



Original Contribution

The effects of case management program completion on suicide risk among suicide attempters: A 5-year observational study



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ARTICLE INFO

Article history:

Received 13 November 2018
Received in revised form 15 December 2018
Accepted 18 December 2018

Keywords:

Case management
Patient compliance
Suicide

ABSTRACT

Background: A prior suicide attempt is known to be the most important risk factor for suicide. Case management programs provide psychosocial support and rehabilitation for suicide attempters. This study aimed to determine whether case management completion is associated with good clinical outcomes for suicide attempters visiting the emergency department (ED).

Methods: A cross-sectional observational study was conducted using risk assessment records for suicide attempters visiting the ED from October 2013 to December 2017. We created two groups according to completion of the case management program. The primary outcome was a decrease in suicide risk. The secondary and tertiary outcomes were untreated stressors and lack of a support system. We calculated the adjusted odds ratio (AOR) of the case management completion for study outcomes adjusting for potential confounders.

Results: Among 439 eligible suicide attempters, only 277 (63.1%) participants completed the case management program. Participants who completed the case management program were more likely to have decreased suicide risk (65.3% vs. 46.9%, AOR: 2.13 (1.42–3.20)) and less untreated stressors (49.8% vs. 61.1%, AOR: 0.64 (0.43–0.96)). However, there was no significant difference in lack of a support system (35.4% vs. 45.7%, AOR: 0.68 (0.45–1.03)).

Conclusion: Completion of a case management program was associated with reduction of suicide risk. Multicomponent strategies to increase compliance with a case management program are needed to prevent suicide reattempt and reduce the health burden of suicide.

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1. Introduction

Suicide is a major public health problem. Nearly 800,000 deaths by suicide occurred in 2015, making it the second leading cause of death by injury after road traffic injuries [1]. In the United States, the age-adjusted suicide rate increased 24%, from 10.5 to 13.0 per 100,000, between 1999 and 2014 [2]. An estimated 25.8 persons per 100,000 die each year from suicide in South Korea, which has maintained the top rank for suicidal rate since 2003 among the Organization for Economic Co-operation and Development (OECD) countries [3]. The importance of suicide prevention is clearly evident, as suicide completion was the leading cause of death, especially in the past 10–30 years [4].

A prior suicide attempt is well known as the single most important risk factor for suicide in the general population [5]. Repetitive suicide attempts increase the success rate of attempts and result in increasing the chance of completed suicide, above 5% within 9 years of a suicide attempt [6,7]. There are multiple contributing factors to suicide, and evidence-based interventions for suicide prevention have been proposed such as restricting access to lethal methods, school-based awareness programs, screening in primary care, public education and media guidelines, and gatekeeper training [8,9].

Case management for suicide prevention is known to be a kind of indicative intervention when targeting specific vulnerable individuals displaying early signs of suicidality or having had a suicide attempt [10]. It provides psychosocial treatments and rehabilitation programs that coordinate with community services so that suicide attempters can return to their daily lives [11]. Although the preventive effect of case management on suicide attempts has been reported to be controversial [12–14] recent studies reported its effectiveness for suicide prevention [15,16].

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Despite its beneficial effects, difficulties have still been noted in providing treatment to patients with poor compliance [17]. Suicide attempters with poor compliance are known to be vulnerable to psychosocial factors and several studies have reported that social support is a protective factor for suicide prevention [18,19]. In Korea, many suicide attempters refused to participate in or discontinued programs for psychosocial reasons, which would lead to an increase in the risk of suicide [20–22]. Recent studies have evaluated both the short- and long-term effects of case management on suicidal prevention in Korea [15,23] but what has not been fully evaluated is whether patients who discontinued the case management program had the same outcomes.

We hypothesized that patients who had completed the case management program would have better clinical outcomes compared with the incomplete group. The goal of this study was to examine the effects of case management program completion on suicidal risk, psychosocial parameters including untreated stressors, and lack of support systems among suicidal attempters visiting the emergency department (ED).

2. Materials and methods

2.1. Study design and setting

This research utilized cross-sectional observational methods to analyze data from initial and post evaluation records for suicide attempters visiting the ED. The research institute is a tertiary hospital designated as a regional emergency medical center that can provide critical care. Approximately 40,000 patients visit the ED annually and it has participated in this case management program since 2013.

