Inpatient Treatment of Suicidality:

A Systematic Review of Clinical Trials

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Abstract

Objective: Psychiatric inpatients represent an acutely vulnerable population with high rates of suicidality (ie, suicidal ideation, attempts, and completed suicide). This systematic review aimed to evaluate treatments for suicidality delivered within inpatient settings.

Data Sources: MEDLINE, Embase, APA PsycInfo, CINAHL, and The Cochrane Library were systematically searched using 3 concepts: suicidality, inpatient population/setting, and treatment/interventions. Searches were limited to years 2001–2024, with no language restrictions.

Study Selection: Of 19,921 articles identified, 11,519 were screened, and 179 underwent full-text review. We included clinical trials on pharmacologic and nonpharmacologic interventions for suicidality in psychiatric inpatients aged 18–65 with moderate to high levels of suicidality that measured changes in suicidality.

Data Extraction and Synthesis: Studies were organized into tables by study design, treatments, participants, suicide measure, outcomes, and key findings. Due to heterogeneity, a meta-analysis was not conducted; instead, a narrative synthesis was used for qualitative analysis.

Results: Forty-nine studies were included. Of 14 pharmacologic trials, intravenous ketamine showed most consistent rapid reduction in suicidality. Thirty-five nonpharmacologic trials, covering a broad spectrum of treatments including chronotherapy, neurostimulations, and psychotherapies, were reviewed. The results were mixed, with some interventions showing potential in reducing suicidality, particularly in the mood, personality, and trauma-related disorders. Many studies had methodological concerns including nonrandomized designs, lack of control arms, and retrospective assessments.

Conclusion: A range of interventions for treating suicidality in inpatient settings have been evaluated, with mixed results. The current review underscores the need for larger, well-designed trials to assess the effectiveness of these treatments in inpatient settings.

J Clin Psychiatry 2025;86(1):24r15382

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Suicidality, defined as the spectrum of suicidal ideation, suicide attempts, and completions,[1,2] is a global public health crisis. Globally, there have been 3.2 million intentional self-harm injuries, approximately 842,000 suicides annually, and 34.9 million years of life lost.[3,4] The global age-standardized suicide mortality rate (ASR) is 9.0 per 100,000 population, with higher rates in males (12.6) compared to females (5.4).[5] The highest rates are in Africa (ASR = 11.2), and the lowest in the Eastern Mediterranean (ASR = 6.4).[5] From 2000 to 2019, global suicide mortality rates declined annually by 2.4% (95% CI, −2.6 to −2.3).[5] The World Health Organization reported that suicide is the leading cause of intentional injury in developed nations and is expected to significantly increase its impact on the global burden of disease in the coming years.[6–8]

In Canada, suicide is the ninth leading cause of death among all ages and higher among 10- to 44-year-olds.[3,9] Within the 5 years prior to suicide, 28.6% had a mental health hospitalization.[10] Furthermore, 1 month prior to suicide, 7.5% had a mental health hospitalization.[10] In a larger analysis of Toronto-based death by suicide from 1998 to 2011, 66.4% of persons had a mental health contact within the year prior to death.[11] Of those with a mental health contact, 21% had a mental health hospitalization.[11] It is evident that a significant portion of those who die by suicide are accessing mental health services and in particular inpatient mental health care shortly prior to death.

Increased suicidality is a common reason for presentation to emergency rooms and subsequent hospital admission. Patients admitted to the hospital with increased suicidality represent a severe and high-risk patient population. Standard practice for treatment of inpatients with suicidality involves containing risk through hospitalization and targeting any underlying mental disorder. However, treating suicidality directly may be more effective than targeting symptoms of an underlying mental disorder.[12] This is particularly imperative as those patients admitted with suicidality represent a vulnerable population with higher suicide rate in the 3 months following discharge compared to those without suicidality.[13]

Clinical Points

- Suicidality is a psychiatric emergency, with inpatients representing a particularly vulnerable population.
- Effective, rapid treatments that directly target suicidality in psychiatric inpatients are scarce in both the existing literature and clinical practice, underscoring the urgent need for studies to identify and validate these interventions.
- Numerous interventions have been evaluated across diverse patient populations, with intravenous ketamine being the most studied pharmacologic option. Nonpharmacologic interventions, though varied in effectiveness, should be selected based on individual patient needs and clinical context.

The current evidence for treatments that directly target suicidality includes ketamine, lithium, clozapine, antidepressants including selective serotonin reuptake inhibitors, electroconvulsive therapy (ECT), and psychotherapy, such as cognitive behavioral therapy (CBT) and dialectical behavioral therapy (DBT).[14] However, it is essential to acknowledge the unique context of psychiatric inpatient treatment, where patients may be involuntarily admitted and experience incapacity to make treatment decisions due to the severity and clinical heterogeneity of their presentations. While Chammas et al[14] provided a comprehensive review of prevention measures in psychiatric inpatient settings, their work was not a systematic review and covered a broader scope, including environmental and staff-related interventions. Similarly, Navin et al[15] conducted a narrative review on suicide prevention strategies in both general and psychiatric hospital settings, encompassing a wide range of preventive measures beyond direct treatment interventions. In another recent study, Fakhari et al[16] combined systematic reviews with expert opinions to identify effective suicide prevention programs, offering broad recommendations for prevention strategies.

While imperative at mitigating overall suicide risk, these studies focus more broadly on prevention strategies rather than specifically on the direct treatment of suicidality in inpatient settings. In contrast, our study systematically reviews clinical trials to evaluate specific pharmacologic and nonpharmacologic treatments for suicidality in psychiatric inpatients. By focusing exclusively on clinical trials, our review aims to provide a detailed and rigorous assessment of treatment efficacy, highlighting the need for standardized methodologies and reporting to improve the evidence base for this vulnerable population.

Further, most of the research on these treatments is limited to the outpatient setting, which decreases their applicability to psychiatric inpatients, whose presentations are often more severe and more clinically heterogeneous. Further, it is unclear if these treatments conducted in outpatients can be feasibly implemented in psychiatric inpatient units. Therefore, it is crucial that clinicians treating psychiatric inpatients have an updated evidence synthesis on effective treatments for suicidality in the inpatient setting. To our knowledge, there are no published reviews which summarize these data. To address this gap, the current systematic review aimed to synthesize data from published clinical trials of interventions to reduce suicidality in psychiatric inpatients. The study was preregistered (PROSPERO CRD42021255367).

MATERIALS AND METHODS

Data Sources and Searches

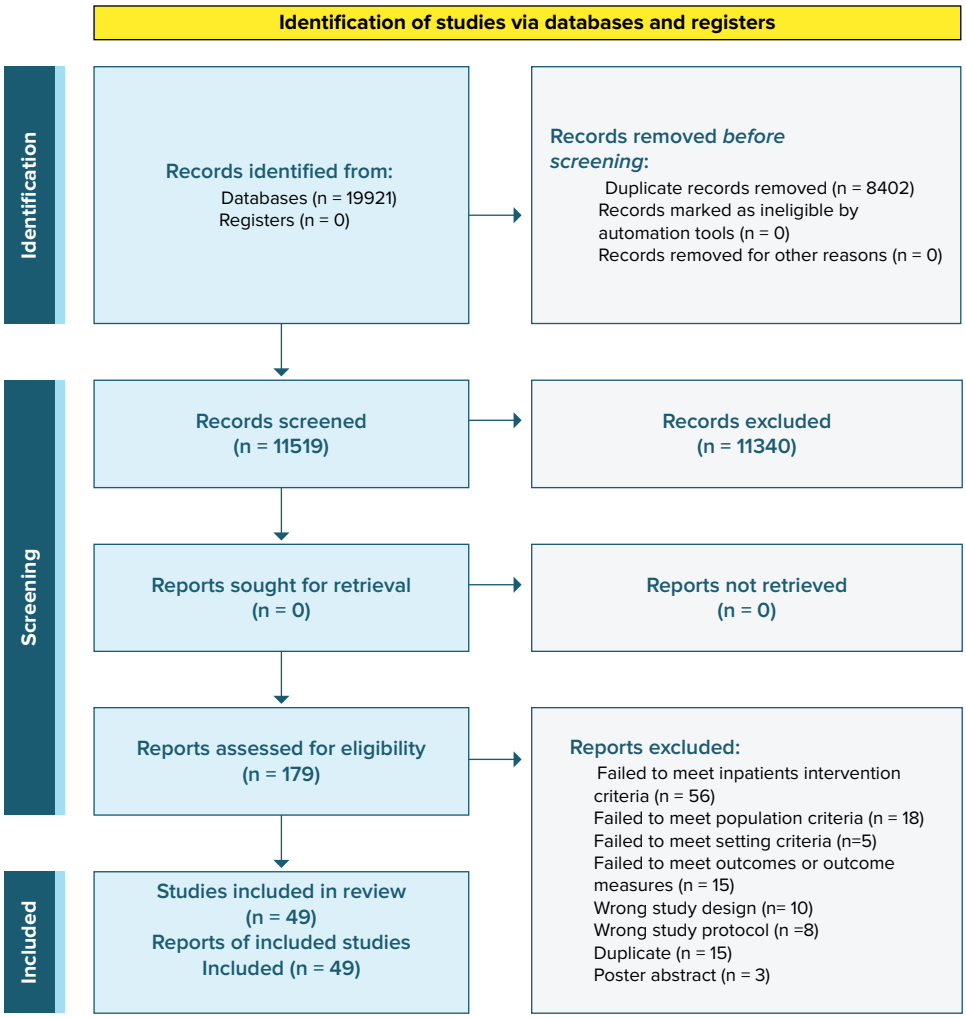
This systematic review adhered to the PRISMA 2020 guidelines.[17] Articles were identified through systematic searches in the following databases: MEDLINE (including Epub ahead of print, in-process, and other nonindexed citations), Embase, APA PsycInfo, Cumulative Index to Nursing & Allied Health Literature (CINAHL), and The Cochrane Library. A medical librarian (T.R.) developed the search strategies with input from the research team and conducted all searches on March 30, 2021, with updates run on April 5, 2022, and January 22, 2024, to capture additional articles published during the course of the review project. The strategy consists of 3 concepts (suicidality, inpatient population/setting, and treatment/interventions) operationalized using database-specific subject headings, keywords in natural language, advanced search operators, and combined with Boolean operators. Case reports, qualitative research, dissertations, and conference abstracts were removed through the search strategy when allowed by the database. The year limits applied were 2001 to the date of search (see above). No language limits were applied. See Supplementary Appendix 1 for the search strategy.

