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Major psychiatric comorbidity among the critically ill: a multi-centred cohort study in Queensland

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Abstract

Background Although comorbid medical diseases are important determinants of outcome among the critically ill, the role of psychiatric comorbidity is not well defined. The objective of this study was to determine the occurrence of psychiatric comorbidity and its effect on the outcome of patients admitted to adult intensive care units (ICU) in Queensland.

Methods Admissions among adults to 12 ICUs in Queensland during 2015–2021 were included and clinical and outcome information was obtained through linkages between the ANZICS Adult Patient Database, the state-wide Queensland Hospital Admitted Patient Data Collection, and death registry.

Results A total of 89,123 admissions were included among 74,513 individuals. Overall, 7,178 (8.1%) admissions had psychiatric co-morbidity with 6,270 (7.0%) having one major psychiatric diagnosis and 908 (1%) having two or more. Individual diagnoses of mood, psychotic, anxiety, or affective disorders were present in 1,801 (2.0%), 874 (1.0%), 3,241 (3.6%) and 354 (0.4%) admissions respectively. Significant differences were observed among the main groups (mood, affective, anxiety, psychotic, or multiple disorders) and those without psychiatric comorbidity with respect to main diagnosis, Acute Physiology and Chronic Health Evaluation (APACHE II) score, sex, age, and medical comorbidity. Crude 30-day case-fatality rates were significantly lower (5.1%) compared to the general ICU population (10.1%) ($p < 0.001$). After controlling for confounding variables in the logistic regression model, patients with psychiatric comorbidity were at lower odds of death.

Conclusions Psychiatric comorbidity is common among ICU presentations and is associated with a lower risk of death. This association is likely to be more complex than being a simple protective factor, and future research needs to further delineate how psychiatric comorbidity informs outcomes of specific ICU presentations.

Keywords Psychiatry, Intensive care, Critical illness

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Background

Although illness severity is a major determinant of outcome following admission to intensive care units (ICU), there has been increasing recognition of the role comorbid illnesses have on the development of persistent critical illness and overall survival [1, 2]. Technological improvements with transplants, cancer care, as well as advancing age and older populations have all increased the prevalence of comorbidities such as diabetes, cancer, and cardiovascular and renal diseases among patients admitted to ICUs in many countries [3–5]. Several studies have shown that overall comorbidity as well as a range of specific medical conditions increase the risk for death among patients admitted to ICUs, and that comorbidity is a major determinant of persistent critical illness outcome [6–9]. While the influences of comorbidities on critical illness have focused on medical illnesses, psychiatric conditions are also an important consideration. Meta-analyses have demonstrated that people living with mental illness die almost 10–20 years earlier than their peers with 14.3% of deaths attributable to mental disorders annually [10]. Mental illnesses can contribute to ICU admission [11, 12], and influence treatment approaches (such as medications, sedation, and participation in rehabilitation) impacting their length of stay [13–15].

Despite the high prevalence of psychiatric comorbidities among ICU patients [16], there is a limited body of evidence examining the relationship between psychiatric comorbidity and the determinants and outcomes of critical illness. Some studies have explored specific decision points such as admission [14], or overall outcomes of specific psychiatric presentations such as overdose [12]. More studies have explored the impact a specific psychiatric diagnosis has on the trajectory of ICU subpopulations [13, 17–24]. However, studies have shown conflicting results on the role of psychiatric comorbidity on survival, which may in part reflect small sample sizes and/or studies being conducted in single centres or highly selected cohorts. The objective of this study was therefore to identify the occurrence, clinical characteristics, and case-fatality associated with major psychiatric comorbidities among a large multicentred cohort of patients admitted to Australian ICUs.

Methods

This multicentre, retrospective observational study examined the association between psychiatric comorbidities and ICU outcomes and is described below following STROBE and RECORD guidelines.

Population

Patients aged 18.0 years or older, who were admitted to 12 participating publicly funded ICUs in Queensland between January 1st 2015 and December 31st 2021 were included.

Participating ICUs included five tertiary, three metropolitan and four regional ICUs. Together, they encompassed all state-wide referral centres for neurosurgical, transplant, burns, cardiothoracic and trauma admissions.

Ethical approval

Ethical approval was granted by the Metro South Hospital and Health Service Human Research Ethics Committee with an individual waiver of consent granted (HREC/2022/QMS/82024).

