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Suicide prevention by limiting access to methods: A review of theory and practice

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ABSTRACT

This review discusses the limitation of access to suicide methods as a way to prevent suicide, an approach which forms a major component of many national suicide prevention strategies. An important distinction is made between efforts that attempt to limit physical access to suicide methods and those that attempt to reduce the cognitive availability of suicide. Physical imitations will be reviewed with reference to restricting access to domestic gas, catalytic converters, firearms, pesticides, jumping, paracetamol and methods used in prisons. Impacts of cognitive availability will be discussed mainly with regard to the media in terms of providing access to technical information and sensational or inaccurate portrayals of suicide. Drawing on psychological models of suicidal ideation and behaviour, this review explores how processes leading to suicidal behaviour and issues around method choice may relate to the effectiveness of limiting access to methods. Potential problems surrounding method limitations are explored, in particular the factors contributing to substitution, the risk that alternative methods of suicide may be used if one is restricted. It is concluded that in appropriate contexts, where substitution is less likely to occur, and in conjunction with psychosocial prevention efforts, limitation of both physical and cognitive access to suicide can be an effective suicide prevention strategy.

More deaths have occurred by suicide worldwide than by homicide and war combined (WHO, 2004). In recent decades, restricting access to means of suicide has been proposed as an implementable and effective strategy for suicide prevention and is one of the key elements of the current National Suicide Prevention Strategy for England (Department of Health, 2002). This paper reviews literature regarding the effectiveness of limiting access to a variety of methods of suicide, relating evidence from psychology, psychiatry and epidemiology to the theory and the practice of suicide prevention. Efforts which aim to limit physical access to suicide methods (i.e., how easily one can physically acquire means to kill oneself) and those which aim to reduce the cognitive availability of suicide methods (i.e., the awareness of suicide as an option and knowledge of possible means of suicide) will be considered separately.

Theoretical considerations

Suicidal ideation and behaviour

Suicidal behaviour usually occurs in close proximity to negative life events, but not all those who experience similar events are at equal risk of suicide (Paykel, Prusoff, & Meyers, 1975). In order to understand how limiting access to means of suicide functions as a suicide prevention strategy, it is important to consider what is known about the factors that contribute to the decision to engage in a suicidal act. Whilst an exhaustive review of approaches to suicidality is beyond the scope of this review, we briefly discuss two psychological models which have been proposed to explain suicidality, to put research concerning prevention into context. We then explore how suicide prevention strategies might act to disrupt the progression from emotional distress, to suicidal ideation and suicidal behaviour.

Two recent models of suicidality, the *arrested flight model* (Williams, 2001; Williams, Crane, Barnhofer, & Duggan, 2005) and the *interpersonal–psychological theory of suicide* (Joiner, 2005; Riberio & Joiner, 2009) attempt to explain the psychological factors that converge to render an individual at risk of suicide. The arrested flight model suggests that suicidality is a consequence of a feeling of entrapment that develops when an overwhelming desire to escape, triggered by feelings of defeat and humiliation, is combined with a perceived inability to escape (due to cognitive deficits in problem solving and autobiographical memory), and a loss of hope that things will improve in future (due to deficits in positive future thinking). The model draws on associative network models of cognitive processing to suggest that once associations between

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negative mood states, feelings of entrapment, and cognitive deficits have become established, they will become increasingly easy to trigger. Thus, over time, suicidal ideation may develop rapidly and in response to relatively minor triggering events or fluctuations in psychological state or mood. An underlying assumption of the model is that suicide is a culturally available response to distress, and the model is concerned not so much with why people think of suicide, but rather, why they do not think of anything else. The strength of the model is in its description of the mental state and cognitive capacities of people in suicidal crisis (which has relevance for the implementation of method limitations), as well as its ability to explain why suicidal ideas may escalate rapidly, leading to apparently impulsive suicidal behaviour. However, the model does not address all stages in the suicidal process. Many people contemplate suicide but do not act on their thoughts, or attempt suicide, but use a method that does not result in death. The Interpersonal–psychological theory proposes that feelings of perceived burdensomeness and thwarted belongingness contribute to suicidality. Furthermore, they suggest that *death by suicide* is only likely to occur when an individual has acquired the courage and capability to commit suicide through exposure to events that have led to a habituation to pain and fear of death. This habituation process may occur through prior suicidal behaviour in oneself or exposure to suicidal behaviour in others, or through the experience of other traumatic, painful or provocative events. The Interpersonal–psychological theory therefore suggests the specific circumstances in which a person may engage in a suicidal act with fatal outcome.

