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Title page

A retrospective study of investigations after suicide in Swedish healthcare

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ABSTRACT

Background

Many suicide deaths occur among individuals who have ongoing contact with healthcare services. Despite more than a decade of intensive efforts to increase the safety of suicidal patients through healthcare in Sweden, the suicide rate has remained relatively unchanged.

Methods

Reports to the regulatory authority in Sweden after investigations of the healthcare provided to individuals who died by suicide in 2015 were examined (n=436). Reported deficiencies in healthcare, immediately performed actions, and non-immediate actions were categorized via a coding scheme and at organizational micro-meso-macro levels. The supervisory authority decisions were coded as "immediate approval," "request for addition," or "inspection."

Results

In 55% (n=240) of cases, healthcare providers reported healthcare deficiencies that contributed to suicide; these deficiencies were primarily in "suicide risk assessment" and "treatment." Actions aimed at preventing new suicides were proposed in 80% of cases (n=347). By far, the most frequent actions were "education and competence," present in 52% of cases (n=227) and did not much correspond with identified deficiencies. Sixty-five percent of the deficiencies and actions were at micro level, while the remainders were at meso level. In 65% (n=284) of cases, the supervisory authority approved the investigation without further requirements.

Conclusions

The most common identified deficiencies were related to care in the immediate interface between patient and staff. Actions proposed to prevent new suicides were centered on single educational interventions without distinctive sustainable effects in the organizations and usually did not correspond with the identified deficiencies. Future research should examine if application of a framework based on knowledge of the suicide process, suicide prevention strategies, and patient safety would enable more sophisticated investigations that could facilitate progress on suicide prevention.

Article summary

Strengths and limitations of this study

- This is the first national aggregated analysis of the outcomes of investigations following suicides in Sweden.
- The categorization of deficiencies and actions for improvements was done by a single person to improve consistency.
- The majority of the suicides in Sweden were not reported to the supervisory authority, probably because not receiving healthcare close in time before death, and these suicides are therefore not included in this study.

- All data were based on the healthcare providers' reports of suicide to the supervisory authority, reports performed in different contexts by different persons with a large spectrum of disparities in experiences resulting in variegated quality

BACKGROUND

Close to 800 000 people die by suicide worldwide every year.[1] Studies show that approximately nine out of ten individuals who die by suicide have a psychiatric disorder at the time of death, and a large proportion of suicide deaths occur among individuals receiving ongoing psychiatric care or who have contact with other healthcare providers.[2-5] There is some evidence that suicide prevention strategies diminish suicide rates[6 7]; however, despite intensified efforts to improve the healthcare safety for suicidal patients, the suicide rate has remained essentially the same in Sweden, at approximately 1200 deaths every year.[8] In recent decades, awareness and knowledge of patient safety has increased. Many countries have established an incident reporting system, meaning that serious adverse events are to be investigated and reported to a supervisory authority. To better understand if failures in the healthcare system have contributed to suicide, all suicides that occurred while a victim was receiving healthcare or within four weeks after healthcare contact were required to be reported to the supervisory authority for healthcare in Sweden in 2006-2017. A review conducted one year after this obligation was implemented showed that the supervisory authority criticized healthcare providers for healthcare deficiencies in 53% of cases, with the most frequent deficiencies being in routines and risk assessments.[9] Since that report, no further national aggregated analysis of the outcomes of the investigations following suicides has been done.

Investigations based on root cause analysis (RCA) have become wide-spread tools in healthcare services efforts to understand and prevent adverse events.[10 11] The principle of RCA is to identify and rectify underlying system vulnerabilities that allow human errors to cause harm to patients.[12] This approach assumes that adverse outcomes can be explained by linear cause-effect chains and have causes that can be found and fixed, and that the actions preceding adverse events differ from those that precede ordinary, successful care.[13] The actual value of incident reporting systems and the RCA approach in healthcare is subject to debate.[14-18] Single analyses usually provide little learning beyond the involved staff and unit. Rather, aggregation of data from multiple analyses should generate more meaningful action plans for improvement and better facilitate the learning processes in organizations.

Swedish law states that when an adverse event has resulted or could have resulted in severe patient harm, this should be reported to the supervisory authority, the Health and Social Care Inspectorate (HaSCI). The role of HaSCI is to "…ensure that reported adverse events have been investigated to a necessary extent, and that appropriate actions have been taken by the healthcare provider to reach a high level of patient safety".[19] The report to the authority is to be preceded by an investigation of the healthcare services provided to the patient before the adverse event, conducted by the healthcare provider. The head of the departments are formally responsible for the investigation and investigators can be any type of healthcare professional. The investigations aim to identify the causes and contributory causes of the incident and to identify improvements that should prevent the same incident from happening again. A distinction is made in investigations between actions performed immediately after an incident and non-immediate actions proposed or taken some time afterwards. The authority then examines the investigation and decides if the healthcare provider has fulfilled their legislated role of investigating the incident and taking actions to ensure patient safety. If there are shortcomings in the investigation, the HaSCI calls for additions or conducts a site visit to inspect the healthcare provider.

The overall aim of this study was to aggregate the conclusions of all investigations conducted after suicides reported to the supervisory authority in Sweden in 2015, and to identify deficiencies in healthcare found in these investigations; the actions proposed to deal with the deficiencies; the level of

the organizational hierarchy (micro-meso-macro) in which the deficiencies and actions were situated; and outcomes of the supervisory authority's decisions.

METHODS

Cases

All suicide cases reported to the HaSCI in 2015 were included. Complete incident investigations from healthcare providers with associated patient records and decisions of the supervisory authority were obtained from the supervisory authority. Every individual suicide was given a code number and the patient's demographic data and contact with all areas of healthcare in the three months before death were registered.

Categorization of data

A coding scheme was used to categorize the causes and contributory causes of the suicide, as well as the immediately performed actions and non-immediate actions reported in the investigations. The coding scheme was based on the general categories of the most widespread method of investigating adverse events in Swedish healthcare, which is based on RCA.[20] The categories were as follows: Education and competence, Communication and information, Organization and management, Technics and equipment, and Policies and procedures. To make the categorization more specific, four of the major categories were divided into additional subcategories. Every category was described and exemplified and a category of "others" was added in case none of the other categories was considered appropriate (*Table 1*). Since the providers rarely made a distinction between causes and contributory causes in the investigations, these are reported as *deficiencies* in this paper. In this study, an action (immediate or non-immediate) was defined as an intervention that aimed to prevent new suicides. Therefore, actions taken to prevent reported suicides (telephone calls, resuscitations) or actions aimed at informing family or staff that a suicide has occurred were not registered as actions in this study. Separate notes were made when a deficiency or action was related to routines and if patient-related factors were reported. In cases where different providers reported the same suicide case, the outcomes of the investigations were grouped. Identical deficiencies or actions reported by different providers regarding the same patient were excluded, thus ensuring that every factor was counted only once. All data collection and categorization was conducted by only one researcher, an experienced psychiatrist, to achieve consistency.