The government in South Korea has provided a case management program to suicide attempters visiting the ED. It provides psychosocial services by linking the emergency medical center, mental health center, and community rehabilitation facilities. The program, which began in 25 emergency medical centers in 2013, is being expanded to 52 centers in 2018.

When suicide attempters visit the ED, medical doctors provide medical treatment for physical stabilization, and counseling is performed by psychiatrists. Case managers, consisting of social workers, nurses, and clinical counselors, conduct weekly face-to-face or telephone interviews with suicide attempters who have agreed to participate in the case management program. Suicide attempters are referred to community mental health centers after completing

a 4-week follow-up care service. The case managers who belong to each of the research institutes are under quality assurance by the Korea Suicide Prevention Center.

The doctors in the ED write risk assessment records for suicide attempters attending the case management program, and the case managers correct them based on the medical records. The case managers evaluate the participants' current suicide risk and categorize them into three grades for each follow-up service: high, medium, and low.

2.2. Study population

The study population included all suicide attempters visiting the ED of Chungbuk National University Hospital between October 2013 and December 2017. Among 1232 suicide attempters, 707 patients agreed to participate in the case management program. Patients who did not consent to the case management program were excluded including those who refused to participate and those who were nonresponsive due to poor medical condition. Excluding follow-up loss, data error, and missing values for related outcomes, a total of 439 patients were included in the final analysis (Fig. 1).

2.3. Main outcomes

The primary outcome was reduced suicide risk, which we defined as whether the last suicide risk recorded by case managers was improved compared with the first suicidal risk. If both the first and last suicide risk were assessed as low, they were categorized as the reduced risk group. In addition, in this group were patients who discontinued the case management after the first follow-up care and their suicide risk assessment indicated the risk for suicide was low. The secondary outcome was untreated stressors, and the tertiary outcome was lack of a support system. These parameters were measured by the case managers based on interviews with suicide attempters; we chose the last score.

2.4. Variables and measurements

The main exposure variable was case management completion. If patients, for any reason, did not complete the case management program for 4 weeks, they were regarded as the control group. All research institutes in South Korea use pre-made standardized risk assessment records and we collected information from the records

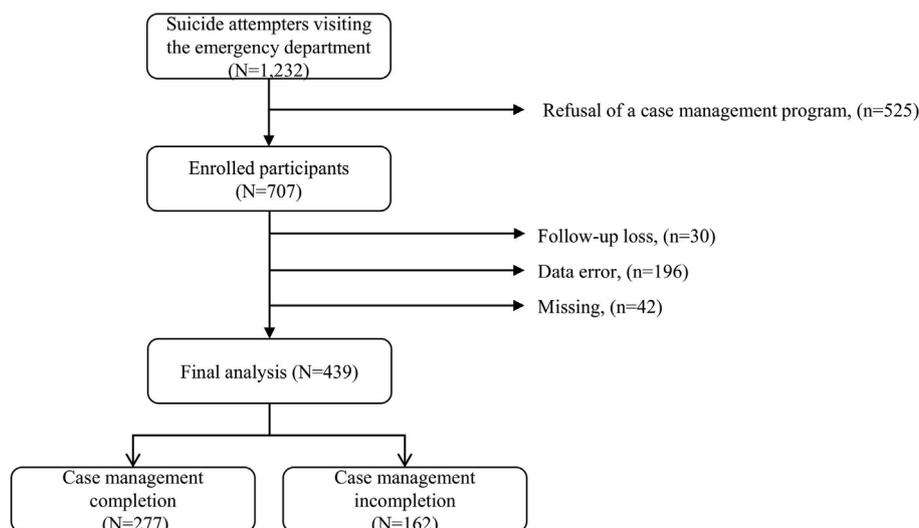


Fig. 1. Study population.

on demographic characteristics (e.g., age, gender, health insurance status, education level, marital status, religion, occupation), suicide-related factors (e.g., housemate, ED visit companion, alcohol consumption, recent physical status, current suicidal ideation and plan, suicide method, place, and motive, and past suicide attempt and method), and clinical characteristics (e.g., mental status, initial vital signs, referral to psychiatric department, and ED disposition). The case managers collected information from interviews on interview-related compliance and reliability, suicide and stress-related characteristics (e.g., current suicide ideation and plan, untreated stressor, lack of support system, and current psychiatric symptoms like depressive mood), and treatment compliance-related factors (e.g., current psychiatric care, medication status, and reason for discontinuation of treatment).

