithium toxicity vs preintervention period (0 cases of lithium toxicity vs 2 cases)* • *Frequent report of adverse effects including tremor, dizziness, slurred speech, and lethargy. No adverse effects reported in the postintervention period*
Treatment setting: General medical and emergency short-stay units in Australia[c] **Study design:** Clustered randomized controlled trial to test effectiveness of partnered pharmacist charting at admission compared to standard medical charting in preventing inpatient medication errors N = 881 patients[30]	Between-group differences in: • Proportion of patient's chart with a medication error detected within 24 h of admission • Proportions of types of errors • Proportions of extreme or high-risk errors	• Reduction in proportion of patients with a medication error in the intervention group vs controls (3.7% vs 78.7%; $P < .001$) • *No difference in most commonly identified errors: (1) omitted drug, (2) incorrect dose* • *Of 486 errors classified as moderate, high, or extreme risk, 235 (48%) involved cardiovascular medications, 166 (34%) involved psychotropic medications, 59 (12%) involved anticoagulants, and 43 (9%) involved narcotic analgesics*
Treatment setting: General medical teaching hospital in Canada[e] **Study design:** Pilot study to assess applicability of an interdisciplinary pharmacist-physician intervention model to reduce high-risk medication use and clinical relevance of alerts generated by a computerized alert system. Pharmacists analyzed computer-generated alerts of PIMs for clinical relevance and contributed to generation of a geriatric pharmacotherapy plan. N = 200 geriatric patient d[31]	• No. of patient-days with a change in ≥1 medication per total patient-days with a pharmacist intervention • Proportion of alerts requiring an intervention	• *PIM-related dose reductions and/or drug discontinuations occurred on 77% of the inpatient days of the study period* • *At least 1 clinically relevant alert was generated for 149 of 200 patient d for an overall clinical relevance of alerts of 74.5%* • *Most frequent drug classes targeted by an intervention were bone resorption inhibitors (20.2%), antiemetics (18.1%), benzodiazepines (13.0%), antidepressants (11.9%), antipsychotics (9.8%), and opiate agonists (7.8%)*

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: University hospitals' ED in the United Kingdom[e] **Study design:** Retrospective chart review to identify prevalence of APM dose omission and determine the effect of pharmacist intervention compared to controls. Pharmacist intervention involved identification of patients as high risk, request for APM prescribing, and implementation of treatment plans in the ED N = 89 patients with PD presenting to the ED and subsequently admitted to hospital[32]	Between-group differences in: • Percentage of omitted APM doses • Deterioration of symptoms after admission to ED • Whether APMs were prescribed in ED	• Lower percentage of APM doses omitted in the ED and/or within 24 h of hospital admission vs controls (3.8% vs 26.0%; $P < .05$) • *10 Cases (112%) of APM omission led to clinically significant deterioration of symptoms in the control group vs 0 in the intervention group*
Treatment setting: University hospital emergency department in France[e] **Study design:** Case series of pharmacists' contribution of medication history-taking and psychotropics expertise/education to multidisciplinary team, raising awareness of iatrogenic events N = 2[33]	Improved quality/clinical care	*Detection of neuroleptic malignant syndrome and implementation of appropriate care*
Treatment setting: University teaching hospital in the Netherlands[e] **Study design:** Retrospective comparative cohort study to describe types and implementation of proposed medication changes as a result of pharmacist-conducted medication review and to evaluate associated benefits compared with controls N = 228 inpatients ≥70 y with delirium[34]	Between-group differences in: • Length of delirium • LOS • In-hospital mortality	• *Shorter delirium duration in the intervention group vs controls (8.56 vs 15.47 d)* • *No significant differences were found for LOS, in-hospital mortality, or discharge destination* • Medication advice regarding psychotropic medications comprised 40% of all medication advice given in the intervention group
Treatment setting: Community hospital inpatient wards in the United States[e] **Study design:** Biphasic pre-/postintervention study to evaluate prescribing patterns of sedative/hypnotic agents and to reduce potential misuse or overuse of these agents before and after daily pharmacy interventions including recommendations for discontinuation of duplicative as needed insomnia therapies N = 197 inpatients[35]	• No. of discontinued sedative/hypnotic agents within 24 h after pharmacist intervention • Presence of >1 sedative/hypnotic agent as needed for insomnia before and after pharmacist intervention • Documented episodes of delirium, lethargy, confusion, falls, and/or oversedation, before and after pharmacist intervention	• *25% of a Total of 97 orders were discontinued within 24 h* • Reduction in number of patients receiving duplicate sedative/hypnotic therapy compared to retrospective controls (15 vs 34; $P = .003$) • *Nonsignificant differences in oversedation, falls, and delirium*
Treatment setting: Inpatient hospital in Japan[e] **Study design:** Two-stage (pre-/postintervention) study to evaluate usefulness of pharmacist intervention on physician prescribing compared to controls. Pharmacist intervention included: (1) discuss polypharmacy and/or excessive antipsychotic doses (defined as more than 1000 mg/d chlorpromazine equivalents), (2) propose gradual tapering if discontinuing antipsychotics, (3) suggest the addition or discontinuation of concurrent medications, (4) recommend monitoring for adverse effects N = 52 inpatients with schizophrenia receiving ≥1 antipsychotic agent[36]	Between-group comparison of: • Doses of antipsychotics • No. of antipsychotics per patient • Medication cost per patient • Seclusion room use	• Reduction in antipsychotic dose (982.6 mg pre vs 857.6 mg post; $P < .001$) • Reduction in number of antipsychotics per patient (2.0 [1.0 to 6.0] pre vs 2.0 [1.0 to 5.0] post) among the postintervention group ($P = .0025$) • Reduction in medication cost per patient per d ($10.33 vs $8.76; $P < .05$) • *Nonsignificant difference in seclusion room use (44.2% vs 28.8%; P = .077)*

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: Inpatient hospital in France[e] **Study design:** Retrospective review to evaluate impact of pharmacist interventions regarding citalopram/escitalopram concomitant prescriptions with other drugs that induce QT prolongation N = 168 contraindicated drug-drug interactions involving citalopram or escitalopram[37]	No. of medications interacting with citalopram/escitalopram: • Discontinued when newly ordered in the hospital • Discontinued when entered as an at-home renewal	• *Discontinuation of 65% of interacting medications that were newly ordered during the hospital stay after intervention* • Discontinuation of 10 (19.4%; $P < .01$) at-home treatment renewals after intervention
Treatment setting: Internal medicine and orthopedic wards in Sweden[c] **Study design:** Randomized controlled study to compare usual care with additional standardized comprehensive medication reviews by clinical pharmacists as members of a ward team to assess for differences in rate of drug-related hospital readmissions N = 429 inpatients aged ≥65 with dementia or cognitive impairment[38]	Between-group differences in: • 180-d Drug-related readmissions • Time to drug-related readmission	• Reduction in drug-related hospital readmission among patients in the intervention group vs controls (11% vs 20%) after adjustment for heart failure confounder (HR = 0.49, 95% CI: 0.27 to 0.90, $P = .02$) • Time to drug-related readmission among patients in the intervention group vs controls (171.2 vs 153.1 d, $P = 0.02$)
Treatment setting: Neurology unit of a tertiary care teaching hospital in China[c] **Study design:** Retrospective review to assess the impact of clinical pharmacist-conducted medication order review, team rounding, and patient education N = 1183 inpatients[39]	Medication prescribing errors	• *Reduction in medication prescribing errors from 19 to 10 per mo* • No. of prescription errors intercepted was negatively associated with the cumulative time of pharmacist medication order review ($P = .0038$)
Treatment setting: Trauma ICU in the United States[d] **Study design:** Before-and-after study to determine whether clinical pharmacists' use of a clinical decision support tool for monitoring sedatives and psychotropic medications related to delirium risk factors would decrease the incidence of delirium vs controls N = 61 inpatients[40]	Between-group differences in: • Occurrence of ICU delirium • Hospital LOS • ICU LOS • Ventilator duration • Delirium-potentiating • Medications administered to patients	• *Nonsignificant differences in incidence of delirium (24.1% vs 33.3%, $P = .45$), ICU LOS (7.55 vs 10.11 d, $P = .26$), and ventilator duration (5.03 vs 7.11 d, $P = .26$)* • Reduction in hospital LOS in the intervention group vs controls (9.98 vs 14.74, $P = .04$) • *Nonsignificant increase in mortality with the intervention group from nondelirium causes (24.2% vs 7%, $P = .07$)*
Treatment setting: Academic medical center ICU in the United States[c] **Study design:** Quality improvement initiative to evaluate whether a pharmacist-initiated electronic handoff tool would reduce the overall, and potentially inappropriate, hospital discharge prescribing rate of AAP in a pre-/postintervention comparison N = 358 ICU patients prescribed an AAP[41]	Between-group differences in: • Proportion of hospital survivors who received a discharge AAP prescription • Proportion of ICU survivors who had an AAP continued on transfer from the ICU • Proportion of discharge prescriptions for AAPs that were potentially appropriate • Overall duration of AAP therapy • Median proportion of the hospital stay (in d) with receipt of an AAP	• *Nonsignificant 22% relative risk reduction in AAP discharge prescribing rate* • Reduction in proportion of ICU survivors with an antipsychotic continued at transition out of ICU (78.7% vs 66.7%, $P = .012$) • *No difference in appropriateness of AAP prescription (31.6% vs 48%, $P = .121$)* • *No difference in duration of AAP therapy* • Reduction in median proportion of hospital stay receiving an AAP (50.4% vs 42.8%, $P = .008$)

