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Chapter 4

Psychopathology and suicide method in mental health care

Annemiek Huisman^a, Cornelis AJ van Houwelingen^b, Ad JFM Kerkhof^a

^a Vrije Universiteit Amsterdam, Department of Clinical Psychology, EMGO⁺ Institute,
Amsterdam, the Netherlands

^b GGz Eindhoven, Eindhoven, the Netherlands

ABSTRACT

Background

Not all suicide methods are evenly distributed among different psychiatric disorders.

Methods

In a nationwide sample of 505 suicides by persons in mental health care, the relationship between psychiatric diagnosis and suicide method was examined with χ^2 tests, logistic regression analyses and multinomial logistic regression analysis, including interactions with age, gender and treatment status.

Results

Psychotic disorders were associated with jumping from heights, and substance-related disorders were associated with self-poisoning. Depressive disorders were not associated with any particular suicide method. Male patients preferred hanging, female patients self-poisoning. Inpatients preferred jumping before a train, outpatients self-poisoning. Bipolar patients preferred jumping before a train over hanging.

Limitations

Psychological mechanisms for selection of suicide methods are still unknown.

Conclusions

Possible means of suicide prevention suggested by this study include limiting access to tall buildings or structures to patients with psychotic disorders; careful prescription of medication to female patients and particularly to patients with substance-related disorders; and limiting easy access to railways near clinical settings to patients with bipolar and psychotic disorders. Limiting access to means of suicide may be less effective for suicidal patients with depressive disorders who may switch to other available methods.

1. INTRODUCTION

Suicide by different methods may constitute different behaviors, with different correlates and determinants. Factors influencing the selection process of a particular suicide method are availability, accessibility and acceptability of a method (Clarke and Lester, 1989), as well as gender and age (Henriksson et al, 1995; Osuna et al, 1997; Denning et al, 2000; Tadros and Salib, 2000). Studies examining the influence of psychopathology on the choice of suicide method are relatively scarce. Up until now, most research has focused on the prevalence of mental disorders among suicides of a particular method, especially more violent suicide methods such as jumping before a train or from heights. Results are not conclusive about the particular role of psychopathology, yet knowledge about these associations may in several ways contribute to the quality of clinical practice. Information might alert clinicians to risks when dealing with patients belonging to method-specific subpopulations of mental disorders. At an institutional level situational prevention might be applied by limiting access to certain methods in settings where corresponding subpopulations are treated. Therefore, the aim of the current study is to examine the associations of psychiatric diagnoses with suicide methods in a nationwide sample of 505 mental health care suicides, including interactions with age, gender and treatment setting.

2. METHOD

Data were obtained from the Netherlands Health Care Inspectorate, an independent organization under the responsibility of the Minister of Health, Welfare and Sport in the Netherlands. On every suicide that occurs in mental health care services a detailed report is sent to the Inspectorate. This report includes the circumstances of the suicide, characteristics of and possible flaws in the treatment of the patient. The purpose of this notification procedure is to monitor the quality of mental health care. Currently about 550 suicides are reported each year, which constitute about 36 % of the national suicide figure.

In the first months of 2006, all consecutive suicide notifications were studied (n=205). Added to these, was a random sample of 300 notifications from all cases in the period 1996-2005 (n=4950), with the purpose of studying historical developments in the supervision system (see results in Huisman et al, 2009). There were no differences between the 2006 notifications and the sample of earlier years regarding the distribution of diagnosis, suicide method, gender or treatment status.

All notifications were screened on suicide method and the following patient characteristics: age, gender, inpatient versus outpatient status, and psychiatric DSM IV diagnosis (Axis I and II) reported by the practitioner involved (usually a psychiatrist). For the analysis the principal

diagnosis was used. In the case of multiple Axis I diagnoses, the reported ranking was followed, the first diagnosis was considered the principal diagnosis. The principal diagnosis reflects the main focus of attention or treatment in relation to the suicide. If only an Axis II diagnosis was reported, this was considered the principal diagnosis. As this was the case only 17 times, personality disorders were not considered a separate diagnostic group in the analysis, 195 patients (39%) had a diagnosis of a personality disorder secondary to a principal diagnosis.

