Suicide and Life-Threatening BEHAVIOR

ORIGINAL ARTICLE

Life experiences preceding high lethality suicide attempts in adolescents at a level I regional trauma center

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Abstract

Objective: To describe life experiences associated with patterns of medically treated and documented self-directed violence among youth who attempted suicide using highly lethal means to understand precipitating factors among youth using such lethal means.

Method: Using data from a regional, level 1 Trauma center, we identified all youth suicide attempt survivors who received treatment from 2010 to 2018 for a suicide attempt with a firearm, hanging, or jump from height injury ($n = 42$). We described differences in patient demographics and life experiences associated with patterns of self-directed violence by suicide attempt mechanism. We additionally assessed mechanisms used in any prior suicide attempts to identify potential increasing lethality of mechanism selection.

Results: There were 42 eligible patients included, of whom 40.5% attempted suicide with a firearm, 26.2% with hanging, 33.3% with jumping injury. A greater proportion of patients with firearm injuries endorsed social support and had fewer preparatory acts, history of self-harming behavior, prior suicide behaviors, and fewer prior attempts compared to patients who attempted suicide with other mechanisms.

Conclusions: Given our findings, means safety should remain a key strategy to prevent highly lethal suicidal behavior among adolescents, especially with firearms, given that such attempts may occur prior to formal contact with mental health services.

KEYWORDS
attempted suicide, high lethality, youth suicide, firearm suicide, trauma inpatients

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INTRODUCTION

Suicide is the second leading cause of death for youth aged 10–17 in the U.S. (Centers for Disease Control & Prevention, 2018). For youth aged 10–17, the majority of these deaths are due to hanging and firearms (50.6% and 39.7%, respectively), while other mechanisms are much less frequent. Poisoning accounts for only 4.9%, and all other mechanisms each contribute less than 2% individually (Centers for Disease Control & Prevention, 2018). Firearms are the most lethal mechanism used in suicide attempts (82.5% case fatality), while the case fatality for hanging ranges from 69% to 84% (for all ages) (Baker et al., 2013). The high lethality of firearms directly contributes to the high proportion of deaths due to suicide using a firearm (Spicer & Miller, 2000). It also means that identifying opportunities for primary prevention is critical, as most people who attempt suicide with a firearm will not survive.

One of the challenges in youth suicide prevention is the difficulty in identifying youth at highest risk of attempting suicide (Hawton et al., 2012). In the absence of explicit communications of suicidal thoughts, intent, or prior nonlethal attempts, it is often difficult to appreciate the escalation of risk and to predict the mechanism of self-directed violence that an adolescent will choose to in an attempt to end their life. This pattern of risk circumvents conventional approaches to identifying and responding to overt warning signs as the primary mechanism for initiating suicide-focused lethal means safety measures. Indeed, the large majority of suicidal thoughts and behavior is covert and does not come to the attention of the healthcare system, thus greatly limiting the ability of healthcare providers to intervene prior to a highly lethal suicide attempt (Geulayov et al., 2018).

Joiner's Interpersonal Psychological Theory of Suicide (IPTS) posits that suicide risk is a combination of both the desire for death, and one's acquired capacity to enact lethal self-harm behavior (Chu et al., 2017; Joiner, 2005). The desire for death includes the perception that one is unable to make meaningful contributions (i.e., perceived burdensomeness) and the perception that one cannot establish or maintain meaningful relationships (i.e., thwarted belongingness). Conventional approaches to assessing and managing suicidality have tended to focus on desire for death (e.g., suicidal intent, wish to die, hopelessness) as a key predictor of suicide risk. However, the IPTS asserts that the desire for death is a necessary but insufficient condition for enacting lethal self-injurious behavior, and that lethal self-harm can only occur if one has acquired the capacity to engage in a fearsome and complex behavior, such as shooting oneself. The capacity for enacting suicide requires both the ability to tolerate intense physical and psychological pain and provocation, in concert with fearlessness about death (Joiner, 2005). Although one is at high risk of death by suicide when desire for death and acquired capacity intersect, imminent risk of enacting lethal self-harm is only possible in the context of access to lethal means.

