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# Increased risk of suicide reattempt according to the type of brief contact interventions in the Vigilans program: The critical role of PTSD and anxiety disorders

Alice Demesmaeker<sup>a,b,\*</sup>, Ali Amad<sup>a</sup>, Wivine Blekic<sup>a</sup>, Charles-Edouard Notredame<sup>a</sup>, Thomas Seloisse<sup>c</sup>, Vincent Jardon<sup>a</sup>, Guillaume Vaiva<sup>a,b</sup>, Fabien D'Hondt<sup>a,b</sup>

<sup>a</sup> Univ. Lille, Inserm, CHU Lille, U1172 - LilNCog - Lille Neuroscience & Cognition, F-59000, Lille, France

<sup>b</sup> Centre national de ressources et de résilience (Cn2r), F-59000, Lille, France

<sup>c</sup> University of Lille, France

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## ABSTRACT

**Introduction:** Global suicide rates highlight the critical need for effective preventive measures. Brief contact interventions (BCIs), such as France's Vigilans program, provide cost-effective prevention strategies. This study evaluates the suicide reattempt risk following BCIs in the aftermath of suicide attempt (SA) and identifies sociodemographic and clinical predictors to guide targeted prevention efforts.

**Method:** We conducted a prospective cohort analysis of 1044 non-first-time suicide attempters, enrolled in the Vigilans program between 2015 and 2020. The program offers diverse BCIs: a phone call only; a phone call followed by postcards (if in suicidal crisis); postcards only (if unreachable); and no intervention (if unreachable and have not provided an address). We used a multivariate Cox model and a multinomial logistic regression to examine the risk associated with each intervention and identify factors influencing intervention receipt.

**Results:** Compared to sole phone call, participants who received both a phone call and postcards, only postcards, or no intervention had a higher risk of suicide reattempt. Posttraumatic stress disorder (PTSD) was linked to a higher likelihood of receiving both a phone call and postcards, postcards only, or no intervention. Panic disorder was associated with receiving both a phone call and postcards, while generalized anxiety disorder (GAD) was linked to receiving postcards only.

**Conclusion:** Participants who received interventions beyond a singular phone call faced higher risks of subsequent SAs. Because these groups had greater suicidality or did not adhere to the program, this finding underscores the importance of tailoring interventions to the specific needs of patients with varying levels of suicidality.

## 1. Introduction

Suicide represents a critical public health concern, with an estimated 16 million suicide attempts (SAs) annually (Fazel and Runeson, 2020), and nearly 700,000 global deaths by suicide each year (World Health Organization (WHO), 2021). This trend of high suicide rates has been persistent for several years, establishing suicide as the leading cause of preventable mortality across all age groups. Importantly, evidence suggests that a history of SA is one of the strongest predictors of subsequent completed suicide (Fazel and Runeson, 2020): approximately 16.3% of individuals who have attempted suicide reattempt, and 2.8% die by suicide within a year (Carroll et al., 2014; Demesmaeker et al.,

2021). Efforts have been made to prevent subsequent suicide, leading to the development of various interventions (Hawton et al., 1998; Hepp et al., 2004).

Brief contact interventions (BCIs), developed since the 1980s, offer cost-effective strategies delivered in a structured schedule, without requiring specialized mental health professionals (Inagaki et al., 2019). Various BCIs have been proposed to maintain contact and facilitate re-engagement with clinical services for patients discharged after an SA, such as the provision of a "crisis card" giving the phone number of a crisis management professional (sometimes referred to as a "green card"), and/or phone calls, short letters, and postcards (Luxton et al., 2013; Milner et al., 2015). BCIs enable multiple contacts with patients over

\* Corresponding author. Univ. Lille, Inserm, CHU Lille, U1172 - LilNCog - Lille Neuroscience & Cognition, F-59000, Lille, France.

E-mail address: [alice.demesmaeker@chu-lille.fr](mailto:alice.demesmaeker@chu-lille.fr) (A. Demesmaeker).

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time, and generally includes a brief message expressing concern for the patient and offering help if needed. These interventions are typically implemented in the months following an SA, as this period has the highest risk of reattempt (Inagaki et al., 2019). Recent literature reviews suggest that BCIs can reduce the risk of suicide reattempts and subsequent suicide following an SA (Ghanbari et al., 2015; Inagaki et al., 2019; Luxton et al., 2013; Menon and Vijayakumar, 2022; Milner et al., 2015). Postcards, in particular, have been shown to be effective by delivering a simple message of concern, helping to maintain a connection with the individual (Kapur et al., 2010).

