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CLINICAL INVESTIGATION

Psychoactive Medication Prescribing After Critical Illness in American Adults Not Justified by a Documented Supporting Diagnosis

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OBJECTIVES: To describe psychoactive medication (PM) prescribing in the 30 days after an ICU admission requiring mechanical ventilation not supported by a documented diagnosis in American adults not prescribed a PM before ICU admission. This nondiagnostically supported PM prescribing was explored in patient subgroups and for up to 2 years.

DESIGN, SETTING, AND PATIENTS: This retrospective cohort study analyzed data from the U.S. claims database PharMetrics Plus for Academics for adults admitted to an ICU requiring invasive mechanical ventilation between January 1, 2018, and December 31, 2019. Patients prescribed a PM or admitted to an ICU or long-term care facility in the year prior, or who ended insurance coverage during the index hospitalization, were excluded.

INTERVENTIONS: None.

MEASUREMENTS AND MAIN RESULTS: Common and uncommon diagnostic codes potentially justifying each PM class prescription were identified using a literature review and expert consensus. A total of 416 of 7898 patients (5.3%) were newly prescribed 484 PMs across four PM classes in the 30-day postdischarge period [193 anxiolytics (39.9%), 176 antidepressants (36.2%), 103 antipsychotics (21.3%), and 12 sleep aids (2.5%)]. A total of 207 prescriptions (42.8%) of these 484 PM prescriptions were not accompanied by a documented supporting diagnosis: 54 of 103 antipsychotics (52.4%), 88 of 193 anxiolytics (45.6%), 5 of 12 sleep aids (41.7%), and 60 of 176 antidepressants (44.1%). Patient subgroups significantly associated with greater 30-day PM prescribing not supported by a documented diagnosis were: younger than 65 (antipsychotics); no history of dementia (anxiolytics); a discharge to home (antidepressants, antipsychotics); and ICU readmission (sleep aids). New PM prescribing in the absence of a supporting documented diagnosis persisted over the next 2 years (31–90 d, 24.7%; 91–180 d, 37.8%; 181–365 d, 42.7%; 366–730 d, 36.6%)

CONCLUSIONS: Although the prevalence of new PM prescribing to American ICU survivors in the 30 days after discharge is relatively low, nearly half is not supported by a documented diagnosis. Future prospective research should determine the prevalence of nondiagnostically documented PM prescribing that is unwarranted.

KEYWORDS: antidepressants; antipsychotics; hypnotics and sedatives; inappropriate prescribing; intensive care; psychiatric conditions; sleep aids

ICU survivors often experience persistent psychologic symptoms leading to new diagnoses of anxiety, depression, stress-related conditions, and sleep disorders (1–13). Psychoactive medications (PMs) such as anxiolytics, antipsychotics, antidepressants, and sleep aids are often continued from the ICU, restarted from the pre-ICU period (14–18), or newly prescribed to treat

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KEY POINTS

Question: How often are psychoactive medications prescribed to American adults in the 30 days after an ICU hospitalization when a diagnosis supporting this prescription is not documented?

Findings: A total of 416 patients (5.3%) were newly prescribed 484 psychoactive medications in the 30 days after their ICU hospitalization. A diagnosis supporting 207 of these prescriptions (42.8%) was not documented.

Meaning: Nearly half of the psychoactive medications newly prescribed in the month after an ICU hospitalization do not have a documented diagnosis supporting use. Future research should investigate the extent to which psychoactive medications are prescribed solely with an absence of a documented diagnosis vs. a true lack of clinical indication.

these conditions (7–13). Prescribing a PM in the absence of a documented supporting diagnosis may be unwarranted and increase the risk for side effects including sedation, respiratory depression, and delirium (19–22).

Multiple studies have evaluated post-ICU PM prescribing (7–13) but only two excluded patients taking a PM(s) before ICU admission (7, 8) and only one considered whether a documented diagnosis supported this prescribing (12). However, this study (12) failed to consider whether the documented diagnoses preceded PM prescribing and was limited to only three diagnoses (i.e., anxiety, depression, and insomnia). Most of these studies have focused on only one PM class (e.g., benzodiazepines [8, 12] or antidepressants [13]) or ICU population (e.g., medical [9] or traumatic brain injury [10]). Lastly, none of these studies (7–13) were conducted in the United States, where PM prescribing patterns may be different from other countries (23).

Given these current gaps, we sought to leverage real-world data to characterize new post-ICU PM prescribing in U.S. adults, across multiple PM classes, in the first 30 days after hospital discharge not supported by a documented diagnosis. We also explored whether certain patients are more likely to be prescribed a PM in the absence of a documented diagnosis during this period and whether it persists in the 2 years after ICU hospitalization discharge. This study represents a first step toward characterizing PM prescribing in U.S. survivors of critical illness that may be clinically unwarranted.

MATERIALS AND METHODS

Data Source

This retrospective cohort analysis used the IQVIA PharMetrics Plus for Academics (P+) database (IQVIA, Durham, NC) licensed to Northeastern University (NU) for 2017–2022. The P+ U.S. health insurance claims database (IQVIA, Durham, NC) includes a cross-section of patients fully insured by multiple private insurance plans, including Medicare Advantage across all geographic areas (24). The NU Institutional Review Board (IRB) waived approval (IRB#24-02-36); study reporting adheres to Strengthening the Reporting of Observational Studies in Epidemiology (25).

Study Population

We included adults admitted to a hospital with an ICU unit who required invasive mechanical ventilation (IMV) from January 1, 2018 to December 31, 2019 (**Supplemental Digital Content [SDC] 1, Supplemental Table 1**, https://links.lww.com/CCM/I41) with continuous insurance coverage in the year before the index hospitalization (**SDC2, Supplemental Fig. 1**, https://links.lww.com/CCM/I41). The 2018–2019 study period was selected to avoid ICU admissions during the COVID-19 pandemic when post-ICU PM prescribing practices and diagnostic documentation may have been different (26). We focused our study on "critically ill" patients given that severity of illness and post intensive care syndrome (PICS) are linked (27, 28). With some of the data needed to calculate severity of illness scores not available in P+, we limited our cohort to patients requiring IMV—an indicator of greater ICU severity of illness that has been used in prior studies (29–35). We excluded patients with factor(s) that might skew post-hospitalization PM prescribing estimates (**SDC 7, Supplemental Fig. 2**, https://links.lww.com/CCM/I41): prescribed any PM or admitted to an ICU or a chronic care facility in the prior 12 months; admitted to the ICU with a toxicological emergency; loss

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of insurance during the ICU hospitalization; or discharged to hospice.

