
Mental Health Outcomes of Adults Hospitalized for COVID-19: Update of a Living Rapid Review

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WHAT'S NEW

Updated March 3, 2021

Search current as of October 8, 2020

Next update expected June 2021

This update revises findings from our original report published in October 2020. Eleven newly published studies (3 retrospective cohort and 8 cross-sectional) were added. We conclude that the prevalence of mental health disorders - including insomnia (43-54%), depression (43-46%), anxiety (23-39%), and adjustment disorder (27%) - is high among hospitalized patients with COVID-19, and the prevalence of many of these disorders is similar or slightly lower in the 3 months following hospitalization. Post-hospitalization symptoms of PTSD (15-31%) and obsessive-compulsive symptoms (20%) are also common.



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PREFACE

The VA Evidence Synthesis Program (ESP) was established in 2007 to provide timely and accurate syntheses of targeted healthcare topics of importance to clinicians, managers, and policymakers as they work to improve the health and healthcare of Veterans. These reports help:

- Develop clinical policies informed by evidence;
- Implement effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures; and
- Set the direction for future research to address gaps in clinical knowledge.

The program comprises three ESP Centers across the US and a Coordinating Center located in Portland, Oregon. Center Directors are VA clinicians and recognized leaders in the field of evidence synthesis with close ties to the AHRQ Evidence-based Practice Center Program and Cochrane Collaboration. The Coordinating Center was created to manage program operations, ensure methodological consistency and quality of products, and interface with stakeholders. To ensure responsiveness to the needs of decision-makers, the program is governed by a Steering Committee composed of health system leadership and researchers. The program solicits nominations for review topics several times a year via the [program website](#).

Comments on this evidence report are welcome and can be sent to Nicole Floyd, Deputy Director, ESP Coordinating Center at Nicole.Floyd@va.gov.

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EXECUTIVE SUMMARY

Key Findings

- A total of 13 studies (3 retrospective cohort and 10 cross-sectional) provide evidence on the prevalence of mental health disorders among patients hospitalized for COVID-19.
- Evidence from 2 small, fair-quality, cross-sectional studies (N=146) suggest that the prevalence of MH conditions among people hospitalized with COVID-19 is high, with insomnia (43.3-54.1%), depression symptoms (43.3-45.9%), anxiety symptoms (23.3-38.8%), and adjustment disorder (26.7%) being common.
- The prevalence of anxiety and insomnia symptoms appears to be similar or slightly lower during the 3-month post-hospitalization period based on 4 additional, small, fair-quality cross-sectional studies (N=1,308). Studies also indicated PTSD symptoms (15.4-31%) and obsessive-compulsive symptoms (19.6%) were common during this time period.
- One large, good-quality, retrospective cohort study (N=62,354) found that hospitalized patients have a 40% increased risk of receiving any MH disorder diagnosis compared to those who are not hospitalized.
- It is unclear whether patient characteristics, COVID-19 disease severity, or level of care are associated with the prevalence of MH conditions in patients who have been hospitalized with COVID-19, as the evidence is mixed.
- Data on mental health care utilization and resource needs are currently very limited. Additionally, no studies examined the prevalence of substance use disorders or psychosis among hospitalized patients with COVID-19.

Background

The ESP Coordinating Center (ESP CC) is responding to a request from VA Central Office for an evidence brief on mental health (MH) outcomes of adults who have been hospitalized for COVID-19. Findings from this evidence brief will be used to inform national VA planning efforts to support Veterans who have been hospitalized for COVID-19 after they have been discharged from the hospital.

Methods

To identify studies, we searched MEDLINE, the WHO COVID-19 database, PsycINFO, and CINAHL from Dec 2019 to Oct 2020. We used prespecified criteria for study selection, data abstraction, and rating internal validity and strength of the evidence. See our PROSPERO protocol for our full methods (Registration # CRD42020199557).

In March 2020, the World Health Organization (WHO) declared the outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (COVID-19), a pandemic. Although most people with COVID-19 experience no symptoms or mild fever, cough, shortness of breath, or fatigue, approximately 1 in 7 experience severe symptoms requiring hospitalization. In-hospital mortality for patients with COVID-19 is around 17%. Many hospitalized patients experience life-threatening complications such as bacterial pneumonia, sepsis, acute respiratory distress syndrome, and multi-organ failure. As a result of the stress of being hospitalized for a serious, highly transmissible illness during a pandemic, experts warn that patients hospitalized with COVID-19 are at high risk of developing mental

health symptoms and psychiatric disorders such as major depression, panic or other anxiety disorders, or post-traumatic stress disorder (PTSD), or of experiencing exacerbations of existing disorders. Veterans who receive care at the VA have high rates of comorbid medical disorders (16% report having 5 or more medical conditions) and high rates of mental health diagnoses (including depression [13.5%], PTSD [9.3%], substance use disorders [8.3%], anxiety disorders [4.8%], and serious mental illness [3.7%]) and may be at particularly high risk of developing new mental health symptoms or disorders, or of experiencing exacerbations of existing mental health symptoms or disorders.

In June 2020, the Department of Veterans Affairs (VA) Central Office requested that the VA Evidence Synthesis Program (ESP) produce 3 rapid evidence reviews on post-acute care needs for adults who have had COVID-19. The first 2 reviews will focus on major organ damage and rehabilitation needs, respectively. This is the third review in the series, focused on mental health needs of adults who have been hospitalized with COVID-19. The purpose of this review is to compare the prevalence of mental health disorders among adults who have been hospitalized for COVID-19 to relevant comparison groups, assess whether mental health disorder prevalence varies by patient and disease characteristics, and ascertain patients' mental health care utilization and resource needs. This is a living review and will be updated frequently. Findings from this evidence brief will be used to inform national VA planning efforts to support Veterans after hospital discharge for COVID-19.

We included cross-sectional and cohort studies that examined the prevalence of mental health disorders and clinical features such as insomnia among adults during or after hospitalization for COVID-19. Among 2,120 potentially relevant citations, 13 studies (3 retrospective cohort and 10 cross-sectional) met our inclusion criteria, including 11 studies that were published since the original report. Seven studies were conducted in China, 2 in the United States, 2 in Italy, 1 in Iran, and 1 in Korea. Study size varied from 64 to 62,354 participants; although most included between 100-800 participants. Six studies collected data during hospitalization and 7 collected data in the post-discharge period (0-3 months after hospitalization). No studies collected data more than 3 months post-discharge. Findings are summarized in **Table 1**.

Table 1. Overview of Findings

Rapid Evidence Review Question	Results & supporting evidence
<p>KQ1) Among adults who have been hospitalized for COVID-19, what is the prevalence of MH disorders during or after hospitalization?</p>	<p>In 2 fair-quality cross-sectional studies, the prevalence of MH conditions <i>during hospitalization</i> was:</p> <ul style="list-style-type: none"> • Depression symptoms: 43.3%-45.9% (2 studies) • Anxiety symptoms: 23.3-38.8% (2 studies) • Adjustment disorder: 26.7% (1 study) • Insomnia: 43.3-54.1% (2 studies) <p>In 6 fair-quality cross-sectional studies, the prevalence of MH conditions <i>in the 3 months following hospitalization</i> was:</p> <ul style="list-style-type: none"> • Depression symptoms: 10-65.7% (5 studies) • Anxiety symptoms: 22.2-42.7% (4 studies) • PTSD symptoms: 15.4-31% (3 studies) • Obsessive compulsive symptoms: 19.6% (1 study) • Insomnia: 39.6% (1 study)
<p>KQ2) How often do adults without preexisting MH conditions who have been hospitalized for COVID-19 develop new MH symptoms or a new MH diagnosis?</p>	<p>We did not identify any studies that were designed to detect incidence of new MH disorders among hospitalized COVID-19 patients without preexisting MH conditions. However, the studies described in KQ1 were primarily conducted among those with no or low prevalence of MH disorders at baseline.</p>
<p>KQ2a) How often do adults without preexisting MH conditions who have been hospitalized for COVID-19 develop new MH symptoms or a new MH diagnosis compared to those with COVID-19 treated only in outpatient settings?</p>	<p>In 3 studies (1 good-quality retrospective cohort & 2 fair-quality cross-sectional) of participants with low, unclear, or no prevalence of preexisting MH conditions, the comparative prevalence of MH conditions was:</p> <ul style="list-style-type: none"> • Any psychiatric diagnosis: Hospitalized pts at higher risk of psychiatric diagnosis than outpatients (HR= 1.4, 95% CI, 1.06-1.85 in 1 good-quality study; prevalence of psychiatric disorders were 60.0% vs 28.8%, p=.006 in 1 fair-quality study) or no differences between groups (1 fair-quality study) • Depression: No differences in MDD or depression symptoms between groups (2 fair-quality studies) • Anxiety: No differences in GAD or anxiety symptoms between groups (1 fair-quality study) or higher prevalence of anxiety symptoms in outpatients (1 fair-quality study) • PTSD: No differences in PTSD symptoms between groups (1 fair-quality study) • Adjustment disorder: Higher prevalence of adjustment disorder in hospitalized pts (26.7% vs 9.6%, p=.042) (1 fair quality study) • Obsessive compulsive: No differences in obsessive compulsive symptoms between groups (1 fair-quality study)