As suicide is a result of many factors, there are several points of intervention. In Fig. 1, the suicidal process is divided into a number of stages, and there is potential for intervention between each stage. Limiting cognitive availability of suicide as an option could reduce the risk of suicidal ideation developing, while limiting cognitive availability of method details may reduce risk of an attempt. Restricting physical availability of suicide methods could have the potential to disrupt the transition from ideation to a suicide attempt and the probability that a suicide attempt will lead to death by suicide (depending on the lethality of the method restricted). In contrast, psychosocial interventions can intervene at earlier stages, helping individuals cope with negative life events and relieve distress that might otherwise result in suicidal ideation.

Factors influencing method choice

Availability and acceptability are viewed as two key factors that influencing suicide method choice and, therefore, key considerations to suicidal individuals planning an attempt (Farmer & Rohde, 1980). Clarke and Lester (1989) further divide these factors into twenty "choice structuring properties", which incorporate both aspects of physical (e.g., planning) and cognitive (e.g., knowledge of technical aspects of the method) availability. The length of this list underscores the potential complexity of the progression from suicidal ideation to development of a plan, and the impact of simple practical matters such as ease of access (Cantor & Baume, 1998). A suicide method must fulfil criteria of both sociocultural acceptability and availability in order to be selected (Clarke & Lester, 1989). Altering widespread cultural attitudes towards the overall acceptability of suicide, or the acceptability of specific methods, may be a challenging task, particularly when judgements of acceptability will be based on different factors for different individuals. However Clarke and Lester's theory does suggest that restricting availability of a method may also limit its use, independently of sociocultural attitudes, and there is substantial support for the suggestion that ease of access influences method choice (see Diagle, 2005, for review). For example, interviews with intentional overdose survivors indicate that the majority of attempters chose overdose because drugs were readily available in the household (Hawton, Fagg, Simkin, Bale, & Bond, 1997). Over half of suicides in rural parts of China are by pesticides or rat poison ingestion, which are highly toxic and widely available (Phillips et al., 2002). In the USA, the vast majority of suicides with firearms are committed by people with access to guns in their homes (Brent, 2001).

Cognitive availability, how accessible something is in one's mind, can also play a role in suicide method choice. The media can increase cognitive availability of a particular suicide method by distributing technical information about how to enact the method, sensationalising it and by giving inaccurate portrayals that may encourage it (see Crane, Hawton, Simkin, & Coulter, 2005 for further review). As a particularly notable example, suicide by charcoal-burning was unheard of in Hong Kong until a woman used this method in November 1998. News reports described her suicide dramatically and with detailed information about how the method was employed. Within two months, charcoal-burning became the third most common suicide method in Hong Kong (Lee, Chan, & Lee, 2002). In contrast, there are currently very few suicides by this method in western countries because it is not culturally associated with suicide even though charcoal is very physically available.

Limiting access

Through an understanding of the factors contributing to suicide and method choice, the underlying rationale for limiting access to suicide methods becomes clearer. The suggestion that physical and cognitive availability are key factors in method choice (Cantor & Baume, 1998; Clarke & Lester, 1989) indicates that restricting access to methods could disrupt the suicidal process.