Outcomes

Using a literature review, we identified anxiolytics, antidepressants, antipsychotics, and nonbenzodiazepine sleep aids as the most common PM types prescribed after ICU hospitalization. We also considered individual PM classes (e.g., benzodiazepines) within these four PM types. We then assigned each PM type and class to their established Anatomical Therapeutic Chemical codes (**SDC 3, Supplemental Table 2**, https://links.lww.com/CCM/I41) (36–38).

Prescriber notes, which could include a clinical rationale for a PM being prescribed, are not available in P+. We therefore relied on the presence of a documented diagnosis code(s) on or before the date the PM was prescribed to define whether prescribing of the PM was diagnostically supported. Through literature review and author consensus, we constructed a list of psychiatric diagnoses using *International Classification of Diseases*, 10th revision-clinical modification codes that could be treated with one or more of the PM types/classes (39–46). These included anxiety, mood disorders (e.g., bipolar disorders, depression), personality disorders, nonmood–related psychotic disorders, stress-related disorders, and sleep disorders (**SDC 4**, **Supplemental Table 3**, https://links.lww.com/CCM/I41).

Next, through literature review and author consensus, we constructed a list of non-psychiatric diagnoses (i.e., pain, migraine, and mild cognitive impairment/dementia) that could also serve as an indication for PM prescribing (**SDC 5**, **Supplemental Table 4**, https://links.lww.com/CCM/I41). Finally, through published guideline recommendations and author consensus, we subjectively categorized each of these psychiatric and nonpsychiatric diagnoses as being either common or less commonly treated with one or more of the PM types/classes (**SDC 6**, **Supplemental Table 5**, https://links.lww.com/CCM/I41) (38–46).

All medications were mapped into RxNorm. Data on all post-ICU PM prescribing and each common and less common documented diagnosis were collected from the start of follow-up (i.e., the index hospitalization end date) to either medical insurance plan disenrollment or 2 years, whichever came first. If a patient changes insurance, the P + database considers them disenrolled. For each first post-ICU PM prescription, we looked for the documented presence of all common and less common diagnoses relevant to the PM prescribed in the prior 30 days for the 0–30 day post-ICU hospitalization PM prescribing window, in the prior 90 days for the 31–90-day PM prescribing window, and in the prior 180 days for the day 91–180, 181–365, and 366–730 prescribing windows. Post-ICU diagnoses were not required to be new as long as they were documented within the specified timeframe. For patients prescribed two different PM classes from the same type (e.g., both a tricyclic and selective serotonin reuptake inhibitor antidepressant), each PM class was counted and evaluated separately.

The primary outcome was the absence of either a common or less common diagnosis on or within the first 30 days after index hospitalization discharge. This outcome was selected on a post hoc basis to better align our analysis to the post-ICU hospitalization period most closely connected with the index ICU admission (SDC 7, Supplemental Fig. 2, https://links.lww.com/CCM/I41). We also conducted an exploratory analysis of new PM prescribing, and whether it was supported by a documented common or less common diagnosis, for the following additional post hospitalization periods: 31–90 days, 91–180 days, 181–365 days, and 366–730 days.

Study Variables

The following characteristics were collected: 1) Baseline at ICU admission: Age, sex, geographic region. 2) Baseline within 1 year before the index hospitalization: Carlson Comorbidity Index (CCI) (47), Hospital Frailty Risk Score (HFRS) (48), history of psychotherapy, the presence of common psychiatric diagnoses, mild cognitive impairment, dementia, a prescribed medication for cognitive decline (49), and a prior hospitalization including its duration. 3) During the index hospitalization: Admission type (i.e., medical vs. surgical), based on the admission or primary diagnosis within 3 days before the ICU admission date and the Current Procedural Terminology (CPT) codes recorded during the index hospitalization. 4) During the 2 years after index hospitalization: Time to first outpatient/office visit, rehospitalization, or ICU readmission (with IMV), and psychotherapy session(s). 5) Date of medical insurance (dis)enrollment. The source tables or packages used to obtain each of the above

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covariates can be found in **SDC 8**, **Supplemental Table 6**, (https://links.lww.com/CCM/I41).

Statistical Analysis

Descriptive analyses of study cohort characteristics were conducted. Continuous variables were expressed as median and interquartile range (IQR) or as mean and SD. Categorical variables were expressed as counts and percentages. Among patients prescribed a PM(s), we presented the numbers and proportions of these PM(s) having greater than or equal to 1 common indication(s), greater than or equal to 1 less common indication(s), no indication, and each common diagnosis by any PM, each PM type, and each PM class.

Complete cases of outcome variables were used in the analyses. Missing data for the baseline variables were reported (50). Statistical significance was defined as a two-sided *p* value of less than 0.05. The *Observational Health Data Sciences and Informatics* CohortGenerator and FeatureExtraction R packages were used to generate the cohort and variables (51, 52). Data analysis was performed using R Version 4.0.3 (R Foundation for Statistical Computing, 2020, Vienna, Austria).

To explore whether PM prescribing in the first 30 days after the index hospitalization in the absence of a documented predefined common or less common diagnosis was different between patient subgroups, we performed eight *a priori* subgroup analyses for this outcome by both PM type and class: 1) prior non-ICU hospitalization, 2) older age (≥65 y old), 3) history of dementia, 4) higher comorbidity (CCI ≥ 5), 5) higher frailty (HFRS ≥ 15), 6) index hospitalization length of stay greater than or equal to median, 7) discharged to home (vs. another setting), and 8) readmission to the ICU. To assess whether PM prescribing in the absence of a documented supporting diagnosis may be associated with greater short-term healthcare utilization, we also explored whether inpatient hospital readmissions and emergency department visits in the 30 days after the index hospitalization were different between patients newly prescribed a PM during this period with a documented common or less common diagnosis supporting use (vs. those who did not). We also conducted a subgroup analysis for patients who maintained insurance coverage in the first 30 days after the ICU hospitalization. Finally, we also explored whether nondiagnostically documented post-ICU hospitalization PM prescribing was different between patients with a diagnosed psychologic condition(s) before ICU admission (vs. those without).

