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REVIEW ARTICLE

Suicide during Transition of Care: a Review of Targeted Interventions

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Abstract

The risk of suicide is significant during the transition of care; the highest in the first few weeks after discharge from a healthcare facility. This systematic review summarizes the evidence for interventions providing care during this high-risk period. In January 2019, PubMed and Scopus were systematically searched using the search terms: Suicide AND (Hospital OR Emergency department) AND Discharge. Articles relevant to interventions targeting suicidal behaviors during the transition of care were selected after the title and abstract screening followed by full-text screening. This review article included 40 articles; with a total patient population of 24,568. The interventions included telephone contacts, letters, green cards, postcards, structured visits, and community outreach programs. An improvement in the engagement of patients in outpatient services was observed but the evidence for suicidal behaviors was conflicting. The reviewed interventions were efficacious in linking patients to outpatient services, reducing feelings of social isolation and helping patients in navigating the available community resources. For patients with repetitive suicidal behaviors, psychosocial interventions such as dialectical behavioral therapy can be helpful. Patients should be followed by targeted interventions based on risk categorization of the patients by using evidence-based tools.

Keywords Suicide · Post-discharge · Intervention · Mental health · Self-harm

Introduction

Suicide is one of the leading causes of death and ranked as the second most common among 15-34 years old patients [1]. According to the Center for Disease Control and Prevention, there were 395,000 intentional self-harm injuries in addition to completed suicides in the United

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States in 2015 [2]. Suicide-related behaviors cost 93.5 billion dollars when accounting for the direct and indirect impact of suicidal behaviors including lost productivity and medical costs [3]. The US National Action Alliance for Suicide Prevention aims at preventing suicide by improving the understanding of suicide, identifying its risk factors, enhancing knowledge of interventions, and implementing these interventions [4]. Suicidal behaviors are not linked to a single factor but are associated with a complex interaction of multiple risk factors including but not limited to genetic factors, family history of psychiatric illnesses, social stressors, underlying psychiatric illnesses, history of trauma, personality traits, and cognitive distortions [5].

The risk of suicide is greater during the transition of care to community settings among patients who were admitted for psychiatric reasons [6]. An analysis of 2000 suicides reported that 41% of suicides occurred before the first follow-up appointment in the community after discharge, 25% within 3 months, 1% within the first 12 months, and the remaining 33% occurred thereafter [6]. Numerous other risk factors such as demographic characteristics, social problems, services delivery, and clinical factors have been studied among these patients [6]. The lack of comprehensive outpatient services and discharges against medical advice potentiates the risk of suicide during the transition of care to the community. This becomes critically important in the context of lack of continuing community care, missing their last follow-up appointment, severe symptoms at their final contact, and being out of contact with services at the time of suicide [7].

A comprehensive plan of action can is required to address the needs of these high-risk patients especially after discharge from an inpatient hospital stay to the community [8]. However, it can be challenging to identify the imminent risk of suicide among these patients at discharge, especially in patients with chronic suicidal behaviors [8]. The objective screening instruments like Suicide Stroop Test, Implicit Association Test, and Suicide Trigger Scale can identify high-risk patients and these patients can be linked with outpatient services to cater to their needs [8]. This article reviews the evidence for the interventions implemented in patients after discharge from the hospital or emergency department, and transition to a community setting. The aim is to educate and enhance awareness among clinicians and policymakers about different interventions that can be utilized during the transition of care.

Methods

This systematic review was conducted according to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist (Supplementary Table 1).

Eligibility Criteria

Our inclusion criteria:

1. All original studies including randomized controlled trials (RCTs) and non-randomized trials focused on the interventions to target suicidal behaviors after discharge from a medical facility to the community were included.
2. No restriction on race, place, sex, age, ethnicity, or language and publication date were applied.

Our exclusion criteria:

Study designs such as case reports, case series, letter to editors, study protocols, thesis, reviews, commentary, conference papers, abstract-only articles, and book chapters or news articles.

Search Strategy

In January 2019, two electronic databases, PubMed and Scopus, were searched for relevant publications, using the following search terms: Suicide AND (Hospital OR Emergency department) AND (Discharge). The manual search of references and relevant articles for included studies was performed by two independent reviewers.

Study Selection

Search results from the two databases were imported to Endnote ×7 (Thompson Reuter, CA, USA) to remove any duplicates. Two independent reviewers performed title and abstract screening (when available) followed by the full-text screening of the included articles by using the pre-determined eligibility criteria. In the case of disagreement, the consensus was reached by discussion among reviewers or guidance from a senior reviewer (SN).

Data Extraction

Two reviewers extracted the data for the first author, year of publication, study design, the summary of intervention and the outcomes of interest, results, and limitations. Data were cross-checked for accuracy by the senior author (SN).

Results

Out of 768 articles after an electronic and manual search, the title and abstract screening were performed resulting in the exclusion of 706 articles. The full-text screening of 62 articles led to the inclusion of 40 articles. PRISMA flow diagram (Fig. 1), summarizes the screening process for this review article. There were 30 RCTs, eight non-randomized or clinical trials, one cohort study, and one descriptive analysis with a total patient population of 24,568. Tables 1, 2, and 3 provide a summary of these interventions in descending order of year of publication.

Postcards, Green Cards, Letters and Crisis Cards

Morgan et al. (1993) conducted an RCT to evaluate the effectiveness of green cards in the repetition of suicidal behaviors. The green cards provided to patients indicated that a physician was available at all times and encouraged them to seek help during future crises. The suicide repetition rate was 8.56% lower in the experimental group compared to the control group. Fifteen patients in the experimental group used a green card to receive services [9]. An RCT by Cotgrove et al. (1995) studied the efficacy of green cards in preventing suicide in an adolescent population aged ≤16. Out of the 105 patients, 47 received a green card. Of these patients, three (6%) attempted suicide in the year following their discharge, compared to seven patients (12%) who attempted suicide in the control group. Five patients used their green cards to get re-admitted. Although there was a lower rate of suicide attempts observed in the intervention

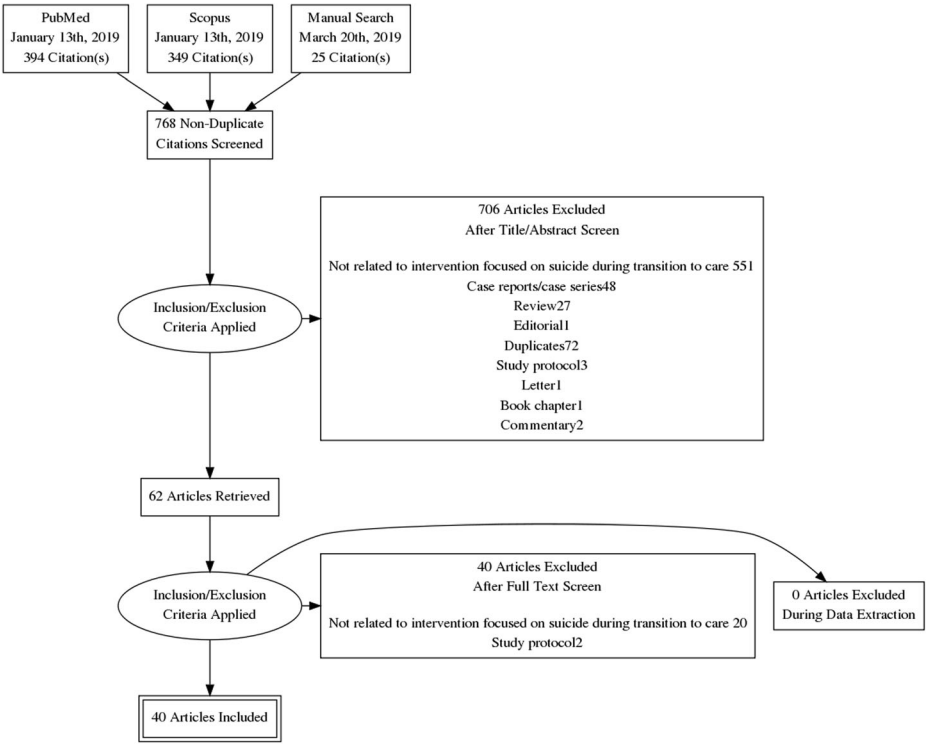

Fig. 1 PRISMA flow diagram: depicts the flow of information through the different phases of this systematic review. It maps out the number of records identified, included and excluded, and the reasons for exclusions

group, the differences between the groups did not reach a statistical significance *($p = 0.26$)* [10].

