Published in final edited form as:

Arch Suicide Res. 2013 ; 17(4): 345–359. doi:10.1080/13811118.2013.801814.

Retrospective Identification of Episodes of Deliberate Self-Harm from Emergency Room Registers in General Hospitals: An Example from Shanghai

Yeqing Xu,

Suicide Research and Prevention Center, Shanghai Mental Health Center, Shanghai Jiao Tong University School of Medicine, Shanghai, China, and Department of Psychiatry, Huashan Hospital, Fudan University School of Medicine, Shanghai, China

Michael R. Phillips,

Suicide Research and Prevention Center, Shanghai Mental Health Center, Shanghai Jiao Tong University School of Medicine, Shanghai, China, and Departments of Psychiatry and Global Health, Emory University School of Medicine, Atlanta, Georgia, USA

Liwei Wang,

Department of Psychiatry, Huashan Hospital, Fudan University School of Medicine, Shanghai, China

Qihong Chen,

Shanghai Jiading District Central Hospital, Shanghai, China

Chunbo Li, and

Suicide Research and Prevention Center, Shanghai Mental Health Center, Shanghai Jiao Tong University School of Medicine, Shanghai, China

Xiao Wu

Shanghai Jiading District Central Hospital, Shanghai, China

Abstract

The objective of this study was to assess the feasibility of using currently available emergency department (ED) records to retrospectively ascertain the prevalence and characteristics of episodes of medically treated deliberate self-harm (DSH). Discussions with ED staff identified 10 ED diagnoses in persons 12 years of age or older that were commonly used for episodes of DSH and another 7 injury-related diagnoses that could, under specific conditions, be acts of DSH. A retrospective analysis of the ED registry of one large general hospital in Shanghai for 2007 to 2010 identified all cases with one of these diagnoses. Diagnosis-specific algorithms based on the characteristics of each case were applied to classify cases as “probable DSH,” “possible DSH” or “probably not DSH.” The 1,495 cases of DSH identified accounted for 0.2% of all ED admissions over the 4 years; only 6 of them (0.4%) had an ED diagnosis of “suicide attempt.” Three ED

Correspondence concerning this article should be addressed to Michael R. Phillips, Shanghai Mental Health Center, Shanghai Jiao Tong University School of Medicine, Suicide Research and Prevention Center, 3210 Humin Road, Shanghai 201108, China. phillipschina@yahoo.com.

The authors report no conflict of interest related to this manuscript.

diagnoses—overdose of medication, fall from height, and pesticide ingestion—accounted for 1,275 (85.3%) of the DSH cases. There were substantial differences in the characteristics of male and female cases of DSH and a 43% drop in the proportion of ED admissions for DSH over the 4 years. In locations where it is not feasible to develop prospective registries of suicide attempts treated in EDs, retrospective analysis of ED records that use algorithms to classify the intentionality of injuries can provide estimates of the prevalence and characteristics of medically treated episodes of DSH.

Keywords

China; deliberate self-harm; emergency department; misclassification; suicide attempt

INTRODUCTION

One of the most important components of suicide prevention efforts is accurate monitoring of the number of completed and attempted suicides in the community. This information is essential for assessing the magnitude and demographic characteristics of the problem and for evaluating the impact of intervention strategies. Almost all studies on the risk factors for suicide identify prior suicide attempt as the strongest predictor of subsequent suicide (Hawton & van Heeringen, 2009; Phillips, Yang, Zhang et al., 2002) so identifying suicide attempts also provides an opportunity to prevent a subsequent suicide. Providing appropriate evaluation and treatment to persons with suicide attempts is a key component of comprehensive suicide prevention strategies (Fleischmann, Bertolote, De Leo et al., 2008; Mann, Apter, Bertolote et al., 2005).

Misclassification problems, which can seriously undermine the quality of this data, can occur both in the recording of deaths and in the recording of attempted suicides. There is a growing literature on the misclassification of suicide deaths (Kapusta Tran, Rockett et al., 2011; Wang, Phillip, Huang et al., 2003) but very little research has been conducted on misclassification of attempted suicides. Misclassification of deaths by suicide occurs in all countries but is most prominent in low- and middle-income countries (LAMIC) where suicide is illegal or highly stigmatized (Pritchard & Amanullah, 2007). For example, in China a national psychological autopsy study found that 49% of deaths recorded as “undetermined accidents” and 5.4% of deaths recorded as specific types of accidents were, in fact, suicides (Wang, Li, Chi et al., 2003). We expect that in these countries the misclassification of suicide attempts as accidents is common but, to our knowledge, no study has yet tried to assess the magnitude of this problem in a LAMIC country.

To definitively classify a behavior as a “suicide attempt,” a physical injury needs to have occurred, the behavior needs to be intentional (not accidental), and the intent of the behavior needs to be death. But limiting suicide attempts to incidents in which individuals with physical injuries admit to intentionally harming themselves with the specific intent of causing their death results in many missed cases, particularly in localities where suicidal behavior is shameful, criminal, or stigmatized. Given the difficulties and inaccuracies inherent in obtaining self-reports of suicidal behavior from community members, most

registries of attempted suicides in high-income countries are based on identifying episodes of deliberate self-harm (DSH) that receive medical attention at general hospital emergency departments (EDs) (CDC, National Center for Injury Prevention and Control, 2012; Fleischmann, Bertolote, De Leo et al., 2005; University of Oxford Center for Suicide Research, 2012).