The fundamental assumption underlying attempts to limit access to suicide methods is that, in many cases, periods of high suicide risk are relatively short and limiting access may delay an attempt until the period of high-risk passes. There is some support for this assumption. Interviews of suicide attempt survivors indicate that two-thirds of suicide attempts are contemplated for less than an hour beforehand (Williams & Wells, 1991), with a recent study finding that almost 50% of patients reported an interval of no more than 10 min between their first current thought of suicide and

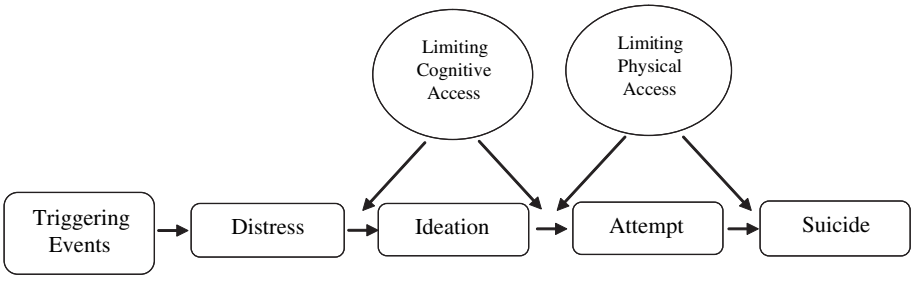

Fig. 1. Points of intervention between stages in the suicidal process.

their actual attempt (Diesenhammer, Strauss, Kemmler, Hinterhuber, & Weiss, 2009). Since suicide attempts with careful planning are probably more likely to be fatal, the number of impulsive suicides may be overestimated from studies of suicide attempt survivors. Nevertheless, these findings indicate that a substantial proportion of suicide attempts are not planned far in advance, even when the method of choice is highly lethal, and are consistent with the arrested flight model (Williams et al., 2005), which suggests that the formation of strong associations between mood, body state information and suicidal feelings across depressive episodes makes suicidal thoughts increasingly easy to trigger over time.

A potential problem for suicide prevention by limiting access to methods is the substitution hypothesis: if one suicide method is unavailable, it will be replaced with another. However, the reasoning involved in method selection is very complex, and problem solving ability is consistently found to be lower in suicidal patients than psychiatric controls (Pollock & Williams, 2001). Problem solving ability also appears to be state- and mood-dependent (Williams et al., 2005) and positively correlated with time since suicidal behaviour (Schotte, Cools, & Payvar, 1990). Because problem solving abilities deteriorate during periods of high suicidal risk, it may be difficult for an individual to circumvent a method limitation (e.g., use an alternative method) at times when they want to attempt suicide. This suggests that immediate limitation of access to suicide methods may be effective in preventing an attempt, at least in the short term. Still, the arrested flight and Interpersonal–psychological models describe, and statistics of repetition of suicidal behaviour indicate, that prior experience of suicidal behaviour predicts future suicidal behaviour (Sakinofsky, 2000). Therefore, while restricting access may hinder a specific attempt, it does little to prevent subsequent suicidal behaviour in the longer term. Nevertheless, in causing delay, limiting access could buy time that provides the opportunity for longer-term interventions.

When considering substitution risk, one must also take into account the lethality of methods, which can be highly variable. For example, a study in the USA found a case fatality of 83% for firearm-related suicidal acts, 61% for hanging/suffocation and 2% for self-poisoning (Spice & Miller, 2000). If access to highly lethal methods of suicide is reduced, even where substitution occurs, the proportion of people who survive suicide attempts will be increased. Conversely, restricting less lethal methods might actually act to increase the number of deaths by suicide if highly lethal methods are substituted.

Thus, method restriction is most likely to be effective where the method restricted is highly lethal, commonly used, widely available and dissimilar to other available methods (Hawton, 2007).

Empirical evidence

Method limitations, as a suicide prevention strategy, have been undertaken in a variety of contexts. Although not a systematic review, this section aims to describe a representative selection of studies which have investigated the impact of limiting access to suicide methods. First, efforts to reduce physical access will be discussed, with regard to domestic gas, catalytic converters, firearms, pesticides, jumping, paracetamol and 'suicide-proofing' prisons. Following this, cognitive availability will be considered, primarily in terms of the impact of suicide report in the media.