Study Selection

Participants. Inpatients of any gender and between 18 and 65 years old diagnosed with any psychiatric diagnosis included in the *Diagnostic and Statistical Manual of Mental Disorders (DSM)-III*,[18] *DSM-III-R*,[19] *DSM-IV*,[20] *DSM-IV-TR*,[21] and *DSM-5*,[22] or *International Classification of Diseases (ICD)-9*,[23] and *ICD-10*.[24] The participants must have moderate to high levels of suicidality as confirmed by standardized measures of suicidality at the start of the trial including, but not limited to, the Beck Scale for Suicide Ideation (BSS),[25] Columbia-Suicide Severity Rating Scale

Figure 1.

Study selection flow diagram based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).



(CSSRS),[26] the suicide item of the Hamilton Depression Rating Scale (HDRS),[27] the suicide item of the Montgomery-Asberg Depression Rating Scale (MADRS),[28] the suicide item of the Quick Inventory of Depressive Symptomatology (QIDS),[29] or the suicide item of the Patient Health Questionnaire-9 (PHQ-9).[30] Studies that recruited participants solely with self-injurious behavior were not included.

Interventions. Studies with pharmacologic or nonpharmacologic interventions were included.

Comparator. No comparator group was necessary.

Outcomes. Studies that reported changes in suicidality as either the primary or secondary outcome were included.

Outcome measurement. All prospective treatment clinical trial study designs and retrospective secondary analysis of prospective trials (open-label, crossover, randomized controlled trials [RCT], and cohort study) that reported changes in measures of suicidality were included. These may include but not limited to BSS,[25] CSSRS,[26] the suicide items of HDRS,[27] MADRS,[28] QIDS,[29] and PHQ-9.[30]

Setting. Studies were limited to the inpatient setting. Studies that included outpatients were excluded if more than 15% of patients were outpatients, unless outcomes were reported for inpatients and outpatients separately. We did not include emergency room interventions unless the intervention began in the emergency room and continued as an inpatient intervention. Similarly, we did not include interventions where patients were recruited on the inpatient unit, but the intervention was intended for after discharge. The focus was on interventions designed to reduce suicidality while patients are admitted to hospital.

Table 1.
Pharmacologic Interventions

	Author	Study	Intervention	Dose/duration	Country	Setting
Ketamine (intravenous, intranasal, oral)	Burger et al[33]	RCT	Intravenous ketamine Placebo (normal saline)	0.2 mg/kg over 2 min Single dose	US	Inpatient (emergency department)
	Domany et al[34]	RCT	Intravenous ketamine Placebo (normal saline)	0.2 mg/kg over 5 min Single dose	US	Inpatient (emergency department)
	Shivanekar et al[35]	Open-label trial	Intravenous ketamine + treatment as usual	0.5 mg/kg over 40 min Single dose	US	Inpatients
	Gaither et al[36]	Open-label trial	Intravenous ketamine	0.5 mg/kg over 40 min Single dose	US	Inpatient (emergency department)
	Vande Voort et al[37]	Open-label trial	Intravenous ketamine	0.5 mg/kg over 100 min Acute phase: thrice weekly for up to 2 wk Continuation phase: once weekly for 4 wk only for those remitted from depression 24 h after acute phase	US	Inpatient (psychiatric unit)
	Abbar et al[38]	RCT	Intravenous ketamine + treatment as usual Placebo (saline) + treatment as usual	Two 40-min infusions (0.5 mg/kg) within 24 h + treatment as usual	France	Inpatient (hospital)
	Domany and McCullumsmith[39]	RCT	Intranasal ketamine Placebo (normal saline)	40 mg (4 squirts of 10 mg) 2 applications for each nostril separated by 10 min	US	Inpatient (emergency department)
	Kaur et al[40]	Open-label trial	Oral ketamine	150 mg/50 ml water within 15 min (3 sessions across 5 d)	India	Inpatient (hospital)
Esketamine (intranasal)	Canuso et al[41]	RCT	Intranasal esketamine + standard of care antidepressants Placebo + standard of care antidepressants	84 mg Twice weekly for 4 wk	US	Inpatient (emergency department or psychiatric unit)
	Fu et al[42]	RCT (ASPIRE I)	Intranasal esketamine + standard of care antidepressants Placebo + standard of care antidepressants	84 mg Twice weekly for 4 wk	US, Europe, Asia, South Africa	Inpatient (emergency department or psychiatric unit)
	Ionescu et al[43]	RCT (ASPIRE II)	Intranasal esketamine + standard of care antidepressants Placebo + standard of care antidepressants	84 mg Twice weekly for 4 wk	US, Argentina, Austria, Belgium, Brazil, Canada, Lithuania, Czech Republic, France, Poland, Spain, Turkey	Inpatient (emergency department or psychiatric unit)
Buprenorphine (sublingual)	Ahmadi et al[44]	RCT	Sublingual buprenorphine	32 mg 64 mg 96 mg Single dose	Iran	Inpatient (psychiatric ward)
	Ahmadi et al[45]	RCT	Sublingual buprenorphine Placebo	16 mg 32 mg Single dose	Iran	Inpatient (psychiatric ward)
Duloxetine	Demyttenaere et al[47]	Post hoc of an RCT[46]	Duloxetine	60 mg or 120 mg Daily for 8 wk	4 countries across Europe and South Africa	Inpatient

Abbreviations: BD = bipolar disorder; BSS = Beck Scale for Suicide Ideation; CGI-SR-I = clinician global impression–imminent suicide risk; CGI-SS-r = clinical global impression Rating Scale (MADRS) Suicidal Ideation Item 10; MDD = major depressive disorder; MSSI = Modified Scale for Suicidal Ideation; OUD = opioid use disorder;

Diagnosis	Sample size (dropouts, N)	Mean age (SD)	Suicide scale	Measure	Key findings	Risk of bias
Depression with suicidal ideation (active-duty military population)	3 7	28 27	BSS	Suicidal ideation	• Significant improvement in suicidality over 4-h period. • No significant difference in BSS from placebo at discharge or 2-wk follow-up.	High
Depression with suicidal ideation in need of psychiatric hospitalization	9 9	35.11 (8.67) 35.78 (9.86)	BSS and MADRS-SI	Suicidal ideation	• Significant improvement in suicidality at 90–180 min after infusion. • Significant between-group difference in remission from suicide (≥2 in MDRS-SI) 90 min after infusion (88% vs 33%).	Low
Transdiagnostic sample of recent suicide attempters, who required hospitalization	16 (0)	34.06 (16.06)	MADRS-SI SSI	Suicidal ideation	• Significant improvement in suicidality at day 1, day 5, day 12, month 1, month 3, and month 6 postinfusion, compared to baseline (Cohen d's: 1.7–8.8)	High
Mood disorders with suicidal ideation	14 (0)	36.1 (13.1)	C-SSRS	Suicidal ideation and behavior	• Significant improvement in suicidal ideation 2 h after the infusion compared to baseline. • Feasibility of intervention.	High
Treatment-resistant MDD or BD I-II hospitalized for acute suicidal ideation	12 (5)	45.8 (8)	MADRS-SI	Suicidal ideation	• Significant improvement in suicidality at the end of acute phase for the entire sample and for the remitters, but not for nonremitters. • No specific report of suicidality after continuation phase.	High
Suicidal patients with MDD, BD, or any psychiatric disorder with no mention of psychotic disorders or substance use dependent	73 (13) 86 (17)	38 (18–75) 41 (18–76)	SSI	Suicidal ideation	• Rapid reduction in suicidality in 2 h after the first infusion, with 44% remission in the ketamine group compared to 7% remission in the placebo group. • Significant improvement in suicidality between groups, with 63% full remission at day 3 in the ketamine group compared to 32% in the placebo group (odds ratio 3.7)	Low
Suicidal ideation in need of psychiatric hospitalization	15 15	35.11 (8.67) 35.78 (9.86)	BSS and MADRS-SI	Suicidal ideation	• Significant improvement in suicidality over a 4-h period (MDRS-SI, but not BSS). • Significant between-group difference in remission from suicide (=0 in MDRS-SI) 4-h postadministration (80% vs 33%). • Low rates of suicidal ideation in 28-d follow-up with no statistically significant group by time interaction. • A trend toward the effect of ketamine in shortening the length of hospitalization.	Unclear
MDD at imminent risk for suicide	30 (0)	37.2 (9.4)	MSSI	Suicidal ideation	• A significant improvement with large effect sizes for suicidal ideation from baseline to day 1 after the last ketamine session (effect size = 1.70).	High
MDD at imminent risk for suicide	36 (9) 32 (10)	35.7 (13.40) 36.0 (12.82)	MADRS-SI, BSS, clinician global judgment of suicide risk rating	Suicidal ideation	• Significant improvement in suicidality at 4 h (effect size = 0.67), but not at 24 h (effect size = 0.35) or at day 25 (effect size = 0.29) and the follow-up (MADRS-SI). • No between-group reductions in BSS and clinician global judgment of suicide risk scores at any time point.	Unclear
MDD with active suicidal ideation in need of psychiatric hospitalization	114 (12) 112 (19)	40.8 (13.17) 37.9 (12.54)	MADRS-SI, CGI-SS-r, CGI-SR-I, and FoST	Suicidal ideation and behavior	• Improvement in suicidality at 24 h after first dose, end of the treatment (day 25), and follow-up (day 90) did not significantly differ from placebo.	Low
MDD with active suicidal ideation in need of psychiatric hospitalization	115 (25) 115 (21)	40.2 (12.73) 41.4 (13.43)	MADRS-SI, CGI-SS-r, CGI-SR-I, and FoST	Suicidal ideation and behavior	• Improvement in suicidality at 24 h after the first dose, end of the treatment (day 25), and follow-up (day 90) did not significantly differ from placebo.	Low
OUD with MDD	17 (1) 17 (0) 17 (3)	31.75 (6.40) 33.94 (9.01) 32.85 (7.00)	BSS	Suicidal ideation	• Significant reduction in suicidal ideation over 3 d with no between-group differences.	Unclear
OUD	20 (0) 20 (0) 21 (0)	37.70 (8.44) 38.60 (9.37) 33.38 (8.89)	BSS	Suicidal ideation	• Significant reduction in suicidal ideation at day 4 posttreatment in 32 mg, but not in 16 mg, as compared to placebo.	Low
MDD with varying degrees of severity in suicidal thoughts	Overall 336	Overall, 44.8 (13.3)	MADRS-SI	Suicidal ideation	• Rapid decline in more pronounced suicidal thoughts (ie, MADRS-SI ≥ 4). • Gradual and slow declined in less pronounced suicidal thoughts (ie, MADRS-SI ≥ 2). • Significant improvements in low reasons for living inventory in individuals with higher baseline suicidal ideation. • Very low correlations between severity of depressive symptoms, suicidality, and reasons for living.	Low

of severity of suicidality (revised); C-SSRS = Columbia-Suicide Severity Rating Scale; FoST = frequency of suicidal thinking; MADRS-SI = Montgomery–Asberg Depression RCT = randomized controlled trial; SSI = Scale for Suicidal Ideation.