Using the DSH category as a proxy for suicide attempt avoids the uncertainty of relying on subjects' acknowledgement of their intention to die and can use the circumstances surrounding the incident to make an informed judgment about whether or not the behavior was intentional or accidental (i.e., not necessarily depending on the report of the subject). The disadvantage of the DSH category is that it may include cases of non-suicidal self-injury; but most such behaviors (e.g., body piercing) never come to EDs for treatment and the repetitive, ritualistic nature of non-suicidal self-cutting behaviors that may come to EDs for treatment clearly distinguishes them from suicide attempts. Using medically treated DSH as a proxy for medically treated suicide attempts would also be reasonable in China. Small prospective studies indicate that the vast majority of DSH cases seen in the EDs of hospitals in China are, in fact, suicide attempts (Bi, Bi, Tong et al., 2010, Li, Philips, Wang et al., 2003); and non-suicidal self-injury (which is uncommon in China) almost never results in treatment in EDs in China (Chen, 2005).

It is not currently possible to determine rates of medically treated episodes of DSH in China (or, we suspect, in many LAMIC) because ED records typically record the type of injury without specifying whether the injury is accidental or intentional. This problem could be resolved by prospectively assessing the intentionality of all injuries treated in the EDs of hospitals, but this would require extensive staff training and changes in recording procedures that are not feasible in most busy hospital EDs in LAMIC. The main goal of the current study is to assess the feasibility of another approach to addressing this problem that uses currently available ED records and, thus, does not require additional training or changes in recording procedures. In order to retrospectively identify the prevalence and characteristics of medically treated DSH using ED records, we determined the most common ED labels ("diagnoses") applied in cases of DSH and then reviewed the ED records of a large general hospital in Shanghai to assess the prevalence and characteristics of individuals given these diagnoses.

METHODS

The study was conducted at the Shanghai Jiading District Central Hospital, which is the largest general hospital (750 beds) in Jiading District, one of the 19 districts in the Shanghai Municipality. The district is in a suburban industrial part of Shanghai with a rapidly expanding population, many of whom are migrant workers. The 2010 population was 1.5 million individuals, 56% of whom were rural migrants. The hospital has over 25,000 inpatient admissions and over 400,000 outpatient visits per year. The ED registry of the hospital included a total of 698,495 entries for persons 12 years of age or older from 1 January 2007 to 31 December 2010.

We used the primary diagnosis recorded in the ED registry (which was not based on ICD-10 categories) to classify all 698,495 entries as “probable DSH,” “possible DSH,” or “probably not DSH.” Detailed discussions between the authors and the directors, physicians and nurses of several EDs of large general hospitals in Shanghai identified 17 target ED diagnoses that included patients with DSH. Cases that did not have these target diagnoses were all classified as “probably not DSH.” Based on ED staff reports, 10 of the 17 target diagnoses in patients 12 years of age or older were classified as “probable DSH” because clinicians believed that in almost all cases they are deliberate acts. These 10 diagnoses include suicide attempt, pesticide ingestion, rodenticide ingestion, ingestion of other chemicals, ingestion of unknown poison, ingestion of foreign bodies, overdose with illegal drugs, hanging, laceration to the neck, and food refusal. All ED cases with these ten diagnoses were categorized as “probable DSH.”

The other 7 target diagnoses (overdose of medication, alcohol poisoning, carbon monoxide poisoning, laceration of the hand, falls, drowning, and other miscellaneous injury) were more equivocal because they could be either accidental or deliberate. To help classify cases with these 7 diagnoses as “probable DSH,” “possible DSH,” or “probably not DSH,” we considered the limited additional information available for each case to develop a classification algorithm for each of the seven types of injury. Variables considered included gender, age, presence of allergies, time of day of the injury, time of year of the injury, location the injury occurred, prior injuries in the same individual, and simultaneous occurrence of multiple cases of the same type of injury (e.g., multiple poisonings, smoke inhalation, etc.). For example, medication overdoses that occurred in the presence of drug allergies were excluded (i.e., “probably not DSH”), nighttime sedative overdose in persons with insomnia were coded as “possible DSH,” and overdoses of sedatives during the daytime were coded as “probable DSH.” Falls from a height in young males during work hours were considered “probably not DSH,” those in persons not of working age during daytime were classified as “possible DSH” and those occurring in the middle of the night were considered “probable DSH.” Similarly, drowning incidents that occurred in the middle of the night were considered “probable DSH” but those that occurred in the daytime at a location that was not designated for swimming were considered “possible DSH.” Multiple-case carbon monoxide poisoning incidents (which can occur when using coal burners for heat or cooking) were excluded (i.e., “probably not DSH”), while individual cases that occurred in summer were coded as “probable DSH.” Wrist-slashing was considered “probable DSH” while other types of hand lacerations were considered “possible DSH.” In some cases an individual had several ED visits for different types of self-harm (e.g., medication overdoses, hand injury, fall, etc.); in such cases all visits for the individual were considered “probable DSH”

The results of the case identification process are shown in Figure 1. Among the 698,495 ED admissions, 2,820 admissions had 1 of the 17 target diagnoses recorded as the primary reason for the ED visit and 1,495 of them (0.21% of all admissions) were classified as probable DSH ($n = 1297$) or possible DSH ($n = 198$). These 1,495 DSH admissions were in 1,459 different individuals; 1,431 of them (98.1%) had a single DSH admission and 28 (1.9%) had multiple DSH admissions over the 4-year period (24 had two admissions, 2 had three admissions, 1 had four admissions and 1 had six admissions). When describing the

characteristics of persons with DSH, the last admission of these 28 individuals with multiple admissions is considered. Thirty-three cases of probable DSH that used multiple methods at the same time (most commonly alcohol poisoning in combination with some other method) were categorized according to the first method listed.