Evans et al. (1999) investigated the effect of offering emergency telephone support on deliberate self-harm (DSH) repetition. Out of 827 patients, 417 received a green card entailing them to telephone support by a trainee psychiatrist to address any crisis that occurred in the six-month post-discharge. This study reported a comparable benefit for the intervention (16.8%) and control (14.4%) group for DSH (OR 1.20. 95% CI 0.82-1.75) [11]. In another RCT, Evans et al. evaluated the effectiveness of crisis cards in the repetition of DSH. The results were similar to their previous study [11]. In this 12-month follow-up study, there was no overall benefit for DSH (OR 1.19, 95% CI 0.85-1.67) [13].

Motto et al. (2001) studied the efficacy of a long-term contact program via letters for suicidal behaviors. These letters were sent monthly for four months, every two months for eight months, and finally every three months for four years (a total of 24 letters for five years). In this study, 843 hospitalized patients with a depressive episode and/or suicidal ideation were randomized into an experimental group ($n = 389$) and a control group ($n = 454$). The intervention group had a lower suicide rate at study endpoint, especially in the first two years ($p = 0.04$) [12].

Carter et al. investigated the efficacy of postcards in reducing repetitions of hospital-treated deliberate self-poisoning (DSP) over a follow-up period of one [14], two [15] and five [20] years. Participants ($n = 772$) were randomized into an intervention group ($n = 378$) and a

Table 1 Summary of postcards, green cards, and letters-based intervention

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
Morgan et al. [9]	RCT	Patients admitted to the hospital for DSH Green card = 101 Control = 111	Green card	- Green card & TAU was provided to the experimental group. - The green card provided information in case of crisis by phone contact or asking for a crisis admission. - Green cards were also sent to general practitioners so they can recommend green cards.	Repetition of suicidal behaviors.	- There was a non-significant reduction in the repetition of DSH among experimental and control groups. - The repetition of suicidal behaviors was 8.56% lower in the experimental group compared to the control group when serious suicidal behaviors were considered. - Greater use of inpatient and outpatient services was reported in the control group compared to the experimental group.	None reported.
Cotgrove et al. [10]	RCT	Adolescents age 16 or less admitted to the hospital after a suicidal attempt. Experimental group = 47 Control group = 58	Green card	Patients received a green card which allowed easier readmission into a pediatric unit at a local hospital for suicidal behaviors.	Rate of suicidal attempts after discharge from the hospital.	- Among the green card group, 6% (3/47) had attempted suicide in 12 months, and five (11%) used their tokens for admission into hospital compared to 12% (7/58) attempting suicide in the control group. - There was a lower rate of repeat suicide attempts among the intervention group compared to the control group, but it did not reach the level of statistical significance.	None mentioned.
Evans et al [11]	RCT	Patients admitted to the hospital with DSH Green card = 417 TAU = 410	Green card	- The green card provided access to a 24-h crisis telephone consultation with a trainee psychiatrist if needed post-discharge for 6 months.	Repetition of DSH within 6 months of the initial incident.	- Green card intervention had no significant effect on overall DSH repetition rate: 16.8% of the intervention group repeated DSH, vs 14.4% of the control group.	Lack of subgroup analyses, self-reported DSH repetition, difficulty to ensure follow-up.

Table 1 (continued)

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
				- The card also encouraged to use other resources in case of physician unavailability.		- The median time for the 1st episode of the repetition of suicidal behavior was 33 days in the intervention group and 40 days among the control group. - Patients with a history of self-harm had greater odds of repeating in the TAU compared to the intervention group but it was statistically insignificant.	
Motto et al [12]	RCT	Patient admitted due to depression or suicidal ideations. Experimental group = 389 Control group = 454	Long-term contacts via letters	- The intervention group was sent an individualized letter with an expression of concern and an opportunity to reply by a self-addressed envelope. - These letters were sent monthly for four months, every two months for eight months, and then every three months for four years. - The follow-up period lasted five years and 24 contacts were made.	The completion of suicides at 5 years and 15 year time points.	- Among the intervention group, 3.9% of patients completed suicide compared to 4.6% in the control group after a follow-up period of 5 years. - After a follow-up period of 15 years, about 6.4% of participants in the experimental group completed suicide compared to 5.7% in the control group. - The benefits for completed suicide in the intervention group was greatest in the first and second years compared to the control group. - However, the survival curves became parallel in years 3 and 4 and were comparable in year 5.	None mentioned.
Evans et al. [13]	RCT	Patients admitted after self-harm. Crisis card = 417	Crisis card	24-h crisis telephone consultation with a psychiatrist for up to	Number of self-harm episodes after receiving treatment.	- About 20.2% of patients (167/827) episodes of DSH in 12 months.	Lack of consistent definition of repetition, lack of

Table 1 (continued)

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
		TAU = 410		6 months after the initial episode.		- Ninety participants (21.6%) that received a crisis card compared to. 77 (18.8%) participants in the control group had a repeat self-harm episode within 12 months. - The time of repetition did was similar between the two groups.	data about patients who found it helpful, repetition was defined by hospital records.
Carter et al. [14]	RCT	Patients age 16 and above with a history of DSP. Postcard = 378 TAU = 394	Postcards	Participants were sent 8 postcards at 1, 2,3,4,6,8,10 and 12 months after discharge in the intervention group.	The proportion of participants with repetitive DSP and the number of repeat episodes.	- About 57% of the participants had one or more repeat episodes of DSP in the intervention group compared with 68% in the control group. This difference was statistically insignificant. - The total number of repeat episodes of DSP was 101 in the intervention group and 192 in the control group. The intervention group had a statistically significant lower risk of DSP compared to the control group.	A subgroup of participants had DSP resulting in a skewed pattern of more than one recurrent event.
Carter et al. [15]	RCT	Patients age 16 and above with a history of DSP. Postcard = 378 TAU = 394	Postcards	Participants were sent 8 postcards at 1, 2,3,4,6,8,10 and 12 months after discharge.	Percentage of participants with readmission for self-poisoning and the number of readmissions for self-poisoning per individual, over 24 months.	- After 24 months, 21.2% of participants in the intervention group had one or more readmissions for DSP compared with 22.8% in the control group. - The total number of repeat episodes of DSP was 145 in the intervention group and 310 in the control group.	A subgroup of participants had a higher percentage of DSP resulting in a skewed pattern of more than one recurrent event.

Table 1 (continued)

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
						- The intervention group had a statistically significant lower risk of DSP compared to the control group.	
Beautrais et al. [16]	RCT	Patients age 16 and above with a history of self-harm or attempted suicide were admitted. Intervention group = 153 TAU = 174	Postcard	- Participants received a series of six postcards over a period of 12 months (2 and 6 weeks; 3, 6, 9 and 12 months) after the first indexed episode of suicide attempt or self-harm. - The postcard expressed concerns about the patient with an invitation to reply back.	Repetition of DSH.	The intervention did not result in the improvement of a proportion of participants admitting to ED or in the total proportion of participants showing up to either the psychiatric emergency service or the ED after controlling for the clinical severity at the start of the study.	The difference among both groups at baseline in clinical severity, an underpowered study.
Hassanian-Moghaddam et al [17]	RCT	Participants age > 12 years with suicidal attempts. Postcard intervention = 1150 TAU = 1150	Postcard	- Patients received postcards by mail at 1, 2, 3, 4, 6, 8, 10 and 12 months after discharge. - It had a different message every time with the invitation to ask any questions.	Suicidal ideations, suicide attempts and self-cutting (proportion and event rates).	- Among the intervention group, 29% of patients reported a significant reduction in suicidal ideation compared to control group (41.7%). - The rates for a suicide attempt were 3.0% vs 5.1% and 4.0% vs 4.7% for self-mutilation among intervention and control groups, respectively. - The NNT for the suicidal attempt was 46.1. - A significant reduction in suicidal attempt was reported among females in the intervention group.	Lack of blinding for research psychologist, DSH was not considered until it happened with DSP.
Robinson et al. [18]	RCT		Postcards	- Postcards were sent once a month.	Suicidal attempt and DSH		Lack of generalizability,