Rapid Evidence Review Question	Results & supporting evidence
	<ul style="list-style-type: none"> • Insomnia: Higher prevalence of insomnia in hospitalized pts (43.3% vs 21.2%, $p=.03$ in 1 fair-quality study) or no differences between groups (1 fair-quality study)
<p>KQ2b) How often do adults without preexisting MH conditions who have been hospitalized for COVID-19 develop new MH symptoms or a new MH diagnosis compared to adults hospitalized for other causes?</p>	No evidence.
<p>KQ2c) Does the probability of developing new MH symptoms or diagnosis during or after hospitalization for COVID-19 vary by patient characteristics (eg, age, sex, race/ethnicity, comorbidities), COVID-19 disease severity, or level of care?</p>	<p>Evidence from 5 fair-quality cross-sectional studies of pts with low, unclear, or no prevalence of preexisting MH conditions had mixed results:</p> <ul style="list-style-type: none"> • Women may be at higher risk of developing certain MH symptoms (including anxiety during hospitalization, PTSD after hospitalization, and insomnia during hospitalization) compared to men (2 studies) • Younger patients may be at higher risk of developing PTSD symptoms compared to older patients after hospitalization (1 study) • Severity of COVID-19 may be associated with certain MH symptoms (including anxiety during and after hospitalization, PTSD after hospitalization, and insomnia during hospitalization), but findings on depression symptoms during and after hospitalization are mixed (3 studies) • Duration of COVID-19 is probably not associated with anxiety or insomnia symptoms during hospitalization, but findings on depression during and after hospitalization are mixed (2 studies) • Length of hospital stay is probably not associated with depression or insomnia symptoms during hospitalization or PTSD symptoms after hospitalization, but may be associated with anxiety symptoms during hospitalization (2 studies) • Receipt of ventilation was not associated with depression, anxiety, or PTSD symptoms post-discharge, while receipt of corticosteroids was associated with worse anxiety symptoms and better PTSD symptoms (1 study)
<p>KQ3) How often do adults with preexisting MH conditions who have been hospitalized for COVID-19 experience exacerbation of MH symptoms?</p>	1 fair-quality cross-sectional study indicated patients (hospitalized and non-hospitalized) with a previous psychiatric had worse symptoms of anxiety, depression, PTSD, insomnia and obsessive-compulsive disorder post-discharge than those without a psychiatric history.
<p>KQ3a) How often do adults with preexisting MH conditions who have been hospitalized for COVID-19 experience exacerbation of MH symptoms compared to those with COVID-19 treated only in outpatient settings?</p>	No evidence.

Rapid Evidence Review Question	Results & supporting evidence
KQ3b) How often do adults with preexisting MH conditions who have been hospitalized for COVID-19 experience exacerbation of MH symptoms compared to adults hospitalized for other causes?	No evidence.
KQ3c) Does the probability of exacerbating MH symptoms during or after hospitalization for COVID-19 vary by patient characteristics (eg, age, sex, race/ethnicity, comorbidities), COVID-19 disease severity, or level of care?	No evidence.
KQ4) How often and what kinds of MH care do adults access during or after hospitalization for COVID-19?	1 fair-quality retrospective cohort study of 339 hospitalized COVID-19 pts reported that 3 out of 19 readmitted pts had a psychiatric illness as their reason for readmission; however psychiatric diagnoses were present upon initial admission for 2 of these pts. Therefore, COVID-19 is unlikely to be the etiology for these psychiatric episodes. Pts readmitted for psychiatric illness underwent psychiatric evaluation.
KQ4a) Does the type or extent of MH care used by adults during or after COVID-19 hospitalization differ compared to before hospitalization?	No evidence.
KQ4b) Does the type or extent of MH care utilization differ for adults hospitalized for COVID-19 compared to adults receiving outpatient treatment for COVID-19?	No evidence.
KQ4c) Does the type or extent of MH care utilization differ for adults hospitalized for COVID-19 compared to adults hospitalized for other causes?	No evidence.
KQ4d) Does the type or extent of MH care utilization during or after hospitalization for COVID-19 vary by patient characteristics (eg, age, sex, race/ethnicity, comorbidities), COVID-19 disease severity, or level of care?	No evidence.
KQ5) What are the MH care resource needs among adults who have been hospitalized for COVID-19?	59% of hospitalized pts report at least some need for psychological guidance in rehabilitation (1 poor-quality cross-sectional study)

MH = mental health; MDD = Major Depressive Disorder; GAD = Generalized Anxiety Disorder; Pt=Patient

The primary limitation of the methods used for this rapid review is that a single reviewer rated studies for inclusion, assessed quality, and abstracted data with second reviewer verification, rather than standard dual independent assessment. This may have resulted in missing eligible studies or data. This risk was reduced by establishing explicit inclusion criteria for studies, developing and using a piloted data abstraction tool, and creating a key to rate each study according to Joanna Briggs Institute quality criteria.

There were several important limitations of the included primary studies. Only a single study was high quality; the other 12 were fair or poor quality, with common methodological limitations including not reporting or accounting for the prevalence of preexisting MH disorders in analyses, limited information on other medical comorbidities that could be confounders, limited information on the severity of COVID-19 among participants, and a lack of information on whether COVID-19 diagnoses were confirmed using laboratory testing. Additionally, 4 studies were small (<100 people) and studies only evaluated outcomes at a single time point (*ie*, no longitudinal studies were available that could rigorously assess if the incidence of MH changes over time).

Future research should examine 5 primary gaps in research:

- Determine the prevalence of major psychiatric disorders among patients hospitalized for COVID-19.
- Conduct larger, longer (*eg*, 3- and 6-month follow-up), multi-center studies.
- Compare patients who have been hospitalized for COVID-19 to relevant control groups.
- Report and account for potential confounders, particularly preexisting mental health disorders, medications, and medical comorbidities.
- Determine the mental health care utilization and resource/treatment needs of patients after discharge for COVID-19.

As of October 2020, evidence from 13 primarily fair-quality studies suggests the prevalence of MH disorders – including insomnia (43.3-54.1%), depression (43.3-45.9%), anxiety (23.3-38.8%), and adjustment disorder (26.7%) – is high among hospitalized patients with COVID-19. The post-hospitalization prevalence of anxiety and insomnia was similar or slightly lower up to 3 months following hospitalization. Symptoms of PTSD (15.4-31%) and obsessive-compulsive symptoms (19.6%) were also common after hospitalization. The prevalence of post-hospitalization depression was more variable in the post-hospitalization period (10-65.7%) than during hospitalization across studies. More research is needed to determine if people with preexisting MH disorders who are hospitalized for COVID-19 experience exacerbation of existing mental health conditions, and to describe the mental health care resources needs of patients who have been hospitalized for COVID-19.

EVIDENCE BRIEF

INTRODUCTION

PURPOSE

The ESP Coordinating Center (ESP CC) is responding to a request from VA Central Office for an evidence brief on mental health outcomes of adults who have been hospitalized for COVID-19. Findings from this evidence brief will be used to inform national VA planning efforts to support Veterans after hospital discharge for COVID-19.

BACKGROUND

In March 2020, the World Health Organization (WHO) declared the outbreak of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus which causes coronavirus disease 2019 (COVID-19), as a pandemic.¹ As of January 2021, over 100 million people have been confirmed to have had COVID-19 and 2 million have died worldwide.² Although most people with COVID-19 experience no symptoms or mild fever, cough, shortness of breath, or fatigue, approximately 1 in 7 experience severe symptoms that require hospitalization.³ Life-threatening complications of COVID-19 include bacterial pneumonia, sepsis, acute respiratory distress syndrome, and multi-organ failure.³ Those who are over 65 years old with underlying medical conditions (including but not limited to hypertension, obesity, chronic lung disease, diabetes, and cardiovascular disease) are at higher risk of hospitalization and death.⁴ Among those hospitalized for COVID-19, 32% have been admitted to the intensive care unit (ICU), 19% required mechanical ventilation, and 17% have died in the hospital.⁵

Addressing complications of COVID-19 may require invasive procedures, including the administration of sedation and/or paralytic agents and intensive intravascular monitoring. These interventions interfere with a patient's ability to respond to and understand their providers, environment, and treatment. In addition, the ICU setting is stressful due to frequent alarms, flashing lights, and providers moving in and out of rooms donning personal protective equipment that can prevent patients from seeing and recognizing faces.⁶ This environmental stress is likely compounded for patients with COVID-19 by isolation from family, friends, and other support systems that results from restrictive hospital visitation policies employed to reduce the risk of COVID-19 transmission.⁷ Hospitalization and isolation requirements may also cause a significant disruption in work, resulting in significant financial hardship and distress. Those with COVID-19 may also worry about transmission and burden to their loved ones or caregivers.

