



Published in final edited form as:

*Inj Prev.* 2022 December ; 28(6): 545–552. doi:10.1136/ip-2022-044620.

## National Estimates of Emergency Department Visits for Medication-related Self-harm—United States, 2016–2019

Andrew I. Geller, MD<sup>1,2</sup>, Daniel C. Ehlman, ScD, MPH<sup>3,4</sup>, Maribeth C. Lovegrove, MPH<sup>1</sup>, Daniel S. Budnitz, MD, MPH<sup>1,2</sup>

<sup>1</sup>Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, GA, USA;

<sup>2</sup>US Public Health Service Commissioned Corps, Rockville, MD, USA;

<sup>3</sup>Division of Injury Prevention, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, Atlanta, GA, USA;

<sup>4</sup>Epidemic Intelligence Service, Centers for Disease Control and Prevention, Atlanta, GA, USA

### Abstract

**Background:** Medication poisoning is a common form of self-harm injury, and increases in injuries due to self-harm, including suicide attempts, have been reported over the last two decades.

**Methods:** Cross-sectional (2016–2019) data from sixty emergency departments (EDs) participating in an active, nationally-representative public health surveillance system were analyzed and United States national estimates of ED visits for medication-related self-harm injuries were calculated.

**Results:** Based on 18,074 surveillance cases, there were an estimated 269,198 (95% confidence interval [CI], 222,059–316,337) ED visits for medication-related self-harm injuries annually in 2016–2019 compared with 1,404,090 visits annually from therapeutic use of medications. Population rates of medication-related self-harm ED visits were highest among persons aged 11–19 years (58.5 [95% CI, 45.0–72.0] per 10,000), and lowest among those aged ≥65 years (6.6 [95% CI, 4.4–8.8] per 10,000). Among persons aged 11–19 years, the ED visit rate for females was four times that for males (95.4 [95% CI, 74.2–116.7] versus 23.0 [95% CI, 16.4–29.6] per 10,000). Medical or psychiatric admission was required for three-quarters (75.1%; 95% CI, 70.0%–80.2%) of visits. Concurrent use of alcohol or illicit substances was documented in 40.2% (95% CI, 36.8%–43.7%) of visits, and multiple medication products were implicated in 38.6%

---

**Corresponding Author:** Andrew I. Geller, MD, Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, 1600 Clifton Road NE, Mailstop V18-4, Atlanta GA 30329 ageller@cdc.gov.

**Contributors:** AIG as the corresponding author is responsible for data integrity and data analysis accuracy, and performed the statistical analyses, drafted the manuscript, and had full access to all study data. DSB supervised the study. MCL led data acquisition. AIG, MCL, and DSB contributed to study concept and design. All authors (AIG, DCE, MCL, and DSB) critically revised the manuscript for important intellectual content, and provided administrative, technical, and material support.

**Competing Interests:** None declared.

**Patient and public involvement:** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Disclaimer:** The findings and conclusions are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention (CDC).

(95% CI, 36.8%-40.4%). The most frequently implicated medication categories varied by patient age.

**Conclusions:** Medication-related self-harm injuries are an important contributor to the overall burden of ED visits and hospitalizations for medication-related harm, with the highest rates among adolescent and young adult females. These findings support continued prevention efforts targeting patients at risk for self-harm.

---

## INTRODUCTION

Suicide rates increased by one-third between 1999 and 2019, and the approximately 47,500 suicide-related deaths in 2019 made suicide the 10<sup>th</sup> leading cause of death in the United States.<sup>1,2</sup> Nearly 500,000 nonfatal self-harm emergency department (ED) visits occurred in 2019,<sup>2</sup> making EDs important settings for identifying patients in need of mental health interventions, as self-harm is an important predictor of future self-harm, including suicide.<sup>3-11</sup> Although poisoning is a common mechanism involved in self-harm morbidity and mortality,<sup>2</sup> and medication-related self-harm accounts for 13% of ED visits for medication-related harms overall,<sup>12</sup> the medications implicated in ED visits for medication-related self-harm injuries have not been well described. Additionally, administrative claims data have poor sensitivity for tracking ED visits for suicidal behavior and non-suicidal self-injury.<sup>13</sup> Therefore, we used data from a nationally representative public health surveillance system to (1) estimate numbers and population rates of ED visits in the United States for medication-related nonfatal self-harm by patient characteristics and (2) identify implicated medication categories, concurrent substances, and clinical manifestations involved in medication-related nonfatal self-harm.

