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REVIEW ARTICLE

Risk factors associated with 30-day unplanned hospital readmission for patients with mental illness

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ABSTRACT: Unplanned hospital readmission rate is up to 43% in mental health settings, which is higher than in general health settings. Unplanned readmissions delay the recovery of patients with mental illness and add financial burden on families and healthcare services. There have been efforts to reduce readmissions with a particular interest in identifying patients at higher readmission risk after index admission; however, the results have been inconsistent. This systematic review synthesized risk factors associated with 30-day unplanned hospital readmissions for patients with mental illness. Eleven electronic databases were searched from 2010 to 30 September 2021 using key terms of 'mental illness', 'readmission' and 'risk factors'. Sixteen studies met the selection criteria for this review. Data were synthesized using content analysis and presented in narrative and tabular form because the extracted risk factors could not be pooled statistically due to methodological heterogeneity of the included studies. Consistently cited readmission predictors were patients with lower educational background, unemployment, previous mental illness hospital admission and more than 7 days of the index hospitalization. Results revealed the complexity of identifying unplanned hospital readmission predictors for people with mental illness. Policymakers need to specify the expected standards that written discharge summary must reach general practitioners concurrently at discharge. Hospital clinicians should ensure that discharge summary summaries are distributed to general practitioners for effective ongoing patient care and management. Having an advanced mental health nurse for patients during their transition period needs to be explored to understand how this role could ensure referrals to the general practitioner are eventuated.

KEY WORDS: 30-day unplanned hospital readmission, mental illness, risk factors.

INTRODUCTION

Unplanned hospital readmission (UHR) rates are a key indicator of the quality of patient care and a focus of

interest for all healthcare systems and policymakers. Unplanned readmissions delay the recovery of patients with mental illness and contribute to the financial burden on families and healthcare services (Mark *et al.*, 2013). Readmission rate is generally measured as a subsequent admission within 30 days following a discharge from the index admission (Zhou *et al.* 2016). However, there is a lack of census in the mental health setting in measuring unplanned readmissions. The evidence varies from a short short-term unplanned admission measurement of 7 days (Donisi *et al.* 2015) to a long long-term measurement of 16 years (Innes *et al.*,

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2015). Regardless of how readmission was measured, mental illness-related readmission rate ranged from 5% (Innes *et al.*, 2015) to 43% (Doerfler *et al.* 2010), which is higher than the general health condition-related readmission rate of 2.8–38% (Zhou *et al.* 2016). Efforts have been made to reduce readmissions with a particular interest in identifying patients at higher risk of readmission following the discharge from index admission, for example social-demographic, past medical/psychiatric history and current discharge information characteristics, but with inconsistent findings (Becker *et al.* 2017; Roque *et al.* 2017; Zhang *et al.* 2016). To date, there is no published review of literature on factors contributing to unplanned hospital readmissions among people with mental illness.

AIM

To synthesize the risk factors associated with 30-day unplanned hospital readmissions for patients with mental illness.

METHODS

A standardized approach for integrating mixed-method research studies was used to review the range of studies included in this review (Heyvaert *et al.* 2017). The approach incorporates outlining the review questions, study selection, quality assessment of the studies, data extraction and synthesis of the data into a narrative format (Heyvaert *et al.* 2017; Fig. 1).

Search strategy

Our overarching research was to determine ‘what risk factors are associated with a 30-day readmission for patients discharged from a psychiatric hospital’. Three sub-questions followed this: (1) what preadmission risk factors are associated with a 30-day readmission? (2) What admission risk factors are associated with a 30-day readmission? and (3) What post-admission risk factors are associated with a 30-day readmission?

A search strategy was developed and tested for content, methodological and face validities to electronically source articles published in English from 11 databases – Medline, EBSCOhost-CINAHL, Scopus, Psych INFO, the Cochrane Reviews and Trails, EMBASE, JBI Connect, PubMed Clinical Queries site, Campbell Collaboration and ProQuest. Initially, the search strategy was developed for the Medline database using Medical Subject Headings (MeSH) that fitted four

categories and was combined as follows: Mental illness-related readmission AND readmission AND unplanned AND predictive factor OR ROC OR C-statistic AND model (please see Appendix 1). This strategy was then adapted for use with other bibliographic databases. The databases were searched in October 2021 for the search period from 1 January 2010 to 30 September 2021.

The keywords were complemented by a search of grey literature sourced from a university library. When the full text of a relevant article was not found, the authors were contacted for further information through the university librarian. If requested information was not available, the article was excluded.

To minimize the introduction of bias and error into the review process, the reviewers searched a wide range of databases to identify all the relevant research. Making the review methods explicit and transparent can facilitate accountability, debate, replication and update of the review (Gough & Elbourne 2002).

Selection of articles

Two reviewers independently reviewed titles and abstracts (HZ and IN), and then, full texts were retrieved and assessed using the following inclusion criteria: Article represents a research article (rather than a letter or commentary); research context was a psychiatric hospital, that is settings in which patient was readmitted; primary focus of the study to assess the risk of unplanned readmission; studies were quantitative and reported risk factors for readmission within a 30-day period. The 30-day readmission is consistent with systematic reviews that have collated evidence on the predictors of readmission (Zhou *et al.* 2019).

Following this, articles were excluded for not meeting the inclusion criteria or not addressing 30-day readmission per se. Divergent opinions were resolved by an independent reviewer (PRD) of the full-text article to determine whether it met the selection criteria perspective (Fig. 2).

Data extraction

Articles were randomly allocated to two reviewers (HZ and IN). Each reviewer used a standardized data extraction tool composed of the following information: the first author, year of article publication, participants’ psychiatric diagnosis, the average age of study participants, data source, sample size, follow-up period, readmission rate, type of statistical analysis and risk factors.

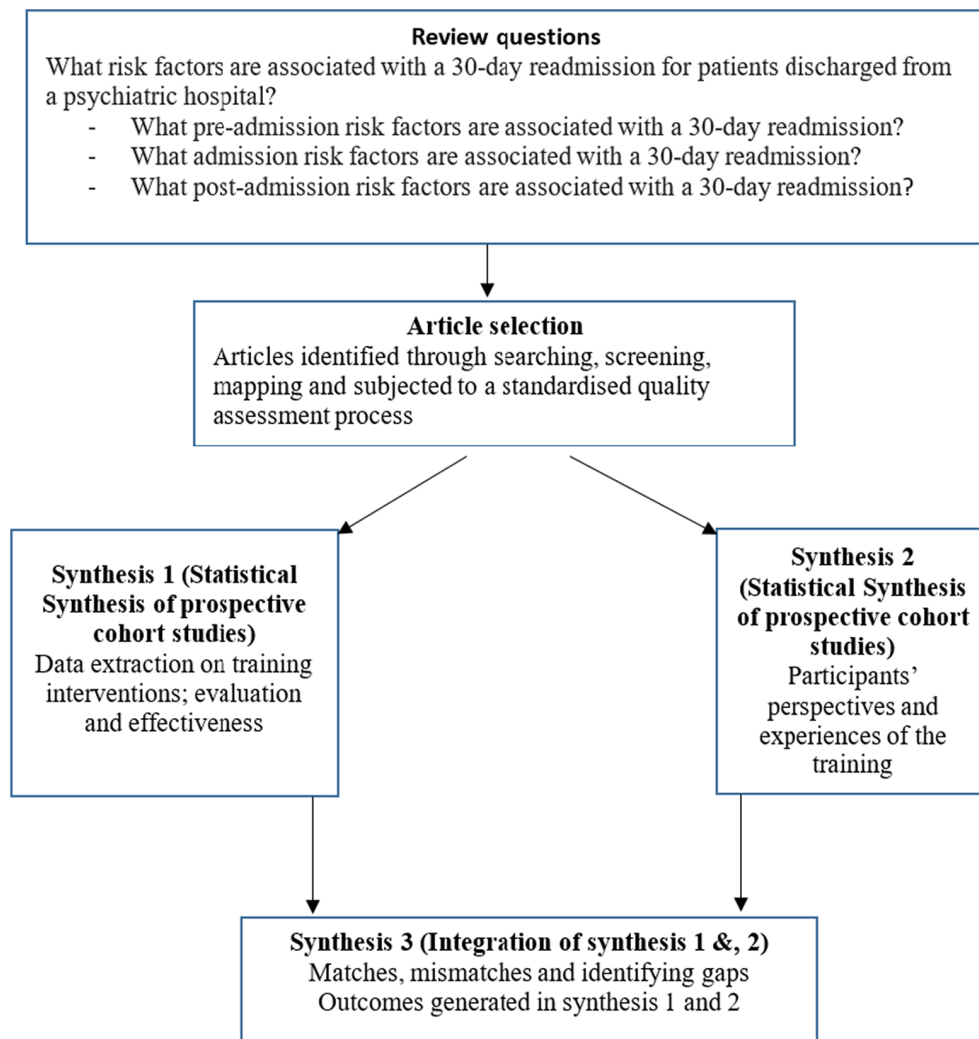


FIG. 1 Systematic approach used for reviewing the identified studies (Adapted from (Harden & Thomas 2010) pp. 276).