RESULTS

Among the 981,990 adults with data in P+ who were hospitalized during the 2-year admission period, 17,280 adults (1.8%) were admitted to the ICU and required IMV (**Fig. 1**). Among these patients, 9382 patients (54.3%) were excluded: history of PM prescribing (41.8%) or admission to a hospital (35.9%) or long term care facility (21.1%) in the prior 1 year; admission due to a toxicological emergency (33.5%); end of insurance during index hospitalization (2.6 %) or discharge to hospice (6.3%).

The study cohort of 7898 PM-naive patients had a median (IQR) index hospitalization length of stay of 8.0 days (3.0–16.0 d); one-quarter (24.1%) were discharged directly to home (**Table 1**; **SDC 9**, **Supplemental Table 7**, https://links.lww.com/CCM/I41). Only two baseline variables had missingness: HFRS 1.2%, CCI 9.6% (Table 1). The median (IQR) time from index hospitalization discharge to first office visit was 7.0 days (2.0–21.0 d) and to last follow-up within the 2 years was 142.5 days (22.0–730.0 d). Two-thirds of patients (5210/7898, 65.9%) maintained insurance coverage greater than or equal to 30 days after the index hospitalization; insurance disenrollment over the 2-year study period is presented in **SDC 10**, **Supplemental Figure 3**, https://links.lww.com/CCM/I41.

During the 30-day post-ICU hospitalization period, 416 patients (5.3%) of the 7898 patients were newly prescribed 484 new PM prescriptions (anxiolytics 39.9%, antidepressants 36.2%, antipsychotics 21.3%, and sleep aids 2.5%; Table 1). A total of 207 prescriptions (42.8%) of these 484 PM prescriptions were prescribed without a documented diagnosis supporting use: 54 of 103 antipsychotics (52.4%), 88 of 193 anxiolytics (45.6%), 5 of 12 sleep aids (41.7%), and 60 of 176 antidepressants (44.1%; Table 1). A breakdown of these patients' diagnoses across each PM class is presented in **Table 2** and **SDC 11**, **Supplemental Table 8,** https://links.lww.com/CCM/I41).

Results of the prespecified patient subgroup comparisons of PM prescribing within 30 days of index hospitalization in the absence of a documented supporting common or less common diagnosis are presented in **Table 3**. Patient subgroups significantly associated

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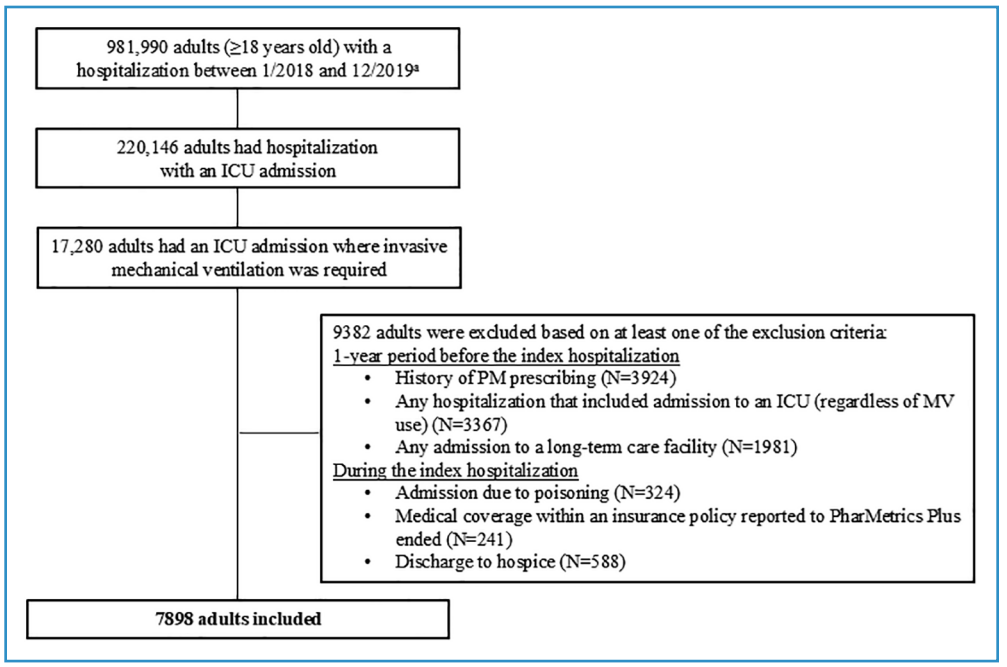


Figure 1. Study flowchart. [a] *n* = 27,511,985 adults in the database during 2018–2019. MV = mechanical ventilation, PM = psychoactive medication.

with greater 30-day PM prescribing in the absence of a documented supporting diagnosis included patients less than 65 years for antipsychotics, patients with no history of dementia for anxiolytics, patients who were discharged to home (vs. another setting) for both antidepressants and antipsychotics, and patients readmitted to the ICU for sleep aids. This subgroup data by PM class is presented in **SDC 12**, **Supplemental Table 9**, https://links.lww.com/CCM/I41). Among patients newly prescribed a PM in the 30 days after hospitalization, neither hospital readmissions nor emergency visits in the 30 days after the index hospitalization were different between patients with a documented diagnosis supporting use and those without (**SDC 13, Supplemental Table 10**, https://links.lww.com/CCM/I41). A post-hoc exploratory analysis revealed new diagnostically undocumented PM prescribing in the 30 days after index hospitalization was similar in the patients who maintained insurance coverage for greater than or equal to 30 days to that of the full cohort (**SDC 14, Supplemental Table 11**, https://links.lww.com/CCM/I41). Another post hoc analysis revealed new diagnostically undocumented PM prescribing in the 30 days after index hospitalization was also similar between the 1405 patients (17.7%) with 1 or more pre-ICU hospitalization psychologic condition (**SDC 15, Supplemental Table 12,** https://links.lww.com/CCM/I41) and the 6493 patients (82.3%) without a preexisting psychologic condition (**SDC 16, Supplemental Table 13**, https://links.lww.com/CCM/I41)