2.5. Statistical analysis

Continuous variables were expressed as the medians and interquartile ranges (IQR) and categorical variables were expressed as counts and proportions. The Pearson's chi-square test for categorical variables and the Wilcoxon rank sum test for continuous variables were used to compare characteristics between the two groups. The Cochran-Armitage test for trend was used to show the clinical effect of case management program on complete group. Adjusted odds ratio (AOR) with 95% confidence intervals (CIs) were calculated using multivariate logistic regression analysis to evaluate the association between program completion and study outcomes (improved suicide risk, unresolved stressful condition, lack of a support system). The model was adjusted for patient age, gender, housemate (presence or not), and any companion visiting the ED with the patient (family members, friends, or not). All statistical analyses were performed using SAS software, version 9.4 (SAS Institute Inc., Cary, NC, USA).

2.6. Ethics statement

This study was approved by the Institutional Review Board of Chungbuk National University Hospital (IRB No. 1803-023-926). Informed consent was submitted by all subjects when they were enrolled.

3. Results

The median age of patients included in the study was 42 years, and 244 participants (55.6%) were female. Out of 439 patients, 20% of participants discontinued follow-up care after the first appointment and only 277 (63.1%) completed the case management program. The proportion of participants aged 40–59 years in the incomplete group was higher than in the complete group (44.4% for incomplete group vs. 33.9% for complete group, $P=0.026$) (Table 1).

Table 2 shows the suicide-related characteristics. Among the suicide attempt method, poisoning was the most common ($n=280$, 63.8%), followed by respiratory threats ($n=69$, 15.7%), and stabbing and firearm ($n=67$, 15.3%). Suicide attempters were likely to be impulsive ($n=361$, 82.2%) and commit suicide in a house or residential group facility ($n=367$, 83.6%). The most common suicide motives were interpersonal problems ($n=203$, 46.2%), followed with mental disorder ($n=151$, 34.4%), and arguing ($n=92$, 21.0%). Patients who completed the case management program were more likely to have a housemate (78.3% vs. 72.2% in incomplete group, $P=0.049$) and visit the ED with their family members or relatives (74.4% vs. 63.6% in incomplete group, $P=0.016$). There were no statistically significant differences between the two groups regarding clinical characteristics such as

Table 1
Demographic findings of study population by case management completion.

	Total		Complete group		Incomplete group		P value
	N	%	N	%	N	%	
Total	439		277	63.1	162	36.9	
Number of follow-up service completion							
1	439	100.0					
2	351	80.0					
3	306	69.7					
4	277	63.1					
Gender							0.697
Male	195	44.4	125	45.1	70	43.2	
Female	244	55.6	152	54.9	92	56.8	
Age							0.026
-19	32	7.3	20	7.2	12	7.4	
20–29	106	24.1	64	23.1	42	25.9	
30–39	61	13.9	39	14.1	22	13.6	
40–49	93	21.2	51	18.4	42	25.9	
50–59	73	16.6	43	15.5	30	18.5	
60–69	28	6.4	24	8.7	4	2.5	
70–	46	10.5	36	13.0	10	6.2	
Median (interquartile range)	42 (26–55)		43 (27–56)		41 (25–51)		0.077
Health insurance							0.508
National health insurance	360	82.0	223	80.5	137	84.6	
Medical benefit	31	7.1	19	6.9	12	7.4	
Others	48	10.9	35	12.6	13	8.0	
Income (\$/month)							0.853
<1000	118	26.9	76	27.4	42	25.9	
1000–2000	77	17.5	51	18.4	26	16.0	
2000–3000	65	14.8	41	14.8	24	14.8	
Others	179	40.8	109	39.4	70	43.2	
Weekend	104	23.7	67	24.2	37	22.8	0.749
ER visit time							0.111
Night (18–09)	277	63.1	167	60.3	110	67.9	
Education level							0.895
Middle school or less	139	31.7	90	32.5	49	30.2	
High school	181	41.2	114	41.2	67	41.4	
College or more	81	18.5	51	18.4	30	18.5	
Others	38	8.7	22	7.9	16	9.9	
Marital status							0.236
Single	149	33.9	89	32.1	60	37.0	
Married	181	41.2	116	41.9	65	40.1	
Divorced	49	11.2	28	10.1	21	13.0	
Others	60	13.7	44	15.9	16	9.9	
Religion							0.090
Yes	147	33.5	103	37.2	44	27.2	
No	253	57.6	152	54.9	101	62.3	
Others	39	8.9	22	7.9	17	10.5	
Occupation							0.462
Unemployed	136	31.0	91	32.9	45	27.8	
Professionals and technicians	27	6.2	16	5.8	11	6.8	
Sales and service workers	59	13.4	34	12.3	25	15.4	
Skilled manual workers, primary industry workers	34	7.7	25	9.0	9	5.6	
Unskilled manual workers	24	5.5	11	4.0	13	8.0	
Students	43	9.8	28	10.1	15	9.3	
Housewives	63	14.4	40	14.4	23	14.2	
Others	53	12.1	32	11.6	21	13.0	