Table 1. Coding scheme for categories with examples of deficiencies and actions

Category and definition	Examples of deficiencies	Examples of actions
Communication and information **Communication with peers and family**		
Deficiencies and actions related to cooperation, communication, information, and interaction between the healthcare provider and the families and peers of patients	Shortcomings in provision of adequate information about healthcare from provider to family/peers Absence of or inadequacies in the providers' contact with family/peers at time of discharge from hospital	New routines for involving family/peers in healthcare New written information about psychiatric disorders and treatment "Courses" or lectures for family/peers about psychiatric disorders and treatment
Documentation		

Deficiencies and actions related to administration and documentation	Non-adherence to local documentation policies Inadequate, missing, wrong, or delayed documentation in patient records	Patient record reviews for quality improvement New guidelines or routines for the documentation process
External communication		
Deficiencies and actions related to cooperation, communication, and collaboration with actors outside the unit/clinic of the healthcare provider	Absence of or inadequacies in information provided at discharge from hospital to other care providers involved in the patient's care	New meeting points for cooperation between different healthcare providers, consultation meetings
Internal communication		
Deficiencies and actions related to cooperation, communication, and interaction between staff within the unit, and between staff and patient	Lack of sharing of important information regarding care between staff, or between staff and patient	New routines for intern communication/reports, written or oral
Education and competence **Education and competence, not specified**		
Deficiencies and actions related to education and competence, excluding those related to suicide risk assessments	Inadequacies in competence or experience of staff Inadequate supervision or introduction of staff	Case report discussions at staff meetings, lectures Reminding staff of existing guidelines
Education and competence in suicide risk assessment		
Deficiencies and actions related to education and competence in suicide risk assessment	Inadequate knowledge or experience of staff to conduct a sufficient suicide risk assessment	Lectures and training in suicide risk assessment Reminding staff about existing policies and guidelines of suicide risk assessment
Technics and equipment		
Deficiencies and actions regarding technics and equipment	Ligature points (hooks, doors) in hospital Shortcomings in information technology systems	Removal of ligature points (hooks, doors) in hospital Changes in information technology systems
Organization and management **Human resources**		
Deficiencies and actions involving staffing, care availability, and psychological working environment	Lack of staff Lack of staff continuity Temporary (rented) doctors Heavy workload	Recruiting new staff Changes in working schedule Changes in job assignments and work distribution between staff
Number of beds in hospital		
Deficiencies and actions related to available beds in hospital	Patient not admitted to inpatient care or discharged because no beds were available	Efforts to expand the number of beds in hospital
Organization/management		
Deficiencies and actions related to leadership, organizational structure of healthcare, and physical working environment	Organizational structures impairing healthcare Shortcomings in leaders' execution of responsibility	Organizational reconstructions Rebuilding of premises

	Inadequate premises	
Policies and procedures **Care plan and crisis plan**		
Deficiencies and actions related to care plan or crisis plan	Inadequate or lack of care plan/ crisis plan	New routines for making care plan /crisis plan or follow up
Diagnosis		
Deficiencies and actions related to the diagnostic process	Delayed, missed, wrong, or inadequate diagnosis	New guidelines or routines for the diagnostic process
Suicide risk assessment		
Deficiencies and actions related to the process of suicide risk assessment	Non-adherence to local policy or guidelines for suicide risk assessment Inadequate risk assessment	New guidelines or routines for suicide risk assessments
Treatment		
Deficiencies and actions related to treatment of the patient	Complications or side-effects of medication/treatment Delayed, inadequate, or wrong medication/treatment Doctors' prescribing	New guidelines, recommendations, or routines for treatment strategies for specific disorders New recommendations for prescription of psychotropic drugs
Work process		
Deficiencies and actions related to the daily working process of staff and the process of reporting and taking care of adverse events	Non-adherence to local policies, routines, or checklists regarding working process of staff Inadequacies in supervision of patients in hospital	New guidelines or routines regarding working process for staff New routines in the process of reporting and taking care of adverse events
Others		
Deficiencies and actions not specified elsewhere		

Organizational levels

A classification of the organizational levels of deficiencies and actions was conducted to better understand where in the organizational system the identified deficiencies and actions were situated. The deficiencies and actions were coded according to a micro-meso-macro-perspective.[21] Microsystems were defined as the basic building blocks of all healthcare systems formed around the patient and family, such as the inpatient or outpatient care unit. The mesosystem encompassed interactions between different microsystem units, such as cooperation between clinics or healthcare providers. The macrosystem involved the whole system of healthcare, such as legislation, political prioritizations, and national policies on healthcare. The highest organizational level for each deficiency, immediate action, and non-immediate action for each case was coded.

Supervisory authority

The decisions of the supervisory authority were coded as follows: "immediate approval," "request for one or more additions," or "inspection."

Statistical analyses

Summary statistics were calculated for deficiencies, immediate actions, non-immediate actions, and decisions of the supervisory authority. Frequencies for each category and organizational hierarchal level in deficiencies, immediate actions, and non-immediate actions were analyzed per individual and aggregated.

Chi-square tests of independence were used to compare the number of deficiencies and non-immediate actions in the same category. We considered a two-sided p-value of <.005 to be statistically significant. Fisher's exact test was used in cases where 20% of the analyzed groups had an expected count of less than 5. The statistical analyses were performed using IBM SPSS Statistics 24.

Ethical review

According to the Swedish *Act Concerning the Ethical Review of Research Involving Humans* (2003:460) and an advisory opinion from the Regional Ethical Review Board (no. 2017/234), this study did not require ethical review as it did not include human participants.

RESULTS

Cases

In total, 1179 suicides were registered in Sweden in 2015.[8] The supervisory authority received 473 reports. In 35 cases, the same suicide was reported by different healthcare providers, regarding different parts and perspectives of the care process, and for one case, the same suicide was reported by three providers, resulting in 436 unique suicide cases. Characteristics of the cases and healthcare received in the last three months before suicide are presented in *Table 2*.

Table 2. Characteristics of cases and care received during the last three months before suicide (including all areas of healthcare)

Characteristic		n (%)
Gender	Men	283 (65)
	Women	152 (35)
Age, years	Median 49, range 13-93	
Healthcare provider last in contact with the patient	Psychiatric care	290 (67)
	Primary care	94 (22)
	Somatic care	33 (8)
	Other	18 (4)
Time until death after last contact with healthcare system, days	Median 4, range 0-88	
Number of contacts with outpatient healthcare services during the last three months	1	38 (9)
	2-4	105 (24)
	>5	216 (50)
Inpatient care	During the last three months	146 (33)
	Inpatient at time of death	36 (8)
Major psychiatric diagnosis documented in patient record	Total (F00-F98)	370 (85)
	Affective disorder (F30)	153 (35)
	Anxiety disorder (F40)	77 (18)
	Substance abuse (F10)	51 (12)
	Psychosis (F20)	36 (8)
	Attention deficit disorder (F90)	20 (5)
	Personality disorder (F60)	13 (3)
	Autism spectrum (F84)	13 (3)
	Other	7 (2)

Prescribed psychotropic drugs at time of death	Total	349 (80)
	Sleeping pills	274 (63)
	Antidepressants	265 (61)
	Anxiolytics	216 (50)
	Antipsychotics, oral	97 (22)
	Mood stabilizers	47 (11)
	Antipsychotics, injection	18 (4)
Suicide risk assessment documented in patient record in the three months before death	Absent	108 (25)
	Low/nonexistent	171 (39)
	Elevated, not acute	116 (27)
	High/acute	41 (9)

Deficiencies in healthcare before suicide

In 55% (n=240) of suicide cases, the healthcare provider identified deficiencies in the healthcare that were considered to have contributed to the suicide. Among all cases, a total of 952 deficiencies were identified. The number of deficiencies per case ranged from 1 to 21, with a median of 3.

The most frequent deficiencies were in "treatment" and "suicide risk assessment". Examples were inadequate or delayed pharmacological treatment, non-adherence to existing guidelines, inadequacies in doctors' prescribing, a misleading suicide risk assessment, and non-adherence to local guidelines for suicide risk assessment. Deficiencies in "external communication" were the third most frequent. Examples were shortcomings in communication between a somatic and psychiatric clinic and a lack of important information being handed over from one healthcare provider to another. For further details, see *Tables 3* and *4*. In 7 cases, identical deficiencies for the same case were reported by different providers, categorized as "external communication", "treatment", "suicide risk assessment" and "care plan."

Table 3. Proportions of cases with deficiencies, immediate actions, and non-immediate actions reported in the investigations of healthcare made after suicide.