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: Medical center ICU in the United States[c] **Study design:** Retrospective review to evaluate ICU pharmacist direct management of sedative therapy for mechanically ventilated patients in collaboration with an intensivist (phase 1). In phase 2, that initiative was expanded to include comprehensive pharmacist pain, agitation, and delirium management and development of an interprofessional team to encourage early mobilization of mechanically ventilated patients. Patients receiving pharmacist intervention were compared to patients receiving usual care n = 70 ICU patients receiving sedation (phase 1); n = 935 ICU patients receiving sedation (phase 2)[42]	Between-group differences in: • Use of continuous sedation • Hospital LOS • Ventilator days • Total amount of sedation used • ICU LOS • No. of RASS scores greater than +1 • Reintubation rates	Phase 1: • 102 Fewer h of continuous sedation (40.4% reduction) in intervention group ($P = .0025$) • 15 Fewer sedative/analgesic drips per patient (54.3% reduction; $P < .001$) ° *13.9% Reduction in medication waste* ° 63% Reduction in continuous benzodiazepine infusions per patient (by mean of 4.6 drips, $P = .0029$), ° 45.6% Reduction of composite of propofol, dexmedetomidine, and fentanyl continuous infusions per patient (by mean of 9.9 drips, $P < .001$) • *1.2 More occurrences of a RASS score greater than +1 in the 24 h after initiation of weaning in the intervention group* • *No difference in reintubation rates* • *Mean reduction of 1.2 ventilator d in intervention group ($P = .07$)* • Reduction in mean ICU LOS in intervention group (11.5 vs 16.5 d; $P = .011$) • *Reduction in mean total hospital LOS by 8.4 d* Phase 2: • Mean duration of ventilation decreased in the intervention group (5.6 vs 4.0 d; $P = 0.03$) • *No difference in mean ICU LOS (4.6 d vs 4.3 d; $P = 0.26$)*
Treatment setting: Long-term care facility in Spain[e] **Study design:** Prospective, quasi-experimental, pre-/postintervention, multicenter study. A multidisciplinary group consisting of a neurologist, a psychiatrist, a geriatrician, 2 general practitioners, and 4 pharmacists designed therapeutic guidelines for treating BPSD to optimize and reduce psychotropic drugs and evaluate after implementation. A pharmacist conducted comprehensive medication reviews to apply the guideline. N = 240 patients with dementia receiving ≥1 psychotropic medication[43]	• Mean number of psychotropic drugs prescribed before (baseline) and after intervention • Mean number of psychotropic drugs prescribed between baseline and 1 and 6 mo	• 28% Reduction in psychotropic drugs prescribed before the intervention vs after (636 vs 458; $P < .0001$) • Reduction in number of psychotropics prescribed per patient compared to baseline at 1 mo and 6 mo (0.771 and 0.634, respectively; $P < .001$)

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: Nursing homes' dementia special care units in the Netherlands[e] **Study design:** Multicenter, cluster randomized, controlled, pragmatic trial using parallel groups to evaluate the impact of structured and repeated multidisciplinary medication review with focus on psychotropic drugs prescribed for neuropsychiatric symptoms. Medication review was carried out by teams including physician, pharmacist, and nurse. N = 380 patients with dementia[44]	Between-group differences in: • Appropriateness of psychotropic drug use as defined by the Appropriate Psychotropic Drug use In Dementia index sum score • Appropriateness of indication, evaluation, and therapy duration subscores	• Greater improvement in the per-patient Appropriate Psychotropic Drug Use in Dementia sum score among patients in the intervention group vs controls (−5.28, $P = .005$) • Greater improvement in evaluation subscore (−2.26, $P = .008$) • Mean subscore for therapy duration declined significantly less in the intervention group (−1.65, $P = .020$) • *No difference in indication subscore (−1.91, $P = .150$)*
General Mental Health Ambulatory Care		
Treatment setting: Outpatient psychiatry clinic at a psychiatric hospital in Saudi Arabia[e] **Study design:** Randomized controlled trial with 6-mo follow-up. Outpatients newly diagnosed with MDD were randomized to receive usual pharmacy services ±2 pharmacist-led educational interventions (at baseline and 3 mo) focused on shared decision making and medication adherence. N = 239[45]	Between-groups differences in: • MMAS • BMQ • MADRS • Health-related quality of life based on the EQ-5D • TSQM	Greater improvements in intervention group vs controls at 3 mo: • Adherence via MMAS ($P = .004$) • Treatment satisfaction via TSQM ($P = .021$) • Beliefs about necessity of antidepressants via BMQ necessity subscore ($P = .005$) *No differences in:* • *Other BMQ scores ($P = .092$ to $.869$)* • *MADRS scores ($P = .971$)* • *Quality-of-life scores ($P = .939$)*
Treatment setting: Outpatient department of psychiatry in a tertiary care setting in India[e] **Study design:** Randomized controlled study to assess effect of patient education provided by pharmacist, including awareness of medications prescribed, disease, importance of adherence to medications, and impact on overall quality of life. Collaborative care (usual care plus pharmacist education) and usual care groups were compared at 6 mo. N = 75 patients diagnosed with bipolar disorder[46]	Between-group differences: • MARS • WHOQOL-BREF	• Improvement in medication adherence (2.06 ± 0.15 on MARS; $P < .001$) in intervention group vs usual care • Improvement in quality of life scores (13.8 ± 10.5 on the WHOQOL questionnaire ($P < .05$) in intervention group vs usual care
Treatment setting: Outpatient psychiatric clinic treating adults with psychotic and bipolar disorders in the United States[d] **Study design:** Pre-post analysis to describe impact of interdisciplinary collaboration between outpatient psychiatrists and clinical pharmacists to reduce the use of anticholinergic drugs. Patients were referred to clinical pharmacist for comprehensive medication review N = 29[47]	Change from baseline to after pharmacist intervention: • ACB • PASS • MoCA - 5-item recall	• *Anticholinergic discontinuation in 13 of 29 patients* • *Dose reduction in 6 of 29 patients* • Reduction in mean ACB score from 7 to 5 ($P \leq .05$) • Reduction in PASS score from 29 to 14 ($P \leq .05$) • Improvement in mean 5-item recall from 4 items at baseline to 5 items at follow-up ($P < .05$)
Treatment setting: Outpatient psychiatry clinic in the United States[d] **Study design:** Retrospective case-control study comparing outcomes of patients at risk for adverse drug effects, treatment nonadherence, or suicidal ideation who underwent psychiatrist referral to a pharmacist for telephone follow-up (cases) vs patients treated by psychiatrist alone (controls) N = 217[48]	Between-group differences in: • PHQ-9 scores • GAD-7 scores • Time spent in clinic • Time to target psychotropic medication dose • Patient self-reported adherence	• *PHQ9/GAD7 scores improved in both groups with no difference between the 2 groups ($P = .87, .75$, respectively)* • Increase in adherence in cases vs controls ($P < .0001$) • Longer time spent in clinic (13.5 vs 11.1 wk, $P = .01$) in cases vs controls • Longer time to target dose (8.7 vs 6 wk, $P = .003$) in cases vs controls

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: Outpatient psychiatric clinic in Colombia[c] **Study design:** Randomized controlled trial comparing outcomes of the intervention group, who received usual care plus pharmaceutical care by a specially trained pharmacist to those who received usual care. Pharmacist provided weekly telephone calls including assessment of mood, behaviors, appetite, sleep, and thought process in respect to medication adherence, effectiveness, and safety N = 92[49]	Between-group differences in: • No. of hospitalizations • No. of emergency service consultations • No. of unscheduled outpatient visits • Clinical Global Impressions scale - disease severity	• Decreased hospitalizations in the intervention group (1 vs 16; HR = 9.03, $P = .042$) • Decreased use of emergency services (5 ED visits vs 23; HR = 3.38, $P = .034$) in the intervention group • Unscheduled outpatient visits were significantly higher in the intervention group ($P = .023$), possibly indicating increased recognition of potential interventions • Greater improvement in Clinical Global Impressions scale ($P = .024$) in the intervention group after 1 y
Treatment setting: VA outpatient psychiatric interim care clinic in the United States[d] **Study design:** Retrospective cohort study of patients unassigned to an outpatient mental health prescriber due to prescriber turnover. Pharmacists delivered medication management including medication prescribing under a local scope of practice N = 81[50]	• No. of interventions • Types of interventions performed • Change in monthly psychiatric emergency services volume from 3 mo before through 5 mo after study initiation	• *152 Interventions performed across 81 patients* • *80% of Interventions were medication renewals* • *20% Included medication initiation, dose adjustment, discontinuation, referrals to other providers* • Decrease in mean number of patients seen in the psychiatric emergency service (300/mo to 237/mo, $P = .041$)
Treatment setting: Specialized, integrated pharmacy at community mental health center in the United States[e] **Study design:** Retrospective cohort analysis of medication adherence rates, hospital and ED use, and related costs between clinics with integrated pharmacies matched to a control data set from clinics using nonintegrated community pharmacies N = 2509[51]	Between-group differences in: • MPR • Rates of hospitalization • Rates of ED use • Estimated cost savings	Specialized, integrated pharmacy group had: • Higher MPR (0.957 vs 0.819, $P < .001$) • Decreased hospitalizations ($P = .018$) • Decreased LOS ($P = .022$) • Fewer ED visits ($P = .025$) • *Estimated $57 cost savings per member per mo in decreased hospitalizations and $1.23 per member per mo in decreased ED visits*
Treatment setting: Outpatient AD treatment center in the United States[c] **Study design:** Eight-wk, parallel-arm randomized trial to evaluate whether a targeted, patient-centered pharmacist-physician team MTM intervention reduced the use of inappropriate anticholinergic medications in elderly patients at an AD treatment center vs controls N = 50[52]	Between-group differences in: • Changes in MAI score • Changes in ADS score • Reduction of anticholinergic medications • Change in perceived health status via SF-36 scores	Intervention group associated with greater improvements in: • MAI (–3.6 vs –1.0, $P = .04$) • ADS (–1.0 vs –0.2, $P = .03$) • Reduction in number of anticholinergic drugs (–0.1 vs –0.06, $P = .004$) • Mental health domain score of SF-36 (4.8 vs –6.1, $P = .005$) • *No significant changes found for the remaining 7 of the 8 domains of SF-36 scores ($P = .06, .76$)*

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: Geriatric outpatient treatment team at a VA medical center in the United States[c] **Study design:** Retrospective cohort study comparing deprescribing of PIM by an interdisciplinary geriatric care team including a clinical pharmacy specialist compared to a usual care team N = 568[53]	Between-group differences in: • Percentage of PIMs deprescribed • Class of medications deprescribed most often • Dose reduction of PIMs • Documentation of discussion between pharmacist and provider regarding risk of not discontinuing PIMs if medications were not changed	Improvements in treatment group vs usual care: • Reduction in PIMs (26.8% vs 16.1%, $P = <.001$) • PIM dose reduction (9.7% vs 2.8%, $P < .001$) • Documentation of risk vs benefit discussion occurred with PIMs not deprescribed (65.2% vs 0.003%, $P < .001$) • Greater deprescribing of NSAIDs ($P < .01$), PPIs ($P < .01$), and peripheral alpha blockers ($P = .02$) • *No difference in deprescribing of anticholinergics ($P = .08$), benzodiazepines ($P = .6$), antihistamines ($P = .6$), or antipsychotics ($P = .22$)*
Treatment setting: Department of public health community behavioral health services in the United States[d] **Study design:** Retrospective study analyzed chronic sedative-hypnotic prescription rates in patients seeking mental health services before and after a pharmacist-led intervention that included provider education, development of a guideline and toolkit for appropriate sedative-hypnotic prescription, identification of older adults receiving sedative-hypnotic medications, and development and distribution of patient education materials targeted at high-risk patients N = 32 944 prescriptions analyzed[54]	Endpoints measured at preintervention, 12 mo, and 24 mo postintervention: • Change in frequency of chronic sedative-hypnotic prescriptions • Change in prescription rates in patients on methadone maintenance • Change in prescription rates in patients >60 y of age	*Chronic sedative-hypnotic prescriptions decreased from 1764 at baseline (15.3%) to 1634 at 12 mo (14.9%) to 1018 at 24 mo (9.8%) postintervention* Decreases in potentially unsafe sedative-hypnotic prescriptions: • *No change from preintervention to 12 mo (0.4%, $P = .32$)* • Decrease from preintervention period to 24 mo (5.5%, $P < .0001$) • Decrease from 12 to 24 mo (5.1%, $P < .0001$) • Decreases in methadone cohort (14.5%, $P < .0001$) • Decreases in elderly cohort (3.6%, $P < .0001$) Corresponding increase in use of antidepressants (4.1%, $P < .05$), hydroxyzine (1.1%, $P = .01$), buspirone (2.1%, $P < .05$), gabapentin (6.3%, $P < .05$), and melatonin agonists (0.3%, $P < .05$), which may have been used as safer alternatives
Treatment setting: An outpatient health care center in the United Kingdom[e] **Study design:** Exploratory qualitative study to examine views and experiences of patients with mental illness on medication management by a pharmacist, including supplementary prescribing under direction of a clinical management plan developed with a psychiatrist N = 11[55]	Commonalities among patient comments obtained from semistructured interviews and self-completion diaries. Themes included pharmacist-patient relationship, comparison to other health care providers, and time allowed for consultation.	*Patients treated under this model all reported positive experiences, including better rapport with the pharmacist, increased trust and participation in their treatment, and increased accessibility of the pharmacist compared to their previous care*