The third reviewer (MAA) resolved the discrepancies. From the identified articles, the following information was extracted (when available) and tabulated for narrative interpretation: study design, sample size, readmission rate and statistical tests used to measure the risk and examined variables and statistically significant factors.

Risk of bias

Two sets of studies (prospective or retrospective non-randomized studies) were appraised independently for quality using the mixed methods appraisal tool for quantitative non-experimental/cohort study and quantitative descriptive study (Hong *et al.* 2018).

Data analysis

Pooling of extracted risk factors was not possible because the included studies examined different diagnoses, variables or follow-up periods to examine the readmission risk factors. Therefore, content analysis was used to synthesize the extracted risk factors. Manual coding of the extracted risk factors was completed inductively based on the categorization and classification of meaning. This led to the emergence of themes and subthemes. The development of themes and subthemes was discussed among all authors until consensus was achieved to ensure consistent interpretation of extracted risk factors (Graneheim & Lundman 2004). The results were presented narratively as per time

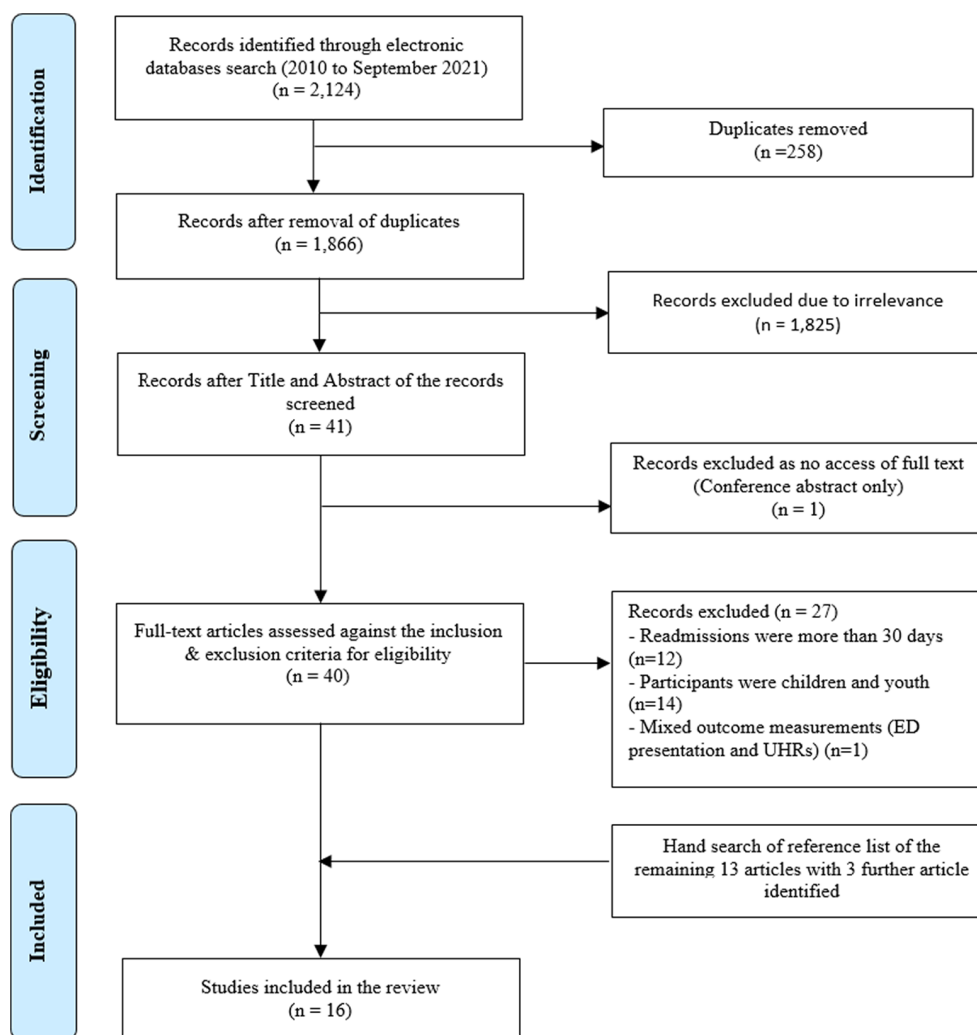


FIG. 2 PRISMA flow chart.

sequence of hospitalization as pre-index admission, index admission and post-index admission.

RESULTS

A search of 11 databases from 2010 to September 2021 generated 2124 records. After removing 258 duplicated records, 1866 records remained. After screening the title and abstract, 1825 irrelevant records were then excluded. Of the remaining 41 records, one was a conference abstract of the remaining 41 records; therefore, it was excluded. Following full retrieval text of 40 records and assessing against the selection criteria, 27 papers were further excluded. Reasons of exclusion are (1) outcome measure of unplanned hospital readmissions were more than 30 days ($n = 12$); (2) participants were children and youth only ($n = 14$), and the

outcome measure was Emergency Department presentation following hospital discharge ($n = 1$). A hand search of the reference list of the 13 remaining articles identified three further eligible article; therefore, a total of 16 articles met the selection criteria and were included in this systematic review.

Characteristics of the included studies

Of the included 16 studies in this review, 10 were conducted in the United States of America (USA), two in Italy and one in Australia, Canada, Hong Kong and Taiwan (Table 1). Four of the included studies examined 7-day UHRs (Donisi *et al.* 2015; Hamilton *et al.* 2015), 14-day UHRs or 15-day UHRs (Hamilton *et al.* 2015; Lin *et al.* 2010; Lorine *et al.* 2015). The remaining studies measured 30-day UHRs. The

prevalence of 30-day unplanned hospital readmission, if reported, varied from 4.5% (Roque *et al.* 2017) to 43.3% (Doerfler *et al.* 2010).

Fifteen retrospective studies and one prospective study (Doerfler *et al.* 2010) were reviewed. Of the 16 studies, 12 used data from electronic databases, three reviewed medical records, and one used a structured interview survey. Nine studies examined data from multi-sites, and seven were single-site studies. Data retrieving period, if reported, was from 1 year (Donisi *et al.* 2015; Lorine *et al.* 2015; Ortiz 2019; Rieke *et al.* 2016) to 10 years (Hamilton *et al.* 2015) or 11 years (Chen *et al.* 2018).

The unit of sample used in the included studies was admissions/hospital episodes, discharges and patients. The sample size included in the final analysis ranged from 115 patients (Callaly *et al.* 2010) to 1 700 000 hospital episodes (Becker *et al.* 2017). The studies included patients over 18 years old, but two had patients as young as 15 years old (Donisi *et al.* 2015) or 16 years old (Chen *et al.* 2018).

Risk of bias within the studies

Table 2 summarizes the risk of bias in the included studies using the mixed methods appraisal tool. Most studies were of a moderate to strong quality. Fifteen included studies were assessed using the quantitative non-experimental/cohort study criteria, and one used quantitative descriptive criteria. All studies provided sufficient details of the study population, information related to inclusion criteria was clearly described, the outcomes were measured in the same way for all the groups, and the statistical analysis was appropriate for the study design.

Examined variables and significant risk factors

Table 3 summarized the examined variables and statistically significant risk factors associated with UHRs of each included study. The examined variables ranged from 5 (Ortiz 2019) to 56 (Weinstein *et al.* 2020). The statistically significant risk factors were then grouped under three subheadings: Pre-index admission, index admission and post-index admission.

Pre-index admission

Social-demographic factors

A total of eight significant variables pertaining to patients' social-demographic background were

extracted. The variables include age, gender, marital status, race/ethnicity, education level, employment status, financial hardship and types of health insurance.

Nine studies cited age as a significant factor associated with UHRs; however, the results are inconsistent. Six studies found younger patients were more likely to be readmitted (Abernathy *et al.* 2016; Chen *et al.* 2018; Doerfler *et al.* 2010; Hariman *et al.* 2020; Lin *et al.* 2010; Roque *et al.* 2017); however, one study indicated higher risks of UHR within the older the patients (in decades) (Becker *et al.* 2017). Compared with patients younger than 53 years, patients who were 54 years old had a lower readmission rate (Germack *et al.* 2021). On the contrary, when the reference group was >85 years, patients aged 18–64 years had a 10–28% more chance of being readmitted (Weinstein *et al.* 2020).