Category	Cases with deficiencies n (%)	Cases with immediate actions n (%)	Cases with non-immediate actions n (%)
All cases	240 (55)	26 (6)	347 (80)
Communication and information			
Communication with peers and family	51 (12)	2 (0.5)	51 (12)
Documentation	65 (15)	1 (0.2)	71 (16)
External communication	74 (17)	2 (0.5)	80 (18)
Internal communication	61 (14)	0 (0)	55 (13)
Education and competence			
Education and competence not specified	54 (11)	1 (0.2)	166 (38)[a]
Education and competence in suicide risk assessment	9 (2)	6 (1)	136 (31)[a]
Organization and management			
Human resources	60 (14)	6 (1)	67 (15)
Number of beds	9 (2)	0 (0)	4 (1)
Organization/management	13 (3)	2 (0.5)	22 (5)[b]
Policies and procedures			

Treatment	84 (19)	2 (0.5)	57 (13)[c]
Suicide risk assessment	86 (20)	6 (1)	94 (22)
Work process	50 (11)	6 (1)	119 (27)[a]
Diagnostics	54 (12)	2 (0.5)	28 (6)[c]
Care plan and crisis plan	46 (11)	0 (0)	46 (11)
Technics and equipment	13 (3)	6 (1)	22 (5)[b]
Other	11 (3)	1 (0.2)	8 (2)

[a] significantly more cases with reported non-immediate actions compared with deficiencies, p<0.0001

[b] significantly more cases with reported non-immediate actions compared with deficiencies, p<0.002

[c] significantly more cases with reported deficiencies compared with non-immediate actions, p<0.0001

Table 4. Total number of deficiencies, immediate actions, and non-immediate actions reported in the investigations of healthcare made after suicide.

Category	Total number of deficiencies, n	Total number of immediate actions, n	Total number of non-immediate actions, n
Total number reported in all investigations	952	45	1330
Communication and information			
Communication with peers and family	61	2	56
Documentation	87	1	84
External communication	103	2	109
Internal communication	77	0	59
Education and competence			
Education and competence not specified	73	1	261
Education and competence in suicide risk assessment	9	6	168
Organization and management			
Human resources	81	7	86
Number of beds	10	0	4
Organization/management	14	3	27
Policies and procedures			
Treatment	115	2	72
Suicide risk assessment	101	6	112
Work process	74	6	161
Diagnostics	70	2	33
Care plan and crisis plan	50	0	57
Technics and equipment			
Technics and equipment	16	6	33
Other			
Other	11	1	8

Note: Each case can be represented by several factors in the same category. Total numbers of reported factors in the investigations (n) are given in the table.

All reported deficiencies were at the micro level in 65% (n=157) of cases (*Table 5*). An example of a deficiency at the micro level was inadequacies in doctors' prescribing or in suicide risk assessment. The remaining 35% (n=83) had at least one deficiency at the meso level, such as shortcomings in cooperation between a psychiatric clinic and somatic clinic or inadequacies in communication between hospital and municipality. No deficiencies were considered to be at the macro level.

Table 5. Distribution of the highest organizational hierarchy level of deficiencies, immediate actions, and non-immediate actions in the cases.

Organizational level	Deficiencies	Immediate actions	Non-immediate actions
Micro	157 (65)	25 (96)	225 (65)
Meso	83 (35)	1 (4)	120 (35)
Macro	0 (0)	0 (0)	1 (0)

Note: Only the highest level in every case is noted. Number and percentage of cases at each level are given in the table, n (%).

Routines

Deficiencies in routines were reported in 20% (n=96) of all cases. These often reflected non-adherence to existing routines. Missing or defective routines were reported in 11% (n=49) of cases. Deficiencies in routines could occur in any category.

Patient-related factors

In 31% (n=135) of cases, patient-related factors were reported to have contributed to the suicide. Examples were changes in the patient's private relationships or life conditions, or circumstances the provider considered to be outside the influence of healthcare.

Immediately performed actions

Immediately performed actions were reported in 6% (n=26) of cases. In these, 45 immediate actions were described. The number of immediate actions per case ranged from 1 to 7, with a median of 1. The most frequent immediate actions taken were categorized as "human resources," usually recruitment of physicians (*Tables 3* and *4)*. In one case, there was an action at the meso level; the remainders were all at the micro level (*Table 5)*.

Non-immediate actions

Non-immediate actions aiming to prevent new suicides were taken or proposed in 80% (n=347) of all cases. In these, a total of 1330 interventions were described. The number of actions per case ranged from 1 to 20, with a median of 3.

The most frequent non-immediate actions were in the category of "education and competence not specified." Examples were case report discussions at staff meetings, lectures about affective disorders, and reminding staff about existing local guidelines. The second most frequently reported non-immediate action category was "education and competence in suicide risk assessment." Examples were lectures for staff about suicide risk assessment and reminding staff about existing guidelines for suicide risk assessment. Together, non-immediate actions in either of these two categories were described in 52% (n=227) of all cases, corresponding to 32% of all reported non-immediate actions.

The third most frequent non-immediate action category was changes in "work process." Examples were new checklists and changes in the intern system of reporting adverse events. For further details, see *Tables 3* and *4*. Identical actions regarding the same case were reported by different providers in 12 cases and were in the categories of "external communication," "education and competence not specified," "suicide risk assessment," "care plan," "work process" and "education and competence in suicide risk assessment."

The organizational levels of the non-immediate actions were equal to those of the deficiencies; in 65% (n=225) of the cases, all actions were at the micro level and in 35% (n=120) there was at least one action at the meso level (*Table 5*). Examples of actions at the micro level were case discussions at staff meetings, lectures, and new checklists. Examples of actions at the meso level were changed procedures for communication or cooperation between different healthcare providers. Only one proposal was at the macro level, and this involved the possibility of the prescribing doctor checking what medications a patient received from pharmacies throughout the country.

Routines

Changes in routines were proposed in 35% (n=152) of all cases, and these actions could be in any category.

Decisions of the supervisory authority

In 65% (n=284) of cases, the supervisory authority approved the report from the healthcare provider without further requirements. In 29% (n=126), the supervisory authority called for one or more additions to the investigation before approval. In 6% (n=25), an inspection took place at the healthcare provider before the decision, and in these cases the supervisory authority usually called for additional actions before their decision. Of the 36 cases with more than one investigation, the decisions of the authority differed in 16 cases.

DISCUSSION

This study describes the aggregate results of healthcare provider investigations made after suicides in Sweden in 2015. In more than half of the studied cases, there were deficiencies in the healthcare provided before suicide that were considered to have contributed to the death. The majority of the deficiencies were at the micro organizational level, and no deficiency was found at the macro level. The most common deficiencies involved care delivered in the immediate interface between patient and staff, which were relatively easy for the investigators to identify. Actions to deal with the deficiencies were substantially more frequent than the number of described deficiencies and were dominated by educational actions. The majority of the actions were at the micro level, and only one proposed action was at the macro level.

The most frequently reported deficiencies were related to "treatment." Four out of five patients in this study were prescribed psychotropic drugs, most commonly sleeping pills and antidepressants. Pharmacological treatment of psychiatric disorders is regarded as a central and evidence-based component of the prevention of suicide.[7 22] To deliver the right treatment for the patient, correct diagnoses are essential: diagnostic errors are known to be common causes of adverse events in all areas of healthcare.[23 24] A majority of the patients in this study had at least one documented psychiatric diagnosis, although less than half had a diagnosis of depression. The deficiencies in "diagnosis" category were lower than would be expected, given the known outcome of suicide, the fact that all cases had contact with healthcare shortly before death, and the fact that a vast majority of suicide

deaths involve individuals who meet the diagnostic criteria for depression at time of death.[5] Many investigations were performed without the participation of a physician, which could help explain the low number of reported diagnostic errors.

Admission to inpatient care is a common choice of treatment for those at risk of suicide. One third of the patients in this study were admitted to the hospital in the three months before their death; however, only 8% of the suicide deaths involved inpatients, which is notably lower than the 24% found in a review of suicides in Sweden in 2007.[9] This decrease could be a result of safer inpatient care; however, it could also reflect a shift of suicides from inpatient care to the post-discharge period, mirroring the reduction in the number of beds in psychiatric care during the last few decades.[25] However, investigators in the present study did not reach this conclusion, as the number of hospital beds was reported as contributing to suicides in only 2% of cases. At the same time, it is not clear if this low frequency resulted because investigators considered this to be an issue outside their mandate.