Characterizing the extent to which youth who attempt suicide demonstrate patterns of suicidal behavior over time may inform prevention efforts for groups at elevated risk, particularly when considered in view of particularly high-risk methods of attempted suicide. Previous studies have noted the role of abuse and neglect (Joiner et al., 2007), military service (Bryan et al., 2010), and professions with frequent exposure to death and dying (e.g., health care, first responders) (Stanley et al., 2016) as contributors to suicide risk. In these cases, suicide risk is conceptualized as unfolding over a period of many years or decades relative to direct and indirect drivers of suicidality. However, adolescents as an age group suffer relatively high rates of death by suicide, including death by highly lethal means (e.g., firearms, ligatures, jumping from a height) that require very high levels of fearlessness about death and the ability to tolerate severe physical and psychological pain. Therefore, understanding precursors to highly lethal suicidal behavior among youth who have relatively less exposure to many years or decades of life experiences that are known to occasion fearlessness about death and tolerance of physical and psychological pain is important for conceptualizing the nature of highly lethal self-inflicted behavior in this population and for informing relevant prevention strategies.

Due to the high case fatality rate associated with the leading causes of death for youth who die by suicide, it is challenging to study patterns of suicide risk over time in youth who attempt suicide with highly lethal means. Many of the existing studies that examine factors associated with youth suicide rely on administrative data for these studies (Keeshin et al., 2018; McKean et al., 2018) may miss important information about precipitating circumstances that may be present in the chart notes or asked of the patient directly (if they survived the attempt). Studies like Choi et al. (2017), which use the National Violent Death Reporting System, are able to utilize coroner/medical examiner reports, which include some of this additional information, but still do not contain any patient reported description of precipitating factors (Choi et al., 2017).

Using data from a regional, level 1 trauma center, we conducted a descriptive study among youth who attempted suicide using highly lethal means and survived. Because we restricted our study to patients who had survived a suicide attempt, we were able to construct a more complete patient history using chart reviews to better understand the pre-suicide attempt life experiences and factors that may have contributed to their decision to attempt suicide and the specific mechanisms they chose. Using our theoretically derived assumption that suicide risk unfolds over time, we sought to describe differences, specifically with regard to reports of past suicide attempts, prior medical encounters and psychiatric history,

among patients who attempted suicide, stratifying on injury mechanism. Understanding these sequences of self-directed violence, health services utilization, and known history of mechanisms of self-directed violence may explicate the ways in which youth who engage in highly lethal suicide attempts demonstrate historical patterns that are consistent with the IPTS and that can elucidate opportunities for prevention.

METHODS

We studied youth suicide attempt survivors to identify life factors associated with mechanism used, comparing more and less lethal mechanisms. This study was conducted at Harborview Medical Center (HMC), a regional Level 1 pediatric and adult trauma center, in Seattle, WA. Eligible patients were youth who attempted suicide with a firearm, hanging/suffocation, or jumping injury. We were primarily interested in assessing characteristics associated with firearm-related suicide attempts, using other highly lethal means as comparators. Hanging/suffocation and jumping were selected for their high case fatality (61.4% and 34.5% among all ages, respectively) (Spicer & Miller, 2000), and the assumption that selection of a highly lethal mechanism indicated a greater intention to die in that suicide attempt than selection of less lethal means. Using the hospital's trauma registry, we identified pediatric (≤18 years old) suicide attempt patients who survived to hospital admission and received treatment at HMC between 2010 and 2018 for an index suicide attempt (counted as the first suicide attempt which received treatment at HMC during the enrollment period). Additionally, patients were excluded during the chart review if mechanism and/or intent did not match the inclusion criteria.