For the analysis diagnoses were grouped in 6 diagnostic categories: 1. psychotic disorders (schizophrenia, schizoaffective disorders and other psychotic disorders); 2. depressive disorders (including dysthymic disorder); 3. bipolar disorders; 4. substance-related disorders (alcohol and/or drug dependence/abuse); 5. anxiety disorders and 6. other disorders. The group of other disorders included: no Axis I diagnosis, unknown, cognitive disorders, eating disorders, attention-deficit hyperactivity disorder and other disturbances (somatoform disorders, exhibitionism, partner relational problem, autism, dissociative disorder).

Age was divided in two categories: younger than 60 and 60 or over, in order to concur with previous studies.

Suicide methods were grouped in 6 categories: 1. jumping before a train; 2. hanging (and strangulation); 3. jumping from a high place; 4. drowning; 5. self-poisoning (by solid or liquid substances); 6. other, unspecified or unknown means.

2.1. Statistical analysis

The objective of this study is to analyze the relationship of suicide method with psychiatric diagnosis, taking into account patient and treatment characteristics. Differences in suicide method and psychiatric diagnosis, gender, age category, treatment status and the presence or absence of an Axis II diagnosis of a personality disorder were explored through a Chi-square test of independence.

Adjusted residuals were examined to see which cells contributed the most to the significant result. Adjusted standardized residuals follow the t distribution, with >1.96 , $p < 0.05$ and > 2.56 , $p < 0.01$.

In addition, the hypothesis that predictor variables diagnosis, gender and treatment status had a separate influence on each suicide method was tested through logistic regression analyses. With those independent variables that had a significant influence, a multinomial logistic regression analysis was performed, as a more general model to predict method of suicide. Dependent variables in the multinomial regression analysis were self-poisoning, jumping before a train, jumping from a high place and the category all other means. Hanging was chosen to be the category of reference, as the most common method of suicide. An alpha level of 0.05 was used in all statistical tests, except in the logistic regression analysis, where alpha was 0.01 after bonferroni correction.

3. RESULTS

The study sample consisted of 280 men and 225 women with a mean age of 46 years and 47 years respectively (median 45, SD=15.5). The age group younger than 60 consisted of 419 patients, the age group 60 or over of 86 patients. Most common Axis I diagnoses were depressive and psychotic disorders (see Table 1). 42 % of the patients had a diagnosis of a personality disorder, in 17 cases this was the principal diagnosis. Of all 505 cases examined, 154 were inpatients (30%), and 351 (70%) were outpatients.

Table 1. Frequencies of principal diagnoses

| | DSM IV Axis 1 principal diagnoses | |
|-----------------------------|-----------------------------------|------|
| | n | % |
| Mental disorders | | |
| Psychotic disorders | 141 | 27.9 |
| Depressive disorders | 218 | 43.2 |
| Bipolar disorders | 36 | 7.1 |
| Substance-related disorders | 41 | 8.1 |
| Anxiety disorders | 22 | 4.4 |
| Other disorders | 47 | 9.3 |
| Total | 505 | 100 |

3.1. Suicide method and psychiatric diagnosis

The most frequently used suicide methods were hanging (34%), self-poisoning (19%), jumping before a train (17%), jumping from a high place (15%) and drowning (8%) (see Table 2). 1 % used a firearm and one patient jumped before a car.

At least 2/3 of the self-poisoning cases used prescribed medication (61/95), in some cases (19/95) in combination with non-prescribed medication and drugs. In 30 cases no information about particular substances was available.

Table 2. Suicide method according to principal diagnosis

| Principal diagnoses | Method | | | | | | | Total |
|-----------------------------|---------|----------|---------|----------|----------------|--------|-----------|-------|
| | Train | Hanging | Jumping | Drowning | Self-poisoning | Other | | |
| | n (%) | n (%) | n (%) | n (%) | n (%) | n (%) | | |
| Psychotic disorders | 30 (21) | 40 (28) | 35 (25) | 10 (7) | 14 (10) | 12 (9) | 141 (100) | |
| Depressive disorders | 35 (16) | 82 (38) | 21 (10) | 15 (7) | 48 (22) | 17 (8) | 218 (100) | |
| Bipolar disorders | 10 (28) | 12 (33) | 4 (11) | 4 (11) | 3 (8) | 3 (8) | 36 (100) | |
| Substance-related disorders | 4 (10) | 11 (27) | 6 (15) | 4 (10) | 13 (32) | 3 (7) | 41 (100) | |
| Anxiety disorders | 4 (18) | 7 (32) | 2 (9) | 3 (14) | 5 (23) | 1 (5) | 22 (100) | |
| Other disorders | 3 (6) | 20 (43) | 6 (13) | 2 (4) | 12 (26) | 4 (9) | 47 (100) | |
| Total | 86 (17) | 172 (34) | 74 (15) | 38 (8) | 95 (19) | 40 (8) | 505 (100) | |