As a result of the stress of being hospitalized for a serious, highly transmissible illness during a pandemic, experts warn that patients who are hospitalized with COVID-19 are at particularly high risk of developing mental health symptoms or experiencing exacerbation or relapse of existing or past mental health disorders.⁸⁻¹⁰ A systematic review evaluating outcomes after the 2002 SARS and 2012 MERS pandemics indicates many patients with serious infections experienced anxiety (35.7%) and insomnia (41.9%) during the acute phase of their illness and some developed post-traumatic stress disorder (PTSD) (32.2%), depression (14.9%), and anxiety disorders (14.8%) after recovery.¹¹ Additionally, research has shown patients hospitalized for other illnesses often experience MH symptoms and report problems sleeping while hospitalized. For example, 50% of patients hospitalized for congestive heart failure report experiencing

depression symptoms during hospitalization,¹² and patients who are hospitalized for any illness report waking up more and having worse sleep quality in the hospital than at home.¹³

Additionally, research on ICU patients has indicated MH disorders that develop after a serious illness can be serious and long-lasting. One-third of patients with any illness treated in the ICU will develop anxiety and depression symptoms and approximately one-fifth will develop PTSD within a year of their ICU stay.⁶ High levels of sedation and paralysis are common among ICU patients and are required for mechanical ventilation. At the same time, sedative and paralytic medications may put hospitalized patients with COVID-19 at an increased risk for some mental health symptoms and disorders, particularly because these medications commonly have side effects such as amnesia and hallucinations. Finally, the Infectious Disease Society of America¹⁴ recommends dexamethasone (a steroid) for the treatment of people hospitalized with COVID-19 and this medication is commonly associated with MH side effects such as anxiety and psychosis.¹⁵

The current social environment may also contribute to greater risk of mental health disorders for hospitalized patients with COVID-19. Many states are instituting stay-at-home or physical distancing orders, people who have been in contact with someone with COVID-19 are being quarantined, and work and school environments are inaccessible or significantly altered to reduce the likelihood of COVID-19 transmission. Recent studies on the effects of the COVID-19 pandemic show that even general populations have a high prevalence of depression, anxiety, insomnia, and acute stress, and therefore those who have been hospitalized are likely to return to home or work environments that are more stressful or significantly changed from pre-pandemic environments.¹⁶⁻¹⁸

In addition to stress-related development or exacerbation of mental health disorders, research on previous epidemics/pandemics with similar pathogens suggests possible biological pathways for increased prevalence of mental health disorders. For example, hospitalized patients with COVID-19 may experience neurologic symptoms such as stroke and encephalopathy during and after their hospitalization, which can impact both acute and chronic mental health.¹⁹

In May 2020, the WHO published interim guidance on the clinical management of COVID-19, including management of mental health symptoms.²⁰ For those with new anxiety or depression symptoms, the WHO recommends providing support strategies including mental health first aid, stress management, and brief psychological interventions based on cognitive behavioral therapy (CBT) as first-line therapy and benzodiazepines as second-line therapy for those with severe distress. If anxiety and depression symptoms persist, patients should consult with mental health professionals for further evaluation and treatment. Given the emergent nature of COVID-19 and the need for immediate guidance, these guidelines are based on a combination of expert opinion and rapid systematic reviews, as opposed to a more rigorous systematic review and GRADE process, which is considered the gold standard. The American Psychological Association provides clinical practice guidelines for many mental health disorders^{21,22} but as of January 2021, has not provided guidance on caring for patients with COVID-19 specifically. The American Psychiatric Association provides high-level guidance for identifying signs of COVID-19-related mental health issues and provide mental health care remotely.^{23,24} Overall, the existing evidence of the impact of COVID-19 on the prevalence of mental health symptoms among patients hospitalized for COVID-19 and after they are discharged is unclear. There are also unanswered

questions about psychological therapies being provided to patients and the effectiveness of those treatments, as well as long-term mental health needs these patients might have and how to best address them.

In June 2020, the Department of Veterans Affairs (VA) Central Office requested that the VA Evidence Synthesis Program (ESP) produce 3 rapid evidence reviews on post-acute care needs for adults who have had COVID-19. The first 2 reviews will focus on major organ damage and rehabilitation needs, respectively. This is the third review in the series, focused on mental health needs of adults who have been hospitalized for COVID-19. In general, Veterans who receive care at the VA are older and have more comorbidities than adults in the general population (16% of Veterans at the VA report 5 or more conditions vs 3% of general population),²⁵ putting them at higher risk for contracting COVID-19. Veterans who receive care at the VA also have a high prevalence of existing mental health disorders including depression (13.5%), PTSD (9.3%), substance use disorders (8.3%), anxiety disorders (4.8%), and serious mental illness (3.7%),²⁶ which could be exacerbated by a COVID-19 hospitalization. The purpose of this review is therefore to evaluate the prevalence of mental health disorders and assess mental health care needs among adults hospitalized for COVID-19 to assist the VA in supporting this population of Veterans. The VA ESP published an initial report synthesizing studies that had been published as of July 2020²⁷; this updated report synthesizes studies published as of October 2020.

SCOPE

This rapid review compares the prevalence of mental health disorders and clinical features among adults who have been hospitalized for COVID-19 to relevant comparison groups, assesses whether the prevalence of mental health disorders varies by patient and disease characteristics, and ascertains mental health care utilization and resource needs for adults following hospitalization for COVID-19.

KEY QUESTIONS AND ELIGIBILITY CRITERIA

Key Questions and eligibility criteria (population, intervention, comparator, outcome, and timing) appear in Table 2. We included cross-sectional and cohort studies and excluded case series and case reports. We included insomnia as an outcome of interest as it is often symptomatic of another underlying MH disorder.

Table 2. Key Questions and Eligibility Criteria

Key Question	Population	Comparator	Outcomes	Timing
1) Among adults who have been hospitalized for COVID-19, what is the prevalence of MH disorders during or after hospitalization?	Adults who have been hospitalized for COVID-19	None	Prevalence of MH disorders, including both diagnoses and symptoms. Specific MH disorders of interest are mood disorders, anxiety disorders, trauma-related disorders, psychotic disorders, and substance use disorders; excluding cognitive disorders such as delirium and dementia.	During or after hospitalization
2) How often do adults without preexisting MH conditions who have been hospitalized for COVID-19 develop new MH symptoms or a new MH diagnosis?	Adults without preexisting MH conditions who have been hospitalized for COVID-19	vs before hospitalization	New MH symptoms or a new MH diagnosis	During or after hospitalization
2a) How often do adults without preexisting MH conditions who have been hospitalized for COVID-19 develop new MH symptoms or a new MH diagnosis compared to those with COVID-19 treated only in outpatient settings?		vs adults without preexisting MH conditions who received outpatient treatment for COVID-19		
2b) How often do adults without preexisting MH conditions who have been hospitalized for COVID-19 develop new MH symptoms or a new MH diagnosis compared to adults hospitalized for other causes?		vs adults without preexisting MH conditions who have been hospitalized for other causes		
2c) Does the probability of developing new MH symptoms or diagnosis during or after hospitalization for COVID-19 vary by patient characteristics (eg, age, sex, race/ethnicity, comorbidities), COVID-19 disease severity, or level of care?		Subgroups vs each other		
3) How often do adults with preexisting MH conditions who have been hospitalized for COVID-19 experience exacerbation of MH symptoms?	Adults with preexisting MH conditions who	vs before hospitalization	Exacerbation of MH symptoms	During or after hospitalization

Key Question	Population	Comparator	Outcomes	Timing
3a) How often do adults with preexisting MH conditions who have been hospitalized for COVID-19 experience exacerbation of MH symptoms compared to those with COVID-19 treated only in outpatient settings?	Adults who have been hospitalized for COVID-19	vs adults with preexisting MH conditions who received outpatient treatment for COVID-19	Exacerbation of MH symptoms	
3b) How often do adults with preexisting MH conditions who have been hospitalized for COVID-19 experience exacerbation of MH symptoms compared to adults hospitalized for other causes?		vs adults with preexisting MH conditions who have been hospitalized for other causes		
3c) Does the probability of exacerbating MH symptoms during or after hospitalization for COVID-19 vary by patient characteristics (eg, age, sex, race/ethnicity, comorbidities), COVID-19 disease severity, or level of care?		Subgroups vs each other		
4) How often and what kinds of MH care do adults access during or after hospitalization for COVID-19?	Adults who have been hospitalized for COVID-19	None	MH care utilization (eg, health care appointments, prescriptions filled, etc)	During or after hospitalization
4a) Does the type or extent of MH care used by adults during or after COVID-19 hospitalization differ compared to before hospitalization?		vs before hospitalization		
4b) Does the type or extent of MH care utilization differ for adults hospitalized for COVID-19 compared to adults receiving outpatient treatment for COVID-19?		vs adults who received outpatient treatment for COVID-19		
4c) Does the type or extent of MH care utilization differ for adults hospitalized for COVID-19 compared to adults hospitalized for other causes?		vs adults who have been hospitalized for other causes		
4d) Does the type or extent of MH care utilization during or after hospitalization for COVID-19 vary by patient characteristics (eg, age, sex, race/ethnicity, comorbidities), COVID-19 disease severity, or level of care?		Subgroups vs each other		
5) What are the MH care resource needs among adults who have been hospitalized for COVID-19?	Adults who have been hospitalized for COVID-19	None	MH care resource needs identified by patients or caregivers.	