Gender was cited as a significant factor associated with UHRs by six studies. One study reported female patients were more likely to experience UHR [Hazard ratio = 1.35, 95% confidence interval (CI) 1.34–1.36] (Becker *et al.* 2017). Being a male had 13% to 33% more chances of being readmitted than females (Abernathy *et al.* 2016; Chen *et al.* 2018; Germack *et al.* 2021; Lin *et al.* 2010; Weinstein *et al.* 2020).

Three studies cited patients' type of health insurance as a significant factor for UHRs. Patients with Medicaid (Rieke *et al.* 2016), uninsured (Abernathy *et al.* 2016) or with less than US\$1007 (Lin *et al.* 2010) insurance premium had up to three times more chances of being readmitted [Odds ratio (OR) = 1.25–3.08]. Another study stated that patients with public insurance (Abernathy *et al.* 2016) or managed care/work compensation were less likely to experience UHRs (OR = 0.48–0.94).

Two studies found patients with unreliable sources of financial support (Hamilton *et al.* 2015) or homeless (Lorine *et al.* 2015) were up to 29.4 times more likely to be readmitted. However, two recent studies stated that patients in poverty or held reasons for entitlement due to age and disability had a 19–50% lower chance of UHRs (Abernathy *et al.* 2016; Germack *et al.* 2021).

An individual's race was significantly associated with UHRs in three studies; however, the results are varied. Becker *et al.* (2017) reported that, compared with White race patients, Black race patients were 1.22 times more likely to be readmitted, while Hispanic race patients had 9% less chance. Ortiz (2019) stated that White race patients (OR = 1.23; 95% CI 1.13–1.34) and Non-Hispanic race patients (OR = 1.48; 95% CI 1.26–1.73) were significant predictors of UHRs.

TABLE 1 Characteristics of the 16 included studies

Reference	Medical condition	Outcome measures (UHR)	Study design	Data source	Sample size	Age (Years)	Follow-up period	Proportion readmitted	Data analysis
Germack 2021 USA	Serious mental illness	30-day	Retrospective	National Medicare database	165 490 patients	≥18	2013–2016	10.1%	Multivariate logistic regression
Del Favero <i>et al.</i> 2020 Italy	Psychiatric illness	30-day	Retrospective	Two psychiatric units of an urban mental health hospital Electronic health care database	798 Patients	45.31 ± 15.26	2016–2017	6.26%	Multivariate logistic regression
Hairman 2020 China/ Hong Kong	Psychotic spectrum disorders (schizophrenia, schizotypal/delusional disorders; mania with psychotic symptoms; bipolar affective disorder with psychotic; severe depression with psychotic symptoms)	28-day	Retrospective	Eight Public psychiatric inpatient units + 11 outpatient clinics The Clinical Data Analysis and Reporting System	30 707 Discharges (18 514 Patients)	Mean ± SD With UHRs (40.33 ± 11.26) Without UHRs (41.89 ± 12.0)	2013–2017	7.09% (Discharge-based calculation)	Multivariate logistic regression AUC = 0.705
Winterstein <i>et al.</i> 2020 USA	Psychiatric illness or dementia	30-day	Retrospective	1679 inpatient psychiatric facilities Administrative Medicare fee-for-service claims data	716 174 Admissions	≥ 18	2012–2013	20.9%	Hierarchical logistic regression AUC = 0.66
Ortiz 2019 USA	Schizophrenia/psychotic disorders (52%); personality disorder (15.4%); bipolar disorder (11.7%); depression (7.6%); anxiety (1.1%); other mental health disorder (8.1%)	30-day	Retrospective	127 state psychiatric hospitals in 39 states Administrative database	60 254 Discharges	18–64	2014	8%	Logistic regression
Chen 2018 Canada	Mood disorders, schizophrenia/psychotic disorders, Substance-related disorders, delirium/dementia, other diagnoses	30-day	Retrospective	Psychiatric hospital Ontario Mental Health Reporting System	42 280 Patients	≥16 Median = 42 (interquartile range [IQR] 28–54)	Oct 2005 to June 2015	7.2%	Multivariate logistic models
Roque <i>et al.</i> 2017 USA	54% of 'other' (adjustment disorder; anxiety disorder; posttraumatic stress disorder); psychosis or bipolar disorder (36%) and depression (10%)	30-day	Retrospective	A state psychiatric hospital Patients' discharge Summary	1152 Discharges	≥18	Sept 2013 to Dec 2014	4.5%	Multivariate logistic regression AUC = 0.60
Abernathy <i>et al.</i> 2016 USA	All psychiatric conditions	30-day	Retrospective	University Primary care clinic; 4 Local electronic health databases	10 408 Patients	57.9 ± 15.6	Oct 2010 to Sept 2013	Not Reported	Multivariable zero-inflated Poisson model
Becker <i>et al.</i> 2017 USA	Severe mental illness or substance use disorders	30-day	Retrospective	Medicaid enrolment data	1 700 000 Hospital episodes (633 114 unique individuals)	57.9 ± 21.4	July 2003 to May 2011	19.6%	Cox proportional hazards regression
Riese 2016 USA	Schizophrenia or other psychosis; delusional disorders; Drug and alcohol-induced mental illness; Adjustment disorder; depression; anxiety, dissociative and somatoform disorder; sexual and gender identity disorders; others	30-Day	Retrospective	A private adult inpatient facility Administrative electronic health records of	1853 Patients	≥19	Oct 2011 to Sept 2012	11%	Multivariable logistic regression

(Continued)

TABLE 1 (Continued)

Reference	Medical condition	Outcome measures (UHR)	Study design	Data source	Sample size	Age (Years)	Follow-up period	Proportion readmitted	Data analysis
Donisi 2015 Italy	All psychiatric illness	7-day 8- to 30-day	Retrospective	4 Acute inpatient wards in 3 general hospitals (1 was a tertiary hospital) Verona Psychiatric Case Register	873 Discharges	≥15	2011	7.3% (7-Day) 13.6% (8–30 days)	Stepwise logistic regression
Lonje 2015 USA	Acute psychiatric illness	15-day	Retrospective	An urban community hospital Chat review	207 Patients	≥18	2010	30%	Logistic regression
Hamilton <i>et al</i> 2015 USA	All psychiatric illness	7-day 8- to 14-day 15- to 30-day	Retrospective	A tertiary psychiatric hospital Electronic medical records	588 of 5009 Readmitted patients	35.1 ± 11.4	2001–2010	Not Reported	Multinomial logistic regression analyses
Cally 2010 Australia	Acute psychiatric illness	28-day	Retrospective	An integrated community and acute inpatient mental health, Drugs and Alcohol services Chart review	Randomly selected from 635 admissions: 54 With UHR 61 Without UHR	Not Specified	2005–2006	12% (same service) 13% (all services readmission)	Forward stepwise logistic regression
Doerfler 2010 USA	Serious mental illness	30-day	Prospective: Survey conducted by structured Interview	An inpatient psychiatric unit of a tertiary hospital Structured interview	97 patients	Mean ± SD 45.1 ± 14.4 With UHR (40.6 ± 12.0) Without-UHR (48.4 ± 15.3)	Not reported	43.3%	Chi-squared test <i>t</i> -Test
Lin 2010 Taiwan	Schizophrenic disorders; affective psychoses	14-day	Retrospective	National Health Insurance Research Database	62 280 patients (114 330 episodes of hospitalization)	52.1 ± 21.1	2000–2005	6.1%	Cumulative incidence and incidence density Cox proportional hazard models

Germack *et al.* (2021) also identified a 10% increase in readmission if patients are of a non-Hispanic Black race.

Two studies cited patients' with up to high school educational background as a predictor of UHRs (Chen *et al.* 2018; Hamilton *et al.* 2015). One study also reported that high school or superior degree patients are less likely to be readmitted (Del Favero *et al.* 2020). Additionally, unemployed patients (Chen *et al.* 2018; Rieke *et al.* 2016) or been single (Ortiz 2019) were significantly associated with UHRs (OR = 1.11–2.23).

Previous healthcare services usage and comorbidities

Patients, who were hospitalized prior to the index admission, were cited by seven studies as a significant predictor of UHRs (OR/Hazard ratio = 1.06–3.06) (Callaly *et al.* 2010; Doerfler *et al.* 2010; Donisi *et al.* 2015; Hariman *et al.* 2020; Lorine *et al.* 2015; Rieke *et al.* 2016; Roque *et al.* 2017).

Seven studies found patients with existing psychiatric conditions as a significant factor for UHRs. Five conditions were identified as predictors of UHRs, including delirium (Weinstein *et al.* 2020), drug/alcohol disorder (Doerfler *et al.* 2010; Hariman *et al.* 2020; Lorine *et al.* 2015), schizoaffective disorder (Weinstein *et al.* 2020), psychosis (Weinstein *et al.* 2020) and bipolar disorder (Weinstein *et al.* 2020); while three were protecting factors, were depression (Weinstein *et al.* 2020), combined mental health conditions (Abernathy *et al.* 2016) or bipolar (Germack *et al.* 2021). Patients with a history of violence were also significantly associated with UHRs (OR = 1.30; 95% CI 1.09–1.55) (Hariman *et al.* 2020).