mental status, vital signs, referral to psychiatric department, and ED disposition (Table 3).

Table 4 shows follow-up care related information and main outcomes. More alcohol problem was reported in incomplete group ($P<0.001$). More than 90% of the participants were not using the mental health center and “Burdensome for counseling” (37.3%) was the most common reason not to. Approximately 30% of the

Table 2
Suicide-related characteristics by case management completion.

	Total		Complete group		Incomplete group		P value
	N	%	N	%	N	%	
Total	439		277	63.1	162	36.9	
Housemate ^a							0.049
Yes	334	76.1	217	78.3	117	72.2	
No	67	15.3	43	15.5	24	14.8	
Others	38	8.7	17	6.1	21	13.0	
Recent physical status							0.494
Healthy	295	67.2	183	66.1	112	69.1	
Acute disease	10	2.3	8	2.9	2	1.2	
Chronic disease without disability	54	12.3	31	11.2	23	14.2	
Chronic disease with disability	76	17.3	53	19.1	23	14.2	
Others	4	0.9	2	0.7	2	1.2	
Alcohol consumption							0.388
Yes	225	51.3	137	49.5	88	54.3	
No	208	47.4	135	48.7	73	45.1	
Others	6	1.4	5	1.8	1	0.6	
Current suicidal ideation							0.203
Yes	155	35.3	106	38.3	49	30.2	
No	115	26.2	67	24.2	48	29.6	
Others	169	38.5	104	37.5	65	40.1	
Companion visiting the ED together							0.016
Family members or relatives	309	70.4	206	74.4	103	63.6	
Friends, colleague, neighbors	59	13.4	34	12.3	25	15.4	
Alone	18	4.1	9	3.2	9	5.6	
Police officer or ambulance crew	44	10.0	24	8.7	20	12.3	
Social worker or volunteer worker	1	0.2	1	0.4	0	0.0	
Others	8	1.8	3	1.1	5	3.1	
Suicide attempt method							0.999
Poisoning	280	63.8	178	64.3	102	63.0	
Respiratory threats ^b	69	15.7	43	15.5	26	16.0	
Stabbing, firearm	67	15.3	42	15.2	25	15.4	
Death-leap	18	4.1	11	4.0	7	4.3	
Others	5	1.1	3	1.1	2	1.2	
Suicide place							0.821
House or residential facility of group	367	83.6	232	83.8	135	83.3	
School, educational facility, office	6	1.4	4	1.4	2	1.2	
Accommodation	6	1.4	3	1.1	3	1.9	
Vehicle	22	5.0	16	5.8	6	3.7	
Others	38	8.7	22	7.9	16	9.9	
Suicide plan							0.635
Planned	66	15.0	42	15.2	24	14.8	
Impulse	361	82.2	229	82.7	132	81.5	
Others	12	2.7	6	2.2	6	3.7	
Family history psychiatric illness							0.531
Yes	67	15.3	40	14.4	27	16.7	
Current psychiatric drug							0.900
Yes	140	31.9	89	32.1	51	31.5	

Table 2 (continued)