In France, the Algos algorithm, which combines various BCIs (i.e. crisis cards, phone calls, and/or postcards) into an operational monitoring system, was tested in a multicentric randomized controlled trial in 2011 for suicide attempters (Vaiva et al., 2018). The intervention was tailored to the patient's SA history and mental health status during the phone call. This clinical trial evolved into the Vigilans program, implemented in the Hauts-de-France region since 2015 for all individuals discharged from the hospital after an SA (Duhem et al., 2018). The BCIs were only implemented for those with a history of prior SA, i.e. non-first-time attempters, as BCIs appear to lower suicide reattempts in this subgroup (Vaiva et al., 2006). Four levels of interventions are provided for these patients during a 6-month period: a phone call only in the days following discharge, if the suicidal crisis has resolved; a phone call, followed by postcards if the patient is still experiencing a suicidal crisis during the phone call; postcards only if the patients do not answer the phone; and no intervention if they do not answer the phone and have not provided an address. The combination of BCIs offered by the Vigilans program seem to have demonstrated its effectiveness by reducing the number of recurrent SAs compared to standard care (Broussouloux et al., 2023; Plancke et al., 2021). However, the risk of suicide reattempt associated with each intervention is not well established, and the characteristics of participants who are more prone to reattempt remain unknown. Recent efforts aim to enhance the efficacy of the Vigilans program, particularly by considering more personalized interventions based on clinical and socio-demographic factors.

The present study aimed to evaluate the risk of suicide reattempt of individuals according to the intervention they received, within the most at-risk period, i.e. within 6 months after an SA (Inagaki et al., 2019). This study focuses on non-first-time attempters, as they receive the BCIs in the Vigilans program. We hypothesize that the risk of recurrence varies according to the level of intervention, dependent on whether patients are in a suicidal crisis during the phone call and reachable by phone in the days following discharge. It is likely that individuals no longer in a suicidal crisis during the phone call will have a low risk of reattempt, while those in a suicidal crisis (receiving a phone call and post-cards) will have a high risk of reattempt. Nonetheless, it remains unclear whether those unresponsive who have solely received postcards are still experiencing a suicidal crisis or, alternatively, feel better and no longer seek contact with mental health professionals. This study also aims to examine sociodemographic and clinical factors of individuals according to intervention received. We will particularly try to determine sociodemographic or clinical characteristics of individuals who are either still in a suicidal crisis or unreachable.

## 2. Method

### 2.1. Study design

This study examined a prospective cohort of 1044 suicide attempters, enrolled in the Vigilans program from January 1, 2015, to September 1, 2020. Since 2015, all individuals admitted to healthcare services for an SA in the Hauts-de-France region, whether in general medical services or psychiatry, are included in the Vigilans BCI program.

### 2.2. Interventions

All subjects discharged from either a general or psychiatric hospital in the Hauts-de-France region after an SA receive a crisis card upon inclusion (with emergency department phone number). The non-first-time attempters received a phone call between the 10th and 21st days after discharge. During the phone call, a team of trained nurses and psychologists assessed whether the suicidal crisis was resolved by asking the patient if they had experienced any suicidal thoughts since being discharged from the hospital. Moreover, personalized postcards are sent at months 2–5 to those unavailable for a phone call or facing a suicidal crisis. The front of the postcards features a figurative or abstract picture tailored to the patients' sociodemographic characteristics (e.g., travel for adults and sports for adolescents), while the back includes a brief message of concern, along with the toll-free number for the Vigilans program, signed by the practitioner (see [Supplementary Fig. 1](#)).

The four possible interventions for the non-first-time attempters are.

- 1) A phone call only, if suicidal crisis has resolved during the phone call received between the 10th and 21st days after discharge
- 2) A phone call followed by postcards, if considered still in suicidal crisis during the phone call received between the 10th and 21st days after discharge
- 3) Postcards only, if unresponsive to three phone calls placed on three different days and times between the 10th and 21st days after discharge
- 4) No intervention, if unresponsive to phone call between the 10th and 21st days after discharge and have not provided an address

Finally, all participants received a standardized phone call at 6 months after discharge. All these interventions are conducted by a team of trained psychologists from the University Hospital of Lille.

### 2.3. Inclusion criteria and exclusions

Men and women of any age surviving an SA and with a history of prior SA were included. The suicidal intent was evaluated by a psychiatrist during an interview before inclusion. A SA was defined as "a situation where a person engages in behavior that is genuinely or apparently life-threatening with the intention to end his or her life or to appear as intending so, yet does not result in death." (Beck et al., 1972). Patients refusing participation or dying during the hospital stay were excluded.

### Ethical approval

The Vigilans study was authorized by the French Ministry of Health and approved by the Ethics Committee of the Nord-Pas-de-Calais region, the Commission Nationale Informatique et Liberté (CNIL), and the Local Data Protection Service. In accordance with this legal status, professionals ensured the patient's understanding and procedural compliance following comprehensive oral and written information provision, and no signed informed consent was required. The study was registered with [ClinicalTrials.gov](#) (NCT03134885).

