

# Adolescent Hospital Discharges Associated with Self-Poisonings in Wisconsin, 2000-2002

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## ABSTRACT

**Objective:** This study investigates the Wisconsin adolescent self-poisoning problem, using state discharge data on medication-related self-inflicted injuries, focusing on medications used and risk factors.

**Methods:** Wisconsin inpatient discharge files for 3 years (January 1, 2000-December 31, 2002) were evaluated. Medication-related injuries were analyzed for intentionality, medications used, discharge status, and risk factors such as mental illness, eating disorders, and alcohol abuse or dependence.

**Results:** There were nearly 3000 medication-related injury hospitalizations—1150 of them self-poisoning hospitalizations—among Wisconsin 12-17 year olds during 2000-2002. Females 12-17 years had twice as many medication-related injuries as males. Sixty percent of medication-related injuries occurred in patients with a mental disorder diagnosis. Non-narcotic analgesics were most commonly used and had one of the highest rates of intentionality (65%). A large proportion of intentional/suicidal medication-related injuries were discharged to another facility (35%), compared to 14% among all medical injuries. Males with medication-related injuries were twice (95% CI: 1.60, 2.75) as likely and females 1.4 (95% CI: 1.2, 1.6) times as likely to have intentional/suicidal injuries if they also abused or depended on alcohol.

**Conclusions:** Given that a nonfatal suicide attempt is the strongest predictor of eventual suicide, the hundreds

of self-poisoning discharges per year in Wisconsin 12-17 year olds is a serious public health concern. Both the medical community and public health community should heed the warnings of these nonfatal suicide attempts and implement educational programs addressing this issue.

## BACKGROUND

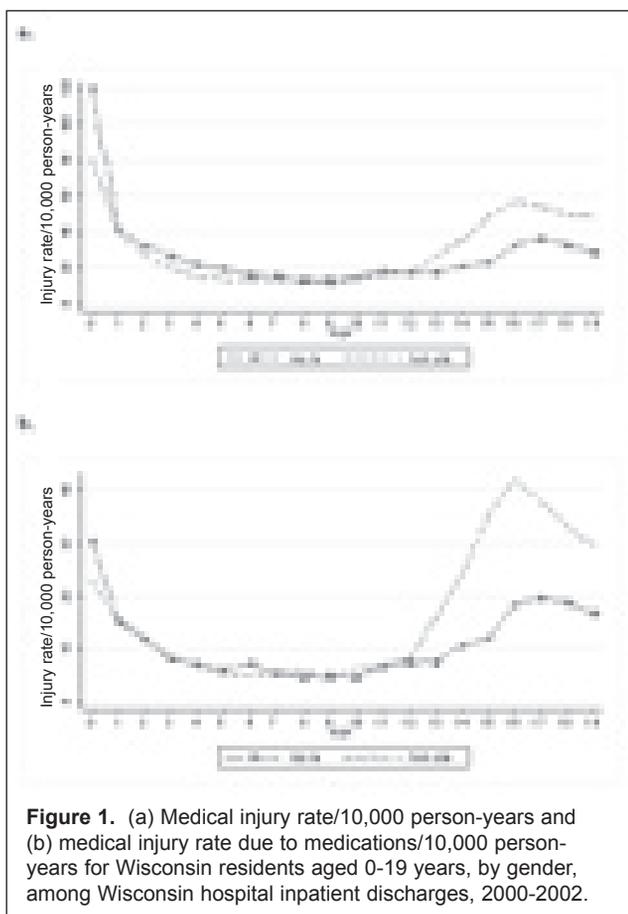
In 2000, suicide replaced homicide as the second highest leading cause of death in 12-17 year olds in the United States.<sup>1</sup> The 2003 Wisconsin Youth Risk Behavior Surveillance (YRBS) System's survey of Wisconsin public high school students reported that 20% seriously considered attempting suicide in the past 12 months and 8% actually attempted suicide in that time.<sup>2</sup> In response to this growing public health problem, the US Department of Health and Human Services has included reducing the overall suicide rate and adolescent suicide attempts as a *Healthy People 2010* objective.<sup>3</sup>