Table 2.
Nonpharmacologic Interventions

	Author	Study	Intervention	Duration	Country	Setting
Biological interventions	Benedetti et al[48]	Quasi-experimental study	Total sleep deprivation, light therapy, and lithium	1 wk	Italy	Inpatient (hospital unit)
	Sahlem et al[49]	Open-label pilot study	Total sleep deprivation, sleep phase advance, bright light therapy	4 d	US	Inpatient (Institute of Psychiatry)
	Lin et al[50]	Post hoc analysis of 2 open-label trials	Electroconvulsive therapy (ECT) Fluoxetine	2–3 times/wk with a max of 12 treatments Fixed dose of 20 mg/d for 6 wk	Taiwan	Inpatient (psychosomatic ward)
	Patel et al[51]	Retrospective study	Electroconvulsive therapy (ECT) Matched controls	3 times/wk with a maximum of 10 treatments	US	Inpatient (civil psychiatric facility)
	George et al[52]	Pilot randomized trial	Repetitive transcranial magnetic stimulation (rTMS) Sham	3 sessions/d for 3 d (54,000 stimuli)	US	Inpatient (military hospital wards)
	Zhang et al[53]	Open-label trial	Repetitive transcranial magnetic stimulation (rTMS)	5 sessions/wk for 2 wk	China	Inpatient (mental health center)
Cognitive and behavioral therapies	Jelinek et al[54]	Uncontrolled pilot study	Metacognitive training for depression (D-MCT)	4 wk	Germany	Inpatient (ward for affective disorders of the clinic for psychiatry)
	Probst et al[55]	Diary card study	Dialectical behavior therapy (DBT)	Weekly for 5 wk	Germany	Inpatient (unit for psychiatric crisis intervention)
	Davidson et al[56]	Pilot RCT	Manual-assisted cognitive therapy (MACT) TAU	6 sessions	United Kingdom	Inpatient (psychiatry service in hospital)
	Diefenbach et al[57]	Open-label trial	Brief cognitive-behavioral therapy for suicidal inpatients (BCBT-I)	3-7 sessions within 10–24 d	US	Inpatient (psychiatric unit or medical floor)
	Tarrier et al[58]	Longitudinal follow-up comparative study	Cognitive-behavior therapy for psychosis (CBTp) Supportive counseling (SC) Treatment as usual (TAU)	15–20 h treatment envelope within a 5-wk postadmission period, plus "booster" sessions at a further 2 wk, and 1, 2, and 3 mo.	United Kingdom	Inpatient or day patient unit for treatment of psychosis
	Haddock et al[59]	Pilot RCT	Cognitive-behavioral suicidal prevention therapy (CBSP) + TAU TAU	20 1-hr sessions over 60 mo	United Kingdom	Inpatients (acute psychiatric ward)

Diagnosis	Sample size (dropouts, N)	Mean age (SD)	Suicide Scale	Measure	Key findings	Risk of bias
Major depressive episode as part of BD	143 (2)	R+ 45.71 (11.90) NR+ 43.36 (8.61) R− 47.91 (10.97) NR− 47.61 (13.44)	HDRS-SI	Suicidal ideation	• Significant, rapid, and persistent improvement in suicidality soon after the first total sleep deprivation cycle. • Larger improvement for responders with a positive suicide history after the first total sleep deprivation + light therapy treatment.	High
Unipolar or bipolar depression	13 (3)	44 (16.4)	C-SSRS and SSI	Suicidal ideation and behavior	• Triple chronotherapy was safe and feasible. • Significant drop in both clinician and self-rated scales of suicidal ideation.	High
MDD receiving ECT or fluoxetine for acute treatment	130 (27) 131 (30)	46.5 (10.6) 45.6 (12.4)	HDRS-17 suicide item	Suicidal ideation	• Both ECT and fluoxetine significantly improved suicidality. • Significantly higher rate of resolution of suicidal ideation in ECT compared to the fluoxetine group (83% vs 50%). • Significantly shorter time to resolution of suicidal ideation in ECT compared to the fluoxetine group. • Greater effect size for ECT groups in comparison to the fluoxetine group (Cohen d = 2.40 vs 1.23). • Equal effectiveness of ECT and fluoxetine in preventing recurrence of suicidal ideation in the 12-wk follow-up period.	High
Seriously mentally ill (MI) including BD, MDD, and SCZ	30 30	32.9 (11.3) mentally ill 37.7 (9.1) mentally ill with substance abuse 33.1 (9.8) mentally ill 39.3 (9.2) mentally ill with substance abuse	BPRS suicide scale	Suicidal ideation	• Greater improvement in suicidality during a shorter period in the ECT group as compared to the control group. • Most pronounced improvement in mentally ill with substance abuse. Note: baseline suicidality was higher in the ECT group	High
PTSD or TBI or both in addition to suicidality	20 (10) 21 (4)	38.7 (15) 46.1 (15.9)	BSS	Suicidal ideation	• rTMS treatment is safe and does not lead to a worsening of suicidality both acutely (over 3 d) and long-term (6-mo follow-up). • Rapid antisuicidal effects. • No significant different between groups.	Unclear
Acute depressive episodes and suicidal ideation	43 54	SI and resolved (n = 63), 43.6 (26.2) SI and unresolved (n = 34), 49.9 (25.1)	HDRS-suicidal-ideation	Suicidal ideation	• Add-on rTMS resulted in significant improvement in suicidal ideation. • Pronounced suicide improvement and remission in adolescents treated with the HF left DLPFC rTMS protocol, compared with LF right DLPFC rTMS protocol (not observed in adults) • More likelihood of achieving remission with HF left DLPFC rTMS protocol in adolescents as compared to adults.	High
Depression	58 (10 did not complete the 4-wk intervention, 2 lost to postassessment, 3 lost to 8-wk follow-up assessment)	41.15 (9.53)	BSS and HDRS-SI	Suicidal ideation	Feasibility, safety, and acceptability of the D-MCT/S modules addressing suicidality. BSS: 4-wk post assessment: Cohen d = 0.272; 8-wk follow-up: Cohen d = 0.258; t0–t1–t2 = P = .068, η2partial = 0.059 HDRS item 3: 4-wk post assessment: Cohen d = 0.488; 8-wk follow-up: Cohen d = 0.45; t0–t1–t2 = P < .001, η2partial = 0.146	High
BPD	44	30.16 (9.39)	Suicidal ideation rating on the diary card Skill use rating on the diary	Suicidal ideation	• Significant improvement in suicidal ideation in individuals that had higher. Percentage of days with successful skill use. • Lower suicidal ideation on days with successful skill use relative to unsuccessful skill use and no skill use. • Higher suicidal ideation on days with unsuccessful skill use compared to days with no skill use.	High
Personality disorder with and without substance misuse admitted after an episode of self-harm	14 (3) 6 (2)	NA	BSS	Suicidal ideation	• Significant improvement in suicidal ideation in MACT compared to TAU at 3-mo follow-up.	Low
Suicide attempts within 1 wk of admission, mostly mood disorders	6 (2)	33.5	C-SSRS	Suicidal ideation and behavior	• Acceptability and feasibility of BCBT-I. • Significant and large improvements in suicidality (Cohen d = 0.97).	High
Schizophrenia or delusional disorder	Data were available for 278 participants (90.0%) at baseline; 210 (68.0%) at 6 wk; 195 (63.1%) at 3 mo; and 218 (70.6%) at 18 mo	Overall Low self-harm score (n = 242): 29.7 (10.6) High self-harm score (n = 36): 28.6 (6.4)	HoNOS nonaccidental self-injury	Self-injury	• Significant reduction in HoNOS suicide behavior scores from baseline. • No significant differences between CBTp, TAU, and SC in suicidal ideation at 6-wk, 3-mo, or 18-mo follow-up.	Unclear
Suicidal thoughts or behaviors within the 3 mo prior to admission	24 (6) 27 (8)	33.88 (12.18) 37.04 (12.41)	BSS SPS ideation and suicide risk	Suicidal ideation and behavior; suicide risk	• Successful implementation of CBSP in acute inpatient setting. • No significant differences in suicidal ideation and suicidal probability between the CBSP + TAU and TAU alone during the 6 mo. At 6 wk BSS: NA SPS ideation, effect size = 0.17 SPS suicide risk, effect size = 0.37 At 6 mo BSS: NA SPS ideation, effect size = 0.27 SPS suicide risk, effect size = −0.18	High

(continued)

Table 2 (continued).