Three studies identified the count of long-term conditions of 20 certain non-psychiatric existing health conditions predicted UHRs (OR = 1.04–1.38). The conditions include Charlson index score ≥ 1 (Becker *et al.* 2017), acute myocardial infarction, anaemia, arrhythmia, asthma, chronic obstructive pulmonary disease/fibrosis, diabetes and associated complications, dialysis, endocrine disease, heart disease, heart failure, haematological disorder, infection, intellectual disability, liver disease, metastasis, pancreatic disease, peptic ulcer, seizures and urinary tract disorder (Weinstein *et al.* 2020). One study also reported patients with five major diagnostic categories had an increased 10–38% likelihood of being readmitted. The categories are the circulatory system; digestive system; respiratory system; infectious and parasitic diseases; and endocrine system (Germack *et al.* 2021).

In comparison, one study stated that chronic obstructive pulmonary disease/fibrosis, metastasis, multiple long-term conditions, renal disease, or nervous system diagnoses were protecting factors (OR = 0.25–0.87; Abernathy *et al.* 2016; Germack *et al.* 2021).

During the index admission

Principal discharge diagnosis

Three studies identified seven principal discharge diagnoses of the index admission as predictors of UHRs (OR = 1.02–17.8). The diagnoses are dementia (Weinstein *et al.* 2020), bipolar disorder (Becker *et al.* 2017), depression (Becker *et al.* 2017), drug disorder (Becker *et al.* 2017), personality disorder (Weinstein *et al.* 2020), psychosis (Becker *et al.* 2017; Weinstein *et al.* 2020) and schizophrenia/schizoaffective disorder (Lorine *et al.* 2015). However, bipolar disorder (Hamilton *et al.* 2015; Weinstein *et al.* 2020), depressive disorder (Weinstein *et al.* 2020) and drug disorder (Weinstein *et al.* 2020) were protective factors by different studies (OR = 0.56–0.95). In addition, patients, who were diagnosed at discharge with adjustment disorder (Weinstein *et al.* 2020), attention deficit disorder/developmental/childhood disorders (Weinstein 2020), anxiety (Weinstein *et al.* 2020) and impulse control disorders (Weinstein *et al.* 2020), were less likely to be readmitted (OR = 0.33–0.91).

Diagnosis assessment tool

Two studies reported that three Health of the Nation Outcome Scales items increased patients' risk of UHR by 40–52%. The items are 'Overactive, aggressive, disruptive or agitated' (Hariman *et al.* 2020), 'Grandiosity' and 'Suspiciousness' (Hamilton *et al.* 2015). Doerfler *et al.* (2010) identified 'Higher composite depression scores than psychotic symptom scores', 'Feeling that most people cannot be trusted', 'Frequent suicidal thoughts or behaviours' and 'Distressed about drug abuse problem' as the four items of diagnostic assessment tools that were significantly associated with UHRs ($P < 0.05$).

Length of hospital stay

Three studies cited the index admission length as a significant factor for UHRs. Two studies reported that patients with a longer length of hospital stay or ≥ 7 days, experienced up to 3.5 times the risk of UHRs. One study indicated that patients who stayed 5–7 days at the index admission were 21% less likely to be readmitted but 37% more chance of having UHRs when length of hospital stay > 15 days (Lin *et al.* 2010).

Antipsychotic medication

Patients have been prescribed serotonin selective reuptake inhibitors, the first-generation or second-generation antipsychotics during the index admission, are at higher risk of being readmitted (OR = 1.08–2.09) (Becker *et al.* 2017; Rieke *et al.* 2016). Additionally, a change in psychiatric medications during hospitalization is a predictor of readmissions (Germack *et al.* 2021). Patients on clozapine were 45% less likely to experience UHRs (Hariman *et al.* 2020).

Admission source

Patients are 1.9–2.49 times more likely to be readmitted when their index admission was scheduled or via governmental agency referral (Rieke *et al.* 2016). Ortiz (2019), in comparison, reported voluntary admission is significantly associated with UHRs (OR = 1.18, 95% CI 1.05–1.33).

Hospital profile

Patients admitted to a psychiatric hospital were found to be significantly associated with mood disorders-related UHRs (OR = 2.01, 95% CI 1.77–2.29) and delirium/dementia-related UHRs (OR = 4.62, 95% CI 3.5–6.1) (Chen *et al.* 2018). Additionally, patients admitted to regional or district hospitals had 21–29% more chances of readmitting (Lin *et al.* 2010).

Post-index admission

Follow-up arrangement

Three studies reported a statistically significant association between follow-up arrangement and UHRs. Patients were up to ten times more likely to be readmitted when the follow-up from the Community Mental Health Team within 7 days post-discharge compared with ≥ 8 days (Callaly *et al.* 2010), absence of psychiatrist/psychologist at follow-up (Donisi *et al.* 2015) new patients or readmission occurred before the first scheduled aftercare appointment (Hamilton *et al.* 2015). Additionally, Callaly *et al.* (2010) stated that not having a discharge plan sent to general practitioner (GP) on discharge from the index admission was negatively associated with UHRs (OR = 0.28).

Follow-up compliance

Two studies cited post-hospital discharge follow-up compliance as a predictor of UHRs (Abernathy *et al.* 2016; Hamilton *et al.* 2015). One study stated that patients who failed to attend the first scheduled

aftercare appointment had a 140% increased risk of being readmitted (Hamilton *et al.* 2015). Similarly, the second study found patients with poor outpatient visit compliance are at risk of UHRs (OR = 1.67; 95% CI 1.25–2.21) (Abernathy *et al.* 2016).

Discharge arrangement

Patients were less likely to be readmitted when they were discharged to family/relatives or institutionalized (Hariman *et al.* 2020), especially in psychiatric nursing homes (Del Favero *et al.* 2020). On the contrary, conditional discharge decreased the risk of UHRs (OR = 0.13; 95% CI 0.13–0.61) (Hariman *et al.* 2020).

DISCUSSION

This review presents synthesized evidence of 16 studies on risk factors associated with a 30-day unplanned hospital readmission in the inpatient mental health setting. It is noted that more than 60% of the included studies ($n = 10$) were conducted in the USA. Only one study was conducted at an integrated community and inpatient service with 20 beds in Victoria, Australia (Callaly *et al.* 2010); however, the analysis was based on a small sample size (54 patients with UHRs vs 61 without UHRs). It is warranted to examine predictive factors associated with mental health condition-related UHRs using a large dataset at the inpatient mental health services.

Like Zhou *et al.* (2019), the outcome measurement of UHRs, sample unit, sample size and data retrieving period was inconsistent across the included studies, which contributed to a significant variance in UHR prevalence. In addition, as displayed in Table 3, the number of examined variables by each included study varied from as many as 5–56, which might explain the inconsistent findings of risk factors.

Pre-index admission

Age was cited as a significant factor related to mental health UHR. Overall, the results were not consistent across the eight studies; however, most studies ($n = 6$) indicated that younger people were more likely to be readmitted. The majority of studies cited ($n = 4$, 80%) suggested that being male has a higher risk of rehospitalization. Inconsistent results were shown between the type of health insurance or financial hardship and its association with UHRs. Zhou *et al.* (2019) suggested that health service accessibility should also be considered when

TABLE 2 Risk of bias assessment using MMAT

	Quantitative non-randomized					Quantitative descriptive						
	S1. Do the Clear cause and effect	S2. Do the collected data allow to address the research questions?	2.1. Is randomisation appropriately performed?	2.2. Are the groups comparable at baseline?	2.3. Are there complete outcome data?	2.4. Are outcomes assessed blinded?	2.5. Did the participants adhere to the assigned intervention?	4.1. Is the sampling strategy relevant to address the research question?	4.2. Is the sample representative of the target population?	4.3. Are the measurements appropriate?	4.4. Is the risk of non-response bias low?	4.5. Is the statistical analysis appropriate to answer the research question?
Germaek <i>et al.</i> (2021)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Del Favero <i>et al.</i> (2020)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Hariman <i>et al.</i> (2020)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Winterstein <i>et al.</i> (2020)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Ortiz (2019)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Chen <i>et al.</i> (2018)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Roque <i>et al.</i> (2017)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Abermathy <i>et al.</i> (2016)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Becker <i>et al.</i> (2017)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Rieke <i>et al.</i> (2016)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Donisi <i>et al.</i> (2015)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Lorine <i>et al.</i> (2015)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Hamilton <i>et al.</i> (2016)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Callaly <i>et al.</i> (2010)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Doerfler <i>et al.</i> (2010)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲
Lin <i>et al.</i> (2010)	▲	n/a	▲	▲	▲	n/a	n/a	▲	▲	▲	▲	▲

Triangle ▲: The criterion was assessed as being met; Inverted triangle ▼: The criterion was not met; Dash –: Unclear whether or not this criterion was met; n/a: Not applicable.