### 2.4. Collected data

At inclusion, data on sociodemographic characteristics (age, sex), SA method (poisoning, cutting or piercing, hanging, drowning, jumping from a height, use of a firearm, association with acute alcohol use or medication overdose), and severity (determined by the patient's inclusion location), were recorded for each patient. The locations for inclusion were intensive care units (ICU), general hospital wards, or other locations (emergency department, psychiatric department, pediatrics department). The SA was classified as serious if necessitated hospitalization in the ICU or general hospital wards. Follow-up included phone

calls and postcard completion, and suicide reattempts that were reported to the Vigilans program. During the phone call at 6 months, psychiatric diagnosis was assessed via the Mini-International Neuropsychiatric Interview (MINI) (Sheehan et al., 1998) through a standardized telephone interview. Patients were also asked if they had made another suicide attempt since their inclusion in the program, date of first recurrence and number of recurrences.

### 2.5. Statistical analysis

Descriptive statistics were calculated for the variables of interest. Continuous variables are presented as the means and standard deviations (SDs). Discrete variables are expressed as frequencies and percentages. All sociodemographic and clinical characteristics of participants were compared according to the intervention administered using Chi-square tests. Kaplan-Meier curves represented the time to reattempt, stratified by the type of intervention delivered. Then, missing data were imputed using the multiple imputation method by chained equations, assuming the data were missing at random. Fifty imputed datasets were generated and combined according to Rubin's rules using the MICE package of R software (Van Buuren and Groothuis-oudshoorn, 2011).

To examine the association between the interventions and suicide reattempt risk within 6 months, a stepwise variable selection was performed, followed by a multivariable Cox model, calculating the hazard ratio (HR) and 95% confidence interval (95% CI). Covariates included in the Cox model for variable selection were age, sex, the method of SA, inclusion location and psychiatric diagnosis.

Finally, to identify factors predicting intervention allocation, we also performed a stepwise variable selection, followed by a multinomial logistic regression, calculating the odds ratio (OR) and 95% confidence interval (95% CI). All variable available at inclusion, i.e. age, sex, method of SA and psychiatric diagnosis, were included in the logistic regression model for stepwise variable selection. *p* values < 0.05 were considered significant. R software version 3.6.1 was used for all analyses.

## 3. Results

### 3.1. Patients at inclusion

A total of 1044 patients, mean age of 42.5 ( $\pm$ 15.4) years, were included in our study and followed up for 6 months (Table 1). The majority of patients were women (65.2%), with 71.7% admitted to emergency departments, psychiatric departments, or pediatric departments following an SA. Self-poisoning (81.8%) and acute alcohol use (50%) were prevalent. Major depressive disorder (62.7%), alcohol use disorder (39.3%), and panic disorder (24.9%) were the most frequent diagnoses.

### 3.2. Intervention delivered and suicide recurrence

Among the 1044 participants, 236 (22.6%) no longer experienced suicidal thoughts after discharge and only received a phone call; 411 (39.4%) participants experiencing a suicidal crisis received postcards following the phone call; 345 (33%) participants unresponsive to phone calls received postcards only; and 52 (5%) received no intervention (see Table 2). There were no statistically significant differences in sociodemographic characteristics, inclusion location and the method of suicide, between the intervention groups. There was a significant difference in psychiatric diagnoses. PTSD was more prevalent among those receiving both a phone call and postcards, only postcards or no intervention at all (*p* = 0.01). Generalized anxiety disorder (GAD) was more frequent among individuals receiving either a phone call and postcards or only postcards (*p* = 0.04). Panic Disorder was significantly more common in those receiving both a phone call and postcards (*p* < 0.01).

**Table 1**  
Characteristics of the participants (N = 1044).

Characteristics N (%)	All Participants (N = 1044)
<b>Age</b>	
Mean ( $\pm$ Sd), Y	42.4 (15.4)
< 25 Y	183 (17.5)
25–44 Y	343 (32.9)
45 - 64	455 (43.6)
$\geq$ 65 Y	63 (6)
<b>Sex</b>	
Women	681 (65.2)
Men	363 (34.8)
<b>Inclusion Location</b>	
Other Departments	749 (71.7)
General Hospital Wards	275 (26.3)
Intensive Care Unit	20 (1.9)
<b>Method Of Sa</b>	
Poisoning	854 (81.8)
Cutting Or Piercing	100 (9.6)
Hanging	38 (3.6)
Jumping From A Height	12 (1.1)
Drowning	6 (0.6)
Use Of A Firearm	5 (0.5)
Other	29 (2.8)
<b>Sa With Aau</b>	522 (50)
<b>Lifetime Diagnosis</b>	
MDD	655 (62.7)
Panic Disorder	260 (24.9)
GAD	154 (14.8)
PTSD	155 (14.8)
Hypomania Or Mania	71 (6.8)
AUD	410 (39.3)
SUD	100 (9.6)

SA = suicide attempt, AAU = Acute alcohol use, MDD = Major depressive disorder, GAD = Generalized anxiety disorder, PTSD = Posttraumatic stress disorder, AUD = Alcohol use disorder, SUD = substance use disorder.