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: Three community mental health clinics in the United States[d] **Study design:** Twelve-mo, prospective, multisite, randomized, controlled study comparing outcomes of pharmacist provided MTM services, including point-of-care blood testing for patients prescribed antipsychotics, to a control group that did not receive MTM services N = 120[56]	Percentage of patients on antipsychotics who meet criteria for metabolic syndrome at baseline Between-group differences in: • Measures of metabolic syndrome, including dyslipidemia, hypertension, and diabetes	Point-of-care testing used to identify: • Dyslipidemia (85.8%, n = 106) • Hypertension (52.5%, n = 63) • Diabetes (22.5%, n = 27) *No differences in metabolic syndrome at baseline (MTM group: 85.2% vs controls: 71.2%, P = .73)* *No differences in metabolic syndrome at 12 mo (MTM group: 84.4% vs controls: 70.2%, P = .104)*
Treatment setting: An outpatient psychiatry clinic in Thailand[d] **Study design:** Prospective, open-label, randomized, controlled study to compare pharmacist-psychiatrist collaboration to identify and reduce DRPs in patients with mild-to-moderate symptoms of schizophrenia vs usual care N = 30[57]	Pre-post and between-group differences in: • Change in WCST scores between baseline and wk 12 • Change in other cognitive tests: WMS, Stroop Color Word Test, TMT A, TMT B • Change in BPRS scores and proportion whose BPRS score decreased by >30% • Reduction in DRPs	Significant pre-post improvements in pharmacist intervention group between baseline and wk 12 in: • WCST perseverative errors (21.23 vs 9.61, P = .003) • WMS Trial I (3.69 vs 5.69, P = .005), total words recalled (22.85 vs 31, P = .002), and short delay free recall trial (5 vs 6.3, P = .048) • TMT B (165.38 vs 126.31, P = .015) *Nonsignificant pre-post differences in pharmacist intervention group between baseline and wk 12:* • *WCST - number of categories complete (1.46 vs 2.15, P = .124)* • *Stroop Color and Word Test (50.54 vs 41.92, P = .196)* • *TMT A (50.54 vs 41.02, P = .196)* Significant between-groups differences in improvement in pharmacist intervention group vs usual care in: • WCST perseverative errors (=11.62 vs = 2.65, P = .017) • DRPs (85.19% vs 9.76% reduction); most common intervention was discontinuation of anticholinergic medications • Change in BPRS scores (11.39 vs 1.94, P < .001) *Other between-groups comparisons were not significant*
Specialty Ambulatory Clinics		
Treatment setting: Epilepsy clinic in Saudi Arabia[e] **Study design:** Prospective, nonrandomized study to assess the impact of a pharmacist-led educational interview (a 30-min structured face-to-face interview) on medication adherence N = 60 patients with epilepsy[58]	Between-group differences in: • Antiepileptic drug adherence as measured by the self-reported 8-item MMAS-8 (Arabic version)	Postintervention increase in MMAS-8 score in patients managed by pharmacist vs controls (6.7 ± 0.823 vs 5.83 ± 1.627, respectively; P = .024)
Treatment setting: Neurology and medical clinics in Nigeria[e] **Study design:** Open, randomized, controlled, longitudinal and two-arm parallel prospective study with a 6-mo follow-up to assess the impact of a pharmacist-implemented, one-on-one educational treatment program N = 193 patients with epilepsy[59]	Between-group differences in: • Epilepsy Knowledge Scale • The Brief Illness Perception Questionnaire	• Postintervention improvements in Epilepsy Knowledge Scale vs controls (P < .001) • Postintervention improvements in perception of epilepsy as measured by the Brief Illness Perception questionnaire vs controls (P < .001)

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: Neurology clinic in China[e] **Study design:** Prospective, randomized study to evaluate effects of medication education and behavioral intervention in patients with epilepsy over 6 mo: Group I: medication education Group II: medication education with behavioral intervention group (based on cue-dose training therapy) N = 109 patients with epilepsy who missed AED doses on more than one occasion[60]	Pre- and postintervention changes as well as between groups comparison in: • 4-Item MMAS-4 • No. of seizures • Knowledge of AEDs	Pre to post: • Both groups improved in MMAS-4 ($P <$ .000) • Both groups had improved seizure frequency ($P <$ .000) • Both groups had improved antiepileptic drug knowledge ($P <$ .000) Between-group comparison: • *No difference in group I vs group II increased adherence: 62.3% vs 64.3% (P = .827)* • *No difference in improved seizure control: 64.2% vs 64.3% (P = .988)* • *No difference in increased knowledge of AEDs: 88.7% vs 80.4% (P = .231)*
Treatment setting: Epilepsy center in Colombia[e] **Study design:** Pragmatic randomized controlled trial to establish the impact of a pharmaceutical care program on HRQOL. The IG received a pharmaceutical care program consisting of medication review follow-up according to Dáder's method, health education, and therapeutic drug monitoring of anticonvulsants N = 144 women with epilepsy[61]	Between-group differences in change in QOLIE-31 from baseline to 6 mo	Mean change in the QOLIE-31 score for the IG was 12.45 points ($P <$ .001) and 2.61 for the control group (P = .072)
Treatment setting: Pharmacist-led neurology clinic in the United States[c] **Study design:** Retrospective chart review of medication management for 6 mo with 3-mo follow-up N = 164 patients with headache disorders, neuropathy, PD, non-PD tremor, seizure disorders[62]	No. of encounters related to: • Medication dose adjustments • Medication changes (ie, additions or discontinuations) No. of hours of provider time saved	*Clinical pharmacist specialists completed 307 encounters:* • *175 Medication dose adjustments* • *139 Medication changes* *Estimated 154 h of provider time saved*
Treatment setting: Neurology clinic, PD referral center in the Netherlands[c] **Study design:** Single-center, prospective, observational pilot study to compare usual care with stepwise introduction of three pharmacist-led interventions: UDP, PKG, and pharmacist-led MR N = 27 patients with PD[63]	• Motor symptoms (eg, "on" time) • Medication adherence • Quality of life Endpoints above measured at each time point: • 6 wk (usual care) • 10 wk (UDP) • 14 wk (UDP + PKG) • 26 wk (UDP + PKG + MR)	• On time improved significantly after the combined UDP, PKG, and MR intervention in nonadherent patients (P = .049) • Quality of life improved significantly only after medication review (P = .01) • *No added value of UDP alone or in combination with PKG*
Treatment setting: Child psychiatric hospital outpatient department in Thailand[d] **Study design:** Prospective, randomized open-label study to evaluate the impact of providing specialty psychiatry pharmacist intervention in identifying and resolving DRPs over 8 wk vs controls N = 50 patients ages 2.5 to 12 y with autism spectrum disorder and disruptive behaviors[64]	Between-group differences in: • No. of patients with ≥1 resolved DRP • Mean ABC-I scores	• 52% of Patients in the intervention group had at least 1 DRP resolved vs 16.0% in control group (P = .016) • The intervention group had a lower mean ABC-I score than the control group (9.8 ± 5.6 vs 17.7 ± 7.9; $P <$ .001)

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: HCV clinics of four VA facilities in the United States[e] **Study design:** Randomized, controlled trial testing a collaborative care model in managing patients with chronic HCV and comorbid MDD for 12 mo vs controls N = 242 patients with chronic HCV infection and MDD[65]	Between-group differences in: • Depression treatment response • Depression remission • No. of patients receiving HCV treatment	• Greater response rate (31.6%) in the intervention group vs controls (14.8%; $P = .002$) • Greater remission rate (19%) in the intervention vs controls (7%; $P = .004$) • *No statistical difference in participants receiving anti-HCV treatment between groups*
Treatment setting: Pharmacy satellite of psychiatry clinic in the United States[e] **Study design:** Descriptive study of clozapine monitoring program providing medication management to enhance continuity of care between clinic, pharmacy, and patients. Results compared nonparticipants. N = 110 clozapine-treated patients[66]	Between-group differences in mean duration of clozapine therapy	• Mean duration of clozapine therapy for clozapine monitoring program patients was 598.7 d compared with 267.4 d for patients who were dispensed clozapine but not part of the program ($P = .001$)
Treatment setting: Clozapine clinic in the United States[d] **Study design:** Quality-assurance prospective chart review to determine the impact of pharmacists on clozapine management and identify barriers to clozapine use to potentially increase its utilization. Outcomes evaluated among patients with provider-only vs provider-pharmacist collaboration as well as and pre- to postpharmacist intervention for those patients that received it N = 22 patients prescribed clozapine[67]	Between-group differences in: • Recommended monitoring (A1c, BMI, weight, total cholesterol, LDL, HDL, triglycerides, blood pressure, pulse) • No. of antipsychotics • No. of medications for clozapine adverse effects (AEs) • Clozapine dose Provider survey	• *No differences in recommended monitoring, number of antipsychotics, number of psychotropics, number of medications for clozapine AEs, and clozapine dose from baseline to endpoint between the collaborative group and the psychiatrist-only group (n = 22) or in the prepharmacist to postpharmacist analysis (n = 11)* • Significant difference in the number of pharmacologic (71 vs 19) and nonpharmacologic (154 vs 3) interventions documented in the collaborative group compared to the psychiatrist-only group ($P = .02$ and $P = .01$, respectively) • *100% of Psychiatrists (n = 11) indicated that they would like all clozapine clinic patients to be seen by a pharmacist*
Treatment setting: Lithium clinic in Thailand[e] **Study design:** Single-center retrospective cohort study to compare the long-term clinical outcomes of following lithium maintenance therapy between patients who received standard care plus pharmaceutical care service (lithium clinic group) and standard care alone (usual care group) N = 360 patients prescribed lithium for bipolar I disorder[68]	Between-group differences in: • Hospitalization rate from any recurrence of any new mood episode • Hospitalization rate due to manic recurrence • Hospitalization rate due to depressive recurrence • Median time to event	Patients in lithium clinic group had lower rates of the following (all rates express per 100 person y): • Hospitalization rate due to any recurrence (2.61 vs 9.02; $P < .0001$) • Manic recurrence (2.60 vs 7.40; $P < .001$) • Hospitalization in manic recurrence subgroup (15% vs 34%; $P = .006$) Patients in lithium clinic group had longer: • Median time to manic recurrence (4.4 vs 3.54 y) • Median time to manic admission (5.36 vs 3.98 y) • Median time to ED visit (5.36 vs 4.09 y) • *No significant differences for depressive recurrence and depressive admission*