Table 1 (continued)

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
		- Patients with a history of suicidal ideations, attempts, and DSH. Postcards intervention =81 TAU =83		- These postcards assessed a person's well-being provides sources for help and encouraged them to engage in six evidence-based self-help strategies that were rotated each month.		- There were no large differences in suicide-related behavior among both groups. - The average number of instances of DSH, at 12 months for postcard and TAU groups, respectively, were 8.4 and 7.9, and at 18 months were 0.1 and 7.6. - About 70.4% of participants completed the questionnaire at the follow-up, 75% had a favorable opinion on the postcard; 63% reported using sources of help messages; 46% used some of the health promotion messages, and 42% reported referring to the postcards often.	high attrition rates.
Kapur et al [19]	RCT	Manchester residents with self-harm. Intervention = 33 TAU = 33	Information leaflet, two telephone calls soon after the presentation and a series of letters over 12 months.	The intervention consisted of the following resources; - Information leaflet listing local and national sources of help mailed as soon as possible after consent - Two telephone calls within the first 2 weeks, and then a series of letters over a 12-month period (at 1, 2, 4, 6, 8 and 12 months).	The number of repeated episodes of self-harm in the 12-month period after the index episode.	- The 12-month repeat rate for individuals in the intervention group was 34.4% compared to 12.5% for TAU. - The total number of episodes of repeat self-harm over 12 months was 41 in the intervention group compared to 7 in the control group.	Lack of generalizability due to a study conducted in Manchester only.
Carter et al [20]	RCT	Patients age 16 and above with a history of DSP.	Postcards	Participants were sent 8 postcards at 1, 2,3,4,6,8,10 and	The proportion of one or more recurrent events	- About 24.9% of participants in the intervention group had one or more repeat episodes	Lack of allocation concealment, skewed

Table 1 (continued)

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
		Postcard = 378 TAU = 394		12-months after discharge.	of DSP and the number of recurrent events of deliberate self-poisoning within individuals over 12 months.	of DSP compared with 27.2% in the control group. - After 5 years, the number of self-poisoning readmission was 484 and 252 in the control and intervention group, a difference of 232 readmissions. This difference was statistically significant. - About 38.1% of the participants had one or more admissions for psychiatric reasons in the intervention group compared to 35.5% in the control group.	prevention due to 25% of patients had a repeated episode of self-poisoning.
Bennewith et al [21]	Experimental study	Patients from three inpatient psychiatric wards. Total patients = 102	Letters	- Eight letters were mailed to patients from the psychiatric hospital within one week of discharge and at 2 weeks, 4 weeks, and 2, 4, 6, 9, and 12 months following discharge. - Letters along with support leaflets including contact information for the helpline, local support groups, and mental health services.	Primary: - Patient inclusion and retention. - Hours worked by staff. For certain subsets of the population, the following data were collected; - Psychiatric readmissions. - Admissions to ED or general hospitals. - Engagement with outpatient services. - Feedback about intervention at the end of the study.	- About 102 (63%) of discharged patients received the intervention. - About 4 to 7 h were spent per week to prepare and mail the letter in two wards. - About 15% (12) participants among 80 patients getting intervention in concerned wards were admitted to ED for self-harm, and 8 of them were admitted. - Two participants were admitted within 2 weeks, 8 within the first 6 months, and two in the next 6 months after discharge. - Overall, feedback in patients was positive and favorable.	- High proportion (72.2%) exclusion due to opt-out or readmission made it difficult to interpret results. - Power was too small to draw any inferences.
Hassanian-Moghaddam et al [22]	RCT	- Patients admitted to the hospital for DSP. Intervention group = 997	Postcards	- Participants were sent postcards with different messages after 1, 2,	Suicidal ideations, suicidal attempts, and DSH.	- There was a decrease in suicidal ideations (58.6% to 46.6%) and suicide attempts (9.1% to	Lack of allocation concealment.

Table 1 (continued)

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
		TAU = 1004		3,4,6,8, and 12 months after discharge. - A 9th postcard was sent on the birthday of each participant. - These postcards included different messages with an offer to contact the study authors.		6.2%), but no significant difference in self-cutting (1.5% to 1.5%) was observed for the intervention group. - The number of suicide attempts in the intervention group was 64 compared to 94 episodes in the TAU group; and self-injurious behaviors were 34 in the intervention group compared to 21 episodes in the TAU group.	

DSH Deliberate Self Harm, *DSP* Deliberate self-poisoning, *RCT* Randomized Controlled Trial, *TAU* Treatment as Usual, *ED* Emergency Department, *NNT* Number Needed to Treat

Table 2 Summary of telephone intervention and BIC interventions

Study	Study Design	Study Population	Intervention	Design of Intervention	Outcome measures	Results	Limitations
Cedereke, et al [23]	RCT	Patients with suicidal attempts. Telephone Intervention = 107 TAU = 109	Telephone Intervention	- Patients received two telephone contacts which were made randomly, with half of the patients at 4 months, and a half at 8 months. - All patients received follow up calls at 12 months.	Suicidal ideations, social situations, acute problems, mental health, repetition of suicidal attempts, and need for professional help.	- Attendance to treatment was 72% (60/83) and 65% (58/89) in the intervention and control groups respectively. - At 12-months follow up, about 17% (14 patients) had 26 suicide attempts and 17% (15 patients) had 27 suicide attempts. - The number of suicide attempts did not differ in either group. - There was a comparable improvement in global functioning and suicidal ideations among both groups.	Lack of inter-rater tests, representation of a sample of suicide attempters, in general, is unknown, the follow-up period started at one month providing intervention during the first month.
Vaiva et al [24]	RCT	Patients with a suicide attempt by overdose. Telephone contact at one month = 147 Telephone contact at 3 months = 146 No telephone contact = 312	Telephone intervention.	- Participants were contacted via telephone by the psychiatrists, and psychological support was provided. - Patients were provided urgent appointments if they were considered high-risk. - GPs were updated about the details of these calls.	The effect of contacting by telephone on repeat suicide attempts.	- The rate of suicide attempts did not differ among the three groups. - After one month, 23% reported adverse outcomes in the intervention group compared to 30% in the control group, while 25% reported adverse outcomes in the intervention group compared to 30% in the control group after 3 months. - The number of suicide reattempts at one-month follow-up was 12% in the intervention group compared to 22% in the control group, and results lasted over a six months period. - The number of suicide reattempts at a three-month follow-up was 17% in the intervention group compared to 22% in the control group.	- No further phone calls after three attempts. - Negative effect on ITT due to the inability to reach some participants.
	RCT		BIC				

Table 2 (continued)

Study	Study Design	Study Population	Intervention	Design of Intervention	Outcome measures	Results	Limitations
Fleischmann et al [25]		Participants with suicide attempts. BIC = 922 TAU = 945		- BIC included standard one-hour individual education close to discharge, after discharge, and nine follow-up contacts. - The follow-up contacts were phone calls or visits during 18 months at 1,2,4,7, and 11 weeks and 4,6,12, and 18 months. - Information was provided regarding suicide including causative factors, epidemiology, alternative options, and referral sources.	Subsequent completed suicide and repeated suicide attempts.	- At the end of the study, more participants completed suicide in the TAU group compared to the BIC group (2.2% vs 0.2%). -About 23.8% of individuals in the TAU group intentionally ingested alcohol or drugs compared to 24.3% in the BIC group. - About 22% in the TAU group and 20.7% in the BIC group had attempted suicide by the 18-month follow-up.	- Due to associated stigma and legal issues, many participants with suicide attempts did not seek treatment. - Lack of resources to keep track of enrolled patients. - Differences in the population at each site and losses at follow-up. - Lack of official mortality statistics in certain sites of the study.
Bertolote et al [26]	RCT	- Participants with suicide attempts. BIC = 922 TAU = 945	BIC	- BIC included standard one-hour individual education close to discharge, after discharge, and nine follow-up contacts. - The follow-up contacts were phone calls or visits during 18 months at 1,2,4,7, and 11 weeks and 4,6,12, and 18 months. - Information was provided regarding suicide including causative factors, epidemiology, alternative options, and referral sources.	Rates of suicide attempts.	- A difference was reported in repeated suicide attempts across different sites (23% in Campinas versus 1% in Yuncheng). - The rates of suicide attempts were higher among females in Campinas compared to Karaj, where males had higher rates. - Across the sites, there was no difference between either groups. - However, there was a notable difference among sites in the rate of suicide attempts.	- Recall bias due to repeated contact among participants in the BIC group. - The difference in the sites, between both groups. - Lack of clear definition to differentiate self-injurious behaviors from suicide attempts.
Hassanzadeh et al [27]	RCT	Patients with suicide attempts. BIC = 321 TAU = 311	BIC	It consisted of the following components: - One hour psycho-educational intervention focusing on suicidal behaviors, risk factors, epidemiology, alternatives to suicidal behavior, and contacts/-referrals.- Follow-up phone calls or visits at weeks 1, 2, 4, 7, 11,	Repetition of suicide attempts during the follow-up period.	- About 24 patients (7.7%) in TAU and 30 patients (9.3%) in the BIC group re-attempted suicide, respectively with a lower number of re-attempts among the control group. - This difference was not statistically significant in both groups.	Lack of comparison of the suicide attempt severity in both groups.