Within 6 months, 135 (12.9%) had reattempted suicide: 72 in the group who received a phone call and postcards; 39 in the group who received postcards only; 13 in the group who had only a phone call; and 11 in the group that received no intervention.

### 3.3. Missing data

There were no missing data at inclusion. At the 6-month follow-up, data on suicide reattempt status were missing for 2% of the participants, the date of first reattempt was missing for 6% and the MINI lifetime diagnosis was missing for up to 16.4%.

### 3.4. Survival curve analysis

Fig. 1 presents the survival curves estimated by the Kaplan-Meier method, illustrating the time to the first suicide reattempt within 6 months. They indicated the highest survival probability for those receiving only a phone call, and the lowest for those with a phone call and postcards, as well as for those who received no intervention.

### 3.5. Suicide reattempt risk according to the intervention received

First, all available variables at inclusion (sociodemographic variables, method of SA, acute alcohol use at the time of the attempt, inclusion location, and psychiatric diagnosis) were included as covariates in the Cox model. However, following the stepwise variable selection model, only alcohol use disorder and acute alcohol use during the last SA were retained as relevant covariables for studying the association between interventions and suicide reattempt (see Table 3). Then, the Cox model revealed that individuals recontacted through all interventions were associated with an increased risk of reattempt compared to those receiving only a phone call (meaning those who are no longer in suicidal crisis). Compared to individuals receiving only a phone call, those

**Table 2**  
Characteristics of the participants according to the intervention received (N = 1044).

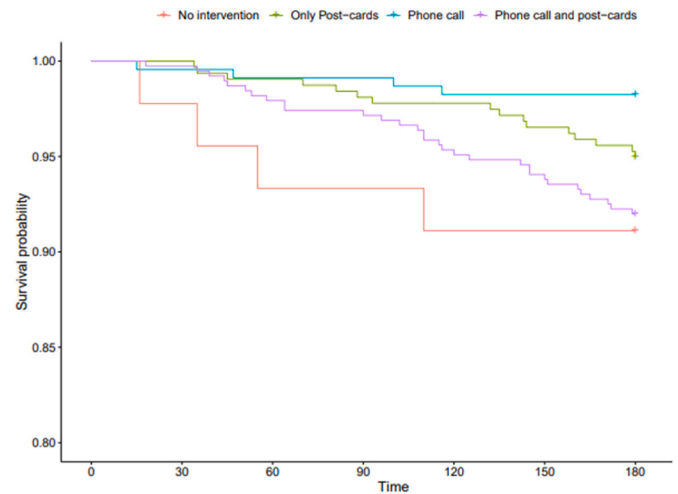
Characteristics N (%)	Phone Call Only (N = 236)	Phone Call And Post- Cards (N = 411)	Only Post- Cards (N = 345)	No Intervention (N = 52)	p- value <sup>a</sup>
<b>Age</b>					0.24
Mean (±Sd), Y	40.2 (15.3)	44.1 (15.5)	42.5 (14.9)	39.4 (15.2)	
< 25 Y	51 (21.6)	61 (14.8)	58 (16.8)	13 (25)	
25–44 Y	81 (34.3)	132 (32.1)	113 (32.7)	17 (32.7)	
45 - 64	94 (39.8)	186 (45.3)	156 (45.2)	19 (36.5)	
≥ 65 Y	10 (4.2)	32 (7.8)	18 (5.2)	3 (5.8)	
<b>Sex</b>					0.32
Women	148 (62.7)	272 (66.2)	232 (67.2)	29 (55.8)	
Men	88 (37.3)	139 (33.8)	113 (32.8)	23 (44.2)	
<b>Inclusion Location</b>					0.16
Other Departments	177 (75)	305 (74.2)	227 (65.8)	40 (76.9)	
General Hospital Wards	55 (23.3)	99 (24.1)	110 (31.9)	11 (21.1)	
Intensive Care Unit	4 (1.7)	7 (1.7)	8 (2.3)	1 (1.9)	
<b>Method Of Sa</b>					0.09
Poisoning	182 (77.1)	337 (82)	293 (85)	42 (80.8)	
Cutting Or Piercing Hanging Jumping From A Height	29 (12.3)	43 (10.4)	24 (7)	4 (7.7)	
Drowning Use Of A Firearm Other	8 (3.4)	13 (3.2)	14 (4)	3 (5.8)	
<b>Sa With Aau</b>	4 (1.7)	5 (1.2)	2 (0.6)	1 (1.9)	
5 (2.1)	12 (2.9)	10 (2.9)	2 (3.8)		
115 (48.7)	207 (50.3)	174 (50.4)	26 (50)	0.98	
<b>Lifetime Diagnosis</b>					
MDD	141 (59.7)	265 (64.7)	215 (62.3)	34 (65.4)	0.13
PTSD	23 (9.7)	68 (16.5)	55 (15.9)	9 (17.3)	0.01
GAD	25 (10.6)	73 (17.8)	51 (14.8)	5 (9.6)	0.04
Hypomania Or Mania	14 (5.9)	37 (9)	20 (5.8)	0	0.09
AUD	82 (34.7)	168 (40.9)	137 (39.7)	23 (44.2)	0.09
SUD	17 (7.2)	39 (9.5)	36 (10.4)	8 (15.4)	0.11
Panic Disorder	46 (19.4)	131 (31.9)	73 (21.2)	10 (19.2)	<0.01