Understanding the risk factors is essential in addressing any public health problem. The strongest known risk factor for suicide is a previous nonfatal suicide attempt.<sup>4</sup> A recent study from Finland showed that an increased risk for suicide remained for a full 37 years after an initial self-poisoning attempt.<sup>5</sup> Many other factors have been identified as being associated with an increased risk for suicide among youth, including drug abuse, alcohol use, mental illness, eating disorders, and family and social problems.<sup>6-8</sup> A previous injury hospitalization has also been shown to indicate a higher risk for subsequent suicidal behavior.<sup>9</sup> Gender trends have also been found; female adolescents are more likely to attempt suicide by self-poisoning than male adolescents.<sup>10</sup>

Self-poisoning by medications or drugs is the third most common method used by adolescents to commit suicide.<sup>1</sup> The types of medications used vary in different populations. A study looking at England's hospital admissions records and a separate study from a poison

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**Figure 1.** (a) Medical injury rate/10,000 person-years and (b) medical injury rate due to medications/10,000 person-years for Wisconsin residents aged 0-19 years, by gender, among Wisconsin hospital inpatient discharges, 2000-2002.

treatment unit in England identified analgesics as the most common medication used in self-poisonings.<sup>11,12</sup> The city of Lodz, Poland, reported that sleep-inducing and psychotropic medications accounted for most of the self-poisonings in their 9-15 year olds.<sup>13</sup> Recently, the British Medicines and Healthcare Products Regulatory Agency and the US Food and Drug Administration have issued warnings to doctors concerning the use and subsequent abuse of antidepressants in children, claiming that the side effects of suicidal thoughts and self-injury outweigh the benefits of these treatments.<sup>14-16</sup>

The purpose of this study was to use hospital discharge data to investigate the number of self-poisonings among Wisconsin adolescents from 2000 to 2002, with a focus on identifying which medications were used and on potential risk factors for self-poisoning.

**METHODS**

The discharge data files for 2000-2002 were obtained from the Wisconsin Bureau of Health Information (BHI). The discharge data routinely collected and disseminated by the BHI is based on the Health Care Finance Administration uniform billing report (UB-92)

for all inpatients discharged from acute care, nonfederal hospitals. The variables from this database included in the analyses were patient demographics, discharge disposition, up to 9 ICD-9 diagnosis codes, and a special E-code field.

The Wisconsin Medical Injury Prevention Program Screening criteria<sup>17</sup> were used to screen for medical injuries among all diagnostic codes. The Wisconsin Patient Safety Injury Surveillance System defines a medical injury as any untoward injury associated with a therapeutic or diagnostic health care intervention. The system consists of ICD-9 codes indicating a medical injury, as determined by a team of physicians, nurses, statisticians, a medical technologist, and epidemiologists. The data for 0-19 year olds was screened for any medical injury and then screened for broad categories of medical injuries: medication-related medical injuries, radiation-related medical injuries, procedure-related medical injuries, and device-, implant-, or graft-related injuries. Rates of all medical injuries and of broad categories were calculated by 10,000 person-years for the 0-19 year age group in Wisconsin. When a large peak in medical injuries was detected in 12-17 year olds, the remaining analyses focused on this age group.

The medication-related injuries were classified into 18 detailed medication categories: (1) antibiotics; (2) hormones; (3) systemic agents; (4) agents affecting blood; (5) blood products; (6) non-narcotic analgesics, antipyretics, and antirheumatics; (7) narcotic analgesics; (8) anticonvulsants; (9) sedatives and hypnotics; (10) other psychotropic medications; (11) medications affecting the autonomic nervous system; (12) cardiovascular medications; (13) medications affecting the digestive system, smooth muscles, and respiratory system; (14) water, minerals, and uric acid medications; (15) anesthesia; (16) other miscellaneous medications; (17) specific reactions to unknown medications; and (18) miscellaneous complications due to unspecified medications. Additional details of the classification criteria are available from the authors upon request.

Rates of self-inflicted injury, routine discharge, discharge to other care facilities, and mental disorder diagnosis were calculated for all discharges, all medical injuries, all medication-related injuries, and each detailed medication category. Relative risks of self-harm given an eating disorder diagnosis or alcohol use were also calculated for all 12-17 year olds and by gender.