The Chi-square test of independence for suicide method and principal psychiatric diagnoses was significant ($\chi^2 = 44.2$, $df = 25$, $p = 0.01$). Table 3 shows which variables contributed most to this significant result. Patients with psychotic disorders jumped from heights more often (25%) than patients with any other principal diagnosis (11%). Furthermore, patients with psychotic disorders less often used self-poisoning as suicide method (10% vs. 22%). Patients with depressive disorders jumped less often from high places (10% vs. 19%). Patients with substance-related disorders self-poisoned more often (32 vs. 18%). Lastly, patients diagnosed with other disorders jumped less often before a train (6% vs. 18%). No differences were found in the χ^2 test for patients with and without an Axis II diagnosis personality disorder ($\chi^2 = 8.4$, $df = 5$, $p = 0.14$).

Table 3. Standardized residuals for Chi-square test of diagnosis and method of suicide

| Principal diagnosis | Method | | | | | |
|-----------------------------|--------|---------|---------|----------|----------------|--------|
| | Train | Hanging | Jumping | Drowning | Self-poisoning | Others |
| Psychotic disorders | 1.6 | -1.7 | 4.0* | -0.2 | -3.2* | 0.3 |
| Depressive disorders | -0.5 | 1.5 | -2.8* | -0.5 | 1.6 | -0.1 |
| Bipolar disorders | 1.8 | -0.1 | -0.6 | 0.8 | -1.7 | 0.1 |
| Substance-related disorders | -1.3 | -1.0 | 0.0 | 0.6 | 2.2* | -0.1 |
| Anxiety disorders | 0.1 | -0.2 | -0.8 | 1.1 | 0.5 | -0.6 |
| Other disorders | -2.0* | 1.3 | -0.4 | -0.9 | 1.2 | 0.2 |

* $p < 0.05$

3.2. Suicide method and gender

The Chi-square test of independence for suicide method and gender was significant ($\chi^2=23.8$, $df=5$, $p<0.001$). The most significant contributors to this difference (see table 4) were hanging and self-poisoning. Male patients hanged themselves significantly more often (41% vs. 26%), female patients chose self-poisoning more frequently as suicide method (12% vs. 27%).

Table 4. Standardized residuals for Chi-square test of suicide method, gender and treatment status

| Suicide method | Gender | | Treatment status | |
|----------------|--------|-------|------------------|-----------|
| | men | women | outpatient | inpatient |
| Train | 0.1 | -0.1 | -5.9* | 5.9* |
| Hanging | 3.5* | -3.5* | -0.1 | 0.1 |
| Jumping | 0.0 | 0.0 | 0.2 | -0.2 |
| Drowning | -0.7 | 0.7 | 1.7 | -1.7 |
| Self-poisoning | -4.3* | 4.3* | 3.9* | -3.9* |
| Others | 0.6 | -0.6 | 0.8 | -0.8 |

* $p < 0.05$

3.3. Suicide method and treatment status

The Chi-square test of independence between suicide method and treatment status was significant ($\chi^2=44.3$, $df=5$, $p<0.001$). Table 4 shows which variables contributed most. Inpatients jumped significantly more often before a train than outpatients (32% inpatients vs. 11% outpatients) and self-poisoned less often (8% inpatients vs. 23% outpatients).

3.4. Suicide method and age

The Chi-square test of independence between suicide method and age was not significant ($\chi^2=5.5$, $df=5$, $p=0.36$).

3.5. Logistic regression analysis

The results of the logistic regression analyses are shown in Table 5. If a patient was in outpatient treatment, the odds he or she jumped in front of a train decreased ($OR=0.25$), while odds for self-poisoning increased ($OR=3.53$). When a patient was primarily diagnosed with a psychotic disorder, odds increased that jumping from a high place was the method of suicide ($OR=2.67$), and decreased for hanging as method used ($OR=0.56$). If a patient was male, odds increased that the suicide method was hanging ($OR=2.25$), and decreased for self-poisoning ($OR=0.32$). In case of a substance-related disorder, the odds increased that self-poisoning was the suicide method used ($OR=3.49$).

