CLINICAL INVESTIGATIONS

Utilization of the Emergency Department after Self-inflicted Injury

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Abstract

Objectives: To compare emergency department (ED) utilization by individuals who present with self-inflicted injuries with utilization by control populations. Individuals with self-inflicted injuries commonly present to the ED, yet little research has been conducted on this population in this setting. **Methods:** Individuals who had an ED presentation in 1995–1996 for a self-inflicted injury were tracked prospectively for three to four years of follow-up. This group was matched by age and gender to two groups: individuals who presented with asthma and individuals who presented with other complaints. Data on return visits to the ED were collected from an administrative database. Groups were compared on rates of return visits. **Results:** There were 478 individuals randomly selected for each group. Individuals in the self-inflicted injury group had higher rates of return visits to the ED over the follow-up period: 232.7 visits per 100 person-years for the self-inflicted injury group, compared with 117.6 for the asthma group, and 83.0 for the "other" group ($p < 0.001$). The self-inflicted injury group had higher rates for many types of diagnoses: self-inflicted injuries, mental disorders, substance abuse, unintentional injuries, assault, headache pain, and other complaints (all $p < 0.001$). Patients with more than three repeat visits per year were more common in the self-inflicted injury group (20.1%) than the asthma or "other" groups (9.2% and 5.6%, respectively). **Conclusions:** Individuals who harm themselves are chronic users of the ED. The ED represents an opportune setting from which individuals can be directed to appropriate treatment programs. **Key words:** self-injurious behavior; attempted suicide; emergency medicine; follow-up studies; utilization. ACADEMIC EMERGENCY MEDICINE 2004; 11:136–142.

Self-inflicted injuries are a common emergency department (ED) presentation and a significant public health issue. A recent international review found that 3–5% of people responded "yes" to the question "have you ever attempted suicide?"[1] This is of particular concern for emergency physicians because, for a variety of reasons, many individuals with self-inflicted injuries seek medical care at emergency facilities. Recent data from 104 EDs in Alberta, Canada, showed that one of every 200 presentations to the ED was for a self-inflicted injury.[2] A study from the United States reported 128 ED presentations for self-inflicted injury per 100,000 population per year in California and 182 per 100,000 population per year in Missouri.[3]

Self-harming individuals suffer from a wide variety of problems, including psychiatric disorders, unemployment/financial difficulties, substance abuse, a difficult childhood, poor physical health, family and intimate partner violence, and relationship difficulties.[4–7] Moreover, these individuals are also at high risk for future self-harming and suicidal behavior.

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Received May 1, 2003; revision received August 22, 2003; accepted August 27, 2003.

Presented at the 16th Suicide Research Symposium, Edmonton, AB, April 1999; 5th World Conference on Injury Prevention and Control, New Delhi, India, March 2000; American Association of Suicidology 34th Annual Conference, Atlanta, GA, April 2001; and Congress of Epidemiology, Toronto, ON, June 2001.

Support for this project was generously provided by the Alberta Centre for Injury Control and Research (ACICR) and the Division of Emergency Medicine, both of the University of Alberta. Mr. Colman was supported in part by the Canadian Association of Emergency Physicians (CAEP) Research Consortium (CAEP RC; Ottawa, ON). Ms. Dryden is supported by the Alberta Heritage Foundation for Medical Research (AHFMR, Edmonton, AB) Graduate Student Program and the Alberta Paraplegic Foundation (TAPF, Edmonton, AB) Studentship Program. Dr. Chahal was supported by Alberta Heritage Foundation for Medical Research (AHFMR, Edmonton, AB) Summer Studentship Program. Dr. Rowe is supported by the Canadian Institute of Health Research (CIHR, Ottawa, ON) as a Canada Research Chair.