	Total		Complete group		Incomplete group		P value
	N	%	N	%	N	%	
Total	439		277	63.1	162	36.9	
Suicide motive							
Mental disorder	151	34.4	103	37.2	48	29.6	0.108
Interpersonal problem	203	46.2	127	45.8	76	46.9	0.829
School or work-related problem	27	6.2	18	6.5	9	5.6	0.692
Economic problem	71	16.2	39	14.1	32	19.8	0.119
Physical disease	50	11.4	37	13.4	13	8.0	0.090
Acquaintance's death or disease	15	3.4	11	4.0	4	2.5	0.403
Abuse	5	1.1	4	1.4	1	0.6	0.431
Legal problem	8	1.8	6	2.2	2	1.2	0.482
Loneliness	5	1.1	2	0.7	3	1.9	0.282
Arguing or fighting	92	21.0	63	22.7	29	17.9	0.229
Others	21	4.8	14	5.1	7	4.3	0.728
Suicidal history							0.844
Yes	260	59.2	163	58.8	97	59.9	
No	165	37.6	105	37.9	60	37.0	
Others	14	3.2	9	3.2	5	3.1	
Number of past suicide attempts							0.759
1	79	30.4	53	32.5	26	26.8	
2	41	15.8	27	16.6	14	14.4	
3	15	5.8	8	4.9	7	7.2	
4 or more	20	7.7	11	6.7	9	9.3	
Past suicide attempt method							0.705
Poisoning	91	35.0	59	36.2	32	33.0	
Stabbing	37	14.2	21	12.9	16	16.5	
Respiratory threats ^b	20	7.7	11	6.7	9	9.3	
Death-leap	9	3.5	7	4.3	2	2.1	

ED: emergency department.

^a Housemate includes spouse, children, parents, grandparents, friends, colleague.

Table 3
Clinical characteristics by case management completion.

	Total		Complete group		Incomplete group		P value
	N	%	N	%	N	%	
Total	439		277	63.1	162	36.9	
GCS							0.770
Alert	297	67.7	189	68.2	108	66.7	
Verbal response	66	15.0	38	13.7	28	17.3	
Painful stimulus	59	13.4	39	14.1	20	12.3	
Unresponsive	16	3.6	10	3.6	6	3.7	
Vital signs							0.881
SBP (Median (IQR))	122		122		123		
	(110–140)		(110–140)		(110–140)		
DBP (Median (IQR))	79		78		79		0.432
	(67–89)		(66–88)		(70–89)		
HR (Median (IQR))	90		90		90		0.723
	(78–103)		(78–104)		(79–101)		
RR (Median (IQR))	20		20		20		0.707
	(20–24)		(20–24)		(20–24)		
Referral to psychiatric department							0.942
Yes	407	92.7	257	92.8	150	92.6	
ED disposition							0.804
Discharge	263	59.9	164	59.2	99	61.1	
Transfer	22	5.0	13	4.7	9	5.6	
Admission	154	35.1	100	36.1	54	33.3	

GCS: Glasgow coma scale; SBP: systolic blood pressure; DBP: diastolic blood pressure; HR: heart rate; RR: respiratory rate; IQR: interquartile range; ED: emergency department.

Table 4
Follow-up care-related characteristics and main outcomes by case management completion.

	Total		Complete group		Incomplete group		P value
	N	%	N	%	N	%	
Total	439		277	63.1	162	36.9	
Interview compliance							0.139
High	200	45.6	135	48.7	65	40.1	
Moderate	201	45.8	122	44.0	79	48.8	
Low	38	8.7	20	7.2	18	11.1	
Current suicide ideation							0.444
Yes	126	28.7	81	29.2	45	27.8	
No	308	70.2	195	70.4	113	69.8	
Unknown	5	1.1	1	0.4	4	2.5	
Current suicide plan							0.268
Yes	14	3.2	8	2.9	6	3.7	
No	420	95.7	269	97.1	151	93.2	
Unknown	5	1.1	0	0.0	5	3.1	
Alcohol problem							<0.001
Yes	75	17.1	44	15.9	31	19.1	
No	356	81.1	232	83.8	124	76.5	
Unknown	8	1.8	1	0.4	7	4.3	
Depressive mood							0.005
Yes	319	72.7	213	76.9	106	65.4	
No	116	26.4	63	22.7	53	32.7	
Unknown	4	0.9	1	0.4	3	1.9	
Current psychiatric care							0.300
Yes	302	68.8	196	70.8	106	65.4	
No	135	30.8	80	28.9	55	34.0	
Unknown	2	0.5	1	0.4	1	0.6	
Reason for discontinuation of psychiatric care							0.724
No insight	25	18.5	11	13.8	14	25.5	
Ineffectiveness	21	15.6	15	18.8	6	10.9	
Economic problem	3	2.2	2	2.5	1	1.8	
Reluctance about psychiatric care	37	27.4	27	33.8	10	18.2	
Inconvenience using medical facilities	5	3.7	5	6.3	0	0.0	
Others	17	12.6	9	11.3	8	14.5	
Mental health center usage							0.509
Yes	26	5.9	17	6.1	9	5.6	
No	408	92.9	258	93.1	150	92.6	
Unknown	5	1.1	2	0.7	3	1.9	
Reason for not using mental health center							0.618
Concern about personal information leakage	3	0.7	1	0.4	2	1.3	
Denial of psychiatric problem	46	11.3	29	11.2	17	11.3	
Burdensome for counseling	152	37.3	91	35.3	61	40.7	
Distrust of counseling	43	10.5	26	10.1	17	11.3	
Others	16	3.9	12	4.7	4	2.7	
Reduced suicide risk							<0.001
Yes	257	58.5	181	65.3	76	46.9	
No	182	41.5	96	34.7	86	53.1	
Untreated stressors							0.022
Yes	237	54.0	138	49.8	99	61.1	
No	202	46.0	139	50.2	63	38.9	
Lack of a support system							0.033
Yes	172	39.2	98	35.4	74	45.7	
No	267	60.8	179	64.6	88	54.3	