Table 5. Logistic regression analysis of variables influencing method of suicide

| Method | Independent variables | B | Wald | Odds ratio | 95% CI | p | R ² |
|----------------|-----------------------------|-------|-------|------------|-----------|------------|----------------|
| Train | Gender (men) | 0.02 | 0.01 | 1.02 | 0.62-1.67 | (p=0.94) | 0.11 |
| | Outpatient treatment | -1.37 | 30.50 | 0.25 | 0.16-0.41 | (p<0.001)* | |
| | Psychotic disorders | 0.22 | 0.40 | 1.25 | 0.63-2.49 | (p=0.53) | |
| | Substance-related disorders | -0.69 | 1.26 | 0.50 | 0.15-1.66 | (p=0.26) | |
| | Depressive disorders | -0.02 | 0.00 | 0.98 | 0.51-1.89 | (p=0.96) | |
| Hanging | Gender (men) | 0.81 | 16.06 | 2.25 | 1.51-3.34 | (p<0.001)* | 0.06 |
| | Outpatient treatment | -0.07 | 0.10 | 0.94 | 0.62-1.41 | (p=0.75) | |
| | Psychotic disorders | -0.58 | 4.16 | 0.56 | 0.32-0.98 | (p=0.04)* | |
| | Substance-related disorders | -0.77 | 3.43 | 0.46 | 0.20-1.05 | (p=0.06) | |
| | Depressive disorders | -0.02 | 0.01 | 0.98 | 0.60-1.60 | (p=0.93) | |
| Jumping | Gender (men) | -0.16 | 0.36 | 0.85 | 0.51-1.43 | (p=0.55) | 0.06 |
| | Outpatient treatment | 0.13 | 0.28 | 1.14 | 0.66-1.98 | (p=0.63) | |
| | Psychotic disorders | 0.98 | 7.12 | 2.67 | 1.30-5.51 | (p=0.01)* | |
| | Substance-related disorders | 0.35 | 0.40 | 1.42 | 0.49-4.14 | (p=0.53) | |
| | Depressive disorders | -0.18 | 0.23 | 0.83 | 0.39-1.77 | (p=0.64) | |
| Drowning | Gender (men) | -0.27 | 0.62 | 0.76 | 0.38-1.51 | (p=0.43) | 0.02 |
| | Outpatient treatment | 0.72 | 2.75 | 2.05 | 0.88-4.77 | (p=0.10) | |
| | Psychotic disorders | -0.10 | 0.04 | 0.90 | 0.35-2.34 | (p=0.83) | |
| | Substance-related disorders | 0.28 | 0.18 | 1.31 | 0.37-4.70 | (p=0.67) | |
| | Depressive disorders | -0.22 | 0.25 | 0.80 | 0.34-1.90 | (p=0.62) | |
| Self-poisoning | Gender (men) | -1.15 | 19.86 | 0.32 | 0.19-0.53 | (p<0.001)* | 0.16 |
| | Outpatient treatment | 1.26 | 14.94 | 3.53 | 1.86-6.70 | (p<0.001)* | |
| | Psychotic disorders | -0.51 | 1.73 | 0.60 | 0.30-1.29 | (p=0.19) | |
| | Substance-related disorders | 1.25 | 7.57 | 3.49 | 1.43-8.50 | (p=0.01)* | |
| | Depressive disorders | 0.27 | 0.76 | 1.31 | 0.71-2.41 | (p=0.38) | |
| Other | Gender (men) | 0.20 | 0.35 | 1.23 | 0.63-2.40 | (p=0.55) | 0.01 |
| | Outpatient treatment | 0.31 | 0.65 | 1.36 | 0.65-2.86 | (p=0.42) | |
| | Psychotic disorders | 0.11 | 0.05 | 1.11 | 0.43-2.86 | (p=0.83) | |
| | Substance-related disorders | -0.11 | 0.02 | 0.90 | 0.22-3.65 | (p=0.88) | |
| | Depressive disorders | 0.02 | 0.00 | 1.02 | 0.42-2.44 | (p=0.97) | |