MH = mental health



METHODS

SEARCHES AND STUDY SELECTION

To identify articles relevant to the key questions, a research librarian searched Ovid MEDLINE, the WHO COVID-19 database, PsycINFO, CINAHL, as well as systematic review databases using terms for *COVID-19*, *mental health*, and *hospitalization* from December 2019 to October 2020 (see Supplementary Materials for complete search strategies). Additional citations were identified from hand-searching reference lists and consultation with content experts. We limited the search to published and indexed articles involving human subjects available in the English language. Study selection was based on the eligibility criteria described above. Detailed information in inclusion/exclusion criteria are available in the Supplementary Materials. Titles, abstracts, and full-text articles were reviewed by 1 investigator and checked by another. All disagreements were resolved by consensus.

QUALITY ASSESSMENT AND DATA EXTRACTION

We used predefined criteria to rate the internal validity of all included studies. We used checklists from the Joanna Briggs Institute (JBI) to assess the internal validity of cross-sectional and cohort studies.²⁸ We extracted study-level data including study characteristics, population, comparator, and outcomes. All data abstraction and internal validity ratings were first completed by 1 reviewer and then checked by another. All disagreements were resolved by consensus.

STRENGTH OF EVIDENCE ASSESSMENT

We graded the strength of the evidence based on the AHRQ Methods Guide for Comparative Effectiveness Reviews.²⁹ Although this method is designed for intervention studies, we applied the concepts to the non-intervention studies, including risk of bias (includes study design and aggregate quality), consistency, directness, and precision of the evidence. Strength of evidence was graded for each key outcome measure and ratings ranged from high to insufficient, reflecting our confidence that the prevalence estimates reflect an unbiased and precise estimate of the true prevalence.

SYNTHESIS OF DATA

Because of the small number of included studies and heterogeneity in outcomes and outcome measurements used by these studies, we synthesized data narratively.

UPDATING THE LIVING REVIEW

This is a living review. We are regularly searching medical databases for new studies, and study selection and quality assessment will adhere to the same processes described above. The report will be updated when new information might change the nature or strength of the conclusions or in accordance with a journal's editorial policies, if a manuscript based on this report is published in a peer-reviewed journal.

The complete description of our full methods can be found on the PROSPERO international prospective register of systematic reviews (<http://www.crd.york.ac.uk/PROSPERO/>; registration number CRD42020199557).

RESULTS

The literature flow diagram (Figure 1) summarizes the results of the search and study selection processes. Among 2,120 potentially relevant citations, we included 13 studies (3 retrospective cohort and 10 cross-sectional).³⁰⁻⁴² Seven studies were conducted in China,^{30,33,35-38,42} 2 in the United States,^{32,40} 2 in Italy,^{39,41} 1 in Iran,³¹ and 1 in Korea.³⁴ Study size varied from 64 to 62,354 participants; although most included between 100-800 participants. Six studies^{31,32,35-37,42} collected data during hospitalization and 7^{30,33,34,38-41} collected data in the post-discharge period (0-3 months after hospitalization). No studies collected data more than 3 months post-discharge.

Patient characteristics varied across studies. Overall, mean age varied from 40.3 years to 57.8 years, and the percentage who were male ranged from 39% to 73%. Medical comorbidities were inconsistently reported across studies, but studies that did report comorbidities reported high prevalence (eg, 4 studies^{30,33,38,42} reported that between 19-62% of participants had at least 1 comorbidity, chronic medical condition, or underlying illness). Race/ethnicity was also inconsistently reported. Of the 2 studies^{32,40} that reported participants' race/ethnicity, both were conducted in the United States. One study⁴⁰ that examined medical record data for a large cohort (N=62,354) of patients with COVID-19 across the United States reported that a large percentage of participants were black (23.6% of participants in the study were black, compared to 13.4% of US population that is black).⁴³ The other study³² examined a smaller cohort (N=339) of hospitalized patients with COVID-19 in Rhode Island and found 37% were Hispanic and 16% were black – both of which are roughly double the percentage of the general population of Rhode Island that are Hispanic and black (16.3% and 8.5%, respectively).⁴⁴ The high proportion of black and Hispanic patients hospitalized with COVID-19 included in these studies reflects national trends in patients hospitalized with COVID-19.⁴⁵

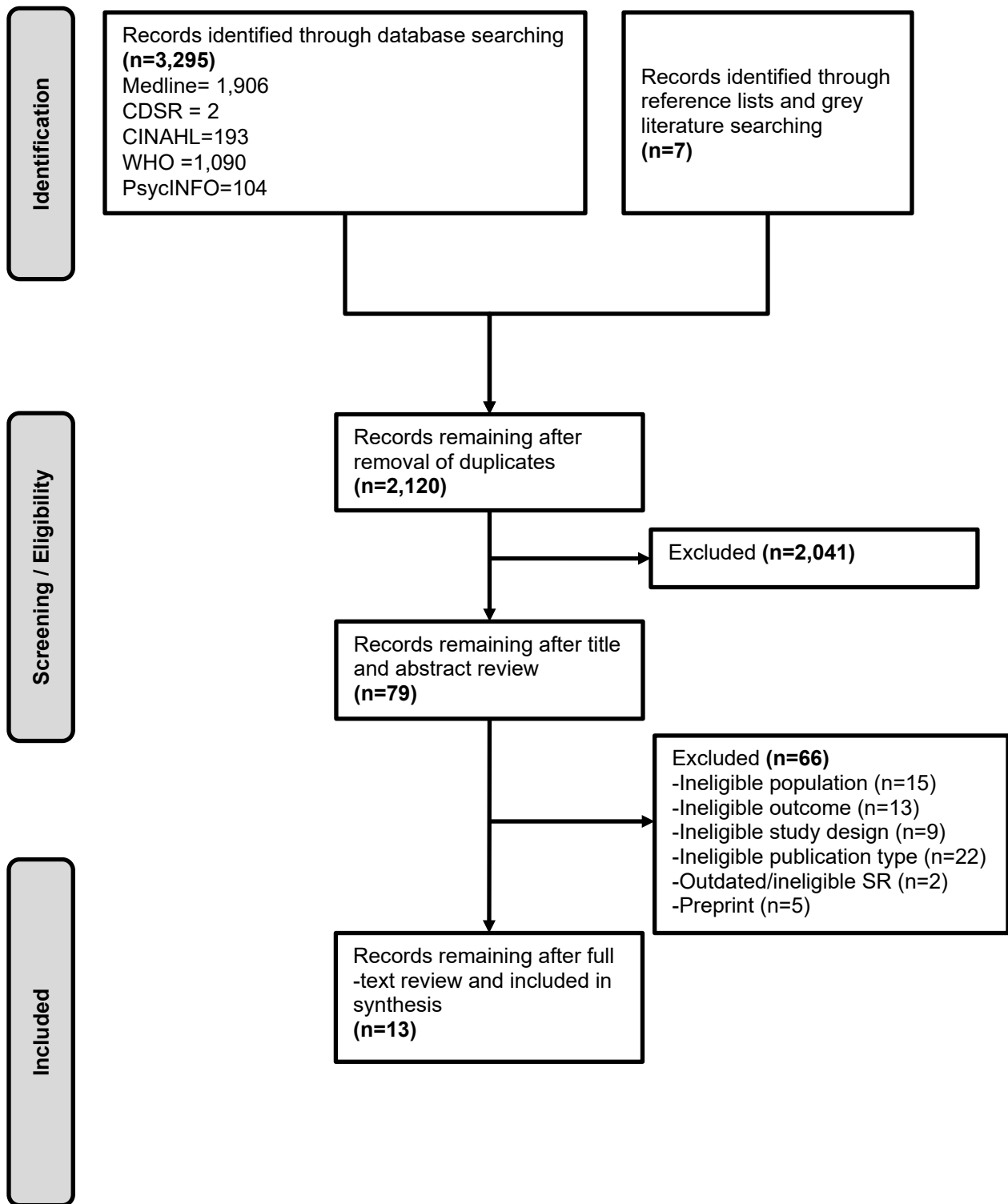
In terms of outcomes, most studies reported the prevalence of symptoms of MH disorders (including depression, anxiety, PTSD, obsessive-compulsive, and insomnia). A few studies reported the prevalence of MH diagnoses (including Major Depressive Disorder, Generalized Anxiety Disorder, adjustment disorder, insomnia, or any psychiatric disorder). No studies reported on the prevalence of substance use disorders or psychosis (either symptoms or diagnoses). A few studies reported on MH care utilization and resource needs, but data were limited.³⁴