We used SPSS 17.0 software to analyze the data. Chi-squared tests were used to compare proportions and time trends, regular t-tests and paired t-tests were used to compare normally distributed continuous variables, and logistic regression models were used to identify variables associated with death among persons with DSH. Multiple comparisons of proportions used a Tukey-type multiple comparison method based on an arcsin transformation of the original proportions (Zar, 1999). When assessing the prevalence, outcome, and management of different DSH injuries, all 1,495 admissions with probable or possible DSH were divided into four groups: the three most common methods of DSH—overdose of medication, fall from height, and pesticide ingestion—each became a separate group and the 14 less-common ED diagnoses (a total of 220 admissions) were combined into a fourth group. All tests are two-tailed and use 0.05 as the level of statistical significance.

RESULTS

Reclassification of ED Admissions with the 17 Target Diagnoses

As shown in Table 1, only 6 of the 1495 admissions (0.4%) retrospectively classified as probable or possible DSH had an ED diagnosis of “suicide attempt.” In three of these cases the method was laceration of the wrist, in one case the method was carbon monoxide poisoning and in two cases the method was not specified.

Less than 1% of the ED admissions with a diagnosis of alcohol poisoning were reclassified as probable or possible DSH, about half of the carbon monoxide poisoning cases were reclassified as DSH, about two-thirds of the cases with a ED diagnosis of “fall from a height” were reclassified as DSH, and over 95% of the other ED diagnoses considered (i.e., medication overdose, drowning, pesticide ingestion, etc.) were classified as probable or possible DSH. Among the 198 admissions classified as possible DSH, 165 (83.3%) had an ED diagnosis of “fall from a height.” Three ED diagnoses—medication overdose, fall from a height, and pesticide ingestion—accounted for 1275 of the 1495 (85.3%) admissions classified as probable or possible DSH. The ten ED diagnoses that were almost always DSH accounted for 22.5% (337/1495) of all DSH cases and the seven ED diagnoses that were only associated with DSH in certain circumstances accounted for 77.5% (1158/1495) of all DSH cases.

The overall case-fatality of DSH was 4.4% (65/1495). Hanging, drowning and suicide attempt were the three DSH-related admission diagnoses with the highest morality. Among the 65 admissions with probable or possible DSH that died in the ED, 57 (87.7%) had one of these three diagnoses.

Time Trends in DSH Admissions from 2007 to 2010

Table 2 shows that the number of ED admissions increased more than 50% over the 4-year period considered in the study. However, the number of ED admission classified as probable or possible DSH decreased by 15% from 2007 to 2010, and the proportion of all admissions classified as DSH dropped by 43% from 3.0 per 1000 admissions to 1.7 per 1000 admissions. This annual decline in the proportion of DSH admissions was statistically significant. Neither the pattern of methods of DSH nor the case-fatality ratio of the DSH admissions changed over the 4-year period.

Comparison of Male and Female Individuals with Probable or Possible DSH

The ratio of unduplicated female DSH cases to male cases was 1.35 (837:622; 95% CI = 1.21–1.49). The mean (sd) age of the 806 unduplicated female DSH cases for whom age was available was lower than that of the 563 unduplicated male DSH cases for whom age was available [35.0 (16.0) vs. 38.7 (16.1) years, $t = -4.21$, $P < 0.001$]. As shown in Table 3, unduplicated male DSH cases were much more likely to jump from a height than female DSH cases, but jumping from a height was significantly more likely to be fatal in women than in men. Female DSH cases were significantly more likely to take overdoses of medications than male DSH cases but the case-fatality of this method was quite low in both men and women. Females DSH cases were also more likely to use carbon monoxide poisoning but this difference was not statistically significant and the method was never fatal. The overall case-fatality of DSH was significantly lower in females than in males; the female to male case-fatality ratio for DSH was 0.56 (95% CI = 0.35–0.91).

Comparison of Outcome and Management of Different Types of DSH Patients

As shown in Table 4, there are substantial differences in the ED outcome and management of patients with probable or possible DSH based on the method they used to harm themselves. Individuals with an ED diagnosis of “overdose of medication” were less likely to die during the admission and less likely to be transferred to inpatient medical wards or to the intensive care department than persons in the other three diagnostic groups. Individuals with an ED diagnosis of “fall from height” were more likely to be transferred to the surgery department or to another hospital than those in the other three diagnostic groups.