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: Mental health court system in the United States[d] **Study design:** Descriptive case reports to describe expanded pharmacist roles N = 2 clients of the court system with multiple psychiatric diagnoses[69]	Impact of pharmacists intervention when part of an interprofessional MHC team on client medication issues	• *Successful deprescribing and stabilization of medications* • *1 Client success*fully completed the mental health court program; 1 did not
Substance Use Disorders		
Treatment setting: Suburban health department in the United States[d] **Study design:** Descriptive analysis of a primary care physician-pharmacist collaborative practice to increase access to buprenorphine/naloxone treatment N = 12[70]	• No. of intakes • Program attendance rate • Patient retention rate at 6 and 12 mo • Urine toxicology screens positive for buprenorphine • Cost savings due to minimized physician time	• *12 of 19 Referred patients completed an intake* • *91% Attendance rate* • *100% 6-mo retention rate; 73% 12-mo retention rate* • *114 Urine toxicology screens (88%) were positive for buprenorphine and negative for other opioids* • *Estimated savings of $22 000 vs historical controls*
Treatment setting: Urban academic primary care clinic affiliated with tertiary hospital in the United States[c] **Study design:** Quality improvement evaluation of the impact of a collaborative care management program in which the pharmacist served as care manager and conducted initial evaluations, buprenorphine inductions, and follow-up visits under a supervising psychiatrist N = 43 patients with opioid dependence or nonmedical use of opioids[71]	Measurements at 6 mo: • Treatment retention • Change from baseline in proportion of aberrant toxicology results • Change from baseline in opioid craving scores	• *43 Patients (95.6%) accepted treatment, and 25 (55.0%) remained in treatment at 6 mo* • Decrease in proportion of aberrant urine toxicology results (69.2% vs 31.8%, $P < .01$) • Decrease in craving scores (scale of 0 to 9; 4.1 vs 0.9, $P < .01$)
Treatment setting: VA health system in the United States[c] **Study design:** Retrospective chart review to classify treatment changes implemented following e-consult to a pharmacist-run urine drug testing service N = 107 e-consults[72]	• Actions taken by pharmacist in cases in which unexpected substances were identified • Actions taken by ordering provider based on pharmacist recommendations made in the e-consult response	*In 50% of the cases in which unexpected substances were identified, psychiatric pharmacists recommended immediate action to be taken by the provider:* • *62 Confirmatory tests or increased test frequencies* • *3 Controlled substance dose decreases* • *17 Drug discontinuations* • *7 Referrals to pain management or substance use specialties* *Postconsultation action by the provider occurred in 32% of this group*
Treatment setting: Specialty mental health pharmacy in the United States[d] **Study design:** Prospective evaluation of impact of pharmacist-prescribing of take-home naloxone and provision of overdose prevention education N = 427 patients receiving methadone or buprenorphine[73]	• No. of naloxone kits prescribed • No. of refilled naloxone kits • No. of patient-reported successful overdose reversals	• *47 Intranasal naloxone kits prescribed* • *7 Naloxone kit refills dispensed* • *3 Patients reported successful opioid overdose reversals*
Treatment setting: Indian Health Service pharmacies in the United States[c] **Study design:** Summary description of program implementation of pharmacist coprescribing naloxone for patients receiving opioids and providing community outreach/training[74]	• Patient access to naloxone via pharmacy purchases of naloxone kits • No. of law enforcement officers trained	• *Pharmacy purchases of naloxone kits increased from 2 to 643 in a 14-mo period, which equated to increased access to naloxone for opioid overdose reversal by 275%* • *350 Law enforcement officers in 6 districts were trained and conducted a mass naloxone dispensing initiative*

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: VA SUD intensive outpatient program in the United States[d] **Study design:** Prospective, longitudinal evaluation to assess impact on access to AUD pharmacotherapy of addition of clinical pharmacy specialists who prescribed medications for AUD under a scope of practice, provided medication management and monitoring N = 11[75]	Mean wait time until the next available clinical pharmacy specialist-delivered or addiction psychiatrist-delivered medication evaluation appointment	*Lower mean wait time for a medication evaluation appointment with clinical pharmacy specialist (1.4 vs 44 d)*
Treatment setting: VA health system tobacco cessation telephone clinic in the United States[c] **Study design:** Retrospective cohort study comparing tobacco cessation rates between patients enrolled in the pharmacist-led tobacco-cessation clinic and controls; pharmacists performed assessment, prescribing of tobacco cessation treatment, and counseling by telephone N = 1006[76]	Between-groups differences in: • Patient reported tobacco cessation at 6 mo • Patient reported tobacco cessation at 1 and 3 mo	• Higher tobacco cessation rates in the pharmacist-managed telephone tobacco cessation clinic group vs the controls at 6 mo (16.1% vs 9.5%; $P < .0001$) • At 1 mo, the pharmacist-managed group had a higher rate of patient-reported tobacco cessation 37% vs 23%; $P < .001$) • At 3 mo, the pharmacist-managed group had a higher abstinence rate (24% vs 13%; $P < .001$)
Primary Care		
Treatment setting: Internal medicine clinic at a university hospital in the United States[d] **Study design:** Prospective open pre-/post-trial assessing effectiveness of an integrated clinical pharmacist benzodiazepine service. Pharmacists collaboratively managed benzodiazepines and medications under a collaborative drug therapy management protocol N = 29 patients on chronic benzodiazepines[77]	Pre/post mean scores: • PHQ-9 • GAD-7 • ISI • PDSS	• GAD-7 decreased from 8.6 to 6.3 ($P = .05$) • *No difference in ISI scores ($P > .05$)* • *Too few responses for the PHQ-9 and PDSS to assess significance of change*
Treatment setting: VA PCMHI clinic in the United States[d] **Study design:** Retrospective chart review 1 y pre- and postincorporation of clinical pharmacy specialist as a prescribing provider N = 57 patients enrolled in PCMHI clinic[78]	Patients discharged from PCMHI for achieving: • Therapeutic goals • Program failure (referred out to specialty mental health clinic)	• *Patients achieving therapeutic goals increased from 20 (35%) to 32 (65%)* • Patients referred out for specialty mental health care decreased from 37 (65%) to 24 (44%; $P = .024$)
Treatment setting: VA PCMHI clinic in the United States[d] **Study design:** Retrospective chart review to evaluate the impact on treatment outcomes of a clinical pharmacy specialist who prescribed psychotropic medications under a scope of practice in collaboration with the primary care provider N = 50 patients with depression, anxiety, PTSD, or AUD[79]	Mean change from baseline to wk 12 on: • PHQ-9 scores • GAD-7 scores • PTSD checklist (PCL-C) scores	• Decrease in PHQ-9 scores (–10, $P < .001$) • Decrease in GAD-7 scores (–8, $P = .006$) • *No difference in PCL-C scores (–14.5, $P = .109$)*
Treatment setting: Three rural FQHC in the United States[e] **Study design:** Prospective, quality improvement project targeting high-risk dual-eligible patients using care coordination, transitions of care, and clinical pharmacist DUR N = 502; 56% treated for mental health disorders[80]	Change at 12 mo: • ED visits • Hospital admissions Change at 3 to 4 mo after DUR: • Total number of medications • Total number of Beers list medications for patients over 65 y	• Reduced ED visits (114 to 81, $P < .004$) • Reduced hospital admissions (89 to 56, $P < .001$) • 5.5% Decrease in total number of medications (n = 140, $P = .001$) • 14.8% Decrease in Beers list medications (n = 81, $P = .009$)

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: VA primary care clinic in the United States[c] **Study Design:** Retrospective chart review to assess impact of collaborative care provided by a registered nurse-certified DM educator and clinical pharmacy specialist who prescribed medications under a scope of practice in collaboration with the primary care provider n = 100 patients with DM; 50 with SMI, 50 without[81]	• Change in mean HbA1c • Mean HbA1c nadir • Mean highest post-nadir HbA1c • Glycemic relapse rate • Mean time to relapse	• Mean HbA1c decreased from 10.6% to 7.8% ($P < .001$) • Mean highest post-nadir HbA1c was higher in the SMI vs non-SMI group (10.1% vs 9.3%, $P < .005$) • *No difference in glycemic relapse or mean time to relapse*
Treatment setting: FQHC in the United States[c] **Study design:** Retrospective chart review for psychiatric medication monitoring postmedication review by clinical pharmacist N = 144[82]	Change from baseline to 3 mo postreview in percentage of patients with: • Up-to-date monitoring parameters • AIMS exam • Risk of drug interactions	• Up-to-date monitoring increased by 18% ($P = .0001$) • Risk of drug interactions decreased by 20% ($P < .001$) • *Up-to-date AIMS exam decreased by 12% ($P = .2113$)*
Community Pharmacy		
Treatment setting: Community pharmacy located on a university campus in Thailand[e] **Study design:** A controlled trial of university students with depression randomized into pharmacist-provided individual or group depression education for 16 wk N = 68 health sciences students[83]	Between-group differences in: • CES-D • SF-36 to measure quality of life	• 79.4% of students in individual education group had a CES-D <22 at wk 16 vs 52.9% among group education students ($P = .027$) • SF-36 physical health increased with individual and group education ($P < .001$ and $P = .003$, respectively) • SF-36 mental health increased with individual education ($P = .036$) • *SF-36 mental health did not improve with group education ($P = .067$)*
Treatment setting: Seventeen community pharmacies in Israel[e] **Study design:** Twenty-four-wk, prospective, randomized, open-label, observational study to evaluate impact of community pharmacist support (education, adherence reminders) compared to treatment as usual N = 96 patients with MDD prescribed escitalopram[84]	Between-group difference in time to treatment discontinuation for any reason	At 6 mo, the adherence rate in the pharmacist support group was 55% vs 15.2% in the treatment as usual group ($P < .0001$)
Treatment setting: Community pharmacies in Australia[e] **Study design:** Prospective pre-/postevaluation of patient-rated outcomes associated with a 3- to 6-mo community pharmacy staff-provided medication support program, which included development of a tailored, goal-oriented support plan N = 295 adults prescribed medication for mental illness[85]	Pre/post changes in: • BIPQ • Mental health wellbeing via the SF-12 • BMQ • TSQM • MMAS-8	• Improvement across all questions of the BIPQ (all P values <.008) • Improvement in the mental health domain of SF-12 ($P < .001$) • Improvement in medication concerns subscale of BMQ ($P = .001$) • Improvement in global medication satisfaction of the TSQM ($P < .001$) • Reduction in number of patients with low MMAS-8 scores ($P = .005$)

