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

Supplementary Materials

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Prepared for:

Department of Veterans Affairs
Veterans Health Administration
Health Services Research & Development Service
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U.S. Department of Veterans Affairs

Veterans Health Administration
Health Services Research & Development Service



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SEARCH STRATEGIES

SYSTEMATIC REVIEW SEARCH STRATEGIES

Ovid MEDLINE Ovid MEDLINE(R) ALL 1946 to October 05, 2020 Date Searched: 10-08-20		
#	Search Statement	Results
1	((coronavir* OR corona virus* OR betacoronavir* OR covid19 OR covid 19 OR nCoV OR CoV 2 OR CoV2 OR sarscov2 OR 2019nCoV OR 2019 novel coronavirus* OR 2019 novel CoV OR wuhan virus*) OR ((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*))).ti,ab,kw.	70075
2	Coronavirus Infections/ OR Coronavirus/ OR betacoronavirus/	34248
3	1 or 2	72751
4	Mental Health/ or exp Mood Disorders/ or exp Depression/ or Depressive Disorder/ or exp Anxiety/ or exp Anxiety Disorders/ or exp Stress Disorders, Traumatic/ or exp Substance-Related Disorders/ or Psychotic Disorders/ or exp Psychotic Affective Disorders/ or exp Hallucinations/ or exp Delusions/ or exp Apathy/ or exp Euphoria/ or exp Aggression/ or exp Personality Disorders/ or exp Schizophrenia/ or exp Mental Disorders/ or exp Obsessive-Compulsive Disorder/ or exp Panic Disorder/ or exp Bipolar Disorder/ or exp Suicide/ or exp Emotions/ or exp Confusion/	1580488
5	((mental adj1 health) or mood or depressed or depression or depressive or anxiety or anxieties or anxious or stress disorder or stress disorders or PTSD or post?trauma or post?traumatic or (substance adj1 (abuse or addiction or dependence)) or (drug adj1 (abuse or addiction or dependence)) or psychotic or psychoses or psychosis or schizoaffective or hallucinating or hallucination or hallucinations hallucinated or delusion or delusions or apathy or apathetic or indifference or agitated or agitation or agitations or euphoria or euphoric or elation or elated or disinhibition or disinhibitions or disinhibited or aggression or aggressions or personality or mental or affective or (obsessive adj compulsive) or OCD or panic or neurosis or neurotic or bipolar or mania or manic or suicide or suicidality or suicidal or emotion or tired or confusion or confused).ti,ab,kw.	1285169
6	4 or 5	2209181
7	exp Hospitalization/ or exp Intensive Care Units/ or Inpatients/ or Subacute Care/	330396
8	(hospital or hospitalized or hospitalization or intensive or ICU or care or post?acute or inpatient or inpatients or admit or admitted or admitting).ti,ab,kw.	2551626
9	7 or 8	2623615
10	3 and 6 and 9	1395
11	(systematic review.ti. or meta-analysis.pt. or meta-analysis.ti. or systematic literature review.ti. or this systematic review.tw. or pooling project.tw. or (systematic review.ti,ab. and review.pt.) or meta synthesis.ti. or meta-analy*.ti. or integrative review.tw. or integrative research review.tw. or rapid review.tw. or umbrella review.tw. or consensus development conference.pt. or practice guideline.pt. or drug class reviews.ti. or cochrane database syst rev.jn. or acp journal club.jn. or health technol assess.jn. or evid rep technol assess summ.jn. or jbi database system rev implement rep.jn. or (clinical guideline and management).tw. or ((evidence based.ti. or evidence-based medicine/ or best practice*.ti. or evidence synthesis.ti,ab.) and (((review.pt. or diseases category/ or behavior.mp.) and behavior mechanisms/) or therapeutics/ or evaluation studies.pt. or validation studies.pt. or guideline.pt. or pmcbook.mp.)) or (((systematic or systematically).tw. or critical.ti,ab. or study selection.tw. or ((predetermined or inclusion) and criteri*).tw. or exclusion criteri*.tw. or main outcome measures.tw. or standard of care.tw. or standards of care.tw.) and ((survey or surveys).ti,ab. or overview*.tw. or	429345

	review.ti,ab. or reviews.ti,ab. or search*.tw. or handsearch.tw. or analysis.ti. or critique.ti,ab. or appraisal.tw. or (reduction.tw. and (risk/ or risk.tw.) and (death or recurrence).mp.)) and ((literature or articles or publications or publication or bibliography or bibliographies or published).ti,ab. or pooled data.tw. or unpublished.tw. or citation.tw. or citations.tw. or database.ti,ab. or internet.ti,ab. or textbooks.ti,ab. or references.tw. or scales.tw. or papers.tw. or datasets.tw. or trials.ti,ab. or meta-analy*.tw. or (clinical and studies).ti,ab. or treatment outcome/ or treatment outcome.tw. or pmcbook.mp.))) not (letter or newspaper article).pt.	
12	10 and 11	63
13	limit 12 to english language	57
14	limit 13 to yr="2019-Current"	57

Cochrane Database of Systematic Reviews (CDSR)		
Date Searched: 10/8/20		
#	Search Statement	Results
1	((coronavir* OR corona virus* OR betacoronavir* OR covid19 OR covid 19 OR nCoV OR CoV 2 OR CoV2 OR sarscov2 OR 2019nCoV OR 2019 novel coronavirus* OR 2019 novel CoV OR wuhan virus*) OR ((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*))).ti,ab,kw.	9
2	MeSH descriptor: [Coronavirus Infections] explode all trees	6
3	MeSH descriptor: [Coronavirus] explode all trees	4
4	MeSH descriptor: [Coronavirus] explode all trees	4
5	{OR #1-#4}	9
6	MeSH descriptor: [Mental Health] explode all trees	21
7	MeSH descriptor: [Mood Disorders] explode all trees	66
8	MeSH descriptor: [Depression] explode all trees	165
9	MeSH descriptor: [Depressive Disorder] explode all trees	62
10	MeSH descriptor: [Anxiety] explode all trees	83
11	MeSH descriptor: [Anxiety Disorders] explode all trees	42
12	MeSH descriptor: [Stress Disorders, Post-Traumatic] explode all trees	22
13	MeSH descriptor: [Substance-Related Disorders] explode all trees	135
14	MeSH descriptor: [Psychotic Disorders] explode all trees	48
15	MeSH descriptor: [Affective Disorders, Psychotic] explode all trees	1
16	MeSH descriptor: [Hallucinations] explode all trees	2
17	MeSH descriptor: [Hallucinations] explode all trees	1
18	MeSH descriptor: [Apathy] explode all trees	1
19	MeSH descriptor: [Euphoria] explode all trees	1
20	MeSH descriptor: [Aggression] explode all trees	29
21	MeSH descriptor: [Personality Disorders] explode all trees	11
22	MeSH descriptor: [Schizophrenia] explode all trees	189
23	MeSH descriptor: [Mental Disorders] explode all trees	868
24	MeSH descriptor: [Obsessive-Compulsive Disorder] explode all trees	7
25	MeSH descriptor: [Panic Disorder] explode all trees	8
26	MeSH descriptor: [Bipolar Disorder] explode all trees	22
27	MeSH descriptor: [Suicide] explode all trees	11



28	MeSH descriptor: [Emotions] explode all trees	103
29	MeSH descriptor: [Confusion] explode all trees	20
30	((mental NEXT health) or mood or depressed or depression or depressive or anxiety or anxieties or anxious or stress disorder or stress disorders or PTSD or post?trauma or post?traumatic or (substance NEAR/1 (abuse or addiction or dependence)) or (drug NEAR/1 (abuse or addiction or dependence)) or psychotic or psychoses or psychosis or schizoaffective or hallucinating or hallucination or hallucinations hallucinated or delusion or delusions or apathy or apathetic or indifference or agitated or agitation or agitations or euphoria or euphoric or elation or elated or disinhibition or disinhibitions or disinhibited or aggression or aggressions or personality or mental or affective or (obsessive NEXT compulsive) or OCD or panic or neurosis or neurotic or bipolar or mania or manic or suicide or suicidality or suicidal or emotion or tired or confusion or confused).ti,ab,kw	1663
31	{OR #6-#30}	1892
32	MeSH descriptor: [Hospitalization] in all MeSH products	350
33	MeSH descriptor: [Intensive Care Units] explode all trees	68
34	MeSH descriptor: [Inpatients] explode all trees	8
35	MeSH descriptor: [Subacute Care] explode all trees	0
36	((hospital or hospitalized or hospitalization or intensive or ICU or care or post?acute or inpatient or inpatients or admit or admitted or admitting)):ti,ab,kw	3561
37	{OR #32-#36}	3565
38	#5 AND #31 AND #37	2

Non-Bibliographic Databases		
Date Searched: 10-08-20		
Database/Resource	Search Terms/Relevant Results	Relevant Results
Cochrane COVID Rapid Reviews	https://www.cochranelibrary.com/covid-19#Rapid%20reviews Search terms: mental health	0
CEBM Oxford COVID-19 Evidence Service	https://www.cebm.net/covid-19/ Search terms: mental health	0
CADTH	https://covid.cadth.ca/ Search terms: mental health	0
McMaster University National Collaborating Centre for Methods and Tools	https://www.nccmt.ca/knowledge-repositories/covid-19-evidence-reviews Search terms: mental health	0
VA ESP COVID-19 Evidence Reviews	https://www.covid19reviews.org Search terms: mental health	0

Systematic Reviews Under Development		
Date Searched: 10-8-20		
Database/Resource	Search Terms/Relevant Results	Relevant Results
PROSPERO (SR registry)	http://www.crd.york.ac.uk/PROSPERO/ Search terms: mental health	3
CEBM Oxford COVID-19 Evidence Service	https://www.cebm.net/covid-19/current-questions-under-review/ Search terms: mental health	0
Cochrane COVID Rapid Reviews	https://covidrapidreviews.cochrane.org/search/site/ Search terms: mental health	1
CADTH	https://covid.cadth.ca/work-in-progress/ Search terms: mental health	0
McMaster University National Collaborating Centre for Methods and Tools	https://www.nccmt.ca/knowledge-repositories/covid-19-evidence-reviews Search terms: mental health	1
medRxiv	https://icite.od.nih.gov/covid19/search/#search:searchId=5f10ae17bc36f669e122f7bb Search terms: mental health (Filters: medRxiv, Systematic Reviews, title/abstract)	0