	Author	Study	Intervention	Duration	Country	Setting
	LaCroix et al[60]	Pilot RCT	Post-admission cognitive therapy (PACT) + EUC EUC	Six 60- to 90-min individual CBT sessions over 3 d	US	Inpatient (psychiatric inpatient unit)
	Ghahramanlou-Holloway et al[61]	Pilot RCT	Post-admission cognitive therapy (PACT) + EUC EUC	Six 60- to 90-min individual CBT sessions over 3 d	US	Inpatient (psychiatric inpatient unit)
	Cha et al[62] (experiment 2)	RCT	Attention bias modification (ABM) Controls	4 sessions of a 20-min computer-based task	US	Inpatient (psychiatric inpatient unit
	Bentley et al[63]	Proof of concept study (RCT)	Unified protocol (UP) + TAU TAU	Daily, 4 d	US	Inpatient (hospital unit)
	Bentley et al[64]	Quasi-experimental study	Unified protocol (UP)	Daily, 7-d schedule allowing patients to receive all modules in the first 2 d on the unit	US	Inpatient (hospital unit)
	Herrmann et al[65]	RCT	Mindfulness-based intervention (MB-SI) Treatment as usual (TAU)	Four 45-min individual session, each per day, over 12 subsequent days	US	Inpatient (psychiatric unit)
Psychodynamic and mentalization-based therapies	Vaslamatzis et al[66]	Naturalistic empirical study (observational)	Specialized inpatient psychotherapeutic program (SIPP)	100 d	Greece	Inpatient (psychiatric university hospital)
	Fowler et al[67]	Naturalistic longitudinal study	Extended inpatient treatment including mentalization-based therapies for adults with borderline personality disorder reference	8 wk	US	Inpatient (psychiatric hospital)
Trauma-focused and specialized interventions	Ross and Haley[68]	Uncontrolled naturalistic study	Trauma model therapy	35 h a wk of group therapy and 3 h a wk of individual therapy while in the inpatient program 30 h a wk of group therapy and 2 h of individual therapy in the partial hospitalization program	US	Inpatient (psychiatric hospital)
	Menefee et al[69]	Naturalistic study	Environment of recovery programs (ROVER/WISER) including evidence-based treatments (EBTs) for PTSD	30 d (5–7 h of therapy per weekday and a minimum of 2 h per day on the weekends)	US	Inpatient (acute hospital setting)
Motivational and brief interventions	Britton et al[70]	Open-label trial	Motivational interviewing to address suicidal ideation (MI-SI)	2 sessions spaced over 3 days	USUS	Inpatient (acute psychiatric unit)
	Britton et al[71]	RCT	Motivational interviewing to address suicidal ideation (MI-SI) Revised MI-SI (MI-SI-R) Treatment as usual (TAU)	2 sessions spaced over 2 d	US	Inpatient (acute psychiatric unit)
	Ducasse et al[72]	RCT	Gratitude diary Food diary	Daily for 7 d	France	Inpatient (department of psychiatric emergency and acute care in the academic hospital)
	O'Connor et al[73]	RCT	Volitional help sheet (VHS) + TAU TAU	6 mo	United Kingdom	Inpatient (emergency department)

Diagnosis	Sample size (dropouts, N)	Mean age (SD)	Suicide Scale	Measure	Key findings	Risk of bias
Recent suicide attempt and ASD or PTSD; military service members and adult beneficiaries	18 (8 at 3-mo) 18 (6 at 3-mo)	28.9 (8.6) 33.0 (10.8)	SSI-W	Suicidal ideation	• No statistically significant between-group difference in reattempt suicide or suicide ideation during 3-mo follow-up. Month 1, Cohen d = −0.97 Month 2, Cohen d = 0.23 Month 3, Cohen d = −0.26	High
Recent suicide attempt or suicide ideation with a history of a prior suicide attempt (63% with multiple attempts; 67% with MDD)-military service members and adult beneficiaries)	12 (2 at 3-mo) 12 (6 at 3-mo)	30.3 (11.4) 27.8 (9.3)	SSI-W	Suicidal ideation	• No statistically significant between-group difference in reattempt suicide or suicide ideation during 3-mo follow-up. Month 1: Cohen d = 0.19, *P* = .633 Month 2: Cohen d = 0.54, *P* = 233 Month 3: Cohen d = −0.06, *P* = .992	High
Suicidal ideation or attempt	Overall, 37 (7)	41.5 (15.1) 45.9 (14.6)	SSI	Suicidal ideation	• No significant between-group differences in reducing suicidality (Cohen d's = 0.04–0.09). • Equal likelihood of experiencing suicidal ideation for the groups at 2-mo follow-up.	Low
Suicide attempt or experiencing active suicidal ideation within the past 2 wk. Heterogenous diagnosis, with most common diagnosis of depression and polysubstance abuse.	6 (1) 6 (1)	Overall: 44 (11.73)	BSS	Suicidal ideation	• Acceptability and feasibility of UP implementation. • No between-group differences in suicidal thoughts or behaviors during a 6-mo follow-up.	Unclear
Suicidal thoughts and behaviors and affective disorders	Pre-UP (n = 133) post-UP (n = 61)	34.1 (13.6)	PHQ-9 suicide item	Suicidal ideation	• Acceptability of UP implementation. • Improvements in suicidality were not significantly different between pre and post-UP implementation (Hedges'g at discharge between pre- and post-UP = 0.05).	High
Veterans with increased suicide risk	20 (8) 13 (5)	Overall, 39.5 (9.52)	C-SSRS	Suicidal ideation and behavior	• No between-group differences in reduction of suicidality at 1-mo follow-up. • Feasibility of MB-SI in an inpatient psychiatric unit.	Unclear
Severe personality disorder	43 (10)	26.3 (5.6)	Suicide Risk Scale	Risk for suicidality, aggressivity, and impulsivity	• Significant improvement in suicidality for all participants. • Significant reduction in suicidality in multimodal psychodynamic psychotherapy plus pharmacotherapy group, but not in multimodal psychodynamic psychotherapy only group.	High
BPD	245 220	28.5 (11.0) 32.7 (13.5)	C-SSRS	Suicidal ideation and behavior	• Large size improvement in suicidality in BDP patients and their references (BPD, Cohen d = 1.19; reference, Cohen d = 0.81) during extended hospitalization.	High
Complex dissociative disorders and depression	60 (14)	36.1 (range 20–52)	BSS	Suicidal ideation	• Significant difference between the admission scores as compared to the discharge and 3-mo follow-up admission vs discharge, Cohen d = 1.12 Admission vs 3 mo, Cohen d = 1.04 Discharge vs 3-mo, Cohen d = 0.03	High
Veterans who voluntarily sought admission to an inpatient, acute psychiatric setting in a southern VA medical center	559 (282 men; 277 women) discontinuation: 92 (71 men and 21 women)	Male: 30.8 (6.7) Female: 41.9 (10.4) Total: 36.3 (10.4)	BSS	Suicidal ideation	• Significant improvement in suicidality (Cohen d = 1.13).	High
Suicidal ideation (veterans)	13 (4 posttreatment, 2 in follow-up)	46.77 (10.49)	SSI	Suicidal ideation	• Acceptability of MS-SI intervention • Immediate and long-term reduction in severity of suicidal ideation with large effect size (Cohen d's = 1.36–3.39 posttreatment; 1.66–1.95 at 2-mo follow-up)	High
Suicidal ideation (veterans)	33 (9 at 1-mo, 10 at 3-mo, 12 at 6-mo) 33 (5 at 1-mo, 7 at 3-mo, 6 at 6-mo) 66 (10 at 1-mo, 11 at 3-mo, 14 at 6-mo)	46.61 (12.69) 43.91 (12.44) 46.03 (12.77)	SSI and suicide attempts	Suicidal ideation and suicide attempts	• Reduction in the presence and severity of suicide was not different between groups over 6-mo follow-up. • MI-SI, odds ratio (95% CI) 0.60 (0.26, 1.40); MI-SI-R, odds ratio (95% CI) 0.58 (0.28, 1.24); combined MI-SI conditions, odds ratio (95% CI) 0.59 (0.31, 1.12).	Unclear
Recent suicidal ideation or attempts	101 (1) 100 (2)	41.58 (12.97) 42.55 (11.82)	Severity and intensity C-SSRS SSI	Suicidal ideation and behavior	• No significant efficacy of 7-d gratitude journal to reduce suicidal ideation as compared to the control • C-SSRS, Cohen d = 0.20; SSI, Cohen d = 0.22.	High
Recent suicide attempts	259 (5) 259 (1)	36.5 (14.59) 36.07 (12.77)	The number of participants who re-presented with self-harm during the 6-mo follow-up period; the number of times a participant re-presented at the hospital with any self-harm during the 6-mo follow-up period	Repetition of self-harm	• No significant between-group difference in the number of participants who represented with self-harm after 6-mo follow-up. • No significant between-group difference in the self-harm representations per patient after 6-mo follow-up.	Low

(continued)

Table 2 (continued).