We developed an abstraction manual to facilitate chart abstraction. Data elements included fit within domains of acquired capacity, access to lethal means, role of the social network, and possible contributing factors that could immediately precipitate a suicide attempt. To understand patterns of behavior and life events that may confer risk of suicide, we assessed documentation of prior suicide attempts, mechanism used and timing of prior attempts, sexual abuse, child abuse, witnessing or experiencing intimate partner violence, and other forms of victimization. For lethal means access, we examined documentation of firearm access (e.g., parent ownership, or firearm at home), and most expedient form of firearm access (e.g., patient owns a firearm, patient has friends or family with a firearm). We additionally examined whether or not there was documentation of lethal means counseling during the hospitalization, and if so, which mechanisms were included in these conversations. Finally, for possible contributing factors, we included documentation of homelessness, substance use disorders, mental illness diagnosis, medication to manage mental health, family history of mental illness,

indication of substance use at the time of the index suicide attempt, and acute stressors including health issues, family conflict, financial issues, employment, humiliating experience, loss of a loved one, conflict with significant other, legal issues, sleeping issues, psychiatric issues, housing, moving to a new area, bullying, change in school, academic issues, anxiety about the future, and lack of social support.

For each of the eligible patients identified in the HMC trauma registry, we conducted chart reviews using the questionnaire to extract relevant data elements using REDCap, a web-based, HIPAA compliant, data management platform (Harris et al., 2009). We reviewed each note entered in the patient's chart including the "ED Note" written by the Emergency Physician, the "Psychiatry Initial consult - liaison" note, the "Social Work - Pediatric Family History" note, and the "Rehab Psychiatry" notes.

Analysis

We used descriptive statistics to describe patient demographics and incident characteristics by incident suicide attempt mechanism. Analyses were completed using Stata 14 (StataCorp 14, 2015). This study was approved by the University of Washington's Human Subjects Division Institutional Review Board.

RESULTS

There was a total of 42 patients aged 9–18 years old from 2010 to 2018 who were treated at Harborview Medical Center for a suicide attempt using a firearm, hanging/suffocation, or jumping injury. Of those, 17 (40.5%) attempted suicide with a firearm, 11 (26.2%) with hanging, and the remaining 14 (33.3%) with jumping (Table 1). A greater proportion of patients who attempted suicide with a firearm during their index attempt were male compared to patients with hanging or jumping (82%, 73% and 64%, respectively). A lower proportion of patients who attempted suicide with a firearm lived in urban areas compared to patients with hanging or jumping (47% versus 55%, and 86%, respectively). A greater proportion of patients with firearm injuries endorsed social support (94%, 82% and 64%, respectively) and had fewer preparatory acts (47%, 46% and 85%, respectively) compared to patients who attempted suicide with hanging or jumping. A smaller proportion of patients with a firearm or hanging injury had a history of self-harming behavior (18%, 18% and 62%, respectively) or prior suicide behavior (18%, 9% and 39%, respectively) compared to patients with a jumping injury.

Patients who attempted suicide with a firearm and hanging had fewer prior attempts than patients with a jumping injury. Patients who attempted suicide by jumping had the

TABLE 1 Patient characteristics by mechanism.