Data collection

Patients eligible for the study were identified through data linkage of local, state-wide, and national electronic health records. At each participating centre, routinely collected clinical information relating to patient demographics, physiology and investigations was retrieved from the eCritical MetaVision™ (iMDsoft, Boston, MA, USA) clinical information system. Further routinely collected patient information, such as illness severity based on the Acute Physiology and Chronic Health Evaluation (APACHE) II score, and details of ICU management were collected from the Australian New Zealand Intensive Care Society (ANZICS) Centre for Outcome and Resource Evaluation (CORE) Adult Patient Database (APD).

Once demographic and ANZICS-CORE-APD data had been established for all eligible patients, further data linkages were made with the state-wide Queensland Hospital Admitted Patient Data Collection (QHAPDC) and death registry. Linkage was performed by the Statistical Analysis and Linkage Unit of the Statistical Service Branch, Queensland Health using confidential unique patient identifiers. Once confidential identifiers were removed, the authors had full access to the linked datasets.

Diagnoses were grouped according to organ system based on APACHE III codes to reflect the admission to ICU. Sepsis was coded according to the site of infection, using International Classification of Diseases 10th Revision Australian Modification (ICD-10AM) codes where not specified. Further general groupings of infection, trauma, neurological, cardiovascular surgery, pregnancy, overdose, toxicity, and environment were based on all available codes.

Psychiatric and medical comorbidities

Details of comorbidities were established from routinely documented diagnostic information, using the ICD-10AM). Psychiatric diagnoses were categorised as Psychotic Disorders (F20-F29), Mood Disorders (F32-39), Affective Disorders (F30, F31), and Anxiety Disorders

(F40-48). Medical comorbidities were classified as per the Charlson Comorbidity Index [25]. The presence of alcohol (F10, G62.1, I42.6, K29.20, K 29.21, K70.1-4, K70.5), cannabis (F12), and tobacco use disorders (F17) were similarly established using ICD-10AM codes.

Statistical analysis

Data were analysed using Stata 18.0 (StataCorp, College Station, Texas, USA). Missing data were not replaced. Prior to analysis of continuous variables, histograms were created to examine the underlying distribution. Skewed variables were reported as medians with interquartile ranges (IQR) and compared using the k-equality of medians test. Grouped categorical data were compared using the Chi^2 test. A multivariable logistic regression model was developed to examine factors associated with 30-day all cause case-fatality. Variables included in the model were psychiatric diagnosis, age, sex, surgical category, main diagnostic category, ventilation status, Charlson score, APACHE II score, and presence of tobacco, alcohol, and cannabis use disorders. The model was limited to first ICU admissions among those who had more than one. The main effects model was presented without variable elimination. *P*-values less than 0.05 were considered significant.

Results

Overall, 89,779 admissions were identified among the 12 participating ICUs for which 89,494 (99.7%) were successfully linked to hospital admissions and death data. Of these a further 371 (0.4%) were excluded based on enrolment criteria and/or data adequacy leaving 89,123 admission episodes among 74,513 individuals for analysis. Of these many patients had multiple admissions; with 10,671 having two, 2,425 having three, 774 having four, and 740 having five or more admissions during the study.

Overall, psychiatric comorbidity was identified in 7,178 (8.1%) of ICU admission episodes, with 6,270 (7.0%) having one major psychiatric diagnosis and 908 (1%) having two or more. Among those with single psychiatric diagnoses, 874 (1.0%) had psychotic, 1,801 (2.0%) mood, 3,241 (3.6%) anxiety, and 354 (0.4%) affective disorders.

There were several differences in clinical features observed between these groups, as shown in Table 1. Subjects with psychotic disorders were more likely to be male, had more infectious diagnoses, and highest proportion of tobacco and alcohol use disorders. Subjects with mood disorders had the highest use of alcohol and the lowest proportion of infections. Patients with anxiety disorders were characterised by the highest proportion of elective surgical patients with more comorbid medical illnesses and cardiopulmonary diagnoses. Affective disorders were associated with fewer comorbid medical diseases and had the shortest length of hospital stay.

The case fatality associated with ICU admission associated with the presence of psychiatric comorbidity is displayed in Table 2.