	Author	Study	Intervention	Duration	Country	Setting
Comprehensive care approaches (integrative, collaborative, and peer support)	Pfeiffer et al[74]	Pilot RCT	Peer specialist intervention (PREVAIL) + usual care Usual care	12 wk	US	Inpatient psychiatry unit
	Engstrom et al[76]	Secondary analysis of a cluster randomized trial[75]	Collaborative care intervention Usual care	12 mo	US	Inpatient (25-level I trauma centers)
	Jun et al[77]	Quasi-experimental study	Suicide prevention program Routine hospital treatments	two 60-min sessions per wk over 4 wk (8 sessions total)	South Korea	Inpatient (psychiatric unit in a university hospital)
	Ellis et al[78]	Open-label pilot study	Collaborative assessment and management of suicidality (CAMS)	4–24 50-min sessions Mean length of stay: 51.4 d	US	Inpatient (psychiatric hospital)
	Ellis et al[79]	Naturalistic, controlled-comparison trial	Collaborative assessment and management of suicidality (CAMS) Treatment as usual (TAU)	10–29 50-min sessions Mean length of stay: 58.8 d	US	Inpatient (psychiatric hospital)
	Ellis et al[80]	Naturalistic, controlled comparison trial	Collaborative assessment and management of suicidality (CAMS) Treatment as usual (TAU)	6–30 50-min sessions Mean length of stay: 59.5 d	US	Inpatient (psychiatric hospital)
	O'Connor et al[81]	RCT	The teachable moment brief intervention (TMBI) + usual care Usual care	Single session of 30–60 min	US	Inpatient (medical/surgical floor) of a level 1 trauma center
	O'Connor et al[82]	Pilot RCT	Teachable moment brief intervention (TMBI) + usual care Usual care	Single session of 30–60 min	US	Medical/surgical floor or inpatient psychiatry unit
	Bahlmann et al[83]	Open-label pilot study	Relapse prevention intervention after suicide event (RISE)	Five 60-min sessions delivered over 2 to 3 times per week over 2–3 wk	Germany	Inpatient (hospital)

Abbreviations: ASD = acute stress disorder; BD = bipolar disorder; BPD = borderline personality disorder; BPRS = Brief Psychiatric Rating Scale; BSS = Beck Scale for Suicide
EUC = enhanced usual care; HDRS = Hamilton Depression Rating Score; HDRS-SI = Hamilton Depression Rating Scale Suicide Item 3; HF = high frequency; HoNOS = Health
with negative history of attempted suicide; OCD = obsessive compulsive disorder; PHQ-9 = Patient Health Questionnaire-9; PTSD = posttraumatic stress disorder;
SPS = Suicide Probability Scale; SSI = Scale/Severity of Suicidal Ideation; SSI-W = Scale for Suicide Ideation, Worst Time Point; TAU = treatment as usual; TBI = traumatic

Diagnosis	Sample size (dropouts, N)	Mean age (SD)	Suicide Scale	Measure	Key findings	Risk of bias
Suicidal ideation or attempts (various diagnosis)	34 (10 by 3-mo and at 6-mo) 36 (5 by 3-mo and 7 by 6-mo)	Overall, 34 (14)	Suicide ideation (Beck Scale)	Suicidal ideation	• Acceptability and feasibility of the PREVAIL intervention. • No reports on within or between-group difference due to limited power.	Unclear
Injury survivors (some with PTSD and suicidal ideation at baseline)	265 370	37.6 (13.4) 39.9 (14.8)	PHQ-9 suicide item	Suicidal ideation	• Feasibility of suicidal assessment and monitoring in pragmatic clinical trials. • No significant difference in improvement of suicidality in intervention relative to the control during the 12-mo follow-up.	High
Mental disorder (SCZ, MDD, BD, anxiety disorders, alcohol use disorder) receiving treatment in the psychiatric unit	25 (3) 25 (2)	46.45 (15.02) 43.52 (16.24)	BSS	Suicidal ideation	• Significant improvement in suicidal ideation compared to the control.	High
Recent history of suicidal ideation/ behavior, mostly primary mood disorders (depression, BD-I, and BD-II) but also PTSD, anxiety disorder NOS, PD, and bulimia nervosa	24 (4)	36.90 (11.06)	BSS and SCS	Suicidal ideation	• Significant decreases in suicidal ideation and suicidal cognition. • Support for the feasibility of implementing a structured, suicide-specific intervention for at-risk patients in inpatient settings.	High
Suicidality (ideation or attempts) within weeks of admission (prominently mood disorders, anxiety disorders, substance-related disorders, and personality disorders)	26 26	32.42 (14.19) 33.31 (13.19)	BSS and SCS	Suicidal ideation; suicide risk by measuring a range of suicidogenic cognitions	• Greater and faster improvement in suicidal ideation and suicidal cognition in CAMS compared to TAU.	High
Suicidality (ideation or attempts) within 2 mo prior to admission, prominently mood disorders and personality disorders	52 (24 at 2-wk, 27 at 12-wk, 34 at 24-wk follow-ups) 52 (29 at 2-wk, 35 at 12-wk, 35 at 24-wk follow-ups)	31.44 (13.91) 32.92 (14.56)	BSS, SCS, and C-SSRS	Suicidal ideation; suicide risk by measuring a range of suicidogenic cognitions; suicidal ideation and behavior	• Significant improvement in suicidal ideation in all patients at discharge and 6-mo follow-up • Significant differences between CAMS and TAU at discharge but not at 6-mo follow-up.	High
Recent suicide attempt survivors	15 (4) 15 (2)	43.67 (13.13) 39.02 (14.43)	SSI, motivation to change, reasons for living	Suicidal ideation, motivation to changes, reasons for living	• TMBI intervention was feasible and acceptable. • No significant between-group differences in suicidal ideation at 1-mo follow-up. • Significant improvements in motivation to address their problems in the TMBI group compared to usual care at 1-mo follow-up ($\beta = 9.02$). • Significant improvements on reasons for living improvements in the TMBI group compared to the usual care group 1-mo follow-up ($\beta = 29.60$). • No statistically significant differences between groups on reported reasons for living.	High
Recent suicide attempt survivors	23 (4 at 1-mo interview, 7 at 3-mo interview, 10 at 12-mo interview) 25 (10 at 1-mo interview 13 at 3-mo interview 15 at 12-mo interview)	43.26 (2.48) 41.96 (2.70)	BSS, motivation to change, reasons for living	Suicidal ideation, motivation to changes, reasons for living	• Acceptability and feasibility of TMBI intervention • No significant between-group differences in suicidal ideation at 12-mo follow-up. • No significant improvements in motivation to address their problems in the TMBI group compared to usual care at 12-mo follow-up ($\beta = -0.40$) • No significant improvements on reasons for living improvements in the TMBI group compared to the usual care group 12-mo follow-up ($\beta = -2.23$).	Unclear
Recent suicide attempters (MDD, ASD, OCD, alcohol dependence)	27 (20)	35.6 (14.2)	BSS	Suicidal ideation	• Significant reduction in suicidal ideation after RISE intervention compared to baseline (effect size = 0.75) • No significant changes between sessions in the intensity of suicidal ideation or in the intent to act on suicidal ideation • 89% had no suicide re-attempts at 6-mo follow-up. • Acceptability of RISE.	High

Ideation; C-SSRS = Columbia-Suicide Severity Rating Scale; DLPFC = dorsolateral prefrontal cortex; DSI-SS = Depressive symptom Inventory Suicidality Subscale; of the Nation Outcome Scales; LF = low frequency; MDD = major depressive disorder; NR+ = nonresponders with positive history of attempted suicide; NR− = nonresponders R+ = responders with positive history of attempted suicide; R− = responders with negative history of attempted suicide; SCS = Suicide Cognition Scale; SCZ = schizophrenia; brain injury.

Data Extraction and Risk of Bias Assessment

Search results were imported into systematic review software Covidence,[31] and the subsequent steps of the review were facilitated by the Covidence interface. Two authors (A.A. and A.S.) independently screened the abstracts and full texts to decide their inclusion based on predefined inclusion criteria. Any discrepancies were discussed by the 2 authors, and a third author (B.D.M.J.) resolved any further conflicts. A.A. extracted the data, which included description of the interventions and control group, demographics, and clinical data including effect measures. The Cochrane risk of bias (RoB) tool[32] was used to assess bias across 5 domains (selection, performance, attrition, reporting, and other).

Synthesis of Results

Data extracted from the included studies underwent thorough review to ensure accuracy and completeness. Structured tables were used to present detailed characteristics of both pharmacologic and nonpharmacologic interventions, including outcomes measured by various suicide scales. These tables provided a comprehensive overview of intervention specifics, participant demographics, and reported outcomes.

Amendments to Preregistered Protocol

A meta-analysis was not conducted due to significant heterogeneity across the included studies. Differences in methodologies, such as variations in suicide scales, outcome measures, and participant populations, prevented the aggregation of data into a single quantitative measure of effect. Although some studies reported effect sizes or provided sufficient data for their calculation or imputation, the methodological diversity precluded a unified quantitative analysis. Instead, a narrative synthesis approach was chosen to qualitatively analyze and interpret the diverse findings reported in the literature. Where available, effect sizes were reported in the tables to facilitate meaningful comparisons across studies using different measurement tools. This approach ensured transparency in presenting the quantitative outcomes reported in the original studies.

RESULTS

The database searches identified 19,921 articles for consideration. 8,402 duplicates were removed, leaving 11,519 unique items for title-abstract screening. From these, 179 studies moved forward and their full-texts assessed for eligibility. Ultimately, 49 studies were included in our final analysis. The PRISMA flow diagram in Figure 1 outlines this process and breaks down the reasons for the exclusion of ineligible studies.

Pharmacologic Interventions

Overall, 14 studies examined the effectiveness of a range of pharmacotherapies for the treatment of suicidality. The details of each study are shown in Table 1. The pharmacologic interventions used for addressing suicidality include ketamine (intravenous, intranasal, and oral), esketamine (intranasal), buprenorphine (sublingual), and duloxetine.

Ketamine (intravenous, intranasal, and oral). A total of 8 studies investigated antisuicidal effects of ketamine. Of these, intravenous administration, ranging from 0.2 to 0.5 mg/kg of body weight, was employed in 6 studies,[33–38] intranasal administration (40 mg) was utilized in 1 study,[39] and oral administration (150 mg/50 mL water) was investigated in another study.[40] These studies encompassed diverse patient populations including suicidal patients with major depressive disorder (MDD) in a military setting, treatment-resistant unipolar or bipolar I or II depression diagnosis, and transdiagnostic cohort with active suicidal thoughts and in need of hospitalization. The intervention duration varied from single sessions to repeated infusions over 4–6 weeks. Collectively, the findings consistently indicated the efficacy of ketamine in acutely improving suicidality.

Esketamine (intranasal). The effectiveness of 4-week treatment of 84 mg intranasal esketamine with standard-of-care antidepressants was evaluated in 3 studies. Patient populations included individuals with depression and suicidality. While 1 study reported positive outcome,[41] 2 notably large studies[42,43] indicated a lack of efficacy for esketamine as an acute antisuicidal intervention. All studies failed to show the benefits of this agent for suicidality after 4 weeks.