Table 2 (continued)

Study	Study Design	Study Population	Intervention	Design of Intervention	Outcome measures	Results	Limitations
				and 4 and 6 months after discharge.		- The need for engagement in the intervention group was higher compared to the control group.	
Chen et al [28]	Clinical trial	Patients with suicide attempts. Total participants = 15	Text messages	- Text messages were sent every week after discharge for the first month, with a total of four contacts. - These were standard supportive messages expressing concern about the patient's wellness, expression of positive feelings, and encouragement.	Accessibility, acceptance, and feasibility of mobile text messages in patients with suicide attempts.	- None of the participants responded to text messages. -At 4 weeks, no patients were referred to professional services or needed aftercare assistance. - 12 Patients considered the text message contacts an acceptable and useful form of help and would like to continue to receive them for a longer duration. - Remaining three patients did not find them helpful and refused to receive any further text messages.	-Small sample size -Short follow-up period -Sampling bias due to the refusal by four of the participants when the family was present.
Vijayakuma et al [29]	RCT	Patients with suicide attempts BIC = 320 TAU = 360	BIC	BIC consisted of the following components; - One hour psycho-educational intervention focusing on suicidal behaviors, risk factors, epidemiology, alternatives to suicidal behavior, and contacts/-referrals. - Follow-up phone calls or visits at weeks 1, 2, 4, 7, 11, and at 4, 6, 12, and 18 months after discharge.	The number of attempts and completed suicides.	- The completed suicide was 1 and attempted suicide was significantly lower in the BIC group compared to the TAU group at the study endpoint. - The number of suicide attempts was 8 in the BIC group and 17 in the control group post-intervention. - Among the intervention group, the number of completed suicide was one patient, while 9 in the control group. - These visits were widely supported by the participants.	-Recruitment of only 40% of eligible patients. - The inaccuracy of data collection regarding suicide given the stigma towards suicide. - Data regarding suicide was collected from patients and their completed suicides without official data collaboration.
Asarnow et al [30]	RCT	Patients aged 10-18 from two emergency departments in LA.	FISP	- FISP includes a session with youth and their families, educating them about the importance of outpatient services, eliminating	Engagement with outpatient services, the severity of suicidal behaviors,	-FISP patients received significantly higher rates of psychotherapy compared to the control group (76% vs 49%), combined	-Brief follow-up period -Lack of immediate post-intervention evaluation of

Table 2 (continued)

Study	Study Design	Study Population	Intervention	Design of Intervention	Outcome measures	Results	Limitations
		FISP = 89 TAU = 92		means of self-harm, and creating safety plan cards. - The follow-up calls were made within the first 48 h after discharge and then as needed calls at 1, 2, and 4 weeks after discharge.	and youth and parent depression scale.	psychotherapy and medication, monotherapy or no treatment (58% vs 37%). FISP patients had higher rates of inpatient hospitalization (91%) compared to the control group (67%). There was no statistically significant effect of the intervention on suicidality or other clinical/functioning outcomes.	clinical/functioning outcomes.
Cebria et al [31]	Experimental study	Experimental group = 604 Control group = 387	Telephone intervention.	-Follow-up appointment within 10 days of discharge. - Telephone intervention was provided at intervals of 1 week, and1, 3, 6, and 12 months. - Patients were encouraged to engage in outpatient appointments.	- Time elapse between initial suicide attempt and subsequent attempts. - The percentage of patients who re-attempted suicide.	- The mean time for the first reattempt was 346.47 days in 2008 and 316.46 days in 2007 among the intervention group. - Among the control group, the mean time in days to the first reattempt, was 346.47 with a pre-treatment period of 300.36. - The percentage of patients who re-attempted suicide reduced from 14% at baseline to 6% in 2008. This rate was 14% among the control group.	-Difficulty meeting deadlines -Confounding factors due to this study being part of a bigger study.
Hughes et al [32]	RCT	Patients aged 10-18 years old with suicidal ideations and behaviors. FISP = 89 TAU = 92	FISP	FISP includes a session with youth and their families educating them about the importance of outpatient services, eliminating means of self-harm, and creating safety plan cards. The follow-up calls were made within the first 48 h after discharge and then as needed calls at 1, 2, and 4 weeks after discharge.	Engagement without patient mental health services.	- This intervention was effectively delivered in the emergency department for 80.9% of patients. - About 88.8% of the families received at least one phone call after the discharge.	None reported.
	RCT		BIC				

Table 2 (continued)

Study	Study Design	Study Population	Intervention	Design of Intervention	Outcome measures	Results	Limitations
Amadéo et al [33]		- Participants with DSH BIC = 100 TAU = 100		BIC consisted of the following components; - One hour psycho-educational intervention focusing on suicidal behaviors, risk factors, epidemiology, alternatives to suicidal behavior, and contacts/-referrals. - Follow-up phone calls or visits at weeks 1, 2, 4, 7, and 11, 4, 6, 12, and 18 months after discharge.	The number of suicides and repeated non-fatal suicidal behaviors.	- There was no significant difference between the two groups. It was 24% in the BIC group and 21% in the TAU groups. - Two participants completed suicidal in the TAU group compared to the BIC group.	High drop-out rates due to inability to contact participants, geographical location impacting access to care.
Cebria et al. [34]	Non-randomized controlled parallel study 5-year follow-up of the original study.	Experimental condition = 296 Control group = 218	Telephone contacts	- Telephone intervention was provided at intervals of 1 week, and at 1,2,6,9, and 12 months in the first part of the study. - The current study focused on benefits at a 5-year follow-up.	The number of individuals who re-attempted suicide and the number of recurrences.	- About 31.4% of individuals in the intervention group attempted suicide compared to 34.8% among the control group. - Ninety participants among the intervention group attempted suicide compared to 69 in the control group. - The incident rates of reattempts were 0.864 for the control group and 0.839 for the intervention group. - The mean time to first re-attempt of suicide was 1429 days in the intervention group compared to 1332 days in the control group. However, this difference was not statistically significant.	Lack of randomization.
Mouaffak et al [35]	RCT	Adults who attempted suicide and were admitted to the general ED. Intervention group = 160 Control group = 160	OSTA	- Patients received telephone calls two weeks after discharge, as well as at months 1 and 3. - These phone calls provided psychosocial assessment and also assessed for suicide by using MADRS.	The number of patients who re- attempted suicide at 12 months, and engagement with outpatient services.	- On an intention to treat basis, the proportion of patients who re-attempted suicide did not differ significantly at 12 months, between the intervention arm 14.5% (22/152) and the control arm 14% (21/150).	- Intervention in the control group lead to underestimation of the effectiveness of the OSTA -Memory bias among patients reporting results

Table 2 (continued)