While the ICU case fatality was similar among each of the psychiatric comorbidities, they were consistently lower than for patients without psychiatric disorders. Post-ICU in-hospital case fatality was similar across all groups. The post-hospital case fatality was highest for multiple and mood psychiatric comorbidity. While the 30-day case-fatality was significantly lower among episodes associated with psychiatric comorbidity as compared to those without (364/7,178; 5.1% versus 8,293/81,945; 10.1%; RR 0.50 95% CI, 0.45-0.55; $p<0.001$), the relative risks for 90-(547/7,178; 0.76% versus 9,898/81,945; 12.1%; RR 0.63; 95% CI 0.58-0.69; $p<0.001$) and 365 day (916/7,178; 12.8% versus 13,360/81,945; 16.3%; RR 0.78; 95% CI 0.74-0.83; $p<0.001$) case fatality were of decreasing magnitude.

A multivariable logistic regression model was developed to examine the effect of psychiatric comorbidity on 30-day all cause case-fatality and summarised in Table 3. After controlling for diagnostic, severity of illness, medical comorbidity, and substance use, psychiatric comorbidities were found to be associated with reduced risk for 30-day all cause case-fatality. Adjusted risks for death associated with psychiatric comorbidities at 30-, 90-and 365-days post ICU admission are shown in Table 4.

Discussion

Our study found that patients admitted to ICU with pre-existing psychiatric diagnoses had lower mortality up to one-year post-presentation compared to the general ICU population. This supports the findings of Gacouin et al. who had found a reduced mortality rate among patients with psychiatric morbidity up to 1 year post ICU [20]. However, this low mortality rate overall is likely to consist of a range of heterogeneous subpopulations. Gacouin et al. reported 72% of their population to be ICU admissions for intentional self-harm [20], which is known to be associated with much lower mortality than other ICU presentations [26].

Such presentations must therefore not be conflated with other ICU presentations, all of which can present with a pre-existing mental illness. For example, Large et. al. found that patients admitted with major trauma and comorbid depression had a lower mortality than their peers, but also had longer ICU and hospital stays, and were more likely to undergo surgery [13]. Conversely, Fond et al. found that patients managed for COVID-19 with comorbid bipolar disorder had an increased mortality compared to their peers [17]. Another important

Table 1 Clinical features associated with major psychiatric co-morbidity among patients admitted to intensive care units in Queensland