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A related commentary appears on page 177.

doi:10.1197/j.aem.2003.08.016

Within one year of the index self-harming episode, 16% of people will repeat this behavior.[8] Furthermore, 7% of individuals who self-harm will eventually die of suicide.[8] Individuals who injure themselves also have increased mortality rates for other causes of death, including violence, injuries, and natural causes such as circulatory and respiratory system disorders.[9–11]

Given the multitude of problems they are dealing with, it is not surprising that individuals commonly access health care in the month prior to a self-harming event.[12–15] There is less research examining health care utilization after a self-harming incident; however, there is evidence that individuals are much more likely to access non-emergency health services, including visiting a family practitioner, after a self-inflicted injury compared with the general population.[12,16,17] One such study led to a call for primary care physicians to take a greater role in ''responding to people at risk for suicide.''[18]

It is unknown whether the trend of increased use of health services after a self-harming incident extends to the ED. The objective of the present study was to compare the ED utilization by individuals who presented with self-inflicted injuries with that by control populations typically seen in the ED. To our knowledge, this is the first study using administrative data in a defined population to examine use of the ED by individuals with self-inflicted injuries.

METHODS

Study Design. A prospective cohort study design was used that compared rates of utilization of the ED by three groups: individuals who presented with self-inflicted injuries, individuals with a visit for asthma, and a random sample of ''other'' ED users. The protocol for this study was approved by the Health Research Ethics Board of the University of Alberta.

Data Source. Individuals for this study were identified through the Ambulatory Care Classification System (ACCS), a database that tracks all ambulatory services provided in the province of Alberta, Canada. For this study, a subset of the ACCS database that included all visits to Edmonton region EDs was made available. The catchment area for these includes the city of Edmonton and surrounding communities, comprising approximately 1,000,000 persons. Because the Canadian health care system is a public, single-payer system (i.e., it is not possible for patients to seek private health care in an emergency situation), the ACCS database captures every medical event in the region that is treated in an ED.

For every ED visit, a separation record was prepared by a trained medical records nosologist. Each record in the database contained a unique personal health number, the service provided, the date and time of visit, and up to ten diagnoses. The personal health number allowed for linkage to demographic data through a registry database that includes virtually all (>99%) Alberta residents.[19]

Definitions. Self-inflicted injuries are often referred to as suicide attempts. However, the term ''suicide attempt'' carries an implication that there is intent to take one's life. Many behaviors are suicidal in nature but are not initiated with a clear suicidal intent. In this article, we refer to any non-fatal behaviors that are suicidal in nature as ''self-inflicted injuries'' or ''self-harming events.''

Study Setting and Population. To be eligible to be selected as a case for the study, an individual had to visit one of the four EDs in Edmonton during the fiscal year of 1995–1996 (April 1, 1995, to March 31, 1996) with a self-inflicted injury. Self-inflicted injury was defined as any visit to the ED that received a diagnostic code, in any of the ten diagnostic codes, of ''Suicide and self-inflicted poisoning/injury'' according to the International Classification of Diseases, 9th revision, Clinical Modification (ICD9-CM).[20] This included codes of E950–E958.9, but excluded E959 (''Late effects of self-inflicted injury''). Finally, individuals had to be residents of the region to be eligible for the study to facilitate follow-up.

A random sample of 500 individuals with self-inflicted injury visits was selected for the study. The random selection was completed by using SPSS Version 11.0.1 (Chicago, IL) from a list of all individuals who met the case definition above.

A chart review was performed by one study author (AMC) to confirm the index diagnosis of self-inflicted injury that led to inclusion in the study. Standardized data collection forms were used for this purpose. Cases that were clearly miscoded and cases in which deliberate intention to self-injure was questionable (e.g., clear inadvertent poisoning) were excluded from the study. Excluded cases were reviewed by several authors, and any exclusion decision was made by consensus.

Each individual in the self-inflicted injury group was matched by gender and five-year age bands to one individual who had a visit in 1995–1996 for asthma (asthmatic group) and one individual who had a visit in 1995–1996 for any reason, excluding asthma and self-inflicted injury (random ED group). Asthmatics were chosen as a comparison group because they are a group traditionally associated with frequent use of the ED. Individuals were eligible for the asthmatic group if they had a visit with an ICD9-CM diagnostic code of 493.x, which identifies ''Asthma.'' Individuals were eligible for the random ED group as long as their ICD9-CM diagnostic code(s) did not meet the criteria for the self-inflicted injury group or the asthmatic group.