## METHODS

### Data Collection

National estimates of ED visits for medication-related nonfatal self-harm injuries (hereafter, self-harm visits) were based on data from the National Electronic Injury Surveillance System–Cooperative Adverse Drug Event Surveillance (NEISS-CADES) project, a national active public health surveillance system based on a nationally representative, stratified probability sample of 60 hospitals with 6 beds and a 24-hour ED.<sup>14,15</sup> Trained data abstractors review clinical records of every ED visit to identify harms (adverse events) from medication use and record up to four implicated medications; patient demographics; intent of medication use; narrative descriptions of the event (including clinical manifestations, precipitating circumstances, and concurrent use of illicit drugs or alcohol); clinician diagnoses; laboratory testing; treatments administered; and discharge disposition from the ED. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.<sup>16,17</sup>

### Definitions

Medication self-harm visits included ED visits from January 1, 2016 through December 31, 2019 with documentation that patients used medication to deliberately harm themselves, and include both suicidal and non-suicidal intent. Therapeutic use visits included those for

harms due to use of medication as directed or unintentional errors. ‘Medication’ included prescription and over-the-counter medications, dietary supplements (e.g., herbals, vitamins, minerals), homeopathic products, and vaccines.

### Statistical Analysis

Cases are weighted based on inverse probability of selection, adjusted for hospital nonresponse and post-stratified to adjust for changes in the number of hospital ED visits each year. National estimates of ED visits (including weighted percentages and weighted rates) and corresponding 95% confidence intervals (CIs) were calculated using the SURVEYMEANS procedure in SAS 9.4 to account for sample weights and complex sample design. Estimates were considered statistically significantly different if their 2-sided 95% CIs were nonoverlapping. National estimates were annualized by dividing total estimates for the four-year period by 4. Estimates based on <20 cases or total estimates of <1200 were considered statistically unstable and are not shown. Estimates with a coefficient of variation of >30% are noted. Population-based rates were calculated by dividing ED visit estimates by corresponding bridged-race population estimates from the US Census Bureau.

## RESULTS

Based on 18,074 surveillance cases, there were an estimated 269,198 (95% confidence interval [CI], 222,059–316,337) medication self-harm ED visits annually in 2016–2019, compared to an estimated 1,404,090 ED visits for harms from therapeutic use of medications (Table 1). Patients aged 11–34 years accounted for 59.3% (95% CI, 56.4%–62.2%) of medication self-harm visits, compared with 16.3% (95% CI, 13.9%–18.7%) of visits for harms from therapeutic use of medications. Patients aged ≥65 years accounted for 4.2% (95% CI, 3.0%–5.4%) of medication self-harm visits compared with 43.0% (95% CI, 36.9%–49.1%) of visits for harms from therapeutic use of medications. Females accounted for 66.2% (95% CI, 64.1%–68.2%) of medication self-harm visits compared with 55.3% (95% CI, 53.3%–57.3%) of visits for harms from therapeutic use of medications.

Medical or psychiatric admission or transfer to another facility was required for 75.1% of medication self-harm ED visits compared with 28.0% of visits for harms from therapeutic use of medications. More medication self-harm visits involved multiple medication products than visits for harms from therapeutic use (38.6% [95% CI, 36.8%–40.4%] vs. 13.6% [95% CI, 12.2%–15.1%], respectively); frequency of involvement of multiple products in medication self-harm visits increased with age from 31.3% (95% CI, 29.7%–32.9%) among patients aged 11–19 years to 43.5% (95% CI, 38.6%–48.3%) among patients aged ≥65 years (Supplemental Table 1). Concurrent use of nonpharmaceutical substances (e.g., alcohol, marijuana) was more commonly documented in medication self-harm visits compared to visits for harms from therapeutic use (40.2% vs. 1.9%, respectively).