During the entire 2-year postindex hospitalization period, a total of 1192 patients (15.1%) of the 7898 patients were newly prescribed greater than or equal to 1 PM 1761 times across the four PM types. PM prescribing in the absence of a documented supporting diagnosis for each postindex hospitalization period was 24.7% for 31 to 90 days, 37.8% for 91 to 180 days, 42.7% for 181 to 365 days, and 36.6% for 366 to 730 days Table 1. A breakdown of PM prescribing by class in the absence of a documented common or less common supporting diagnosis across these periods is presented in **SDC 17, Supplemental Table 14**, https://links.lww.com/CCM/I41). The cumulative number of PMs newly prescribed across the entire 2-year study period by each evaluation period and whether a supporting common or less common diagnosis was documented on or before the PM prescription is presented in **SDC 18, Supplemental Figure 4**, https://links.lww.com/CCM/I41.

DISCUSSION

This real-world investigation represents the first published, large-scale study of critically ill American adults to characterize new PM prescribing in the absence of a documented diagnosis supporting use in the immediate period after hospital discharge. Although the prevalence of post-ICU new PM prescribing in the 30 days after hospitalization in the United States was relatively low, nearly 50% of these prescriptions were not accompanied by a documented diagnosis supporting use. This nondiagnostically documented new PM prescribing was greatest for antipsychotics and anxiolytics, particularly benzodiazepines, and

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TABLE 1.
Patient Characteristics

Characteristics	Study cohort, *n* = 7898
Baseline	
Age, median (IQR)	72.0 (60.0–80.0)
Male, *n* (%)	4759 (60.3)
Carlson Comorbidity Index[a], median (IQR)	5.0 (3.0–7.0)
Hospital Frailty Risk Score[a], median (IQR)	8.4 (5.2–13.0)
History of psychotherapy (nonpharmacologic), *n* (%)	27 (0.3)
History of any psychologic comorbidities, *n* (%)	1405 (17.8)
Anxiety, *n* (%)	662/1405 (47.1)
Mood disorder-depression, *n* (%)	638/1405 (45.4)
Stress-related disorder, *n* (%)	158/1405 (11.2)
Sleep disorder, *n* (%)	356/1405 (25.3)
Mood disorder-bipolar, *n* (%)	56/1405 (4.0)
Psychotic disorder, *n* (%)	20/1405 (1.4)
Personality disorder, *n* (%)	7/1405 (0.5)
History of dementia including Alzheimer's disease[b], *n* (%)	2429 (30.8)
Prior non-ICU hospitalization, *n* (%)	2199 (27.8)
Index hospitalization	
Primary reason for ICU admission	
Surgical, *n* (%)	1887 (23.9)
Medical, *n* (%)	6011 (76.1)
Index hospitalization length of stay in days, median (IQR)	8.0 (3.0–16.0)
Location following index hospitalization, *n* (%)	
Home	1901 (24.1)
Other than home	3499 (44.3)
Long-term care (including skilled nursing facility)	1522 (19.3)
Inpatient rehabilitation facility	620 (7.9)
Another acute care hospital (including a long-term acute care hospital)	490 (6.4)
Others[c]	867 (11.0)
Not documented[d]	2498 (31.6)
2 y postindex hospitalization	
Time to first post-ICU outpatient/office visit in days (median, IQR)	7.0 (2.0–21.0)
Rehospitalization, *n* (%)	2241 (28.4)
Time to first rehospitalization, median (IQR)	24.0 (10.0–112.0)
ICU readmission, *n* (%)	1513 (19.2)
ICU readmission with mechanical ventilation, *n* (%)	692 (8.8)
Time to first ICU readmission, median (IQR)	89.0 (17.0–290.0)
Psychotherapy (nonpharmacologic), *n* (%)	435 (5.5)

IQR = interquartile range.
[a]Missingness: Carlson Comorbidity Index *n* = 762 (9.6%), Hospital Frailty Risk Score *n* = 145 (1.2%).
[b]Diagnosis without medication for cognitive decline *n* = 2336, diagnosis with medication for cognitive decline *n* = 78, medication for cognitive decline only *n* = 15.
[c]Others include insurance coverage > 7 d and having a separate inpatient visit within 7 d *n* = 849, psychiatric facility *n* = 18.
[d]End of insurance within 7 d *n* = 582, insurance coverage > 7 d and having an outpatient visit(s) within 7 d *n* = 124, insurance coverage > 7 d and no visit within 7 d *n* = 1792.

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TABLE 2.

Pre-Defined Common, Less Common, or No Diagnoses on or Before Psychoactive Medication Prescribing in Patients Newly Prescribed a Psychoactive Medication After the Index Hospitalization During the 30-D and Each Subsequent Follow-Up Period