TABLE 3 Examined variables of included 16 studies and significant variables associated with 30-day all-cause mental health condition-related UHRs

Reference	Outcome Measures (UHR)	Examined variables	Significant risk factors
Germack 2021 USA	30-day	Psychiatric medication change; age; sex; race; low socioeconomic status; Dual eligible; Reason for entitlement' Count of long-term conditions; serious mental illness diagnosis (Bipolar, schizophrenia/psychosis); comorbid drug use disorder; LOS; surgical procedure; major diagnostic categories	Psychiatric medication change (OR = 1.10) Male (OR = 1.13) Non-Hispanic Black (OR = 1.10) Count of long-term conditions (OR = 1.11) Major diagnostic categories (circulatory system; digestive system; respiratory system; infectious and parasitic diseases; endocrine system) (OR = 1.10–1.38) Protective factors Age > 54 years; reason for entitlement (age and disability); bipolar; major diagnostic category – nervous system
Del Favero <i>et al.</i> 2020 Italy	30-day	Gender; age; marital status; employment; highest education; principal diagnosis; 2nd psychiatric diagnosis; type of admission (compulsory); discharge disposition; LOS; general medical disease; substance or alcohol use	Protective factors High school degree or superior; discharge to psychiatric nursing home
Hariman 2020 China/ Hong Kong	28-day	Group 1 – Socioeconomic characteristics (5): Gender; level of education; hospital fees waived because of social security; abode (residence) after discharge; age Group 2 – Past medical and psychiatric history and current discharge information characteristics (5): History of violence; history of suicide; Charlson score; number of previous admissions; duration of illness (years); Group 3 – Current discharge information (14): Diagnosis <schizophrenia affective disorders>; comorbid substance abuse; comorbid personality disorder; comorbid mental retardation; follow-up by clinical psychologists; follow-up by occupational therapists; follow-up by community psychiatric service; discharged against medical advice; legal status upon discharge; conditional discharge; special care system status; clozapine prescribed; deport prescribed; length of stay/LOS (days) Group 4 – Health of the Nation Outcome Scale (HoNOS) scores (12): 12 items (Score 0 Vs. Score 1–4)	Model 1 (Group 1): AUC = 0.619 Model 1 (Group 1 + 2): AUC = 0.688 Model 1 (Group 1 + 2 + 3): AUC = 0.699 Model 1 (Group 1 + 2 + 3 + 4): AUC = 0.705 Higher number of previous admissions (OR = 1.064; 95% CI 1.055–1.072) Comorbid substance misuse (OR = 1.494; 95% CI 1.163–1.918) history of violence (OR = 1.295; 95% CI 1.085–1.548) HoNOS item 1: Overactivity or aggression disruption or agitation (OR = 1.496; 95% CI 1.057–2.116) Protective factors Older age; prescribing clozapine; living with family and relatives after discharge; imposition of conditional discharge
Weinstein 2020 USA	30-day	Validating 56 factors Demographic (2): Age, gender; principal discharge diagnosis (13); psychiatric comorbidities (13); non-psychiatric comorbidities (25); Other factors (3): Discharged against medical advice; suicide attempt/self-harm; aggression Examined Sex, gender, The Agency for Healthcare Research and Quality's CCS categories – 13 categories Counts of psychiatric and non-	Male (OR = 1.215; 95% CI 1.200–1.231) Age (18–34) (OR = 1.283; 95% CI 1.235–1.332) Age (35–44) (OR = 1.219; 95% CI 1.175–1.265) Age (45–54) (OR = 1.160; 95% CI 1.119–1.201) Age (55–64) (OR = 1.098; 95% CI 1.061–1.137)

(Continued)

TABLE 3 (Continued)

Reference	Outcome Measures (UHR)	Examined variables	Significant risk factors
		psychiatric comorbidities; history of discharge against medical advice (AMA); legal status for admission; suicide attempt/ideation or self-harm; aggression; history of ECT	CCS 653 Dementia (OR = 1.133; 95% CI 1.099–1.168) CCS 658 Personality disorder (OR = 1.171; 95% CI 1.037–1.322) CCS 659.2 Psychosis (OR = 1.022; 95% CI 1.000–1.043) Delirium (OR = 1.077; 95% CI 1.058–1.097) Drug/alcohol disorder (OR = 1.120; 95% CI 1.104–1.137) Schizoaffective disorder (OR = 1.311; 95% CI 1.289–1.332) Psychosis (OR = 1.152; 95% CI 1.136–1.332) Bipolar disorder (OR = 1.229; 95% CI 1.212–1.247) Personality disorder (OR = 1.238; 95% CI 1.218–1.259) Anxiety (OR = 1.099; 95% CI 1.084–1.114) Adjustment disorder (OR = 1.125; 95% CI 1.090–1.161) PTSD (OR = 1.057; 95% CI 1.037–1.078) Other psych disorders (OR = 1.128; 95% CI 1.108–1.147) Intellectual disability (OR = 1.032; 95% CI 1.005–1.060) Developmental disability (OR = 1.007; 95% CI 0.980–1.033) Other infection (OR = 1.069; 95% CI 1.052–1.087) Metastasis (OR = 1.122; 95% CI 1.029–1.223) Diabetes complications (OR = 1.040; 95% CI 1.014–1.067) Diabetes (OR = 1.036; 95% CI 1.020–1.051) Malnutrition (OR = 1.022; 95% CI 0.994–1.051) Haematological disorder (OR = 1.154; 95% CI 1.061–1.254) Seizures (OR = 1.077; 95% CI 1.059–1.095) Heart failure (OR = 1.093; 95% CI 1.069–1.119) Arrhythmia (OR = 1.066; 95% CI 1.046–1.086) Asthma (OR = 1.056; 95% CI 1.038–1.074) Dialysis (OR = 1.382; 95% CI 1.269–1.503) Endocrine disease (OR = 1.080; 95% CI 1.064–1.096) Anaemia (OR = 1.090; 95% CI 1.074–1.106) AMI (OR = 1.090; 95% CI 1.046–1.136) Pancreatic disease (OR = 1.110; 95% CI 1.068–1.153) Urinary tract disorder (OR = 1.046; 95% CI 1.024–1.068) Peptic ulcer (OR = 1.092; 95% CI 1.065–1.120)

(Continued)

TABLE 3 (Continued)

Reference	Outcome Measures (UHR)	Examined variables	Significant risk factors
			<p>Infection (OR = 1.065; 95% CI 1.045–1.086)</p> <p>Liver disease (OR = 1.134; 95% CI 1.112–1.157)</p> <p>Heart disease (OR = 1.044; 95% CI 1.028–1.060)</p> <p>COPD/fibrosis (OR = 1.084; 95% CI 1.068–1.101)</p> <p>Lung problems (OR = 1.031; 95% CI 1.013–1.049)</p> <p>Organ transplant (OR = 1.123; 95% CI 1.016–1.242)</p> <p>Uncompleted pregnancy (OR = 1.090; 95% CI 1.008–1.180)</p> <p>Injury (OR = 1.048; 95% CI 1.034–1.062)</p> <p>Discharged AMA in prior 12 months (OR = 2.107; 95% CI 2.044–2.172)</p> <p>Not discharged AMA in prior (OR = 1.413; 95% CI 1.390–1.437)</p> <p>Suicide attempt/self-harm (OR = 1.171; 95% CI 1.151–1.192)</p> <p>Aggression (OR = 1.091; 95% CI 1.064–1.118)</p> <p>Protective factors</p> <p>Age (65–74; 85+); CCS 650 Adjustment disorder; CCS 651 Anxiety</p> <p>CCS 652/654/655 ADD/; Developmental/Childhood disorders;</p> <p>CCS 656 Impulse control disorders; CCS 657.1 Bipolar disorder</p> <p>CCS 657.2/662 Depressive disorder; CCS 659.1 Schizoaffective disorder</p> <p>CCS 660 Alcohol disorder; CCS 661 Drug disorder; CCS 670/663 Other mental illness; Depression; No admissions to determine AMA</p> <p>Race/White (OR = 1.23; 95% CI 1.13–1.34)</p> <p>Non-Hispanic (OR = 1.48; 95% CI 1.26–1.73)</p> <p>Not married (OR = 1.53; 95% CI 1.32–1.76)</p> <p>Voluntarily admitted (OR = 1.18; 95% CI 1.05–1.33)</p> <p>LOS 7 days (OR = 3.52; 95% CI 3.04–4.08)</p> <p>LOS 8–31 days (OR = 3.20; 95% CI 2.79–3.66)</p> <p>LOS 32–92 days (OR = 1.91; 95% CI 1.65–2.22)</p> <p>Schizophrenia or other psychotic Disorders (OR = 1.69; 95% CI 1.46–1.96)</p> <p>Personality disorder (OR = 1.76; 95% CI 1.50–2.06)</p> <p>Follow-up/Not the outpatient (OR = 1.27; 95% CI 1.16–1.40)</p> <p>Living arrangement/Not private residence (OR = 1.54; 95% CI 1.40–1.68)</p>
Ortiz 2019 USA	30-day	Race; mental health disorders; LOS; referred at discharge; continuing care plan transmitted	