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TABLE 2: Psychiatric pharmacist patient-level impact across patient care settings[a] (continued)

Study Design and Methodology	Patient-Level Outcomes Evaluated	Results[b]
Treatment setting: Chain community pharmacies in the United States[c] **Study design:** Prospective survey to assess adult patients' satisfaction with receiving long-acting injectable antipsychotics in a community pharmacy and to assess satisfaction compared to the same service received elsewhere n = 104 patient satisfaction; n = 57 service comparison[86]	• Patient satisfaction • Relationship between demographics and likelihood of recommending the services to others	• *Positive response rate of at least 93% on 9 of 11 satisfaction questions* • *In comparing the service to other locations "I trusted the RPh as much or more than others" and "The RPh listened as carefully" had a positive score higher than 90%* • *3 Other questions have positive scores less than 90%* • No relationship between demographics and likelihood of recommending the service to others

AAP = atypical antipsychotic; ABC-I = Aberrant Behavior Checklist-Irritability; ACB = anticholinergic cognitive burden; ADS = Anticholinergic Drug Scale; AE = adverse effect; AED = antiepileptic drug; AIMS = Abnormal Involuntary Movement Scale; APM = anti-parkinsonian medication; AUD = alcohol use disorder; BIPQ = Brief Illness Perception Questionnaire; BMI = body mass index; BMQ = Beliefs about Medications Questionnaire; BPRS = Brief Psychiatric Rating Scale; BPSD = behavioral and psychological symptoms of dementia; CES-D = Centre for Epidemiologic Studies Depression Scale; CI = confidence interval; CQC = Care Quality Commission; DAI = drug attitudes inventory/index; DM = diabetes mellitus; DRP = drug-related problem; DUR = drug utilization review; ED = emergency department; FQHC = federally qualified health center; GAD-7 = Generalized Anxiety Disorder 7-item scale; HCV = hepatitis C virus; HDL = high-density lipoproteins; HR = heart rate; HRQOL = health-related quality of life; ICU = intensive care unit; IG = intervention group; IMM-2 IPFQR = inpatient psychiatric facility quality reporting influenza immunization; ISI = insomnia severity index; LDL = low-density lipoproteins; LOS = length of stay; MADRS = Montgomery-Asberg Depression Rating Scale; MAI = medication appropriateness index; MARS = Medication Adherence Report Scale; MDD = major depressive disorder; MHC = mental health court; MMAS = Morisky Medication Adherence Scale; MoCA = Montreal Cognitive Assessment; MPR = medication possession ratio; MR = medication review; MTM = medication therapy management; PASS = Pittsburgh Anticholinergic Symptom Scale; PCMHI = Primary Care Mental Health Integration; PD = Parkinson disease; PDSS = Panic Disorder Severity Scale; PHQ-9 = Patient Health Questionnaire-9; PIM = potentially inappropriate medication; PKG = Parkinson KinetiGraph; PMEG = patient medication education groups; PPI = proton pump inhibitor; PTSD = posttraumatic stress disorder; QOLIE-31 = Quality of Life in Epilepsy Inventory-31; RASS = Richmond Agitation Sedation Scale; SF-12 = Short Form-12 Health Survey; SF-36 = Short Form 36 Health Survey; SMI = serious mental illness; TMT A = Trail Making Test A; TMT B = Trail Making Test B; TSQM = Treatment Satisfaction Questionnaire for Medication; UDP = unit dose packaging; VA = Veterans Affairs; WCST = Wisconsin Card Sorting Test; WHOQOL-BREF = World Health Organization Quality of Life; WMS = Wechsler Memory Scale.

[a]Data published since Goldstone et al.[21]

[b]Nonstatistically significant results in italic.

[c]At least 1 author is board certified in an area other than psychiatry or other advanced pharmacy practice training.

[d]At least 1 author is a board-certified psychiatric pharmacist or has other psychiatric/neurologic training.

[e]No evidence available that authors are board certified or have advanced pharmacy practice training or no authors are pharmacists.

Articles were gathered a priori by health care setting sections to match those utilized by Goldstone and colleagues[21] in their prior review. Specific verbiage about the treatment settings listed in Table 2 reflects each study authors' characterization of the setting. To determine the presence of BCPP, other board certification(s), or additional training in psychiatric/neurologic disorders or advanced clinical pharmacy practice, we reviewed the author information included in each article and searched the BPS credential verification database[23] for surnames(s) of all authors of included articles as well as the websites of authors' affiliated institutions for information about training and credentials.

Findings

Psychiatric pharmacists improve patients' treatment outcomes in a variety of health care settings. Hospitalized patients experience fewer medication errors and reductions in repeat hospitalizations as a result of psychiatric pharmacists' involvement.[30,38,39,68] Outpatients in primary care, general mental health, and specialty clinics have improved medication safety (eg, reduction in anticholinergic burden, improved medication appropriateness) and reach therapeutic goals (eg, symptom reduction, fewer hospitalizations) at a higher rate when a pharmacist who is focused on CNS medications contributes to their care.[47,49,52,54,60,64,65] Patients filling prescriptions in community pharmacies have better access to long-acting injectable antipsychotic medications and increased medication adherence and are more satisfied with their medications when receiving pharmacist-delivered, psychiatry-focused interventions.[83-86] Patients seeking care for SUD experience increased access to buprenorphine-naloxone and naloxone, both life-saving medications, when a psychiatric pharmacist is involved in the SUD care setting.[70,73,74] According to the literature reviewed, there is evidence to suggest that having a psychiatric pharmacist on the health care team improves patient outcomes across

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a wide variety of inpatient and outpatient settings from general practice to specialized services.

The published literature documents a wide array of services performed by pharmacists focusing on psychiatric and neurologic disease that leads to improvements in patient-level outcomes. Care interventions that include input of pharmacists' expertise into the interprofessional health care team are the most frequently described among the articles that met our search criteria. Joint decision making about medication treatment between psychiatric/neurologic pharmacists, prescribers, and other members of the health care team, leads to statistically significant improvements in disease outcomes and/or medication appropriateness in 22 of 27 studies that described this approach.* Some of the studies are underpowered to detect a difference and do not show statistically significant outcomes.[31,33,56,69,70,72] Psychiatric pharmacists also show statistically significant benefits on patient-level outcomes in at least 5 peer-reviewed publications by providing services, including medication reviews,† patient education,‡ patient and/or data evaluation for medication safety and efficacy,[26,31,35,37,40,41,47] and independent management of medication therapy upon referral.[50,76-79,81]

Twenty (31.3%) of the included studies have at least 1 BCPP author with formal advanced training in psychiatry/neurology. Eighteen (28.1%) of the included studies have at least 1 author with BPS certification in a nonpsychiatric area and/or formal advanced training in clinical pharmacy practice. In 24 (37.5%) of the included studies, there is no evidence of BPS certification or other advanced clinical pharmacy practice training among the authors.

Discussion

This systematic review summarizes areas of impact of psychiatric pharmacists. It extends the findings of Goldstone et al[21] and others[87-89] by highlighting recent work done by psychiatric pharmacists on patient-level outcomes. Many previous studies[90-92] describe the impact of pharmacist-performed comprehensive medication reviews and medication management services by highlighting only the number of drug-related problems identified or the number of pharmacist-suggested interventions accepted by the treatment team. Although useful, these findings do not measure the impact of the psychiatric pharmacist directly on patient outcomes, such as symptom control, quality of life, or need for hospitalization. Subsequently, justifying broader inclusion of psychiatric pharmacists across care settings and payment for their patient care services is difficult. This review shows that psychiatric pharmacists can improve patient outcomes. Interprofessional collaboration with input into medication prescribing, comprehensive medication review, and patient education have the most evidence supporting the role of psychiatric pharmacists on patient outcomes. This review also illustrates the types of patient-level outcomes that have been studied previously and may provide good examples for future research. A recent survey[93] conducted by CPNP suggests that psychiatric pharmacists engage in many innovative practices, but only a minority are tracking any outcomes, and the metrics being collected are varied. To date, the greatest evidence of pharmacists' impact on patient-level outcomes is on improving medication adherence, achieving therapeutic goals, avoiding hospitalizations, and improving medication safety through avoidance of inappropriate medications and management of adverse effects. Future work by psychiatric pharmacists should focus on the impact of their services on these patient-level outcomes with study designs that include pre-post or randomized controlled comparisons, such as those by Hashimoto[36] and Mishra.[42] Use of standardized measurement tools or well-defined assessments of health service use is also recommended, such as those in the work of Harms[79] and Doyle,[80] among others.

A broad definition of *psychiatric pharmacist* is deliberately utilized for this review in order to include as many pharmacists practicing with a focus on CNS medications as possible. Questions remain regarding the degree of training and/or certification necessary for achieving optimal patient-level outcomes when a pharmacist is focused on CNS medication management. Nearly two-thirds of the included studies have an author with a BPS certification. Just less than one-third of the studies included in this review have 1 or more BCPP authors. In addition, nearly one-third of the included studies have at least 1 author with board certification in another area, most commonly BCACP. This means that these studies have authors who are certified to manage patients with multiple comorbid conditions and complex medication regimens. Many of them may have had brief additional training in psychiatric and neurologic disorders as part of their certification preparation.[12,13] One such study by Ammerman and colleagues,[53] all of whose authors have 1 or more nonpsychiatric board certifications, do not find statistically significant differences in rates of deprescribing of psychotropic medications despite significant rates of deprescribing of other medication classes. Perhaps inclusion of a BCPP with enhanced expertise in evaluation of psychotropic medications might have led to a statistically significant rate of deprescribing of those medications as well. In the remaining 24 studies, there was no evidence of board certification or enhanced formal clinical training among the authors. This may signify that positive patient-level outcomes may be realized by inclusion of pharmacists without specialized certification.