PRIMARY LITERATURE SEARCH STRATEGIES

Ovid MEDLINE [Ovid MEDLINE(R) ALL 1946 to July 15, 2020]		
Date searched: 10-08-20		
#	Search Statement	Results
1	(coronavir* OR corona virus* OR betacoronavir* OR covid19 OR covid 19 OR nCoV OR CoV 2 OR CoV2 OR sarscov2 OR 2019nCoV OR 2019 novel coronavirus* OR 2019 novel CoV OR wuhan virus*) OR ((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*)).ti,ab,kw.	70075
2	Coronavirus Infections/ OR Coronavirus/ OR betacoronavirus/	34248
3	1 or 2	72751
4	Mental Health/ or exp Mood Disorders/ or exp Depression/ or Depressive Disorder/ or exp Anxiety/ or exp Anxiety Disorders/ or exp Stress Disorders, Traumatic/ or exp Substance-Related Disorders/ or Psychotic Disorders/ or exp Psychotic Affective Disorders/ or exp Hallucinations/ or exp Delusions/ or exp Apathy/ or exp Euphoria/ or	1580488

	exp Aggression/ or exp Personality Disorders/ or exp Schizophrenia/ or exp Mental Disorders/ or exp Obsessive-Compulsive Disorder/ or exp Panic Disorder/ or exp Bipolar Disorder/ or exp Suicide/ or exp Emotions/ or exp Confusion/	
5	((mental adj1 health) or mood or depressed or depression or depressive or anxiety or anxieties or anxious or stress disorder or stress disorders or PTSD or post?trauma or post?traumatic or (substance adj1 (abuse or addiction or dependence)) or (drug adj1 (abuse or addiction or dependence)) or psychotic or psychoses or psychosis or schizoaffective or hallucinating or hallucination or hallucinations hallucinated or delusion or delusions or apathy or apathetic or indifference or agitated or agitation or agitations or euphoria or euphoric or elation or elated or disinhibition or disinhibitions or disinhibited or aggression or aggressions or personality or mental or affective or (obsessive adj compulsive) or OCD or panic or neurosis or neurotic or bipolar or mania or manic or suicide or suicidality or suicidal or emotion or tired or confusion or confused).ti,ab,kw.	1285169
6	4 or 5	2209181
7	exp Hospitalization/ or exp Intensive Care Units/ or Inpatients/ or Subacute Care/	330396
8	(hospital or hospitalized or hospitalization or intensive or ICU or care or post?acute or inpatient or inpatients or admit or admitted or admitting).ti,ab,kw.	2551626
9	7 or 8	2623615
10	3 and 6 and 9	1395
11	limit 10 to english language	1319
12	limit 11 to yr="2019-Current"	1294

WHO COVID-19 Database

Date searched: 10-08-20

#	Search Statement	Results
1	mental health or mood or depressed or depression or depressive or anxiety or anxieties or anxious or stress disorder or stress disorders or PTSD or post-trauma or post-traumatic or substance abuse or substance addiction or substance dependence or drug abuse or drug addiction or drug dependence or psychotic or psychoses or psychosis or schizoaffective or hallucinating or hallucination or hallucinations hallucinated or delusion or delusions or apathy or apathetic or indifference or agitated or agitation or agitations or euphoria or euphoric or elation or elated or disinhibition or disinhibitions or disinhibited or aggression or aggressions or personality or mental or affective or obsessive compulsive or OCD or panic or neurosis or neurotic or bipolar or mania or manic or suicide or suicidality or suicidal or emotion or tired or confusion or confused (Title, abstract, subject)	1986
2	hospital or hospitalized or hospitalization or intensive or ICU or care or post-acute or post acute or inpatient or inpatients or admit or admitted or admitting (Title, abstract, subject)	21697
3	1 and 2	1299
4	limit 3 to english language	1090

PsycINFO

Date Searched: 10-08-20

#	Search Statement	Results
1	TI (((coronavir* OR corona virus* OR betacoronavir* OR covid19 OR covid 19 OR nCoV OR CoV 2 OR CoV2 OR sarscov2 OR 2019nCoV OR 2019 novel coronavirus* OR 2019 novel CoV OR wuhan virus*) OR ((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*)))) OR AB (((coronavir* OR corona virus* OR betacoronavir* OR covid19 OR covid 19 OR nCoV OR CoV 2 OR CoV2 OR sarscov2 OR 2019nCoV OR 2019 novel coronavirus* OR 2019 novel CoV OR wuhan virus*) OR	437



	((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*))) OR KW (((coronavir* OR corona virus* OR betacoronavir* OR covid19 OR covid 19 OR nCoV OR CoV 2 OR CoV2 OR sarscov2 OR 2019nCoV OR 2019 novel coronavirus* OR 2019 novel CoV OR wuhan virus*) OR ((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*))))	
2	DE "Coronavirus"	339
3	1 or 2	587
4	((((((((((((((((((((DE "Mental Health" OR DE "Mental Status") OR (DE "Affective Disorders" OR DE "Disruptive Mood Dysregulation Disorder" OR DE "Major Depression")) OR (DE "Major Depression" OR DE "Anaclitic Depression" OR DE "Dysthymic Disorder" OR DE "Endogenous Depression" OR DE "Reactive Depression" OR DE "Recurrent Depression" OR DE "Treatment Resistant Depression")) AND (DE "Anxiety" OR DE "Anxiety Sensitivity" OR DE "Death Anxiety" OR DE "Health Anxiety" OR DE "Social Anxiety" OR DE "Anxiety Disorders" OR DE "Generalized Anxiety Disorder" OR DE "Obsessive Compulsive Disorder" OR DE "Panic Attack" OR DE "Panic Disorder" OR DE "Phobias" OR DE "Separation Anxiety Disorder" OR DE "Trichotillomania")) OR (DE "Posttraumatic Stress Disorder" OR DE "Complex PTSD" OR DE "DESNOS")) OR (DE "Substance Use Disorder" OR DE "Addiction" OR DE "Alcohol Use Disorder" OR DE "Cannabis Use Disorder" OR DE "Drug Abuse" OR DE "Drug Dependency" OR DE "Inhalant Abuse" OR DE "Opioid Use Disorder" OR DE "Tobacco Use Disorder")) OR (DE "Psychoticism")) AND (DE "Acute Psychosis" OR DE "Acute Schizophrenia" OR DE "Acute Schizophrenia" OR DE "Acute Stress Disorder") OR (DE "Hallucinations" OR DE "Auditory Hallucinations" OR DE "Hypnagogic Hallucinations" OR DE "Visual Hallucinations")) OR (DE "Delusions")) OR (DE "Apathy")) OR (DE "Euphoria")) AND (DE "Aggressive Behavior" OR DE "Attack Behavior" OR DE "Coercion" OR DE "Conflict" OR DE "Microaggression" OR DE "Relational Aggression" OR DE "Threat" OR DE "Aggressiveness")) OR (DE "Personality Disorders" OR DE "Antisocial Personality Disorder" OR DE "Avoidant Personality Disorder" OR DE "Borderline Personality Disorder" OR DE "Dependent Personality Disorder" OR DE "Histrionic Personality Disorder" OR DE "Narcissistic Personality Disorder" OR DE "Obsessive Compulsive Personality Disorder" OR DE "Paranoid Personality Disorder" OR DE "Passive Aggressive Personality Disorder" OR DE "Sadomasochistic Personality" OR DE "Schizoid Personality Disorder" OR DE "Schizotypal Personality Disorder")) OR (DE "Mental Disorders" OR DE "Affective Disorders" OR DE "Anxiety Disorders" OR DE "Bipolar Disorder" OR DE "Borderline States" OR DE "Chronic Mental Illness" OR DE "Dissociative Disorders" OR DE "Eating Disorders" OR DE "Gender Dysphoria" OR DE "Mental Disorders due to General Medical Conditions" OR DE "Neurocognitive Disorders" OR DE "Neurodevelopmental Disorders" OR DE "Neurosis" OR DE "Paraphilias" OR DE "Personality Disorders" OR DE "Psychosis" OR DE "Serious Mental Illness" OR DE "Sleep Wake Disorders" OR DE "Somatoform Disorders" OR DE "Stress and Trauma Related Disorders" OR DE "Substance Related and Addictive Disorders" OR DE "Thought Disturbances")) OR (DE "Obsessive Compulsive Disorder" OR DE "Hoarding Disorder" OR DE "Koro")) OR (DE "Panic Disorder")) OR (DE "Bipolar Disorder" OR DE "Bipolar I Disorder" OR DE "Bipolar II Disorder" OR DE "Cyclothymic Disorder" OR DE "Mania")) OR (DE "Suicide" OR DE "Attempted Suicide" OR DE "Suicidality")) OR (DE "Emotions" OR DE "Contempt" OR DE "Desire" OR DE "Emotional Content" OR DE "Emotional Disturbances" OR DE "Emotional Health" OR DE "Emotional Processing" OR DE "Emotional Regulation" OR DE "Emotional States" OR DE "Emotional Style" OR DE "Expressed Emotion" OR DE "Negative Emotions" OR DE "Positive Emotions")) OR (DE "Mental Confusion")	477518
5	TI (((mental N1 health) or mood or depressed or depression or depressive or anxiety or anxieties or anxious or stress disorder or stress disorders or PTSD or post#trauma or post#traumatic or (substance N1 (abuse or addiction or dependence)) or (drug N1 (abuse or addiction or dependence)) or psychotic or psychoses or psychosis or	1304130



	schizoaffective or hallucinating or hallucination or hallucinations hallucinated or delusion or delusions or apathy or apathetic or indifference or agitated or agitation or agitations or euphoria or euphoric or elation or elated or disinhibition or disinhibitions or disinhibited or aggression or aggressions or personality or mental or affective or (obsessive N1 compulsive) or OCD or panic or neurosis or neurotic or bipolar or mania or manic or suicide or suicidality or suicidal or emotion or tired or confusion or confused)) OR AB (((mental N1 health) or mood or depressed or depression or depressive or anxiety or anxieties or anxious or stress disorder or stress disorders or PTSD or post#trauma or post#traumatic or (substance N1 (abuse or addiction or dependence)) or (drug N1 (abuse or addiction or dependence)) or psychotic or psychoses or psychosis or schizoaffective or hallucinating or hallucination or hallucinations hallucinated or delusion or delusions or apathy or apathetic or indifference or agitated or agitation or agitations or euphoria or euphoric or elation or elated or disinhibition or disinhibitions or disinhibited or aggression or aggressions or personality or mental or affective or (obsessive N1 compulsive) or OCD or panic or neurosis or neurotic or bipolar or mania or manic or suicide or suicidality or suicidal or emotion or tired or confusion or confused)) OR KW (((mental N1 health) or mood or depressed or depression or depressive or anxiety or anxieties or anxious or stress disorder or stress disorders or PTSD or post#trauma or post#traumatic or (substance N1 (abuse or addiction or dependence)) or (drug N1 (abuse or addiction or dependence)) or psychotic or psychoses or psychosis or schizoaffective or hallucinating or hallucination or hallucinations hallucinated or delusion or delusions or apathy or apathetic or indifference or agitated or agitation or agitations or euphoria or euphoric or elation or elated or disinhibition or disinhibitions or disinhibited or aggression or aggressions or personality or mental or affective or (obsessive N1 compulsive) or OCD or panic or neurosis or neurotic or bipolar or mania or manic or suicide or suicidality or suicidal or emotion or tired or confusion or confused))	
6	4 or 5	1405197
7	(DE "Hospitalization" OR DE "Commitment (Psychiatric)" OR DE "Hospital Admission" OR DE "Hospital Discharge" OR DE "Psychiatric Hospitalization" OR DE "Hospitalized Patients") OR (DE "Intensive Care" OR DE "Neonatal Intensive Care")	47161
8	TI ((hospital or hospitalized or hospitalization or intensive or ICU or care or post#acute or inpatient or inpatients or admit or admitted or admitting)) OR AB ((hospital or hospitalized or hospitalization or intensive or ICU or care or post#acute or inpatient or inpatients or admit or admitted or admitting)) OR KW ((hospital or hospitalized or hospitalization or intensive or ICU or care or post#acute or inpatient or inpatients or admit or admitted or admitting))	510929
9	7 or 8	515328
10	3 and 6 and 9	106
11	limit 10 to english language	106
12	limit 11 to yr="2019-Current"	104