	Firearm N = 17 n (%)	Hanging N = 11 n (%)	Jumping N = 17 n (%)	Total N = 42 n (%)
Patient & injury characteristics				
Male	14 (82.4)	8 (72.7)	9 (64.3)	31 (73.8)
Age (years)				
9–10	0 (0.0)	1 (9.1)	0 (0.0)	1 (2.4)
11–12	0 (0.0)	2 (18.2)	0 (0.0)	2 (4.8)
13–14	2 (11.8)	4 (36.4)	4 (28.6)	10 (23.8)
15–16	7 (41.2)	2 (18.2)	5 (35.7)	14 (33.3)
17–18	8 (47.1)	2 (18.2)	5 (35.7)	15 (35.7)
Race/ethnicity				
White, non-Hispanic	11 (68.8)	9 (81.8)	8 (57.1)	28 (68.3)
Black, non-Hispanic	1 (6.3)	0 (0.0)	0 (0.0)	1 (2.4)
Asian/Pacific Islander	2 (12.5)	1 (9.1)	4 (28.6)	7 (17.1)
Native American /Alaskan Native	2 (12.5)	0 (0.0)	0 (0.0)	2 (4.9)
Hispanic	0 (0.0)	1 (9.1)	2 (14.3)	3 (7.3)
Urban county residence	8 (47.1)	6 (54.5)	12 (85.7)	26 (61.9)
Private insurance	8 (47.1)	9 (81.8)	11 (78.6)	28 (66.7)
No history of mental health diagnosis	5 (35.7)	7 (77.8)	2 (15.4)	14 (33.3)
Attempt location—home	13 (86.7)	9 (100.0)	2 (15.4)	24 (57.1)
Hospital treatment				
In hospital mortality	8 (47.1)	7 (63.6)	2 (14.3)	17 (40.5)
Lethal means counseling[*]	5 (55.6)	1 (25.0)	3 (25.0)	9 (36.0)
Patient history				
Suicide Attempt Information Source				
Patient	1 (5.9)	0 (0.0)	1 (7.1)	2 (4.8)
Patient and family	9 (52.9)	3 (27.3)	11 (78.6)	23 (54.8)
Family or friends only	7 (41.2)	8 (72.7)	2 (14.3)	17 (40.5)
Family history of mental illness	8 (53.3)	3 (37.5)	4 (36.4)	15 (35.7)
Acute factors noted[**]				
Family conflict	4 (23.5)	1 (9.1)	8 (57.1)	13 (31.0)
Humiliating experience	2 (11.8)	2 (18.2)	2 (14.3)	6 (14.3)
Conflict with significant other	7 (41.2)	4 (36.4)	1 (7.1)	12 (28.6)
Academic issues	5 (29.4)	2 (18.2)	4 (28.6)	11 (26.2)
Bullying	0 (0.0)	2 (18.2)	4 (28.6)	6 (14.3)
Anxiety about future	2 (11.8)	0 (0.0)	2 (14.3)	4 (9.5)
Psychiatric issues	2 (11.8)	0 (0.0)	1 (7.1)	3 (7.1)
Lack of social support	2 (11.8)	0 (0.0)	2 (14.3)	4 (9.5)
Other[***]	4 (23.5)	1 (9.1)	0 (0.0)	5 (11.9)
Presence of social support	15 (93.8)	9 (81.8)	9 (64.3)	33 (78.6)
Preparatory acts notes	8 (47.1)	5 (45.5)	11 (84.6)	24 (57.1)

(Continues)

Table 1 (Continued)

	Firearm N = 17 n (%)	Hanging N = 11 n (%)	Jumping N = 17 n (%)	Total N = 42 n (%)
History of prior suicide attempts	3 (17.6)	1 (9.1)	5 (38.5)	9 (21.4)
History of self-harm	3 (17.6)	2 (18.2)	8 (61.5)	13 (31.0)
Prior juvenile detention	3 (17.6)	1 (9.1)	1 (7.1)	5 (11.9)

Note: Patients missing data for race (*n* = 2).

* Among youth who survived to discharge (*n* = 25).

** Patients could have multiple acute factors.

*** Other acute stressors included housing issues, loss of a loved one, financial issues, legal issues, and a recent change of school.
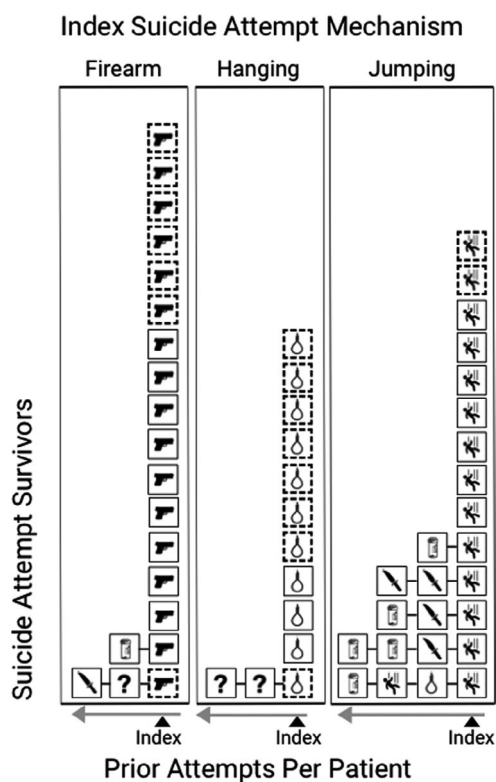