Each match was randomly selected by using SPSS Version 11.0.1 from all individuals of the same gender and five-year age band who presented to the ED in

1995–1996. All individuals had to be discharged alive to be eligible for the follow-up portion of the study.

Study Protocol. By using the personal health number attached to every visit in the database, information was collected about subsequent visits to any ED in the region during the follow-up period. Return visit information was extracted for any visits in the initial year (1995–1996) subsequent to the index visit and any visits in the following three years (April 1, 1996, to March 31, 1999). Thus, follow-up time could vary from three to four years.

Measures. The primary outcome of interest was the rate of follow-up visits to the ED for any reason during the follow-up period. Follow-up visits were subdivided into several categories to look at specific ICD9-CM diagnoses (see Appendix). The four most common diagnoses among all follow-up visits are reported: injury, mental disorders, headache, and respiratory disease. In addition, selected subcategories of these diagnoses are reported. Each follow-up visit was uniquely assigned to one category according to the first diagnostic code assigned, with the exception of self-inflicted injuries and assaults, which were assigned according to E-codes that must appear after the first diagnostic code.

Data Analysis. Data were tabulated by using SPSS Version 11.0.1. Rates of return visits among the self-inflicted injury group were compared with the asthmatic group and random ED group by using Poisson methods.[21] Rates are presented as the number of visits per 100 person-years, with 95% confidence intervals (CIs). Rates are compared between groups using a Mantel–Haenszel chi-square test.[21]

RESULTS

Sample Selection. During 1995–1996, there were 275,660 total visits to the four Edmonton EDs, of which 2,573 (1%) were coded as self-inflicted injuries. The self-inflicted injury visits were made by 2,178 individuals, of whom 1,516 were local residents. Of these, 500 were randomly selected for the study (see Figure 1). Following the chart review, 22 individuals (4%) were excluded from the self-inflicted injury group: three (<1%) because their personal health numbers were not valid (precluding follow-up), six (1%) because their initial visit was miscoded as a self-inflicted injury (e.g., insect bite), and 13 (2%) because it was unlikely that they actually had the intention to injure themselves (e.g., individual inadvertently took incorrect dose of prescribed medication). The final sample consisted of 478 individuals with self-inflicted injuries, who were matched by age and gender to 478 individuals with asthma and 478 individuals randomly selected from the ED population (non-self-inflicted injury, non-asthma).

The most common method of self-inflicted injury among the sample was self-inflicted poisoning (primarily drug overdose) by 410 (86%) individuals, whereas 48 (10%) individuals cut themselves and 20 (4%) used other methods.