Overall, only 1 study was good quality,⁴⁰ 10 were fair quality,^{30-35,37-39,41} and 2 were poor quality.^{36,42} Among fair-quality studies, common methodological limitations included not reporting or accounting for the prevalence of preexisting MH disorders in analyses, limited information on other medical comorbidities that could be confounders, limited information on the severity of COVID-19 among participants, and a lack of information on whether COVID-19 diagnoses were confirmed using laboratory testing. Poor-quality studies had additional limitations including not using validated instruments and inappropriate handling of missing data. Because we have extremely low confidence in the results of these poor-quality studies, we do not report results in the following sections except when they provide the only available data on a certain outcome.

A list of excluded studies and study-level data abstraction and quality assessment for included studies appear in the Supplementary Materials.

LITERATURE FLOW

Figure 1: Literature Flowchart



KEY QUESTION 1: Among adults who have been hospitalized for COVID-19, what is the prevalence of MH disorders during or after hospitalization?

Eight cross-sectional studies^{30,31,33-35,38,39,41} reported the prevalence of MH disorders among patients during hospitalization or in the 3 months after hospitalization for COVID-19 (**Table 3**).

During hospitalization, approximately 5 out of 10 patients with COVID-19 experienced insomnia,^{31,35} 4 out of 10 experienced depression symptoms,^{31,35} 3 out of 10 experienced anxiety symptoms,^{31,35} and 3 out of 10 met criteria for adjustment disorder.³¹ Approximately 2 out of 10 patients experienced moderate-severe depression or anxiety symptoms during hospitalization.^{33,35} PTSD and obsessive-compulsive symptoms were not assessed in studies of hospitalized patients. The prevalence of anxiety and insomnia symptoms was similar or slightly lower in the post-discharge period. Studies of the post-discharge period also found approximately 2 out of 10 people hospitalized for COVID-19 experienced PTSD symptoms or obsessive-compulsive symptoms, and 1 out 10 met criteria for a PTSD diagnosis.^{33,34,38,39} The prevalence of depression was more variable across studies of the post-hospitalization period (10-66%) than during hospitalization (43-46%).^{30,33,34,38,39,41} No studies in the post-discharge period assessed the prevalence of adjustment disorder.

Findings on the prevalence of mental health disorders were generally of similar magnitude across studies. However, this was not the case with depression, where prevalence ranged from 10% to 65%. The 10% estimate comes from a study³⁹ (N=402) that measured depression symptoms using the 13-item Beck Depression Inventory. The same study found the prevalence of depression was 28.9% when using the Zung Self-Rating Depression Scale. The 65.7% estimate comes from a study³⁸ (N=675) that reported 19% of participants had moderate to severe symptoms of depression (score >10 on PHQ-9) while 46.7% had mild symptoms (score >5 on PHQ-9). Three other studies^{30,33,41} reported the prevalence of depression symptoms fell between these 2 scores, and measured outcomes using the Zung Self-Rating Depression Scale or Hospital Anxiety and Depression Scale-Depression.

Overall, we have low confidence in these findings, as most findings are only supported by 1-3 fair-quality studies, and findings on depression symptoms are inconsistent.

Table 3. Prevalence of MH Disorders in Patients Hospitalized for COVID-19

	During hospitalization	0-3 months post-discharge	3+ months post-discharge
Depression	43.3-45.9% depression symptoms ^{31,35} 24.7% moderate-severe depression symptoms ³⁵ 3.3% MDD ³¹	10-65.7% depression symptoms ^{30,33,38,39,41} 19% moderate-severe depression symptoms ³⁸	No data
Anxiety	23.3-38.8% anxiety symptoms ^{31,35}	22.2-42.7% anxiety symptoms ^{33,39,41}	No data

	During hospitalization	0-3 months post-discharge	3+ months post-discharge
	16.5% moderate-severe anxiety symptoms ³⁵ 6.7% GAD ³¹	10.4% moderate-severe anxiety symptoms ³⁸	
PTSD	No data	15.4-31% PTSD symptoms ^{33,34,39} 12.4% PTSD diagnosis ³⁸	No data
Adjustment disorder	26.7% adjustment disorder ³¹	No data	No data
Obsessive-compulsive	No data	19.6% obsessive compulsive ³⁹ symptoms	No data
Sleep disorders	43.3-54.1% insomnia ^{31,35} 21.1% moderate-severe insomnia symptoms ³⁵	39.6% insomnia symptoms ³⁹	No data

Key: MDD=Major depressive disorder; GAD=Generalized Anxiety Disorder; PTSD=Post-traumatic Stress Disorder
Li 2020 & Zhang 2020 do not appear in the table as they were poor quality. Ma 2020 also does not appear in the table as the study only reported data for those with severe COVID-19.

KEY QUESTION 2: How often do adults without preexisting MH conditions who have been hospitalized for COVID-19 develop new MH symptoms or a new MH diagnosis?

We identified no studies that were designed to detect the incidence of new MH disorders among patients without preexisting MH disorders hospitalized for COVID-19. However, most studies reported in KQ1 were conducted among populations with low or no prevalence of preexisting MH disorders. Specifically, of the 8 studies that reported prevalence of MH disorders among all patients hospitalized for COVID-19 (see KQ1), 5 studies^{31,33,35,39,41} were conducted in populations with low or no prevalence of preexisting MH disorders. Of these, 3 studies^{31,33,39} reported low prevalence of preexisting MH disorders (18-26% of included populations had a history of psychiatric disorders), 1 study⁴¹ reported 6% of the study population was taking antidepressant and 3% was taking anxiolytic therapies before admission, and 1 study³⁵ reported that people with psychotic disorders were excluded. The remaining 3 studies^{30,34,38} did not indicate whether or not patients had any preexisting MH disorders. Findings among populations with low or no prevalence of preexisting MH disorders were similar to findings among populations with unclear prevalence of preexisting MH disorders.

Overall, we have low confidence that the results of KQ1 reflect the development of new mental health disorders. Although most of these studies were conducted among populations with low or no prevalence of preexisting MH disorders at baseline, more directly relevant studies (*ie*, cohort studies conducted exclusively among populations with no preexisting MH disorders prior to COVID-19 hospitalization) would provide more robust data to address this question.

KEY QUESTION 2A: How often do adults without preexisting MH conditions who have been hospitalized for COVID-19 develop new MH symptoms or a new MH diagnosis compared to those with outpatient COVID-19?

Three studies (2 cross-sectional^{31,39} and 1 retrospective cohort)⁴⁰ compared the prevalence or incidence of MH disorders between hospitalized patients versus outpatients with COVID-19 (**Table 4**). The best available evidence from a good-quality retrospective cohort study⁴⁰ (N=62,354) indicates that hospitalized patients had a 40% increased risk of being diagnosed with a psychiatric disorder 14-90 days after their COVID-19 diagnosis compared to outpatients with COVID-19. Strengths of this study include its large sample size and that it was designed to detect incidence of new MH disorders (*ie*, did not include people with preexisting MH disorders in analyses); however, limited information was provided about hospital characteristics. Another, smaller, fair-quality cross-sectional study³¹ (N=82) similarly found rates of diagnosed MH disorders were higher among hospitalized than non-hospitalized patients up to 2 weeks after hospitalization; however, these findings are more limited as authors did not control or account for preexisting MH disorders in analyses. By contrast, a second, fair-quality cross-sectional study³⁹ (N=402) noted that hospitalization did not have an independent effect on MH symptoms measured a mean of 1 month after discharge in a multivariate analysis. Participants in this study were recruited after presenting to the Emergency Department (300 were subsequently admitted to the hospital while the other 102 were managed at home), so the outpatient group likely had more severe symptoms than most outpatients with COVID-19.