Buprenorphine (sublingual). There were 2 studies that investigated the efficacy of sublingual, single doses of buprenorphine, ranging from 16 mg to 96 mg. The studies included patients with opioid use disorder (OUD) with or without comorbid MDD. The length of the interventions was 3–4 days. Overall results showed efficacy of high-dose buprenorphine for rapid relief of suicidal ideation.[44,45]

Duloxetine. The antisuicidal effect of duloxetine was examined in a post hoc analysis, which pooled data from inpatients with MDD receiving 60 mg of duloxetine once or twice daily for 8 weeks.[46] The findings demonstrated a rapid improvement in suicidal thoughts by the end of the treatment period.[47]

Nonpharmacologic Interventions

There were 35 studies that investigated various nonpharmacologic interventions for the treatment of

suicide. Table 2 demonstrates the characteristics of each study. The interventions were categorized into biological interventions, cognitive and behavioral therapies, psychodynamic and mentalization-based therapies, trauma-focused and specialized interventions, motivational and brief interventions, and comprehensive care approaches (integrative, collaborative, and peer support).

Biological interventions. Biological interventions employ physiological and neurological approaches to tackle suicidal ideation. The included studies explored chronotherapy, ECT, and repetitive transcranial magnetic stimulation (rTMS). Studies of biological interventions reported promising outcomes, especially with chronotherapy, showcasing its potential impact on sleep regulation and suicidality reduction.[48,49] Further, ECT[50,51] and rTMS[52,53] demonstrated effectiveness, underscoring the importance of physiological interventions in addressing suicidal ideation.

Cognitive Behavioral Therapy. CBT, targeting distorted thought patterns, maladaptive behaviors, and emotional dysregulation, constitutes foundational strategies in addressing suicidality. These approaches aim to equip individuals with practical coping mechanisms and cognitive restructuring techniques, addressing psychological and behavioral aspects of suicidality. Studies that have been conducted include metacognitive training for depression,[54] DBT,[55] manual-assisted cognitive therapy (MACT),[56] CBT,[57,58] cognitive-behavioral suicidal prevention therapy (CBSP),[59] postadmission cognitive therapy (PACT),[60,61] attention bias modification (ABM),[62] unified protocol (UP),[63,64] and mindfulness-based intervention for suicidal ideation (MB-SI).[65] Studies of CBT-based interventions reported a diverse range of outcomes. While some interventions demonstrated promise in reducing suicidality in specific populations, the overall effectiveness remains nuanced. Ongoing refinement and customization of CBT approaches are crucial to optimize their effectiveness in treating suicidality.

Psychodynamic and mentalization-based therapies. Psychodynamic and mentalization-based therapies delve into the understanding of mental states and past experiences. These approaches emphasize deep psychological exploration to address the root causes of suicidality. The included studies explored specialized inpatient psychotherapeutic program (SIPP)[66] and mentalization-based treatment (MBT),[67] which foster collaborative relationships, offering alternative perspectives to patients' subjective experiences. SIPP and MBT demonstrated efficacy in reducing suicidality, highlighting their potential in addressing complex emotional challenges.

Trauma-focused and specialized interventions. Trauma-focused and specialized interventions recognize the profound impact of trauma on mental health and its potential role in improving suicidality. These interventions offer targeted therapeutic strategies to unravel the roots of suicidality linked to traumatic experiences, emphasizing the need for tailored and comprehensive approaches. The studies included in this category were trauma model therapy[68] and inpatient trauma-focused treatment in the environment of recovery programs (ROVER/WISER).[69] These interventions showed promise in addressing trauma-related factors and treating suicidality, emphasizing the importance of personalized interventions for comprehensive care.

Motivational and brief interventions. Motivational and brief interventions adopt focused strategies to address suicidality. This category encompasses interventions such as motivational interviewing for suicide ideation (MI-SI),[70,71] gratitude diary,[73] and volitional help sheet (VHS)[73] aiming to enhance motivation, foster gratitude, and provide self-directed psychological support within specific time frames. While MI-SI showed potential benefits in reducing suicidality, the effectiveness of gratitude diary and VHS was not observed in these studies, emphasizing the need for further exploration and refinement of these interventions.

Comprehensive care approaches (integrative, collaborative, and peer support). Comprehensive care approaches integrate various therapeutic modalities, collaborative efforts, and peer support to address the multifaceted nature of suicidality. They recognize the need for a comprehensive, multidimensional strategy to address biological, psychological, and social factors simultaneously. The studies included in this category were Peers for Valued Living,[74] collaborative care interventions,[75,76] suicide prevention program,[77] collaborative assessment and management of suicidality (CAMS),[78-80] Teachable Moment Brief Intervention,[81,82] and relapse prevention intervention after suicidal event (RISE).[83] Comprehensive care approaches demonstrated varying degrees of effectiveness in addressing suicidality, with suicide prevention program, CAMS, and RISE showing particular promise in reducing suicidal ideation. Further research is needed to optimize the integration of these approaches for enhanced effectiveness in comprehensive suicidality care.

Quality Assessment

Among pharmacologic interventions, the RoB for 3 studies was unclear, 5 studies were at high risk, and 6 studies had low RoB. The quality assessments for nonpharmacologic interventions found 25 studies at high RoB, 3 studies at low RoB, and the RoB for 7 studies were unclear. Major study limitations were due to lack of random sequence generation and inadequate blinding (Table 3).

DISCUSSION

This systematic review examines the effectiveness of inpatient treatments for suicidality across various

Table 3.

Quality Assessment[a]

Author	Random sequence generation	Allocation concealment	Blinding (investigators)	Blinding (participants)	Selective outcome reporting	Missing data	Overall bias
Abbar et al[38]	0	0	0	0	0	0.5	Low
Ahmadi et al[45]	0	0	0	0	0	0	Low
Ahmadi et al[44]	0.5	0	0	0	0	0.5	Unclear
Bahlmann et al[83]	1	1	1	1	0	0	High
Benedetti et al[48]	0.5	0.5	0.5	0.5	0	0	High
Bentley et al[63]	0.5	0.5	0	0	0	0	Unclear
Bentley et al[64]	0.5	0.5	1	0.5	0	1	High
Britton et al[71]	0.5	0.5	0.5	0	0	0	Unclear
Britton et al[70]	0.5	0.5	1	1	0	0.5	High
Burger et al[33]	0	0	0	0	0	1	High
Canuso et al[41]	0.5	0	0.5	0	0	0	Unclear
Cha et al[62]	0	0	0.5	0	0	0	Low
Davidson et al[56]	0.5	0	0	0	0	0	Low
Demyttenaere et al[47]	0	0	0	0	0	0	Low
Diefenbach et al[57]	0.5	0.5	1	0.5	0	0	High
Domany and McCullumsmith[39]	0.5	0.5	0	0	0	0	Unclear
Domany et al[34]	0.5	0	0	0	0	0	Low
Ducasse et al[72]	0	0	1	0	0	0	High
Ellis et al[80]	1	1	1	1	0	0.5	High
Ellis et al[79]	0.5	0.5	1	1	0	0	High
Ellis et al[78]	1	1	1	1	0	0	High
Engstrom et al[76]	0	0	1	0	0	0	High
Fowler et al[67]	0.5	0.5	1	0.5	0	0.5	High
Fu et al[42]	0.5	0	0	0	0	0	Low
Gaither et al[36]	1	1	1	1	0	0.5	High
George et al[52]	0.5	0.5	0.5	0	0	0	Unclear
Ghahramanlou-Holloway et al[61]	0.5	0.5	0	0	0	1	High
Haddock et al[59]	1	0.5	0.5	0	0	0.5	High
Herrmann et al[65]	0	0.5	0.5	0	0	0.5	Unclear
Ionescu et al[43]	0	0	0	0	0	0.5	Low
Jelinek et al[54]	1	1	1	1	0	0.5	High
Jun et al[77]	1	1	1	0.5	0	0	High
Kaur et al[40]	1	1	1	1	0	0.5	High
LaCroix et al[60]	0.5	0	0.5	0	0	1	High
Lin et al[50]	1	0	1	1	0	0	High
Menefee et al[69]	1	1	1	1	0	0.5	High
O'Connor et al[82]	0	0	0.5	0	0	0.5	Unclear
O'Connor et al[73]	0	0	0	0	0	0.5	Low
O'Connor et al[81]	0.5	0.5	0.5	0.5	0	0.5	High
Patel et al[51]	1	0	1	0.5	0	0	High

(continued)

Table 3 (continued).

Author	Random sequence generation	Allocation concealment	Blinding (investigators)	Blinding (participants)	Selective outcome reporting	Missing data	Overall bias
Pfeiffer et al[74]	0.5	0.5	0.5	0	0	0	Unclear
Probst et al[55]	0.5	0.5	0.5	0.5	0	0	High
Ross and Haley[68]	1	0.5	1	1	0	0	High
Sahlem et al[49]	1	0.5	1	1	0	0	High
Shivanekar et al[35]	1	1	1	1	0	0	High
Tarrier et al[58]	0.5	0.5	0.5	0	0	0	Unclear
Vande Voort et al[37]	1	0.5	1	1	0	0	High
Vaslamatzis et al[66]	0.5	1	0.5	0.5	0	0	High
Zhang et al[53]	1	0.5	1	1	0	0	High

[a]Quality assessment for the included studies. The scores 0, 0.5, and 1 in each domain indicate good, unsure, and bad quality, respectively. The overall risk of bias was determined by the number of scores in each domain, as follows: low risk of bias = all domains with 0 or only 1 domain with 0.5; unclear risk of bias = 2 or 3 domains with 0.5; high risk of bias = 4 or more domains with 0.5 or 1 domain with 1.

psychiatric populations and therapeutic modalities. We synthesized evidence from 14 studies of pharmacologic interventions and 35 studies of nonpharmacologic interventions aimed to reduce suicidality in psychiatric inpatients. The findings indicate that there is a wide range of interventions evaluated in inpatient settings, and their effectiveness varies depending on the patient population and specific treatment approach.