Intentional/suicide injuries were defined by ICD-9 E-codes E950-E959. Mental disorder diagnoses were defined by diagnoses codes 290-319. Alcohol use or de-

pendence was defined by codes V11.3, 303.X, and 305.0. Eating disorders were defined by codes 307.1, 307.5X, and 783.0.

## RESULTS

After an initial peak of medical injuries in newborns, the medical injury rate remained low (around 20/10,000 person-years) until another peak was seen in 12-17 year olds, particularly pronounced in females (Figure 1a). Breaking the medical injuries into broad categories of medication-related, procedure-related, radiation-related, and device- or implant- or graft-related revealed that medication-related injuries were most responsible for the peak seen in medical injuries in 12-17 year olds (Figure 1b).

When rates of medication-related injuries were calculated for each of the 18 detailed medication categories, the largest peak for the 12-17 year olds was related to use of non-narcotic analgesics, antipyretics, and antirheumatics (Figure 2a). The next highest rate of medication-related injuries, less than a third as high as the non-narcotic analgesics rate, was related to the use of other psychotropic medications (Figure 2).

There were nearly 3000 medication injury discharges among Wisconsin adolescents aged 12-17 years during the study period (Table 1). Females aged 12-17 years had twice as many medication injury discharges as males of the same ages. While 4% of all hospital discharges in this age group were classified as intentional, almost 40% of the medication-related injury discharges were classified as self-inflicted (Table 1). Forty-six percent of female medication-related injury discharges were classified as self-poisonings, as were 26% of male medication-related injury discharges. Non-narcotic analgesics were responsible for the largest number of medication-related injury discharges, and had a high rate of intentionality (65%) as well. Systemic agents were responsible for the second largest number of medication-related injury discharges, but had a low rate of intentionality (26%). Other psychotropics were responsible for half the number of medication-related injury discharges as non-narcotics, but had a high rate of intentionality (62%). Another medication category, unspecified drugs, had both high numbers of injury discharges and a high rate of intentionality (73%) (Table 1).

A mental disease diagnosis was noted in 60% of the medication-related injury discharges for 12-17 year olds (Table 1). Medication categories with high intentionality rates also had high rates of mental disease diagnosis: 87% of those with other psychotropic-related injury discharges, 80% of those with a non-narcotic analgesic-

**Table 1.** Percent of Intentional/Suicide Injuries and Mental Disorder Diagnoses by Detailed Medication Categories Wisconsin Hospital Admissions Aged 12-17 years, 2000-2002

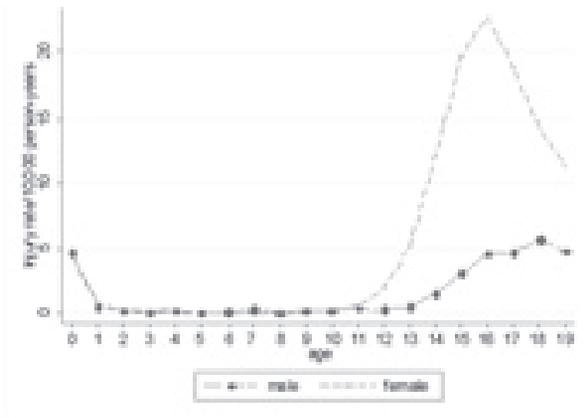
|  | Intentional/<br>Suicide (%) | Mental<br>Disorder (%) | Total<br>(n) |
|--|-----------------------------|------------------------|--------------|
| All admissions   | 3.5                         | 30.2                   | 41,436       |
| All medical injuries                                     | 24.5                        | 41.5                   | 4694         |
| All medication-related injuries                          | 39.8                        | 59.9                   | 2893         |
| Non-narcotic analgesics, antipyretics, antirheumatics    | 64.6                        | 80.2                   | 1144         |
| Other psychotropics                                      | 62.5                        | 86.5                   | 557          |
| Systemic agents  | 26.0                        | 39.2                   | 462          |
| Miscellaneous complication due to unspecified medication | 72.8                        | 74.8                   | 408          |
| Narcotics  | 16.7                        | 32.3                   | 251          |
| Antibiotics  | 20.9                        | 32.3                   | 201          |
| Sedatives, hypnotics                                     | 47.9                        | 68.6                   | 188          |
| Hormones   | 13.0                        | 34.1                   | 138          |
| Other miscellaneous medications                          | 50.0                        | 79.0                   | 138          |
| Anticonvulsants, antiparkinsonism                        | 44.9                        | 68.4                   | 136          |
| Specific reaction to unknown medication                  | 0.0                         | 13.3                   | 120          |
| GI, smooth muscle, respiratory medications               | 57.5                        | 77.7                   | 94           |
| Autonomic nervous system medications                     | 48.4                        | 61.3                   | 93           |
| CV medications   | 73.9                        | 76.1                   | 46           |
| Blood products   | 0.0                         | 16.3                   | 43           |
| Anesthesia   | 11.8                        | 26.5                   | 34           |
| Agents affecting blood constituents                      | 41.2                        | 58.8                   | 17           |
| Water, mineral, uric acid medications                    | 40.0                        | 53.3                   | 15           |