As shown in Table 5, there were several significant differences in the outcome and management of admissions classified as probable DSH versus those classified as possible DSH. However, these differences are related to the different distribution of the methods of DSH (i.e., ED diagnoses) in the two groups. Compared to probable DSH admissions (of which only 14% were falls from a height), possible DSH admissions (83% of which were falls from a height), were more likely to be transferred to the surgery department, to an inpatient ward or to another hospital and they were less likely to be discharged after observation or to leave the ED against medical advice. The case-fatality among admissions classified as probable DSH was not significantly different from that for admissions classified as possible DSH (6.1% vs. 4.1%, $\chi^2 = 1.61$, $P = 0.205$).

DISCUSSION

In most circumstances Chinese hospitals diagnose illnesses according to the International Classification of Diseases (ICD-10, World Health Organization, n.d.), but they do not use the ICD coding system for injuries, which first classifies the intentionality of the injury (i.e., accidental or intentional) and subsequently identifies the method and the agent resulting in the injury. The EDs of hospitals in China do not usually record (or ask about) the intentionality of injuries so the default diagnosis is that all injuries are accidental. This practice (which is common in many LAMICs) results in the misclassification of all intentional injuries as unintentional injuries (i.e., accidents), the failure to identify suicide attempts, and, more importantly, missed opportunities to prevent subsequent suicides. Details of the circumstances of the injury available at the time of the visit to the EDs of general hospitals usually make determination of intentionality relatively easy, so we expect the main reason for failing to classify injuries as accidental or intentional is that the stigma associated with self-harm makes patients reluctant to accept the “suicide” label and makes clinicians reluctant to apply the “suicide” label.

Rectifying this problem in China and elsewhere will be a long-term process because it will require changing attitudes, providing training to all clinicians that work in EDs, and, probably, new government regulations about diagnosing injuries. In the meantime, one interim measure to obtain information on medically treated episodes of DSH (which is the closest available proxy for medically treated suicide attempts) is to retrospectively assess the intentionality of injuries using currently available ED records. This study demonstrated the feasibility of this method of identifying episodes of DSH.

Major Findings

Retrospective analysis of the ED registry of a large general hospital in Shanghai identified 10 different ED injury-related diagnoses that are almost always episodes of DSH in adults: suicide attempt, pesticide ingestion, rodenticide ingestion, ingestion of other chemicals, ingestion of unknown poison, ingestion of foreign bodies, overdose with illegal drugs, hanging, laceration to the neck, and food refusal. We are quite confident that the vast majority of individuals with these ED diagnoses—which accounted for 23% of all cases classified as probable or possible DSH—were, in fact, cases of DSH.

The other 7 ED injury diagnoses considered accounted for 77% of all cases of probable or possible DSH, but these diagnoses (including overdose of medication, alcohol poisoning, carbon monoxide poisoning, laceration of the hand, falls, drowning, and other miscellaneous injuries) were only the result of DSH in certain circumstances so it was more difficult to reliably assess intentionality. For example, alcohol intoxication is a common cause of ED admission, but in a small minority of cases it is an intentional act of self-harm (DSH) that can have associated thoughts of death (i.e., a suicide attempt). Overdoses of medications, carbon monoxide poisoning, falling from a height and drowning are relatively common methods of self-harm but they can also be the result of accidents. Using information provided by the ED clinicians, we established algorithms based on the time, season, and other factors related to the injury to retrospectively classify these injuries as “probable

DSH,” “possible DSH,” and “probably not DSH.” Prospective studies will be needed to assess the accuracy of these algorithms.

None of the cases retrospectively classified as probable or possible DSH were identified as DSH in the ED record and less than 1% of them had an ED diagnosis of “suicide attempt.” This highlights the clinical importance of this issue. Identifying and evaluating episodes of DSH is one of the most important interventions for preventing suicide (Mann, Apter, Bertolote et al., 2005).

Over the last 15 years China has seen a rapid decrease in suicide rates (Wang, Li, Chi et al., 2008). This change could either be the result of decreasing rates of suicidal behavior or the result of lower case-fatality of suicidal behavior. The results from this study show a substantial 17% decrease in the absolute number of ED admissions with DSH over the 4-year period from 2007 to 2010 and an even more dramatic 43% decrease in the proportion of ED admissions classified as DSH. These results support the conclusion that the prevalence of DSH (or, at least, medically treated episodes of DSH) is decreasing in parallel with the decreasing rates of suicide. But the very low case-fatality rates for medication ingestion (0.3%) compared to the relatively high case-fatality for pesticide ingestion (8.6%) suggests another possible explanation for decreasing suicide rates. With rapid urbanization the proportion of the population that has ready access to pesticides is dropping so the resultant change in the methods of DSH (from pesticide ingestion to medication ingestion) could be leading to a decrease in the overall case-fatality of suicidal behavior. Nationally representative psychological autopsy studies are needed to determine which of these mechanisms is primarily responsible for the declining suicide rates.