Limiting physical access

One of the early demonstrations of the effectiveness of limiting access to means was detoxification of gas in homes, as observed by Kreitman (1976). Between 1955 and 1975, the gas in English homes was gradually changed region by region from toxic charcoal gas to non-toxic natural gas. Prior to this, one-third of all suicides in England involved gas poisoning. From 1955 to 1975, the suicide rate decreased significantly and closely correlated with the rate of decrease of toxic gas. By 1976, the overall suicide rate had declined in all age groups and for both sexes by nearly a third. The suicide rate by other methods did increase slightly over the same period, suggesting some substitution of other methods. The same effect was observed after the detoxification of domestic gas in Japan (Lester & Abe, 1989) and the USA (Lester, 1990).

Some time after the reduction of suicides in England by detoxification of domestic gas, there was a gradual increase in deaths from car exhaust, suggesting some substitution, supporting the idea that there is high risk for substitution in cases where there are methods available that are similar to the method being restricted. The number of suicides by motor gas tended to increase along with the number of cars per capita (Ohberg, Lonnqvist, Sarna, Vuori, & Penttila, 1995). Since 1993, environmentally motivated legislation has required the fitting of catalytic converters on new vehicles in the United Kingdom, reducing the level of carbon monoxide in vehicle exhaust from 3.5% to 0.5%, which made suicide by carbon monoxide poisoning from motor gas considerably more difficult. In the six years following the legislation, the suicide rate by gas poisoning fell dramatically. There was also a reduction in overall suicides, though the extent of this varied across demographic groups, with some indication of substitution by hanging amongst young men and women (Amos, Appleby, & Kiernan, 2001). Catalytic converters have been considered largely responsible for the recent fall in the suicide rate in England and Wales (Kendell, 1998). The effects of both detoxifying domestic gas and motor gas may have been relatively invulnerable to substitution because the characteristics of gas poisoning are quite unique and not easily replaced. Gas poisoning was a popular method for suicide because it was widely considered to be highly lethal, painless, non-disfiguring and requiring little planning. At the time, no other available means of suicide shared these characteristics (Clarke & Lester, 1989). Charcoal-burning may provide a substitute, but is so far cognitively unavailable in the west.

Firearms are another lethal method and are widely available in some countries. Longitudinal data from five countries closely correlates the proportion of households owning firearms with the proportion of firearm suicides (Ajdacic-Gross et al., 2006). Population studies have indicated that increasing firearm restrictions, such as stricter licensing laws and safer gun storage, correlates with a reduction in suicide rates (e.g., Canada: Bridges, 2004; Caron, 2004; USA: Ludwig & Cook, 2000; Australia: Ozanne-Smith, Ashby, Newstead, Stathakis, & Clapperton, 2004; UK: Haw et al., 2004). In 1989, the Firearms Amendment Act was introduced in the United Kingdom, and increased firearms restrictions regarding purchase, registration and safe storage of guns. This was linked to a significant reduction in firearm suicides and a decrease in the overall suicide rate of farmers, who commonly use firearms (Gunnell, Middleton, & Frankel, 2000). This illustrates that even where use of firearms is relatively rare, restricting access can have a beneficial effect for particular groups within a population. Also, delaying access to firearms may be a helpful restriction, as a longitudinal study of mortality rates of gun purchasers in California observed that risk for suicide by firearms was elevated by 57-fold in the week after firearm purchase and decreases exponentially (Wintemute, Parham, Beaumont, Wright, & Drake, 1999), though evidence is more mixed for whether such legislation impacts overall suicide rates (see Ludwig & Cook, 2000 for a review of the evidence for and against the efficacy of firearm restrictions). Shooting may be substituted by other violent methods that are less

easily restricted, such as hanging. Rich, Young, Fowler, Wagner, and Black (1990) observed that gun restrictions in Canada forbidding the ownership of handguns significantly reduced suicide by firearms, but this was offset by an increase in suicide by jumping. These methods share characteristics in that they are both violent methods, which may explain the substitution. Nevertheless, shooting has a slightly higher case lethality than most alternatives, which might explain why firearm restriction efforts have been observed to significantly reduce overall suicide rates in some cases where the use of firearms is very high.