Estimated annual population rates of ED visits for medication self-harm were nearly twice as high among females (33.1 [95% CI, 27.0–39.1] per 10,000) compared with males (17.4 [95% CI, 14.0–20.8] per 10,000). Considering both females and males, estimated annual population rates of visits for medication self-harm were highest among patients aged 11–19 years (58.5 [95% CI, 45.0–72.0] per 10,000) followed by patients aged 20–34 years (38.2

[95% CI, 31.3–45.2] per 10,000). Females accounted for 79.9% of medication self-harm visits among patients aged 11–19 years (Supplemental Table 1), with a visit rate of 95.4 (95% CI, 74.2–116.7) per 10,000 versus 23.0 (95% CI, 16.4–29.6) per 10,000 for males. The difference in rates of medication self-harm visits by sex declined with increasing age (Figure 1). While rates of visits from therapeutic use of medications exceeded rates of medication self-harm visits for most age groups, among females aged 11–19 years, there were approximately 60% more medication self-harm visits each year than visits involving harms from therapeutic use (ratio 1.6 [95% CI, 1.1–2.1]).

Overall, the most frequently implicated medication categories in self-harm ED visits were nonopioid analgesics (e.g., acetaminophen, ibuprofen) (24.4%), benzodiazepines (24.2%), and antidepressants (23.2%) (Table 2). Four medication categories commonly prescribed for treating psychiatric diagnoses (antidepressants, antipsychotics, benzodiazepine and non-benzodiazepine hypnotics [e.g., zolpidem]), alone or with other substances, were implicated in an estimated 52.9% (95% CI, 50.8%-55.0%) of medication self-harm visits. Products commonly available over-the-counter (OTC) (nonopioid analgesics, cough/cold or antihistamine products, vitamins/minerals or herbals/complementary nutritional products) were implicated in an estimated 36.2% (95% CI, 34.5%-37.9%) of medication self-harm visits.

The medications most frequently implicated in self-harm visits varied by age group, however (Table 3). Nonopioid analgesics was the most frequently implicated category of medications involved in self-harm visits among patients aged 11–19 years (39.1%) and patients aged 20–34 years (24.7%). Benzodiazepines was the most frequently implicated category of medications involved in self-harm visits among patients aged 35–49 years (32.3%), aged 50–64 years (35.4%), and aged 65 years (40.2%). Among patients aged 11–19 years, products commonly available over-the-counter (OTC) were involved in 54.4% of medication self-harm visits, but only 25.4% of medication self-harm visits among patients aged 35–49 years, and only 14.1% of medication self-harm visits among patients aged 65 years (Supplemental Table 2). Antipsychotics or antidepressants were involved in 31.3% (95% CI, 29.8%-32.8%) of medication self-harm visits overall, and the proportion of visits involving antipsychotics or antidepressants did not significantly vary by age group except for adults aged 65 years (24.8%; 95% CI 20.9%-28.8%).

Overall, there were an estimated 105,878 (39.3%; 95% CI, 36.7%-42.0%) ED visits annually for self-harm involving use of medications from a single category alone (i.e., without other categories of medications, alcohol, or illicit substances) (Table 2). Medication categories that were most frequently implicated alone in medication self-harm visits included hypoglycemics (46.2%), nonopioid analgesics (44.4%), cough/cold or antihistamine products (30.7%), and vitamin/mineral or herbal/complementary nutritional products (30.3%). For medication self-harm visits implicating nonopioid analgesics alone, nearly all (88.4%; 95% CI, 85.2%-91.6%) involved either acetaminophen-containing (51.6%; 95% CI, 49.0%-54.1%) or non-steroidal anti-inflammatory drug (NSAID)-containing products (41.8%; 95% CI, 37.9%-45.8%). Of medication self-harm visits implicating cough/cold or antihistamine products alone, nearly three-quarters (72.5%; 95% CI, 67.5%-77.4%) involved non-selective antihistamines (e.g., diphenhydramine) and nearly one-quarter

(22.6%; 95% CI, 18.7%-26.6%) involved cough/cold products. Melatonin was involved in most (54.0%; 95% CI, 44.1%-63.9%) self-harm visits implicating vitamin/mineral or herbal/complementary nutritional products alone.

