HHS Public Access

Author manuscript

Mayo Clin Proc. Author manuscript; available in PMC 2016 November 01.

Published in final edited form as:

Mayo Clin Proc. 2015 November ; 90(11): 1475–1481. doi:10.1016/j.mayocp.2015.07.023.

Patterns of Healthcare Usage in the Year Prior to Suicide: A Population-Based Case-Control Study

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Abstract

Objective—To compare the type and frequency of healthcare visits in the year before suicide between decedents and controls.

Patients and methods—Cases (n=86) were Olmsted County, Minnesota residents whose death certificates listed “suicide” as the cause of death from January 1, 2000 through December 31, 2009. Each case had three age- and sex-matched controls (n=258). Demographic, diagnostic and healthcare usage data were abstracted from medical records. Conditional logistic regression was used to analyze differences in the likelihood of having had psychiatric and non-psychiatric visits in the year before death, as well as in visit types and frequencies 12 months, 6 months and 4 weeks before death.

Results—Cases and controls did not significantly differ in having had any healthcare exposure (p=.18). Suicide decedents, however, had significantly higher numbers of total visits in the 12 months, 6 months, and 4 weeks prior to death (all p<.001), were more likely to have carried psychiatric diagnoses in the previous year (OR 8.08; 95% CI 4.31 to 15.17, p<.001) and were more likely to have had outpatient and inpatient mental health visits (OR 1.24, 95% CI 1.05 to 1.47, p=.01, OR 6.76, 95% CI 1.39 to 32.96, p=.02, respectively). Only cases had had emergency department mental health visits; no control did.

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Megan M. Chock reports no conflicts of interest.
Tanner J. Bommersbach reports no conflicts of interest.
Jennifer Geske reports no conflicts of interest.
J. Michael Bostwick reports no conflicts of interest.

Disclaimer

The views expressed in the submitted article are the authors’ own and not an official position of Mayo Clinic.

Financial support and disclosure

Supported in part by an Alpha Omega Alpha Carolyn L. Kuckein Student Research Fellowship.

Conclusion—Given that suicide decedents did not differ from controls in having had any healthcare exposure in the year before death, the fact alone that decedents saw a doctor provides no useful information about risk. Compared to controls, however, decedents had more visits of all types including psychiatric ones. Higher frequencies of healthcare contacts were associated with elevated suicide risk.

Keywords

Suicide; health behavior; mental health; epidemiology; health services research

Background

Suicide is an important public health issue for two main reasons: the size of its impact and the potential for its prevention. Suicide is the tenth-leading cause of death in America, taking 41,149 lives in 2013 and representing 1.6% of all deaths in the United States.[1] For every one of these suicide deaths, countless others are affected, including the bereaved, community members, and providers.

Suicide prevention has gained national attention starting with the 1999 Surgeon General's Call to Action to Prevent Suicide, which was revised in 2012 to include an emphasis on the role of screening for suicide in primary care and emergency departments.[2] The idea that healthcare providers play a role in suicide prevention stems from research showing that 75–80% of all suicide decedents have contact with the healthcare system in the year before their death.[3–5]

That the medical literature so often references that those dead by suicide have visited a doctor in close proximity to their deaths makes it seem as if this fact alone can aid in predicting suicide. However, these studies almost never contain a non-suicide comparator group and thus shed no light on whether there are any differences in patterns of healthcare usage in suicides vs. non-suicides. A handful of case-control studies comparing patterns of healthcare utilization between suicide cases and members of the general population have been conducted in Canada,[6,7] Taiwan,[8] the United Kingdom,[9] Iceland[10] and Denmark[11] as well as among U.S. military service members[12] and on an Indian reservation in the upper Midwest.[13] These studies largely focus on specific types of visits rather than overall patterns of healthcare use; for example, outpatient visits to general practitioners and/or mental health providers,[7–9,12] emergency department visits[10] or inpatient hospitalizations.[11] Only one compares patterns of healthcare utilization in outpatient, inpatient, emergency and community mental health settings among adults in Alberta, Canada.[6]

These studies have yielded mixed results, with the majority finding an increased amount of health care utilization by suicide cases vs controls.[6,10–12] One study found no difference in the month before death but increased utilization by cases in the 10 years prior,[9] and a single study found a decreased likelihood of accessing health care in the six months prior to suicide.[13] In addition to non-uniform assessments of healthcare utilization, the generalizability of these studies is limited due to differences between these healthcare systems and populations and that of the United States.

Without firmly establishing that there are significant differences in patterns of healthcare use between those who die by suicide and similar others in the general population who do not, it is unreasonable to expect that providers ought to be able to identify suicide risk merely based on the fact that patients have visited a doctor.