Pesticide ingestion is a highly lethal method of self-poisoning. In many developing countries pesticides are widely available and account for over half of all suicides. There is also often a higher proportion of suicides by young people and women in developing countries, and there is some consensus that this may be explained by an excess of pesticide-related impulsive self-harm with low suicidal intent but a high case fatality (Gunnell & Eddleston, 2003). Three quarters of people who ingested pesticides as a deliberate act of self-harm used pesticides that were available within the home or nearby (Mohamed et al., 2009). This suggests that limitation of access to pesticides might dramatically reduce suicide rates, particularly among young people and women; it has been implemented successfully in Sri Lanka, where the banning of several highly lethal pesticides led to a 50% reduction in suicides, which has lasted over a decade (Gunnell & Eddleston, 2003). In Samoa, rises in paraquat imports were linked to a surge of suicides by paraquat poisoning, tripling overall suicide rates; subsequent reductions on imports appeared to have the opposite effect (Bowles, 1995).

Access to jump sites has also been limited in an effort to reduce suicide rates. Though there are many potential jump sites, certain locations tend to gain particular notoriety as suicide spots. Installation of safety fences at high-risk jump sites, including the Eiffel Tower, Sidney Harbour Bridge and the Empire State Building (Lin & Lu, 2006), has been successful in reducing suicides by jumping at these sites. Following the installation of safety fences at the Duke Ellington Bridge in Washington D.C., Berman, O'Carroll, and Silverman (1994) observed a decline both in jumping suicides at that location and in the overall suicide rate in the surrounding area. There may be a low substitution risk when a bridge is fenced, as suicide attempters who jumped from certain bridges often reported choosing this method due to symbolism associated with the specific bridge (Rosen, 1975, 1976). An interesting study contrasted people who committed suicide by jumping from two different bridges in Australia and found completely different profiles in the two groups (Cantor & Hill, 1990). Introducing barriers at one bridge may not necessarily result in substitution involving other bridges, but it is difficult to observe what type of effect setting up barriers at individual locations has on the overall suicide rate, because suicide by jumping is relatively rare. However, even if jumpers substitute another method, Gunnell, Nowers, and Bennewith (2005) point out that the very public nature of jumping, and the potential for observers of such suicides to be psychologically traumatised or physically injured, makes it important to reduce suicides by jumping and that the incorporation of jump barriers should be considered in the design of new buildings that have the potential to become jump sites.

Where a method is common and very accessible, small changes can impact suicide rates. In England, overdose accounts for nearly a quarter of suicides (Department of Health, 2002), self-poisoning is the most common form of deliberate self-harm requiring hospital admission (Wilkinson et al., 2002) and, prior to 1998, paracetamol had been implicated in up to half of intentional overdose attempts (Hawton et al., 1997). In 1998, legislation was introduced in the United Kingdom that required analgesics to be blister packaged and reduced pack sizes to non-lethal doses. Limits on the number of packs that could be bought in a single transaction were also enforced, the aim being to reduce household supplies of paracetamol which might be available for impulsive overdose. It is particularly interesting that this relatively simple intervention appeared to have a considerable impact on suicide rates, resulting in a 64% reduction of severe paracetamol overdoses and a 21% reduction of overall paracetamol overdoses (Turvill, Burroughs, & Moore, 2000). These changes persisted, with little evidence of substitution over three years following the restriction, resulting in the estimated prevention of approximately 200 deaths (Hawton, 2002). Although people could easily circumvent the intervention by acquiring several packs from different shops this requires planning, which many suicide attempters have limited capacity to do (Schotte et al., 1990). Going from shop to shop and then pressing large quantities of pills out of blister packs also takes some time and may cause a sufficient delay to allow a change of emotional state. Although a wide variety of toxins are physically available within the home, they may not serve as substitutes because sociocultural influences cause a preference for certain drugs. For instance, pain-killers may have a certain symbolic impact of numbing or removing pain from the suicide attempter and they are a substance which is typically ingested. The success of altering analgesic packaging suggests that this approach should be applied to other drugs that are commonly used in overdose, though restricting access to effective pharmaceuticals used in overdose has the potential to compromise medical care. When the decision was made to phase out co-proxamol (a widely used pain-killer with high toxicity which had been implicated in approximately 20% of all drug-related poisoning suicides), there was public outcry at the removal of a medication perceived to be unique in its effectiveness for patients with chronic pain. There is good evidence that this intervention has reduced suicide deaths from co-proxamol without an obvious increase in other drug poisoning deaths (Hawton et al., 2009). However some patients with chronic pain, who are themselves at elevated risk of suicidality (e.g., Tang & Crane, 2006), may now be experiencing less effective pain management. This illustrates the problem of balancing the desire to prevent suicides with the potential negative effects that preventative measures may have on society.