While studies generally indicated hospitalized patients are at higher risk of developing *any* mental health disorder compared to outpatients with COVID-19, the risk of developing *specific* mental health disorders between hospitalized patients and outpatients is less clear. The prevalence of depression (both diagnoses and symptoms), PTSD symptoms, and obsessive-compulsive symptoms were similar between hospitalized patients and outpatients with COVID-19.^{31,39} One study³¹ found a higher prevalence of adjustment disorder among hospitalized patients than outpatients. Findings on the prevalence of anxiety and insomnia symptoms were mixed. One study³¹ indicated the prevalence of anxiety symptoms is similar in hospitalized and non-hospitalized groups during hospitalization, while another³⁹ indicated the prevalence of anxiety symptoms is lower in hospitalized patients. By contrast, the first study³¹ indicated hospitalized patients have a higher prevalence of insomnia symptoms than outpatients during hospitalization,³¹ while the second study³⁹ found similar rates of insomnia between groups 1 month after hospitalization.

Overall, we have moderate confidence in the finding that hospitalized patients are at increased risk of being diagnosed with any psychiatric disorder, as this finding is supported by a large, good-quality, retrospective cohort study as well as a smaller, fair-quality, cross-sectional study. We have low confidence in all other findings, as they were either supported by 1-2 smaller studies with methodological limitations, or findings were inconsistent.

Table 4. Comparative Prevalence of MH Disorders in Patients Hospitalized for COVID-19 vs Patients not Hospitalized for COVID-19

	During hospitalization	0-3 months post-discharge	3+ months post-discharge
Any psychiatric diagnosis	No data	<ul style="list-style-type: none"> • 2 studies found hospitalized pts were at higher risk of psychiatric diagnoses than pts that were not admitted (in 1 study⁴⁰: HR 1.40, 95% CI: 1.06-1.85, and in the other study³¹ the prevalence of psychiatric disorders was 60% vs 28.8%; p=.006). • 1 study found hospitalization status did not have an independent effect on MH symptoms.³⁹ 	No data
Depression	<ul style="list-style-type: none"> • 1 study found similar rates of MDD (around 3-4%) between groups.³¹ • 1 study found similar rates of depression symptoms (around 35-43% between groups.³¹ 	1 study found similar prevalence of depression symptoms between groups (around 29-36% on Zung Self-Rating Depression Scale, 10-15% on Beck Depression Inventory scale). ³⁹	No data
Anxiety	1 study found similar rates of GAD (around 5-6%) and anxiety symptoms (around 23-33%) between groups. ³¹	1 study found lower anxiety symptoms among hospitalized pts than outpatients (39% vs 51.7% on STAI-state; 32% vs 44% on STAI-trait). ³⁹	No data
PTSD	No data	1 study found similar rates of PTSD symptoms (around 15%) between groups. ³⁹	No data
Adjustment disorder	1 study found hospitalized pts had higher rates of adjustment disorder than outpatients (26.7% vs 9.6%; p=.042). ³¹	No data	No data
Obsessive-compulsive	No data	1 study found similar rates of obsessive-compulsive symptoms (around 19-23%) between groups. ³⁹	No data
Sleep disorders	1 study found hospitalized pts had higher rates of insomnia than outpatients (43.3% vs 21.2%; p=.05). ³¹	1 study found similar rates of insomnia (around 39-41%) between groups. ³⁹	No data

Key: HR=Hazard Ratio; CI=Confidence Interval; MH=Mental Health; MDD=Major depressive disorder; GAD=Generalized Anxiety Disorder; STAI= State-Trait Anxiety Inventory; PTSD=Post-traumatic Stress Disorder
Li 2020 & Zhang 2020 do not appear in the table as they were poor quality. Ma 2020 also does not appear in the table as the study only reported data for those with severe COVID-19.

KEY QUESTION 2B: How often do adults without preexisting MH conditions who have been hospitalized for COVID-19 develop new MH symptoms or a new MH diagnosis compared to adults hospitalized for other causes?

We identified no evidence addressing this question.

KEY QUESTION 2C: Does the probability of developing new MH symptoms or diagnosis during or after hospitalization for COVID-19 vary by patient characteristics (eg, age, sex, race/ethnicity, comorbidities), COVID-19 disease severity, or level of care?

Five cross-sectional^{30,33,35,38} studies evaluated whether patient characteristics, COVID-19 severity, or level of care were associated with either the prevalence or severity of MH symptoms (**Table 5**).

In terms of patient characteristics, female gender was associated with insomnia symptoms during hospitalization³⁵ but not depression symptoms at any time point.^{30,33,35} Findings on the association of female gender with either anxiety or PTSD symptoms were mixed, with some studies^{33,35} indicating female gender was associated with anxiety during hospitalization and PTSD symptoms post-discharge and others^{33,35} finding no gender-based differences post-discharge. Findings were also mixed on the association of age and PTSD symptoms, with 1 study³³ indicating younger adults had worse PTSD symptoms post-discharge but another³⁴ finding no association between age and PTSD symptoms at the same time point. Age was not associated with either depression or anxiety symptoms post-discharge in any study.^{30,33} No studies reported on the association between race/ethnicity and MH disorders at any time point.

In terms of COVID-19 disease characteristics, COVID-19 severity was associated with anxiety symptoms during hospitalization and post-discharge,^{35,38} PTSD symptoms post-discharge,³⁸ and insomnia during hospitalization,³⁵ but findings were mixed on whether COVID-19 severity was associated with depression symptoms either during hospitalization or post-discharge.^{30,35,38} Duration of COVID-19, by contrast, was not associated with anxiety symptoms or insomnia during hospitalization. Findings were mixed on whether COVID-19 duration was associated with depression symptoms either during hospitalization or post-discharge.

In terms of level and type of care, length of hospital stay was associated with anxiety symptoms during hospitalization,³⁵ but not depression during hospitalization,³⁵ PTSD symptoms post-discharge,³⁴ or insomnia symptoms during hospitalization.³⁵ Receipt of ICU care was associated with depression symptoms post-discharge, but receipt of ventilation was not.³⁸ Receipt of ventilation also was not associated with anxiety or PTSD symptoms post-discharge.³⁸ Receipt of corticosteroids was associated with higher risk of anxiety symptoms and lower risk of PTSD symptoms post-discharge.³⁸

Overall, we have low confidence in these findings, as each association was only examined in 1-3 fair-quality studies, and many findings were inconsistent across studies.

Table 5. Prevalence of MH Disorders Among Patients Hospitalized for COVID-19 by Patient Characteristics, COVID-19 Disease Severity, and Level of Care

	Gender	Age	Race/ethnicity	Comorbidities	COVID-19 disease severity	Level & type of care
Depression	3 studies (1 DH and 2 PD) found no association between depression symptoms and gender. ^{30,33,35}	2 studies (both PD) found no association between depression symptoms and age. ^{30,33}	No data	1 PD study found no association between depression symptoms and comorbidities. ³⁰	1 DH study found longer duration of COVID-19 was associated with depression symptoms, ³⁵ while 1 PD study found no association between duration of COVID-19 and depression symptoms. ³⁰ 2 DH studies found COVID-19 severity was associated with depression symptoms, ^{35,38} while 1 PD study found no association between COVID-19 severity and depression symptoms. ³⁰	1 DH study found length of hospital stay was not associated with depression symptoms. ³⁵ 1 PD study found receipt of ventilation not associated with depression symptoms, but receipt of ICU care was associated with depression symptoms. ³⁸
Anxiety	1 DH study found an association between female sex and anxiety symptoms. ³⁵ 1 PD study found no association between anxiety symptoms and gender. ³³	1 PD study found no association between anxiety symptoms and age. ³³	No data	No data	1 DH study found longer duration of COVID-19 was not associated with anxiety symptoms. ³⁵ 2 studies (1 DH and 1 PD) found COVID-19 severity was associated with anxiety symptoms. ^{35,38}	1 DH study found length of hospital stay was associated with anxiety symptoms. ³⁵ 1 PD study found receipt of ventilation not correlated with anxiety symptoms, but receipt of corticosteroids was associated with anxiety symptoms. ³⁸
PTSD	1 PD study found an association between female sex and PTSD symptoms. ³³	1 PD study found younger adults had worse PTSD symptomology. ³³	No data	No data	1 PD study found COVID-19 severity was associated with PTSD symptoms. ³⁸	1 PD study found no association between length of hospitalization and PTSD symptomology. ³⁴ 1 PD study found receipt of ventilation not correlated with PTSD symptoms, but receipt



	Gender	Age	Race/ethnicity	Comorbidities	COVID-19 disease severity	Level & type of care
	1 PD study found no association between PTSD symptoms and gender. ³⁴	1 PD study found no association between PTSD symptoms and age. ³⁴				of corticosteroids was associated lower risk of PTSD symptoms. ³⁸
Sleep disorders	1 DH study found an association between female sex and insomnia symptoms. ³⁵	No data	No data	No data	1 DH study found insomnia was not associated with duration of COVID-19 but was associated with severity of COVID-19. ³⁵	1 DH study found no association between length of hospital stay and insomnia symptoms. ³⁵

Key= DH=During hospitalization; PD=Post-discharge; PTSD=Post-traumatic Stress Disorder. Excluded Zhang 2020 from table as it was poor quality.