Multiple medication categories and/or other substances were documented to be involved in at least four-fifths of estimated medication self-harm ED visits involving gabapentinoids (i.e., gabapentin, pregabalin) (87.0%; 95% CI, 83.7%-90.4%), benzodiazepines (81.8%; 95% CI, 79.6%-84.0%), non-benzodiazepine hypnotics (81.6%; 95% CI, 78.4%-84.9%), muscle relaxants (81.1%; 95% CI, 76.5%-85.6%) and prescription opioids (80.5%; 95% CI, 76.5%-84.5%) (Table 2). Concurrent use of illicit substances or alcohol was documented in at least two-fifths of estimated medication self-harm visits involving benzodiazepines (53.9%; 95% CI, 50.2%-57.7%), gabapentinoids (50.3%; 95% CI, 43.5%-57.2%), prescription opioids (46.9%; 95% CI, 42.0%-51.9%), non-benzodiazepine hypnotics (46.5%; 95% CI, 41.7%-51.3%), muscle relaxants (45.5%; 95% CI, 40.6%-50.4%), and antipsychotics (40.2%; 95% CI, 36.2%-44.1%) (Supplemental Table 3).

The frequency of involvement of multiple medication categories or other substances (alcohol, illicit substances) in ED visits for medication self-harm varied by patient age (Supplemental Table 4). Among patients aged 11–19 years, an estimated 58.9% of medication self-harm visits involved a single medication category alone, compared with an estimated 26.8% of medication self-harm visits among patients aged 35–49 years. Conversely, concurrent use of alcohol and illicit substances was highest among patients 35–49 years of age (54.8%) and significantly lower among patients aged 11–19 years of age (19.2%) and patients aged 65 years (25.2%) (Supplemental Table 1).

The most frequently documented manifestations in medication self-harm visits were altered mental status (13.1%), laboratory abnormality without current symptoms (7.6%), and unresponsiveness/cardiorespiratory failure (5.3%) (Table 4). No clinical manifestations were documented in 65.2% of medication self-harm visits; however, of such visits, 13.4% (95% CI, 9.8%-17.1%) of patients were treated with decontamination (activated charcoal or gastric aspiration) or reversal agents (naloxone, naltrexone, flumazenil, n-acetylcysteine, glucagon, or parenteral 50% dextrose). In an estimated 2.5% (95% CI, 1.5%-3.4%) of medication self-harm visits without documentation of clinical manifestations, patients required mechanical ventilation as documented by intubation or administration of a paralytic or anesthesia induction agent, and an estimated 25.8% (95% CI, 17.0%-34.6%) of these visits also involved decontamination or reversal.

Medication self-harm visits involving unresponsiveness/cardiorespiratory failure/mechanical ventilation, decontamination, or reversal agents (22.6%; 95% CI, 18.9%-26.3%) more frequently involved subsequent admission or transfer to another facility (85.5% vs. 72.1%), but there were no differences in patients' sex or concurrent use of alcohol or illicit substances and the proportions of patients in each age group were similar (Supplemental Table 5). Such visits more frequently involved benzodiazepines (29.0% vs. 23.1%), prescription opioids (28.1% vs. 9.5%), muscle relaxants (8.1% vs. 3.4%), and amphetamine stimulants (5.7% vs. 2.0%).

## DISCUSSION

Between 2016–2019, there were more than one million estimated ED visits in the United States for medication-related self-harm, three-quarters of which resulted in a medical or psychiatric admission or transfer. Among females aged 11–19 years, there was nearly one ED visit for medication self-harm for every 100 persons each year. Among patients aged 11–19 years, 54% of self-harm ED visits involved medications commonly available OTC and only 19% involved concurrent use of alcohol or illicit substances. On the other hand, among patients aged 35–49 years, only 25% of self-harm visits involved medications commonly available OTC while 55% involved concurrent use of alcohol or illicit substances. The proportion of self-harm visits involving benzodiazepines or prescription opioids increased with age from 14% among patients aged 11–19 years to 55% among patients aged 65 years. These epidemiologic data on patient characteristics, medications, and other substances involved in self-harm ED visits provide guidance for prevention efforts, but additional prevention effectiveness research is needed.

