

Firearm suicide: pathways to risk and methods of prevention

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Firearms are utilized in approximately half of all US suicides, making them a serious public health concern and a target of suicide prevention efforts. Practical capability influences the transition from suicidal ideation to action and is particularly relevant to firearm suicide. Firearm ownership, experience using firearms, unsafe firearm storage, and high cultural acceptability of firearms increase risk for death by firearm suicide. Means safety strategies, which emphasize the reduction of practical capability for suicide through the limitation of access to and safe storage of firearms, are effective in preventing suicide and include interventions such as lethal means counseling, firearm legislation, and promoting safe storage practices. Public health interventions aimed at reducing firearm suicide are critical topics for continued research.

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Introduction

In 2015, 44 193 individuals in the US died by suicide. Approximately half of these individuals utilized a firearm [1]. It is evident that firearm suicide is a profound public health issue that must be more clearly understood. A crucial aspect of furthering our understanding is identifying risk factors that differentiate individuals who experience suicidal thoughts from those who act on those thoughts.

The three-step theory (3ST) examines suicide risk from this perspective and argues that severe suicidal ideation develops from the joint presence of psychological pain and hopelessness, particularly when this distress outweighs an individual's perceived connectedness to others [2•]. The theory posits that individuals will only engage in suicidal behavior if they also have the capacity

for suicidal behavior. Such capacity may be genetically driven (dispositional capability), acquired through repeated experiences that habituate the individual to pain and fear of death (acquired capability), and/or through the access to, knowledge of, and fluency with lethal means (practical capability [2•]). Practical capability is especially relevant to firearm suicide and numerous studies have investigated elements of risk related to this component of the 3ST. Emerging strategies for preventing firearm suicide have also been the focus of recent research efforts. These strategies, referred to broadly as means safety, emphasize limitation of access, safe storage, or decrease in potency of methods for suicide and have been found to be effective in preventing suicide [3,4]. This review aims to clarify factors that increase risk for firearm suicide and describes recent advances in prevention efforts designed to mitigate this risk.

Risk for firearm suicide: practical capability Knowledge

One factor that increases risk for death by suicide is the lethality associated with a method. There is an 88–99.5% lethality rate associated with firearms, making them the most lethal means of suicide [5,6]. In fact, firearms have been found to be 2.6 times more lethal than the next most lethal method of suicide, suffocation [5]. In order to use a firearm in an attempt, however, individuals may need to develop comfort and fluency with the mechanics of a firearm. Indeed, Anestis and Capron found that the number of times an individual has fired a gun is associated with fearlessness about death, pain tolerance, and lifetime suicide attempts. This finding may indicate that experience with firearms habituates individuals to the concepts of death and pain, or that individuals with lower fear of death and higher pain tolerance are more likely to seek out experiences with firearms [7]. In either scenario, individuals may be at heightened risk for firearm suicide due to increased knowledge and comfort handling firearms.

Availability

Another factor contributing to the disproportionate representation of firearm suicide decedents is the widespread availability of this means of suicide. It is estimated that one-third of US citizens own one or more firearms [8•]. Access to firearms is particularly noteworthy given that researchers have found firearm ownership and availability significantly increase risk for suicide [9•,10–14]. Importantly, this increased risk extends to all members of the household, not just the legal owner of the firearm [15]. Furthermore, the relationship between firearm ownership

and death by suicide remains significant even when accounting for other robust predictors of suicide, such as mental illness, suicidal ideation, male gender, state-wide rurality, religiosity, and state elevation [16]. This is not to suggest that firearm ownership causes individuals to become suicidal; in fact, research has shown that firearm-owning households are no more or less likely than non-firearm-owning households to possess other risk factors for suicide [15] and there is no significant relationship between firearm ownership and suicidal ideation [17]. Rather, these findings indicate that firearm ownership has the ability to arm thoughts of suicide if they develop, increasing risk for suicide through access to a highly lethal means. Supporting this perspective, Betz and colleagues found that once suicidal ideation is present, firearm owners are more likely than non-firearm owners to develop suicide plans involving firearms [18]. Similarly, among currently suicidal individuals who have a history of one or more suicide attempts, those who own firearms demonstrate a stronger association between thoughts of suicide and self-perceived likelihood of engaging in a future suicide attempt (C Houtsma *et al.*, unpublished).