Objective

To compare the frequency and types of healthcare contact in the year before death between suicide decedents (cases) and age- and sex-matched controls over the same time period.

Patients and Methods

Both Mayo Clinic and Olmsted Medical Center Institutional Review Boards approved the study.

Study Population and Setting

The Rochester Epidemiology Project (REP), established in 1966, contains the medical records of a population-based cohort in Olmsted County, Minnesota.[15] The two major healthcare providers in Olmsted County are the Mayo Clinic and the Olmsted Medical Center (OMC), which through multiple branch offices and associated hospitals care for nearly every Olmsted County resident.[15] As of 2010, the REP database contained the records of 502,860 unique residents of Olmsted County who had had at least one contact with a healthcare provider in the Mayo Clinic or OMC system.[15] The REP database provides a unique opportunity to examine a population not segregated by type of health insurance or specific provider. Researchers have access to EMR and paper charts for detailed review, which provide more information on patient-provider interactions than billing or diagnosis codes. The data contained in the REP allow the design of retrospective population-based case-control studies.

Study Design

This was a population-based case-control study. The primary research question was whether or not there were significant differences in healthcare utilization between people who would go on to die by suicide and similar others within the population during the 12 months prior to death date. In other words, if an eventual suicide decedent and a similar person presented to a healthcare setting in the same time period, were there any differences in the pattern of healthcare visits that might indicate a higher likelihood of dying by suicide?

Case selection

Cases were selected from Olmsted County death certificates from January 1, 2000 to December 31, 2009 (10 years), which were reviewed by a member of the REP study team that was not involved with data collection. All individuals with “suicide” listed as the cause of death were considered potential cases. The resulting 132 records were then assessed by two authors (MC and TB) to confirm residency status in Olmsted County in the year prior to death, classified by last recorded address in an Olmsted County zip code. This resulted in 86 confirmed cases of suicide in Olmsted County residents between 2000 and 2009. Each

subject kept his or her unique REP ID number as an identifier without any name or demographic data.

Control selection

The final list of 86 cases was sent to a third author (JG). For each case, three controls were randomly selected from matched Olmsted County residents who had provided research consent for the REP (258 controls). Controls were matched according to date of birth (within one year) and sex. All controls were confirmed to be residents of Olmsted County during the study period. The final blinded list of 344 study subjects (86 cases, 258 controls) was sent to authors MC and TB for data collection. Controls were matched in a 3:1 ratio consistent with established methods.[17]

Data Collection Methods

Two authors (MC and TB) independently reviewed the entire medical record for each subject for the year prior to death using the REP browser and electronic and paper medical records at each institution (Mayo Clinic, Olmsted Medical Center, and Olmsted County Hospital). The following demographic information was collected for each subject:

- Sex
- Birthdate
- Zip code

From within the medical record, the following information was extracted for any face-to-face healthcare visit that occurred within the one year prior to the death date of the corresponding suicide decedent:

- Type of visit (one of six categories): Inpatient mental health (MH), Inpatient non-MH, Outpatient MH, Outpatient non-MH, Emergency MH, and Emergency non-MH
- For an inpatient admission, total number of days hospitalized (initial admission note to hospital discharge summary)

Only face-to-face healthcare visits were counted during this study, based on the assumption that these represented potential opportunities for providers to address suicide prevention. The Appendix contains details on definitions and classification of visits.

Statistical Analysis

Study data were collected and managed using Research Electronic Data Capture (REDCap) electronic data capture tools hosted at Mayo Clinic,[18] cleaned, and transferred to SAS Version 9.3. Matched analysis via conditional logistic regression was used to examine differences in frequency and type of visits between suicide decedents and controls, and to test for associations between death by suicide and other factors with $p<.05$ used to denote statistical significance. Cases and controls were compared in the following ways:

- Likelihood of at least one face-to-face visit with a healthcare provider during the previous year (12 months)

- Number of total visits within 12 months, six months, and four weeks of death date
- Types of healthcare contacts within the prior 12 months
- Presence of a mental health diagnosis

Results

Suicide decedents and control subjects did not differ significantly on any baseline variables except that cases were significantly more likely to have a mental health diagnosis in the prior 12 months (OR 8.08, 95% CI 4.3 to 15.2, $p<.001$; see Tables 1 and 2).