Analysis of the characteristics of the retrospectively identified cases of DSH found substantial differences between men and women with DSH. Women with DSH are younger than men with DSH and are more likely to take overdoses of medications—a method that has a very low case-fatality ratio in China. (The low case-fatality of medication overdoses in China occurs because the vast majority involve ingestion of sleeping medications or anti-anxiety agents [Xue, Phillips, & Liu et al., 2004], not anti-depressants or anti-psychotics.) Men with DSH are more likely to jump from a height than women with DSH, but the case-fatality ratio of jumping is higher in women than in men. These characteristics of the retrospectively identified cases of DSH are similar to those reported from prospective studies that identified suicide attempts treated in the EDs of general hospitals in LAMIC (Fleischman, 2005). This similarity supports the validity of this retrospective method of identifying cases of DSH.

As expected, the outcomes and interventions employed in these DSH admissions depended on the type of injury. Individuals who jump from a height are more likely to be transferred to surgery wards and those who ingest medications are more likely to be discharged after a period of observation. Differences in the outcome and interventions employed between cases classified as “probable” versus “possible” DSH were largely driven by differences in the distribution of the different types of injuries in the two groups. More detailed studies are needed to determine whether there are fundamental differences between individuals who use methods that are almost always DSH (e.g., hanging, pesticide ingestion) and those who use

methods that are only occasionally acts of DSH (e.g., excessive alcohol ingestion, drowning).

Limitations

This study is a retrospective analysis of the ED records in one large general hospital in Shanghai over a 4-year period. The data recorded in the ED registry are limited (in some cases even the age of the subject was not available) so judgments about whether or not a particular case should be considered a possible or probable case of DSH were often based on quite limited information. A prospective study with detailed assessments of ED cases would provide more accurate assessments of the prevalence of DSH among ED visits and of the pattern of misclassification of the ED diagnoses of injuries. Such prospective studies could be used to assess the validity of the retrospective method we have employed to identify cases of DSH using ED registries.

The generalizability of these results to other urban hospitals in China is unclear, but there is no reason to believe that the accuracy of the ED registries in other hospitals is any better than that at the Jiading District Central Hospital, a large suburban hospital in Shanghai. Jiading is a rapidly expanding urban district with a high proportion of migrant laborers—a common situation in urban China—so the demographic characteristics of individuals with DSH and the pattern of DSH methods may be somewhat different from that seen in the EDs of hospitals in urban areas with a more stable population. The suicide rate is higher in rural China than in urban China and pesticide ingestion is a more common method of attempting suicide in rural China (Phillips, Li, & Zhang, 2002; Yang, Phillips, Zhou et al., 2005), so the prevalence and characteristics of DSH identified using the ED registries of rural hospitals may be different from those in urban hospitals; to date no studies have specifically assessed this issue.

The prevalence and pattern of suicide is changing rapidly over time in China (Wang, Li, Chi et al., 2008) so it is probable that the pattern and prevalence of DSH is also changing. The 4-year window this study covers (2007 to 2010) may not represent the situation before or after this period. For example, at present non-suicidal self-injury does not appear to be highly prevalent in China (Chen, Phillips, & Li, 2009) so DSH is a reasonable proxy for suicide attempt, but this may change in the future.

Implications

The prevalence and pattern of medically treated episodes of DSH in China—and possibly in other LAMICs—cannot be determined by reference to the cases identified as “suicide attempt” in the registries available from the EDs of large general hospitals. Focused efforts on improving the accuracy and completeness of ED records, such as the Web-based Injury Statistics Query and Reporting System (WISQARS) program in the United States (CDC, National Center for Injury Prevention and Control, 2012) and the European Registry (University of Oxford Center for Suicide Research, 2012) will be needed to provide reliable statistics on DSH. However, these changes will take considerable time and effort to implement so they are not currently feasible in most LAMIC. Interim steps to develop hospital-specific algorithms to retrospectively assess the intentionality of injuries recorded in

ED registries is one viable method of estimating the prevalence and characteristics of medically treated DSH.

Studies on the characteristics and treatment of attempted suicide in LAMIC that identify cases in EDs of general hospitals need to provide detailed information on the case-identification methods employed. The cases typically identified as “suicide attempt” in ED registries may only be a small proportion of the actual cases and, thus, may not be representative of medically treated suicide attempts.

These findings highlight potential problems of suggested revisions to the ICD-10 coding scheme for injuries. The ICD-11 committee responsible for updating the classification for injuries has proposed downgrading the importance of intent (i.e., intentional vs. unintentional) in the classification by changing the indicators for intention from the first two digits of the 3-digit ICD-10 code for “external cause codes” to the fourth digit of a 4-digit code for ICD-11 (McKenzie, Fingerhut, & Harrison, 2011). This change would give precedence to coding “mechanism” (e.g., poisoning) and “object” (e.g., pesticide) over intent (e.g., accidental vs. intentional). Such a change would make it even harder to promote efforts to distinguish unintentional from intentional injuries in EDs of general hospitals. If the WHO considers this distinction of secondary importance why should busy ED physicians worry about making the distinction?

Improving the identification of episodes of DSH treated in the EDs of general hospitals is only the first step. In China, like in most LAMIC, almost none of the individuals treated in EDs for injuries secondary to suicide attempts receive psychological assessment, treatment or referral. Very few general hospitals in China have mental health professionals on staff and those that do have mental health professionals rarely assign them to assess the psychological status of individuals treated for suicide attempts in their EDs. But in China, like everywhere else, prior suicide attempt is the most powerful predictor of subsequent suicide (Phillips, Yang, Zhang et al., 2002). The vast majority of persons who die of suicide in China have never seen a mental health professional (Phillips, Yang, Zhang et al., 2002), so the ED is a key “window of opportunity” to intervene in a potentially fatal trajectory.