Study	Study Design	Study Population	Intervention	Design of Intervention	Outcome measures	Results	Limitations
				- A phone call at 3 months inquired about the patients' engagement in health care.		- At the 12-month follow-up, 24.2% of the intervention group and 31% of the control group declared having initiated a medical follow-up.	retrospectively at the study endpoint.
Exbrayat et al [36]	Controlled study	Patients admitted for suicide attempts. Experimental group = 436 Control group = 387	Telephone intervention.	- Telephone calls were made at 8, 30, and 60 days after treatment for attempted suicide. - Patients were assessed using a 3-point scale for suicide risk, emergency and degree of harmfulness. - Treatment adherence was also assessed.	The rate of recidivism was assessed by repeated suicidal attempts.	- Among the intervention group, repeated suicide attempts were significantly fewer (55/436) compared to the control (69/387) group after the initial index episode, estimating a rate/ratio drop of 33%. - Among 244 patients who responded to all telephone follow-up calls, the OR was even less: 0.50. - The mean time to the first repeated suicide attempt was 143.9 days in the intervention group compared to 107.0 days in the control group.	Heterogeneous population
Normand et al., [37]	Cohort study	Participants aged 15-21 years were divided into two cohorts based on being contacted via phone call at one year after discharge. Contact at one year, Group A = 93 No contact at one year, Group B = 80	Telephone contact and Letters	Follow-up phone calls followed by a standardized letter in case of an unsuccessful attempt Group A was contacted at one week, 1 and 6 months, and then at 1 year. Group B was contacted at 1 week, 1 month, and 6 months.	Feasibility assessment repeated suicidal attempts and engagement with outpatient care.	- About 23 participants (13.3%) re-attempted suicide at a one-year follow-up. However, only 93 participants were available for contact for follow-up phone calls. - Most of these patients were female (95%) and 70% had received inpatient treatment. - About 65.2% of patients who attempted suicide were engaged in outpatient care at one week, 56.5% at one month, and 34% at 6 months and one year.	- Lack of other communication means to reach out to patients. - The impact of phone-call programs on participants could not be measured due to the design of this study.

Table 2 (continued)

Study	Study Design	Study Population	Intervention	Design of Intervention	Outcome measures	Results	Limitations
						- Subjective feedback at one year was obtained in 50.5% of participants with a favorable response.	
Berrouiguent et al [38]	Descriptive analysis of three patients.	Three patients were identified in this descriptive analysis.	SIAM	Patients received SIAM text messages at 48 h after discharge, then on days 8 and 15, and then at 1, 2, 3, 4, 5, and 6 months.	Use of brief communication by mobile health technology to prevent suicide.	One patient contacted the emergency crisis support service immediately after receiving text messages, while the other two participants contacted up to 6 days following a message.	Small sample size

BIC Brief Intervention and Contact, *DSH* Deliberate Self Harm, *FISP* Family Intervention for Suicide Prevention, *GP* General Practitioner, *ITT* Intention-to-Treat, MADRS, Montgomery-Asberg Depression Rating Scale, *OR* Odds Ratio, *OSTA* Organization of a Suitable Monitoring for Suicide Attempters, *RCT* Randomized Controlled Trial, *SIAM* Suicide Intervention Assisted by Messages, *TAU* Treatment As Usual

Table 3 Summary of miscellaneous interventions

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
Donaldson et al [39]	Non-randomized clinical trial	Adolescents with suicide attempts. Experimental group =23 TAU = 87	Structured three telephone interventions by a doctor level clinician.	- After discharge, 3 phone interviews over 8 weeks were scheduled with patients and parents at 1, 2, and 6 weeks following discharge. - These phone calls focused on treatment expectations, outpatient services, problems, concerns, and resistance of patients and their parents to attend pre-decided out-patient psychotherapy sessions.	The data regarding school functioning, suicidal behaviors, and psychotherapy visits were collected.	- The experimental group had fewer psychotherapy 'no shows' (9% vs 18%). - The average number of sessions attended by the intervention group was 5.5 compared to 3.9 by the control group. - No reattempts were reported in the experimental group compared to 9% among the control group.	Small sample size,
	non-randomized clinical trial						
Bennwith et al [40]	Cluster RCT	Patients admitted due to DSH. Intervention group = 964 TAU = 968	Letter to the general practitioners.	- GPs of patients were contacted by letter with information about the incident of DSH, a letter forwarded to the patient (at their discretion) inviting them to make an appointment for a consultation, and a copy of the guidelines to manage DSH. - Each practitioner was provided a copy of the guidelines at the start of the trial in the intervention group.	The occurrence of a repeat episode of DSH in the 12 months after the index episode, the time in days to the first repeat episode and the number of repeats.	- The percentage of participants with a repeat episode of DSH within 12 months of the index episode was slightly higher in the intervention group compared to the control group. - However, there was no difference after adjusting for the clusters. - Among the intervention group, there were frequent repeat episodes of DSH and it took fewer days to the first repeat episode in the intervention group (104.9) compared to the control group (109.5). - The Poisson and Cox regression analyses showed that these differences were not significant.	Lack of active education in the intervention, a short delay between the index episode and the receipt of the letter by the GPs.
	RCT		MCT				-None reported.

Table 3 (continued)

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
Currier et al [41]		Patients admitted for suicidal ideations, plans, or behaviors MCT = 56 OPC = 64		Adolescents and parents contacted by phone 1, 2, and 6 weeks following discharge to assist in the outpatient care process.	Engagement in first outpatient appointment and improvement in clinical symptoms and functional status.	- Among MCT patients, about 69.6% were contacted compared to 29.6% in the OPC group, and short improvement after discharge was reported - No difference among both groups was reported in the long-term considering clinical symptoms and the need for admission for suicidal behaviors.	
Hvid et al [42]	RCT	Patients with a suicide attempt. OPAC = 69 TAU = 64	OPAC	- This program included a core of rapid response, active outreach and a nurse offering home visits and contacts. - The duration of intervention was 6 months with home visits plus other forms of contact, such as telephone and text messaging.	Repeated suicidal behaviors including attempted and completed suicide.	- Six out of 69 patients in the intervention group repeated suicidal behaviors compared to 14 patients out of 64 in the control group. After controlling for previous suicidal behaviors, the intervention had a favorable impact. - The number of repetitive acts after one year was eight in the intervention group and 22 in the control group with statistically significant results.	Small sample size.
Chen et al [43]	RCT	Patients with suicide attempts Postcard intervention = 373 Control group = 388	Postcard and CM	- The team contacted the suicide attempters via telephone or visited their homes within one week after receiving the information. - The CM services were provided at least six times in the following three months.	- The occurrence of a suicide reattempt during a 6 month follow-up period. - The ITT analyses (control group vs intervention	The mean time to attempt suicide was reported as mentioned below; - The control group with CM < 3 months - 166.8 days. - The control group with full CM services - 166.9 days. - Intervention group with CM only - 170.7 days.	Higher attrition rates.

Table 3 (continued)

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
				- Patients received a crisis postcard in a sealed envelope after three months with individual coping strategies and resources to deal with a crisis.	group) were also performed in this study.	- Intervention group with CM and a postcard - 177.3 days. The ITT analysis suggested no benefit for crisis postcard, but the per-protocol analysis indicated a strong benefit for the crisis postcard.	
Simpson et al [44]	RCT	Patients discharged from four mental health wards. Peer support = 23 TAU = 23	Peer Support for four weeks after discharge.	Peer support workers, with a history of recovery of their own, provided acceptance, respect, empathy, support, companionship, hope, shared experiences and ideas about how to cope with mental illness.	Hopelessness, feeling of loneliness and social isolation, quality of life, receipt of clinical service, and peer support activities.	- No significant difference was found among the treatment and control group on the BHS, Quality of Life Scale, and UCLA Loneliness Scale. - The measures of hope increased in both conditions with a near significant change on the Beck Hopelessness Scale in those receiving peer support. - One patient among the treatment group was readmitted compared to three among the TAU group at one month's discharge. At a three-month follow-up, one patient in the intervention group was readmitted. - The total cost per case was 2154 pounds compared to 1922 pounds among the control group. There was no significant difference among the groups for the cost of different services.	- Delay in recruiting peer support groups, specific geographical history, small sample size and a smaller number completed the follow-up measures. - Missing data exceeds more than 50% for hopelessness and quality of life scale.
Currier et al [45]	Quasi-experimental design	Veterans assessed for being at a	SAFE VET was developed.	- SAFE VET combined SPI–SFU. - In safety planning intervention, participants were provided with a	Suicide attempts within the first 6 months of	- Patients in the intervention group had fewer suicidal behaviors (45%) during the	- The risk for confounding