Variable	Multiple (*n*=908)	Psychotic (*n*=874)	Mood (*n*=1801)	Anxiety (*n*=3241)	Affective (*n*=354)	None (*n*=81945)	*P* value
Median Age (IQR), years	44.8 (34.1-58.3)	47.0 (37.1-56.8)	52.5 (39.2-64.0)	54.8 (40.5-66.1)	50.2 (37.2-60.5)	61.7 (48.3-71.7)	<0.001
Male	478 (52.6%)	583 (66.7%)	987 (54.8%)	1559 (48.1%)	162 (45.8%)	50658 (61.8%)	<0.001
Surgical group							<0.001
Non-surgical	709 (78.1%)	661 (75.6%)	1425 (79.1%)	1805 (55.7%)	285 (80.5%)	37380 (45.6%)	
Elective	99 (10.9%)	86 (9.8%)	186 (10.3%)	953 (29.4%)	36 (10.2%)	32591 (39.8%)	
Non-elective	100 (11.0%)	127 (14.5%)	190 (10.6%)	483 (14.9%)	33 (9.3%)	11974 (14.6%)	
Median APACHE II score (IQR)	17 (12-22)	16 (11-21)	17 (12-23)	15 (11-20)	16 (12-22)	15 (11-21)	<0.001
Median Charlson score (IQR)	1 (0-2)	1 (0-2)	0 (0-2)	1 (0-2)	0 (0-2)	1 (0-2)	<0.001
Charlson category							<0.001
0	410 (35.2%)	341 (39.0%)	943 (52.4%)	1109 (34.2%)	198 (55.9%)	27610 (33.7%)	
1-2	320 (35.2%)	362 (41.4%)	512 (28.4%)	1355 (41.8%)	101 (28.5%)	34766 (42.4%)	
3-4	137 (15.1%)	130 (14.9%)	235 (13.1%)	509 (15.7%)	36 (10.2%)	12691 (15.5%)	
5+	41 (4.5%)	41 (4.7%)	111 (6.2%)	268 (8.3%)	19 (5.4%)	6878 (8.4%)	
Diagnosis							<0.001
Cardiovascular	134 (14.8%)	96 (11.0%)	202 (11.2%)	867 (26.8%)	39 (11.0%)	25410 (31.0%)	
Pulmonary	115 (12.7%)	177 (20.3%)	143 (7.9%)	735 (22.7%)	47 (13,3%)	10667 (13.0%)	
Musculoskeletal	85 (9.4%)	106 (12.1%)	176 (9.8%)	294 (9.1%)	28 (7.9%)	5885 (7.2%)	
Gastrointestinal	64 (1.1%)	79 (9.0%)	156 (8.7%)	347 (10.7%)	27 (7.6%)	11700 (14.3%)	
Neurologic	153 (16.9%)	155 (17.7%)	235 (13.1%)	413 (12.7%)	53 (15.0%)	14826 (18.1%)	
Metabolic	302 (33.3%)	195 (22.3%)	778 (43.2%)	338 (10.4%)	144 (40.7%)	5271 (6.4%)	
Genitourinary	20 (2.2%)	28 (3.2%)	49 (2.7%)	101 (3.1%)	2 (0.5%)	4171 (5.1%)	
Sepsis no source	30 (3.3%)	37 (4.2%)	52 (2.9%)	117 (3.6%)	14 (4.0%)	3301 (4.0%)	
Other[a]							
Trauma	134 (14.8%)	125 (14.3%)	238 (13.2%)	338 (19.4%)	42 (11.9%)	8177 (10.0%)	<0.001
Infection	137 (15.1%)	197 (22.5%)	233 (12.9%)	565 (17.4%)	49 (13.8%)	13850 (16.9%)	<0.001
Cardiovascular surgery	43 (4.7%)	34 (3.9%)	79 (4.4%)	495 (15.3%)	13 (3.7%)	16163 (19.7%)	<0.001
Ethanol	171 (18.8%)	124 (14.2%)	358 (19.9%)	355 (11.0%)	51 (14.4%)	6477 (7.9%)	<0.001
Tobacco	188 (20.7%)	281 (32.2%)	324 (18.0%)	567 (17.5%)	69 (19.5%)	9131 (11.1%)	<0.001
Cannabis	33 (3.6%)	68 (7.8%)	49 (2.7%)	89 (2.8%)	15 (4.2%)	711 (0.9%)	<0.001
Hospital							<0.001
Metro	157 (17.3%)	147 (16.8%)	344 (19.1%)	359 (11.1%)	63 (17.8%)	7217 (8.8%)	
Rural/Regional	99 (10.9%)	134 (15.3%)	246 (13.7%)	350 (10.8%)	41 (11.6%)	9430 (11.5%)	
Tertiary	652 (71.8%)	593 (67.9%)	1211 (67.2%)	2532 (78.1%)	250 (70.6%)	65298 (79.7%)	
Median ICU length of stay (IQR)	2.5 (1.1-6.0)	2.6 (1.3-5.7)	2.0 (1.1-4.9)	2.1 (1.0-5.3)	2.1 (1.2-4.7)	1.5 (0.9-3.2)	<0.001
Median hospital length of stay (IQR)	14 (6-31)	13 (7-23)	11 (5-29)	15 (9-28)	9 (5-21)	10 (6-17)	<0.001

APACHE Acute physiology and chronic health evaluation, *ICU* Intensive care unit, *IQR* Interquartile range

Other[a] includes 759 other subjects but detailed data not shown due to low cell numbers with some conditions

complication to consider in the context of comorbid mental illness is delirium [27]. Further distinction must be made between patients with a history of mental illness, and those with ongoing symptoms at the time of ICU presentation.

Unfortunately, the data presented in this study is unable to differentiate between these specific subpopulations. As such, our findings do not inherently contradict the body of literature which has described how specific mental illnesses can complicate both the inpatient and

Table 2 Case fatality associated with ICU admission among patients with psychiatric comorbidity