SA = suicide attempt, AAU = Acute alcohol use, MDD = Major depressive disorder, GAD = Generalized anxiety disorder, PTSD = Posttraumatic stress disorder, AUD = Alcohol use disorder, SUD = substance use disorder.

<sup>a</sup> Results of Chi-square tests.

receiving no intervention (were unreachable) were associated with the highest risk of reattempt (HR = 4.14 (1.21–14.19), p = 0.02) and those receiving post-cards only were associated with the lowest risk of reattempt (HR = 2.82 (1.11–7.12), p = 0.03).

However, even though there were selected in the stepwise, when added to the multivariate Cox model, alcohol use disorder was associated with an increased risk of suicide reattempt while result for acute alcohol use was non-significant (HR = 1.85 (1.08–3.15), p = 0.02 and



**Fig. 1.** Kaplan Meier curves of suicide reattempt within 6 months according to the type of intervention delivered.

**Table 3**  
Association between the type of intervention and suicide re-attempt within 6 months.

	Suicide Re-Attempt (N = 135)			
	HR (95% CI) <sup>a</sup>	p <sup>a</sup>	Adjusted HR (95% CI) <sup>b</sup>	p <sup>b</sup>
<b>Age (Ref = 25–44 Y)</b>				
<25 Y	1.03 (0.52–2.03)	0.94		
45–64	0.85 (0.49–1.48)	0.56		
>65 Y	0.24 (0.04–1.58)	1.14		
<b>Sex (Ref = Men)</b>				
Women	1.15 (0.69–1.90)	0.59		
<b>Inclusion Location (Ref = Other Departments)</b>				
General Hospital Wards	0.79 (0.44–1.45)	0.45		
Intensive Care Unit	Nc			
<b>Method Of Sa (Ref = Poisoning)</b>				
Cutting Or Piercing	1.26 (0.59–2.67)	0.54		
Hanging	1.61 (0.49–5.33)	0.43		
Jumping From A Height	Nc			
Drowning	Nc			
Use Of Firearm	Nc			
<b>Sa With Aau</b>	0.78 (0.48–1.25)	0.29	0.61 (0.36–1.02)	0.06
<b>Intervention Received (Ref = Phone Call Only)</b>				
Phone Call And Post- Cards	3.73 (1.33–10.49)	0.01	3.64 (1.29–10.25)	0.02
Post-Cards Only	2.95 (1.16–7.53)	0.02	2.82 (1.11–7.12)	0.03
No Intervention	4.49 (1.32–15.27)	0.02	4.14 (1.21–14.19)	0.02
<b>Lifetime Diagnosis</b>				
MDD	1.43 (0.83–2.46)	0.18		
Panic Disorder	1.33 (0.77–2.29)	0.30		
GAD	0.97 (0.48–1.97)	0.94		
PTSD	1.61 (0.89–2.89)	0.11		
Hypomania Or Mania	1.11 (0.46–2.67)	0.82		
AUD	1.61 (0.99–2.63)	0.06	1.85 (1.08–3.15)	0.02
SUD	0.95 (0.41–2.25)	0.91		

SA = suicide attempt, AAU = Acute alcohol use, MDD = Major depressive disorder, GAD = Generalized anxiety disorder, PTSD = Posttraumatic stress disorder, AUD = Alcohol use disorder, SUD = substance use disorder.

<sup>a</sup> Unadjusted Hazard Ratio and p-value; Results of unadjusted Cox model on multiple imputed datasets.

<sup>b</sup> Adjusted Hazard Ratio and p-value; Results of multivariable Cox model on multiple imputed datasets.

HR = 0.61 (0.36–1.02), p = 0.06 respectively).

### 3.6. Predictive factors of interventions received

First, the stepwise variable selection only retained psychiatric diagnoses as relevant for studying the association between predictive factors and the delivered intervention (see Table 4). Then, the multinomial logistic regression highlighted that post-traumatic stress disorder (PTSD) was associated with a higher risk of belonging to the groups receiving a phone call and postcards, postcards only or no intervention (OR = 1.81 (1.08–3.05), p = 0.02, OR = 2.01 (1.18–3.44), p = 0.01 and OR = 2.55 (0.99–6.54), p = 0.05 respectively) compared to individuals receiving only a phone call. A lifetime diagnosis of panic disorder increased the risk of belonging to the group receiving both a phone call and postcards (OR = 1.85 (1.24–2.77), p < 0.01), and GAD increased the risk of receiving only postcards (OR = 1.75 (1.03–2.97), p = 0.04).