Even where an intervention is successful in limiting physical availability, it cannot work in isolation as a suicide prevention strategy. Access to most conceivable suicide methods in prisons is highly physically limited, but the rates of suicide are still very high. The use of safer cells with fewer ligature points has shown some evidence of reducing suicide rates (Burrows, Brock, Hulley, Smith, & Summers, 2003), but the suicide rate in prisons is still nearly 15 times higher than in the general population (Department of Health, 2004) with over 90% of prison suicides in England resulting from hanging (Paton & Jenkins, 2005). The potential impact of restrictions and the need to balance their benefits and costs must also be considered. Suicide-proof cells are very bleak environments and unlikely to be conducive to the mental health of those incarcerated, indicating a need for complementary psychosocial interventions. DeLeo (2002) describes suicide prevention efforts as comparable to efforts in preventing heart disease, where a wide variety of factors need to be addressed (genetic, nutritional, physiological, social, etc.). As there are many factors contributing to suicide, there are many potential points of intervention. Where possible, it would always be preferable to intervene at earlier stages, providing psychological and social support to reduce an individual's suffering as well as their suicide risk.

Limiting cognitive access

While the influence of cognitive availability is a relatively recent field of research, several studies have addressed issues surrounding

cognitive availability of suicide. As mentioned earlier, the impact of introducing new or rare methods through the media has been dramatically illustrated with the rise in charcoal-burning in China (Lee et al., 2002). More broadly, research suggests that media reports of suicides are most likely to have an impact when the method of suicide is described in detail, the story is repeated, the suicide features dramatically and prominently, and the suicide is by someone the audience identifies with, such as a celebrity (Hawton & Williams, 2005).

Cognitive availability of suicide can be influenced at the individual, interpersonal and population levels. At the individual level, recent research suggests that mental images of suicidal behaviour may come vividly to mind at times of distress in people who have been suicidal in the past (Holmes, Crane, Fennell, & Williams, 2007), supporting the idea that suicidal ideas can be rapidly reactivated (Williams et al., 2005). Joiner (2005) suggests that individuals may habituate to the fear-inducing properties of suicidal behaviour over time and it is possible that part of this habituation may occur through repeated re-experiencing of suicide-related imagery. Exposure to suicidal behaviour in family and friends has also been shown to increase risk of suicidality (e.g., Hargus, Hawton, & Rodham, 2009), possibly in part by increasing awareness of suicidality as a response to distress within a given family or social group. Clearly it is not possible to eradicate knowledge. However, it may be possible to address high cognitive availability of suicide through psychological treatment which aims to contextualise or alter suicide-related imagery ('imagery rescripting') or address dysfunctional beliefs about suicide developed through exposure to suicidal behaviour in others.

Increases in cognitive availability of suicide can also occur in the population at large, in particular, following widespread media coverage of suicides. A study of adolescents in a psychiatric unit identified exposure to suicidal behaviour in the media as a potential contributory factor in individual cases of deliberate self-harm (Zahl & Hawton, 2004). For example a two-fold increase in subway suicides was observed following reports of subway suicides occurring between 1970 and 1971 in Toronto. After a six-month restriction of reporting of subway suicides, the rate of such suicides returned to baseline levels (Littmann, 1983). The number of subway suicides also fell by 75% in Vienna during the six months following the introduction of media guidelines restricting dramatic reporting of these events (Etzersdorfer & Sonneck, 1998). Media blackouts on reporting suicide appear to have also reduced suicide rates overall (Motto, 1970).

Individuals who are already vulnerable are more likely to be affected by exposure to suicidal behaviour in the media. For example a recent study of the impact of a highly publicised Taiwanese celebrity suicide on patients with a history of depression indicated that just under 40% of the sample reported that the media coverage had increased their suicidal thinking and/or behaviour, this effect being more pronounced in those with a history of suicidal behaviour and those who were depressed in the weeks prior to the media coverage (Cheng et al., 2007).