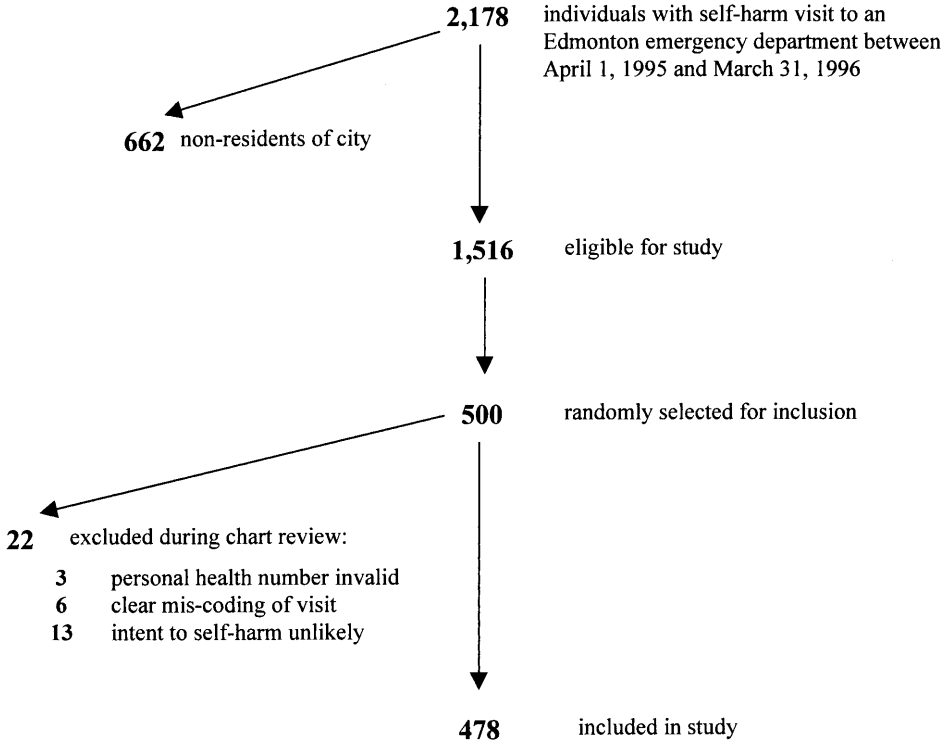

Figure 1. Inclusion/exclusion for self-inflicted injury cases in the study.

Description of Groups. There were 156 (32.6%) males and 322 (67.4%) females in each group. The mean age at the time of the initial ED visit was 32.2 years (SD ± 13.0) for the self-inflicted injury group, 32.0 (SD ± 13.1) for the asthmatic group, and 31.7 (SD ± 13.4) for the random ED group.

Follow-up Visits. Because date of the index visit varied in the index year, follow-up times differed slightly among the three groups. The total follow-up time was 1,671.87 person-years for the self-inflicted injury group, 1,723.93 person-years for the asthmatic group, and 1,699.62 person-years for the random ED group.

Table 1 shows that the rate of return visits to the ED for any reason during the follow-up period was significantly higher for the self-inflicted injury group than either of the comparison groups ($p < 0.001$). Rates of return visits for the self-inflicted injury group were almost twice that of the asthmatic group and more than two times that of the random ED group.

Injury Visits. Rates of return visits for any type of injury (intentional or unintentional) were significantly higher among the self-inflicted injury group than the asthmatic or the random ED groups ($p < 0.001$). Rates were higher for the self-inflicted injury group in all three injury subcategories (all $p < 0.001$). Rates of return visits for self-inflicted injury were approximately 20 times greater in the self-inflicted injury group than the random ED group or the asthmatic group. Rates of return visits as a victim of assault were more than three times higher in the self-inflicted injury group than the asthmatic group or the random ED group. Finally, rates of unintentional injury were more than twice as high in the self-inflicted injury group than the asthmatic group or the random ED group.

Mental Health Visits. Rates of return visits for any mental disorder were significantly higher in the self-inflicted injury group than in the asthmatic group and the random ED group ($p < 0.001$). Rates were also higher in the subcategories of mental disorders: depression, alcohol abuse, drug abuse, and other mental disorders (all $p < 0.001$). Rates were in the range of five to eight times higher for the self-inflicted injury group than for the asthmatic group and the random ED group for all these diagnoses. Return visits that received a primary diagnosis of schizophrenia were notably rare.

Headache Visits. Rates of return visits for treatment of headache were significantly higher in the self-inflicted injury than in the asthmatic group and the random ED group ($p < 0.001$). Rates of return visits that included a diagnosis of headache for the self-inflicted injury group were more than four times higher than the asthmatic group and more than twice as high as the random ED group.

Respiratory Disease Visits. Rates of return visits for acute treatment of respiratory disease were highest in the asthmatic group. However, rates of return visits for respiratory disease were significantly higher in the self-inflicted injury group than in the random ED group ($p < 0.001$).

Other Visits. Rates of return visits for other reasons (not categorized above) were significantly higher in the self-inflicted injury group than in the asthmatic group and the random ED group ($p < 0.001$).