Table 3 (continued)

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
		higher risk of suicide. -SAFE VET =1186 -TAU = 454	E-CARE was provided as TAU.	list of coping skills and support systems in times of crisis in a 20-40 min session. - Follow-up contact was made within 72 h (or up to one week) to assess suicide and mood, and a review of safety planning was performed. - Follow-up calls were made to ensure participation in outpatient clinics.	discharge, suicidal ideations within 6 months, suicide-related coping skills, and engagement in an outpatient clinic.	follow-up period compared to TAU. - About 3.03% of participants engaged in suicidal behaviors compared to 5.29% among the control group. - Patients in the intervention group were twice as likely to engage in outpatient treatment for mental health, but not for substance use.	bias since it was not an RCT. - Medical records were used to extract information. It is possible that there was a lack of information for some patients. - Patients in the TAU group may have had a prior safety plan. - The population was predominantly male. - Since this study was not performed in the ED, high-risk patients were likely not added.
Grimholt et al [46]	RCT	Adult patients with DSP Intervention group = 101 TAU = 101	Systematic follow-up by GPs.	- Participants with DSP received follow-up with their GPs within a week after discharge. At least one consultation each month for the first 3 months and two consultations during the last three months were scheduled.	Suicidal ideations, depression, the feeling of hopelessness, and self-reported self-harm.	- There were no significant differences between either group on SSI, BDI, or BHS scales. - The prevalence of negative life events at 3 (41.9% vs 46.9%) and 6 months (53.1% vs	The discrepancy between self-reported data of DSP, hospital, and ED, short follow-up period, small

Table 3 (continued)

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
				- GPs received a summary of the hospital stay with a liaison senior psychiatrist and GP.		55.6%) was not different among either group. - At follow-up, self-reported DSP was 39.5% in the intervention group vs 15.8% in the control group.	sample size, the possible exclusion of high-risk patients. Withdrawn data and missing data may have affected the effect size and statistical power.
Grimholt et al [47]	RCT	Adult patients with DSH. Intervention group = 101 TAU = 101	Systematic follow-up by GPs	- Among the intervention group, GP was advised to contact the patient and schedule a follow-up appointment within a week after discharge. - The minimum was 5 consultations. - GPs received written guidelines and a discharge summary after discharge from the hospital.	Suicidal ideations	- About 50% in the intervention and 57.1% in the control group communicated their DSH thoughts with their GPs before the index episode. - At the 6 month follow-up, 40.9% in the intervention group and 47.8% in the control group voiced their thoughts to GPs. -Patients in the intervention group received significantly more psychotherapy and intervention tools than the control group. - Patients in the intervention group attended more sessions than the control group. - The drop-out rate was higher in the control group while satisfaction scores were comparable among both groups.	- GPs were not assessed for adherence to guidelines, and reported frequency by patients was not verified. - GPs in the control group were not blinded, increasing the risk of bias.

Table 3 (continued)

Study	Study Design	Study population	Intervention	Design of intervention	Outcome measures	Results	Limitations
Scanlan, et al [48]	Open-label clinical intervention trial	64 participants were included in the study but data was evaluated for 38 patients.	Hospital-to-home peer support workers.	Peer workers providing individualized practical and emotional support to individuals for six to eight weeks following discharge from an inpatient psychiatric unit.	Functional and clinical recovery, social and psychological well-being, and engagement in outpatient services.	- Improvement in terms of functional and clinical recovery and in the areas of intellectual, social and psychological wellness. - Participants' self-report of hospital readmissions suggested that there was a reduction in hospital bed days following engagement with the program from 68 to 57 days. - Seven patients were readmitted out of 18. - Time from referral to first contact ranged from 0 to 76 days. Median time from referral to first contact was 2 days. Mean time from referral to first contact was 6.4 days (including four outliers) or 2.8 days (excluding outliers) - The duration of engagement with the program ranged from 13 to 209 days. The average duration was 90 days. - The overall feedback was favorable.	- Small sample size and absence of a specific control group. - Self-reported hospitalization data, and available only for a subset of the sample.

BDI Beck Depression Inventory, *BHS* Beck Hopelessness Scale, *CM* Case Management, *DSH* Deliberate Self-Harm, *DSP* Deliberate Self-Poisoning, *ED* Emergency Department, *E-CARE* ED Clinical care, augmented by additional assessment, *GPs* General Practitioners, *ITT* Intention to treat, *MCT* Mobile Crisis Team, *OPAC* Outreach, Problem Solving, Adherence, Continuity, *OPC* Outpatient mental health clinic, *RCT* Randomized Controlled Trial, *SAFE* Suicide Assessment and Follow-up Engagement, *VET* Veteran Emergency Treatment, *SPI-SFU* Safety Planning Intervention and Structured Follow-up, *SSI* Beck Scale for Suicide Ideation, *TAU* Treatment as Usual

control group ($n = 394$). The intervention group received a total of eight postcards in a one year span at 1, 2, 3, 4, 6, 8, 10 and 12 months after discharge. Although the rate of hospital-treated-self-poisoning events was reduced by 50% over a 1-year, 2-years and 5-years period in the intervention group, there was no significant reduction in the proportion of individuals with a history of repetitive DSP [14, 15, 20].

Beautrais et al. examined the effect of postcard intervention in reducing DSH in patients with suicidal behaviors. 174 participants received treatment as usual (TAU), whereas 153 participants received TAU plus postcard intervention. The intervention comprised six mailed postcards in the first year following discharge; at 2 and 6 weeks and later at 3, 6, 9 and 12 months. The results showed no significant differences between the groups, in proportion as well as in the total number of participants re-presenting with self-harm to the ED (OR 0.932, $p > 0.75$) [16].

Hassanian-Moghaddam et al. assessed the efficacy of a postcard intervention to reduce suicidal behaviors such as ideation, attempts and self-cutting/mutilation in a follow up of 12 and 24 months in two separate RCTs [17, 22]. Patients received postcards by mail at 1, 2, 3, 4, 6, 8, 10 and 12 months after discharge. Although there was a reduction in suicidal ideation and attempts in the intervention arm, there was no observed difference in self-cutting or self-mutilation behaviors [17, 22].

Robinson et al. (2012) also studied the efficacy of postcards among patients aged 15-24.Monthly postcards were sent for 12 months after discharge. The rates of suicide attempts, suicidal ideations and DSH were comparable among the intervention and control group at 12 and 18 months [18]. Kapur et al. compared the intervention comprising of leaflet listing sources of help, two telephone calls soon after the presentation and a series of letters over 12 months to TAU in adults presenting with self-harm. In the intervention group, the 12-month repeat rate was 34.4% compared to 12.5% for the TAU group ($p = 0.046$). The reasons causing an increased repeat rate in the interventional group versus the control are unclear. There were also a higher number of episodes of repeat self-harm over the 12 months in the intervention group (41 v. 7, incidence rate ratio = 5.86, 95% CI 1.4-24.7, $p = 0.0016$) [19]. Bennewith et al. conducted a feasibility study for support letters in high-risk patients. Eight letters were mailed at 1, 2 and 4 weeks and later at 2, 4, 6, 9, and 12 months following discharge. Most patients felt that they were adequately supported while some preferred fewer letters [21].

Telephone Contact

Cedereke et al. investigated the effect of repeated telephone contacts on treatment attendance, repetition of suicidal behaviors, and mental health in the year after a suicide attempt. Patients ($n = 107$) received a telephone call at 4 and 8 months following discharge from a medical emergency inpatient unit while 109 subjects received TAU. Fourteen participants (17%) in the intervention group had repetitive suicidal attempts compared to 15 participants (17%) in the control group [23]. In 2006, Vaiva et al. evaluated the effectiveness of telephone calls for repetitive suicidal attempts. Patients with suicidal ingestions were randomly assigned to three different groups who had telephone contact at one month in the first group, three months in the second group, and no telephone contact in the control group. There were significantly lower numbers of suicide attempts in the group that received a telephone call after one month compared to the control group (12% vs 22%). For the patients contacted at three months, the difference was not significantly lower than the control group (17% vs 22%, $p = 0.27$) [24].