related injury discharge, and 75% of those with an unspecified medication-related injury discharge (Table 1).

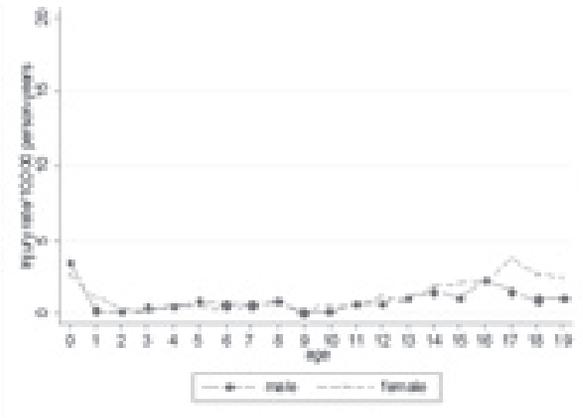
Discharge disposition analyses revealed that hospital discharges for all causes in this age group resulted predominantly in routine discharges, with only 4.4% being transferred to another care facility (Table 2). When the discharge was related to medication injuries, 20% were transferred to another care facility, and when the medication-related injury discharge was classified as intentional/suicidal, 35% of the patients were transferred to another care facility (Table 2).

Males with medication-related injury discharges were 2.10 (95% CI: 1.60, 2.75) times more likely and females 1.37 (95% CI: 1.17, 1.61) times more likely to have intentional/suicidal injuries if they also had alcohol abuse or dependence coded in their discharge record. Males with medication-related injury discharges

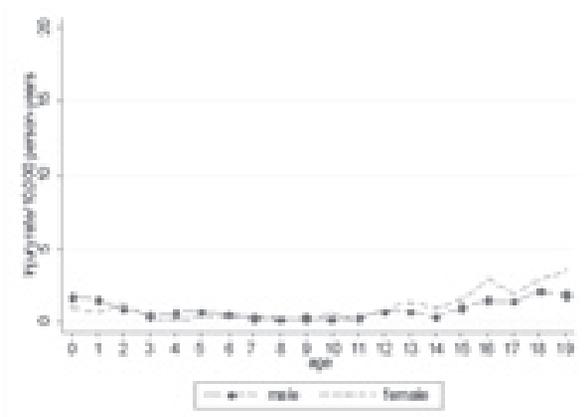
a. Non-narcotic analgesics, antipyretics, antirheumatics