KEY QUESTION 3: How often do adults with preexisting MH conditions who have been hospitalized for COVID-19 experience exacerbation of MH symptoms?

There is limited available evidence on the exacerbation of MH symptoms among those with preexisting MH disorders who have been hospitalized for COVID-19. No studies were specifically designed to ask this question. Of the studies that included a subset of participants who were hospitalized with COVID-19 and had preexisting MH disorders, only 1 evaluated whether outcomes differed for those with versus without preexisting MH disorders. This study³⁹ (N=402) found that previous psychiatric history had a significant effect on current self-reported MH symptoms ($p < 0.0001$). Specifically, patients with a previous psychiatric history (*ie*, diagnosis of MDD, GAD, panic attack disorder, bipolar disorder, social phobia, eating disorder, or other MH disorder) had worse symptoms of anxiety, depression, PTSD, insomnia, and obsessive-compulsive disorder post-discharge than those without a previous psychiatric history. Of note, in this study only 300 participants were hospitalized with COVID-19, with the other 102 participants managed at home. The study does not separate results by hospitalization status. Overall, evidence is insufficient to draw conclusions on MH outcomes for COVID-19 patients with pre-existing MH disorders, given the paucity of available data.

KEY QUESTION 3A: How often do adults with preexisting MH conditions who have been hospitalized for COVID-19 experience exacerbation of MH symptoms compared to those with outpatient COVID-19?

We identified no evidence addressing this question.

KEY QUESTION 3B: How often do adults with preexisting MH conditions who have been hospitalized for COVID-19 experience exacerbation of MH symptoms compared to adults hospitalized for other causes?

We identified no evidence addressing this question.

KEY QUESTION 3C: Does the probability of exacerbating MH symptoms during or after hospitalization for COVID-19 vary by patient characteristics (eg, age, sex, race/ethnicity, comorbidities), COVID-19 disease severity, or level of care?

We identified no evidence addressing this question.

KEY QUESTION 4: How often and what kinds of MH care do adults access during or after hospitalization for COVID-19?

There is limited available evidence on MH care utilization among those hospitalized for COVID-19. One study³² of 339 hospitalized COVID-19 patients examined the reasons for readmission of 19 patients who were readmitted after a median of 5 days following hospitalization for COVID-19. Authors reported that 3 out of 19 readmitted patients had a psychiatric illness as their reason

for readmission. However, the study also reported psychiatric diagnoses upon initial admission for 2 of these patients. Therefore, COVID-19 is unlikely to be the etiology for these psychiatric symptoms. The 3 patients readmitted for psychiatric illness underwent psychiatric evaluation. Evidence is insufficient to draw conclusions on MH care utilization during or after hospitalization for COVID-19, due to the limited available data.

KEY QUESTION 4A: Does the type or extent of MH care used by adults during or after COVID-19 hospitalization differ compared to before hospitalization?

We identified no evidence addressing this question.

KEY QUESTION 4B: Does the type or extent of MH care utilization differ for adults hospitalized for COVID-19 compared to adults receiving outpatient treatment for COVID-19?

We identified no evidence addressing this question.

KEY QUESTION 4C: Does the type or extent of MH care utilization differ for adults hospitalized for COVID-19 compared to adults hospitalized for other causes?

We identified no evidence addressing this question.

KEY QUESTION 4D: Does the type or extent of MH care utilization during or after hospitalization for COVID-19 vary by patient characteristics (eg, age, sex, race/ethnicity, comorbidities), COVID-19 disease severity, or level of care?

We identified no evidence addressing this question.

KEY QUESTION 5: What are the MH care resource needs among adults who have been hospitalized for COVID-19?

There is limited available evidence on MH resource needs among people hospitalized for COVID-19. A poor-quality study³⁶ found 59% of hospitalized patients reported at least some need for psychological guidance in rehabilitation; however, the study does not provide any additional information on what is meant by “guidance.” Evidence is therefore insufficient to draw conclusions on MH care resource needs based on the paucity of available data.

SUMMARY AND DISCUSSION

We conducted a rapid evidence review to determine the prevalence of MH disorders among adults hospitalized for COVID-19, to compare this to the prevalence of MH disorders in relevant comparison groups, and to determine MH care utilization and resource needs post-hospitalization for patients with COVID-19. Although a few systematic reviews have examined the prevalence of MH disorders during the COVID-19 pandemic, they have either focused on the general population,⁴⁶ or evaluated patients with COVID-19 together with SARS and MERS patients.¹¹ To our knowledge, this is the first evidence review on the prevalence of mental health disorders *specifically* among patients who have been hospitalized for COVID-19. Because of the rapidly changing body of evidence given the urgency of COVID-19 research and frequency with which new COVID-19 studies are being published, this is a living review, updated frequently. This is the first update of the initial review, adding literature published in the 4 months following the initial report. In this update, 11 new studies (3 retrospective cohort and 8 cross-sectional) were included and added to the initial report which included only 2 studies (both cross-sectional).

Overall, studies indicate there is a high prevalence of MH symptoms among people who have been hospitalized with COVID-19. Specifically, during hospitalization, insomnia (43.3-54.1%), depression symptoms (43.3-45.9%), anxiety symptoms (23.3-38.8%), and adjustment disorder (26.7%) are common. The prevalence of anxiety and insomnia symptoms appears to be similar or slightly lower during the 3-month post-hospitalization period. The prevalence of post-hospitalization depression symptoms was more variable (10-66%) than during hospitalization. A variety of tools were used to measure depression symptoms in these studies, which may explain some – but likely not all – of the variance. Although we found no studies directly comparing hospitalized COVID-19 patients to patients hospitalized for other reasons, our included studies' estimates of MH disorder prevalence during hospitalization are similar to prevalence estimates from studies of patients acutely ill with SARS and MERS infections,¹¹ and patients hospitalized for other serious illnesses.¹² None of our included studies measured MH outcomes more than 3 months after hospitalization, nor did they measure the prevalence of substance use disorders or psychosis at any time point.

One large, good-quality, retrospective cohort study⁴⁰ provides the best available evidence on the incidence of new MH disorders in hospitalized versus non-hospitalized patients with COVID-19 that do not have preexisting MH conditions. This study found hospitalized patients have a 40% increased risk of receiving *any* new MH disorder diagnosis. However, additional, smaller, fair-quality cross-sectional studies^{30,39} examining comparative prevalence do not provide a clear picture of *which* MH disorders people hospitalized with COVID-19 might be at higher risk of experiencing. For example, some studies reported hospitalized patients were at higher risk of experiencing insomnia and lower risk of experiencing anxiety compared to outpatients, while others indicated rates of these MH conditions were similar between inpatients and outpatients.

It is unclear whether certain patient, COVID-19 disease, or level of care characteristics are associated with the development of MH conditions among patients hospitalized for COVID 19 who do not have preexisting MH conditions. Evidence of the impact of patient characteristics such as gender, age, and race/ethnicity on MH symptoms is generally mixed. Women may be at higher risk of developing certain MH symptoms (including anxiety during hospitalization, PTSD post-discharge, and insomnia at both time points) compared to men and younger patients may be at higher risk of developing PTSD symptoms compared to older patients post-discharge.

However, these findings are all based on studies with small sample sizes and methodological limitations. Severity of COVID-19 may be associated with anxiety during and after hospitalization, PTSD after hospitalization, and insomnia during hospitalization, but findings on depression are mixed. Duration of COVID-19 is probably not associated with anxiety or insomnia symptoms, but findings on depression are mixed. Certain types of care, such as corticosteroids, are associated with higher risk of anxiety symptoms (which may be an unintended side effect of these medications),¹⁵ but lower risk of PTSD symptoms.

Evidence is limited on whether patients hospitalized with COVID-19 with preexisting MH disorders experience an exacerbation of MH symptoms, what types of MH care are utilized by hospitalized COVID-19 patients post-discharge, and what patients' self-reported MH care resource needs are. We only identified a single study addressing each of these areas of interest, and each study provided limited data to address our questions.

LIMITATIONS

There were limitations to both our rapid review methods and limitations of our included studies.

Rapid Review Limitations

The primary limitation of our rapid review methods is that we had a single reviewer assess articles for inclusion, abstract data, and assess study quality, with a second reviewer verifying selection and abstraction. This could have resulted in missing eligible studies or data, although we attempted to reduce this risk by establishing explicit inclusion criteria for studies, developing and using a piloted data abstraction tool, and developing a key for determining whether a study met each of JBI's quality criteria.