Fleischmann et al. conducted an RCT on 1867 patients with suicide attempt presenting to the ED in five different countries. The intervention group received standard one hour individual educational closer to discharge as well as nine follow-up contacts (phone calls or visits) during the 18 month period at 1,2,4,7, and 11 weeks and 4,6,12, and 18 months. At the end of the study, significantly fewer deaths from suicide occurred in the BIC than in the TAU group (0.2% versus 2.2%, respectively; $P < 0.001$) [25]. Bertolote et al. continued the RCT of Fleischmann et al. to for an 18-months follow up study to evaluate rates of repeated suicide attempts in the same patient population. The proportion of subjects with repeated suicide attempts was similar in the BIC and TAU groups (7.6% vs. 7.5%, $p = 0.909$), but there were differences in rates across the five sites. No significant differences were observed between the intervention and control groups at study endpoint, contrary to the initial encouraging decline of suicide mortality previously reported by Fleischmann et al. [25, 26]

Hassanzadeh et al. compared the effect of brief intervention and contact (BIC) to TAU on the repetition of suicidal attempts. The participants were followed up by phone calls or visits at 1, 2, 4, 7, and 11 weeks, 4 months, and 6 months after discharge. BIC did not significantly reduce the repeated suicide attempts, but the patients' need to get support increased significantly (alpha value = 63.67, $p < 0.001$) compared to the TAU. The patients in the BIC group tried to get support from outpatient/inpatient services, relatives, friends or by telephone contact to a significantly larger extent (alpha value = 69.2, $p < 0.001$) compared to the patients receiving TAU [27].

In a study by Chen et al., 15 participants were contacted by text messages in the first week after discharge followed by once a week during the first month, for a total of four contacts. Twelve patients reported the text message acceptable and helpful way of communication with an interest in continuing to receive them for a longer duration [28]. Vijayakumar et al. conducted an RCT to determine the efficacy of BIC in reducing subsequent suicidal behaviors. In this study, 302 participants were randomized to BIC and 320 to the control group. Eight patients attempted suicide in the BIC group compared to the 17 in the control group (OR = 17.3, CI = 10.8 – 29.7). One patient completed suicide in the intervention group and nine in the control group (OR = 35.4, CI = 18.4 - 78.02). Most importantly, the interventions were liked by the participants [29].

In an RCT, Asarnow et al. evaluated the usefulness of Family Intervention for Suicide Prevention (FISP) for utilizing outpatient mental health resources after discharge. FISP consisted of a brief session with youth and their families in the ED to focus on a safety plan. It was supplemented by follow-up calls made within the first 48 h after discharge and then as needed calls at 1, 2, and 4 weeks after discharge. Intervention patients were significantly more likely to attend outpatient treatment, as compared to usual ED-Care patients (92% vs 76%, $p = .004$). The intervention group also had a significantly higher rate of psychotherapy (76% vs 49%; $p = 0.001$); combined psychotherapy and medication (58% vs 37%; $p = 0.003$); and significantly more psychotherapy visits (mean 5.3 vs 3.1; $p = 0.003$) [30].

A case-control study by Cebria et al. evaluated the usefulness of a telephone contact program in patients discharged from the ED following a suicide attempt. Intervention group ($n = 296$ received a telephone call after 1 week followed by contacts at 1, 3, 6, 9 and 12-month intervals. The patients in the control group ($n = 218$) received TAU during the 1-year follow-up. There was a delay in suicide reattempts in the intervention group compared to the baseline year (mean time in days to first reattempt, year 2008 = 346.47, SD = 4.65; mean time in days to first reattempt, year 2007 = 316.46, SD = 7.18, $p < 0.0005$) and compared to the control population during the same period (mean time in days to first reattempt, treatment period =

346.47, SD = 4.65; mean time in days to first reattempt, pre-treatment period = 300.36, SD = 10.67; $p < 0.0005$). The intervention reduced the rate of patients who reattempted suicide in the experimental population compared to the previous year (intervention 6% (16/296) v baseline 14% (39/285), difference = 8%, (95% CI =2% to 12%) and to the control population (intervention 6% (16/296) v control 14% (31/218) difference = 8%, (95%CI = 13% to 2%) [49].

Cebria et al. contacted the participants again after five years in order to evaluate the benefit of telephone contacts on suicidal behaviors in a long-term study. No statistically significant difference was observed in the number of people who reattempted suicide after 5 years (intervention group: 31.4% vs control group: 34.4%). The results, thereby indicating that the beneficial effects of telephone contact at one year were not maintained after 5 years [34]. Hughes et al. conducted an RCT investigating the feasibility of FISP in improving the probability of follow-up treatment for suicidal youths. This intervention was effectively delivered in the emergency department for 80.9% of patients [32].

Stéphane Amadéo, et al. conducted an RCT intervention for non-fatal suicidal behaviors in TAU or TAU plus BIC groups. The results showed no significant differences between the two groups in terms of the number of presentations to the hospital for repeated suicidal behaviors [33]. Mouaffak, et al. tested the effectiveness of a follow-up plan OSTA (organization of suitable monitoring for suicide attempters) over a period of one year. On an intention to treat basis, the proportion of patients who reattempted suicide did not differ significantly between the interventional group 14.5% (22/152) and the control group 14% (21/150) [35]. In a controlled study, Exbrayat et al. evaluated the efficacy of a protocol of telephone follow-up of 436 patients at 8, 30, and 60 days after they were treated for an attempted suicide. In the intervention group, repeated suicide attempts were significantly fewer (55/436) compared to the control (69/387) group after the initial index episode ($P = 0.037$). The interval between the index episode and the first repeated suicide attempt was 143.9 days (± 105.3) in the intervention group and 107.0 days (± 105.2) in the control group ($P = 0.05$) [36].

Normand et al. conducted a study on a cohort of 173 adolescents and young adults admitted for a suicide attempt. The cohort was re-contacted using phone calls at one week, one month, six months and twelve months after discharge. At one year follow-up, 23 participants (13.3%) had re-attempted suicide. However, only 93 participants were available for contact for follow-up phone calls. Feedback showed that the intervention was considered supportive of the patients and their families [50]. A descriptive study by Berrouiguet et al. reported three selected patients (out of the 244 recruited patients) who received text messages at 48 h after discharge, then at day 8 and 15, and then at 1, 2, 3, 4, 5, and 6 months. One patient contacted the emergency crisis support service immediately after receiving text messages, while the other two participants contacted up to six days following the text message [38].

Structured Outpatient Service

Donaldson et al. conducted a non-randomized trial in an adolescent population of 23 patients with suicidal behaviors. The participants and their families verbally agreed to participate in at least four psychotherapy sessions and three phone interviews over an eight-week period. The results were compared to the 78 patients in the control group at the study endpoint. The experimental intervention resulted in fewer outpatient psychotherapy 'no shows' (9% vs. 18%) and a trend toward a greater number of sessions attended (5.5 vs. 3.9). There were no re-attempts in the experimental group as compared to 9% in the comparison group [39]. A cluster RCT study by Bennewith et al. examined the effect of sending letters from the general

practitioners (GPs) to patients who were admitted after an episode of self-harm. At one year follow-up after the index episode of self-harm, no significant difference in the incidence of DSH episodes was observed in the intervention and control groups (odds ratio = 1.2, 95% CI = 0.9 to 1.5) [40].

Currier et al. conducted an RCT investigating the efficacy of the Mobile Crisis Team (MCT) or an Outpatient Mental Health Clinic (OPC) as a follow-up for patients discharged from the ED after an attempted suicide. Successful first clinical contact after ED discharge occurred in 39 of 56 (69.6%) participants randomized to the MCT versus 19 of 64 (29.6%) to the OPC (relative risk 1/4 2.35, 95% CI 1/4 1.55–3.56, $p < 0.001$). There was some early improvement after discharge in both groups but this efficacy was not observed for symptomatic improvement or repeated ED admissions [41].