Acknowledgments

This study was supported by a grant from the Shanghai Municipal Bureau of Health (grant number 20124129).

REFERENCES

- Bi B, Tong J, Liu L, Wei S, Li H, Hou J, ... Phillips MR (2010). Comparison of patients with and without mental disorders treated for suicide attempts in the emergency departments of four general hospitals in Shenyang, China. *General Hospital Psychiatry*, 32(5), 549–555. [PubMed: 20851276]
- Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. (n.d.) Web-based Injury Statistics Query and Reporting System (WISQARS). Retrieved from <http://www.cdc.gov/injury/wisqars>
- Chen Y, Phillips MR, & Li X (2009). Current status of research on non-suicidal self-harm in adolescents. *Chinese Journal of Nervous and Mental Diseases*, 35(11), 697–699. (in Chinese)
- Fleischmann A, Bertolote JM, De Leo D, Botega N, Phillips MR, Sisask M, Wasserman D (2005). Characteristics of attempted suicides seen in emergency care settings of general hospitals in eight low and middle income countries. *Psychological Medicine*, 35, 1467–1474. [PubMed: 16164770]

- Fleischmann A, Bertolote JM, Wasserman D, De Leo D, Bolhari J, Botega NJ, Thanh HT (2008). Effectiveness of brief intervention and contact for suicide attempters: A randomized controlled trial in five countries. *Bulletin of the World Health Organization*, 86, 703–709. [PubMed: 18797646]
- Hawton K, & Van Heeringen K (2009). Suicide. *Lancet*, 373, 1372–1381. [PubMed: 19376453]
- Kapusta ND, Tran US, Rockett IR, De Leo D, Naylor CP, Neiderkrotenthaler T, Sonneck G (2011). Declining autopsy rates and suicide misclassification: A cross-national analysis of 35 countries. *Archives of General Psychiatry*, 68(10), 1050–1057. [PubMed: 21646567]
- Li X, Phillips MR, Wang Y, Zhang C, Ji H, Bian Q, He F (2003). Comparison of impulsive and non-impulsive attempted suicide. *Chinese Journal of Nervous and Mental Diseases*, 29, 27–31. (in Chinese)
- Mann JJ, Apter A, Bertolote J, Beautrais A, Currier D, Haas A, Hendin H (2005). Suicide prevention strategies: A systematic review. *Journal of the American Medical Association*, 294, 2064–2074. [PubMed: 16249421]
- McKenzie K, Fingerhut L, & Harrison J (2011). Restructuring the external causes of injury chapter for ICD-11: Update of progress May 2011. Retrieved from http://www.bing.com/search?q=Restructuring+the+External+Causes+of+Injury+Chapter+for+ICD-11%3A&pc=Z129&form=ZGAFDF&install_date=20111207
- Phillips MR, Li X, & Zhang Y (2002). Suicide rates in China, 1995–1999. *Lancet*, 359, 835–840. [PubMed: 11897283]
- Phillips MR, Yang G, Zhang Y, Wang L, Ji H, & Zhou M (2002). Risk factors for suicide in China: A national case-control psychological autopsy study. *Lancet*, 360, 1728–1736. [PubMed: 12480425]
- Pritchard C, & Amanullah S (2007). An analysis of suicide and undetermined deaths in 17 predominantly Islamic countries contrasted with the UK. *Psychological Medicine*, 37(3), 421–430. [PubMed: 17176500]
- University of Oxford Center for Suicide Research. (n.d.). WHO: Euro multicenter study of suicidal behavior. Retrieved from <http://cebmh.warne.ox.ac.uk/csr/reswhoeuro.html>
- Wang L, Phillips MR, Huang Z, Zhang Y, & Yang G (2003). Evaluation of the accuracy of reported suicides in the Chinese population. *Chinese Journal of Epidemiology*, 24(10), 889–892. (in Chinese) [PubMed: 14575601]
- Wang SY, Li YH, Chi GB, Xiao SY, Ozanne-Smith J, Stevenson M, & Phillips MR (2008). Injury-related fatalities in China: An under-recognized public-health problem. *Lancet*, 372, 1765–1773. [PubMed: 18930527]
- World Health Organization. (n.d.) International classification of diseases and related health problems 10th revision (ICD-10). Retrieved from <http://apps.who.int/classifications/icd10/browse/2010/en>
- Xue D, Ji H, Phillips MR, & Liu Z (2004). Characteristics of suicide attempts treated over a 7-year period in the emergency department of a general hospital in Beijing. *Sichuan Mental Health*, 17(2), 95–98. (in Chinese)
- Yang GH, Phillips MR, Zhou MG, Wang LJ, Zhang YP, & Xu D (2005). Understanding the unique characteristics of suicide in China: National psychological autopsy study. *Biomedical and Environmental Science (China CDC)*, 18, 379–389.
- Zar HG (1999). *Biostatistical analysis* (4th ed, pp. 563–565). New Jersey: Prentice Hall.

* see Table 1 for the list of diagnoses

FIGURE 1.
Case identification.

TABLE 1.