CINAHL		
Date Searched: 10-08-20		
#	Search Statement	Results
1	TI (((coronavir* OR corona virus* OR betacoronavir* OR covid19 OR covid 19 OR nCoV OR CoV 2 OR CoV2 OR sarscov2 OR 2019nCoV OR 2019 novel coronavirus* OR 2019 novel CoV OR wuhan virus*) OR ((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*)))) OR AB (((coronavir* OR corona virus* OR betacoronavir* OR covid19 OR covid 19 OR nCoV OR CoV 2 OR CoV2 OR sarscov2 OR 2019nCoV OR 2019 novel coronavirus* OR 2019 novel CoV OR wuhan virus*) OR ((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*)))) OR MW (((coronavir* OR corona virus* OR betacoronavir* OR covid19 OR covid 19 OR nCoV OR CoV 2 OR CoV2 OR sarscov2 OR 2019nCoV OR 2019 novel coronavirus* OR	6508



	2019 novel CoV OR wuhan virus*) OR ((wuhan OR hubei OR huanan) AND (severe acute respiratory OR pneumonia*)))	
2	(MH "Coronavirus Infections+") OR (MH "Coronavirus+")	5793
3	S1 or S2	8434
4	(MH "Mental Health") OR (MH "Affective Disorders+") OR (MH "Depression+") OR (MH "Anxiety+") OR (MH "Anxiety Disorders+") OR (MH "Stress Disorders, Post-Traumatic+") OR (MH "Substance Use Disorders+") OR (MH "Psychotic Disorders+") OR (MH "Affective Disorders, Psychotic+") OR (MH "Hallucinations+") OR (MH "Delusions+") OR (MH "Apathy") OR (MH "Aggression+") OR (MH "Personality Disorders+") OR (MH "Schizophrenia+") OR (MH "Mental Disorders+") OR (MH "Obsessive-Compulsive Disorder+") OR (MH "Panic Disorder") OR (MH "Bipolar Disorder+") OR (MH "Emotions+") OR (MH "Confusion+")	799259
5	TI (((mental N1 health) or mood or depressed or depression or depressive or anxiety or anxieties or anxious or stress disorder or stress disorders or PTSD or post?trauma or post?traumatic or (substance N1 (abuse or addiction or dependence)) or (drug N1 (abuse or addiction or dependence)) or psychotic or psychoses or psychosis or schizoaffective or hallucinating or hallucination or hallucinations hallucinated or delusion or delusions or apathy or apathetic or indifference or agitated or agitation or agitations or euphoria or euphoric or elation or elated or disinhibition or disinhibitions or disinhibited or aggression or aggressions or personality or mental or affective or (obsessive N1 compulsive) or OCD or panic or neurosis or neurotic or bipolar or mania or manic or suicide or suicidality or suicidal or emotion or tired or confusion or confused)) OR AB (((mental N1 health) or mood or depressed or depression or depressive or anxiety or anxieties or anxious or stress disorder or stress disorders or PTSD or post?trauma or post?traumatic or (substance N1 (abuse or addiction or dependence)) or (drug N1 (abuse or addiction or dependence)) or psychotic or psychoses or psychosis or schizoaffective or hallucinating or hallucination or hallucinations hallucinated or delusion or delusions or apathy or apathetic or indifference or agitated or agitation or agitations or euphoria or euphoric or elation or elated or disinhibition or disinhibitions or disinhibited or aggression or aggressions or personality or mental or affective or (obsessive N1 compulsive) or OCD or panic or neurosis or neurotic or bipolar or mania or manic or suicide or suicidality or suicidal or emotion or tired or confusion or confused)) OR MW (((mental N1 health) or mood or depressed or depression or depressive or anxiety or anxieties or anxious or stress disorder or stress disorders or PTSD or post?trauma or post?traumatic or (substance N1 (abuse or addiction or dependence)) or (drug N1 (abuse or addiction or dependence)) or psychotic or psychoses or psychosis or schizoaffective or hallucinating or hallucination or hallucinations hallucinated or delusion or delusions or apathy or apathetic or indifference or agitated or agitation or agitations or euphoria or euphoric or elation or elated or disinhibition or disinhibitions or disinhibited or aggression or aggressions or personality or mental or affective or (obsessive N1 compulsive) or OCD or panic or neurosis or neurotic or bipolar or mania or manic or suicide or suicidality or suicidal or emotion or tired or confusion or confused))	691984
6	S4 or S5	1056831
7	(MH "Hospitalization+") OR (MH "Inpatients") OR (MH "Intensive Care Units+") OR (MH "Subacute Care")	242805
8	(hospital or hospitalized or hospitalization or intensive or ICU or care or post-acute or post acute or inpatient or inpatients or admit or admitted or admitting)	1841837
9	S7 or S8	1885471
10	S3 and S6 and S9	295
11	limit S10 to english language	284
12	limit S11 to yr="2019-Current"	193

INCLUSION/EXCLUSION CRITERIA

	Include	Exclude	Code
Population	<u>Include</u> adults who have been hospitalized with confirmed or presumed COVID-19 diagnosis.	<u>Exclude</u> adults who have been hospitalized for SARs, MERs, or other respiratory diseases and adults with COVID-19 that have not been hospitalized. Also exclude adults staying at facilities where the primary purpose is to quarantine individuals who have COVID-19 or have been exposed to COVID-19.	E1
Intervention	NA	<u>Exclude</u> intervention studies that do not report relevant outcome data	E2
Comparator	<u>Include</u> <ul style="list-style-type: none"> • KQ1, 4 & 5- no comparator • KQ2, 3, & 4a- before vs after hospitalization • KQ2a, 3a & 4b- patients hospitalized for COVID-19 vs patients who received outpatient treatment for COVID-19 • KQ2b, 3b & 4c- patients hospitalized for COVID-19 vs patients hospitalized for other causes • KQ2c, 3c, & 4d- subgroups vs each other 	NA	E3
Outcomes	<u>Include</u> prevalence or incidence of diagnosis or symptoms of mood disorders, anxiety disorders, trauma-related disorders, psychotic disorders, and substance use disorders, as well as health care utilization and self-reported mental health care resource needs	<u>Exclude</u> prevalence or incidence of diagnosis or symptoms of delirium, cognitive disorders, and post intensive care syndrome (PICS) except when mental health symptoms of PICS are reported separately	E4
Timing	<u>Include</u> during or after hospitalization	<u>Exclude</u> before hospitalization	E5
Setting	<u>Include</u> any setting	NA	E6
Study Design	<u>Include</u> retrospective/prospective cohort or cross-sectional	<u>Exclude</u> case series, case reports, and other study designs where sample is selected based on observed outcome	E7
Publication type	<u>Include</u> full-text studies	<u>Exclude:</u> Abstract only, protocol only, editorial, letter, narrative review.	E8
Outdated or ineligible SR	<u>Include</u> systematic reviews that meet our inclusion criteria	<u>Exclude</u> systematic reviews that include studies prior to 2019, that examine conditions other than COVID-19, <i>etc</i>	E9
Language	<u>Include</u> English	<u>Exclude</u> languages other than English	E10
Preprints	NA	<u>Exclude</u> pre-prints	E11

LIST OF EXCLUDED STUDIES

Exclude reasons: 1=Ineligible population, 2=Ineligible intervention, 3=Ineligible comparator, 4=Ineligible outcome, 5=Ineligible timing, 6= Ineligible setting, 7=Ineligible study design, 8=Ineligible publication type, 9=Outdated or ineligible systematic review, E10=language, E11=preprint

#	Citation	Exclude reason
1	Ahmed, H., et al. (2020). "Long-term clinical outcomes in survivors of severe acute respiratory syndrome and Middle East respiratory syndrome coronavirus outbreaks after hospitalisation or ICU admission: A systematic review and meta-analysis." <i>Journal of Rehabilitation</i>	E1
2	André A, Félix C, Corvacho M, Nzwalo H. On the plausibility of late neuropsychiatric manifestations associated with the COVID-19 pandemic. <i>J Neurol Sci.</i> 2020;417:117060.	E8
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EVIDENCE TABLES