In univariate analysis by case and control status, the number of total visits in the 12 months (9.1±12.2 vs 4.5±6.9, OR 1.06, 95%CI 1.03 to 1.09, $p<.001$), 6 months (5.0±8.3 vs 2.3±3.9, OR 1.10, 95%CI 1.04 to 1.16, $p<.001$) and 4 weeks (1.1±2.2 vs 0.4±1.0, OR 1.38, 95% CI 1.15 to 1.67, $p<.001$) prior to death date were all significantly higher in cases than controls. The total days of inpatient treatment were also significantly higher in cases than controls (3.8±10.5 vs 0.3±2.0, OR 1.19, 95%CI 1.08 to 1.32, $p<.001$), driven by differences in inpatient mental health stays (3.2±10.3 vs 0.1±0.9, OR 1.30, 95% CI 1.05 to 1.61, $p=.02$). There was no statistically significant difference in days of non-mental health inpatient treatment between cases and controls (0.6±2.5 vs 0.3±1.5, OR 1.10, 95% CI 0.97 to 1.25, $p=.14$). Cases were also significantly more likely to have visited the emergency department for a non-mental health reason in the past 12 months (OR 1.51, 95%CI 1.04 to 2.20, $p=.03$). However, the likelihood of having had any healthcare contact in the past 12 months was not significantly different; 78% of controls and 85% of cases had at least one healthcare visit in the past 12 months (OR 1.56, 95%CI 0.82 to 2.99, $p=.18$; see Table 2).

When adjusting for the presence of mental health diagnosis, new differences emerged. Cases were more likely to have had non-mental health inpatient admissions than controls (OR 1.86, 95%CI 1.02 to 3.41, $p=.05$; see Table 3). Cases were not significantly more likely to have had an emergency department visit for a non-mental health reason (OR 1.47, 95% CI 0.97 to 2.23, $p=.07$). The finding that cases were significantly more likely to have had visits for mental health reasons in inpatient, outpatient and emergency department settings was unchanged. Cases were also significantly more likely to have had a healthcare visit in the prior 12 months (OR 1.04, 95% CI 1.00 to 1.07, $p=.04$) and four weeks before death when compared with controls during the same time period (OR 1.26, 95%CI 1.01 to 1.60, $p=.04$).

Discussion

This study is unique in several ways. Unlike previous studies based in the United States, it is population-based and does not rely on study subjects having a health plan membership or health insurance during the study period.[3] In this way, the results are more useful for healthcare providers, who realistically only see patients who actually come to their office. Given the paucity of studies comparing healthcare contact by suicide decedents to matched controls in the general U.S. population, the REP provides a generally homogenous population and potentially more generalizable results.[15] The majority of suicide cases

confirmed by death certificate data were male (72 of 86 cases, 83.7%), consistent with others' findings.[19,20]

Interestingly, our results were similar to other population-based case-control studies in markedly different healthcare systems. Recent studies in Canada,[6] Taiwan[8] and Denmark[11] also found an increased likelihood amount of healthcare utilization in suicide cases compared with controls. These countries have universal health insurance, unlike the United States. These studies, combined with our results, seem to indicate that increased healthcare utilization among suicide decedents is a consistent pattern across different cultures and health systems.

A significant strength is that this study focused on provider documentation rather than ICD and billing codes. It was assumed that the provider would document issues of concern addressed during that face-to-face interaction, which was of particular importance in considering whether an active mental health issue was present. Reviewing the medical record in a retrospective fashion simulated the plausible clinical scenario of a provider reviewing a patient's chart before or during a face-to-face visit. Put differently, clinicians would have had access to the same information that we did when conducting this study and similarly would have been able to recognize different types and frequency of healthcare usage. A potential limitation of relying on retrospective documentation is that providers may not have accurately recorded all clinical problems addressed, or may have omitted or incorrectly documented parts of the interaction.

Our results yielded several notable findings. Suicide decedents were significantly more likely to have had a mental health diagnosis and not surprisingly were significantly more likely to have had more mental health-related visits in the outpatient, inpatient, and emergency department settings. However, there was no significant difference in the odds of having had any contact with the healthcare system in the year prior to death. In other words, merely stating that suicide decedents have had contact with the healthcare system in the past year is not in and of itself a distinguishing factor of healthcare use. Suicide decedents were not more likely than controls to have outpatient visits for non-psychiatric reasons.