FIGURE 1 Mechanisms used in prior suicide attempts by index suicide attempt mechanism. Within each index suicide attempt mechanism category, each row represents a unique patient, with the number of each individual's prior attempts and mechanism used in those prior attempts extending to the left. The squares with dotted lines indicate that due to the patient's condition, the patient was unable to provide information

greatest variation in prior attempt mechanism, reporting prior attempts with cut/piercing injuries, poisoning, jumping, and hanging. No patients with a hanging injury had documentation of any other mechanism used in a prior attempt, although 8 of the 11 patients were never able to communicate with staff so chart notes relied on family member reports. For patients who attempted suicide with a firearm, 7 of the 17

were unable to communicate with staff, but only three charts included mention of a prior attempt (Figure 1). We found documentation of lethal means counseling of any kind in the chart of 36% of patients who survived to hospital discharge. When lethal means counseling was documented, it was not consistently conducted by providers from the same discipline or in a specific note type.

DISCUSSION

To our knowledge, this is one of the most comprehensive looks at prior suicide behavior and attempts among youth who attempted suicide with highly lethal means. While prior studies have included larger sample sizes, ours is the first to use medical record notes to assess medically attended and covert prior attempts and mechanisms as well as life experiences not captured in diagnosis codes among youth who attempted suicide with highly lethal means. Our findings demonstrate that highly lethal methods may occur in the absence of identifiable prior suicide attempt behaviors, which may reflect the differences in the ability to tolerate physical pain and discomfort that are associated with these different mechanisms.

Notably, among high lethality mechanisms, jumping from heights had the greatest variability in previous report of attempted suicide, which may indicate that those who engage in this behavior needed to acquire the capacity to tolerate the psychological provocation of ascending to a height and then jump in a public setting. In contrast, there may be less and/or different patterns of psychological provocation associated with firearm and hanging attempts that can be enacted in private settings, often at one's residence. Taken together, these findings indicate the importance of lethal means safety interventions as a primary prevention strategy for highly lethal suicidal behaviors, as these types of behaviors do not appear to include overt patterns of self-directed violence over time that could be identified to occasion secondary and tertiary intervention strategies. Indeed, a recent study of suicide

attempters who completed questionnaires for studies funded by the Military Suicide Research Consortium failed to detect a significant difference in fearlessness about death across different mechanisms of injury, which further suggests the fundamental importance of limiting and removing access to lethal means (Bauer et al., 2020). However, it is also possible that our findings reflect the potential challenges of communicating with those whose speech and/or cognitive abilities are impaired after enacting a highly lethal suicide attempt, including decrements in the ability recall events for those who have been injured following attempted suicide via firearms, jumping from a height, or hanging.

While lethal means counseling does not have quite as robust an evidence base supporting its efficacy as lethal means restriction (Knipe et al., 2017; Kreitman, 1976; Yip et al., 2012), one study found lethal means counseling given to parents of suicidal youth receiving treatment in the Emergency Department was associated with locking up medication and safe firearm storage two weeks post-discharge (Runyan et al., 2016). Although lethal means counseling is a recommended strategy to reducing lethal means access, we found it is not widely implemented even among our sample of patients who have recently attempted suicide with highly lethal means. A recent study among emergency department nurse managers at hospital-based emergency departments in 8 states found less than half (44%) of EDs have a written protocol for lethal means counseling, leading to significant variation in offering lethal means counseling or asking about firearm access (Runyan et al., 2018). Even when looking specifically at a pediatric psychiatric emergency room, firearm access was only documented in 3% of cases (Giggie et al., 2007). Given the obvious demonstration of suicidal intent, it is concerning that only 36% of pediatric suicide attempt survivors in our study who survived to hospital discharge had documentation of lethal means counseling at any point during their hospital stay. This tangible brief intervention is well-established to reduce risk of death by suicide, which is critically important given the high proportion of youth who die by suicide during a first suicide attempt and should be implemented broadly as a primary prevention strategy, as well as expanded in clinical settings for secondary prevention among suicide attempt survivors.