DATA ABSTRACTION OF INCLUDED STUDIES

Author Year Study design Sample Size Country	Population	How diagnosed with COVID-19	Timing & When Outcomes Measured	Comparator (if applicable)	Outcomes
Atalla 2020 ¹ Retrospective chart review N=339 United States	Hospitalized COVID-19 patients who were re-admitted vs not readmitted -Age (median): 61 -Sex (Female): 43.7% -Race (Total): 37.2% Hispanic, 1.2% Asian, 16.2% African American, 42.8% Caucasian, 2.7% other -Comorbidities (Total): Congestive heart failure (9.4%), Cardiac arrhythmias (18.9%), Hypertension (45.4%), Diabetes (33.3%), Obesity (39.8%), Chronic pulmonary disease (15.3%), Renal failure (10.6%), Liver disease (3.2%), Cancer (8%), Alcohol abuse (5.3%), Drug abuse (5%), Mental illness (17.1%)	Reverse transcriptase polymerase chain reaction (RT- PCR).	Mar 1 - Apr 19 2020 Outcomes extracted from medical records, presumably during hospitalization	Readmitted (n=19) vs non- readmitted (n=320) COVID-19 patients	KQ4: 3/19 readmitted patients had a psychiatric episode as the reason for readmission. 2/3 of these patients either had bipolar disorder or suicidal ideation noted at initial admission (1 patient with bipolar disorder and other comorbidities was admitted for a fall then re-admitted for AMS and aggressive agitation; the other patient with suicidal ideation at admission was re-admitted for suicidal ideation, depression, and acute gastroenteritis). The third patient did not have a mental health disorder noted at initial admission (reason for initial admission = hip pain, chest pain; reason for re-admission- brief psychotic episode). KQ5: Authors note these 3 patients needed psychiatric evaluation.
Cai 2020 ² Cross- sectional N=126 China	COVID-19 survivors transferred to isolation hospital for 14-day quarantine -Age (mean): 45.7 -Sex (female): 52.4% -Race: NR - Comorbidities: 24 (19%) subjects reported a history of one	National Health Commission of China's Guideline for the Diagnosis and Treatment of COVID-19	Feb 20 - Mar 15 2020 Outcomes measured during 14-day quarantine after hospitalization	Subgroups vs. each other	KQ1: PTSD (measured through PTSD-SS): 31% scored ≥50 Anxiety (measured on SAS): 22.2% scored ≥standard score of 50 Depression (measured on SDS): 38.1% scored ≥standard score of 53

Author Year Study design Sample Size Country	Population	How diagnosed with COVID-19	Timing & When Outcomes Measured	Comparator (if applicable)	Outcomes
	or more chronic medical illnesses, 23 (18.3%) had a history of psychiatric disorders, with 2 having a history of depressive moods but no clinical diagnosis, 4 had a history of anxious moods, and 17 had a history of chronic insomnia. None had prior diagnosis of PTSD, other psychiatric diagnoses, or history of psychoactive substance use.				KQ2: Older subjects (60+) scored lower on PTSD-SS. Female subjects scored higher on PTSD-SS than male subjects. Those with higher education scored lower on SDS. No other significant differences in depression or anxiety scores by age, sex, education, or social support on Mann-Whitney Test.
Chang 2020 ³ Cross-sectional N=64 Korea	Patients with COVID-19 who were treated and discharged from a university hospital -Age (mean): 54.7 - Sex (% female): 56% -Race: NR - Comorbidities: NR	WHO interim guidance with laboratory confirmation using RT-PCR kit	Feb-Apr 2020 Outcomes measured after discharge (mean 75.7 days)	PTSD group vs non-PTSD group	KQ1: 13/64 ppts had a PCL-5 score of >33, which indicated that the prevalence of PTSD was 20.3%. KQ2: No significant difference in sex, age, length of hospitalization, or time since discharge in PTSD vs. no-PTSD groups.
Hu 2020 ⁴ Cross-sectional N=64 China	Inpatients who were definitively diagnosed with COVID-19 treated in two isolation wards of a hospital for adult patients with severe COVID-19 -Age: 48.8 -Sex (% Female): 49.5% -Race: NR -Comorbidities: Those with severe psychotic disorders were excluded	NR	Mar 7 - Mar 24 2020 Outcomes measured during hospitalization	Subgroups vs. each other	KQ1: 45.9% of pts had depression symptoms (PHQ-9 > 5). 38.8% of pts had anxiety symptoms (GAD-7 > 5), and 54.1% of pts had insomnia symptoms (ISI > 8). High proportions of participants had moderate or severe symptoms of depression (24.7%), anxiety (16.5%), and insomnia (21.1%). KQ2: Participants with depression symptoms had longer duration of COVID-19 than those without depression symptoms. Depression symptoms were also correlated with COVID-19 severity but not length of hospital stay. Participants with anxiety symptoms had a higher



Author Year Study design Sample Size Country	Population	How diagnosed with COVID-19	Timing & When Outcomes Measured	Comparator (if applicable)	Outcomes
					percentage who were females and longer hospital stay than those without anxiety symptoms. COVID-19 severity was associated with anxiety symptoms while COVID-19 duration was not associated with anxiety symptoms. Participants with insomnia had a higher percentage of females than those without insomnia. Insomnia symptoms were associated with COVID-19 severity, but not COVID-19 duration or length of hospital stay.
Li 2020 Cross-sectional N=280 China	Hospitalized COVID-19 patients in stable condition Age: <35 (9.3%), 36-50 (26.4%), 51-65 (37.1%), >66 (27.1%) Sex (% female): 48.2% Comorbidities: hypertension (30.7%), diabetes (11.1%), and chronic heart diseases, chronic liver disease (4.6%), chronic lung disease (3.9%), cerebrovascular disease (2.5%), gastric ulcer (2.1%), tumor (1.8%), anemia (1.8%), chronic kidney disease (1.1%), hyperthyroidism (1.1%), hypothyroidism (0.7%), and gout (0.7%). Pts with mental illness were excluded.	Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (Trial Version 6)	Feb 29 - Mar 2 2020 Outcomes measured during hospitalization	NA	KQ1: Psychological dysfunction of COVID-19 patients as a result of the disease: Sleep disorders (63.6%), anxiety (62.1%), fear (50.0%), apathy (41.8%), depression (40.7%), despair (32.5%). KQ5: 59% reported at least some need for psychological guidance in rehabilitation.
Liu 2020 ⁵ Cross-sectional N=675 China	Recovered COVID patients who had been discharged from hospitals Age: 53.6 Sex (% female): 53% Race: NR Comorbidities: Underlying illness (37.2%)	NR	Apr 11-22, 2020 Outcomes measured during post-discharge period	Subgroups vs. each other	KQ1: About 84 (12.4%) were provisionally diagnosed with clinically significant symptoms of PTSD due to COVID-19. The median score of PCL-5 was 12 (ICQ [4,16]). For anxiety, 70 (10.4%) were categorized as having moderate to severe symptoms, with another 218 (32.3%) reporting mild symptoms. 128 (19%) were categorized as having moderate to severe depression symptoms, with another 315 (46.7%) reporting mild symptoms. The median



Author Year Study design Sample Size Country	Population	How diagnosed with COVID-19	Timing & When Outcomes Measured	Comparator (if applicable)	Outcomes
			(average 36.75 days)		<p>scores of GAD-7 and PHQ-9 were respectively 4 and 5 .</p> <p>There was significant overlap in symptoms; 41 (6.07%) had severe anxiety and clinically significant PTSD, 57 (8.44%) had clinically significant PTSD and depression, another 57 (8.44%) had both depression and anxiety symptoms, and 37 (5.48%) were categorized with all three.</p> <p>KQ2: Treatment by invasive mechanical ventilation and testing positive for COVID-19 RNA after discharge were not significant predictors of any of the three mental illness indicators ($p > .05$). Treatment with corticosteroid was associated with lower risk of PTSD due to COVID-19 ($p = .016$) but higher risk of anxiety ($p = .022$). ICU was associated with higher level of depression ($p = 0.003$).</p> <p>Disease severity consistently acted as a main risk factor for PTSD due to COVID-19 ($p < .001$), severe depression ($p < .001$) and severe anxiety ($p < .001$). Thus, the more severe the disease was, the worse the mental illness outcomes.</p> <p>Odds of reporting moderate to severe anxiety were significant increased by higher disease severity (OR, 2.91, 95% CI, [1.55,5.48]) and living with children (OR, 8.01, 95% CI, [2.79,23.04]).</p> <p>Odds of reporting severe depression significantly increased by each of the following: higher educational level (OR, 1.54, 95% CI, [1.07, 2.22]), living with children (OR, 4.75, 95% CI, [2.20, 10.23]), smoking (OR, 4.89, 95% CI, [2.05, 11.66]), higher disease severity (OR, 4.40, 95% CI, [2.51, 7.74])</p>

Author Year Study design Sample Size Country	Population	How diagnosed with COVID-19	Timing & When Outcomes Measured	Comparator (if applicable)	Outcomes
Ma 2020 ⁶ Cross-sectional survey N=770 (93 with severe COVID-19 infection)	COVID-19 patients across 5 designated isolation hospitals for COVID-19 (before discharge) Age: 50.4 Sex (% female): 52% Race: NR Comorbidities: NR	Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia	Feb 24 - Mar 8, 2020 Outcomes measured during hospitalization	NA	KQ1: Of the 93 patients with severe COVID-19 infection. 48 (14.5% of total pop) had symptoms of depression and 45 (10.3% of total pop) did not (defined as score \geq 5 on PHQ-9)
China					
Mazza 2020 ⁷ Cross-sectional N=402 Italy	COVID-19 survivors enrolled in an ongoing prospective cohort study at a hospital in Italy. Age: 57.8 Sex (% female): 34.3% Race: NR Comorbidities: 26.4% had history of psychiatric illness	Not specified	Apr 6 - June 9, 2020 Outcomes measured mean 31 days after discharge	Hospitalized vs. outpatients with COVID-19	KQ1: Proportion of hospitalized pts scoring at or above thresholds for clinical relevance on: PTSD Checklist for DSM-5 (PCL-5): 40/260 (15.4%) Zung Self-rating Depression Scale (ZSDS): 79/273 (28.9%) Beck's Depression Inventory (BDI-13): 28/279 (10.0%) State-Trait Anxiety Inventory (STAI-state): 99/254 (39.0%) STAI-trait: 83/257 (32.3%) Women's Health Initiative Insomnia Rating Scale (WHIIRS): 108/273 (39.6%) Obsessive Compulsive Inventory (OCI): 52/265 (19.6%) KQ2: In a multivariate analysis of the effects of sex, previous diagnosis of psychiatric illness, and hospitalization on current psychiatric status, hospitalization status did not have an independent effect (Wilks' lambda=0.98; F=0.84; d.f. 8,266; p=0.570). The unadjusted prevalence of anxiety (assessed through STAI) was lower among hospitalized patients compared to non-hospitalized patients (STAI-state: 39.0% vs. 51.7% vs , p= 0.037; STAI-trait: 32.2% vs 44.2% vs , p=0.038). The unadjusted prevalence of PTSD, depression, insomnia,