Variable	None (*n*=*81,945*)	Multiple (*n*=908)	Psychotic (*n*=874)	Mood (*n*=1801)	Anxiety (*n*=3241)	Affective (*n*=354)	*p*-value
Survive	61,586 (75.2%)	698 (76.9%)	708 (81.1%)	1,379 (76.6%)	2,566 (79.2%)	292 (82.5%)	
ICU death	5,661 (6.9%)	27 (3.0%)	23 (2.6%)		103 (3.2%)	11 (3.1%)	<0.001
Hospital death	2,051 (2.5%)	20 (2.2%)	15 (1.7%)	58 (3.2%)	79 (2.4%)	9 (2.5%)	
Post-hospital death	12,647 (15.4%)	163 (18.0%)	128 (14.7%)	49 (2.7%) 315 (17.5%)	493 (15.2%)	42 (11.9%)	
30-day	8,293 (10.1%)	39 (4.3%)	36 (4.1%)	87 (4.8%)	185 (5.7%)	17 (4.8%)	<0.001
90-day	9,898 (12.1%)	62 (6.8%)	54 (6.2%)	146 (8.1%)	263 (8.1%)	22 (6.2%)	<0.001
365-day	13,360 (16.3%)	119 (13.1%)	87 (10.0%)	254 (14.1%)	425 (13.1%)	31 (8.8%)	<0.001

ICU Intensive care unit

Table 3 Multivariable modelling of risk factors for 30-day all cause case fatality

Variable	Odds Ratio	95% CI	*P*-value
No psych comorbidity (reference)	1	-	-
Multiple	0.37	0.24-0.56	<0.001
Psychotic	0.37	0.24-0.57	<0.001
Mood	0.36	0.27-0.48	<0.001
Anxiety	0.58	0.47-0.71	<0.001
Affective	0.47	0.25-0.90	0.011
Male	0.99	0.93-1.05	0.7
Age (per year)	1.01	1.01-10.1	<0.001
Ventilated	1.37	1.29-1.46	<0.001
Non-surgical (reference)	1	-	-
Elective Surgical	0.11	0.09-0.12	<0.001
Unscheduled surgical	0.62	0.57-0.68	<0.001
Diagnosis Cardiovascular (reference)	1	-	-
Pulmonary	0.67	0.61-0.75	<0.001
Musculoskeletal	0.56	0.49-0.65	<0.001
Gastrointestinal	0.78	0.70-0.86	<0.001
Hematology	0.89	0.60-1.32	0.6
Neurologic	1.40	1.28-1.52	<0.001
Metabolic	0.16	0.13-0.20	<0.001
Genitourinary	0.20	0.17-0.24	<0.001
Pregnancy	0.08	0.02-0.35	<0.001
Sepsis no source	0.61	0.530.69	<0.001
Tobacco Use	0.58	0.52-0.65	<0.001
Cannabis Use	0.46	0.30-0.70	<0.001
Alcohol Use	0.90	0.82-1.00	0.053
Charlson Comorbidity Index	1.16	1.14-1.18	<0.001
APACHE II Score	1.16	1.15-1.16	<0.001

APACHE Acute physiology and chronic health evaluation, *CI* Confidence interval

post-discharge recovery processes and the relationship between mental illness, critical illness and recovery is likely to be nuanced and complex. Each mental illness diagnostic group in our study had slightly different characteristics. For example, those with anxiety disorders had the lowest APACHE II scores, and yet the longest ICU

Table 4 Adjusted risk for 30-, 90-, and 365-day all cause case fatality associated with psychiatric comorbidities

Variable	30-days Adjusted Odds Ratio (95% confidence interval)	90-days Adjusted Odds Ratio (95% confidence interval)	365-days Adjusted Odds Ratio (95% confidence interval)
No psych comorbidity (reference)	1	1	1
Multiple	0.37 (0.24-0.56)	0.53 (0.37-0.75)	0.83 (0.64-1.10)
Psychotic	0.37 (0.24-0.57)	0.48 (0.34-0.69)	0.67 (0.51-0.88)
Mood	0.36 (0.27-0.48)	0.57 (0.45-0.73)	0.79 (0.66-0.96)
Anxiety	0.58 (0.47-0.71)	0.74 (0.63-0.88)	0.86 (0.74-0.99)
Affective	0.47 (0.25-0.90)	0.50 (0.28-0.89)	0.46 (0.28-0.77)

length of stay. This is partially consistent with the findings of May et al, who found both increased length of stay and illness severity [28]. As supported in other settings, those with psychotic disorders have high rates of tobacco and cannabis use [29], and those with mood disorders had the highest rate of ethanol use [30]. However, other associations, such as patients with psychotic disorders having a higher rate of infectious disorder presentations, or bipolar disorder being associated with a shorter length of ICU stay would benefit from further exploration.