Limitations

Our findings should be considered in view of several limitations. First, our reliance on medical notes to capture critical domains meant we were not able to obtain complete data on all patients. Although extracted data were based upon a structured psychiatry consultation-liaison service intake template, there is likely to have been meaningful variation in the specific types of questions and prompts used by different providers, as well as differences in the level of detail and specific history noted by each clinician. Importantly, the absence of an endorsed experience in a chart does not mean it was not present in the patient's life. Nonetheless, the use of existing medical records data allowed us to include more patients from a wider span of years without concern for retraumatization that could occur with additional contact and discussion about a suicide attempt and reduces potential issues of recall bias that would be associated with contacting patients and interviewing them about life events years prior. Second, our findings are limited by our use of diagnostic codes to identify patients to include in data extraction, as previous research suggests that identification of cases based on suicide-specific ICD codes is likely to substantially underestimate the number of cases (Stanley et al., 2018) However, given our emphasis on overt acts of highly lethal suicidal behavior, it is less likely that cases of self-inflicted hanging, firearm injury, and jumping from a height were omitted from this dataset, as these are more clearly identifiable via explicit ICD codes compared to suicidal thoughts and intent without an attempt, or instances of potentially self-inflicted poisoning. Our sample size was also small, limiting our ability to conduct formal hypothesis testing of acquired capacity experiences associated with specific lethal means. Finally, these findings only included patients from a large level I trauma center serving four Northwestern States, including remote regions of Alaska. Therefore, our findings may not be generalizable to other regions of the country or to adolescent suicide attempters who do not engage in highly lethal suicidal behavior that occasions transfer and admission to a trauma center. Despite these limitations, our finding offers new insight concerning the sequence of documented self-directed violence in youth who attempt suicide with highly lethal means.

CONCLUSION

Despite the modest sample size for this study, this represents one of the first studies to focus exclusively on suicide attempt survivors in an effort to better understand youth who die by suicide. This allowed us to conduct chart reviews of medical records, including psychiatric assessments conducted by the psychiatry consultation-liaison service of a large trauma center, following a suicide attempt and obtain information on precipitating factors and history of self-directed violence directly from the patients. Given the highly lethal nature of the attempts included in this sample, these patients represent those who happened to have survived long enough to present for care at Harborview Medical Center. In this way, the patients in this sample are similar to many adolescents who would have died by suicide but not for the access to trauma care at a trauma center. Therefore, understanding the medical

history articulated by these patients who happened to survive highly lethal attempts shed light on the patterns of suicidal incidents that may precede such attempts, which is often not possible to sample in the case of death by suicide.

Given nearly all (i.e., 82.5%) of firearm suicide attempts are fatal (Spicer & Miller, 2000), it is rarely possible to assess suicidal intent, plans, rehearsal, or other preparatory behavior, as well as any precipitating factors and prior attempts among individuals who attempt suicide with a firearm. It is unknown if individuals who attempt suicide with a firearm do so with less preparation and planning than individuals who attempt with other means, or why they chose a firearm for that suicide attempt. Understanding how patients who enact suicidal behavior with a firearm differ from patients who select other means can provide insight into possible intervention strategies, including primary and secondary prevention efforts that do not depend on formal contact with the healthcare system for the treatment of overt suicidality. Given our findings, it seems essential that public health efforts promote primary prevention as a key strategy to prevent highly lethal suicidal behavior among adolescents, especially with firearms. Safe storage (i.e., storing the firearm unloaded and locked, with ammunition stored separately) is one such way to reduce risk of firearm-related suicide among youth, as most youth who attempt suicide using a firearm obtain the weapon from their home (Choi et al., 2017; Grossman et al., 2005). Lethal means safety counseling is another evidence-based approach to reducing access to highly lethal means like firearms (Runyan et al., 2016).

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