Author Year Study design Sample Size Country	Population	How diagnosed with COVID-19	Timing & When Outcomes Measured	Comparator (if applicable)	Outcomes
					and obsessive compulsive disorders (assessed through screening tools) were similar between hospitalized and non-hospitalized groups: PTSD (PCL-5): 15.4% (hospitalized vs 14.8 (non-hospitalized); p=0.901 Depression (ZSDS): 28.9% (hospitalized) vs 35.8% (non-hospitalized); p=0.212. Depression (BDI-13): 10.0 (hospitalized) vs 15.1% (non-hospitalized); p=0.185. Insomnia (WHIIRS): 39.6% (Hospitalized)
Taquet 2020 ⁸ Retrospective cohort N=62,354 US	Patients with record of COVID-19 diagnosis in TriNetX Analytics Network (network that captures anonymized healthcare data): Age: mean 49.3 Sex: 55.4% female, 45.1% male, 0.4% other Race: 51.0% White, 23.6% Black, 2.5% Asian, 0.5% American Indian or Alaska Native, 0.2% Native Hawaiian of Other Pacific Islander, 22.3% unknown Comorbidities: 25.6% previously diagnosed psychiatric illness (2.0% Psychotic Disorder, 15.9% Mood Disorder, 19.5% Anxiety Disorder)	ICD-10 codes in health record (COVID-19 (U07.1 and U07.2); pneumonia due to SARS-associated coronavirus (J12.81); other coronavirus as the cause of disease classified elsewhere (B97.29); or coronavirus infection unspecified (B34.2))	Jan 20 - Aug 1, 2020 Outcomes measured 14-90 days after COVID-19 diagnosis	Hospitalized vs. outpatient patients with COVID-19	KQ2: Analysis restricted to patients without prior diagnosis of MH illness Hospitalized patients were at higher risk of psychiatric diagnosis than patients that were not admitted to hospital (HR 1.40, 95% CI: 1.06-1.85; p=0.019).
Tomasoni 2020 ⁹ Cross-sectional	COVID-19 patients hospitalized, with documented clinical recovery and virological clearance: Age: median 55 yrs (IQR 43-65) Sex: 73% male	Not stated, but virological clearance was assessed through tests of nasopharyngeal	Apr - Jun 2020 Outcomes measured 1-3 months after	NA	KQ1: Anxiety symptoms (HADS-A): 29% (29/100) Depression symptoms (HADS-D): 11% (11/100) Of those that scored in the pathological range on HADS-A/D scale: 30% had anxiety and depression, 63% only anxiety, and 4% only depression

Author Year Study design Sample Size Country	Population	How diagnosed with COVID-19	Timing & When Outcomes Measured	Comparator (if applicable)	Outcomes
N=105 Italy	Race: NR Comorbidities: median Charlson Comorbidity Score 1 (IQR 0-2.5); 5.7% taking antidepressant and 2.8% taking anxiolytic therapies before admission	swabs	discharge		
Yuan 2020 ¹⁰ Cross-sectional n = 96 China	Hospitalized COVID-19 patients who were discharged to forced-quarantine at a separate hospital for 2 weeks. -Age: 35.7% (NSRD) vs 53.7%(SRD) were 18-45 years old -Sex: 50% (NSRD) vs 52.4% (SRD) were female -Race: NR -Comorbidities: 40.7% (NSRD) vs 38.1% (SRD) had at least 1 comorbidity	National Health Commission of China's Guideline for the Diagnosis and Treatment of COVID-19 (7th trial ed)	Feb-Mar 2020 Outcomes measured up to 2 weeks after hospitalization	None	KQ1: 42/96 (44%) of pts self-reported depressive symptoms on Zung self-rating depression scale (SDS). KQ2: No correlation between self-reported depression and gender, age, comorbidities, severity of initial infection, or duration of initial illness.
Zarghami 2020 ¹¹ Cross-sectional N = 82 Iran	All COVID-19 patients in 1 city, excluding those who were intubated or deceased, excluding children <10 years old, excluding pts unwilling to participate in study -Age: mean 40.3 (hospitalized); mean 43.6 (non-hospitalized) -Sex: 61% female -Race: NR -Comorbidities: 20% had history of psychiatric illness and 5% consumed psychiatric	By real-time polymerase chain reaction	Mar-Apr 2020 Outcomes measured during hospitalization	Hospitalized vs outpatient patients with COVID-19	KQ2: Pts hospitalized for COVID-19 had higher rates of diagnosed psychiatric disorders compared to non-hospitalized pts (60% vs 28.8%; p=.006). Pts hospitalized for COVID-19 had similar rates of diagnosed Generalized Anxiety Disorder (6.7% vs 5.8%) and diagnosed Major Depressive Disorder (3.3% vs 3.8%) as non-hospitalized pts. However, hospitalized pts had higher rates of diagnosed insomnia (43.3% vs 21.2%; p=.05) and higher rates of diagnosed adjustment disorders (26.7% vs 9.6%; p=.042). Those hospitalized had higher rates of diagnosed past psychiatry disorders (26.6% vs 17.3%).

Author Year Study design Sample Size Country	Population	How diagnosed with COVID-19	Timing & When Outcomes Measured	Comparator (if applicable)	Outcomes
	medications				When assessed on screening tools (rather than through diagnosis), rates of depression (PHQ-9>5) and anxiety (GAD-7>5) were similar between hospitalized & non-hospitalized groups.
Zhang 2020 ¹² Retrospective cohort N=135 China	Patients hospitalized with COVID-19 for 14+ days Age: median 63 Sex: 42.2% female Race: NR Comorbidities: 61.5% had at least one comorbidity (31.1% cardiovascular & cerebrovascular disease, 28.1% endocrine disease, 9.6% malignancy, 4.4% chronic respiratory disease, 3% gastrointestinal disease, 1.5% urologic disease)	Real-time RT-PCR test	Jan 25-Mar 15, 2020 Outcomes measured within 30 days of hospital admission	Subgroups vs. each other	KQ1: Of the 135 people that had sleep scores on RCSQ and PSQI that could be categorized into poor or good sleep, 75 (55%) had poor sleep. Of those with poor sleep, 32% had chronic insomnia. KQ2: No significant correlation between sleep quality and age, sex, marital status, education, or comorbidities.

KQ=Key Question; NA=Not applicable; NR=Not reported; NSRD=No self-reported depression; SRD=Self-reported depression

CROSS-SECTIONAL STUDIES - QUALITY ASSESSMENT KEY

1. Were the criteria for inclusion in the sample clearly defined?
ESP Key: Yes=Complete inclusion/exclusion criteria provided. Unclear=Some inclusion/exclusion criteria provided but some key information is missing. No= No inclusion/exclusion criteria provided. NA=Not applicable
2. Were the study subjects and the setting described in detail?
ESP Key: Yes= Pt characteristics including demographics (age, sex, race/ethnicity, comorbidities), COVID-19 severity, location, and time period provided Unclear= Some info on patient characteristics provided but some key information is missing. No= No meaningful description of study population provided. NA=Not applicable
3. Was the exposure measured in a valid and reliable way?
ESP Key: NA for all studies- exposure is the same as the condition for this report.
4. Were objective, standard criteria used for measurement of the condition?
ESP Key: Yes= Confirmation of COVID-19 via laboratory testing Unclear=Presumed COVID-19 based on clinical guidance or symptoms No= No criteria provided or criteria were inappropriate for capturing COVID-19 status. NA=Not applicable
5. Were confounding factors identified?
ESP Key: Yes= Authors provide complete information on pre-existing MH disorders and other relevant confounders. Unclear= Authors provide some information on MH disorders or other relevant confounders, but it's incomplete. No= Authors do not provide any information on potential confounders. NA= Not applicable

6. Were strategies to deal with confounding factors stated?

ESP Key:

Yes= Appropriate matching or stratifying processes used to adjust for potential confounders.

Unclear= Authors attempted to control for confounders but information is missing on the methods used or results found.

No= No matching or stratifying process used

NA= Not applicable

7. Were the outcomes measured in a valid and reliable way?

ESP Key:

Yes= Used diagnostic assessment or validated tool to measure outcomes

Unclear= Missing information on how outcomes were measured.

No= Non-validated tools used to measure outcomes.

NA=Not applicable

8. Was appropriate statistical analysis used?

ESP Key:

Yes=Appropriate statistical analysis used and results of analyses were reported.

Unclear= Some missing information on either statistical analysis used or reported data.

No= No statistical analysis conducted.

NA= Not applicable

COHORT STUDIES – QUALITY ASSESSMENT KEY

1. Were the two groups similar and recruited from the same population?

ESP Key:

Yes= Inclusion/exclusion criteria described, a table comparing patient characteristics in 2 groups provided, and no significant baseline differences between groups.

Unclear=Incomplete or no description of inclusion/exclusion criteria, patient characteristics, and/or assessment of differences between groups.

No= Inconsistent inclusion/exclusion criteria used between groups or considerable differences between groups at baseline.

2. Were the exposures measured similarly to assign people to both exposed and unexposed groups?

ESP Key:

Yes= Same COVID-19 diagnostic criteria used for both groups

Unclear= Unclear whether 2 groups used same COVID-19 diagnostic criteria

No= Different COVID-19 diagnostic criteria used for each group.

NA=Not applicable

3. Was the exposure measured in a valid and reliable way?

ESP Key:

Yes= Confirmation of COVID-19 via laboratory testing

Unclear=Presumed COVID-19 based on clinical guidance or symptoms

No= No criteria provided or criteria were inappropriate for capturing COVID-19 status.

NA=Not applicable

4. Were confounding factors identified?

ESP Key:

Yes= Authors provide complete information on pre-existing MH disorders and other relevant confounders.

Unclear= Authors provide some information on MH disorders or other relevant confounders, but it's incomplete.

No= Authors do not provide any information on potential confounders.

NA= Not applicable

5. Were strategies to deal with confounding factors stated?

ESP Key:

<p>Yes= Appropriate matching or stratifying processes used to adjust for potential confounders.</p> <p>Unclear= Authors attempted to control for confounders but information is missing on the methods used or results found.</p> <p>No= No matching or stratifying process used</p> <p>NA= Not applicable</p>
<p>6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?</p>
<p>ESP Key:</p> <p>Yes= Confirmed that patients do not have MH outcome at start of study, or it is impossible that they would have MH outcome.</p> <p>Unclear= Unclear if patients had MH outcome at start of study.</p> <p>No= Some or all patients had MH outcome at start of study.</p> <p>NA=Not applicable</p>
<p>7. Were the outcomes measured in a valid and reliable way?</p>
<p>ESP Key:</p> <p>Yes= Used diagnostic assessment or validated tool to measure outcomes</p> <p>Unclear= Missing information on how outcomes were measured.</p> <p>No= Non-validated tools used to measure outcomes.</p> <p>NA=Not applicable</p>
<p>8. Was the follow up time reported and sufficient to be long enough for outcomes to occur?</p>
<p>ESP Key</p> <p>Yes= follow-up was reported and long enough for outcome to occur.</p> <p>Unclear= Unclear what the follow-up time period was.</p> <p>No= Follow-up too short for outcome to occur.</p> <p>NA= Not applicable</p>
<p>9. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?</p>
<p>ESP Key</p> <p>Yes= Attrition <20% and reasons for dropout were explained.</p> <p>Unclear= Unclear % who dropped out and/or unclear reasons for drop out</p>

No= Attrition >20% or reasons for reasons for dropout are different between groups

NA= Not applicable

10. Were strategies to address incomplete follow up utilized?

ESP Key

Yes= Data from drop-outs are accounted for appropriately in analysis.