Future studies should further explore and delineate how certain psychiatric comorbidities interface with different ICU presentations, and how this might influence the best approach to their ICU care as well as impact functional and other outcomes beyond mortality [31]. Differentiating the association between mental illness and ICU presentation can be challenging. For example, medication overdose can be recreational, unintentional, or with suicidal intent [32]. The same could be said for many trauma presentations, such as falls from a height or motor vehicle collisions. While the circumstances can be clear in some situations, such as when the person speaks to someone or leaves a note before the event, at other times it can remain unclear for the entirety of the ICU admission and beyond. This is even more complicated in the setting of a person who presents with both a serious medical condition and a relapse of their mental illness, such as a person presenting with sepsis and a manic episode. A manic episode can cause misadventure and personal neglect that precipitates the onset of sepsis, but it is equally possible for the illness processes of sepsis (such as pain, distress, and sleep disturbance) as well as its management (such as medications) to precipitate a manic episode.

While our study benefits from a large sample size and a case-mix reflective of a population at large, some limitations merit discussion. First. although the data available in the study databases was extensive and well standardized, it was not specifically collected for the study. We did not include psychiatric medication administrations. In addition, the presence of a psychiatric diagnosis is best made by a psychiatrist in a prospective manner. However, we do not have data to validate the accuracy for use of ICD10-AM codes in our hospitals in comparison to this "gold standard". Studies conducted elsewhere in Australia have indicated that ICD10-AM codes may underestimate true rates of psychiatric diagnoses as established by chart review [33]. Second, the relationship between the psychiatric comorbidities and the index presentation could not be delineated. This study was unable to differentiate presentations where psychiatric comorbidities contributed to the presentation and those where this was incidental. This includes during the hospital admission, ICU admission, or both. Additionally, discharge codes may represent either acute new conditions or a pre-existing exacerbated diagnoses and by limiting to discharge codes only associated with the present admission we could not establish chronicity. Furthermore, we did not make any attempt to determine the severity of the psychiatric diagnoses. Finally, it is likely that there is a highly complex interaction between the variables evaluated in this study that we were unable to elucidate. We observed that not only psychiatric diagnoses were associated with lower risk for death but also substance use disorders. While potentially these could have some protective effect, it seems likely that they are interacting in some way with other confounding variables in the association with outcome. Further research that delves deeper into the interactions between acuity and severity of psychiatric comorbidity, underlying medical illnesses, severity and diagnosis of critical illnesses, and socioeconomic determinants is needed.

Conclusions

Psychiatric comorbidities are common among patients admitted to ICUs and are associated with improved survival for at least one-year post admission. It remains unclear as to why patients with psychiatric comorbidities

suffer lower mortality related to critical illness although there are many variables that may confound this observation. Future research should further explore the nuance between psychiatric comorbidities and outcomes for various ICU presentations and whether psychiatric interventions may improve outcomes for critically ill populations at large.

Research in context

Evidence before this study

Pre-existing mental illness is a common comorbidity in the ICU population. While some studies have shown psychiatric comorbidity being associated with lower mortality, others have shown mental illness complicating treatment and outcomes of various critical illnesses, including increased mortality.

Added value of this study

This study provides a large sample of patients admitted to 12 ICUs with psychiatric comorbidity and shows decreased mortality at all time points regardless of underlying psychiatric diagnosis.

Implications of all the available evidence

At a population level, comorbid mental illness is not associated with increased short- or long-term mortality among ICU patients. However, this relationship is likely to be nuanced, and future studies need to further explore how specific mental illnesses interact with specific ICU presentations.

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Authors' contributions

The study conception and design (KW, MR, AT, KL); data acquisition (DF, KW, FE, SB, SS, MR, AGA, AK, JM, KS, PM, AT, SL, KBL); analysis (KL); interpretation of data (DF, KW, FE, SB, SS, MR, AGA, AK, JM, KS, PM, AT, SL, KBL); article drafting (DF, KL), article revision for important intellectual content (DF, KW, FE, SB, SS, MR, AGA, AK, JM, KS, PM, AT, SL, KBL); final approval of the version submitted for publication (DF, KW, FE, SB, SS, MR, AGA, AK, JM, KS, PM, AT, SL, KBL); agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved (KW, KL).