Primary Study Limitations

There were several important limitations of our 13 included studies. As described in the "Results" section, only 1 study was high quality. The other 12 studies were fair or poor quality, with common methodological limitations including not reporting or accounting for the prevalence of preexisting MH disorders in analyses, limited information on other medical comorbidities that could be confounders, limited information on the severity of COVID-19 among participants, and a lack of information on whether COVID-19 diagnoses were confirmed using laboratory testing. Additionally, 4 studies enrolled fewer than 100 people. Small sample sizes increase the risk that findings are the result of random error and make it difficult to determine if there are statistically differences between subgroups. Finally, all studies measured outcomes at a single time point or gave prevalence estimates over a given time period; none directly evaluated whether the prevalence of MH symptoms changed over time. We indirectly evaluated changes over time by comparing the prevalence of MH symptoms in studies conducted during the hospitalization period to different studies conducted in the post-hospitalization period, but studies of multiple time points would provide more rigorous estimates.

GAPS AND FUTURE RESEARCH

We identified several important knowledge gaps that should be informed by future research. Even after the addition of 11 new studies published since the initial report, many of the same research gaps remain.

- Researchers should assess the prevalence of psychiatric disorders, including but not limited to anxiety disorders, mood disorders, PTSD, substance use disorders, sleep disorders, and psychotic disorders, among patients hospitalized for COVID-19. We identified no studies evaluating the prevalence psychotic disorders or substance use disorders, and limited data on the prevalence of PTSD among people hospitalized for COVID-19. Robust assessment of the prevalence of these MH disorders should be prioritized in future research. Evidence from primarily SARS and MERS patients who are seriously ill indicate that almost one-third go on to develop PTSD,¹¹ and it is plausible that those hospitalized with COVID-19 might be at a similar risk. There is also a well-established link between traumatic experiences and substance use disorders,⁴⁷ and those who experience trauma from their COVID-19 illness could be at risk of developing substance use disorders after hospital discharge. While psychotic disorders are overall less prevalent than other mental health disorders, there are case reports of psychosis among both inpatients and outpatients with COVID-19.^{48,49} Preliminary evidence⁵⁰ from a cross-sectional study published as a research letter in *JAMA Psychiatry* suggests the prevalence of psychotic disorders after severe COVID-19 is very low (0.2%). However, in the case reports, the psychotic disorders were new onset, often severe, and occurred in populations at otherwise low risk for psychosis. Therefore, this low prevalence but potentially serious consequence of COVID-19 warrants further investigation. Finally, although we identified more studies examining the prevalence of depression, anxiety, insomnia, and adjustment disorders in the search conducted for this updated report, the evidence base was still small for most MH outcomes and depression prevalence estimates were inconsistent across studies; therefore, the evidence continued to be insufficient to draw firm conclusions.
- Researchers should conduct larger, longer, multi-center studies to provide more rigorous estimates of post-hospitalization prevalence of mental health disorders. We identified 7 studies examining prevalence of MH disorders after hospitalization. However, 6 of these studies were cross-sectional, generally with small sample sizes (range= 64-675; total n=1,468), conducted in single hospitals or single cities. Additionally, studies only analyzed data during or up to 3 months after hospitalization for COVID-19. Researchers should conduct larger studies, at multiple locations (eg, multiple hospitals/clinics at multiple locations), with longer periods of follow-up (eg, 6 or more months post-discharge) to allow for time to meet DSM-5 criteria for a new-onset mental health disorder and to provide stronger estimates of longer term MH outcomes. Evaluating longer-term outcomes is particularly important given there is emerging evidence that some patients experience long-term effects (including MH disorders or symptoms) of COVID-19 – so-called “long COVID.”^{51,52} Preliminary research indicates one-third of people with mild COVID-19⁵³ do not return to usual health within 2-3 weeks, and four-fifths of those hospitalized for COVID-19 are still experiencing at least 1 symptom of COVID-19 two months after their initial symptoms.⁵⁴ It is currently unclear what proportion of people experience long-term MH effects of COVID-19. Large-scale data repositories or electronic health record (EHR) data could be used to conduct this type of longitudinal, comparative, multisite research of longer-term outcomes.
- Researchers should compare patients who have been hospitalized for COVID-19 to relevant control groups. More comparative studies are needed, as these can help to determine the extent to which outcomes are driven by the COVID-19 illness itself or by

other factors such as the experience of hospitalization, severity of COVID-19 symptoms, level of care needed such as ICU versus non-ICU, and other factors.

- Researchers should report and account for potential confounders, particularly preexisting mental health disorders, medications, and medical comorbidities. As discussed in the “Limitations” section, few studies reported whether participants had preexisting mental health disorders. This is problematic because the prevalence of *post-hospitalization* mental health disorders is likely influenced by the prevalence of *pre-hospitalization* mental health disorders. For cross-sectional studies, researchers should at minimum report the proportion of participants with specific preexisting mental health disorders. For comparative cross-sectional studies or longitudinal studies, researchers should report the proportion of participants with specific preexisting mental health disorders *for each comparison group*. Ideally, researchers would account for preexisting mental health disorders in prevalence estimates (*eg*, by separately reporting the proportion of participants with mental health disorders among those who had preexisting disorders and the proportion of participants with new-onset mental health disorders, and by estimating adjusted prevalence or risk ratios). Similarly, researchers should also report patients’ preexisting medications and medical comorbidities. Finally, wherever possible, researchers should also report on patients’ social determinants of health (such as homelessness and social support), as these factors are likely to influence the pre-hospitalization prevalence of mental health disorders.
- Researchers should assess the mental health care utilization and resource needs of patients after their discharge for COVID-19. While we identified 2 studies that provide some information about the MH care needs of COVID-19 patients during or after hospitalization, the studies were small and low quality, and, most importantly, they did not provide much information about patient MH care preferences or needs. It is unclear, for example, whether patients hospitalized with COVID-19 should be screened for mental health disorders, and if so, when. It is also unclear if traditional methods of diagnosing and treating mental health disorders are sufficient for these patients, or if additional or novel assessments, treatment strategies, or resources should be provided. Given the absence of evidence on patients’ post-hospitalization needs and preferences, continuing to rely on existing, standard procedures for primary care outreach to assess patients’ mental and physical health needs after hospitalization is likely appropriate. However, developing mental health screening tools tailored to the specific needs of patients who have been hospitalized for COVID-19 is also warranted. Screening items could include assessment of mental health symptoms related to hospitalization as well as other concerns stemming from the COVID-19 pandemic that could impact mental health (*eg*, loss of employment, separation from loved ones, anxiety about possible reinfection, *etc*).

CONCLUSIONS

In this update, we identified a total of 3 retrospective cohort and 10 cross-sectional studies examining prevalence, most of which significant methodological limitations. Only a small handful of studies compared MH symptoms and diagnoses in patients hospitalized for COVID-19 to other relevant patient groups. Evidence from primarily fair-quality studies suggests the prevalence of MH disorders – including insomnia (43.3-54.1%), depression (43.3-45.9%), anxiety (23.3-38.8%), and adjustment disorder (26.7%) – is high among hospitalized patients with COVID-19. The prevalence of anxiety and insomnia is similar or slightly lower in the 3

months following hospitalization. Symptoms of PTSD (15.4-31%) and obsessive-compulsive symptoms (19.6%) are also common after hospitalization. The prevalence of post-hospitalization depression is more variable (10-65.7%) in the post-hospitalization period than during hospitalization. More research is needed to determine if people with preexisting MH disorders who are hospitalized for COVID-19 experience exacerbation of existing mental health conditions, and to evaluate mental health treatment utilization and resource needs following hospitalization. This evidence base is rapidly evolving, and higher-quality evidence may change these conclusions.

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In designing the study questions and methodology at the outset of this report, the ESP consulted several technical and content experts. Broad expertise and perspectives were sought. Divergent and conflicting opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Therefore, in the end, study questions, design, methodologic approaches, and/or conclusions do not necessarily represent the views of individual technical and content experts.

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Operational Partners

Operational partners are system-level stakeholders who have requested the report to inform decision-making. They recommend Technical Expert Panel (TEP) participants; assure VA relevance; help develop and approve final project scope and timeframe for completion; provide feedback on draft report; and provide consultation on strategies for dissemination of the report to field and relevant groups.

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Peer Reviewers

The Coordinating Center sought input from external peer reviewers to review the draft report and provide feedback on the objectives, scope, methods used, perception of bias, and omitted evidence. Peer reviewers must disclose any relevant financial or non-financial conflicts of interest. Because of their unique clinical or content expertise, individuals with potential conflicts may be retained. The Coordinating Center and the ESP Center work to balance, manage, or mitigate any potential nonfinancial conflicts of interest identified.

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