Unclear= Unclear how data from drop-outs were handled

No= Data from drop-outs not appropriately handled in analysis.

NA= Not applicable

11. Was appropriate statistical analysis used?

ESP Key:

Yes=Appropriate statistical analysis used and results of analyses were reported.

Unclear= Some missing information on either statistical analysis used or reported data.

No= No statistical analysis conducted.

NA= Not applicable

QUALITY ASSESSMENT OF INCLUDED STUDIES

CROSS-SECTIONAL STUDIES

Author Year	Criteria for inclusion in the sample clearly defined?	Study subjects and the setting described in detail?	Exposure measured in a valid and reliable way?	Objective, standard criteria used for measurement of the condition?	Confounding factors identified?	Strategies to deal with confounding factors stated?	Outcomes measured in a valid and reliable way?	Appropriate statistical analysis used?	Overall
Cai 2020 ²	Yes; all cured COVID-19 pts discharged from a single hospital into forced quarantine	Yes; No information on race, but reported information on age, sex, comorbidities, and COVID-19 severity	NA	Unclear; diagnosis based on National Health Commission of China guidelines	Yes; reports prevalence of history of psychiatric problems and chronic medical illnesses in the sample	Yes; analyses compared rates of MH symptoms for participants with vs without history of psychiatric problems	Yes; validated measures of MH outcomes	Yes for comparative analyses	Fair quality
Chang 2020 ³	Yes; all diagnosed, hospitalized, treated, and discharged COVID-19 pts from a single hospital	Unclear; No information on race or comorbidities, but reported information on age and sex	NA	Yes; PCR	No; no information on pre-existing MH disorders or other potentially relevant confounders	No, no information other than similar demographics across groups.	Yes; validated measures of MH outcomes	Yes; for comparison of those with vs. without PTSD.	Fair quality
Hu 2020 ⁴	Yes; complete inclusion/exclusion criteria provided.	Yes; No information on race, but reported information on age, sex, comorbidities, and COVID-19 severity	NA	No; participants were "definitively" diagnosed, but no criteria provided	Unclear; included some information on excluding severe psychotic disorders and dementia, but no additional details about potential confounders	No; No controlling for pre-existing MH disorders in analysis	Yes; validated measures of MH outcomes	Yes, for comparison of differences among subgroups	Fair quality

Author Year	Criteria for inclusion in the sample clearly defined?	Study subjects and the setting described in detail?	Exposure measured in a valid and reliable way?	Objective, standard criteria used for measurement of the condition?	Confounding factors identified?	Strategies to deal with confounding factors stated?	Outcomes measured in a valid and reliable way?	Appropriate statistical analysis used?	Overall
Li 2020 ¹³	Yes; complete inclusion/exclusion criteria provided.	Unclear; No information on race or COVID-19 severity, but reported information on age, sex, and comorbidities.	NA	Unclear; diagnosis based on "Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia"	Yes; reported prevalence of chronic medical illnesses in the sample and excluded those with mental illness	NA; Pts did not have preexisting mental illness so no need for stratification	No; no measures listed, only individual items without citations or measures referenced	NA (not a comparative study)	Poor quality
Liu 2020 ⁵	Yes; report inclusion of all patients and 90% response rate	Yes; No information on race, but reported information on age, sex, comorbidities, and COVID-19 severity	NA	No; No criteria provided	Unclear; some information on comorbidities but no information on preexisting MH conditions	No; No controlling for pre-existing MH disorders in analysis	Yes; validated measures of MH outcomes	Yes, for OR estimates according to demographics, disease severity, etc.	Fair quality
Ma 2020 ⁶	Yes; complete inclusion/exclusion criteria provided and 98% compliance.	Unclear; No information on race or comorbidities, but reported information on age, sex, and COVID-19 severity	NA	Unclear; diagnosis based on Diagnosis and Treatment Protocol for Novel Coronavirus Pneumonia (Trial Version 6) in China	Unclear; no discussion of comorbidities or information on preexisting MH conditions	No; No controlling for pre-existing MH disorders in analysis	Yes; validated measures of MH outcomes	NA (not a comparative study)	Fair quality

Author Year	Criteria for inclusion in the sample clearly defined?	Study subjects and the setting described in detail?	Exposure measured in a valid and reliable way?	Objective, standard criteria used for measurement of the condition?	Confounding factors identified?	Strategies to deal with confounding factors stated?	Outcomes measured in a valid and reliable way?	Appropriate statistical analysis used?	Overall
Mazza 2020 ⁷	Yes; complete inclusion/exclusion criteria provided.	Yes; No information on race, but reported information on age, sex, comorbidities, and COVID-19 severity	NA	No, no criteria provided	Yes; reports previous psychiatric history	Yes; previous psychiatric history was included in analyses	Yes; validated measures of MH outcomes	Yes, for comparisons of hospitalized vs outpatient COVID-19 patients	Fair quality
Tomasoni 2020 ⁹	Yes; complete inclusion/exclusion criteria provided.	Yes; No information on race, but reported information on age, sex, comorbidities, and COVID-19 severity	NA	Unclear; no information on diagnosis but virological clearance was assessed through tests of nasopharyngeal swabs	Yes; prior antidepressant and anxiolytic use reported	Unclear; no controlling for preexisting MH disorders but rates of medication use were very low	Yes; validated measures of MH outcomes	NA (not a comparative study)	Fair quality
Yuan 2020 ¹⁰	Yes; all cured COVID-19 pts from a single hospital in forced quarantine	Yes; No information on race, but reported information on age, sex, comorbidities, and COVID-19 severity	NA	Unclear; diagnosis based on National Health Commission of China guidelines	No; no information on pre-existing MH disorders or other potentially relevant confounders	No; No controlling or accounting for pre-existing MH disorders in analysis (eg, did not present results separately for subgroups with potential confounding factors such as pre-existing MH disorders)	Unclear; no reference for a validation study of the Zung measure of depression	NA (not a comparative study)	Fair quality

Author Year	Criteria for inclusion in the sample clearly defined?	Study subjects and the setting described in detail?	Exposure measured in a valid and reliable way?	Objective, standard criteria used for measurement of the condition?	Confounding factors identified?	Strategies to deal with confounding factors stated?	Outcomes measured in a valid and reliable way?	Appropriate statistical analysis used?	Overall
Zarghami 2020 ¹¹	Yes; complete inclusion/exclusion criteria provided.	Unclear; No information on race or severity of COVID-19 illness in hospitalized pts other than those who were intubated were excluded	NA	Yes; Confirmed by polymerase chain reaction	Unclear; Included information on comorbidities and on which patients had pre-existing MH disorders, though other potential confounders were not assessed (eg, severity of MH symptoms, pre-/post-hospitalization access to resources)	No; No controlling for pre-existing MH disorders in analysis	Yes; outcomes measured through diagnostic interview and screening tools PHQ-9 & GAD-7	Unclear; Analysis appropriate for differences in psychiatric disorders in admitted vs outpatient pts, but no OR calculated for comparison between male & female admitted pts.	Fair quality

Pts=Patients; NA=Not applicable; MH=Mental health; PCR= Polymerase Chain Reaction



COHORT STUDIES

Author Year	Two groups similar and recruited from the same population?	Exposure measured similarly to assign people to groups?	Exposure measured in a valid and reliable way?	Confounding factors identified?	Strategies to deal with confounding factors stated?	Groups /ppts free of the outcome at the start of the study?	Outcomes measured in a valid and reliable way?	Follow-up time reported and long enough for outcome to occur?	Follow-up was complete, or reasons for loss to follow up described and explored?	Strategies to address incomplete follow-up utilized?	Appropriate statistical analysis used?	Overall
Atalla 2020 ¹	Yes; full inclusion criteria stated	Yes; same diagnostic method used for all ppts	Yes; PCR	Yes; MH co-morbidities reported	No; no matching or other adjustment	No; some ppts had preexisting MH disorders at study start	Yes; healthcare utilization measure was appropriate	Yes; adequate length of follow up	Yes; no attrition as data were collected from chart review	Yes; no dropouts	Yes, appropriate statistical analysis methods used	Fair quality
Taquet 2020 ⁸	Yes; full inclusion criteria stated	Yes; same diagnostic method used for all ppts	Unclear; multiple criteria stated	Yes; MH co-morbidities reported	Yes; matching of groups based on 28 variables affecting risk of COVID and 22 variables affecting risk of control health events	Yes; analyses conducted with only those who did not have preexisting MH disorders	Yes; ICD-10 codes of psychiatric diagnoses appropriate	Yes; adequate length of follow up	Yes; no attrition as data were collected from chart review	Yes; no dropouts	Yes, appropriate statistical analysis methods used	Good quality

Zhang 2020 ¹²	Yes; full inclusion criteria stated	Yes; same diagnostic method used for all pts	Yes; PCR	No; no MH co-morbidities reported	No; no matching or other adjustment	Unclear; not reported	Yes; validated outcome assessment tools	Yes; adequate length of follow up	Unclear; 18/153 (11%) of pts excluded because sleep quality could not be easily categorized	No; 11% of pts who could not be easily categorized not accounted for in analysis	Unclear; some missing info on statistical methods	Poor quality
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Ppts=Participants; PCR= Polymerase Chain Reaction; MH=Mental health

PEER REVIEW COMMENTS (OCT 2020 VERSION)

Comment #	Reviewer #	Comment	Author Response
<i>Are the objectives, scope, and methods for this review clearly described?</i>			
1	1	Yes	None
2	3	Yes	None
3	4	Yes	None
4	7	Yes	None
<i>Is there any indication of bias in our synthesis of the evidence?</i>			
5	1	No	None
6	3	No	None
7	4	No	None
7	7	No	None
<i>Are there any <u>published</u> or <u>unpublished</u> studies that we may have overlooked?</i>			
9	1	No	None
10	3	No	None
11	4	No	None
12	7	No	None
<i>Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report.</i>			
13	1	This review is thorough and does a good job of reviewing the limited number of studies available on this topic. In some respects, given the limited literature, I think the review could have been substantially shorter but as a living review they have provided a good framework for adding additional studies.	Thank you – we will keep the framework as is as we anticipate there will be more relevant, published studies soon.
14	1	The one recommendation I would make is that they more clearly lay out a framework for the different ways COVID might impact mental health outcomes, which lend themselves to different questions and different comparisons and subgroup analyses. It also depends on whether the aim of the review is predicting the burden of disease in which case simple prevalence studies may suffice, or whether they are meant to explore casual hypotheses, in which case more careful selection of control groups is needed.	We aimed to both estimate the burden of disease and to explore potential causal pathways. In response to this comment, we have rephrased the Key Questions and PICOs so it's clearer which questions assess overall burden of disease and therefore have no comparator (KQ1, KQ4, & KQ5) and which questions assess potential causal pathways and therefore have a comparator (KQ2, KQ2a, KQ2b, KQ2c, KQ3, KQ3a, KQ3b, KQ3c, KQ4a, KQ4b, KQ4c, KQ4d).