Reclassification Results of 2820 Emergency Department Admissions with 17 Diagnoses that are Potentially Deliberate Self-Harm (DSH)

Primary diagnosis in emergency department record	Reclassification of diagnosis				Probable OR possible DSH	Mortality among admissions classified as probable or possible DSH
	Probably not DSH		Possible DSH			
	n (Column %)	n (Row %)	n (Row %)	n (Row %)	n (Column %)	% (n/N)
All 17 Diagnoses	2820 (100.0%)	1325 (47.0%)	198 (7.0%)	1297 (46.0%)	1495 (100.0%)	4.4% (65/1495)
Alcohol poisoning	1109 (39.3%)	1101 (99.3%)	0	8 (0.7%)	8 (0.5%)	0
Overdose of medication	713 (25.3%)	25 (3.5%)	27 (3.8%)	661 (92.7%)	688 (46.0%)	0.3% (2/688)
Fall from height	499 (17.7%)	155 (31.1%)	165 (33.1%)	179 (35.9%)	344 (23.0%)	7.9% (27/344)
Pesticide ingestion	243 (8.6%)	0	0	243 (100%)	243 (16.3%)	8.6% (21/243)
Carbon monoxide poisoning	88 (3.1%)	41 (46.6%)	4 (4.5%)	43 (48.9%)	47 (3.1%)	0
Drowning	42 (1.5%)	1 (2.4%)	2 (4.8%)	39 (92.9%)	41 (2.7%)	22.0% (9/41)
Ingestion of other chemicals	32 (1.1%)	0	0	32 (100%)	32 (2.1%)	0
Rodenticide ingestion	23 (0.8%)	0	0	23 (100%)	23 (1.5%)	0
Hanging	16 (0.6%)	0	0	16 (100%)	16 (1.1%)	31.3% (5/16)
Laceration of the hand	16 (0.6%)	1 (6.3%)	0	15 (93.7%)	15 (1.0%)	0
Other miscellaneous injury	16 (0.6%)	1 (6.3%)	0	15 (93.7%)	15 (1.0%)	0
Ingestion of unknown poison	13 (0.5%)	0	0	13 (100%)	13 (0.9%)	0
Suicide attempt	6 (0.2%)	0	0	6 (100%)	6 (0.4%)	16.7% (1/6)
Ingestion of foreign bodies	1 (0.04%)	0	0	1 (100%)	1 (0.1%)	0
Overdose with illegal drugs	1 (0.04%)	0	0	1 (100%)	1 (0.1%)	0
Laceration to the neck	1 (0.04%)	0	0	1 (100%)	1 (0.1%)	0
Food refusal	1 (0.04%)	0	0	1 (100%)	1 (0.1%)	0

TABLE 2.

Total Number of Emergency Department (ED) Admissions and Number of Admissions Classified as Probable or Possible Deliberate Self-Harm (DSH) by Year from 2007–2010

	Total N (%)	2007 n (%)	2008 n (%)	2009 n (%)	2010 n (%)	χ^2	p-value	χ^2 for Trend	p-value
ED visits	698,495	139,748	151,936	191,983	214,828	–	–	–	–
Probable or possible DSH	1495 (0.21%)	418 (0.30%)	383 (0.25%)	337 (0.18%)	357 (0.17%)	94.02	<0.001	86.56	<0.001
Probable DSH	1297 (0.19%)	352 (0.25%)	337 (0.22%)	291 (0.15%)	317 (0.15%)	72.64	<0.001	65.08	<0.001
Possible DSH	198 (0.03%)	66 (0.05%)	46 (0.03%)	46 (0.02%)	40 (0.02%)	26.26	<0.001	24.12	<0.001
DSH method	n = 1495	n = 418	n = 383	n = 337	n = 357				
Overdose of medication	688 (46.0%)	197 (47.1%)	177 (46.2%)	158 (46.9%)	156 (43.7%)	1.09	0.780	0.70	0.401
Fall from height	344 (23.0%)	107 (25.6%)	71 (18.5%)	86 (25.5%)	80 (22.4%)	7.18	0.067	0.13	0.718
Pesticide ingestion ^a	243 (16.3%)	52 (12.4%)	74 (19.3%)	49 (14.5%)	68 (19.0%)	9.89	0.020	3.48	0.062
All other methods	220 (14.7%)	62 (14.8%)	61 (15.9%)	44 (13.1%)	53 (14.8%)	1.20	0.754	0.11	0.740
DSH mortality/admission	4.4% (65/1495)	4.1% (17/418)	4.2% (16/383)	4.2% (14/337)	5.0% (18/357)	0.55	0.908	0.38	0.539

Note.

^aMultiple comparison testing found that pesticide ingestion was a significantly higher proportion of all DSH in 2008 versus 2007 but there were no other significant differences by year in the proportion of DSH that were pesticide ingestions.