*References 30, 35-37, 39, 40, 42-44, 47, 48, 52-54, 57, 65, 65-68, 71

†References 24, 25, 36, 38, 43, 44, 61, 63, 64, 80, 82, 85

‡References 25, 28, 39, 45, 46, 49, 58-60, 64, 77, 83-85

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However, 8 of these studies specifically include statements regarding additional, brief, focused psychiatric/neurologic training provided to pharmacists interacting with patients in the studies. Although no direct comparisons of patient-level outcomes associated with different levels of pharmacist training/certification are found in the literature, this review appears to suggest that additional training in psychiatry/neurology beyond that included with typical pharmacy degree training is the standard in the majority of published work in which patient-level outcomes are impacted.

This review should be viewed with some limitations in mind. Because only studies describing patient-level outcomes associated with psychiatric pharmacist–provided interventions/activities are included, additional areas of pharmacist impact, such as receipt of referrals, economic impacts to health systems, or provision of drug information, are not assessed. In addition, it is possible that the level of training or psychiatric/neurologic practice experience of some authors and pharmacists associated with the included studies is not accurately characterized as this information was difficult to locate in some cases and was only based on the BPS database[23] at the time of this review, not at the time the pharmacists were carrying out their work or when each article was written. Only a selection of neurologic conditions that are most pertinent to use of CNS medications are included, and thus, we cannot comment on pharmacists' impact in areas such as multiple sclerosis, stroke, or pain or on the neurologic pharmacist specialty as a stand-alone area. Finally, the number of large, well-designed trials is relatively small, and those that have been published are heterogeneous in their methods, precluding meta-analysis.

Conclusion

Pharmacists who focus on the management of CNS medications positively impact patients with psychiatric and neurologic disorders. The majority of studies that assess the impact of psychiatric pharmacists on patient-level outcomes show reductions in emergency department visits and hospitalizations, an improvement in medication adherence, and an increase in patients meeting therapeutic goals and disease control. It is standard for pharmacists who impact patient care in these areas to have additional training in psychiatric and/or neurologic disorders and treatments. In the future, psychiatric pharmacists who are designing and delivering new or innovative services should focus on capturing patient-level outcomes.

Acknowledgments

The authors thank Barbara Wells, PharmD, FCCP, BCPP, for editorial contributions to this article. Additionally, the authors acknowledge the CPNP as well as Gregory H. Payne, MBA, CPNP director of technology, for support and assistance on this project.

References

1. Institute of Medicine. Informing the future: critical issues in health. 4th edition. Washington: The National Academies Press; 2007.
2. ClinCalc.com [Internet]. The top 200 of 2020 [cited 2020 Jul 2]. Available from: https://clincalc.com/DrugStats/Top200Drugs.aspx
3. Center for Health Care Strategies [Internet]. Faces of Medicaid: Clarifying multimorbidity patterns to improve targeting and delivery of clinical services for Medicaid populations [2010 Dec 1; cited 2020 Jul 21]. Available from: https://www.chcs.org/resource/faces-of-medicaid-clarifying-multimorbidity-patterns-to-improve-targeting-and-delivery-of-clinical-services-for-medicaid-populations/.
4. Carney CP, Jones L, Woolson RF. Medical comorbidity in women and men with schizophrenia: a population-based controlled study. J Gen Intern Med. 2006;21(11):1133-7. DOI: 10.1111/j.1525-1497.2006.00563.x. PubMed PMID: 17026726.
5. De Hert M, Correll CU, BoBes J, Cetkovich-Bakmas M, Cohen D, Asai I, et al. Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. World Psychiatry. 2011;10(1):52-77. DOI: 10.1002/j.2051-5545.2011.tb00014.x. PubMed PMID: 21379357.
6. Das-Munshi J, Ashworth M, Dewey ME, Gaughran F, Hull S, Morgan C, et al. Type 2 diabetes mellitus in people with severe mental illness: inequalities by ethnicity and age. Cross-sectional analysis of 588 408 records from the UK. Diabet Med. 2017; 34(7):916-24. DOI: 10.1111/dme.13298. PubMed PMID: 27973692.
7. Ayani N, Sakuma M, Morimoto T, Kikuchi T, Watanabe K, Narumoto J, et al. The epidemiology of adverse drug events and medication errors among psychiatric inpatients in Japan: the JADE study. BMC Psychiatry. 2016;16(1):303. DOI: 10.1186/s12888-016-1009-0. PubMed PMID: 27577925; PubMed Central PMCID: PMC5004271.
8. Thurman DJ, Logroscino G, Beghi E, Hauser WA, Hesdorffer DC, Newton CR, et al. The burden of premature mortality of epilepsy in high-income countries: a systematic review from the Mortality Task Force of the International League Against Epilepsy. Epilepsia. 2016;58(1):17-26. DOI: 10.1111/epi.13604. PubMed PMID: 27888514; PubMed Central PMCID: PMC7004822.
9. Dorsey ER, Elbaz A, Nichols E, Abd-Allah F, Abdelalim A, Adsuar JC, et al. Global, regional, and national burden of Parkinson's disease, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Neurol. 2018;17(11):939-53. DOI: 10.1016/S1474-4422(18)30295-3. PubMed PMID: 30287051.
10. Tarolli CG, Zimmerman GA, Auinger P, McIntosh S, Horowitz RK, Kluger BM, et al. Symptom burden among individuals with Parkinson disease. Neurol Clin Pract. 2019;10(1):65-72. DOI: 10.1212/CPJ.0000000000000746. PubMed PMID: 32190422.
11. Board of Pharmacy Specialties [Internet]. Board of Pharmacy Specialties (BPS) homepage [cited 2020 Jul 21]. Available from: https://www.bpsweb.org/.
12. American Pharmacists Association [Internet]. APhA Policy Manual [cited 2019 Nov 15]. Available from: https://www.pharmacist.com/policy-manual?page=3&key=pharmacist
13. Pharmacotherapy Review Course, Pract Exam, and Core Therapeutic Modules Package (No Recert Credit) (Cert # L199330) [Internet]. Knowledge Connection [cited 2020 May 6]. Available from: http://elearning.ashp.org/products/7872/

http://prime-pdf-watermark.prime-prod.pubfactory.com/ | 2024-12-23

pharmacotherapy-review-course-pract-exam-and-core-therapeutic-modules-package-no-recert-credit-cert-l199330
14. Critical Care Pharmacy Review Course, Pract Exam, and Core Therapeutic Modules Package (Cert #L199186) [Internet]. Knowledge Connection [cited 2020 May 1]. Available from: http://elearning.ashp.org/products/7612/critical-care-pharmacy-review-course-pract-exam-and-core-therapeutic-modules-package-cert-l199186
15. National Council [Internet]. Psychiatric shortage: causes and solutions press release [cited 2020 Jul 22]. Available from: https://www.thenationalcouncil.org/wp-content/uploads/2017/03/Psychiatric-Shortage_National-Council-.pdf?daf=375ateTbd56
16. Bazil C. Improving treatment outcomes in the management of epilepsy. J Manag Care Med. 2019;22(2):49-53.
17. Board of Pharmacy Specialties [Internet]. Fall 2019 BPS certification examination results [cited 2020 Jul 9]. Available from: https://www.bpsweb.org/2019/12/16/fall-2019-bps-certification-examination-results/.
18. CPNP [Internet]. RPD survey confirms stability in securing psychiatric positions [cited 2020 Jul 9]. Available from: https://cpnp.org/perspective/2019/01/391857
19. Stimmel GL. Psychiatric pharmacy. Am J Health Syst Pharm. 2013;70(4):366-7. DOI: 10.2146/ajhp120504. PubMed PMID: 23370144.
20. College of Psychiatric and Neurologic Pharmacists [Internet]. CPNP homepage [cited 2020 May 6]. Available from: https://cpnp.org/front
21. Goldstone LA, DiPaula BA, Caballero J, Park S, Price C, Zasadzki Slater M. Improving medication-related outcomes for patients with psychiatric and neurologic disorders: value of psychiatric pharmacists as part of the health care team. Ment Health Clin [Internet]. 2015;5(1):1-28. DOI: 10.9740/mhc.2015.01.001.
22. Maddux MS. Board of regents commentary. Qualifications of pharmacists who provide direct patient care: perspectives on the need for residency training and board certification. Pharmacotherapy. 2013;33(8):888-91. DOI: 10.1002/phar.1285. PubMed PMID: 23625823.
23. Board of Pharmacy Specialties [Internet]. New credential verification BPS [cited 2020 Apr 27]. Available from: https://portalbps.cyzap.net/dzapps/dbzap.bin/apps/assess/webmembers/secure/manage?webid=BPS&pToolCode=cert-verify&pAdd=Yes
24. Wolf C, Pauly A, Mayr A, Grömer T, Lenz B, Kornhuber J, et al. Pharmacist-led medication reviews to identify and collaboratively resolve drug-related problems in psychiatry – a controlled, clinical trial. Davey CG. PLoS One. 2015;10(11):e0142011. DOI: 10.1371/journal.pone.0142011. PubMed PMID: 26544202; PubMed Central PMCID: PMC4636233.
25. Pauly A, Wolf C, Mayr A, Lenz B, Kornhuber J, Friedland K. Effect of a multi-dimensional and inter-sectoral intervention on the adherence of psychiatric patients. PLoS One. 2015;10(10):e0139302. DOI: 10.1371/journal.pone.0139302. PubMed PMID: 26437449; PubMed Central PMCID: PMC4593549.
26. Cotugno S, Morrow G, Cooper C, Cabie M, Cohn S. Impact of pharmacist intervention on influenza vaccine assessment and documentation in hospitalized psychiatric patients. Am J Health Syst Pharm. 2017;74(23 Suppl 4):S90-4. DOI: 10.2146/ajhp160755. PubMed PMID: 29167145.
27. White D, Wright M, Baber B, Barrera A. A pilot study evaluating the effectiveness of a medicines education group in a mental health inpatient setting: a UK perspective. Ment Health Clin [Internet]. 2017;7(3):116-23. DOI: 10.9740/mhc.2017.05.116. PubMed PMID: 29955509; PubMed Central PMCID: PMC6007567.
28. Werremeyer A, Orr M. Pharmacist-led medication education groups on an inpatient psychiatric unit-impact on readmissions and emergency department visits. J Am Coll Clin Pharm. 2018;2(3):228-35. DOI: 10.1002/jac5.1060.
29. Tillery EE. Minimizing negative outcomes associated with potentially harmful lithium levels by means of pharmacist-led educational interventions in an inpatient psychiatric facility. Ment Health Clin [Internet]. 2015;5(1):29-34. DOI: 10.9740/mhc.2015.01.029.
30. Tong EY, Roman C, Mitra B, Yip G, Gibbs H, Newnham H, et al. Partnered pharmacist charting on admission in the general medical and emergency short-stay unit - a cluster-randomised controlled trial in patients with complex medication regimens. J Clin Pharm Ther. 2016;41(4):414-8. DOI: 10.1111/jcpt.12405. PubMed PMID: 27255463.
31. Arvisais K, Bergeron-Wolff S, Bouffard C, Michaud A-S, Bergeron J, Mallet L, et al. A pharmacist–physician intervention model using a computerized alert system to reduce high-risk medication use in elderly inpatients. Drugs Aging. 2015;32(8):663-70. DOI: 10.1007/s40266-015-0286-5. PubMed PMID: 26248475.
32. Hospital Pharmacy Europe [Internet]. Pharmacist impact on Parkinsons disease-related care in the ED; 2018 [cited 2019 Jul 8]. Available from: https://hospitalpharmacyeurope.com/news/editors-pick/pharmacist-impact-on-parkinsons-disease-related-care-in-the-ed/#:~:text=Pharmacist%20intervention%20was%20associated%20with,symptoms%20while%20in%20the%20department
33. Leenhardt F, Perier D, Pinzani V, Giraud I, Villiet M, Castet-Nicolas A, et al. Pharmacist intervention to detect drug adverse events on admission to the emergency department: two case reports of neuroleptic malignant syndrome. J Clin Pharm Ther. 2017;42(4):502-5. DOI: 10.1111/jcpt.12531. PubMed PMID: 28488314.
34. van Velthuijsen EL, Zwakhalen SMG, Pijpers E, van de Ven LI, Ambergen T, Mulder WJ, et al. Effects of a medication review on delirium in older hospitalised patients: a comparative retrospective cohort study. Drugs Aging. 2018;35(2):153-61. DOI: 10.1007/s40266-018-0523-9. PubMed PMID: 29396715; PubMed Central PMCID: PMC5847150.
35. Badr AF, Kurdi S, Alshehri S, McManus C, Lee J. Pharmacists' interventions to reduce sedative/hypnotic use for insomnia in hospitalized patients. Saudi Pharm J. 2018;26(8):1204-7. DOI: 10.1016/j.jsps.2018.07.010. PubMed PMID: 30510473; PubMed Central PMCID: PMC6257887.
36. Hashimoto Y, Tensho M. Effect of pharmacist intervention on physician prescribing in patients with chronic schizophrenia: a descriptive pre/post study. BMC Health Serv Res. 2016;16(1):150. DOI: 10.1186/s12913-016-1408-4. PubMed PMID: 27117589; PubMed Central PMCID: PMC4847190.
37. Chastang A, Renet S, Corny J, Beaussier H, Petre A, Lillo-Lelouet A, et al. Impact of hospital pharmacist interventions on the combination of citalopram or escitalopram with other QT-prolonging drugs. Int J Clin Pharm. 2019;41(1):42-8. DOI: 10.1007/s11096-018-0724-7. PubMed PMID: 30610545.
38. Gustafsson M, Sjölander M, Pfister B, Jonsson J, Schneede J, Lövheim H. Pharmacist participation in hospital ward teams and hospital readmission rates among people with dementia: a randomized controlled trial. Eur J Clin Pharmacol. 2017;73(7):827-35. DOI: 10.1007/s00228-017-2249-8. PubMed PMID: 28391409; PubMed Central PMCID: PMC5486919.
39. Yi Z-M, Sun S-S, Li X-X, Lu M, Zhai S-D. An evaluation of clinical pharmacist service on a neurology care unit. Int J Clin Pharm. 2016;38(1):30-3. DOI: 10.1007/s11096-015-0224-y. PubMed PMID: 26659084.
40. Lightfoot M, Sanders A, Burke C, Patton J. Clinical pharmacist impact on intensive care unit delirium: intervention and monitoring. Hosp Pharm. 2019;54(3):180-5. DOI: 10.1177/0018578718778226. PubMed PMID: 31205329; PubMed Central PMCID: PMC6535931.
41. Kram BL, Schultheis JM, Kram SJ, Cox CE. A pharmacy-based electronic handoff tool to reduce discharge prescribing of atypical antipsychotics initiated in the intensive care unit: a