The finding that overall approximately one-half of estimated visits implicated antidepressants, antipsychotics, and hypnotics (benzodiazepine or non-benzodiazepine) is consistent with the most common medications identified in suicide deaths.<sup>18</sup> However, among adolescents and teenagers aged 11–19 years, most estimated medication self-harm ED visits involved 3 categories of medications commonly available OTC (nonopioid analgesics, cough/cold products or antihistamines, or vitamins/minerals and herbals/complementary nutritionals). OTC products were previously reported as the most common substances involved in US suicidal poisonings among 10–24-year-olds from 2010 to 2018, specifically OTC analgesics (acetaminophen, ibuprofen) and diphenhydramine.<sup>19</sup> This may be due to the relative ease of access to these products compared with prescription medications among adolescents and teenagers. Overall, medication self-harm ED visits frequently involved use of multiple substances, including nonpharmaceutical substances (alcohol and illicit drugs). This finding is consistent with research demonstrating increased risk for self-harm among those with co-occurring substance use disorders,<sup>20–22</sup> and supports efforts to address substance use and other co-morbid psychiatric disorders.

Three basic approaches to self-harm prevention are societal means restriction, screening for at risk individuals, and community-based primary prevention. A recent systematic review<sup>23</sup> has found means restriction can reduce self-harm attempts and suicides (without subsequent increases in self-harm and suicides by other mechanisms) based on studies of the impact of removing propoxyphene-containing products and barbiturates. However, wholesale means restriction across all the medication categories commonly involved in self-harm ED visits is not feasible. Partial means restrictions (e.g., limiting pack size and legal purchasing age for nonopioid analgesics) have also been implemented with studies identifying impact in some countries, but determining conclusive evidence of effectiveness for pack size and purchasing age restriction has been complicated by secular trends in self-harm and suicides.<sup>24</sup> Innovative approaches and further research are needed to identify the most effective policies and mechanisms for means restriction which would allow access to medications by those who benefit from them while reducing access by those who may self-harm with them.

Brief interventions in the ED to prevent re-attempts, coupled with post-visit follow ups, may lead to a reduction in subsequent suicide attempts<sup>25</sup> and suicide re-attempt mortality.<sup>26</sup> For patients who have presented to EDs for medication-related self-harm, counseling families on how to reduce access to other lethal means (e.g., firearms, household poisons) as well as medications and illicit substances may be effective at reducing self-harm morbidity and mortality among youth.<sup>27–29</sup> Means restriction counseling should be initiated by trained personnel at the time of the visit, but ideally would be implemented preventively, prior to any injury.<sup>30</sup>

Screening programs to identify individuals at risk for self-harm in order to provide means restriction and follow-up care may reduce the number of ED visits for self-harm. In 2021, the U.S. Surgeon General called for increased attention to youth mental health,<sup>31</sup> citing recent data suggesting increased prevalence of mental health issues among young persons, such as increased ED visits for psychiatric purposes from 2011 to 2015.<sup>32</sup> While not all cases of self-harm involve depression, 2018 guidelines from the American Academy of Pediatrics endorse universal screening for depression starting at age 12, and providing family education, follow up care, and safety assessment and planning for those who screen positive.<sup>33</sup> The Joint Commission's National Patient Safety Goal for suicide prevention calls for hospitals, including EDs, to screen all patients presenting for a behavioral health condition for suicidal ideation, and to use written care protocols in caring for those who screen positive.<sup>34</sup> However, gaps in ED management of those who screen positive for self-harm risk have been consistently observed, with ED documentation of lethal means counseling occurring 50% of the time,<sup>35–38</sup> suggesting room for improvement.

Broader screening strategies may be needed to further reduce medication-related self-harm. Prior research has suggested that although most patients who attempt self-harm visited the ED in the year prior to their attempt, it was more often for a primary medical diagnosis than for a behavioral health diagnosis.<sup>39,40</sup> Universal screening has been studied as a potentially feasible intervention in mostly academic hospital-based EDs<sup>41–44</sup> but further research is needed to explore long-term sustainability<sup>45–47</sup> and to improve the sensitivity of universal screening initiatives.<sup>48,49</sup> Pairing an ED-based universal safety assessment with a brief safety planning intervention and post-visit telephone follow-up was associated with a 30% reduction in suicidal behavior by adults presenting to 8 participating hospital EDs.<sup>25,50</sup>