Deficiencies in "suicide risk assessment" were frequently reported, as exemplified by inadequate performance of risk assessment or insufficient supervision of patients assessed to be at high risk for suicide at psychiatric inpatient units. All cases in this study were in contact with healthcare services during the three months before their suicide, and 90% were in contact more than once. Documentation of suicide risk in patients' records during the last three months before suicide was absent in 25% of cases and regarded as low/nonexistent in 39%. Suicide is usually the final outcome of a process over time and involves the interaction of several factors. As suicide intentions also fluctuate rapidly, assessments must be repeated to catch suicidal crises. [6] The small number of cases in this study where suicide risk was assessed as high might reflect difficulties in assessments. However, it could also indicate success of healthcare in cases when suicide risk was assessed as high and then followed by preventive actions. Further research is needed to confirm this hypothesis.

Substantially more actions to prevent new suicides were reported compared to the number of identified deficiencies, possibly reflecting insights into the weaknesses of the healthcare system that confer risk to patient safety. The proposed actions centered on educational interventions: these actions were proposed for half of cases and corresponded to one third of all reported actions. In comparison, deficiencies in "education and competence" were reported in only 10% of cases, indicated that providers aimed to solve deficiencies in different categories with educational actions. Most of the proposed educational actions represented a single case discussion or reminder of a routine in staff meetings, suggesting that the deficiencies were being simplified and quick fixes were being applied. Evidence that educational interventions reduce suicide rates relies on studies of extensive education programs.[26-30] In order to reach successful implementation and sustainable behavior change, considerable work - including long-term multi-faceted interventions - is usually needed. Macrae emphasizes the importance of active reflection, mindful participation, and emotional engagement.[31 32] If this kind of reflection is not part of how healthcare providers promote learning, the large amount of single educational actions can create a false sense of security without making the organization safer. Strong leadership with visible engagement in patient safety at all levels is of high importance in shaping and maintaining safe structures in organizations.[32-36] Very few deficiencies regarding management were reported in this study, probably reflecting the investigators' lack of understanding of this issue rather than an absence of management shortcomings.

Even though missing or defective routines seldom were reported as contributing to suicides, new or changed routines were proposed to prevent new suicides in one third of the investigations, often in the category of "work process." This focus on routines in patient harm investigations has been shown before.[9 35 37] Well-functioning work processes and adherence to routines are indisputably of high

importance for ensuring safe healthcare. However, the large number of changes without corresponding shortcomings shown in this study might result in insecurity, rather than safety, among staff. This suggests that providers oversimplify the challenges of patient safety at the frontlines of healthcare.

Immediate action was taken in only a few cases, which probably reflects the absence of obvious deficiencies possible to be fixed. Compared to non-immediate actions, a larger share of immediate actions concerned "technics and equipment," usually the removal of ligature points such as hooks and doors.

A majority of identified deficiencies and actions were at the organizational micro level – they were usually within the care unit where the patient had their last contact with healthcare services. These findings were similar to those of a prior Swedish study.[18] The results probably reflect the investigators' knowledge and understanding of suicide and what they consider can be fixed more than the actual circumstances. The real purpose of investigations of healthcare after adverse events should be to reveal gaps and inadequacies in the healthcare system and to find effective and meaningful actions leading to sustainable improvement of healthcare.[38] To succeed in this, we need to develop methods appropriate to current healthcare services and to improve the ability of healthcare organizations to learn from and recall incidents and investigation outcomes.[10 31 32] Past studies have shown that the results and conclusions of investigations are rarely passed down to the organization and that there is an absence of formalized organizational memory, even though many patient safety activities that arise from the investigations after incidents are based on such memory-making activities.[18 39]

Vincent suggests the use of a "safety analysis of the patient journey" to identify the series of events and combinations of errors and system vulnerabilities that in combination and gradually unfold over time.[32] Analyses over a longer period of time would enable identification of successful recovery from suicidal crises, which is necessary knowledge to progress in work on suicide prevention. This approach also requires investigators to view care through the eyes of patients, understand the patient's journey in the care system, and to grasp the reality of the complex healthcare system the patient and next of kin have to navigate. Attention to interactions between different levels of the organization is also needed. What happens at the micro level, such as in personal meetings with patients, reflects decisions and management at the top of the healthcare organization; as well what happens at the micro level influences top-level decisions.[40] These reflections on time, patient perspectives, and organizations were generally nonexistent in the investigations in this study but appear necessary to achieve progress in the care of suicidal patients.

This study illustrate how suicide as a possible patient harm is investigated in a nation where a RCA-inspired method is the recommended method, and what kind of learning and change in the health care systems that are possible with that approach. The result implies that sharper methods of investigation are needed to achieve progress in patient safety.

Limitations and strengths

All data were based on the healthcare providers' reports of suicide to the supervisory authority. The contents in these reports are regulated by law; however, there still may have been shortcomings and inadequacies not pointed out and that the authority did not observe. The investigations were performed in different contexts by different persons with a large spectrum of disparities in experiences resulting in variegated quality. The investigations were performed after suicides, which often upset and strongly

affect involved staff, and an awareness of external supervision might have biased the outcomes. Furthermore, there is no national taxonomy for categorization of deficiencies and actions; a coding scheme was therefore created and used in this study. The category of "others" was used only in a few cases, suggesting the categories in the coding scheme covered most of the reported deficiencies and actions.

The strengths of this study are that the data collection and categorization were conducted by only one researcher, an experienced psychiatrist, to achieve consistency, and that the data were population-based. This study was performed almost a decade after the obligation to report suicides was implemented and most providers and investigators would have been familiar with the procedure. Therefore, the cases in the study are expected to match the actual numbers to a good extent and the investigations are expected to be representative for suicides committed by patients in contact with healthcare within four weeks before death.

Conclusions

Many of the individuals who died by suicide were in contact with healthcare services shortly before death, and deficiencies in healthcare considered to contribute to these deaths were reported for more than half of these patients. The majority of reported deficiencies and actions were at the organizational micro level and the most common deficiencies related to care delivered in the immediate interface between patient and involved staff, which was easy for the investigators to identify. Actions proposed to prevent new suicides were centered on single educational interventions without distinctive sustainable effects in the organizations and usually did not correspond with the identified deficiencies.

Generally, the investigations lacked the perspectives of the patients and an analysis of the suicide process over time in connection with the complexity of healthcare organizations. Future research should examine if application of a framework based on knowledge of the suicide process, strategies of suicide prevention, and patient safety would enable more sophisticated investigations facilitating progress in work on the prevention of suicide.

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JÖNKÖPING UNIVERSITY
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2019-06-13

Dear Editors:

I wish to submit an original research article for publication in BMJ Open, titled "A retrospective study of investigations after suicide in Swedish healthcare." The paper was co-authored by Axel Ros, MD, PhD, Professor Boel Andersson Gäre, MD, PhD, and Professor Åsa Westrin, MD, PhD.

This study aggregated the conclusions of all investigations conducted after suicides reported to the supervisory authority in Sweden in 2015. We believe that our study makes a significant contribution to the literature because it will help to inform healthcare providers of the typical causes of suicide related to healthcare and advance their work on improving patient safety.

This manuscript has not been published or presented elsewhere in part or in entirety and is not under consideration by another journal. We have read and understood your journal's policies, and we believe that neither the manuscript nor the study violates any of these. There are no conflicts to declare. Although we examined the research checklists of the EQUATOR Network, none seemed applicable to our work.

Thank you for your consideration. I look forward to hearing from you.