With respect to the frequency of healthcare utilization, suicide decedents had a significantly higher number of visits of any sort in the year prior to death, six months prior to death, and four weeks prior to death than control subjects in the same time periods. Suicide decedents spent significantly more days in the hospital than controls (3.8±10.5 vs. 0.3±2.0, OR 1.19, 95% CI 1.08 to 1.32, $p<.001$), which was driven almost entirely by increased inpatient days for a psychiatric reason. Interestingly, after controlling for mental health diagnosis, suicide decedents had a higher number of days spent in the inpatient setting for non-psychiatric reasons, suggesting that they may have been sicker overall. These findings are consistent with other studies that have found an association with suicide and physical comorbidities[11] in addition to psychiatric disorders.[14,20]

One type of healthcare utilization, emergency department visits for a mental health reason, was a distinguishing factor between cases and controls. No control presented in the emergency department for a mental health reason throughout the study period. In contrast,

14 of the 86 suicide decedents (16%) had at least one emergency department visit for a mental health reason in the year before death. This finding suggests that record of presentation in the emergency department for a mental health issue should alert clinicians that the patient carries significantly higher likelihood of death by suicide. Although cases were also more likely than controls to have visited the emergency department for non-mental health reasons in the past year, when controlling for mental health diagnosis no significant difference between cases and controls was found. One interpretation of this finding is that mental health diagnosis is associated with a higher number of emergency department visits, which others have similarly described.[6,10,21] A recent case-control study nested in the cohort of patients presenting to the emergency department in Reykjavik, Iceland found that suicide risk increased with the number of ED visits in a dose-response matter even after controlling for age, gender and psychiatric diagnoses.[10]

An inherent limitation to the REP is that only healthcare visits to licensed providers in the Mayo Clinic and Olmsted Medical Center systems are included in the database; the records from community mental health providers (e.g. psychologists, therapists, social workers) are not available.[15] Thus, this study may underestimate the number of outpatient mental health visits for all subjects. Another inherent limitation is that study subjects are limited to Olmsted County residents. As others have noted, death certificate data may underrepresent suicide mortality by as much as 24%.[20] Therefore, it is possible that the cases identified in this study may not represent all of the suicide decedents in Olmsted County.

The REP database does not contain information on health insurance status, education, and neighborhood income, which can affect healthcare utilization.[22,23] Although this is a limitation, our study focused on identifying particular patterns of healthcare usage that, in addition to known risk factors, may be used to inform suicide prevention. This study was designed to answer whether or not health care providers might be able to use a patient's pattern of recent health care use to identify increased suicide risk, not to explain the reason for differential utilization. The overall aim is to improve suicide prevention for providers. Two necessary conditions for this are 1) provider recognition of warning signs for suicide[24] and 2) the opportunity to interact with a patient, which this study defined as a face-to-face visit. Factors such as socioeconomic status or mental health history are risk factors for suicide, but they are largely non-modifiable from a provider's perspective.[24] In contrast, providers have more opportunities to address modifiable warning signs in patients who interact more frequently with the healthcare system. The challenge is to recognize these opportunities.

Further studies that build upon this study's findings to more clearly identify predictors of suicide are necessary to inform prevention. For example, a similarly designed REP study comparing suicide cases with psychiatric diagnoses to non-suicidal controls with psychiatric diagnoses could identify different clinical presentations before death date. This study was not designed to focus on differences between suicide decedents that may have contributed to differential healthcare utilization. Future studies comparing suicide method, specific mental health diagnosis, and non-mental health conditions may help further understanding of the drivers of increased healthcare utilization among suicide decedents.

Conclusion

It appears that the distinguishing factors for a group at higher risk of suicide are those with mental health histories, any healthcare visit for a mental health reason, and hospitalizations for any reason. Only suicide decedents had record of an emergency room visit for any mental health reason in the time period analyzed, indicating that a clinician must be aware of the increased likelihood of suicide in any individual with this type of visit. Suicide decedents are more likely than age- and sex-matched controls to interact with the healthcare system in the outpatient, inpatient and emergency department settings in the month and year before death. In addition to awareness about other suicide risk factors, clinicians and health systems should recognize that patients exhibiting increased healthcare usage particularly for mental health reasons might be at higher suicide risk.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

1. Contributors: We would like to thank Barbara (Barb) Abbott of the Rochester Epidemiology Project for her assistance in obtaining death certificate data and training with the REP browser, and Melissa Rethlefsen for her assistance with the initial literature review.

2. Funders: Supported in part by an Alpha Omega Alpha Carolyn L. Kuckein Student Research Fellowship. This study was made possible by the Rochester Epidemiology Project (grant number R01-AG034676; Principal Investigators: Walter A. Rocca, MD, and Barbara P. Yawn, MD, MSc).

3. Prior presentations: American Association of Suicidology Annual Conference, April 18, 2015.

Permission has been obtained from those acknowledged.