http://prime-pdf-watermark.prime-prod.pubfactory.com/ | 2024-12-23

quality improvement initiative. J Pharm Pract. 2019;32(4):434-41. DOI: 10.1177/0897190018761412. PubMed PMID: 29486664.
42. Louzon P, Jennings H, Ali M, Kraisinger M. Impact of pharmacist management of pain, agitation, and delirium in the intensive care unit through participation in multidisciplinary bundle rounds. Am J Health Syst Pharm. 2017;74(4):253-62. DOI: 10.2146/ajhp150942. PubMed PMID: 28179250.
43. Massot Mesquida M, Tristany Casas M, Franzi Sisó A, García Muñoz I, Hernández Vian Ó, Torán Monserrat P. Consensus and evidence-based medication review to optimize and potentially reduce psychotropic drug prescription in institutionalized dementia patients. BMC Geriatr. 2019;19(1):7. DOI: 10.1186/s12877-018-1015-9. PubMed PMID: 30621606; PubMed Central PMCID: PMC6323667.
44. van der Spek K, Koopmans RTCM, Smalbrugge M, Nelissen-Vrancken MHJMG, Wetzels RB, Smeets CHW, et al. The effect of biannual medication reviews on the appropriateness of psychotropic drug use for neuropsychiatric symptoms in patients with dementia: a randomised controlled trial. Age Ageing. 2018;47(3):430-7. DOI: 10.1093/ageing/afy001. PubMed PMID: 29432518.
45. Aljumah K, Hassali MA. Impact of pharmacist intervention on adherence and measurable patient outcomes among depressed patients: a randomised controlled study. BMC Psychiatry. 2015;15:219. DOI: 10.1186/s12888-015-0605-8. PubMed PMID: 26376830; PubMed Central PMCID: PMC4574071.
46. Mishra A, Krishna GS, Alla S, Kurian TD, Kurian J, Ramesh M, et al. Impact of pharmacist-psychiatrist collaborative patient education on medication adherence and quality of life (QOL) of bipolar affective disorder (BPAD) patients. Front Pharmacol. 2017;8:722. DOI: 10.3389/fphar.2017.00722. PubMed PMID: 29066976; PubMed Central PMCID: PMC5641349.
47. Lupu AM, Clinebell K, Gannon JM, Ellison JC, Chengappa KNR. Reducing anticholinergic medication burden in patients with psychotic or bipolar disorders. J Clin Psychiatry. 2017;78(9):e1270-5. DOI: 10.4088/JCP.16m11269. PubMed PMID: 29178683.
48. Lindell VA, Stencel NL, Ives RC, Ward KM, Fluent T, Choe HM, et al. A pilot evaluating clinical pharmacy services in an ambulatory psychiatry setting. Psychopharmacol Bull. 2018;48(2):18-28. PubMed PMID: 29713097.
49. Salazar-Ospina A, Amariles P, Hincapié-García JA, González-Avendaño S, Benjumea DM, Faus MJ, et al. Effectiveness of the Dader method for pharmaceutical care on patients with bipolar i disorder: results from the EMDADER-TAB study. J Manag Care Spec Pharm. 2017;23(1):74-84. DOI: 10.18553/jmcp.2017.23.1.74. PubMed PMID: 28025928.
50. Gibu M, Clark J, Gold J. Mental health pharmacists as interim prescribers. Ment Health Clin [Internet]. 2017;7(3):111-5. DOI: 10.9740/mhc.2017.05.111. PubMed PMID: 29955508; PubMed Central PMCID: PMC6007566.
51. Wright WA, Gorman JM, Odorzynski M, Peterson MJ, Clayton C. Integrated pharmacies at community mental health centers: medication adherence and outcomes. J Manag Care Spec Pharm. 2016;22(11):1330-6. DOI: 10.18553/jmcp.2016.16004. PubMed PMID: 27783555.
52. Moga DC, Abner EL, Rigsby DN, Eckmann L, Huffmyer M, Murphy RR, et al. Optimizing medication appropriateness in older adults: a randomized clinical interventional trial to decrease anticholinergic burden. Alzheimers Res Ther. 2017;9(1):36. DOI: 10.1186/s13195-017-0263-9. PubMed PMID: 28535785; PubMed Central PMCID: PMC5442667.
53. Ammerman CA, Simpkins BA, Warman N, Downs TN. Potentially inappropriate medications in older adults: deprescribing with a clinical pharmacist. J Am Geriatr Soc. 2018;67(1):115-8. DOI: 10.1111/jgs.15623. PubMed PMID: 30300947.
54. Avdagic K, Geier M, Coralic Z, Finley P. Evaluation of the impact of a multimodel intervention on prescribing patterns of sedative-hypnotics in a behavioral health system. Prim Care Companion CNS Disord. 2018;20(3):18m02269. DOI: 10.4088/PCC.18m02269. PubMed PMID: 29873949.
55. Deslandes RE, John DN, Deslandes PN. An exploratory study of the patient experience of pharmacist supplementary prescribing in a secondary care mental health setting. Pharm Pract (Granada). 2015;13(2):553. DOI: 10.18549/pharmpract.2015.02.553. PubMed PMID: 26131043.
56. Schneiderhan ME, Shuster SM, Davey CS. Twelve-month prospective randomized study of pharmacists utilizing point-of-care testing for metabolic syndrome and related conditions in subjects prescribed antipsychotics. Prim Care Companion CNS Disord. 2014;16(5):10.4088/PCC.14m01669. DOI: 10.4088/PCC.14m01669. PubMed PMID: 25667811; PubMed Central PMCID: PMC4321016.
57. Sathienluckana T, Unaharassamee W, Suthisisang C, Suanchang O, Suansanae T. Anticholinergic discontinuation and cognitive functions in patients with schizophrenia: a pharmacist–physician collaboration in the outpatient department. Integr Pharm Res Pract. 2018;7:161-71. DOI: 10.2147/IPRP.S176653. PubMed PMID: 30464898; PubMed Central PMCID: PMC6208936.
58. AlAjmi R, Al-Aqeel S, Baz S. The impact of a pharmacist-led educational interview on medication adherence of Saudi patients with epilepsy. Patient Prefer Adherence. 2017;11:959-64. DOI: 10.2147/PPA.S124028. PubMed PMID: 28572723; PubMed Central PMCID: PMC5441662.
59. Eshiet U, Okonta J, Ukwe C. The efficacy of a pharmacist implemented educational treatment programme for people with epilepsy: a report of a randomised controlled trial. Seizure. 2019;69:147-53. DOI: 10.1016/j.seizure.2019.04.011. PubMed PMID: 31048271.
60. Tang F, Zhu G, Jiao Z, Ma C, Chen N, Wang B. The effects of medication education and behavioral intervention on Chinese patients with epilepsy. Epilepsy Behav. 2014;37:157-64. DOI: 10.1016/j.yebeh.2014.05.017. PubMed PMID: 25022824.
61. Losada-Camacho M, Guerrero-Pabon MF, Garcia-Delgado P, Martínez-Martinez F. Impact of a pharmaceutical care programme on health-related quality of life among women with epilepsy: a randomised controlled trial (IPHIWWE study). Health Qual Life Outcomes. 2014;12:162. DOI: 10.1186/s12955-014-0162-8. PubMed PMID: 25358723; PubMed Central PMCID: PMC4236797.
62. Martin AW, Heberle AP, Knight JM. Interventions associated with implementation of a pharmacist-led neurology pharmacotherapy clinic in an ambulatory care setting. J Am Coll Clin Pharm. 2018;2(2):116-22. DOI: 10.1002/jac5.1039.
63. Stuijt C, Karapinar-Çarkit F, van den Bemt B, van Laar T. Effect of pharmacist-led interventions on (non)motor symptoms, medication-related problems, and quality of life in Parkinson disease patients. Clin Neuropharmacol. 2018;41(1):14-9. DOI: 10.1097/WNF.0000000000000260. PubMed PMID: 29300205.
64. Wongpakaran R, Suansanae T, Tan-khum T, Kraivichian C, Ongarjsakulman R, Suthisisang C. Impact of providing psychiatry specialty pharmacist intervention on reducing drug-related problems among children with autism spectrum disorder related to disruptive behavioural symptoms: a prospective randomized open-label study. J Clin Pharm Ther. 2017;42(3):329-36. DOI: 10.1111/jcpt.12518. PubMed PMID: 28317138.
65. Kanwal F, Pyne JM, Tavakoli-Tabasi S, Nicholson S, Dieckgraefe B, Storay E, et al. A randomized trial of off-site collaborative care for depression in chronic hepatitis C virus. Health Serv Res. 2017;53(4):2547-66. DOI: 10.1111/1475-6773.12758. PubMed PMID: 28891153; PubMed Central PMCID: PMC6051980.
66. Heins K. Fairview Pharmacy Services clozapine monitoring program: description and evaluation of a clinical pharmacy service. Ment Health Clin [Internet]. 2019;9(3):138-40. DOI: 10.9740/mhc.2019.05.138. PubMed PMID: 31123662; PubMed Central PMCID: PMC6513055.