Sincerely,
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Contributorship statement

Elin Roos af Hjelmsäter

- Substantial contributions to the design of the work, analysis and interpretation of data
- Collected all data necessary for the study
- Drafting the work and revisions of the manuscript
- Final approval of the version of the manuscript to be published
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Axel Ros, Boel Andersson Gäre and Åsa Westrin

- Did all and in equal parts contribute to design, analysis and interpretation of the study
- Did all and in equal parts contribute to revisions of the manuscript
- Final approval of the manuscript including agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Deficiencies in healthcare prior to suicide and actions to deal with them: A retrospective study of investigations after suicide in Swedish healthcare

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Title page

Deficiencies in healthcare prior to suicide and actions to deal with them: A retrospective study of investigations after suicide in Swedish healthcare

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ABSTRACT

Objectives

The overall aim of this study was to aggregate the conclusions of all investigations conducted after suicides reported to the supervisory authority in Sweden in 2015, and to identify deficiencies in healthcare found in these investigations; the actions proposed to deal with the deficiencies; the level of the organizational hierarchy (micro-meso-macro) in which the deficiencies and actions were situated; and outcomes of the supervisory authority's decisions.

Design and setting

This is a retrospective study of all reports from Swedish primary and secondary healthcare after suicide to the regulatory authority in Sweden in 2015.

Results

In 55% (n=240) of cases, healthcare providers reported healthcare deficiencies that contributed to suicide; these deficiencies were primarily in "suicide risk assessment" and "treatment." Actions aimed at preventing new suicides were proposed in 80% of cases (n=347). By far, the most frequent actions were "education and competence," present in 52% of cases (n=227) and did not much correspond with identified deficiencies. Sixty-five percent of the deficiencies and actions were at micro level, while the remainders were at meso level. In 65% (n=284) of cases, the supervisory authority approved the investigation without further requirements.

Conclusions

The most common identified deficiencies were related to care in the immediate interface between patient and staff. Actions proposed to prevent new suicides were centered on single educational interventions without distinctive sustainable effects in the organizations and usually did not correspond with the identified deficiencies. Future research should examine if application of a framework based on knowledge of the suicide process, suicide prevention strategies, and patient safety would enable more sophisticated investigations that could facilitate progress on suicide prevention.

Article summary

Strengths and limitations of this study

- This is the first national aggregated analysis of the outcomes of investigations following suicides in Sweden.
- The categorization of deficiencies and actions for improvements was done by a single person to improve consistency.
- All data were based on the healthcare providers' reports of suicide to the supervisory authority, reports performed in different contexts by different persons with a large spectrum of disparities in experiences resulting in variegated quality.

BACKGROUND

Close to 800 000 people die by suicide worldwide every year.[1] Studies show that approximately nine out of ten individuals who die by suicide have a psychiatric disorder at the time of death, and a large proportion of suicide deaths occur among individuals receiving ongoing psychiatric care or who have contact with other healthcare providers.[2-5] There is some evidence that suicide prevention strategies diminish suicide rates[6 7]; however, despite intensified efforts to improve the healthcare safety for suicidal patients, the suicide rate has remained essentially the same in Sweden, at approximately 1200 deaths every year.[8] In recent decades, awareness and knowledge of patient safety has increased. Many countries have established an incident reporting system, meaning that serious adverse events are to be investigated and reported to a supervisory authority. To better understand if failures in any area of the healthcare system have contributed to suicide, all suicides that occurred while a victim was receiving healthcare or within four weeks after healthcare contact were required to be reported by the healthcare provider to the supervisory authority for healthcare in Sweden in 2006-2017. A review conducted one year after this obligation was implemented showed that the supervisory authority criticized healthcare providers for healthcare deficiencies in 53% of cases, with the most frequent deficiencies being in routines and risk assessments.[9] Since that report, no further national aggregated analysis of the outcomes of the investigations following suicides has been done. To our knowledge, there are neither any international aggregated analyses nor other analysis of this kind published.

Investigations based on root cause analysis (RCA) have become wide-spread tools in healthcare services efforts to understand and prevent adverse events.[10 11] The principle of RCA is to identify and rectify underlying system vulnerabilities that allow human errors to cause harm to patients.[12] This approach assumes that adverse outcomes can be explained by linear cause-effect chains and have causes that can be found and fixed, and that the actions preceding adverse events differ from those that precede ordinary, successful care.[13] The actual value of incident reporting systems and the RCA approach in healthcare is subject to debate.[14-18] Single analyses usually provide little learning beyond the involved staff and unit. Rather, aggregation of data from multiple analyses should generate more meaningful action plans for improvement and better facilitate the learning processes in organizations.

Swedish law states that when an adverse event has resulted or could have resulted in severe patient harm, this should be reported to the supervisory authority, the Health and Social Care Inspectorate (HaSCI). The role of HaSCI is to "…ensure that reported adverse events have been investigated to a necessary extent, and that appropriate actions have been taken by the healthcare provider to reach a high level of patient safety".[19] The report to the authority is to be preceded by an investigation of the healthcare services provided to the patient before the adverse event, conducted by the healthcare providing organization. The head of the departments are formally responsible for the investigation and investigators can be any type of healthcare professional. The investigations aim to identify the causes and contributory causes of the incident and to identify improvements that should prevent the same incident from happening again. A distinction is made in investigations between actions performed immediately after an incident and non-immediate actions proposed or taken some time afterwards. The authority then examines the investigation and decides if the healthcare provider has fulfilled their legislated role of investigating the incident and taking actions to ensure patient safety. If there are shortcomings in the investigation, the HaSCI calls for additions or conducts a site visit to inspect the healthcare provider.

The overall aim of this study was to aggregate the conclusions of all investigations conducted after suicides reported to the supervisory authority in Sweden in 2015, and to identify deficiencies in healthcare found in these investigations; the actions proposed to deal with the deficiencies; the level of

the organizational hierarchy (micro-meso-macro) in which the deficiencies and actions were situated; and outcomes of the supervisory authority's decisions.

METHODS

Cases

All suicide cases (n=436) reported to the HaSCI in 2015 were included. Complete incident investigations from healthcare providers with associated patient records and decisions of the supervisory authority were obtained from the supervisory authority. Every individual suicide was given a code number and the patient's demographic data, contact with all areas of healthcare and received treatment in the three months before death were registered. Major diagnoses documented and coded in accordance with the ICD-10 coding system in the records were registered.

Categorization of data

A coding scheme was used to categorize the causes and contributory causes of the suicide, as well as the immediately performed actions and non-immediate actions reported in the investigations. The coding scheme was based on the general categories of the most widespread method of investigating adverse events in Swedish healthcare, which is based on RCA.[20] The categories were as follows: Education and competence, Communication and information, Organization and management, Technics and equipment, and Policies and procedures. To make the categorization more specific, four of the major categories were divided into additional subcategories. Every category was described and exemplified and a category of "others" was added in case none of the other categories was considered appropriate (*Table 1*). Since the providers rarely made a distinction between causes and contributory causes in the investigations, these are reported as *deficiencies* in this paper. In this study, an action (immediate or non-immediate) was defined as an intervention that aimed to prevent new suicides. Therefore, actions taken to prevent reported suicides (telephone calls, resuscitations) or actions aimed at informing family or staff that a suicide has occurred were not registered as actions in this study. Separate notes were made when a deficiency or action was related to routines and if patient-related factors were reported. In cases where different providers reported the same suicide case, the outcomes of the investigations were grouped. Identical deficiencies or actions reported by different providers regarding the same patient were excluded, thus ensuring that every factor was counted only once. How learning from the investigation was described; inside the department, outside the department, irrelevant or not mentioned, was registered. All data collection and categorization was conducted by only one researcher, an experienced psychiatrist, to achieve consistency.