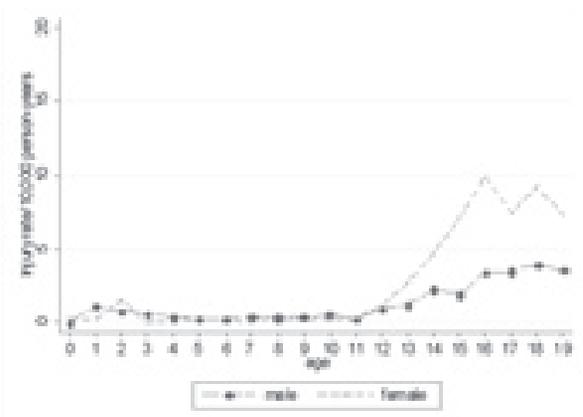
b. Narcotic analgesics



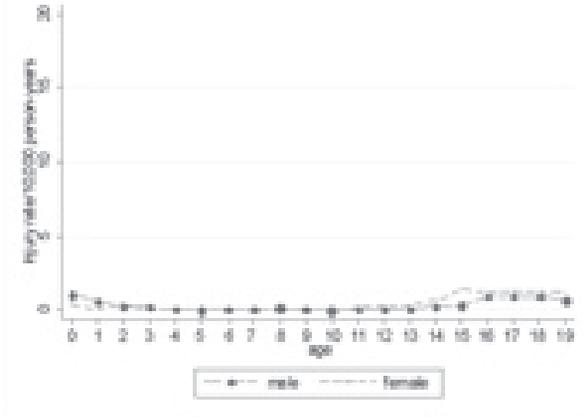
c. Sedatives, hypnotics



d. Other psychotropics



e. GI, smooth muscle, and respiratory medications



f. Miscellaneous complication from unspecified medication

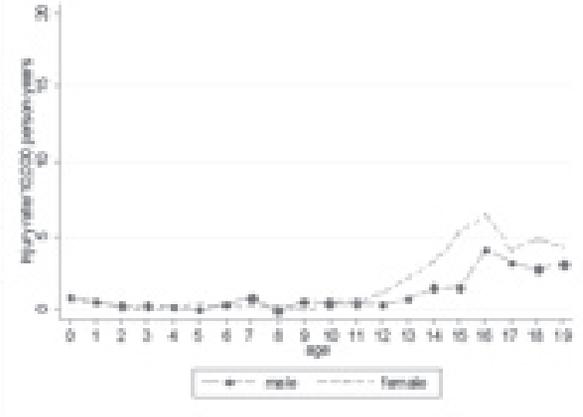


Figure 2. Medical injury rate/10,000 person-years for specific medications, Wisconsin hospital inpatient discharges, 2000-2002.

were 1.27 (95% CI: 0.25, 6.30) times more likely and females 1.45 (95% CI: 1.20, 1.74) times as likely to have intentional/suicidal injuries if they also had an eating disorder diagnosis.

## DISCUSSION

Over the 3-year study period, there were 1150 Wisconsin self-poisoning hospital discharges in 12-17 year olds. There were an additional 81 medication-related discharges classified as indeterminate in intentionality and an additional 161 classified as accidental poisonings, which we did not include in our analyses. A limitation of this study is that the problem of self-poisonings among adolescents in Wisconsin may be even more serious than what is reflected in the data if misclassification of intentionality occurred. Another limitation of the study is that we are unable to determine how many individuals account for the 1150 self-poisonings over the course of the study's 3 years because there are no personal identifiers in the data. The YRBS data reported that 4% of high school students surveyed had attempted suicide more than 1 time within a 12-month period<sup>2</sup> so some of the self-poisonings over the 3-year study period may represent multiple attempts by a single individual. Our calculations involving alcohol use and eating disorders may underestimate the relationship between these risk factors and self-poisoning. Alcohol use and eating disorders may not be coded consistently, depending on the reason for admission.

Our analyses revealed several important trends. Adolescent females had a much higher rate of self-poisonings compared to adolescent males. These findings were consistent with trends found statewide,<sup>2</sup> nationally,<sup>6</sup> and internationally.<sup>11,13</sup> Our data also found that mental illness, alcohol use, and eating disorders were related to an increased risk for self-poisoning, as determined by other studies.<sup>6-8</sup> While antidepressant use by children has been garnering much of the attention of medical agencies<sup>14,15</sup> and the media, we found that non-narcotic analgesics, which are more easily accessible to adolescents than antidepressants, were responsible for most of the medication-related discharges and for most of the known intentional/suicidal injuries. Non-narcotic analgesics were also implicated in suicide studies in London<sup>12</sup> and Australia.<sup>18</sup>