Presence or absence of predefined diagnoses on or before PM prescribing (d)	PM prescribed within each follow-up window after index hospitalization (d)[a]				
	0–30	31–90	91–180	181–365	366–730
Look back window for justifying diagnosis (d)	30	90	180	180	180
Any PM, *n* (%)	484	421	288	248	320
No predefined diagnosis	207 (42.8)	74 (17.6)	42 (14.6)	38 (15.3)	57 (17.8)
Diagnosis of ≥ 1 common indication(s)	170 (35.1)	229 (54.4)	153 (53.1)	114 (46.0)	147 (45.9)
Diagnosis of ≥ 1 less common indication(s)	107 (22.1)	118 (28.0)	93 (32.3)	96 (38.7)	116 (36.2)
Anxiolytics, *n* (%)	193	169	132	133	146
No predefined diagnosis	88 (45.6)	37 (21.9)	26 (19.7)	27 (20.3)	35 (24.0)
Diagnosis of ≥ 1 common indication(s)	43 (22.3)	60 (35.5)	40 (30.3)	37 (27.8)	32 (21.9)
Diagnosis of ≥ 1 less common indication(s)	62 (32.1)	72 (42.6)	66 (50.0)	69 (51.9)	79 (54.1)
Antidepressants, *n* (%)	176	197	111	85	122
No predefined diagnosis	60 (34.1)	26 (13.2)	11 (9.9)	8 (9.4)	15 (12.3)
Diagnosis of ≥ 1 common indication(s)	87 (49.4)	141 (71.6)	84 (75.7)	65 (76.5)	91 (74.6)
Diagnosis of ≥ 1 less common indication(s)	29 (16.5)	30 (15.2)	16 (14.4)	12 (14.1)	16 (13.1)
Antipsychotics, *n* (%)	103	44	36	23	37
No predefined diagnosis	54 (52.4)	5 (11.4)	5 (13.9)	2 (8.7)	3 (8.1)
Diagnosis of ≥ 1 common indication(s)	36 (35.0)	27 (61.4)	23 (63.9)	11 (47.8)	17 (45.9)
Diagnosis of ≥ 1 less common indication(s)	13 (12.6)	12 (27.3)	8 (22.2)	10 (43.5)	17 (45.9)
Sleep aids, *n* (%)	12	11	9	7	15
No predefined diagnosis	5 (41.7)	6 (54.5)	0 (0.0)	1 (14.3)	4 (26.7)
Diagnosis of ≥ 1 common indication(s)	4 (33.3)	1 (9.1)	6 (66.7)	1 (14.3)	7 (46.7)
Diagnosis of ≥ 1 less common indication(s)	3 (25.0)	4 (36.4)	3 (33.3)	5 (71.4)	4 (26.7)

PM = psychoactive medication.

[a]The total *N* for each PM type is calculated based on the prescription of different PM classes. For example, if a patient was prescribed both a tricyclic antidepressant and an selective serotonin reuptake inhibitor (each different class of antidepressants), they would be counted as two different instances of antidepressant PM prescribing.

was more common in patients who were younger and who were discharged directly to home. An important caveat of the results we report in our retrospective insurance claims analysis is that we cannot make firm conclusions about whether the PM prescribing was clinically warranted, given PM prescribing may be appropriate even if a supporting diagnosis is not documented.

A study from the United Kingdom evaluating post-ICU PM prescribing in the context of a documented diagnosis reported an incidence of diagnostically undocumented PM prescribing of 5% in the 3 months after hospital discharge, less than half the 11.5% incidence we report (12). However, diagnosis coding and documentation practices are different in countries with socialized medical systems. Further, their analysis was limited to

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TABLE 3.
Comparison of Prescribed Psychiatric Medication Within 30 D After Index Hospitalization, Where Neither a Common nor Less Common Diagnosis was Documented, Across Subgroups

Subgroup		Absence of documented predefined diagnosis on or before psychoactive medication prescribing, *n* (%)			
		Anxiolytics	Antidepressants	Antipsychotics	Sleep aids
Any prior non-ICU hospitalization	Yes	14 (32.6)	7 (26.9)	15 (65.2)	0 (0)
	No	74 (49.3)	53 (35.3)	39 (48.8)	5 (45.5)
	p	0.08	0.54	0.25	1.00
Age, ≥ 65 y old	Yes	35 (40.7)	28 (40.6)	16 (39)	2 (100)
	No	53 (49.5)	32 (29.9)	38 (61.3)	3 (30)
	p	0.08	0.20	0.04	0.30
History of dementia including Alzheimer's disease	Yes	18 (29)	16 (27.1)	16 (44.4)	0 (0)
	No	70 (53.4)	44 (37.6)	38 (56.7)	5 (55.6)
	p	< 0.01	0.22	0.33	0.31
Charlson Comorbidity Index of ≥ 5	Yes	38 (42.2)	31 (34.8)	29 (54.7)	3 (60)
	No	50 (48.5)	29 (33.3)	25 (50)	2 (28.6)
	p	0.46	0.96	0.78	0.62
Hospital Frailty Risk Score of ≥ 15	Yes	6 (30)	9 (56.2)	4 (57.1)	N/A[a]
	No	82 (47.4)	51 (31.9)	50 (52.1)	5 (41.7)
	p	0.21	0.09	1.00	N/A
Index hospitalization length of stay is the median of 8 or more days	Yes	47 (39.8)	47 (37)	40 (51.3)	5 (55.6)
	No	41 (54.7)	13 (26.5)	14 (56)	0 (0)
	p	0.06	0.26	0.86	0.31
Discharged to home	Yes	44 (48.9)	30 (46.2)	36 (76.6)	2 (66.7)
	No	44 (42.7)	30 (27)	18 (32.1)	3 (33.3)
	p	0.48	0.02	< 0.01	0.74
An ICU readmission	Yes	26 (39.4)	14 (35)	9 (30)	0 (0)
	No	62 (48.8)	46 (33.8)	45 (61.6)	5 (50)
	p	0.27	1.00	0.01	0.60

[a]N/A: All sleep aids were prescribed in patients with Hospital Frailty Risk Score of < 15.

benzodiazepines and Z-drugs and only the diagnoses of anxiety, depression, and insomnia; whether the condition was documented before the PM prescription was not evaluated. Our study, which evaluated a broader group of PMs (including antipsychotics) and is newer, reflects PM prescribing during a period when guidelines for PMs are available (53), ICU deprescribing efforts have become more established (54) and the long-term safety concerns of PMs are better recognized (55).

Comparing our results to other published post-ICU PM prescribing studies (all conducted in Europe) (9–11, 13) is challenging given none of these studies considered the interrelationship between PM prescribing and the documentation of a supporting diagnosis. Furthermore, these studies have often targeted very specific ICU populations (9, 10, 13), incorporated short follow-up periods (9–11, 13) and not evaluated many commonly prescribed PMs (13). Our findings in ICU patients are lower than those reported in outpatient (non-ICU) PM prescribing studies (56–59). This finding is likely related in part to the restrictions applied to each cohort and may be related to greater

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PM prescribing scrutiny in patients recently discharged from an ICU hospitalization.