Table 1. Coding scheme for categories with examples of deficiencies and actions

Category and definition	Examples of deficiencies	Examples of actions
Communication and information **Communication with peers and family**		
Deficiencies and actions related to cooperation, communication, information, and interaction between the healthcare provider and the families and peers of patients	Shortcomings in provision of adequate information about healthcare from provider to family/peers Absence of or inadequacies in the providers' contact with family/peers at time of discharge from hospital	New routines for involving family/peers in healthcare New written information about psychiatric disorders and treatment "Courses" or lectures for family/peers about psychiatric disorders and treatment
Documentation		

Deficiencies and actions related to administration and documentation	Non-adherence to local documentation policies Inadequate, missing, wrong, or delayed documentation in patient records	Patient record reviews for quality improvement New guidelines or routines for the documentation process
External communication		
Deficiencies and actions related to cooperation, communication, and collaboration with actors outside the unit/clinic of the healthcare provider	Absence of or inadequacies in information provided at discharge from hospital to other care providers involved in the patient's care	New meeting points for cooperation between different healthcare providers, consultation meetings
Internal communication		
Deficiencies and actions related to cooperation, communication, and interaction between staff within the unit, and between staff and patient	Lack of sharing of important information regarding care between staff, or between staff and patient	New routines for intern communication/reports, written or oral
Education and competence **Education and competence, not specified**		
Deficiencies and actions related to education and competence, excluding those related to suicide risk assessments	Inadequacies in competence or experience of staff Inadequate supervision or introduction of staff	Case report discussions at staff meetings, lectures Reminding staff of existing guidelines
Education and competence in suicide risk assessment		
Deficiencies and actions related to education and competence in suicide risk assessment	Inadequate knowledge or experience of staff to conduct a sufficient suicide risk assessment	Lectures and training in suicide risk assessment Reminding staff about existing policies and guidelines of suicide risk assessment
Technics and equipment		
Deficiencies and actions regarding technics and equipment	Ligature points (hooks, doors) in hospital Shortcomings in information technology systems	Removal of ligature points (hooks, doors) in hospital Changes in information technology systems
Organization and management **Human resources**		
Deficiencies and actions involving staffing, care availability, and psychological working environment	Lack of staff Lack of staff continuity Temporary (rented) doctors Heavy workload	Recruiting new staff Changes in working schedule Changes in job assignments and work distribution between staff
Number of beds in hospital		
Deficiencies and actions related to available beds in hospital	Patient not admitted to inpatient care or discharged because no beds were available	Efforts to expand the number of beds in hospital
Organization/management		
Deficiencies and actions related to leadership, organizational structure of healthcare, and physical working environment	Organizational structures impairing healthcare Shortcomings in leaders' execution of responsibility	Organizational reconstructions Rebuilding of premises

	Inadequate premises	
Policies and procedures **Care plan and crisis plan**		
Deficiencies and actions related to care plan or crisis plan	Inadequate or lack of care plan/ crisis plan	New routines for making care plan /crisis plan or follow up
Diagnosis		
Deficiencies and actions related to the diagnostic process	Delayed, missed, wrong, or inadequate diagnosis	New guidelines or routines for the diagnostic process
Suicide risk assessment		
Deficiencies and actions related to the process of suicide risk assessment	Non-adherence to local policy or guidelines for suicide risk assessment Inadequate risk assessment	New guidelines or routines for suicide risk assessments
Treatment		
Deficiencies and actions related to treatment of the patient	Complications or side-effects of medication/treatment Delayed, inadequate, or wrong medication/treatment Doctors' prescribing	New guidelines, recommendations, or routines for treatment strategies for specific disorders New recommendations for prescription of psychotropic drugs
Work process		
Deficiencies and actions related to the daily working process of staff and the process of reporting and taking care of adverse events	Non-adherence to local policies, routines, or checklists regarding working process of staff Inadequacies in supervision of patients in hospital	New guidelines or routines regarding working process for staff New routines in the process of reporting and taking care of adverse events
Others		
Deficiencies and actions not specified elsewhere		

Organizational levels

A classification of the organizational levels of deficiencies and actions was conducted to better understand where in the organizational system the identified deficiencies and actions were situated. The deficiencies and actions were coded according to a micro-meso-macro-perspective.[21] Microsystems were defined as the basic building blocks of all healthcare systems formed around the patient and family, such as the inpatient or outpatient care unit. The mesosystem encompassed interactions between different microsystem units, such as cooperation between clinics or healthcare providers. The macrosystem involved the whole system of healthcare, such as legislation, political prioritizations, and national policies on healthcare. The highest organizational level for each deficiency, immediate action, and non-immediate action for each case was coded.

Supervisory authority

The decisions of the supervisory authority were coded as follows: "immediate approval," "request for one or more additions," or "inspection."

Statistical analyses

Summary statistics were calculated for deficiencies, immediate actions, non-immediate actions, and decisions of the supervisory authority. Frequencies for each category and organizational hierarchal level in deficiencies, immediate actions, and non-immediate actions were analyzed per individual and aggregated.

Chi-square tests of independence were used to compare the number of deficiencies and non-immediate actions in the same category. We considered a two-sided p-value of <.005 to be statistically significant. Fisher's exact test was used in cases where 20% of the analyzed groups had an expected count of less than 5. The statistical analyses were performed using IBM SPSS Statistics 24.

Ethical review

According to the Swedish *Act Concerning the Ethical Review of Research Involving Humans* (2003:460) and an advisory opinion from the Regional Ethical Review Board (no. 2017/234), this study did not require ethical review as it did not include human participants.

Patient and Public Involvement

Patients or public were not involved in this study.

RESULTS

Cases

In total, 1179 suicides were registered in Sweden in 2015.[8] The supervisory authority received 473 reports. In 35 cases, the same suicide was reported by two different healthcare providers, regarding different parts and perspectives of the care process, and for one case, the same suicide was reported by three providers, resulting in 436 unique suicide cases. Characteristics of the cases and healthcare received in the last three months before suicide are presented in *Table 2*.

Table 2. Characteristics of cases and care received during the last three months before suicide (including all areas of healthcare; primary and secondary, psychiatric and somatic)

Characteristic		n (%)
Gender	Men	283 (65)
	Women	152 (35)
Age, years	Median 49, range 13-93	
Healthcare provider last in contact with the patient	Psychiatric care	290 (67)
	Primary care	94 (22)
	Somatic care	33 (8)
	Other	18 (4)
Time until death after last contact with healthcare system, days	Median 4, range 0-88	
Number of contacts with outpatient healthcare services during the last three months	1	38 (9)
	2-4	105 (24)
	>5	216 (50)
Inpatient care	During the last three months	146 (33)
	Inpatient at time of death	36 (8)
Major psychiatric diagnosis documented and coded in accordance with ICD-10 in patient record	Total (F00-F98)	370 (85)
	Affective disorder (F30)	153 (35)
	Anxiety disorder (F40)	77 (18)
	Substance abuse (F10)	51 (12)
	Psychosis (F20)	36 (8)

	Attention deficit disorder (F90)	20 (5)
	Personality disorder (F60)	13 (3)
	Autism spectrum (F84)	13 (3)
	Other	7 (2)
Prescribed psychotropic drugs at time of death	Total	349 (80)
	Hypnotic drugs	274 (63)
	Antidepressants	265 (61)
	Anxiolytics	216 (50)
	Antipsychotics, oral	97 (22)
	Mood stabilizers	47 (11)
	Antipsychotics, injection	18 (4)
Suicide risk assessment documented in patient record in the three months before death	Absent	108 (25)
	Low/nonexistent	171 (39)
	Elevated, not acute	116 (27)
	High/acute	41 (9)

Deficiencies in healthcare before suicide

In 55% (n=240) of suicide cases, the healthcare provider identified deficiencies in the healthcare that were considered to have contributed to the suicide. Among all cases, a total of 952 deficiencies were identified. The number of deficiencies per case ranged from 1 to 21, with a median of 3.

The most frequent deficiencies were in "treatment" and "suicide risk assessment". Examples were inadequate or delayed pharmacological treatment, non-adherence to existing guidelines, inadequacies in doctors' prescribing, a misleading suicide risk assessment, and non-adherence to local guidelines for suicide risk assessment. Deficiencies in "external communication" were the third most frequent. Examples were shortcomings in communication between a somatic and psychiatric clinic and a lack of important information being handed over from one healthcare provider to another. For further details, see *Tables 3* and *4*. In 7 cases, identical deficiencies for the same case were reported by different providers, categorized as "external communication", "treatment", "suicide risk assessment" and "care plan."

Table 3. Proportions of cases with deficiencies, immediate actions, and non-immediate actions reported in the investigations of healthcare made after suicide.