Multiple Visits. Individuals with multiple return visits to the ED were common in all three groups; however, they were most frequent in the self-inflicted injury group. More than one fifth of the self-inflicted injury group (20.1%) averaged more than three visits

TABLE 1. Rates, by Group, per 100 Person-years of Follow-up, of Return Visits to Emergency Departments in Edmonton, AB, April 1, 1995, to March 31, 1999

	Rates per 100 Person-years of Follow-up (95% Confidence Interval)		
	Self-inflicted Injury Group (*n* = 478)	Asthmatic Group (*n* = 478)	Random ED Group (*n* = 478)
All visits	232.7 (225.4, 240.0)	117.6 (112.5, 122.8)	83.0 (78.7, 87.4)
Injury	59.6 (55.9, 63.3)	12.9 (11.2, 14.6)	14.9 (13.1, 16.8)
Self-inflicted	27.1 (24.6, 29.6)	0.9 (0.4, 1.3)	1.4 (0.8, 1.9)
Unintentional	25.2 (22.8, 27.6)	10.2 (8.6, 11.7)	11.4 (9.8, 13.0)
Assault	7.3 (6.0, 8.6)	1.9 (1.3, 2.6)	2.2 (1.5, 2.9)
Any mental disorder	43.9 (40.7, 47.1)	5.8 (4.7, 6.9)	6.5 (5.3, 7.7)
Depression	12.6 (10.9, 14.3)	2.1 (1.4, 2.8)	1.6 (1.0, 2.3)
Schizophrenia	0.5 (0.1, 0.8)	0.1 (0.0, 0.3)	0.0 (n/a)
Alcohol abuse	12.4 (10.8, 14.1)	1.2 (0.7, 1.7)	1.7 (1.1, 2.3)
Drug abuse	1.8 (1.2, 2.4)	0.2 (0.0, 0.5)	0.2 (0.0, 0.5)
Other mental disorder	16.6 (14.7, 18.6)	2.2 (1.5, 2.9)	2.9 (2.1, 3.7)
Headache pain	25.7 (23.3, 28.2)	5.5 (4.4, 6.6)	9.6 (8.2, 11.1)
Respiratory	9.3 (7.8, 10.7)	65.5 (61.7, 69.4)	3.5 (2.6, 4.4)
Other	94.1 (89.5, 98.8)	27.8 (25.4, 30.3)	48.5 (45.2, 51.8)

per year during the follow-up period, whereas less than 10% of the asthmatic group and the random group had three visits per year (9.2% and 5.6%, respectively). Five percent of the self-inflicted injuries group averaged more than ten visits per year during the follow-up period.

DISCUSSION

The results of the current study show that individuals who present to the ED with self-inflicted injuries are chronic users of the ED, even when compared with asthmatics, a patient group traditionally associated with heavy ED use. Our results indicate that it is not a small percentage of individuals who skew the results, but, in fact, a large proportion of the self-inflicted injury group returns on multiple occasions to the ED. Our results also confirm that individuals who engage in self-harming behavior suffer from multiple health problems and present in return visits to the ED for diverse reasons: mental health difficulties, substance abuse, personal violence, injuries, and poor physical health.

Similar characteristics have been reported among chronic ED users.[22–27] Follow-up studies describing chronic ED users have found that prior ED use is a significant predictor of future ED use, future hospitalization, and increased mortality.[27–29] The personal and societal costs of ED use, hospitalization, and premature death among the self-harming population are high. Although mental health interventions in the ED may not be efficient, appropriate, or possible for all patients with self-inflicted injuries, interventions to assist with their problems are clearly required and imperative. The ED may be an ideal place to identify individuals at high risk for future suicidal behavior and future ED use and refer them for appropriate outpatient prevention services.

Considering the majority of patients with self-inflicted injuries are discharged, the responsibility for risk assessment and referral to services after discharge lies with emergency physicians.[30] With respect to treatment options for these patients, many possible options (e.g., medications, therapy and counseling, and addiction treatment) are available to emergency physicians; however, limited evidence exists to direct the clinician. Systematic reviews have shown that antidepressants have little effect on reducing the rate of suicidal behavior among those with previous self-injuries.[31] However, psychosocial interventions, such as problem-solving therapy, have been shown to be effective,[31–33] particularly among high-risk suicidal patients.[32] Staff in the ED should direct patients to such programs where possible.