Alphabetical list of abbreviations

CI	Confidence interval
MH	Mental health
OR	Odds ratio
REP	Rochester Epidemiology Project

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Appendix. Definition and criteria of healthcare visits

Visit – face-to-face contact between patient and provider

- Not including tests (e.g. echocardiograms, imaging, colonoscopies)
- Not including written or telephone correspondences

Mental health diagnosis – a patient was defined as having a mental health diagnosis in the past year if the following were present:

1. Visit to any healthcare provider described a mental health diagnosis (e.g. mood disorder, psychotic disorder, anxiety, substance abuse disorder other than tobacco) as an active issue discussed during the visit and/or included in the final treatment
2. Record of a provider renewing or prescribing an anti-depressant, mood stabilizer, or a documented phone call to discuss mental health

Mental health visit

Mental health or substance abuse diagnosis listed as an active issue in the final impression/plan, not including nicotine dependence

1. Did not include marital counseling, sex therapy, sleep studies

Inpatient admission and length of stay

- One visit constituted by a hospital admission note and a hospital discharge summary
  - Multiple interactions with various healthcare providers and specialties encompassed in same visit
- Length of stay started at hospital admission date and ended at hospital discharge summary date
  - If hospital admission and discharge occurred in the same day, length of stay = one day
- Included operations (documentation had to include an operation note)

Table 1

Demographics

	All N=344	Controls N=258	Cases N=86
Age (at case's time of death)	45.7±18.9	45.6±18.7	45.7±19.0
Gender (male)	288 (83.7)	216 (83.7)	72 (83.7)

Table 2

Healthcare utilization by case/control status

	All N=344	Controls N=258	Cases N=86	OR (95% CI)	p-value*
Any visit in the past 12 months**	274 (79.7)	201 (77.9)	73 (84.9)	1.56 (0.82, 3.0)	.18
Mental health diagnosis in the past 12 months	**74 (21.5)**	**30 (11.6)**	**44 (51.2)**	**8.08 (4.3, 15.2)**	**<.001**
Total visits (all types)					
Prior 12 months*	**5.6±8.8**	**4.5±6.9**	**9.1±12.2**	**1.06 (1.03, 1.09)**	**<.001**
Prior 6 months	**2.9±5.5**	**2.3±3.9**	**5.0±8.3**	**1.10 (1.04, 1.16)**	**<.001**
Prior 4 weeks	**0.6±1.4**	**0.4±1.0**	**1.1±2.2**	**1.38 (1.15, 1.67)**	**<.001**
Days inpatient (all types)	**1.2±5.7**	**0.3±2.0**	**3.8±10.5**	**1.19 (1.08, 1.32)**	**<.001**
Days inpatient MH	**0.8±5.4**	**0.1±0.9**	**3.2±10.3**	**1.30 (1.05, 1.61)**	**.02**
Days inpatient nonMH	0.4±1.8	0.3±1.5	0.6±2.5	1.10 (0.97, 1.25)	.14
MH ED visits	**0.1±0.5**	**0.0±0.0**	**0.4±1.0**	**-**	**-**
MH outpatient visits	**1.0±0.5**	**0.2±1.1**	**3.1±8.3**	**1.55 (1.27, 1.89)**	**<.001**
MH inpatient admissions	**0.1±4.4**	**0.0±0.1**	**0.3±0.9**	**15.70 (3.59, 68.59)**	**<.001**
non MH ED visits	**0.3±0.6**	**0.2±0.5**	**0.4±0.8**	**1.51 (1.04, 2.20)**	**.03**
non MH outpatient visits	4.1±6.4	3.9±6.3	4.7±6.6	1.02 (0.98, 1.06)	.34
non MH inpatient admissions	0.1±0.4	0.1±0.4	0.2±0.5	1.51 (0.88, 2.59)	.14

*All p-values are from conditional logistic regression models. Mean±SD are presented to give readers a context in additional to the odds ratio.

**Frequency (%)

***Mean ± s.d.

Table 3

Healthcare utilization by case/control status adjusted for mental health diagnosis

	OR (95% CI)	p-value
Any visit	1.17 (0.57, 2.40)	.66
Total visits		
prior 12mo	**1.04 (1.002, 1.07)**	**.04**
prior 6mo	1.05 (0.99, 1.12)	.10
prior 4wk	**1.26 (1.01, 1.58)**	**.04**
Days inpatient	**1.13 (1.02, 1.25)**	**.02**
Days inpatient MH	1.161 (0.98, 1.38)	.08
Days inpatient nonMH	1.092 (0.95, 1.25)	.21
MH ED visits	-	-
MH outpatient visits	**1.24 (1.05, 1.47)**	**.01**
MH inpatient admissions	**6.76 (1.39, 32.96)**	**.02**
non MH ED visits	1.47 (0.97, 2.23)	.07
non MH outpatient visits	1.01 (0.96, 1.05)	.82
non MH inpatient admissions	1.86 (1.02, 3.41)	.05