## 4. Discussion

This study examined the impact of various BCIs offered by the Vigilans program on the risk of suicide reattempt over 6 months, alongside identifying predictive sociodemographic or clinical factors for intervention delivery. Four types of interventions are delivered by the Vigilans program: (i) a phone call only, if participants are not in suicidal crisis during the phone call at 10 days after discharge; (ii) phone calls and postcards, if participants are in suicidal crisis during the phone call; (iii) postcards only if participants are unresponsive; and (iv) no intervention if participants are unresponsive and have not provided an address. Compared to those who received a phone call only, participants receiving any other form of intervention exhibited elevated risk of suicide reattempt, and those receiving no intervention faced the highest risk. Since interventions were provided based on the presence of a suicidal crisis during the phone call or a lack of response, it can be inferred that individuals who continued to endorse suicidality or who did not

**Table 4**  
Predictive factors of intervention received (reference = A phone call only).

Characteristics n (%)	Phone call and post-cards (n = 411)				Only post-cards (n = 345)				No intervention (n = 52)			
	OR (95% CI) <sup>a</sup>	P <sup>a</sup>	aOR (95% CI) <sup>b</sup>	P <sup>a</sup>	OR (95% CI) <sup>a</sup>	P <sup>a</sup>	aOR (95% CI) <sup>b</sup>	P <sup>b</sup>	OR (95% CI) <sup>a</sup>	P <sup>a</sup>	aOR (95% CI) <sup>b</sup>	P <sup>b</sup>
<b>Age (ref = 25–44 y)</b>												
<25 y	0.73 (0.46–1.17)	0.19			0.82 (0.51–1.31)	0.40			1.21 (0.54–2.72)	0.63		
45–64	1.21 (0.84–1.76)	0.31			1.19 (0.81–1.74)	0.37			0.96 (0.47–1.98)	0.91		
≥65 y	1.96 (0.92–4.21)	0.08			1.29 (0.56–2.94)	0.54			1.43 (0.35–5.76)	0.61		
<b>Sex (ref = Men)</b>												
Women	1.16 (0.83–1.62)	0.83			1.22 (0.86–1.73)	0.26			0.75 (0.41–1.38)	0.35		
<b>Inclusion location (ref = Other departments)</b>												
General hospital wards	1.04 (0.72–1.52)	0.82			1.56 (1.07–2.28)	0.02			0.88 (0.42–1.84)	0.74		
Intensive care unit	1.02 (0.29–3.52)	0.98			1.56 (0.46–5.27)	0.47			1.11 (0.12–10.19)	0.93		
<b>Method of SA (ref = Poisoning)</b>												
Cutting or piercing	0.80 (0.48–1.33)	0.39			0.51 (0.29–0.91)	0.02			0.60 (0.20–1.79)	0.35		
Hanging	0.88 (0.36–2.16)	0.78			1.09 (0.47–2.64)	0.85			1.62 (0.41–6.39)	0.48		
Jumping from a height	0.67 (0.18–2.55)	0.56			0.31 (0.06–1.72)	0.18			1.08 (0.11–9.97)	0.94		
Drowning	NC				0.12 (0.01–1.07)	0.05			NC			
Use of a firearm	0.18 (0.02–1.75)	0.14			0.21 (0.02–2.01)	0.17			NC			
Other	1.30 (0.45–3.74)	0.63			1.24 (0.42–3.70)	0.70			1.73 (0.32–9.26)	0.52		
SA with AAU	1.07 (0.77–1.47)	0.69			1.07 (0.77–1.49)	0.68			1.05 (0.58–1.92)	0.87		
<b>Lifetime diagnosis</b>												
MDD	1.37 (0.98–1.93)	0.07			1.48 (1.04–2.13)	0.03			1.62 (0.81–3.25)	0.17		
Panic disorder	2.23 (1.51–3.29)	<0.01	1.85 (1.24–2.77)	<0.01	1.43 (0.95–2.18)	0.09	1.14 (0.74–1.77)	0.54	1.52 (0.70–3.32)	0.30	1.27 (0.56–2.87)	0.56
GAD	2.00 (1.23–3.25)	<0.01	1.57 (0.95–2.59)	0.08	2.07 (1.23–3.48)	<0.01	1.75 (1.03–2.97)	0.04	1.54 (0.57–4.15)	0.39	1.21 (0.43–3.41)	0.71
PTSD	2.31 (1.40–3.80)	<0.01	1.81 (1.08–3.05)	0.02	2.38 (1.42–3.99)	<0.01	2.01 (1.18–3.44)	0.01	2.83 (1.14–7.02)	0.02	2.55 (0.99–6.54)	0.05
Hypomania or mania	1.90 (1.01–3.59)	0.05	1.49 (0.78–2.86)	0.23	1.61 (0.80–3.22)	0.18	1.31 (0.64–2.67)	0.46	NC		NC	
AUD	1.36 (0.97–1.91)	0.07	1.14 (0.61–2.13)	0.67	1.51 (1.06–2.16)	0.02	1.50 (0.80–2.81)	0.20	1.88 (0.99–3.58)	0.05	2.49 (0.94–6.59)	0.07
SUD	1.44 (0.80–2.61)	0.22	1.25 (0.87–1.78)	0.22	1.86 (1.03–3.38)	0.04	1.35 (0.93–1.95)	0.12	2.99 (1.19–7.52)	0.02	1.52 (0.76–3.03)	0.24