The most significant predictor of deterioration after a psychiatric emergency is noncompliance with follow-up treatment.[34,35] It seems likely that even simple strategies undertaken in the ED, such as encouraging treatment compliance, could prove beneficial to such patients. Arrangements for a fixed appointment for follow-up referral significantly increase the likelihood of referral compliance.[36] Moreover, linking the patients with a health care provider, albeit at times difficult, may be an important step to take in preventing further events.[37]

This study has several methodological strengths that make the results valid and unique. First, databases such as the ACCS can be powerful tools for conducting large-scale observational cohort studies. The ACCS database has full population coverage, does not tolerate missing data, and allows for linkage of visits through a unique personal health number. This can be particularly useful in studying traditionally difficult research populations, such as psychiatric patients.

Second, the coding for self-inflicted injuries appears valid. Although relying on E-codes from hospital data may underestimate the true prevalence of self-inflicted injuries,[38,39] it appears that self-inflicted injury visits are rarely miscoded. The chart review conducted for the present study found that 481 of 500 (96%) visits with self-inflicted injury E-codes were coded correctly. A similar exercise for a study in California found that 86% of visits with self-inflicted injury E-codes were coded correctly.[40]

LIMITATIONS

There are several limitations of this study that should be discussed. First, the method of statistical analysis chosen for the study assumes that visits are independent. However, visits to the ED by the same patient are correlated; individuals who use the ED are more likely to return to the ED than others.[29] Regardless, the purpose of the present study was to demonstrate the burden created by a particular group of ED users; whether there is any association between the visits does not diminish the fact that, as a group, individuals with self-inflicted injuries are chronic users of the ED.

Second, although the database used for this study had 100% coverage of any return visits to local EDs, it did not capture any return visits to EDs outside the region. If individuals in the study moved residence outside of the region and consequently accessed other EDs, these visits would not be captured in our database. This could bias our results if the three study groups differed in their rates of residential mobility. There is a strong body of evidence that suggests residential mobility is more common among psychiatric patients and the mentally ill than with the general population.[41–44] This evidence suggests that we may be underestimating the return visit rates of the self-inflicted injury group. Although it may be more likely that individuals in the self-inflicted injury group relocated outside of the city, we cannot verify this in the current study.

Finally, although coverage by the ACCS database is complete and diagnosis of self-inflicted injury appears to be accurate, it is possible that any given visit may be missing comorbid or secondary diagnoses. Other studies that did not use administrative data found that more than 80% of individuals had a psychiatric disorder at the time of a self-inflicted injury[4,5,7]; in the present study, only 35% of self-inflicted injury visits had a mental disorder diagnosis coded (data not shown). However, despite the acknowledgment of underreporting of certain diagnoses, there is no reason to suspect that it would introduce a bias by being more or less prevalent in one of the study groups.

CONCLUSIONS

Individuals who engage in suicidal behavior are chronic users of the ED and visit for a variety of reasons. Their increased rates of morbidity and associated ED use make interventions a high priority; the ED is an ideal place to identify high-risk patients who could benefit from appropriate treatment. Simple strategies that do not tax already overburdened EDs can be implemented to assist in the delivery of treatment programs that reduce future suicidal behavior.

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APPENDIX. ICD9-CM Diagnoses Used to Code Specific Emergency Department Visits

Injury: 800–999
Self-inflicted injury: E950–E958.9
Assault: E960–E968.9
Mental disorder: 290–316 excluding 307.81 (headache)
Depression: 296.2–296.99, 300.4, 309.0–309.1, 311
Schizophrenia: 295.0–295.9, 301.2
Drug abuse: 292.0–292.9, 304.0–304.9, 305.2–305.9
Alcohol abuse: 291.0–291.9, 303.0–303.9, 305.0
Headache pain: 346.0–346.9, 307.81, 784.0
Respiratory: 460–519
Other: Any visit not categorized above