Category	Cases with deficiencies n (%)	Cases with immediate actions n (%)	Cases with non-immediate actions n (%)
All cases	240 (55)	26 (6)	347 (80)
Communication and information			
Communication with peers and family	51 (12)	2 (0.5)	51 (12)
Documentation	65 (15)	1 (0.2)	71 (16)
External communication	74 (17)	2 (0.5)	80 (18)
Internal communication	61 (14)	0 (0)	55 (13)
Education and competence			
Education and competence not specified	54 (11)	1 (0.2)	166 (38)[a]
Education and competence in suicide risk assessment	9 (2)	6 (1)	136 (31)[a]
Organization and management			

Human resources	60 (14)	6 (1)	67 (15)
Number of beds	9 (2)	0 (0)	4 (1)
Organization/management	13 (3)	2 (0.5)	22 (5)[b]
Policies and procedures			
Treatment	84 (19)	2 (0.5)	57 (13)[c]
Suicide risk assessment	86 (20)	6 (1)	94 (22)
Work process	50 (11)	6 (1)	119 (27)[a]
Diagnostics	54 (12)	2 (0.5)	28 (6)[c]
Care plan and crisis plan	46 (11)	0 (0)	46 (11)
Technics and equipment	13 (3)	6 (1)	22 (5)[b]
Other	11 (3)	1 (0.2)	8 (2)

[a] significantly more cases with reported non-immediate actions compared with deficiencies, p<0.0001

[b] significantly more cases with reported non-immediate actions compared with deficiencies, p<0.002

[c] significantly more cases with reported deficiencies compared with non-immediate actions, p<0.0001

Table 4. Total number of deficiencies, immediate actions, and non-immediate actions reported in the investigations of healthcare made after suicide.

Category	Total number of deficiencies, n	Total number of immediate actions, n	Total number of non-immediate actions, n
Total number reported in all investigations	952	45	1330
Communication and information			
Communication with peers and family	61	2	56
Documentation	87	1	84
External communication	103	2	109
Internal communication	77	0	59
Education and competence			
Education and competence not specified	73	1	261
Education and competence in suicide risk assessment	9	6	168
Organization and management			
Human resources	81	7	86
Number of beds	10	0	4
Organization/management	14	3	27
Policies and procedures			
Treatment	115	2	72
Suicide risk assessment	101	6	112
Work process	74	6	161
Diagnostics	70	2	33
Care plan and crisis plan	50	0	57
Technics and equipment			
Technics and equipment	16	6	33

Other			
Other	11	1	8

Note: Each case can be represented by several factors in the same category. Total numbers of reported factors in the investigations (n) are given in the table.

All reported deficiencies were at the micro level in 65% (n=157) of cases (*Table 5*). An example of a deficiency at the micro level was inadequacies in doctors' prescribing or in suicide risk assessment. The remaining 35% (n=83) had at least one deficiency at the meso level, such as shortcomings in cooperation between a psychiatric clinic and somatic clinic or inadequacies in communication between hospital and municipality. No deficiencies were considered to be at the macro level.

Table 5. Distribution of the highest organizational hierarchy level of deficiencies, immediate actions, and non-immediate actions in the cases.

Organizational level	Deficiencies	Immediate actions	Non-immediate actions
Micro	157 (65)	25 (96)	225 (65)
Meso	83 (35)	1 (4)	120 (35)
Macro	0 (0)	0 (0)	1 (0)

Note: Only the highest level in every case is noted. Number and percentage of cases at each level are given in the table, n (%).

Routines

Deficiencies in routines were reported in 20% (n=96) of all cases. These often reflected non-adherence to existing routines. Missing or defective routines were reported in 11% (n=49) of cases. Deficiencies in routines could occur in any category.

Patient-related factors

In 31% (n=135) of cases, patient-related factors were reported to have contributed to the suicide. Examples were changes in the patient's private relationships or life conditions, or circumstances the provider considered to be outside the influence of healthcare.

Immediately performed actions

Immediately performed actions were reported in 6% (n=26) of cases. In these, 45 immediate actions were described. The number of immediate actions per case ranged from 1 to 7, with a median of 1. The most frequent immediate actions taken were categorized as "human resources," usually recruitment of physicians (*Tables 3* and *4)*. In one case, there was an action at the meso level; the remainders were all at the micro level (*Table 5)*.

Non-immediate actions

Non-immediate actions aiming to prevent new suicides were taken or proposed in 80% (n=347) of all cases. In these, a total of 1330 interventions were described. The number of actions per case ranged from 1 to 20, with a median of 3.

The most frequent non-immediate actions were in the category of "education and competence not specified." Examples were case report discussions at staff meetings, lectures about affective disorders,

and reminding staff about existing local guidelines. The second most frequently reported non-immediate action category was "education and competence in suicide risk assessment." Examples were lectures for staff about suicide risk assessment and reminding staff about existing guidelines for suicide risk assessment. Together, non-immediate actions in either of these two categories were described in 52% (n=227) of all cases, corresponding to 32% of all reported non-immediate actions.

The third most frequent non-immediate action category was changes in "work process." Examples were new checklists and changes in the intern system of reporting adverse events. For further details, see *Tables 3* and *4*. Identical actions regarding the same case were reported by different providers in 12 cases and were in the categories of "external communication," "education and competence not specified," "suicide risk assessment," "care plan," "work process" and "education and competence in suicide risk assessment."

The organizational levels of the non-immediate actions were equal to those of the deficiencies; in 65% (n=225) of the cases, all actions were at the micro level and in 35% (n=120) there was at least one action at the meso level (*Table 5*). Examples of actions at the micro level were case discussions at staff meetings, lectures, and new checklists. Examples of actions at the meso level were changed procedures for communication or cooperation between different healthcare providers. Only one proposal was at the macro level, and this involved the possibility of the prescribing doctor checking what medications a patient received from pharmacies throughout the country.

Learning from the investigations were described to be inside the department in 56% (n=266) of the reports. In only 4% (n=20) of the reports, sharing of the experiences and conclusions outside the own department were described. In all other reports, nothing was mentioned about the learning or considered not being relevant.

Routines

Changes in routines were proposed in 35% (n=152) of all cases, and these actions could be in any category.

Decisions of the supervisory authority

In 65% (n=284) of cases, the supervisory authority approved the report from the healthcare provider without further requirements. In 29% (n=126), the supervisory authority called for one or more additions to the investigation before approval. In 6% (n=25), an inspection took place at the healthcare provider before the decision, and in these cases the supervisory authority usually called for additional actions before their decision. Of the 36 cases with more than one investigation, the decisions of the authority differed in 16 cases.

DISCUSSION

This study describes the aggregate results of healthcare provider investigations made after suicides in Sweden in 2015. In more than half of the studied cases, there were deficiencies in the healthcare provided before suicide that were considered by the providers to be of significance to the death. The majority of the deficiencies were at the micro organizational level, and no deficiency was found at the macro level. The most common deficiencies involved care delivered in the immediate interface between patient and staff, which were relatively easy for the investigators to identify. Actions to deal with the deficiencies were substantially more frequent than the number of described deficiencies and

were dominated by educational actions. The majority of the actions were at the micro level, and only one proposed action was at the macro level.

The most frequently reported deficiencies were related to "treatment." Four out of five patients in this study were prescribed psychotropic drugs, most commonly sleeping pills and antidepressants. Pharmacological treatment of psychiatric disorders is regarded as a central and evidence-based component of the prevention of suicide.[7 22] To deliver the right treatment for the patient, correct diagnoses are essential: diagnostic errors are known to be common causes of adverse events in all areas of healthcare.[23 24] A majority of the patients in this study had at least one documented psychiatric diagnosis, although less than half had a diagnosis of depression. The deficiencies in "diagnosis" category were lower than would be expected, given the known outcome of suicide, the fact that all cases had contact with healthcare shortly before death, and the fact that a vast majority of suicide deaths involve individuals who meet the diagnostic criteria for depression at time of death.[5] Many investigations were performed without the participation of a physician, which could help explain the low number of reported diagnostic errors.