(Continued)

TABLE 3 (Continued)

Reference	Outcome Measures (UHR)	Examined variables	Significant risk factors
Chen 2018 Canada	30-day	Gender, age (<35, 35–50, or >50 years), marital status, language spoken, education level (<high school or high school), employment status, aboriginal status, type of hospital (general or psychiatric), index admission LOS (14 or >14 days)	<p>Mood disorders</p> <p>Female (OR = 1.05; 95% CI 0.94–1.18)</p> <p>Being single/divorced (OR = 1.07; 95% CI 0.95–1.20)</p> <p>Language/French (OR = 1.01; 95% CI 0.67–1.52)</p> <p>Language/Other (OR = 1.24; 95% CI 0.96–1.60)</p> <p>Education/High school (OR = 0.93; 95% CI 0.81–1.07)</p> <p>Education/Unknown (OR = 1.19; 95% CI 0.97–1.47)</p> <p>Unemployed (OR = 1.53; 95% CI 1.35–1.73)</p> <p>Not Aboriginal (OR = 1.15; 95% CI 0.78–1.71)</p> <p>Psychiatric hospital type (OR = 2.01; 95% CI 1.77–2.29)</p> <p>Schizophrenia/Other Psychotic Disorders</p> <p>Being single/divorced (OR = 1.81; 95% CI 1.62–2.03)</p> <p>Unemployed (OR = 1.67; 95% CI 1.49–1.87)</p> <p>Not Aboriginal (OR = 1.63; 95% CI 1.25–2.13)</p> <p>Psychiatric hospital (OR = 1.47; 95% CI 1.31–1.64)</p> <p>Substance-Related Disorders</p> <p>Age/35–50 Years (OR = 1.17; 95% CI 1.04–1.32)</p> <p>Being single/divorced (OR = 1.19; 95% CI 1.06–1.34)</p> <p>Education/High school (OR = 1.09; 95% CI 0.96–1.23)</p> <p>Education/Unknown (OR = 1.15; 95% CI 0.90–1.47)</p> <p>Unemployed (OR = 1.91; 95% CI 1.71–2.14)</p> <p>Psychiatric hospital type (OR = 1.18; 95% CI 1.05–1.34)</p> <p>Delirium/Dementia</p> <p>Age/35–50 years (OR = 1.10; 95% CI 0.54–2.24)</p> <p>Being single/divorced (OR = 1.04; 95% CI 0.87–1.24)</p> <p>Language/Other (OR = 1.14; 95% CI 0.83–1.54)</p> <p>Education/High school (OR = 1.26; 95% CI 1.03–1.54)</p> <p>Education/Unknown (OR = 1.37; 95% CI 1.10–1.71)</p> <p>Unemployed (OR = 1.93; 95% CI 1.16–3.18)</p> <p>Not Aboriginal (OR = 1.34; 95% CI 0.61–3.94)</p> <p>Psychiatric hospital (OR = 2.11; 95% CI 1.18–2.54)</p>

(Continued)

TABLE 3 (Continued)

Reference	Outcome Measures (UHR)	Examined variables	Significant risk factors
			<p>Protective factors</p> <p>Mood disorders</p> <p>Age/35–50 (OR = 0.77; 95% CI 0.67–0.88)</p> <p>Age/>50 (OR = 0.97; 95% CI 0.85–1.11)</p> <p>Schizophrenia/Other psychotic disorder</p> <p>Female (OR = 0.92; 95% CI 0.19–1.07)</p> <p>Age/35–50 (OR = 0.72; 95% CI 0.65–0.81)</p> <p>Age/>50 (OR = 0.55; 95% CI 0.49–0.62)</p> <p>Education/High school (OR = 0.87; 95% CI 0.78–0.96)</p> <p>Education/Unknown (OR = 0.77; 95% CI 0.67–0.90)</p> <p>Language/French (OR = 0.54; 95% CI 0.38–0.77)</p> <p>Language/Other (OR = 0.61; 95% CI 0.51–0.72)</p> <p>Substance-related disorders</p> <p>Age/>50 (OR = 0.92; 95% CI 0.79–1.06)</p> <p>Female (OR = 0.99; 95% CI 0.77–1.26)</p> <p>Language/French (OR = 0.98; 95% CI 0.54–1.75)</p> <p>Language/Other (OR = 0.61; 95% CI 0.42–0.87)</p> <p>Not Aboriginal (OR = 0.84; 95% CI 0.65–1.09)</p> <p>Delirium/Dementia</p> <p>Female (OR = 0.75; 95% CI 0.58–0.98)</p> <p>Age/>50 (OR = 0.60; 95% CI 0.34–1.08)</p> <p>Language/French (OR = 0.88; 95% CI 0.52–1.50)</p>
Roque 2017 USA	30-day	Age; gender; race/ethnicity; primary diagnosis; housing status at discharge; employment; long-acting injectable at discharge; substance abuse; education; insurance status	<p>Repeat readmission (OR = 1.43; 95% CI 1.18–1.74)</p> <p>Protective factor</p> <p>Age score (an eight-point score corresponds to the ages of 18–24 and 0 points are scored when older than 94) (OR = 0.54; 95% CI 0.79–1.39)</p>
Abernathy <i>et al.</i> 2016 USA	30-day	Age; gender; race (white/Non-white); marital status; residence (urban/rural); primary doctor being resident; insurance status; distance in miles; visit compliance; poverty level; number of service utilizations	<p>Age (OR = 1.0056; 95% CI 1.0020–1.0092)</p> <p>Male (OR = 1.1489; 95% CI 1.0263–1.2860)</p> <p>Visit compliance (OR = 1.6575; 95% CI 1.2455–2.2058)</p> <p>Distance (OR = 1.0018; 95% CI 0.9990–1.0046)</p> <p>Protective factors</p> <p>Non-white (OR = 0.8714; 95% CI 0.768–0.989)</p> <p>Unmarried (OR = 0.9643; 95% CI 0.856–1.0865)</p> <p>Primary care physician was resident (OR = 0.6901; 95% CI 0.608–0.785)</p> <p>Public insured (OR = 0.482; 95% CI 0.427–0.551)</p>

(Continued)

TABLE 3 (Continued)

Reference	Outcome Measures (UHR)	Examined variables	Significant risk factors
Becker <i>et al.</i> 2017 USA	30-day	Age; sex; race; physical health status (the Charlson Index), participant's status with regard to social security income due to disability (yes/no)	Poverty (OR = 0.8118; 95% CI 0.7141–0.9228)
			Cluster_MCC (OR = 0.4129; 95% CI 0.3545–0.4810)
Rieke 2016 USA	30-day	LOS; homeless status; use of antipsychotics at discharge (first-generation and second-generation antipsychotic use); employment status (disability; unemployed; employed; retired); previous admissions	Cluster_CANCER (OR = 0.6544; 95% CI 0.4961–0.8633)
			Cluster_COPD (OR = 0.5486; 95% CI 0.4359–0.6905)
			Cluster_RD (OR = 0.2510; 95% CI 0.1931–0.3263)
			Mental health (MH)(OR = 0.6094; 95% CI 0.4919–0.7551)
			Cluster_MCC + MH(OR = 0.9235; 95% CI 0.6913–1.2338)
			Cluster_COPD+MH(OR = 0.3081; 95% CI 0.5313–1.2210)
			Cluster_RD + MH(OR = 0.5260; 95% CI 0.5528–1.3538)
			Age (in decades) (HR = 1.05; 95% CI 1.05–1.05)
			Female (HR = 1.35; 95% CI 1.34–1.36)
			Race/Black (HR = 1.22; 95% CI 1.21–1.23)
			Charlson Index = 1 (HR = 1.08; 95% CI 1.07–1.09)
			Charlson Index>1 (HR = 1.61; 95% CI 1.59–1.62)
			On SSI (HR = 1.20; 95% CI 1.19–1.21)
			Psychotic disorder (HR = 1.10; 95% CI 1.09–1.11)
			Bipolar disorder (HR = 1.06 95% CI 1.04–1.08)
			Major depressive disorder (HR = 1.17; 95% CI 1.15–1.19)
			Dementia (HR = 1.02; 95% CI 1.01–1.03)
Drug use disorder (HR = 1.50; 95% CI 1.48–1.52)			
Alcohol use disorder (HR = 1.06; 95% CI 1.05–1.08)			
Protective factors			
Year of study (HR = 0.97; 95% CI 0.96–0.97)			
Race/Hispanic (HR = 0.91; 95% CI 0.90–0.92)			
Race/Other (HR = 0.99; 95% CI 0.98–1.00)			
For Female			
Medicare (OR = 3.08; 95% CI 1.35–7.04)			
Medicaid (OR = 2.26; 95% CI 1.05–4.84)			
Taking first-generation antipsychotics (OR = 2.09; 95% CI 1.26–3.4)			
Source of admission/Governmental agency (OR = 2.41; 95% CI 1.22–4.77)			
Previous admissions (OR = 1.29; 95% CI 1.12–1.49)			