SA = suicide attempt, AAU = Acute alcohol use, MDD = Major depressive disorder, GAD = Generalized anxiety disorder, PTSD = Posttraumatic stress disorder, AUD = Alcohol use disorder, SUD = substance use disorder.

<sup>a</sup> Unadjusted Odd Ratio and p-value; Results of unadjusted multinomial regression model on multiple imputed datasets.

<sup>b</sup> Adjusted Odd Ratio and p-value; Results of multivariable multinomial regression model on multiple imputed datasets.

engage with the program were at a higher risk of reattempting suicide within 6 months. Additionally, results revealed that individuals with PTSD were more likely to be in suicidal crisis during the phone call or unresponsive. Furthermore, patients with panic disorder were more likely to be in suicidal crisis during the phone call after discharge, while those with GAD were more likely to be unresponsive. By incorporating systematic screening for these mental health conditions and providing targeted care, we can potentially amplify the impact of these interventions, whose efficacy is currently less pronounced.

We observed that individuals who continued to endorse suicidality or who did not engage with the program (i.e. those receiving postcards only, a combination of a phone call and postcards, or no intervention), faced a 2 to 4 times higher risk of suicide reattempt compared to those who are no longer in a suicidal crisis during the phone call between 10 and 21 days after hospital discharge (HR = 2.82 (1.11–7.12),  $p = 0.03$ ; HR = 3.64 (1.29–10.25),  $p = 0.02$  and HR = 4.14 (1.21–14.19),  $p = 0.02$  respectively). Firstly, it was unclear whether the individuals in the group receiving only postcards are still experiencing a suicidal crisis or, conversely, have improved and no longer seek contact with mental health professionals. It appears that this group might encompass a wide range of patients from those who may urgently need support to those who are potentially recovering. They exhibit a two times higher risk of reattempt than those receiving only a phone call but a lower risk than those undergoing the other two interventions. This 'intermediate' risk level may reflect the potential heterogeneity in the clinical profiles of patients within the postcard-only group, encompassing both individuals who are recovering and those still in acute crisis. Secondly, the group receiving no intervention, comprising individuals who neither responded to the phone call nor provided an address, suggesting a poor adherence to the program or a likely lack of stable residence, emerged as the subgroup at the highest risk. It highlights the importance of addressing the unique challenges faced by individuals who are unwilling to engage in treatment or without stable housing in the context of suicide prevention interventions (Lizardi and Stanley, 2010). Ultimately, individuals who are facing a suicidal crisis during the phone call and thus received both a phone call and postcards experienced a threefold increased risk. Therefore, these subgroups may benefit from targeted additional interventions to mitigate their elevated risk.

Our analysis identified PTSD as a predictor for belonging to the groups more likely to receive both phone calls and postcards, postcards only, or no intervention at all—specifically those still experiencing suicidal crisis 10 days after hospital discharge or those unresponsive to this phone call. PTSD thus appears to be a predictive factor for higher risk of suicidality, as well as for non-adherence to the program. Existing literature reviews have consistently highlighted a strong association between PTSD and suicidal ideation, SA, and death by suicide (Akbar et al., 2023; Panagioti et al., 2010). However, to our knowledge, there are no studies demonstrating that PTSD is associated with poorer adherence to treatment. Given these findings, it is imperative to prioritize PTSD screening among individuals who have attempted suicide. This also applies to individuals presenting anxiety disorders, as our results indicate that those with panic disorder are at a higher risk of experiencing a suicidal crisis during the phone call, in line with recent findings from a meta-analysis (Zhang et al., 2022). Those with GAD face an increased risk of receiving postcards only, indicating poorer program adherence. A possible explanation could be that individuals with panic disorder are at higher risk of suicidal behavior due to the overwhelming nature of panic attacks, which can lead to feelings of hopelessness and a loss of control (Zhang et al., 2022). Additionally, the frequent comorbidity with depression could exacerbate suicidal ideation, particularly when left untreated (Diaconu and Turecki, 2007). In the case of GAD, poor treatment adherence could be linked to chronic worry, as it might foster doubts about the effectiveness of treatment. This could lead to avoidance of medical appointments or treatment-related activities, driven by anxiety about health outcomes or the medical process. In contrast, the existing scientific literature on treatment compliance