Cognitive availability of a method can be particularly influenced when technical information on how to carry it out is available. Marzuk, Tardiff, and Leon (1994) investigated the effect of a book called *Final Exit*, a suicide manual with instructions for quick and painless suicide methods. Following its release, suicide by the primary method recommended by the manual increased 30%. There was no notable effect on overall suicides, perhaps because people who go to the trouble of researching technical information in a book are likely to be quite determined and hence more likely to die by suicide by whatever means is available. However, detailed information of suicide methods is now widely available from pro-suicide sites on the internet making such information more easily accessible to impulsive suicide attempters (Biddle, Donovan, Hawton, Navneet, & Gunnell, 2008). Reducing the availability of information on how to commit suicide can have the opposite effect; changing dramatic warnings on pesticide labels from "one swallow can kill" to "harmful" decreases the number of suicides by these chemicals (Lim, 2003), presumably because pesticides are less likely to be conceptualised as a means of suicide amongst users.

Whilst communicating technical information on how to implement a method increases risk for suicide, omitting unpleasant details may reinforce misconceptions. The media often glosses over troubling aspects of suicide, such as physical pain, and unrealistically portrays the mental state of suicide attempters. It is a widely held misconception among suicide attempters that paracetamol overdose is a painless way to die and that hanging is instantaneous (Gunnell, Bennewith, Hawton, Simkin, & Kapur, 2005; Hawton, 2002), but there are actually very few suicide methods that are reliably painless. Theoretically, challenging the false beliefs may be helpful in reducing the popularity of some methods. However, it is not clear what form such re-education interventions might take, particularly because whilst increased knowledge of the unpleasant aspects of suicide methods may act as a deterrent for some individuals, for others they may increase the method's appeal.

Future research

While there is relatively strong evidence that limiting access works in some instances, there is still much research to be done regarding further opportunities for limiting access to means of suicide.

Before any potential limitation strategy is introduced it is essential to fully explore the association been availability of the method in question and suicide rates, as well as the factors that influence selection of the particular method, and the social groups in whom the method is most commonly used. This would ideally require a combination of epidemiological, quantitative and qualitative research to explore both population level and individual-level factors influencing the method's use. Knowledge of these factors is likely to be essential not only in determining the most appropriate way to restrict access, but also in determining how the efficacy of restriction efforts can best be evaluated. Often a number of suicide prevention strategies are implemented simultaneously making it very difficult to determine which, if any, have had significant effects on risk of death by suicide, particularly when effects are examined in the context of broader population level fluctuations in suicide rate. As much effort needs to be directed towards the evaluation of effectiveness of interventions as to the means of executing the interventions themselves. No suicide prevention interventions are without cost, financial, social or otherwise, and there is a danger that, without proper evaluation, resources may be directed towards interventions that have little actual benefit to society in terms of a reduction in suicide. Also, the impact of new types of media on suicide rates should also be further investigated, particularly with regard to the internet. Considering the impact of detailed information about suicide methods (e.g., charcoal-burning), the fact that this information is widely available on the internet is alarming. However, in contrast to passive encounters of information about suicide from reading the newspaper or watching television, active searching is required to find sites with information about suicide methods. Thus, the impact of information on the internet might be more comparable to books such as *Final Exit*, though such information is more easily accessible when on-line.

Some forms of method limitation, such as the banning of toxic pesticides in Sri Lanka, have undoubtedly been highly effective, but

many developing countries are unable to introduce such bans for economic reasons. Given the widespread use of pesticides in poisoning death, the development of cheap non-toxic pesticides is a matter of urgency. Another area where simple elimination of the means of suicide is problematic is death by hanging. It is impossible to eliminate either ligature points or potential ligatures in the natural environment, but there may be benefit in attempting to limit access to information on the technicalities of hanging from media reports and the internet. Additionally, because hanging has a high case fatality rate and has increased as a method of suicide in recent years, careful research needs to be conducted in order to determine whether the restriction of other methods of suicide will be likely to produce a further shift towards hanging, potentially increasing risk of death by suicide.