*p < 0.05

3.6. Multinomial logistic regression analysis

Compared to suicides by hanging, patients who poisoned themselves were more likely to have a substance-related disorder (OR=4.13), to be in outpatient treatment (OR=3.22) and less likely to be male (OR=0.23). Patients who jumped before a train were more likely to have a bipolar disorder (OR=5.53) or a psychotic disorder (OR=4.97) and less likely to be outpatient (OR=0.36). Suicides by jumping from a high place were more likely to have a diagnosis of a psychotic disorder (OR=3.42) and less likely male (OR=0.51), when compared to patients who suicided by hanging. Compared to hanging, other methods were used less by males (OR=0.56). The multinomial logistic regression explained 21 % of the variance (see Table 6).

4. DISCUSSION

The aim of the present study is to examine the associations between psychiatric diagnoses and suicide methods. The strongest association was found between psychotic disorders and jumping from a high place. This strong link corroborates with findings of De Moore and Robertson (1999) and Kreyenbuhl et al. (2002). De Moore and Robertson found among survivors of self-harm that 55 % of the jumpers had a psychotic disorder versus only 4 % of those who used a firearm. Kreyenbuhl et al. report that jumping from a height was the most frequently used method among suicides with schizophrenia, whereas only 4 % of the suicides without schizophrenia used this method. However, Beautrais (2007) summarizes in her review on suicides by jumping that although some studies report an overrepresentation of more severe psychiatric disorders (including psychotic disorders), other studies did not find the same features. These conflicting outcomes may reflect small numbers in the reviewed studies or may be related to the fact that jumping from a height predominantly took place in domestic settings or locations near psychiatric hospitals or other care facilities. The current study, based on clinical diagnoses, surpasses some the above-mentioned shortcomings of diagnostic a-specificity and selective study samples due to its large size and nationwide catchment area. Therefore, the conclusion that there is a specific association between psychotic disorders and jumping from a high place seems well supported. An explanation for this phenomenon might be that because of disabling functional and cognitive deficits, reasons suggested by De Moore and Robertson (1999) and by Kreyenbuhl et al. (2002) earlier, patients with psychotic disorders resort to simply making use of the force of gravity. This particular method might require less preparation and might reflect heightened impulsivity. It would need though a systematic questioning of schizophrenic patients, not only the suicide prone, about their evaluation of various suicide methods, to understand their preferences better.

The high prevalences in the current study of both affective disorders and psychotic disorders in train suicides are in line with earlier studies (Mishara, 2007). In a review of 5 train suicide

Table 6. Multinomial logistic regression analysis

| Patient characteristic | Suicide method | | | | | | | | | | | |
|-----------------------------|----------------|------------|---------|-----------|----------------|------------|-------|------------|---------|------------|--|--|
| | Train | | Jumping | | Self-poisoning | | Other | | Hanging | | | |
| | OR | 95% CI | OR | 95% CI | OR | 95% CI | OR | 95% CI | OR | 95% CI | | |
| Male | 0.61 | 0.35-1.06 | 0.51* | 0.29-0.92 | 0.23** | 0.13-0.40 | 0.56* | 0.32-0.99 | 1.00 | 0.32-0.99 | | |
| Outpatient treatment | 0.36** | 0.21-0.61 | 1.17 | 0.63-2.15 | 3.22** | 1.61-6.45 | 1.71 | 0.91-3.22 | 1.00 | 0.91-3.22 | | |
| Psychotic disorders | 4.97* | 1.31-18.83 | 3.42* | 1.21-9.64 | 0.84 | 0.31-2.24 | 2.17 | 0.75-6.31 | 1.00 | 0.75-6.31 | | |
| Depressive disorders | 2.82 | 0.77-10.30 | 0.91 | 0.32-2.56 | 1.12 | 0.49-2.60 | 1.39 | 0.51-3.81 | 1.00 | 0.51-3.81 | | |
| Bipolar disorders | 5.53* | 1.23-24.82 | 1.13 | 0.26-4.88 | 0.42 | 0.09-1.88 | 1.99 | 0.53-7.39 | 1.00 | 0.53-7.39 | | |
| Substance-related disorders | 2.54 | 0.46-13.98 | 2.39 | 0.60-9.48 | 4.13* | 1.30-13.05 | 2.80 | 0.73-10.73 | 1.00 | 0.73-10.73 | | |
| Anxiety disorders | 3.33 | 0.57-19.34 | 1.00 | 0.16-6.23 | 1.39 | 0.33-5.75 | 2.09 | 0.45-9.77 | 1.00 | 0.45-9.77 | | |