Admission to inpatient care is a common choice of treatment for those at risk of suicide. One third of the patients in this study were admitted to the hospital in the three months before their death; however, only 8% of the suicide deaths involved inpatients, which is notably lower than the 24% found in a review of suicides in Sweden in 2007.[9] This decrease could be a result of safer inpatient care; however, it could also reflect a shift of suicides from inpatient care to the post-discharge period, mirroring the reduction in the number of beds in psychiatric care during the last few decades.[25] However, investigators in the present study did not reach this conclusion, as the number of hospital beds was reported as contributing to suicides in only 2% of cases. At the same time, it is not clear if this low frequency resulted because investigators considered this to be an issue outside their mandate.

Deficiencies in "suicide risk assessment" were frequently reported, as exemplified by inadequate performance of risk assessment or insufficient supervision of patients assessed to be at high risk for suicide at psychiatric inpatient units. All cases in this study were in contact with healthcare services during the three months before their suicide, and 90% were in contact more than once. Documentation of suicide risk in patients' records during the last three months before suicide was absent in 25% of cases and regarded as low/nonexistent in 39%. Suicide is usually the final outcome of a process over time and involves the interaction of several factors. As suicide intentions also fluctuate rapidly, assessments must be repeated to catch suicidal crises. [6] The small number of cases in this study where suicide risk was assessed as high might reflect difficulties in assessments. However, it could also indicate success of healthcare in cases when suicide risk was assessed as high and then followed by preventive actions. Further research is needed to confirm this hypothesis.

Substantially more actions to prevent new suicides were reported compared to the number of identified deficiencies, possibly reflecting insights into the weaknesses of the healthcare system that confer risk to patient safety. The proposed actions centered on educational interventions: these actions were proposed for half of cases and corresponded to one third of all reported actions. In comparison, deficiencies in "education and competence" were reported in only 10% of cases, indicated that providers aimed to solve deficiencies in different categories with educational actions. Most of the proposed educational actions represented a single case discussion or reminder of a routine in staff meetings, suggesting that the deficiencies were being simplified and quick fixes were being applied. Evidence that educational interventions reduce suicide rates relies on studies of extensive education programs.[26-30] In order to reach successful implementation and sustainable behavior change, considerable work - including long-term multi-faceted interventions - is usually needed. Macrae

emphasizes the importance of active reflection, mindful participation, and emotional engagement.[31 32] If this kind of reflection is not part of how healthcare providers promote learning, the large amount of single educational actions can create a false sense of security without making the organization safer. Strong leadership with visible engagement in patient safety at all levels is of high importance in shaping and maintaining safe structures in organizations.[32-36] Very few deficiencies regarding management were reported in this study, probably reflecting the investigators' lack of understanding of this issue rather than an absence of management shortcomings.

Even though missing or defective routines seldom were reported as contributing to suicides, new or changed routines were proposed to prevent new suicides in one third of the investigations, often in the category of "work process." This focus on routines in patient harm investigations has been shown before.[9 35 37] Well-functioning work processes and adherence to routines are indisputably of high importance for ensuring safe healthcare. However, the large number of changes without corresponding shortcomings shown in this study might result in insecurity, rather than safety, among staff. This suggests that providers oversimplify the challenges of patient safety at the frontlines of healthcare.

Immediate action was taken in only a few cases, which probably reflects the absence of obvious deficiencies possible to be fixed. Compared to non-immediate actions, a larger share of immediate actions concerned "technics and equipment," usually the removal of ligature points such as hooks and doors.

A majority of identified deficiencies and actions were at the organizational micro level – they were usually within the care unit where the patient had their last contact with healthcare services. These findings were similar to those of a prior Swedish study.[18] The results probably reflect the investigators' knowledge and understanding of suicide and what they consider can be fixed more than the actual circumstances. The real purpose of investigations of healthcare after adverse events should be to reveal gaps and inadequacies in the healthcare system and to find effective and meaningful actions leading to sustainable improvement of healthcare.[38] To succeed in this, we need to develop methods appropriate to current healthcare services and to improve the ability of healthcare organizations to learn from and recall incidents and investigation outcomes.[10 31 32] In this study, learning from the investigations were in most cases described to be inside the own department, sharing of the experiences and conclusions outside the own department were described in only a few cases. Past studies have shown that the results and conclusions of investigations are rarely passed down to the organization and that there is an absence of formalized organizational memory, even though many patient safety activities that arise from the investigations after incidents are based on such memory-making activities.[18 39] Vincent suggests the use of a "safety analysis of the patient journey" to identify the series of events and combinations of errors and system vulnerabilities that in combination and gradually unfold over time.[32] Analyses over a longer period of time would enable identification of successful recovery from suicidal crises, which is necessary knowledge to progress in work on suicide prevention. This approach also requires investigators to view care through the eyes of patients, understand the patient's journey in the care system, and to grasp the reality of the complex healthcare system the patient and next of kin have to navigate. Attention to interactions between different levels of the organization is also needed. What happens at the micro level, such as in personal meetings with patients, reflects decisions and management at the top of the healthcare organization; as well what happens at the micro level influences top-level decisions.[40] These reflections on time, patient perspectives, and organizations were generally nonexistent in the investigations in this study but appear necessary to achieve progress in the care of suicidal patients.

The deficiencies in healthcare reported by the healthcare providers were in their investigations considered to be contributing factors to the completed suicide. This way of describing contributing factors is according to Swedish law and the RCA method. Healthcare and the suicide process both are complex processes, and such a linear approach might not be appropriate. This study illustrates how suicide as a possible patient harm is investigated in a nation where a RCA-inspired method is the recommended method, and what kind of learning and change in the health care systems that are possible with that approach. The result implies that sharper methods of investigation are needed to achieve progress in patient safety.

Limitations and strengths

All data were based on the healthcare providers' reports of suicide to the supervisory authority. The contents in these reports are regulated by law; however, there still may have been shortcomings and inadequacies not pointed out and that the authority did not observe. The investigations were performed in different contexts by different persons with a large spectrum of disparities in experiences resulting in variegated quality. The investigations were performed after suicides, which often upset and strongly affect involved staff, and an awareness of external supervision might have biased the outcomes. Furthermore, there is no national taxonomy for categorization of deficiencies and actions; a coding scheme was therefore created and used in this study. The category of "others" was used only in a few cases, suggesting the categories in the coding scheme covered most of the reported deficiencies and actions.

The strengths of this study are that the data collection and categorization were conducted by only one researcher, an experienced psychiatrist, to achieve consistency, and that the data were population-based. This study was performed almost a decade after the obligation to report suicides was implemented and most providers and investigators would have been familiar with the procedure. Therefore, the cases in the study are expected to match the actual numbers to a good extent and the investigations are expected to be representative for suicides completed by patients in contact with healthcare within four weeks before death.

Conclusions

Many of the individuals who died by suicide were in contact with healthcare services shortly before death, and deficiencies in healthcare considered to be of significance to these deaths were reported for more than half of these patients. The majority of reported deficiencies and actions were at the organizational micro level and the most common deficiencies related to care delivered in the immediate interface between patient and involved staff, which was easy for the investigators to identify. Actions proposed to prevent new suicides were centered on single educational interventions without distinctive sustainable effects in the organizations and usually did not correspond with the identified deficiencies. Conclusions from the investigations usually stayed inside the own department, systematic sharing and learning from experiences should be a future possibility to improve healthcare in a wider way and facilitate learning in practice.

Generally, the investigations lacked the perspectives of the patients and an analysis of the suicide process over time in connection with the complexity of healthcare organizations. Future research should examine if application of a framework based on knowledge of the suicide process, strategies of suicide prevention, and patient safety would enable more sophisticated investigations facilitating progress in work on the prevention of suicide.

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Authors´ contributor statement

ERaH designed the study, collected and registered the data, made the first analyses and wrote the manuscript. BAG, AR and ÅW contributed to the study design, analyses of the data and revisions of the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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Data sharing statement

The complete coding scheme is available by e-mailing elin.roos.af.hjelmsater@rjl.se.

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