The majority of suicide prevention strategies involving limitation of means are universal (e.g., those which address an entire population). However, it is likely to be of importance to direct more attention to the use of limitation of means as a selective or indicated prevention strategy: for example, a strategy targeted at only a sub-group of the population deemed to be at high risk, such as farmers, doctors, or at people who have already shown signs of vulnerability (those who have attempted suicide – see Nordentoft, 2007, for a review of suicide prevention strategies viewed in this manner). For example, there is evidence that where parents of children and adolescents presenting to hospital with an intentional overdose are given injury prevention advice they do take action to restrict access to lethal means of suicide, whereas in the absence of such advice they are much less likely to do so (e.g., McManus et al., 1997). This suggests that a large-scale trial of indicated limitation of means might complement broader population-based efforts to limit means of suicide.

Conclusions

Limiting access to methods is one of the suicide prevention efforts with the most robust supporting evidence, possibly because it can be implemented quickly and measured relatively easily in comparison to other suicide prevention strategies which might aim to tackle the underlying causes of distress within the population. However, suicide prevention research has several challenges, partly due to the complexity of factors involved in suicidal behaviour. It may be relatively simple to collect statistics on the occurrence of suicides before and after an intervention, yet though the intervention may link to a change in suicide rates, causality cannot be assumed. For example, part of the dramatic change in suicide rate after detoxification of domestic gas in England may have been due to other coinciding efforts for suicide prevention, such as the increase of hotline services that was occurring simultaneously (Bagley, 1968), and doubt has recently been cast over the longer-term effectiveness of restriction in paracetamol pack sizes with the suggestion that apparent beneficial effects were the result of broader population trends in suicidal behaviour (Bateman, 2009). Ideally, individual-level research would complement research exploring population level trends, but such research is difficult to conduct, both because suicide remains a rare event, and because significant ethical issues are raised by research that involves discussing the reasoning behind method choice with people who may remain acutely suicidal. Retrospective studies may be hampered by recall biases and are also affected by an inherent bias: attempters using more lethal methods of suicide or those who engage in more careful planning are more likely to die as a result of their attempts and hence to be under-represented in such research. Quasi-experiments are possible by observing the change in suicide rates over time following new restrictions in comparison to control communities where no new restrictions occur, but the majority of population studies do not use controls because good control regions are often not available.

Despite the limitations of suicide prevention research, converging evidence from a range of methods (population studies, case-controlled group investigations, qualitative interviews) strongly suggests that limiting access can be an effective method of suicide prevention, particularly in contexts where the method in question is popular, highly lethal, widely available, and/or not easily substituted by other similar methods. It is possible that limitation of access to means is only effective because of the delay it causes, which allows people who would have otherwise completed suicide to get help. Without interventions that actually relieve the distress of suicidal people, substitution would probably occur much more frequently. Therefore restriction of access should be implemented in conjunction with other suicide prevention strategies. Still, because in many cases suicidal thoughts remain undisclosed, limiting access to means of suicide is likely to remain an essential component of suicide prevention, which when designed on a solid base of research and used in combination with other suicide prevention strategies, has considerable capacity to save lives.

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Corrigendum

Corrigendum to: "Suicide prevention by limiting access to methods: A review of theory and practice" [Social Science & Medicine, 70, (2010), 1626–1632]

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The authors have noted some referencing errors in the above paper. The corrected text and one reference are reproduced below:

p. 1628
"suicides by motor gas tended to increase along with the number of cars per capita (Lester, 1990)"

p. 1628
"decrease in the overall suicide rate by farmers, who commonly use firearms (Hawton, Fagg, Simkin, Harriss, & Malmberg, 1998)"

p. 1629
" 50% reduction in suicides, which has lasted over a decade (Gunnell, Fernando, Hewagama, Priyangika, Konradsen, & Eddleston, 2007)"

p. 1631 (References)
"Bateman, D.N. (2009). Limiting paracetamol pack size: Has it worked in the UK? *Clinical Toxicology, 47*, 536–541."

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