Our results underscore the importance of reviewing post-ICU PM prescribing practices for clinical appropriateness, particularly when a diagnosis supporting use is not documented. These efforts are particularly important in older adults who are at greater risk for PM-related safety concerns (53). Future research is needed to determine whether strategies shown to be effective in reducing clinically unwarranted PM prescribing during the ICU hospitalization period, including prescribing guidelines (60), clinical decision support systems (61), and medication reconciliation and deprescribing at the time of ICU and hospital discharge (62–64), can be successfully adapted to the post-ICU hospitalization setting. Post-ICU prescriber education programs focused on evidence-based PM prescribing and the short- and long-term risks associated with this prescribing are also important.

Our study has several strengths. By using a U.S. commercial insurance database that includes a large number of older adults, our study cohort is broadly representative of IMV adults admitted to American ICUs. We focused on evaluating patients during the first 30-days after hospitalization to ensure the post-hospital PM prescribing we report is well-aligned with a recent critical illness. By restricting our analysis to only those adults requiring IMV, our study was able to focus on only those patients who are critically ill, at greater risk for PICS, and being prescribed a PM in the period shortly after hospital discharge. We carefully excluded patients with prior PM use or with baseline confounding conditions that could influence post-ICU PM prescribing. We considered the presence of both psychiatric and nonpsychiatric diagnoses, even those that are less common, in an effort to meticulously evaluate all diagnoses that might support PM prescribing. Finally, we conducted multiple subgroup analyses in an effort to identify patient populations at the greatest risk for new post-ICU PM prescribing not justified by a documented diagnosis.

Our study also has limitations. Prescribers may have diagnosed a patient with a condition justifying PM use but failed to document their diagnosis in the patient record. Claims datasets inherently lack clinician notes that might include a rationale for PM prescribing. Whether PMs prescribed are clinically warranted cannot be rigorously evaluated in a retrospective dataset. The absence of data on medication directions for use further limits assessment of PM prescribing appropriateness. A validated diagnostic coding algorithm for PM prescribing in ICU survivors does not exist. The prevalence of PM prescribing in the absence of a supporting documented diagnosis may be different in ICU patients not requiring IMV. In the absence of PM prescribing data during the index ICU hospitalization, inherent in any claims database, we do not know how many of the PMs prescribed in the first 30 days after hospitalization were first prescribed during the index ICU hospitalization. Our exclusion of patients with a PM prescription before the index hospitalization may have underestimated the prevalence of new PM prescribing 30 days after the ICU hospitalization if the PM prescribed during this period was different from the PM prescribed before the ICU hospitalization.

Although common and less common diagnostic codes supporting the prescribing of each PM were rigorously developed, diagnostic misclassification may have occurred. Although we also considered less-common diagnoses for PM prescribing, there still may be diagnoses justifying a PM prescription we did not consider. Mortality data are not available in the P+ database; therefore, we were not able to censor for mortality. Although delirium may persist after hospital discharge and result in antipsychotic prescribing, we did not include diagnostic codes for delirium in our analysis given it is poorly diagnosed and documented in the outpatient setting (65). Also, self-paid office visits and self-paid medications, including over-the-counter medication use (e.g., melatonin), were not captured. Post-ICU PM prescribing practices may have changed since our evaluation period. Finally, given the variability in follow-up duration we observed, underascertainment of later prescribing events (e.g., due to insurance disenrollment) is possible, although this was not apparent during our primary 30-day evaluation period.

CONCLUSIONS

While our real-world study reveals the prevalence of post-ICU new PM prescribing in the 30 days after hospitalization in the United States to be relatively low, nearly 50% of these prescriptions were not accompanied by a documented diagnosis supporting use. Our analysis highlights the importance of conducting future prospective

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research to determine the prevalence of nondiagnostically documented PM prescribing that is unwarranted. Efforts to improve the documentation of psychiatric diagnoses and patient symptoms, when a psychiatric diagnosis cannot be made, should be developed and evaluated. Patient-centered research is crucial to better understand how ICU survivors after hospital discharge perceive and experience PM prescribing and how better shared decision-making between patients and providers may enhance PM prescribing appropriateness.

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REFERENCES

1. Wunsch H, Guerra C, Barnato AE, et al: Three-year outcomes for medicare beneficiaries who survive intensive care. *JAMA* 2010; 303:849–856
2. Needham DM, Davidson J, Cohen H, et al: Improving long-term outcomes after discharge from intensive care unit: Report from a stakeholders' conference. *Crit Care Med* 2012; 40:502–509
3. Pandharipande PP, Girard TD, Jackson JC, et al; BRAIN-ICU Study Investigators: Long-term cognitive impairment after critical illness. *N Engl J Med* 2013; 369:1306–1316
4. Jackson JC, Pandharipande PP, Girard TD, et al; Bringing to Light the Risk Factors And Incidence of Neuropsychological Dysfunction in ICU Survivors (BRAIN-ICU) Study Investigators: Depression, post-traumatic stress disorder, and functional disability in survivors of critical illness in the BRAIN-ICU study: A longitudinal cohort study. *Lancet Respir Med* 2014; 2:369–379
5. Elliott D, Davidson JE, Harvey MA, et al: Exploring the scope of post-intensive care syndrome therapy and care: Engagement of non-critical care providers and survivors in a second stakeholders meeting. *Crit Care Med* 2014; 42:2518–2526
6. Marra A, Pandharipande PP, Girard TD, et al: Co-occurrence of post-intensive care syndrome problems among 406 survivors of critical illness. *Crit Care Med* 2018; 46:1393–1401
7. Olafson K, Marrie RA, Bolton JM, et al: The 5-year pre- and post-hospitalization treated prevalence of mental disorders and psychotropic medication use in critically ill patients: A Canadian population-based study. *Intensive Care Med* 2021; 47:1450–1461
8. Mansi ET, Rentsch CT, Bourne RS, et al: Benzodiazepine and z-drug prescribing in critical care survivors and the risk of rehospitalisation or death due to falls/trauma and due to any cause: A retrospective matched cohort study using the UK Clinical Practice Research Datalink. *Intensive Care Med* 2025; 51:125–136
9. Wunsch H, Christiansen CF, Johansen MB, et al: Psychiatric diagnoses and psychoactive medication use among nonsurgical critically ill patients receiving mechanical ventilation. *JAMA* 2014; 311:1133–1142
10. Vehviläinen J, Skrifvars MB, Reinikainen M, et al: Psychotropic medication use among patients with a traumatic brain injury treated in the intensive care unit: A multi-centre observational study. *Acta Neurochir (Wien)* 2021; 163:2909–2917
11. Mansi ET, Rentsch CT, Bourne RS, et al: Psychotropic prescribing after hospital discharge in survivors of critical illness, a retrospective cohort study (2012-2019). *J Intensive Care Soc* 2024; 25:171–180
12. Mansi ET, Rentsch CT, Bourne RS, et al: Patient characteristics and practice variation associated with new community prescription of benzodiazepine and z-drug hypnotics after critical illness: A retrospective cohort study using the UK clinical practice research datalink. *Pharmacoepidemiol Drug Saf* 2024; 33:e70056
13. von Oelreich E, Eriksson J, Eriksson M, et al: Antidepressant drug use after intensive care: A nationwide cohort study. *Sci Rep* 2024; 14:15863
14. Marshall J, Herzig SJ, Howell MD, et al: Antipsychotic utilization in the intensive care unit and in transitions of care. *J Crit Care* 2016; 33:119–124
15. Tomichek JE, Stollings JL, Pandharipande PP, et al: Antipsychotic prescribing patterns during and after critical illness: A prospective cohort study. *Crit Care* 2016; 20:378
16. Lambert J, Vermassen J, Fierens J, et al: Discharge from hospital with newly administered antipsychotics after intensive care unit delirium – incidence and contributing factors. *J Crit Care* 2021; 61:162–167