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Data availability

Data cannot be shared publicly due to institutional ethics, privacy, and confidentiality regulations. Data released for research under Sect. 280 of the Public Health Act 2005 requires an application to the Director-General of Queensland Health (PHA@health.qld.gov.au).

Declarations

Ethics approval and consent to participate

This study was approved by the Metro South Hospital and Health Service Human Research Ethics Committee (HREC/2022/QMS/82024) with an individual waiver of consent granted. Individual informed consent was not required.

Competing interests

The authors declare no competing interests.

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References

1. Esper AM, Martin GS. The impact of cormorbid conditions on critical illness. Crit Care Med. 2011;39(12):2728–35.
2. Zador Z, Landry A, Cusimano MD, Geifman N. Multimorbidity states associated with higher mortality rates in organ dysfunction and sepsis: a data-driven analysis in critical care. Crit Care. 2019;23:1–11.

3. Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. Lancet. 2012;380(9836):37–43.
4. Harrison C, Henderson J, Miller G, Britt H. The prevalence of complex multimorbidity in Australia. Aust N Z J Public Health. 2016;40(3):239–44.
5. Prados-Torres A, Calderón-Larrañaga A, Hancco-Saavedra J, Poblador-Plou B, van den Akker M. Multimorbidity patterns: a systematic review. J Clin Epidemiol. 2014;67(3):254–66.
6. Simpson A, Puxty K, McLoone P, Quasim T, Sloan B, Morrison DS. Comorbidity and survival after admission to the intensive care unit: a population-based study of 41,230 patients. J Intensive Care Soc. 2021;22(2):143–51.
7. Ongel EA, Karakurt Z, Salturk C, Takir HB, Burunsuzoglu B, Kargin F, Ekinci GH, Mocin O, Gungor G, Adiguzel N. How do COPD comorbidities affect ICU outcomes? Int J Chronic Obstr Pulm Dis 2014:1187–96.
8. Rezoagli E, McNicholas BA, Madotto F, Pham T, Bellani G, Laffey JG, LUNG SAFE Investigators tETG. Presence of comorbidities alters management and worsens outcome of patients with acute respiratory distress syndrome: insights from the LUNG SAFE study. Ann Intensiv Care. 2022;12(1):42.
9. Jung C, Flaatten H, Fjølner J, Bruno RR, Wernly B, Artigas A, Bollen Pinto B, Schefold JC, Wolff G, Kelm M. The impact of frailty on survival in elderly intensive care patients with COVID-19: the COVIP study. Crit Care. 2021;25:1–9.
10. Walker ER, McGee RE, Druss BG. Mortality in Mental disorders and Global Disease Burden implications: a systematic review and Meta-analysis. JAMA Psychiatry. 2015;72(4):334–41.
11. Nohl A, Ohmann T, Kamp O, Waydhas C, Schildhauer TA, Dudda M, Hamsen U. Major trauma due to suicide attempt: increased workload but not mortality. Eur J Trauma Emerg Surgery: Official Publication Eur Trauma Soc. 2022;48(1):519–23.
12. Athavale V, Green C, Lim KZ, Wong C, Tiruvoipati R. Characteristics and outcomes of patients with drug overdose requiring admission to Intensive Care Unit. Australasian Psychiatry: Bull Royal Australian New Z Coll Psychiatrists. 2017;25(5):489–93.
13. Large J, Naumann DN, Fellows J, Connor C, Ahmed Z. Clinical outcomes following major trauma for patients with a diagnosis of depression: a large UK database analysis. Trauma Surg Acute care open. 2021;6(1): e000819.
14. King DA, Hussein E, Shochet GE, Bar-Lavie YP. Admission Rate of Patients With Major Psychiatric Disorders to the Intensive Care Unit. American J Crit. 2020;29(6):480–3.
15. Casey E, Hughes JW, Waechter D, Josephson R, Rosneck J. Depression predicts failure to complete phase-II cardiac rehabilitation. J Behav Med. 2008;31(5):421–31.
16. Pilowsky JK, Elliott R, Roche MA. Pre-existing mental health disorders in patients admitted to the intensive care unit: a systematic review and meta-analysis of prevalence. J Adv Nurs. 2021;77(5):2214–27.