## CONCLUSION

Despite the pervasiveness of suicide and suicidal behavior in adolescents, the subject does not attract the extensive attention from either medical or public health communities that other adolescent problems such as ho-

**Table 2.** Discharge Status,\* Wisconsin Hospital Admissions Aged 12-17 years, 2000-2002

|   | Routine<br>Discharge<br>(%) | Transfer<br>to Other<br>Facility† (%) | Total<br>(n) |
|---|-----------------------------|---------------------------------------|--------------|
| All admissions  | 94.7                        | 4.4                                   | 41,436       |
| All medical injuries  | 85.5                        | 13.9                                  | 4694         |
| All medication-related injuries   | 79.3                        | 20.3                                  | 2893         |
| All intentional/suicide medication-related injuries   | 64.7                        | 34.8                                  | 1150         |
| <b>Intentional/Suicide Medication-Related Injuries,<br/>By Detailed Medication Categories</b> |                             |                                       |              |
| Non-narcotic analgesics, antipyretics, antirheumatics   | 65.1                        | 34.2                                  | 739          |
| Other psychotropics   | 59.5                        | 39.9                                  | 348          |
| Miscellaneous complications due to unspecified medications                                    | 63.0                        | 37.1                                  | 297          |
| Systemic agents   | 59.2                        | 40.8                                  | 120          |
| Sedatives and hypnotics   | 55.6                        | 44.4                                  | 90           |
| Anticonvulsants, anti-parkinsonism  | 59.0                        | 39.3                                  | 61           |
| Other miscellaneous medications   | 65.2                        | 34.8                                  | 59           |
| GI, smooth muscle, and respiratory medications  | 70.4                        | 29.6                                  | 54           |
| Autonomic nervous system medications  | 53.3                        | 46.7                                  | 45           |
| Antibiotics   | 61.9                        | 38.1                                  | 42           |
| Narcotics   | 54.8                        | 45.2                                  | 42           |
| Cardiovascular medications  | 55.9                        | 44.1                                  | 34           |
| Hormones  | 44.4                        | 55.6                                  | 18           |
| Agents affecting blood constituents   | 71.4                        | 28.6                                  | 7            |
| Water, mineral, and uric acid medications   | 50.0                        | 50.0                                  | 6            |
| Anesthesia  | 75.0                        | 25.0                                  | 4            |
| Blood products  | 0.0                         | 0.0                                   | 0            |
| Specific reaction to unknown medications  | 0.0                         | 0.0                                   | 0            |

\*Patients who left against medical advice and expired patients have been excluded from the table due to small numbers.

†Other facility as indicated on form UB-92, item 22: short-term general hospital, skilled nursing facility, intermediate care facility, or another type of institution.

micide, drug abuse, and sexual activity receive. Studies have shown that many persons attempting or successfully committing suicide had recent contact with health care professionals, some as recently as 1 week prior to the attempt. In a study of 13-18 year olds admitted to a hospital following an overdose, nearly a quarter had seen their general practitioners 1 week prior to the overdose and half had seen them in the previous month.<sup>19</sup> A New Zealand study found increased relative risks for suicide among those hospitalized for self-injury, injuries of undetermined causes, and assault in the previous 12 months.<sup>9</sup> These previous hospitalizations and office visits represent opportunities for intervention on the part

of the medical community. Teachers and advisors of adolescent students should also be educated on risk factors for adolescents with suicidal thoughts. Educational programs, such as the Signs of Suicide (SOS), a school-based prevention program, have been shown to lower suicide rates effectively.<sup>20</sup> The SOS uses an educational approach that increases students' awareness of depressive symptoms in themselves and their peers through videos and discussions, and then screens the students for depression.<sup>20</sup>

We used hospital discharge data to estimate the extent of the adolescent self-poisoning problem in Wisconsin. Our results show that there are hundreds of adolescents in Wisconsin alone who are at risk for eventual suicide. Both the medical community and public health community should heed the warnings of these nonfatal suicide attempts and implement education programs addressing this issue.

## ACKNOWLEDGMENT

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