Comment #	Reviewer #	Comment	Author Response
15	1	<p>As I see it there are at least three distinct pathways: 1) Direct neuropsychiatric effects – these may depend on severity but may not be limited to hospitalized patients. Clearly controlling for pre-existing MH condition is important, but so is exploring individual effects on different MH conditions. An important question for Veterans due to the high prevalence of pre-existing MH conditions is whether that predisposes them to effects of virus.</p>	<p>We revised the key questions so that KQs 2-2c assess the development of new MH symptoms or disorders in those with no preexisting conditions and KQs 3-3c assess the exacerbation of MH symptoms in those with preexisting MH conditions.</p> <p>Assessing risk factors for either contracting COVID-19 or being hospitalized for COVID-19 are outside the scope of this review. However, we comment that VA-using Veterans have high rates of mental health disorders in the background and discussion and discuss how this might increase their risk of being hospitalized for COVID-19.</p>
16	1	<p>As I see it there are at least three distinct pathways: 2) Effects of hospitalization, especially severe illness/ICU care.</p> <p>a. Effects specific to virus – this requires a similarly sick control group. This is the one point that is omitted in the discussion and recommendations for future research. From a predictive point, it may not matter as much whether the outcomes are caused by the illness itself/treatment or something unique about COVID but it does matter from an etiologic perspective to know whether COVID is different from severe influenza. Some of this may also reflect that COVID patients are more isolated in the hospital than other ill patients – what is the impact of being in hospital with less regular interaction with nurses and all those interactions hindered by PPE?</p> <p>b. Effects of severe illness/ICU care itself – teasing this out requires closer attention to the level of care in the hospital. We already know about the effects of prolonged hospitalization and ICU care in particular. But comparing outcomes relative to the level of illness would help – <i>ie</i>, an analysis that compared non-hospitalized infection, hospitalized/no ICU and hospitalized + ICU.</p>	<p>In response to item a- we have revised the KQs so that KQ2b and 3b now compare patients hospitalized for COVID-19 to patients hospitalized for other causes.</p> <p>In response to item b- we have revised the KQs so that KQ2a and 3a compare patients hospitalized for COVID-19 to patients with outpatient COVID-19. We have also specified in KQ2c and 3c that we’re interested in whether development/exacerbation of MH disorders differs by “COVID-19 disease severity” or “level of care.”</p> <p>In response to both items, we also added an additional bullet to the “gaps and future research needs” that recommends researchers compare patients who have been hospitalized for COVID-19 to relevant control groups, including those listed in the KQs.</p>
17	1	<p>Given the broad inclusion criteria, I would have liked to know more about the 17 studies included based on abstract but excluded based on full article.</p>	<p>See Supplementary Materials, “List of excluded studies” section for the list of studies we excluded as well as the reasons why we excluded them.</p>

Comment #	Reviewer #	Comment	Author Response
18	1	Some acknowledgment should be made of the other effects of the pandemic response on MH. <i>Ie</i> that some of the MH effects post discharge may also reflect the continuing effect of the pandemic – economic uncertainty, social isolation. This point should also be included in future studies that you cant assess MH in isolation of other social stressors on a patient.	<p>Paragraph 4 of the Background section discusses the underlying effects of the pandemic on mental health, and the risk that patients hospitalized for COVID-19 are returning home to stressful environments.</p> <p>In the Future Research Needs section, we also comment that the development of post-COVID-19 hospitalization mental health screening tools should include items assessing “other concerns stemming from the COVID-19 pandemic that could impact mental health (<i>eg</i>, loss of employment, separation from loved ones, anxiety about possible reinfection, <i>etc</i>).”</p>
19	3	Very well done! Appropriate methods, well written and clear. As noted, the literature has not yet matured to the point of providing any real answers to the questions posed. The limitations and cautions about MH outcome assessment in this context are well laid out in the discussion.	Thank you.
20	3	A couple minor suggestions: - consider putting information about timing of outcome assessment into the in-text tables. For example, with KQ1 it took me a couple reads to identify timing - it is in the narrative part of the results, but it is an important piece of information and you might consider making more visible by putting in table	We added the missing information on outcome measurement timing to tables as appropriate.
21	3	Consider more clearly defining the outcomes in the methods - in particular to distinguish between symptoms and disorders (obviously they are related, but also different as you nicely point out in the discussion). Some studies may simply not have been designed to answer the question about disorders, but they may be able to provide information about the prevalence of various symptoms. Again, the information is all there, just a matter of slight tweaks to organization/subheadings	Under “Key Questions and eligibility criteria,” under the “outcomes” column, we clarified that we were interested in both diagnoses & symptoms.

Comment #	Reviewer #	Comment	Author Response
22	3	Consider tweaking the wording of some of the questions to guide living review organization. There are different things people would want to know about COVID and its effects on mental health. One might be the extent to which people with known MH comorbidities are getting COVID and whether they are disproportionately represented among those with COVID. Another might be whether COVID exacerbates the severity of MH symptoms in people with and without known MH diagnoses. Another might be the incidence of MH disorders after COVID related hospitalization (which is kind of what KQ1a is, but not quite). Again, the studies are all there, but I suspect moving forward more evidence will emerge and it may be helpful to bucket them in a slightly different way.	<p>We revised the KQs so that KQ2-2c now focus on development of new MH disorders or symptoms among those without preexisting MH disorders while KQ3-3c focus on exacerbation of MH symptoms in those with preexisting MH disorders.</p> <p>Determining whether patients with mental health disorders have a higher risk of being hospitalized with COVID-19 is outside the scope of this review, although we comment that some mental health disorders such as depression may be a risk factor for COVID-19 hospitalization in the discussion section, under “limitations.”</p>
23	4	Thank you for the opportunity to review this timely and ongoing review of mental health outcomes of adults hospitalized for COVID-19. I appreciate that there are only 2 papers that met criteria so far, and I understand that the review will likely change as other papers become available.	None.
24	4	My major concern is that the aims are a bit trite and could have been framed in a more meaningful fashion. For example, the big questions that needs answering are: 1) Is COVID hospitalization causal with respect to new onset psychiatric disorders? If so, in what way? Is it the illness itself (or its severity) or a side effect of treatment?	We revised KQ2, KQ2a, KQ2b, KQ2c, KQ3, KQ3a, KQ3b, and KQ3c to compare patients hospitalized for COVID-19 to specific control groups (vs before hospitalization, vs people with outpatient COVID-19, vs people hospitalized for other causes, vs subgroups that vary by COVID-19 severity and level of care). These types of comparisons will provide initial information on potential causal pathways between COVID-19 and outcomes.
25	4	2) Does COVID hospitalization exacerbate existing psychiatric disorders? Again, in what way? And I would add a third question:	We revised KQ3-3c to assess whether hospitalization for COVID exacerbates MH symptoms among those with preexisting MH disorders.
26	4	3) Are those with psychiatric disorders (can be specific as to MDD, PTSD, GAD, SUD <i>etc</i>) at increased risk of COVID hospitalization? at increased risk of being COVID positive? These are more meaningful questions than the current aims, and would make for a much more meaningful introduction and discussion sections, with more clearcut implications for action. This reframing would not change the other sections markedly.	Determining whether patients with mental health disorders have a higher risk of being hospitalized with COVID-19 is outside the scope of this review. However, we comment that some mental health disorders such as depression may be a risk factor for COVID-19 hospitalization in the discussion section, under “limitations.”

Comment #	Reviewer #	Comment	Author Response
27	4	More minor concerns: 1) Include the purpose/aims in the executive summary before key findings.	Added a sentence on the purpose of the review to the executive summary.
28	4	2) What were the other 2 reviews conducted? Not essential, but helpful as background info.	Added a sentence indicating the first 2 reviews will focus on major organ damage and rehabilitation needs.
29	4	3) 3/14-20 and 8/57 and following: This is a pretty sweeping statement. Please specify if this is for VA patients or veterans in general (including veterans who don't use the VA).	Clarified that these statistics are for Veterans who receive care at the VA.
30	4	4) 3/26-31: specify if you mean pre-COVID, post-COVID, or concurrent prevalence of mental disorders. MH services use patterns and needs may be different for each of these categories.	Clarified that we were interested in adult patients during and after hospitalization for COVID-19.
31	4	5) 5/27: Can we really call these "outcomes" since there are no comparators and no-hospital data? Outcomes connotes a time ordering as well as implied causality.	We agree that the evidence is overall too weak to establish a causal relationship between COVID-19 hospitalization and during/post-hospitalization MH disorders. We have kept in the term "outcome" to maintain consistent language throughout the report since we use the term "outcome" in our methods to describe the type of data we were looking for (see "Eligibility criteria" section). We believe using the same term throughout the report will make it easier for readers to track what we looked for vs what we found. However, we have also clarified the type of data and made sure to refrain from causal language in this report.
32	4	6) 6/7: "Long-term prevalence" is not an epidemiological term. This should be incidence.	Changed to incidence and clarified these would be new mental health disorders diagnosed 3 and 6 months after discharge.
33	4	7) 7/1st para of background: change to past tense	Put applicable sentences in past tense.
34	4	8) Table 2: Yuan study: provide cutpoint and interpretation for Zung SDS. Also, for Zarghani, who diagnosed psychiatric disorders? Was there an instrument?	For Yuan 2020, we added that self-reported depressive symptoms were equivalent to SDS score >50. For Zharghami 2020, we added a sentence that psychiatric disorders were diagnosed by a psychiatrist, but that the specific diagnostic criteria were not reported.