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17. Burry LD, Bell CM, Hill A, et al: New and persistent sedative prescriptions among older adults following a critical illness: A population-based cohort study. *Chest* 2023; 163:1425–1436
18. Burry LD, Bell CM, Hill A, et al: Trends in sedative prescription among older adults after critical illness: A population-based cohort study. *Am J Respir Crit Care Med* 2024; 210:680–683
19. Austin CA, Yi J, Lin FC, et al: The association of selective serotonin reuptake inhibitors with delirium in critically ill adults: A secondary analysis of the bringing to light the risk factors and incidence of neuropsychologic dysfunction in ICU survivors ICU study. *Crit Care Explor* 2022; 4:e0740
20. Duprey MS, Devlin JW, Griffith JL, et al: Association between perioperative medication use and postoperative delirium and cognition in older adults undergoing elective noncardiac surgery. *Anesth Analg* 2022; 134:1154–1163
21. Zaal IJ, Devlin JW, Hazelbag M, et al: Benzodiazepine-associated delirium in critically ill adults. *Intensive Care Med* 2015; 41:2130–2137
22. Caroff DA, Szumita PM, Klompas M: The relationship between sedatives, sedative strategy, and healthcare-associated infection: A systematic review. *Infect Control Hosp Epidemiol* 2016; 37:1234–1242
23. Yang SY, Chen LY, Najoan E, et al: Polypharmacy and psychotropic drug loading in patients with schizophrenia in Asian countries: Fourth survey of Research on Asian Prescription Patterns on antipsychotics. *Psychiatry Clin Neurosci* 2018; 72:572–579
24. Chua KP, Conti RM, Becker NV: Trends in and factors associated with out-of-pocket spending for COVID-19 hospitalizations from March 2020 to March 2021. *JAMA Network Open* 2022; 5:e2148237
25. von EE, Altman DG, Egger M, et al: Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. *BMJ* 2007; 335:806–808
26. Pandharipande P, Williams Roberson S, Harrison FE, et al: Mitigating neurological, cognitive, and psychiatric sequelae of COVID-19-related critical illness. *Lancet Respir Med* 2023; 11:726–738
27. Brown SM, Wilson EL, Presson AP, et al; with the National Institutes of Health NHLBI ARDS Network: Understanding patient outcomes after acute respiratory distress syndrome: Identifying subtypes of physical, cognitive and mental health outcomes. *Thorax* 2017; 72:1094–1103
28. Wang F, Li J, Fan Y, et al: Construction of a risk prediction model for detecting postintensive care syndrome-mental disorders. *Nurs Crit Care* 2024; 29:646–660
29. Al-Alwan A, Ehlenbach WJ, Menon PR, et al: Cardiopulmonary resuscitation among mechanically ventilated patients. *Intensive Care Med* 2014; 40:556–563
30. Yamamoto T, Mizobata Y, Kawazoe Y, et al: Incidence, risk factors, and outcomes for sepsis-associated delirium in patients with mechanical ventilation: A sub-analysis of a multicenter randomized controlled trial. *J Crit Care* 2020; 56:140–144
31. Dumas G, Lemiale V, Rathi N, et al: Survival in immunocompromised patients ultimately requiring invasive mechanical ventilation: A pooled individual patient data analysis. *Am J Respir Crit Care Med* 2021; 204:187–196
32. Sjoding MW, Admon AJ, Saha AK, et al: Comparing clinical features and outcomes in mechanically ventilated patients with COVID-19 and acute respiratory distress syndrome. *Ann Am Thorac Soc* 2021; 18:1876–1885
33. Zangrillo A, Belletti A, Palumbo D, et al; COVID-BioB Study Group: One-year multidisciplinary follow-up of patients with COVID-19 requiring invasive mechanical ventilation. *J Cardiothorac Vasc Anesth* 2022; 36:1354–1363
34. Nanwani-Nanwani K, López-Pérez L, Giménez-Esparza C, et al: Prevalence of post-intensive care syndrome in mechanically ventilated patients with COVID-19. *Sci Rep* 2022; 12:7977
35. Martínez E, Aguilera C, Márquez D, et al: Post intensive care syndrome in survivors of COVID-19 who required mechanical ventilation during the third wave of the pandemic: A prospective study. *Heart Lung* 2023; 62:72–80
36. World Health Organization: Anatomical Therapeutic Chemical (ATC) Classification. Available at: https://www.who.int/tools/atc-ddd-toolkit/atc-classification. Accessed July 25, 2024
37. Lindsey PL: Psychotropic medication use among older adults: What all nurses need to know. *J Gerontol Nurs* 2009; 35:28–38
38. K Pavlova M, Latreille V: Sleep disorders. *Am J Med* 2019; 132:292–299
39. DeGeorge KC, Grover M, Streeter GS: Generalized anxiety disorder and panic disorder in adults. *Am Fam Physician* 2022; 106:157–164
40. Qaseem A, Owens DK, Etxeandia-Ikobaltzeta I, et al; Clinical Guidelines Committee of the American College of Physicians: Nonpharmacologic and pharmacologic treatments of adults in the acute phase of major depressive disorder: A living clinical guideline from the American College of Physicians. *Ann Intern Med* 2023; 176:239–252
41. Buelt A, McQuaid JR: Comparing clinical guidelines for the management of major depressive disorder. *Am Fam Physician* 2023; 107:123–124
42. Schnurr PP, Hamblen JL, Wolf J, et al: The management of posttraumatic stress disorder and acute stress disorder: Synopsis of the 2023 U.S. Department of Veterans Affairs and U.S. Department of Defense clinical practice guideline. *Ann Intern Med* 2024; 177:363–374
43. Edinger JD, Arnedt JT, Bertisch SM, et al: Behavioral and psychological treatments for chronic insomnia disorder in adults: An American Academy of Sleep Medicine clinical practice guideline. *J Clin Sleep Med* 2021; 17:255–262
44. Sateia MJ, Buysse DJ, Krystal AD, et al: Clinical practice guideline for the pharmacologic treatment of chronic insomnia in adults: An American Academy of Sleep Medicine clinical practice guideline. *J Clin Sleep Med* 2017; 13:307–349
45. Driessen J, Baik SH, Zhang Y: Trends in off-label use of second-generation antipsychotics in the medicare population from 2006 to 2012. *Psychiatr Serv* 2016; 67:898–903
46. Wong J, Motulsky A, Eguale T, et al: Treatment indications for antidepressants prescribed in primary care in Quebec, Canada, 2006-2015. *JAMA* 2016; 315:2230–2232
47. Charlson ME, Pompei P, Ales KL, et al: A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation. *J Chronic Dis* 1987; 40:373–383