TABLE 3.
Comparisons of Methods of Deliberate Self-Harm (DSH) and Case-Mortality of Specific Methods of DSH by Gender

Method of DSH	Percent (n) of all unduplicated DSH cases			Case-mortality of each method % (n/N)		
	Female (n = 837)	Male (n = 622)	χ^2 (p-value)	Female	Male	χ^2 (p-Value)
All Diagnoses	100.0% (837)	100.0% (622)		3.3% (28/837)	5.9% (37/622)	5.68 (0.017)
Alcohol poisoning	0.7% (6)	0.3% (2)	*(0.479)	0	0	–
Overdose of medication	61.8% (517)	24.8% (154)	196.76 (<0.001)	0.2% (1/517)	0.6% (1/154)	*(0.407)
Fall from height	5.1% (43)	48.1% (299)	366.51 (<0.001)	16.3% (7/43)	6.7% (20/299)	4.76 (0.029)
Pesticide ingestion	17.2% (144)	14.5% (90)	1.98 (0.159)	7.6% (11/144)	11.1% (10/90)	0.82 (0.366)
Carbon monoxide poisoning	3.6% (30)	1.9% (12)	3.50 (0.062)	0	0	–
Drowning	2.6% (22)	3.1% (19)	0.24 (0.626)	18.2% (4/22)	26.3% (5/19)	*(0.709)
Ingestion of other chemicals	1.7% (14)	2.7% (17)	1.93 (0.165)	0	0	–
Rodenticide ingestion	2.0% (17)	1.0% (6)	2.62 (0.106)	0	0	–
Hanging	1.3% (11)	0.5% (3)	2.60 (0.107)	36.4% (4/11)	33.3% (1/3)	*(1.000)
Laceration of the hand	1.1% (9)	1.0% (6)	0.04 (0.836)	0	0	–
Other miscellaneous injury	1.2% (10)	1.0% (6)	0.17 (0.676)	0	0	–
Ingestion of unknown poison	1.2% (10)	0.5% (3)	2.05 (0.152)	0	0	–
Suicide attempt	0.5% (4)	0.3% (2)	*(1.000)	25.0% (1/4)	0	*(1.000)
Ingestion of foreign bodies	0	0.2% (1)	*(0.426)	0	0	–
Overdose with illegal drugs	0	0.2% (1)	*(0.426)	0	0	–
Laceration to the neck	0	0.2% (1)	*(0.426)	0	0	–
Food refusal	0	0.2% (1)	*(0.426)	0	0	–

Note.

* Uses Fisher exact test.

Management and Outcome of Admissions with Probable or Possible Deliberate Self-Harm that Involved Different Methods of Self-Harm

TABLE 4.

	[A] 688 Overdose of medication n (column %)	[B] 344 Fall from height n (column %)	[C] 243 Pesticide ingestion n (column %)	[D] 220 Other methods n (column %)	χ^2	P-value	Multiple comparisons
Discharge from ED after observation period	494 (71.8%)	142 (41.3%)	149 (61.3%)	114 (51.8%)	96.58	<0.001	A > C,D,B; C > B
Transfer to inpatient medical ward	17 (2.5%)	48 (14.0%)	33 (13.6%)	21 (9.5%)	56.39	<0.001	B,C,D > A
Leave ED against medical advice	70 (10.2%)	10 (2.9%)	10 (4.1%)	15 (6.8%)	22.55	<0.001	A > C,B
Discharge from ED without specific treatment	49 (7.1%)	9 (2.6%)	5 (2.1%)	24 (10.9%)	25.24	<0.001	D,A > B,C
Transfer to other hospital	13 (1.9%)	52 (15.1%)	6 (2.5%)	10 (4.5%)	84.30	<0.001	B > D,C,A
Died in ED	2 (0.3%)	27 (7.8%)	21 (8.6%)	15 (6.8%)	51.37	<0.001	C,B,D > A
Transfer to intensive care unit	6 (0.9%)	25 (7.3%)	16 (6.6%)	8 (3.6%)	33.59	<0.001	B,C,D > A
Discharge from ED after fluid replacement	36 (5.2%)	4 (1.2%)	3 (1.2%)	10 (4.5%)	15.88	0.001	A > C,B
Transfer to surgery department	1 (0.1%)	27 (7.8%)	0 (0.0%)	3 (1.4%)	*	<0.001	B > D,A,C

Note. ED, emergency department.

* Uses Fisher exact test.

Comparison of Management and Outcome of 1297 Admissions Classified as Probable Deliberate Self-Harm (DSH) versus 198 Classified as Possible DSH

TABLE 5.

	1,297 Probable DSH n (column %)	198 Possible DSH n (column %)	χ^2 (p-value)
Discharge from ED after observation period	798 (61.5%)	101 (51.0%)	7.93 (0.005)
Transfer to inpatient medical ward	95 (7.3%)	24 (12.1%)	5.39 (0.020)
Leave ED against medical advice	100 (7.7%)	5 (2.5%)	7.07 (0.008)
Discharge from ED without specific treatment	81 (6.3%)	6 (3.0%)	3.24 (0.072)
Transfer to other hospital	56 (4.3%)	25 (12.6%)	23.14 (<0.001)
Died in ED	53 (4.1%)	12 (6.1%)	1.61 (0.205)
Transfer to intensive care unit	43 (3.3%)	12 (6.1%)	3.65 (0.056)
Discharge from ED after fluid replacement	50 (3.9%)	3 (1.5%)	2.75 (0.097)
Transfer to surgical department	21 (1.6%)	10 (5.1%)	9.96 (0.002)

Note. ED, emergency department.