participants were not receiving psychiatric care and the stated reason for not receiving it was different between the two groups: “Reluctance about psychiatric care” (33.8%) was the most common reason in the complete group and “No insight” (25.5%) was the most common in the incomplete group. Participants who completed the case management program showed reduced suicide risk ($P < 0.001$), fewer untreated stressors ($P = 0.022$), and more of a support system ($P = 0.033$) than those in the incomplete group.

In the case management completed group, all outcomes decreased significantly as the follow-up care progressed (from 14.8% to 6.5%) for the proportion of those with a higher suicide risk (P -for trend < 0.001), from 75.5% to 49.8% for untreated stressors (P -for trend < 0.001), and from 47.3% to 35.4% for lack of a support system (P -for trend 0.004) (Fig. 2). The main outcomes from the multivariate logistic analysis are shown in Table 5. Compared with the incomplete group, the complete group was more likely to have reduced suicide risk (AOR (95% CI): 2.11 (1.40–3.16)) and fewer untreated stressors (AOR (95% CI): 0.66 (0.44–0.997)). However, there was no statistically significant difference in lack of a support system (AOR (95% CI): 0.67 (0.44–1.02)).

4. Discussion

This study was conducted in one regional medical center and showed that the risk of suicide was reduced in the group who completed the case management program. Participants who did not complete were more likely to be aged 40–59 years with fewer housemates and relatives who visited the ED with them. In addition, depressive mood, untreated stressors, and the lack of a support system were more frequently encountered in the incomplete group. These results imply that the poor compliance group is vulnerable to the psychosocial contributing factors of suicide. A recent study demonstrated that psychosocial therapy reduced later suicide attempts and fatal outcomes after short-term follow-up [24]. Hyeonjae et al. [15] reported that participants aged 40–59 years were more likely to receive the case management program. However, in another study conducted in Korea and Taiwan, there was no difference in age distribution correlating to case management agreement [13,22]. Considering this was a community-based study, additional studies are needed to clarify the relationship between age and case management completion.

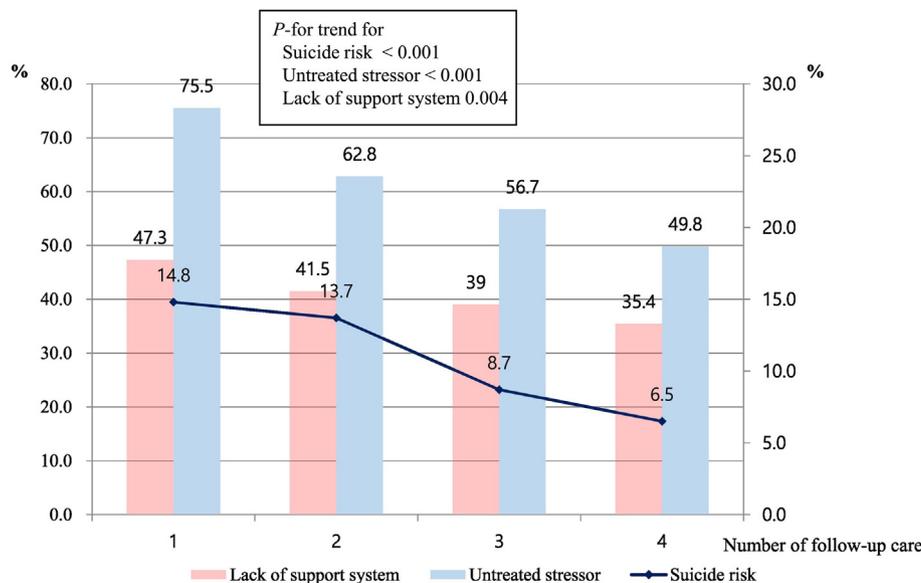


Fig. 2. The trends of outcomes in the case management completed group as progressing follow-up care.