among patients with suicidal risk is sparse and appears to indicate that those suffering from depression were at the highest risk in previous studies (DiMatteo et al., 2000). However, the high prevalence of depression in our study may have reduced its predictive power, making it harder to distinguish its specific impact on program adherence or severity of suicidal crisis. Finally, our study did not reveal any association between the age and sex of the participants and being still in a suicidal crisis or unreachable by phone in the days following discharge. However, prior research has acknowledged the significant influence of these factors on suicide reattempt and treatment adherence (Christiansen et al., 2007; Rufino et al., 2021). To our knowledge, no study on BCI has examined whether interventions are more effective on suicide reattempt based on the age or sex of the subjects and further research seem necessary (Lizardi and Stanley, 2010; Tay and Li, 2022).

#### 4.1. Strengths and limitations

A key strength of our study is the comprehensive analysis using a large and exhaustive regional cohort comprising patients who have been discharged from the hospital after an SA. The broad inclusion criteria increase the ecological validity of the results and their potential generalizability. Furthermore, we are the first considering the age, sex, and psychiatric diagnosis of participants in the association between interventions received and suicide reattempt. However, our study has some limitations, as the assessment of suicide reattempt and psychiatric diagnosis relied solely on information obtained during the 6-month follow-up phone call, introducing a potential memory bias. Additionally, missing data were addressed through multiple imputation, a robust method, although it is important to acknowledge the inherent challenges associated with handling missing information. Finally, we do not have data regarding whether the patients initiated psychiatric follow-up after their SA. The management of patients who have attempted suicide should rely on rapid and structured follow-up, continuous risk assessment, and evidence-based therapeutic interventions, such as cognitive behavioral therapy (CBT). If some participants did receive such follow-up, it could have potentially influenced reattempt rates and affected the overall results. However, BCIs offer a valuable complementary approach. They maintain ongoing contact with individuals during the critical period following hospital discharge, especially when immediate access to psychotherapy is limited. BCIs help reduce social isolation and also facilitate the progressive engagement of patients who may be initially reluctant to participate in structured psychotherapies.

Our study has important clinical implications for the management of individuals at high risk of suicide reattempts following hospital discharge. The findings emphasize the critical role of PTSD and anxiety disorders in predicting both symptom severity of suicidal crisis and engagement in care. As such, systematic screening for these conditions should become a standard practice in suicide prevention strategies. Personalized follow-up interventions, such as enhanced mental health support and targeted therapy referrals, could help address the specific needs of patients with PTSD or anxiety, improving the overall effectiveness of prevention programs. One practical recommendation would be to provide immediate access to psychotherapy, such as cognitive behavioral therapy (CBT), which could help improve long-term outcomes and adherence to treatment.

From a research perspective, our results highlight the need to further explore the long-term efficacy of BCIs across psychiatric profiles. Specifically, future studies should investigate how different psychiatric diagnoses, such as PTSD or GAD and panic disorder, influence the success of BCIs in preventing suicide reattempts. Additionally, research should focus on the impact of CBT and outpatient follow-up in reducing suicide risk.

## 5. Conclusion

In conclusion, our study reveals that participants who received

interventions beyond a singular phone call faced higher risks of subsequent SAs. Therefore, it can be inferred that individuals who continued to endorse suicidality or who did not engage with the interventions prescribed by the Vigilans algorithm were at a higher risk of suicide reattempt. This means that the increasing re-contacting techniques planned in Vigilans (first a phone call, then a phone call and a postcard, etc.) indeed seems to re-contact patients in need but are currently insufficient to reduce the risk of reattempt. PTSD, panic disorder and GAD are associated with a greater likelihood of engaging in interventions delivered to individuals who are still experiencing a suicidal crisis in the days following hospital discharge or who are not adhering to the program. Therefore, it is crucial to screen for PTSD and anxiety disorders upon inclusion and provide targeted intervention for those diagnosed, aiming to enhance the effectiveness of the Vigilans program.

### CRedit authorship contribution statement

**Alice Demesmaeker:** Writing – original draft, Visualization, Methodology, Formal analysis, Conceptualization. **Ali Amad:** Writing – original draft, Methodology. **Wivine Blekic:** Writing – original draft. **Charles-Edouard Notredame:** Methodology, Conceptualization. **Thomas Seloisse:** Methodology, Data curation. **Vincent Jardon:** Methodology, Conceptualization. **Guillaume Vaiva:** Supervision, Methodology, Data curation, Conceptualization. **Fabien D'Hondt:** Writing – original draft, Validation, Supervision, Methodology, Conceptualization.

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### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jpsychores.2024.11.031>.

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