*p < 0.05, **p < 0.01, R² = 0.21 (Nagelkerke), OR = odds ratio, CI = confidence interval

studies, affective disorders were most prevalent (39%) followed by functional non-affective psychosis (25%) (Van Houwelingen and Kerkhof, 2008). Notwithstanding the findings that patients with psychotic disorders are particularly prone to the use of methods that result in physical injury more often than patients with affective psychoses (Held et al, 1998; Radomsky et al, 1999), these findings illustrate that suicides resulting in severe physical injury are not the exclusive domain of patients with psychotic disorders.

In case of train suicides the choice for this method might be structured by a factor that is shared both by patients with schizophrenia and by patients with affective disorders, such as the proximity and accessibility of a railway nearby the psychiatric hospital. In this study, not diagnosis but inpatient status has the strongest association with the choice of jumping before a train as suicide method.

Another strong association was found between substance-related disorders and self-poisoning. Most of the self-poisoning cases in this study used prescribed medication. Although research on self-poisoning and alcohol and drugs related disorders is scarce, this result is in line with previous findings (Preuss et al, 2003). A possible explanation for this link could be that both the addictive behavior and the suicidal act are psychologically the same behaviour: the use of psychotropic substances to alter consciousness.

In our study, male patients hanged themselves more often and women self-poisoned significantly more frequent. This corroborates the study of Denning who found that, with equal suicide intent, men, compared to women, tend to use more violent suicide methods such as hanging or guns, while women self-poison more often (Denning, 2000). However, for jumping in front of a train or from a height, no sex differences were found, which is in line with results of Kposowa and McElvain (2006).

4.1. Limitations of the study

The current study is conducted with persons who were being treated in mental health care services. Thus associations found between psychopathology and method of suicide may not be the same for those not receiving mental healthcare.

In addition, this research was done within a national context of prevalences of psychiatric disorders and availability and acceptability of a set of methods. This means that the generalizability of the findings could be limited towards countries which differ significantly in terms of those parameters. For example, suicides by gunshots were rare in this study, although this method is frequently used in some countries.

Information about socio-demographic factors such as employment and circumstances of living (Abe et al, 2004) were not included in this study, although these variables (Pirkola et al, 2003) may influence the choice of method as well. Lastly, psychological mechanisms for selection of suicide methods need further study.

4.2. Implications for suicide prevention

Since distinct associations between pathology and suicide method were found, it can be inferred that limiting access to some methods will only partially lead to switching to another method (Clarke and Lester, 1989). A reduction of the suicide risk might be reached when physicians are extra careful when prescribing medication to female patients and patients with substance-related disorders. Likewise, reduced access to or the fencing-off of tall structures is indicated in environments with populations of patients with disorders in the schizophrenia spectrum (Beautrais, 2007). Psychotic candidate suicides might abandon the idea if they are unable to find an alternative which is equally acceptable (Clarke and Lester, 1989; De Moore and Robertson, 1999). This option would seem difficult to realize in large urban settings with schizophrenic patients living independently or semi-independently throughout the city. In addition, fences should be built in front of railway tracks in the proximity of inpatients settings. It is worth mentioning that, although this constitutes a somewhat different railway setting, minimizing direct contact of the public with moving trains in the Hong Kong underground has led to a significant reduction in the number of railway suicides, apparently without causing displacement to other unsealed railway platforms (Law et al, 2009).

Clinicians can discuss preferences found in this study with patients early on in the treatment, which may open up the opportunity of exploring anticipatory preventive strategies.

In the current study depressive disorders were associated with a variety of suicide methods, which would seem to indicate that patients with depressive disorders are less selective in their methods. This implies that strategies limiting access to certain means of suicide might be less effective for the largest group of patients, i.e. those with depressive disorders. These patients might switch to a different method if one method were to become less easily available. This phenomenon should be anticipated if interventions limiting inpatients' access to railways are to be successful.