Hvid et al. conducted an RCT to investigate the efficacy of the OPAC program (outreach, problem-solving, adherence, continuity) in patients with attempted suicide over a period of six months. The intervention included active outreach with nurse home visits as well as other forms of contact, such as telephone and text messaging. There was a significant lower repetition rate in the intervention group, where the proportion of repetitive patients fell from 34% to 14% ($p = 0.005$). There were also fewer suicidal acts, in total 37 acts in 58 patients in the control group and 22 acts in 93 patients for the intervention group. The rate ratio for intervention was 0.3185 (95% CI 0.2078-0.4881) [51]. Another RCT by Chen et al. evaluated the benefit of crisis postcards with case management (CM) in the prevention of further suicide attempts. Patients were contacted via phone and at least six CM services were provided over the next three months. Thereafter, crisis postcards were provided with strategies to cope and provide psychological support in times of crisis. The intention-to-treat analysis indicated that the crisis postcard had no effect (hazard ratio = 0.84; 95% CI = 0.56 – 1.29), whereas the per-protocol analysis showed a strong benefit for the crisis postcard (hazard ratio = 0.39; 95% CI = 0.21 – 0.72). Although this study could not provide a significant advantage of adding crisis postcards to case management in the prevention of suicide attempts, further studies are needed to clarify [43].

Simpson et al. conducted an RCT to investigate the role of a peer support group in suicide prevention. In this four-week-long trial, 23 patients received a peer support group compared to the 23 participants in the TAU group. No significant difference was seen between the intervention and control group on the Beck Hopelessness Scale (U = 177, $P = 0.083$), Quality of Life Scale (U = 238.00, $P = 0.732$) and UCLA Loneliness scale (U = 236.5, $P = 0.724$) [44]. A study by Currier et al. tested the effectiveness of combining a Safety Planning Intervention with structured follow-up among Veterans at risk for suicide, seeking treatment at Veteran Affairs Medical Center ED. In safety planning, participants were given a list of coping skills and support systems in the time of crisis in a 20-40 min session. Follow-up contact was made at 72 h and thereafter. The participants in the intervention group were more likely to adhere to outpatient treatment and had 45% fewer suicidal behaviors [45].

Grimholt et al. conducted an RCT to assess the effect of systematic follow-up by GPs to decrease suicidal behaviors and psychiatric symptoms. The intervention group received a follow-up within a week after discharge, once a month for 3 months and 2 consultations in the next 3 months. There were no significant differences between the groups in SSI, BDI or BHS mean scores or change from baseline to three or six months. During follow-up, self-reported DSP was 39.5% in the intervention group vs. 15.8% in controls ($p = 0.009$). Readmissions to general hospitals were similar (13% in both groups, $P = 0.963$), while DSP episodes treated at EMAs were 17% in the intervention group and 7% in the control group

($p = 0.103$) [46]. Another study by Grimholt et al. investigated the effect of follow-up by GPs on adherence to and satisfaction with treatment after discharge from the ED. This study showed a positive response with a higher level of satisfaction observed among patients in the intervention group. Patients in the intervention group received significantly more consultations than the control group (mean 6.7 vs. 4.5 ($p = 0.004$)). The intervention group was significantly more satisfied with the time their GP took to listen to their personal problems (93.1% vs. 59.4% ($p = 0.002$)) and with the fact that the GP included them in medical decisions (87.5% vs. 54. 8% ($p = 0.009$)). The intervention group was significantly more satisfied with the treatment in general than the control group (79% vs. 51% ($p = 0.026$)) [47] Scanlan et al. evaluated the efficacy of a six to eight-week peer-delivered support program following discharge from an inpatient psychiatric unit. The participants experienced improvement in clinical and functional recovery as well as self-reported decreased readmission days [48].

Discussion

This review article summarizes the evidence for interventions to address suicidal behaviors during the transition of care after discharge from the medical facilities. These interventions included green cards, letters, crisis cards, postcards, telephone-based interventions, BIC, FISP, MCT, OPAC, support through peer support workers, and engagement with outpatient providers. The outcomes of interest were suicidal ideations and attempts, DSH, DSP, and utilization of outpatient services. Despite the higher engagement of participants in outpatient services, the evidence for suicidal behaviors is mixed in these studies.

In this article, 12 studies assessed for engagement in outpatient services and subjective feedback for these interventions. Of these, nine studies reported favorable evidence for engagement in outpatient services with one study reporting no benefits. All studies received positive feedback from the participants. The utilization of outpatient services is critical since participants are at a higher risk during the transition of care, especially during the first three months [6]. This risk is potentiated in patients who leave the care facility against medical advice due to the prevalent stigma towards mental health issues. About 75% of individuals do not engage in outpatient services during the transition of care [25].

In addition to existing stigma, patients with mental illnesses lack sufficient social support and communication skills predisposing them to suicidal behaviors [21, 52]. Well-planned interventions provide a multitude of benefits ranging from psychosocial counseling to CM and monitoring of suicidal behaviors. These interventions create a feeling of connectedness, reduce social isolation, and provide an opportunity to connect with an active listener [21, 52]. A study estimated that approximately 6.3 adolescents would need to engage in FISP to prevent one adolescent from failing to receive outpatient services [30]. This clinically meaningful advantage reinforces the need to engage in outpatient services to prevent the worsening of mental health illnesses, reduce suicidal behaviors and lower rates of recidivism.

The reviewed interventions have conflicting evidence for outcomes related to suicidal behaviors including suicidal ideations and suicidal attempts, DSH, and DSP. Out of 17 studies assessing suicidal attempts and DSP, nine studies had an improvement in suicidal attempts and DSP. Only four studies out of nine suggested an improvement in suicidal ideations. However, the evidence was minimal for DSH with only three studies suggesting a favorable response. The methodological issues such as missing data, differences in baseline severity among study

groups, and lack of reliable definition of DSH are potential issues. There was also a differential response to these interventions in patients with first-episode of suicidal behaviors compared to patients with a history of repetitive suicidal behaviors [12]. This necessitates the need for subgroup analyses of the participants due to the differences in baseline severity of psychiatric symptoms and heterogeneity of the patient population. Patients with chronic suicidal ideations and behaviors are more likely to benefit from specialized psychotherapeutic treatment such as dialectal behavioral therapy and cognitive behavioral therapy [12].

A low cost and effective targeted intervention improves suicide-related outcomes and has considerable public health benefits. In a study, the costs of the postcards, telephone outreach, and CBT-based intervention was compared to TAU [53]. The treatment costs and mortality benefits were favorable for postcard interventions compared to TAU [53]. The population impact of these interventions was limited due to the low sensitivity of detecting suicide risk of each patient and the limitations of the healthcare system [53]. This highlights the importance of targeted screening tools followed by evidence-based intervention for high-risk patients during the transition of care.

This review article has several limitations. First, this is a narrative review lacking quantitative analysis of the interventions. Second, as this article included both randomized and non-randomized controlled trials, it was challenging to use a uniform quality assessment tool for all studies. However, the authors have attempted to summarize the limitations of all studies in their relevant tables. Third, a robust search strategy was employed to screen articles relevant to our topic of interest, it is likely that we missed a few evidence-based interventions due to the narrative nature of this review article.

To conclude, patients are at a high suicide risk during the transition of care from medical care facilities to the community setting, especially during the first three months. Several interventions address this challenging public health issue. The reviewed interventions were efficacious in linking patients to outpatient services, reduce feelings of social isolation, and help patients better navigate the available community resources. There was conflicting evidence for outcomes related to suicidal behaviors with lesser evidence for patients with repetitive suicidal behaviors. This highlights the importance of psychosocial interventions such as dialectical behavioral therapy and cognitive behavioral therapy but not limited to these two only. Hospitalization should be followed by targeted interventions based on risk categorization of the patients by using evidence-based tools.

Conclusion

Patients are at a higher risk during the transition of care from medical care facilities to the community setting, especially during the first three months. Several interventions have been designed to address this challenging public health issue. The interventions reviewed in this article were found to be efficacious for linking patients to outpatient services as they reduce feelings of social isolation, and help patients navigate the community resources available to them. There was conflicting evidence for outcomes related to suicidal behaviors with lesser evidence for patients with repetitive suicidal behaviors. This highlights the importance of targeted psychosocial interventions such as dialectical behavioral therapy and cognitive behavioral therapy but not limited to these two only. Hospitalization should be followed by targeted interventions based on risk categorization of the patients by using evidence-based tools.

Compliance with Ethical Standards

This is a review article, so it did not require IRB approval or other requirements for human or animal studies. No consent was needed.

Conflict of Interest There were no conflicts of interest.

Any Applicable Disclaimer Statements No disclosures to report.

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