The manner in which firearms are stored is also relevant to suicide risk. For example, Anestis and colleagues found that a greater proportion of suicide decedents who stored their firearm at home and in a non-secure location died using a firearm rather than by another method of suicide [19]. Similarly, among firearm owning military personnel, storing a firearm loaded and in a non-secure location was associated with increased levels of fearlessness about death and a stronger association between current suicidal ideation and self-perceived likelihood of making a future suicide attempt [4].

Acceptability

Social gun culture, defined as social norms that emphasize participation in firearm-related activities, may also play a role in the availability and acceptability of firearms [8^{*}]. Kalesan and colleagues found that firearm ownership was 2.25 times higher among individuals reporting exposure to social gun culture, even when accounting for the strength of statewide firearm policies and firearm fatality rates [8^{*}]. This suggests that sociocultural context may meaningfully influence the decision to own a firearm, the exposure an individual has to firearms, and the acceptability of such exposure. It has also been suggested that firearms are a more culturally acceptable suicide method among US men, as it is considered more ‘masculine’ to die in a violent manner [20]. Additionally, Butterworth and colleagues found that suicide decedents who held conservative social and economic policy views were more likely than those with liberal policy views to have died by firearm suicide, versus other methods. Importantly, these differences were accounted for by higher rates of firearm ownership among those with conservative views [21].

This supports the notion that beliefs and culture influence firearm ownership, which in turn impacts risk for firearm suicide.

At-risk groups

Several components of practical capability converge within certain groups, significantly elevating risk for death by firearm suicide. For example, men die by firearm suicide at a significantly higher rate than women. In 2015, the firearm suicide rate for US men was 11.95 per 100 000, whereas the rate for women was 1.90 per 100 000 [1]. In addition, firearm suicide rates are highest among older, White males living in rural areas; demographics which generally mirror those of firearm owners [22]. Men who suffer from physical health problems may be at even higher risk for firearm suicide. In a sample of male suicide decedents, Hempstead and colleagues found that firearms were utilized at a disproportionate rate among those who were also experiencing health problems at the time of their death [22]. Certain occupations that require the use of firearms, including law enforcement and military service, are associated with increased risk for firearm suicide. In fact, firearms are the most utilized method of suicide among both groups [23]. In these professions, access to and familiarity with firearms are believed to play a substantial role in suicide method choice [23].

Means safety

Although means safety approaches are applicable to a variety of suicide methods, firearms are an ideal candidate for targeted interventions in the US because they are highly lethal, widely available, and popular [24]. However, these approaches are often met with distrust or resistance among firearm owners, so it is important to note that the term ‘means safety,’ as opposed to ‘means restriction,’ has been associated with greater intentions to adhere to clinician recommendations regarding decreasing access to firearms [25].

Decreasing availability: removal, safe storage, and other interventions

Several firearm-specific means safety approaches seek to alter an individual’s practical capability by decreasing firearm availability, including temporarily removing firearms from the household or storing them more safely. In a nationally representative sample of suicide decedents, Shenassa and colleagues found that firearm owners who stored their firearms unloaded or in a locked location were at least 60% less likely to die by firearm than those who stored firearms loaded and/or in an unlocked location [11]. A hazard countermeasures approach to firearm suicide prevention recommends safe storage practices, including storing firearms unloaded, separate from ammunition, in locked containers, and in locations outside the home (e.g., a gun club) [26]. Tools for the safe storage of firearms include cable and trigger locks, safes, and lock boxes (for a comprehensive list, see [27]). Another class of tools

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