The number of pharmacologic studies was limited to 14, with 11 studies including an assessment of suicidality as the primary outcome. Of the included studies, diagnoses were MDD, bipolar disorders, and OUD. Pharmacologic interventions, particularly ketamine, show promising results in rapidly reducing suicidality. Administration of ketamine, a *N*-methyl-D-aspartate receptor antagonist, intravenously as a single dose,[33–36] repeated infusion,[37,38] intranasally,[39] and orally[40] could reduce suicidality within hours postadministration. However, there are no reports on the long-term benefits and safety of this agent for suicidal patients. Esketamine, on the other hand, did not appear to be effective in reducing suicidality acutely or 3-month follow-up relative to placebo in large-sample studies.[42,43] However, 1 investigation reported its efficacy at 4 hours after administration.[41] This suggests that the formulation and route of administration could contribute to ketamine's antisuicidal effects. Further, high-dose buprenorphine (32, 64, and 96 mg), compared to low dose and placebo, may be beneficial in rapidly improving suicidality in individuals with daily opioid abuse.[44,45] Consideration for this agent in regard to safety is crucial. Lastly, duloxetine, a serotonin-norepinephrine reuptake inhibitor, demonstrated effectiveness in reducing suicidal thoughts, although the decline in less pronounced suicidal ideation was gradual.[46,47] With respect to ketamine and buprenorphine, our findings are consistent with the literature reporting that ketamine has antisuicidal effects in outpatient populations[84] and that buprenorphine may also have antisuicidal properties.[85] Duloxetine has not been previously shown to have specific antisuicidal effects compared to other antidepressants, whereas bupropion has shown more specific antisuicidal effects.[86]

The majority of studies evaluated the effectiveness of nonpharmacologic interventions to reduce suicidality. Of the 35 studies reviewed, 20 had reduction of suicidality as the primary outcome. Interventions included chronotherapy, neurostimulation such as ECT and rTMS, and several modalities of psychotherapy. Nonpharmacologic studies included a wider array of patient populations including MDD, bipolar disorders, OUD, personality disorders, posttraumatic stress disorder (PTSD), panic disorder, schizophrenia, or delusional disorder. There were very few psychotherapeutic interventions that had more than 1 reported study.

Mood Disorders

Chronotherapy and total sleep deprivation combined with light therapy show promise in rapidly improving suicidality among individuals with mood disorders.[40,41] Additionally, neurostimulation interventions such as ECT[50,51] and rTMS[52,53] appear to be effective in reducing suicidal thinking in a shorter period compared to pharmacologic treatment.

Personality Disorders

DBT remains a gold-standard treatment for borderline personality disorder (BPD), which is often associated with suicidality.[55] Trauma-focused

therapies[68] and interventions such as MACT[56] and SIPP combined with pharmacotherapy[66] have shown promise in reducing suicidality in individuals with personality disorders. Extended inpatient treatment including mentalization-based therapies may offer the potential for suicidality among patients with BPD without iatrogenic effects.[67]

PTSD

Integrating trauma-focused treatments including evidenced-based therapies into inpatient programs (ROVER/WISER) for veterans with PTSD appeared to be beneficial.[69] Further, MI-SI shows promise for addressing suicidality in this patient population[70] while the results of this intervention are inconclusive.[71]

Transdiagnostic Approaches

Using cognitive-based therapies such as CBT,[57,58] CBSP,[59] PACT,[60,61] and ABM[62] showed mixed results in reducing suicidality among psychiatric inpatients. Collaborative care interventions, group therapy, CAMS, and RISE demonstrated feasibility and effectiveness in some studies[77–80,83] although not all.[63,81,82] However, MB-SI,[65] gratitude diary,[72] and VSH[73] do not seem to be effective for suicidality.

While the reviewed interventions show some promise in reducing suicidality among psychiatric inpatients, their implementation in clinical settings requires careful consideration of feasibility and cost. Pharmacologic interventions such as intravenous ketamine, despite their rapid efficacy, may incur significant costs and require specialized administration and monitoring, making them less accessible in resource-limited settings. Nonpharmacologic interventions, such as psychotherapies (eg, CBT and DBT) and chronotherapy, may be more cost-effective but necessitate trained personnel and infrastructure to ensure proper delivery. Furthermore, neurostimulation techniques, although effective, involve high equipment costs and technical expertise. Clinicians must weigh these factors when deciding on the most appropriate interventions for their specific settings, considering both the financial and logistical constraints they may face. This work underscores the need further for well-controlled clinical trials to evaluate the potential interventions reviewed, which could help establish a stepwise approach to the treatment of suicidality, such as integrated care pathways. Additionally, this work would empower hospital organizations to develop and widely implement evidence-based programs tailored to their specific populations, ultimately reducing financial barriers through economies of scale.

The major limitation of this review is the number of studies that focused on assessing suicidality as a primary outcome. The vast majority of studies were not randomized, and some were secondary analyses of clinical trials. Given that there are nuances and safety considerations in assessing patients with increased suicidality, it is important to prospectively evaluate these treatments. It is worth mentioning that conducting clinical trials in suicidal patients is inherently high risk. Furthermore, assessing outcomes such as death by suicide is complicated by ethical concerns and the rarity of such events, necessitating large sample sizes for meaningful analysis. Population data offer valuable evidence supporting the efficacy of many interventions, such as ECT in reducing the risk of suicide death in the year after admission for depression.[87] While RCTs may be limited for certain interventions, considering alternative forms of evidence, including population data, is crucial in evaluating their effectiveness. Notwithstanding, many studies did not specifically recruit those participants with increased suicidality thus potentially limiting the overall response. It is also unclear if the antisuicidal effects are treatment-specific or if they are related to the resolution of the underlying disorder. It would be important to analyze how suicidality decreased compared to other related symptoms or include other active treatment groups in the comparison arm. Furthermore, a meta-analysis was initially considered in line with our PROSPERO registered objectives. However, significant heterogeneity in the use of suicide scales and variations in the reporting of effect sizes precluded its feasibility. Even with the assistance of imputation from graphical data, the number of studies with compatible methodologies and outcomes was insufficient to conduct a reliable meta-analysis. This variability highlights the need for standardized reporting and measurement in future research to enable more robust quantitative synthesis.

CONCLUSION

Pharmacologic approaches including ketamine show promise as rapid antisuicidal treatment options for suicidal psychiatric inpatients. However, further research is required to determine longer-term efficacy and safety. Additionally, there are a range of nonpharmacologic strategies that may help manage suicidality on psychiatric inpatient units, particularly neurostimulation, chronotherapy, cognitive-based, and combination psychotherapies, yet the results require careful interpretation due to the heterogeneous populations, study designs, and treatment durations of the studies included in the current review. While there are multiple trials of nonpharmacologic interventions, most are limited by small sample sizes and other methodological issues. Given the burden of acute suicidality on mental health inpatient services, larger, well-designed trials are warranted to evaluate

safe, effective, and scalable interventions that reduce suicidality in patients admitted to hospital.

Article Information

Published Online: January 8, 2025. https://doi.org/10.4088/JCP.24r15382

Submitted: April 11, 2024; accepted September 27, 2024.

To Cite: Abdolizadeh A, Jones BDM, Hosseini Kupaei M, et al. Inpatient treatment of suicidality: a systematic review of clinical trials. *J Clin Psychiatry*. 2025;86(1):24r15382.

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Relevant Financial Relationships: None.

Funding/Support: None.

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Supplementary Material: Available at Psychiatrist.com.

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The Journal of Clinical Psychiatry

Supplementary Material

Article Title: Inpatient Treatment of Suicidality: A Systematic Review of Clinical Trials

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DOI Number: 10.4088/JCP.24r15382

LIST OF SUPPLEMENTARY MATERIAL FOR THE ARTICLE

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Search strategies for “Inpatient Treatment of Suicidality: A Systematic Review of Clinical Trials”
All databases last searched on January 22, 2024

Ovid MEDLINE® <1946-Present>		
1	suicide/ or suicidal ideation/ or suicide, attempted/ or suicide, completed/	66173
2	(suicid* adj3 (attempt* or commit* or complet* or die* or dead or ideation* or thought* or plan* or consider* or contemplat* or behavio?r* or method*)).ti,ab,kf.	50291
3	suicidal*.ti,ab,kf.	43807
4	self-injurious behavior/ or self mutilation/	13276
5	(selfharm* or self-harm or selfinjur* or self-injur* or selfinflict* or self-inflict* or self-mutilat* or selfmutilat* or selfpoison* or self-poison*).ti,ab,kf.	20567
6	((fatal* or lethal* or intentional* or deliberate*) adj2 (dose or doses or dosing or overdos* or self-administ* or selfadminist*)).ti,ab,kf.	15806
7	or/1-6	120648
8	((nonsuicid* or NSSI) not suicid*).ti,ab,kf.	621
9	7 not 8 [suicidality]	120075
10	Hospitals, Psychiatric/	26137
11	Psychiatric Department, Hospital/	7019
12	hospitalization/ and (mental* or psychiatr* or depress* or suicid*).ti,ab,kf,hw.	23129
13	(((hospital* or patient*) adj2 (admit* or admission*)) and (mental* or psychiatr* or depress* or suicid*)).ti,ab,kf,hw.	20501
14	((hospitaliz* or hospitalis* or "in hospital" or "in the hospital") and (mental* or psychiatr* or depress* or suicid*)).ti,ab,kf,hw.	59036
15	inpatient*.ti,ab,kf.	144716
16	or/10-15 [inpatient]	223729
17	exp drug therapy/	1521018
18	exp Psychotherapy/	221246
19	(therap* or psychotherap* or pharma* or prescri* or dose* or dosing or dosage* or somatic* or behavio* activat* or mindfulness or treat* or intervention* or program* or outcome* or healthcare).ti,ab,kf,hw.	13364446
20	((clinical or patient* or inpatient* or hospital*) adj3 (care or manag* or servic*)).ti,ab,kf,hw.	959877
21	or/17-20	13998789
22	9 and 16 and 21	8397
23	limit 22 to case reports	956
24	22 not 23	7441
25	Focus Groups/	36550
26	Interviews as Topic/	66845
27	qualitative research/	85041
28	24 not (25 or 26 or 27)	7343
29	limit 28 to yr="2001 -Current"	5810