17. Fond G, Pauly V, Leone M, Orleans V, Garosi A, Lancon C, Auquier P, Baumstarck K, Llorca PM, Boyer L. Mortality among inpatients with bipolar disorders and COVID-19: a propensity score matching analysis in a national French cohort study. Psychol Med. 2023;53(5):1979–88.
18. Lakbar I, Leone M, Pauly V, Orleans V, Sougbo KJ, Diao S, Llorca PM, Solmi M, Correll CU, Fernandes S, et al. Association of severe mental illness and septic shock case fatality rate in patients admitted to the intensive care unit: a national population-based cohort study. PLoS Med. 2023;20(3): e1004202.
19. Kao LT, Liu SP, Lin HC, Lee HC, Tsai MC, Chung SD. Poor clinical outcomes among pneumonia patients with depressive disorder. PLoS ONE. 2014;9(12): e116436.
20. Gacouin A, Maamar A, Fillatre P, Sylvestre E, Dolan M, Le Tulzo Y, Tadié JM. Patients with preexisting psychiatric disorders admitted to ICU: a descriptive and retrospective cohort study. Ann Intensive Care. 2017;7(1):1.
21. Shen HN, Lu CL, Yang HH. Increased risks of acute organ dysfunction and mortality in intensive care unit patients with schizophrenia: a nationwide population-based study. Psychosom Med. 2011;73(7):620–6.
22. Obed D, Schroeter A, Gruber L, Salim M, Krezdorn N, Vogt PM. Outcomes following burn injury in intensive care patients with major psychiatric disorders. Burns: J Int Soc Burn Injuries. 2023;49(4):830–7.
23. Barel N, Bdolach-Abraham T, Levin P, Einav S. Psychiatric patients' intensive care admission characteristics, weaning from mechanical ventilation and sedative drug use: a single center retrospective case-control study. J Crit Care. 2023;77:154331.
24. Rosgen BK, Moss SJ, Soo A, Stelfox HT, Patten SB, Fiest KM. Healthcare utilization and mortality outcomes in patients with pre-existing psychiatric disorders after intensive care unit discharge: a population-based retrospective cohort study. J Crit Care. 2021;66:67–74.
25. Quan H, Sundararajan V, Halfon P, Fong A, Burnand B, Luthi JC, Saunders LD, Beck CA, Feasby TE, Ghali WA. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. Med Care. 2005;43(11):1130–9.
26. Fernando SM, Reardon PM, Ball IM, Van Katwyk S, Thavorn K, Tanuseputro P, Rosenberg E, Kyeremanteng K. Outcomes and costs of patients admitted to the intensive care unit due to accidental or intentional poisoning. J Intensive Care Med. 2020;35(4):386–93.
27. Aung Thein MZ, Pereira JV, Nitchingham A, Caplan GA. A call to action for delirium research: Meta-analysis and regression of delirium associated mortality. BMC Geriatr. 2020;20:1–12.
28. May AD, Parker AM, Caldwell ES, Hough CL, Jutte JE, Gonzalez MS, Needham DM, Hosey MM. Provider-documented anxiety in the ICU: prevalence, risk factors, and associated patient outcomes. J Intensive Care Med. 2021;36(12):1424–30.
29. Khokhar JY, Dwiel LL, Henricks AM, Doucette WT, Green AI. The link between schizophrenia and substance use disorder: a unifying hypothesis. Schizophr Res. 2018;194:78–85.
30. Puddephatt JA, Irizar P, Jones A, Gage SH, Goodwin L. Associations of common mental disorder with alcohol use in the adult general population: a systematic review and meta-analysis. Addiction. 2022;117(6):1543–72.
31. Flaws D, Patterson S, Bagshaw T, Boon K, Kenardy J, Sellers D, Tronstad O. Caring for critically ill patients with a mental illness: a discursive paper providing an overview and case exploration of the delivery of intensive care to people with psychiatric comorbidity. Nurs Open. 2023;10(11):7106–17.
32. Harriss L, Hawton K, Zahl D. Value of measuring suicidal intent in the assessment of people attending hospital following self-poisoning or self-injury. Br J Psychiatry. 2005;186(1):60–6.
33. Nguyen TQ, Simpson PM, Braaf SC, Cameron PA, Judson R, Gabbe BJ. Level of agreement between medical record and ICD-10-AM coding of mental health, alcohol and drug conditions in trauma patients. Health Inf Manag. 2019;48(3):127–34.

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