(Continued)

TABLE 3 (Continued)

Reference	Outcome Measures (UHR)	Examined variables	Significant risk factors
Donisi 2015 Italy	7-day 8- to 30-day 31- to 90-day	LOS; legal status (compulsory hospitalization or not); follow-up contacts (day care, home visits, sheltered care and outpatient care — with or without psychiatrists or psychologists) after discharge (whether at least one contact occurred within 7 and 30 days); four groups of primary psychiatric diagnoses: schizophrenia, neurotic and personality disorders, affective disorders and other diagnoses; three history groups based on contacts made in the 3 years before their first admission in 2011: 'new users' (those with no previous contacts), 'first admission' (patients with previous outpatient contacts but not admissions) and 'previously admitted' (those with previous admissions). Socio-demographic variables: Gender; Age; Marital status, Living situation; Educational level; Occupational status	For Male Disability (OR = 2.23; 95% CI 1.29–3.87) Taking first-generation antipsychotics (OR = 2.09; 95% CI 1.26–3.48) Previous admissions (OR = 1.26; 95% CI 1.08–1.47) 7 days Psychiatric history/Previous admitted (OR = 3.06) 30 days Psychiatric history/Previous admitted (OR = 2.72) Outpatient contacts without psychiatrist/psychologist at follow-up (OR = 2.24) Protective factors Longer LOS
Lorine 2015 USA	15-day 3- to 6-month	Age; gender; race; psychiatric diagnosis; History of incarceration; history of alcohol/ drug abuse; number of previous inpatient hospitalizations; type of insurance; LOS of admission; residence admitted from (and whether patients lived alone or with family members); urine drug screen (UDS); legal status (voluntary/ involuntary); medication compliance; availability of outside support (e.g. family member, friend, church members, self-help groups)	Diagnosis of schizophrenia/schizoaffective disorder (OR = 17.8; 95% CI 2.70–117.7) History of alcohol abuse (OR = 8.54; 95% CI 1.80–40.60) Number of previous psychiatric hospitalizations (OR = 2.18; 95% CI 1.28–3.73) Homeless (OR = 29.4; 95% CI 3.99–217)
Hamilton <i>et al.</i> 2015 USA	7-day 8- to 14-day 15- to 30-day	Age; gender; race/ethnicity; marital status; employment status; years of education; arrest history; involuntary/voluntary status; since hospitalization – employment status; Sources of financial support; residence status after last hospitalization; belief as to reasons of readmission (was not ready to discharge, medication not effective medication not taken, stressful environment after discharge, unsure); compliance to psychiatric medication; experience with medication effectiveness; experience with medication side effect; aftercare referral; aftercare attendance;	A longer index LOS (OR = 1.04; 95% CI 1.01–1.07) The BPRS item grandiosity (OR = 1.52; 95% CI 1.13–2.03) The BPRS item suspiciousness (OR = 1.40; 95% CI 1.07–1.84) Patients readmitted to the hospital prior to their first scheduled aftercare appointment (OR = 10.23; 95% CI 5.25–19.95) Missing the first scheduled aftercare appointment (OR = 2.40; 95% CI 1.34–4.29) Patients reporting inconsistent sources of financial support (OR = 3.96; 95% CI 1.09–14.37)

(Continued)

TABLE 3 (Continued)

Reference	Outcome Measures (UHR)	Examined variables	Significant risk factors
		principal diagnosis; LOS of index admission; country psychiatric centre hospitalizations	With 12 years of education (OR = 1.92; 95% CI 1.14–3.25) Patients readmitted before their first scheduled aftercare appointment (OR = 2.49, 95% CI: 1.27–4.88) Protective factors Depression (UHR during 1st week); diagnosis other than schizophrenia, depression or bipolar disorder (primarily substance abuse and anxiety disorders); diagnosis of bipolar disorder (UHR during 2nd week); diagnosis other than schizophrenia, bipolar disorder or depression (UHR during 2nd week following discharge)
Callaly 2010 Australia	28-day	Sex; type of accommodation the patient was discharged to; age at which a patient started receiving psychiatric care; had recent history of substance use in the 30 days before admission; had criminal involvement in the 30 days before admission; LOS of the index admission; 12 item scores of the HoNOS on admission or discharge in relation to the index admission and the risk of early readmission; number of admissions in the previous 12 months (0–5+); previous admission; unemployed; emotionally unstable personality disorder; no discharge plan sent to GP; on DSP; days post-discharge until first contact)	Having been admitted in the previous year ($P = 0.004$) Receiving the Disability Support Pension ($P = 0.015$) Not having a discharge plan sent to the patient's GP on discharge from the index admission ($P = 0.05$) Receiving follow-up by the mental health team within 7 days of discharge ($P = 0.007$) Being unemployed ($P = 0.015$). Number of admissions in the previous 12 months (OR = 1.86) Contact within the first seven days of discharge (OR = 3.85) Protective factors A discharge plan not being sent to the GP (OR = 0.28)
Doerfler 2010 USA	30-day	Age; number of hospitalization in past year; number of people in household; ethnicity; education level; work status; who made decision to enter hospital; reason for admission (suicide, harm to others, unable to self-care, psychotic symptoms); depressive symptoms; psychotic symptoms; aggressive and disruptive behaviours; patients who expressed stressful events/distress rating	Chi-squared test and t -test; $P < 0.05$ Compared with patients lived in the community for at least 6 months, patients with readmission were significantly Younger Had more psychiatric hospitalizations in the past year; Had higher symptom scores for 'feeling that most people cannot be trusted' Reported suicidal thoughts or actions were more distressed about these thoughts Rated alcohol problem as more serious; Reported a drug abuse problem as more serious; More distressed about drug abuse problem
Lin 2010 Taiwan	14-day	Gender; age (years); LOS (days); insurance premium; leading discharge diagnosis; location of hospital; accreditation level	Chi-squared test and t-test; $P < 0.05$ Male LOS Hospitalization >15 days Economic poverty A leading discharge diagnosis of schizophrenia/affective disorders Residence in less-urbanized regions Hospital characteristics (location/regional)

examining unplanned hospital readmission because readmission indicates the quality of care and health service accessibility. Race or ethnicity of patients was not consistently associated with UHRs. The lower educational background of patients and unemployment were consistently cited as the predictors of UHRs. In summary, patients were at higher risk of being readmitted if they were younger, male, with limited education and unemployed.

This review identified that patients with previous hospital admission had up to three times more chances of being readmitted ($n = 7$), supported by two studies for all-cause 28- or 30-day UHRs (Donisi *et al.* 2016; Zhou *et al.* 2019). Existing psychiatric conditions or general medical conditions were not consistently associated with increased UHRs. This is different from the findings of Zhou *et al.* (2019) that comorbidity was the most frequently cited predictor. The disparity with Zhou *et al.* (2019) could be that people living with a severe mental illness such as bipolar disorder, psychosis, schizophrenia or schizoaffective disorders, may find it challenging to self-present to the hospital because of the underlining symptoms.

During the index admission

Patients identified as aggressive, agitated or paranoid during their discharge assessment are likely to be readmitted (Hamilton *et al.* 2015; Hariman *et al.* 2020). Other studies reporting similar findings state the effect of residue aggression or overactivity upon discharge leads to caregivers being overwhelmed by the externalization of these symptoms resulting in a readmission (Donisi *et al.* 2016).

Three reviewed studies consistently reported that patients with more than 7 days of hospital stay increased the risk of UHR (Hamilton *et al.* 2015; Lin *et al.* 2010; Ortiz 2019). A more extended hospital stay might be sicker, homeless or lacking adequate social support and living arrangements (Mercer *et al.* 1999).