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48. Gilbert T, Neuburger J, Kraindler J, et al: Development and validation of a Hospital Frailty Risk Score focusing on older people in acute care settings using electronic hospital records: An observational study. *Lancet* 2018; 391:1775–1782
49. Frech FH, Li G, Juday T, et al: Economic impact of progression from mild cognitive impairment to Alzheimer disease in the United States. *J Prev Alzheimers Dis* 2024; 11:983–991
50. Wu TT, Smith LH, Vernooij LM, et al: Data missingness reporting and use of methods to address it in critical care cohort studies. *Crit Care Explor*. 2023; 5:e1005
51. Sena A, Gilbert J, Rao G, Schuemie M: CohortGenerator: An R Package for Cohort Generation Against the OMOP CDM. 2024. Available at: https://github.com/OHDSI/CohortGenerator. Accessed July 25, 2024
52. Schuemie M, Suchard M, Ryan P, Reps J, Sena A, Inberg G. *FeatureExtraction: Generating Features for a Cohort*. 2024. R package version 3.5.2. Available at: https://github.com/OHDSI/FeatureExtraction. Accessed July 25, 2024
53. 2023 American Geriatrics Society Beers Criteria® Update Expert Panel: American Geriatrics Society 2023 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults. *J Am Geriatr Soc* 2023; 71:2052–2081
54. Bourne RS, Herridge MS, Burry LD: Less inappropriate medication: First steps in medication optimization to improve post-intensive care patient recovery. *Intensive Care Med* 2024; 50:982–985
55. Teverovsky EG, Gildengers A, Ran X, et al: Benzodiazepine use and risk of incident MCI and dementia in a community sample. *Int Psychogeriatr* 2024; 36:142–148
56. Wiechers IR, Leslie DL, Rosenheck RA: Prescribing of psychotropic medications to patients without a psychiatric diagnosis. *Psychiatr Serv* 2013; 64:1243–1248
57. Wiechers IR, Kirwin PD, Rosenheck RA: Increased risk among older veterans of prescribing psychotropic medication in the absence of psychiatric diagnoses. *Am J Geriatr Psychiatry* 2014; 22:531–539
58. Rhee TG, Schommer JC, Capistrant BD, et al: Potentially inappropriate antidepressant prescriptions among older adults in office-based outpatient settings: National trends from 2002 to 2012. *Adm Policy Ment Health* 2018; 45:224–235
59. Rhee TG, Rosenheck RA: Initiation of new psychotropic prescriptions without a psychiatric diagnosis among US adults: Rates, correlates, and national trends from 2006 to 2015. *Health Serv Res* 2019; 54:139–148
60. Beauchemin M, Cohn E, Shelton RC: Implementation of clinical practice guidelines in the health care setting: A concept analysis. *ANS Adv Nurs Sci* 2019; 42:307–324
61. Sutton RT, Pincock D, Baumgart DC, et al: An overview of clinical decision support systems: Benefits, risks, and strategies for success. *NPJ Digit Med* 2020; 3:17
62. Ceschi A, Noseda R, Pironi M, et al: Effect of medication reconciliation at hospital admission on 30-day returns to hospital: A randomized clinical trial. *JAMA Netw Open* 2021; 4:e2124672
63. Bosma LBE, Hunfeld NGM, Quax RAM, et al: The effect of a medication reconciliation program in two intensive care units in the Netherlands: A prospective intervention study with a before and after design. *Ann Intensive Care* 2018; 8:19
64. Bookstaver R, Griffin K, Davidson JF, et al: Medication reconciliation in an ICU recovery clinic. *Am J Respir Crit Care Med* 2016; 193:A1825
65. Fiest KM, Soo A, Hee Lee C, et al: Long-term outcomes in ICU patients with delirium: A population-based cohort study. *Am J Respir Crit Care Med* 2021; 204:412–420

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