Comment #	Reviewer #	Comment	Author Response
35	4	9) Note: I would not call the SDS or PHQ9 or GAD7 "self-report instruments." They are screening instruments as opposed to diagnostic instruments (eg, CIDI, MINI, CAPS) - which are also self-report. The distinguishing feature is not self-report, but rather whether they are screening/symptom counting or diagnostic in nature. And of course these methods are in contrast to pure clinical diagnoses which are notoriously unreliable.	Throughout the report, we removed the reference to "self-reported" symptoms and instead refer to these as symptoms. Elsewhere, we refer to the PHQ-9 and GAD-7 as "symptom screening tools" (p. 17, table 2; p. 18, table 3).
36	4	10) Technically, prevalence is not a rate (see Table 2, also 16/para 1, Table 3, 19/25 and throughout the ms). Instead of rate, just say prevalence.	Replaced "rate" with "prevalence" as appropriate.
37	4	11) Table 4: Since this is a study of patients post-hospitalization (presumably during the 2 week post-hospitalization quarantine period), the reporting in the prevalence column should be reversed. For example, of those with comorbidities, x% had SDS depression compared to y% of those with no comorbidities. Should be the same for gender (x% of males had SDS depression compared to y% of females) and all other variables.	Revised this table so it now reports the prevalence of depression by subgroup of interest.
38	4	12) 19/Discussion: Clinicians treating COVID are not psychiatrists, so I am curious as to how diagnosed psychiatric disorders was operationalized.	Added information to the findings section on p. 16 to clarify how psychiatric assessments were carried out in this study (a psychiatrist spoke to patients via video chat with a tablet [inpatient settings] or personal mobile phone [outpatient settings] to complete diagnostic assessments).
39	4	13) Discussion: Identification of psychiatric disorders depends on many factors, including instrumentation (screeners vs diagnostic instruments), clinician training, setting, etc. Mental disorders are typically under-diagnosed in some settings (eg, primary care), but more accurately diagnosed in mental health specialty clinics. I would guess that COVID units don't often have mental health specialists on staff, so they likely don't have very refined psychiatric diagnostic capabilities.	In the study that reported diagnoses, psychiatrists were the ones that gave diagnoses, so it is unlikely that provider training or setting contributed to underdiagnosis. However, we agree that lack of mental health specialist involvement in inpatient care may contribute to low rates of diagnoses in clinical settings. We have added a sentence describing this to the discussion section.
40	4	14) Discussion: many psychiatric symptoms likely overlap with COVID symptoms or COVID treatment side effects (eg, fatigue, sleep disturbance, agitation).	Added language to indicate that providers may have seen mental health symptoms as symptoms or side-effects of COVID-19 itself, which may have resulted in under-diagnosis.

Comment #	Reviewer #	Comment	Author Response
41	4	Typos, edits needed: 5/22: pre-existing 21/37 22/46	Changed these to "preexisting."
42	7	The review gave a very clear assessment of its limitations related to the methodology (one reviewer determining inclusion) and the infancy, hence limitation, of research in this domain. Overall, well done.	Thank you.

PEER REVIEW COMMENTS (MARCH 2021 VERSION)

Comment #	Reviewer #	Comment	Author Response
<i>Are the objectives, scope, and methods for this review clearly described?</i>			
1	3	Yes	None
2	4	Yes	None
3	7	Yes	None
<i>Is there any indication of bias in our synthesis of the evidence?</i>			
4	3	No	None
5	4	No	None
6	7	No	None
<i>Are there any <u>published</u> or <u>unpublished</u> studies that we may have overlooked?</i>			
7	3	No	None
8	4	No	None
9	7	No	None
<i>Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report.</i>			
10	3	Overall looks really good. Appreciated the table which specifies new evidence. Well written and clear. A few suggestions:	Thank you
11	3	- in a couple instances (eg - second paragraph of discussion) report states that the prevalence of the MH conditions during hospitalization (depression, anxiety, insomnia, adjustment d/o) was similar or slightly lower during the three months following hospitalization. However, according to the tables, depression and anxiety were the only symptoms for which there were studies reporting prevalence estimate during and after hospitalization - and, as the report states, depression sx prevalence may have been quite different (there was a range) - so really it is only anxiety sx that were similar prevalence during post discharge period if I am reading correctly	We revised the results, discussion and conclusion to indicate that the prevalence of <i>anxiety</i> and <i>insomnia</i> symptoms, across studies, were similar or slightly lower in the post-hospitalization period, while <i>depression</i> symptoms were variable across studies in the post-hospitalization period.

Comment #	Reviewer #	Comment	Author Response
12	3	- I know this is not one of the key questions, but it might be useful somewhere in discussion to give some context for the prevalence numbers during hospitalization: are these numbers high? are they surprising when you consider the general hospitalized population? There are many reasons - many iatrogenic - why insomnia is very common among hospitalized patients (in my experience, the vast majority of hospitalized patients can't sleep well in the hospital). One example is a paper by Freedland KE et al, Psychosomatic Medicine, 2003 - prevalence of depression sx was over 50% among patients hospitalized with congestive heart failure. Again, not something to go into in detail, but it is an area of uncertainty/inquiry that may be worth briefly mentioning	We added information to the background section to indicate patients hospitalized for other reasons often experience MH issues and problems sleeping. We also added a sentence to the discussion section to contextualize the findings: "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, and patients hospitalized for other serious illnesses."
13	4	- another future studies thing to consider highlighting is the relationship between persistence of MH sx during the 3-6 months (or longer) post COVID and the persistence of COVID sx in general - prolonged or even long-haul COVID and impact on MH sx prevalence.	We added 2 sentences to the "future research needs" section indicating that it is important to evaluate long-term MH outcomes given there is emerging evidence that some people experience long-term effects of COVID-19 (ie, long COVID).
14	4	Thank you for undertaking the continuous updating of this important topic. It will be fun for you all (as researchers) and me (as a reviewer) to see how this literature evolves.	No comment
15	4	I am still struggling with the wording and results of Key Question 2. It seems to me that the intent of this question is to get at incidence, that is, the incidence of mental health conditions for those hospitalized with COVID (or is hospitalization for COVID a risk factor for mental health conditions) and then compare that to the incidence of mental health conditions for outpatient COVID patients, etc. The design to answer these questions is a cohort study, or at the very least 2 measurements over time of the condition (mental health problems) under study. I'm uncomfortable with any reference to "prevalence" in the question 2 results and supporting evidence. Additionally, since 2 measurements need to be taken to determine incidence, any strictly cross-sectional studies should be excluded from inclusion in question 2 reporting. I strongly recommend cleaning up the wording and the studies included for this question. The question will be most clearly stated by using the word incidence.	You are correct that we are interested in the incidence of new MH disorders among those with no preexisting MH disorders. The studies we identified were generally not designed to detect incidence (as you point out, most of these were cross-sectional). However, these studies did contain information that was helpful in estimating incidence until more robust data are available. Despite potential limitations, such as measurement bias, recall bias or other systematic error, we extrapolated what we could from the cross-sectional studies that reported prevalence. Our rationale is that most of these cross-sectional studies indicated that the included populations had no, unclear, or low prevalence of preexisting MH disorders. We have changed the description of findings for KQ2 to reflect this rationale and have made sure to describe potential limitations of these studies and preliminary estimates.

Comment #	Reviewer #	Comment	Author Response
16	4	Insomnia is not technically a psychiatric disorder, but often symptomatic of an underlying psychiatric or mental health condition. It can also may have a medical or pharmaceutical etiology. While it is good to include insomnia in the review, please clarify why you are including it along with the above caveats.	We indicated that we were interested in MH disorders “and clinical features such as insomnia” to the scope section. We also indicated that “We included insomnia as an outcome of interest as it often symptomatic of another underlying MH disorder.”

REPORT FINDINGS BY DATE

Rapid Evidence Review Question	Oct 2020 - Original Report	March 2021 - Updated Report
<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 studies (1 of a sample of patients with a low prevalence of preexisting MH conditions, and 1 that did not report on patients' preexisting MH conditions), overall prevalence of MH conditions during/immediately after hospitalization were:</p> <ul style="list-style-type: none"> • Depression symptoms: 43.3%-44% (2 fair-quality studies) • Anxiety symptoms: 23.3% (1 fair-quality study) • MDD: 3.3% (1 fair-quality study) • GAD: 6.7% (1 fair-quality study) • Insomnia: 43.3% (1 fair-quality study) <p>Adjustment disorder: 26.7% (1 fair-quality study)</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>No evidence.</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 of baseline. Therefore, we can extrapolate that most of the MH conditions reported by these studies likely reflect new MH conditions.</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 1 study of a sample of patients with a low prevalence of preexisting MH conditions, the comparative prevalence of MH conditions during hospitalization were:</p> <ul style="list-style-type: none"> • Depression symptoms: 43.3% (H) vs 34.6% (NH) (1 fair-quality study) • Anxiety symptoms: 23.3% (H) 32.7% (NH) (1 fair-quality study) • MDD: 3.3% (H) vs 3.8% (NH) (1 fair-quality study) • GAD: 6.7% (H) vs 5.8% (NH) 	<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



	<p>(1 fair-quality study)</p> <ul style="list-style-type: none"> • Insomnia: 43.3% (H) vs 21.2% (NH); $p=.03$ (1 fair-quality study) <p>Adjustment disorder: 26.7% (H) vs 9.6% (NH); $p=.042$ (1 fair quality study)</p>	<p>groups (1 fair-quality study) or higher prevalence of anxiety symptoms in outpatients (1 fair-quality study)</p> <ul style="list-style-type: none"> • 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) • 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>	<p>No evidence.</p>	<p>No evidence.</p>
<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>In 1 fair-quality study of a sample of patients whose preexisting MH conditions were not reported, there was no significant correlation found between post-hospitalization depression symptoms and patient characteristics (gender, age, or comorbidities [hypertension, diabetes, CVD, malignant tumors, liver disease or lung disease]) or COVID-19 disease severity.</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)



		<ul style="list-style-type: none"> • 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)
KQ3) How often do adults with preexisting MH conditions who have been hospitalized for COVID-19 experience exacerbation of MH symptoms?	No evidence.	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.
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?	No evidence.	No 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.	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.	No evidence.
KQ4) How often and what kinds of MH care do adults access during or after hospitalization for COVID-19?	No evidence.	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.	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.	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.	No evidence.
KQ4d) Does the type or extent of MH care utilization during or after hospitalization for COVID-19 vary by patient characteristics (<i>eg</i> , age, sex, race/ethnicity, comorbidities), COVID-19 disease severity, or level of care?	No evidence.	No evidence.
KQ5) What are the MH care resource needs among adults who have been hospitalized for COVID-19?	No evidence.	59% of hospitalized pts report at least some need for psychological guidance in rehabilitation (1 poor-quality cross-sectional study)

Italics indicates a statistically significant difference between groups at a significance level of .05.

MH=Mental health; MDD=Major Depressive Disorder; GAD=Generalized Anxiety Disorder; H =Hospitalized; NH=Non-hospitalized; CVD=Cardiovascular disease; Pt=Patient

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