Post-index admission

Discharge follow-up arrangements were considered significantly associated with unplanned hospital admission; however, the results were inconsistent (Callaly *et al.* 2010; Donisi *et al.* 2015; Hamilton *et al.* 2015). Two studies reported a reduced risk of UHR when the mental health team contacted patients within 7 days of discharge (Donisi *et al.* 2015; Hamilton *et al.* 2015). One study, however, suggested that making contact within 7 days increased the risk of UHR (Callaly *et al.* 2010). The latter study had a small sample size of

54 compared with 588 or 873 samples in the other two studies. The results of the two studies on the role of timely outpatient follow-up are promoted as a key component of transitional care models that have successfully reduced readmission rates (Clancy 2009; Naylor *et al.* 2013). However, the readmission risk profile of patients and the presence of multiple comorbidities may influence the timing of the contact with the patient post-discharge (Jackson *et al.* 2015). Some patients may not benefit from the 7-day follow-up. Jackson *et al.* (2015) tested the optimal time when patients with conditions of varying clinical complexity should receive outpatient follow-up and reported that patients with a high risk of readmission and multiple comorbidities would benefit from an early follow-up compared with those at low risk and fewer morbidities. Regardless of the long-term conditions' profile risk and complexity, this study recommends that contact reduces readmission risk within 14 days of discharge (Jackson *et al.* 2015).

Our review showed that ensuring a discharge summary is available to the primary care provider or having a psychiatrist or psychologist to support the patient following discharge are protective factors for UHR. The findings highlight a need for seamless communication between general practice and specialist mental health services about the care given to people with mental illness. The results resonate with those of other reports that have indicated that for people with mental illness, continuity of their care from hospital to primary care setting is often far from optimal (Hardy & Huber 2014). The insights from this review about ensuring the GP has the discharge summary and makes contact with the patient should be interpreted in the context of the complexities of primary care providing care to people with mental illness (Hardy & Huber 2014). The need to engage with people with mental illness in primary care and post-discharge is critical. It may require a specialist mental health nurse dedicated to contacting the patient and family (Hardy & Huber 2014) to supplement the role of the GP.

The findings also highlight the importance of involving community mental health nurses in the immediate post-discharge period, for patients being discharged directly to the primary care physician from the mental health system. The community mental health nurse can facilitate discharge documents and contact with the primary care physician during this period. A scoping review of 34 studies revealed that nurse care coordination role has been established and applied for complex health and social care needs with positive

patient outcomes in the community via interpersonal and interprofessional communication and information transfer (Karam *et al.* 2021). Future research should however examine the cost-effectiveness and workload implications of mental health nurse care coordination role.

Future research is recommended to include issuing the date of discharge summary and primary care provider distribution as variables in identifying readmission risk factors (Zhou *et al.* 2021). The timely issued discharge summaries and distributed the summary to patients' primary care providers, that is GP is critical, whereby patients have an early unplanned visit to the primary care provider post-hospital discharge. Having shared the hospitalization information, the GP could effectively assess the patient and provide the care and treatment, which would reduce unplanned readmission (Mahfouz *et al.* 2017).

In this review, insufficient support in the community post-hospital discharge contributes to a higher readmission rate. This was echoed by evidence that patients discharged to family or relatives, or an institution reduced the risk of unplanned admission. Social workers are recommended in the discussion of developing a hospital-to-home discharge plan early in the index admission to ensure accommodation arrangement, ongoing continuity of care from community services and social support (Heenan & Birrell 2019; Johnson & Capasso 2012).

Although one study (Hariman *et al.* 2020) reported a positive impact of arranging patients on conditional discharge in the reduction in unplanned readmission, the result offers an opportunity for healthcare providers to examine the appropriate selection of patients to have this option prior to final hospital discharge (Hariman *et al.* 2020). However, it is also warranted to explore the community services support required for patients on conditional discharge (Davoren *et al.* 2013).

Two studies of this review consistently identified poor post-hospital discharge follow-up compliance increases the likelihood of UHRs. It is critical to qualitatively explore the reasons for poor follow-up attendance from patients' perspectives and develop and implement strategies to improve compliance (Cakir *et al.* 2017). Our review highlights the importance of community mental health teams paying attention to patients with no fixed abode post-discharge. Cakir *et al.* (2017) suggested patients with no transportation, housing and social support are likely to miss their follow-up appointment.

Strength and limitations

This is the first systematic review of the literature from 2000 to June 2021 on risk factors associated with mental health UHRs. The rigorous methodology applied to this systematic review utilized a comprehensive electronic databases search strategy, strict inclusion, exclusion and quality assessment criteria to synthesize characteristics of the included studies, examined variables and the statistically significant risk factors. However, pooling of extracted significant risk factors was not possible due to the heterogeneity of the included studies in terms of different diagnoses, examined variables and follow-up time frames to identify readmissions. The outcomes of the predictive models included in this systematic review were limited to 30-day unplanned hospital readmission.

CONCLUSIONS

This paper systematically reviewed 16 research-based studies and confirmed the complexity of identifying unplanned hospital readmission predictors for people with mental illness. The studies were heterogeneous regarding varied readmission measurement, confounding variables measurement, study setting and sample size. Four consistently cited readmission predictors were patients with lower educational background, unemployment, previous mental illness hospital admission and more than 7 days of the index hospitalization.

RELEVANCE TO CLINICAL PRACTICE

This review has identified modifiable and non-modifiable risk factors that policymakers and clinicians may consider to predict and prevent UHRs in a mental health setting. The results linking behavioural challenges such as aggression to 30-day UHRs suggest the need to expand to the caregivers the support provided to the patient during a 7-day follow-up. Supporting caregivers will ensure the timely discharge of patients from inpatient settings and promote recovery. Further studies are needed to understand how this support could be modelled and implemented.

The support from a GP post-discharge is well documented as a distinct factor for predicting UHRs across multiple morbidities (Zhou *et al.* 2019). Policymakers and clinicians need to examine how discharge summaries reach patients' GP and if a follow-up consultation took place. This is particularly important for patients being discharged from the mental health services directly to

their GPs. The role of an advanced mental health nurse in patient care during this transition period needs to be explored to understand how this role could ensure referrals to the general practitioner are eventuated.

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DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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hospital readmissions: A systematic review. *BMJ Open*, 9 (1), e020554.

APPENDIX 1:

Print Search History: EBSCOhost

<http://web.b.ebscohost.com.dbgw.lis.curtin.edu.au/ehost/searchhistory/PrintSearchHistory?sid=54cl2...>



Thursday, October 8, 2021 2:36:38 AM

#	Query	Limiters/Expanders	Last Run Via	Results
S26	S18 AND S23	Limiters - Full Text; Published Date: 20110101-20210931 Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	29
S25	S18 AND S23	Limiters - Full Text Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	42
S24	S18 AND S23	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	256
S23	S19 OR S20 OR S21 OR S22	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	103 238
S22	Psychiatric disorder	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	15 124
S21	Psychiatric illness	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	3598

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Print Search History: EBSCOhost

<http://web.b.ebscohost.com.dbgw.lis.curtin.edu.au/ehost/searchhistory/PrintSearchHistory?sid=54cl2...>

S20	Mental disorder	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	81 246
S19	mental illness	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	61 371
S18	S11 AND S17	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	6843
S17	S12 OR S13 OR S14 OR S15 OR S16	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	23 996
S16	re-admission	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	968
S15	readmit	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	2616
S14	readmission	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	21 453
S13	rehospitali	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	2680
S12	(MH "Readmission")	Expanders - Apply equivalent subjects	Interface - EBSCOhost Research Databases Search Screen - Advanced Search	14 303

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SEARCH STRATEGY

Print Search History: EBSCOhost

http://web.b.ebscohost.com.dbgw.lis.curtin.edu.au/ehost/searchhistory/PrintSearchHistory?sid=54e12...

		Search modes - Boolean/Phrase	Database - CINAHL Plus with Full Text	
S11	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	1 009 945
S10	(MH "Predictive Value of Tests")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	51 652
S9	(MH "Predictive Validity")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	7 147
S8	predict	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	404 303
S7	predictive factor	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	10 939
S6	(MH "Sensitivity and Specificity")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	88 678
S5	sensitivity specific	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	111 673
S4	"model"	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	648 822
S3	c-statistic	Expanders - Apply equivalent	Interface - EBSCOhost Research Databases	2 507

3 of 4

Print Search History: EBSCOhost

http://web.b.ebscohost.com.dbgw.lis.curtin.edu.au/ehost/searchhistory/PrintSearchHistory?sid=54e12...

		subjects Search modes - Boolean/Phrase	Search Screen - Advanced Search Database - CINAHL Plus with Full Text	
S2	"ROC"	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	35 588
S1	(MH "ROC Curve")	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - CINAHL Plus with Full Text	29 750