Embase Classic+Embase <1947 to 2024 January 19>		
1	*suicide/ or *suicide attempt/ or *suicidal behavior/ or *suicidal ideation/ or *self poisoning/	66253
2	(suicid* adj3 (attempt* or commit* or complet* or die* or dead or ideation* or thought* or plan* or consider* or contemplat* or behavio?r* or method*)).ti,ab.	68029
3	suicidal*.ti,ab.	58953
4	*automutilation/	10963
5	(selfharm* or self-harm or selfinjur* or self-injur* or selfinflict* or self-inflict* or self-mutilat* or selfmutilat* or selfpoison* or self-poison*).ti,ab.	25953
6	((fatal* or lethal* or intentional* or deliberate*) adj2 (dose or doses or dosing or overdos* or self-administ* or selfadminist*)).ti,ab.	22168
7	or/1-6	145152
8	((nonsuicid* or NSSI) not suicid*).ti,ab,kw,hw.	632
9	7 not 8 [suicidality concept]	144590
10	(hospital patient or hospitalization).sh. and (mental* or psychiatr* or depress* or suicid*).ti,ab,kw,hw.	90682
11	(((hospital* or patient*) adj2 (admit* or admission*)) and (mental* or psychiatr* or depress* or suicid*)).ti,ab,kw,hw.	51620
12	((hospitaliz* or hospitalis* or "in hospital" or "in the hospital") and (mental* or psychiatr* or depress* or suicid*)).ti,ab,hw.	110319
13	inpatient*.ti,ab,kw.	250286
14	or/10-13 [inpatient concept]	381652
15	(therap* or psychotherap* or pharma* or somatic* or behavio* activat* or mindfulness or treat* or intervention* or program* or outcome* or healthcare).ti,ab,kw,hw.	18478282
16	((clinical or patient* or inpatient* or hospital*) adj3 (care or manag* or servic*)).ti,ab,kw,hw.	1422285
17	15 or 16 [intervention]	18888438
18	9 and 14 and 17	12625
19	case report/	3065388
20	18 not 19	10741
21	limit 20 to embase	6531
22	limit 21 to yr="2001 -Current"	5113

CINAHL (EBSCO)		
S1	(MH "Suicide") OR (MH "Suicidal Ideation") OR (MH "Suicide, Attempted")	31,089
S2	(suicid* N3 (attempt* or commit* or complet* or die* or dead or ideation* or thought* or plan* or consider* or contemplat* or behavio?r* or method*))	25,845
S3	suicidal*	21,715
S4	(MH "Self-Injurious Behavior") OR (MH "Injuries, Self-Inflicted")	8,139
S5	selfharm* or self-harm or selfinjur* or self-injur* or selfinflict* or self-inflict* or self-mutilat* or selfmutilat* or selfpoison* or self-poison* or automutilat*	12,090
S6	((fatal* or lethal* or intentional* or deliberate*) N2 (dose or doses or dosing or overdos* or self-administ* or selfadminist*))	1,898
S7	S1 OR S2 OR S3 OR S4 OR S5 OR S6	48,944
S8	((nonsuicid* or NSSI) not suicid*)	387
S9	s7 NOT s8	48,594
S10	(MH "Hospitals, Psychiatric")	6,742
S11	(MH "Psychiatric Units")	2,963
S12	MH hospitalization AND (mental* or psychiatr* or depress* or suicid*)	6,365
S13	(((hospital* or patient*) N2 (admit* or admission*)) and (mental* or psychiatr* or depress* or suicid*))	9,316
S14	((hospitaliz* or hospitalis* or "in hospital" or "in the hospital") and (mental* orpsychiatr* or depress* or suicid*))	21,480
S15	inpatient*	133,916
S16	S10 OR S11 OR S12 OR S13 OR S14 OR S15	159,522
S17	therap* or psychotherap* or pharma* or prescri* or dose* or dosing or dosage* or somatic* or behavio* activat* or mindfulness or treat* or intervention* or program* or outcome* or healthcare	4,193,299
S18	((clinical or patient* or inpatient* or hospital*) N3 (care or manag* or servic*))	468,635
S19	S17 OR S18	4,296,054
S20	S9 AND S16 AND S19	3,442
S21	PT dissertation	26,055
S22	TI CASE REPORT*	74,717
S23	TI case stud*	25,104
S24	S20 NOT (S21 OR S22 OR S23) Limiters - Publication Date: 20010101-20240131	3,309

Embase Classic+Embase <1947 to 2024 January 19>		
1	*suicide/ or *suicide attempt/ or *suicidal behavior/ or *suicidal ideation/ or *self poisoning/	66253
2	(suicid* adj3 (attempt* or commit* or complet* or die* or dead or ideation* or thought* or plan* or consider* or contemplat* or behavio?r* or method*)).ti,ab.	68029
3	suicidal*.ti,ab.	58953
4	*automutilation/	10963
5	(selfharm* or self-harm or selfinjur* or self-injur* or selfinflict* or self-inflict* or self-mutilat* or selfmutilat* or selfpoison* or self-poison*).ti,ab.	25953
6	((fatal* or lethal* or intentional* or deliberate*) adj2 (dose or doses or dosing or overdos* or self-administ* or selfadminist*)).ti,ab.	22168
7	or/1-6	145152
8	((nonsuicid* or NSSI) not suicid*).ti,ab,kw,hw.	632
9	7 not 8 [suicidality concept]	144590
10	(hospital patient or hospitalization).sh. and (mental* or psychiatr* or depress* or suicid*).ti,ab,kw,hw.	90682
11	(((hospital* or patient*) adj2 (admit* or admission*)) and (mental* or psychiatr* or depress* or suicid*)).ti,ab,kw,hw.	51620
12	((hospitaliz* or hospitalis* or "in hospital" or "in the hospital") and (mental* or psychiatr* or depress* or suicid*)).ti,ab,hw.	110319
13	inpatient*.ti,ab,kw.	250286
14	or/10-13 [inpatient concept]	381652
15	(therap* or psychotherap* or pharma* or somatic* or behavio* activat* or mindfulness or treat* or intervention* or program* or outcome* or healthcare).ti,ab,kw,hw.	1847828 2
16	((clinical or patient* or inpatient* or hospital*) adj3 (care or manag* or servic*)).ti,ab,kw,hw.	1422285
17	15 or 16 [intervention]	1888843 8
18	9 and 14 and 17	12625
19	case report/	3065388
20	18 not 19	10741
21	limit 20 to embase	6531
22	limit 21 to yr="2001 -Current"	5113

	EBM Reviews - Cochrane Central Register of Controlled Trials <December 2023> EBM Reviews - Cochrane Database of Systematic Reviews <2005 to January 17, 2024>	
1	suicid*.ti,ab,kw.	7719
2	(selfharm* or self-harm or selfinjur* or self-injur* or selfinflict* or self-inflict* or self-mutilat* or selfmutilat* or selfpoison* or self-poison* or automutilat*).ti,ab,kw.	1581
3	((fatal* or lethal* or intentional* or deliberate*) adj2 (dose or doses or dosing or overdos* or self-administ* or selfadminist*)).ti,ab,kw.	195
4	1 or 2 or 3	8623
5	((nonsuicid* or NSSI) not suicid*).ti,ab,kw.	37
6	4 not 5	8591
7	((hospitaliz* or hospitalis* or hospital patient or "in hospital" or "in the hospital") and (mental* or psychiatr* or depress* or suicid*)).ti,ab,kw.	10369
8	(((hospital* or patient*) adj2 (admit* or admission*)) and (mental* or psychiatr* or depress* or suicid*)).ti,ab,kw.	3022
9	inpatient*.ti,ab,kw.	19974
10	7 or 8 or 9	30280
11	(therap* or psychotherap* or pharma* or prescri* or dose* or dosing or dosage* or somatic* or behavio* activat* or mindfulness or treat* or intervention* or program* or outcome* or healthcare).ti,ab,kw.	1626165
12	((clinical or patient* or inpatient* or hospital*) adj3 (care or manag* or servic*)).ti,ab,kw.	89221
13	11 or 12	1633549
14	6 and 10 and 13	1204
15	(case report* or case stud*).ti.	1182
16	14 not 15	1203

	APA PsycInfo <1806 to January Week 2 2024>	
1	exp suicide/	32265
2	suicidal ideation/	12806
3	(suicid* adj3 (attempt* or commit* or complet* or die* or dead or ideation* or thought* orplan* or consider* or contemplat* or behavio?r* or method*)).ti,ab,id.	47193
4	suicidal*.ti,ab,id.	42362
5	suicid*.tm.	8092
6	exp self-injurious behavior/	7841
7	(selfharm* or self-harm or selfinjur* or self-injur* or selfinflict* or self-inflict* orself-mutilat* or selfmutilat* or selfpoison* or self-poison* or automutilat*).ti,ab,id.	16767
8	((fatal* or lethal* or intentional* or deliberate*) adj2 (dose or doses or dosing or overdos*or self-administ* or selfadminist*)).ti,ab,id.	1195
9	or/1-8	79765
10	((nonsuicid* or NSSI) not suicid*).ti,ab,id.	665
11	9 not 10 [suicidality]	79124
12	exp psychiatric hospitalization/	11635
13	psychiatric hospitals/	8551
14	psychiatric units/	2447
15	hospitalized patients/ and (mental* or psychiatr* or depress* or suicid*).ti,ab,id,hw.	8004
16	(((hospital* or patient*) adj2 (admit* or admission*)) and (mental* or psychiatr* ordepress* or suicid*)).ti,ab,id,hw.	11348
17	((hospitaliz* or hospitalis* or "in hospital" or "in the hospital") and (mental* or psychiatr* ordepress* or suicid*)).ti,ab,id,hw.	44885
18	inpatient*.ti,ab,id.	57047
19	or/12-18 [inpatient]	100748
20	11 and 19	9549
21	(therap* or psychotherap* or pharma* or prescri* or dose* or dosing or dosage* or somatic* or behavio* activat* or mindfulness or treat* or intervention* or program* or outcome* or healthcare).ti,ab,id,hw.	2130631
22	((clinical or patient* or inpatient* or hospital*) adj3 (care or manag* or servic*)).ti,ab,id,hw.	106487
23	20 and (21 or 22)	6532
24	limit 23 to ("0200 clinical case study" or "0700 interview" or "0750 focus group" or 1400nonclinical case study or 1600 qualitative study)	1284
25	23 not 24	5248
26	limit 25 to dissertation	249
27	25 not 26	4999
28	limit 27 to yr="2001 -Current"	3637