http://prime-pdf-watermark.prime-prod.pubfactory.com/ | 2024-12-23

67. Maryan S, Harms M, McAllister E, DeJongh B. Comparison of clozapine monitoring and adverse event management in a psychiatrist-only and a clinical pharmacist-psychiatrist collaborative clinic. Ment Health Clin [Internet]. 2019;9(2):70-5. DOI: 10.9740/mhc.2019.03.070. PubMed PMID: 30842913; PubMed Central PMCID: PMC6398353.
68. Suanchang O, Kulsomboon V, Sirisinsuk Y, Phoomchan N, Skawatananont C. Clinical outcomes of a pharmaceutical care service in lithium clinic adjunct to standard care compared with standard care alone in patients with bipolar disorder: 10 years naturalistic retrospective cohort study. Thai J Pharm Sci. 2017;41(4):166-73.
69. DeJongh B, Oldani M. Case reports of interprofessional care for clients enrolled in a mental health court. Ment Health Clin [Internet]. 2018;8(6):317-21. DOI: 10.9740/mhc.2018.11.317. PubMed PMID: 30397575; PubMed Central PMCID: PMC6213897.
70. DiPaula BA, Menachery E. Physician–pharmacist collaborative care model for buprenorphine-maintained opioid-dependent patients. J Am Pharm Assoc (2003). 2015;55(2):187-92. DOI: 10.1331/JAPhA.2015.14177. PubMed PMID: 25749264.
71. Suzuki J, Matthews ML, Brick D, Nguyen M-T, Jamison RNN, Ellner AL, et al. Implementation of a collaborative care management program with buprenorphine in primary care: a comparison between opioid-dependent patients and patients with chronic pain using opioids nonmedically. J Opioid Manag. 2014;10(3):159-68. DOI: 10.5055/jom.2014.0204. PubMed PMID: 24944066; PubMed Central PMCID: PMC4085743.
72. Stammet MM, Spradley SS. Evaluation of treatment changes following electronic consultation to a pharmacist-run urine drug testing service in a veterans healthcare system. J Opioid Manag. 2016;12(6):389-95. DOI: 10.5055/jom.2016.0358. PubMed PMID: 28059431.
73. Geier M, Gasper JJ. Naloxone prescribing by psychiatric clinical pharmacists for patients receiving opioid agonist treatment. Ment Health Clin [Internet]. 2015;5(1):46-9. DOI: 10.9740/mhc.2015.01.046.
74. Duvivier H, Gustafson S, Greutman M, Jangchup T, Harden AK, Reinhard A, et al. Indian Health Service pharmacists engaged in opioid safety initiatives and expanding access to naloxone. J Am Pharm Assoc (2003). 2017;57(2):S135-40. DOI: 10.1016/j.japh.2017.01.005. PubMed PMID: 28292501.
75. Dimitropoulos E, Bertucci S, Wong K. Integration of a clinical pharmacy specialist into a substance use disorder intensive outpatient treatment program to improve prescribing rates of alcohol use disorder pharmacotherapy. Subst Abus. 2018;39(2):190-2. DOI: 10.1080/08897077.2018.1449172. PubMed PMID: 29558338.
76. Chen T, Kazerooni R, Vannort EM, Nguyen K, Nguyen S, Harris J, et al. Comparison of an intensive pharmacist-managed telephone clinic with standard of care for tobacco cessation in a veteran population. Health Promot Pract. 2014;15(4):512-20. DOI: 10.1177/1524839913509816. PubMed PMID: 24231631.
77. Furbish SML, Kroehl ME, Loeb DF, Lam HM, Lewis CL, Nelson J, et al. A pharmacist–physician collaboration to optimize benzodiazepine use for anxiety and sleep symptom control in primary care. J Pharm Pract. 2017;30(4):425-33. DOI: 10.1177/0897190016660435. PubMed PMID: 27480874; PubMed Central PMCID: PMC5511764.
78. Parikh M, Ebong EE, Harris E, Barnes B. Evaluation of clinical pharmacy services within the primary care-mental health integration model at the Tuscaloosa Veterans Affairs Medical Center. Ment Health Clin [Internet]. 2016;6(5):260-5. DOI: 10.9740/mhc.2016.09.260. PubMed PMID: 29955480; PubMed Central PMCID: PMC6007590.
79. Harms M, Haas M, Larew J, DeJongh B. Impact of a mental health clinical pharmacist on a primary care mental health integration team. Ment Health Clin [Internet]. 2017;7(3):101-5. DOI: 10.9740/mhc.2017.05.101. PubMed PMID: 29955506; PubMed Central PMCID: PMC6007568.
80. Doyle D, Emmett M, Crist A, Robinson C, Grome M. Improving the care of dual eligible patients in rural federally qualified health centers. J Prim Care Community Health. 2016;7(2):118-21. DOI: 10.1177/2150131915617297. PubMed PMID: 26582045; PubMed Central PMCID: PMC4794360.
81. Milkovich SA, Rychel RL, Pascuzzi K, Purdum MB, Taylor GJ, Burant CJ, et al. Serious mental illness and its impact on diabetes care in a VA nurse/pharmacist-managed population. Fed Pract. 2017;34(Suppl):S32-7. PubMed PMID: 30766314.
82. Gallimore CE, Sokhal D, Zeidler Schreiter E, Margolis AR. Pharmacist medication reviews to improve safety monitoring in primary care patients. Fam Syst Health. 2016;34(2):104-13. DOI: 10.1037/fsh0000185. PubMed PMID: 26986622.
83. Phimarn W, Kaewphila P, Suttajit S, Saramunee K. Depression screening and advisory service provided by community pharmacist for depressive students in university. SpringerPlus. 2015;4(1):470. DOI: 10.1186/s40064-015-1259-1. PubMed PMID: 26357601; PubMed Central PMCID: PMC4556723.
84. Klang SH, Ben-Amnon Y, Cohen Y, Barak Y. Community pharmacists' support improves antidepressant adherence in the community. Int Clin Psychopharmacol. 2015;30(6):316-9. DOI: 10.1097/YIC.0000000000000090. PubMed PMID: 26163876.
85. McMillan SS, Kelly F, Hattingh HL, Fowler JL, Mihala G, Wheeler AJ. The impact of a person-centred community pharmacy mental health medication support service on consumer outcomes. J Ment Health. 2018;27(2):164-73. DOI: 10.1080/09638237.2017.1340618. PubMed PMID: 28675321.
86. Mooney EV, Hamper JG, Willis RT, Farinha TL, Ricchetti CA. Evaluating patient satisfaction with pharmacist-administered long-acting injectable antipsychotics in the community pharmacy. J Am Pharm Assoc (2003). 2018;58(4):S24-9.e2. DOI: 10.1016/j.japh.2018.04.035. PubMed PMID: 30006184.
87. Nkansah N, Mostovetsky O, Yu C, Chheng T, Beney J, Bond CM, et al. Effect of outpatient pharmacists' non-dispensing roles on patient outcomes and prescribing patterns. Cochrane Database Syst Rev. 2010;7:CD000336. DOI: 10.1002/14651858.CD000336.pub2. PubMed PMID: 20614422.
88. Richardson TE, O'Reilly CL, Chen TF. A comprehensive review of the impact of clinical pharmacy services on patient outcomes in mental health. Int J Clin Pharm. 2014;36(2):222-32. DOI: 10.1007/s11096-013-9900-y. PubMed PMID: 24306436.
89. Australian Commission on Safety and Quality in Health Care [Internet]. Medication safety in mental health [cited 2020 May 4]. Available from: https://www.safetyandquality.gov.au/publications-and-resources/resource-library/medication-safety-mental-health
90. Hannou S, Voirol P, Pannatier A, Weibel M-L, Sadeghipour F, von Gunten A, et al. Pharmacist intervention acceptance for the reduction of potentially inappropriate drug prescribing in acute psychiatry. Int J Clin Pharm. 2017;39(6):1228-36. DOI: 10.1007/s11096-017-0513-8. PubMed PMID: 28905171.
91. Eberly ME, Eatmon CV. Impact of psychotropic medication reviews on prescribing patterns. Fed Pract. 2016;33(Suppl 2):22S-5S. PubMed PMID: 30766208.
92. Bhat S, Kroehl ME, Trinkley KE, Chow Z, Heath LJ, Billups SJ, et al. Evaluation of a clinical pharmacist-led multidisciplinary antidepressant telemonitoring service in the primary care setting. Popul Health Manag. 2018;21(5):366-72. DOI: 10.1089/pop.2017.0144. PubMed PMID: 29211661; PubMed Central PMCID: PMC6425925.
93. Silvia RJ, Lee KC, Bostwick JR, Cobb CD, Goldstone LW, Moore TD, et al. Assessment of the current practice of psychiatric pharmacists in the United States. Ment Health Clin [Internet]. 2020;10(6):346-53. DOI: 10.9740/mhc.2020.11.346.

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