Table 5

Association between case management completion and study outcomes.

	Total	Positive outcomes		Unadjusted	Adjusted ^a
	N	N	%	OR (95% CI)	OR (95% CI)
Primary outcome: Reduced suicide risk					
Total	439	257	58.5		
Complete group	277	181	65.3	2.13 (1.44–3.17)	2.11 (1.40–3.16)
Incomplete group	162	76	46.9	1.00	1.00
Secondary outcome: Untreated stressors					
Total	439	237	54.0		
Complete group	277	138	49.8	0.63 (0.43–0.94)	0.66 (0.44–0.997)
Incomplete group	162	99	61.1	1.00	1.00
Tertiary outcome: Lack of a support system					
Total	439	172	39.2		
Complete group	277	98	35.4	0.65 (0.44–0.97)	0.67 (0.44–1.02)
Incomplete group	162	74	45.7	1.00	1.00

OR: odds ratio; CI: confidence interval.

^a Adjusted for age, gender, housemate, and companion visiting the emergency department with the patient.

Adherence to medical care is poor for patients with psychological problems [25]. Suicide attempters with poor compliance with treatment may have repeated suicide episodes, leading to poor outcomes after all [26,27]. According to the results of this study, 20% of participants discontinued the case management program after the first follow-up care appointment and only 63.1% completed the entire course. Some studies have analyzed factors affecting poor registration rate in case management programs [21,22]. This research illustrates the importance of continuous monitoring and follow-up care for suicide attempters after leaving the ED. Although the poor compliance group might have less co-morbid illness and less severity of suicide, appropriate intervention strategies are needed for them considering that suicide attempt is the most important risk factor for suicide.

Several studies reported that more sophisticated treatments such as cognitive behavior therapy were beneficial and the clinical effect of case management was still controversial for suicide prevention [12–14]. However, recent studies reported that case management reduced the risk of suicide reattempt. According to the result of a 2017 ED-based suicide attempters case management project in Korea, the proportion of those with a higher suicide risk decreased from 15.6% to 6.3% after completing the course [28].

Furthermore, one multicenter, randomized controlled trial conducted in Japan reported that assertive case management reduced the number of self-harm episodes by 12% during the study period [16]. Other research conducted in Korea indicated that case management may have a short-term effect on risk of suicide reattempt in the first 24 weeks [15]. Unlike the present study, the control group included those who refused case management alongside those who did not complete it. The difference in outcomes might be more evident because the control group included the refusal group. In our study, we evaluated the efficacy of case management for suicide attempters who agreed to case management, and this change could emphasize the importance of compliance with case management.

However, in this study, suicide attempters who refused the case management tend to have poor insight and treatment compliance for suicide and many of them are not adequately treated after all [20]. Therefore, case management should focus on improving adherence to treatment and also developing patients' vulnerable social support systems. The case management program, which is implemented in Korea, is expected to be more effective because it includes continuous counseling and economic and psychosocial support by linking the patients to local communities.

This study has several limitations. First, it is a retrospective observational study and might have potential confounders which influenced the exposures and outcomes. Second, it was conducted in a local university hospital, which might present a difficulty for generalization of the results. Third, all information including main outcomes was collected through interviews with suicide attempters. This method might be subject to estimation, which can result in another bias. Finally, there were quite a few data errors and missing values during the study period. The initial and post evaluation records were written by emergency medical doctors and case managers respectively and there might be discrepancies between the two data sets. We need more strict quality assurance to solve the problem.

5. Conclusion

Completion of the case management program can reduce the risk of suicide and relieve untreated stressors. Multidisciplinary strategies are needed to increase compliance with case management and continue to provide psychosocial support for suicide attempters. These efforts could reduce the risk of suicide and its public health burden in our communities.

Disclosure

The authors have no potential conflicts of interest to disclose.

Funding acknowledgement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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