In 2021, the US Department of Health and Human Services released *The Surgeon General's Call to Action to Implement the National Strategy for Suicide Prevention* to refocus efforts on the six societal public health actions called for in the 2012 National Strategy: activating a broad public health response to suicide, addressing upstream factors including social determinants of health, reducing access to lethal means, adopting evidence-based care for at-risk individuals, enhancing crisis care and care transitions, and improving the quality, timeliness, and use of suicide-related data.<sup>51–54</sup> CDC's *Preventing Suicide: A Technical Package of Policy, Programs, and Practices* includes 7 strategies and approaches with the best available evidence designed to help communities address the multiple factors impacting suicide, both upstream to prevent risk before it occurs, and later downstream, when people may already be at risk: strengthening economic supports, strengthening access and delivery of suicide care, creating protective environments, promoting connectedness, teaching coping

and problem-solving skills, identifying and supporting persons at risk, and lessening harms and preventing future risk.<sup>29</sup>

This study is subject to several limitations. First, it likely underestimates the burden of medication-related self-harm injury because it does not include episodes treated outside of EDs, and it does not include suicide deaths (because of variability in how deaths are tracked in ED health records systems). It also does not include data during the COVID-19 pandemic, during which suspected suicide attempt ED visits increased among teens and adolescents aged 12–17 years (50.6% higher among females, 3.7% higher among males).<sup>55</sup> Second, intent of use could have been misclassified if patients misreported intentionality or arrived in the ED unresponsive and unable to report intentionality, or if clinicians incorrectly identified or did not fully document intentionality or details leading to the ED visit. Third, information about whether the ingested medication was prescribed to the patient was not routinely available, but could help inform means restriction approaches. Additionally, some implicated medications and nonpharmaceutical substances were identified based on laboratory testing alone, which could bias towards identification of drugs included on standard ED toxicology screens (e.g., benzodiazepines) and potentially against others (e.g., antipsychotics). Fourth, patients may be admitted for a primary psychiatric diagnosis, primary medical diagnosis, or both, and these data do not distinguish between hospitalizations for primarily psychiatric or primarily medical management. Also, medication self-harm visit data could not be analyzed by race/ethnicity because of variability in how each NEISS-CADES participating hospital collects and records race/ethnicity data.

## CONCLUSIONS

Medication-related self-harm is an important contributor to overall burden of ED visits and hospitalizations for medication-related harm, with the highest rates among adolescent and young adult females. These findings support continued prevention efforts targeting patients at risk for self-harm to prevent morbidity and mortality.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgments:

The authors thank Kathleen O. Rose, RN, Sandra K Goring, RN, Arati Baral, MS, and Alex Tocitu, MBA, from Northrop Grumman (contractor to CDC) and Nina J. Weidle, PharmD, from Chenega Government Consulting (contractor to CDC) for medical abstraction and programming assistance, as well as Tom Schroeder, MS, Elenore Sonski, CPC, Herman Burney, MS, and data abstractors from the US Consumer Product Safety Commission, for assistance with data acquisition. The authors thank Deborah Stone, ScD, MSW, MPH from CDC's National Center for Injury Prevention and Control for her input on the manuscript. No individuals received compensation for their contributions.

## REFERENCES

1. US Department of Health and Human Services, Centers for Disease Control and Prevention. Suicide Prevention: Fast Facts. 2020; <https://www.cdc.gov/suicide/facts/index.html>. Accessed March 30, 2022.



2. US Department of Health and Human Services, Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). 2020; <https://www.cdc.gov/injury/wisqars/index.html>. Accessed March 30, 2022.
3. Crandall C, Fullerton-Gleason L, Agüero R, LaValley J. Subsequent suicide mortality among emergency department patients seen for suicidal behavior. *Acad Emerg Med*. 2006;13(4):435–442. [PubMed: 16531601]
4. Bilen K, Ottosson C, Castren M, et al. Deliberate self-harm patients in the emergency department: factors associated with repeated self-harm among 1524 patients. *Emerg Med J*. 2011;28(12):1019–1025. [PubMed: 21076053]
5. Chen VC, Tan HK, Chen CY, et al. Mortality and suicide after self-harm: community cohort study in Taiwan. *Br J Psychiatry*. 2011;198(1):31–36. [PubMed: 21200074]
6. Cooper J, Kapur N, Webb R, et al. Suicide after deliberate self-harm: a 4-year cohort study. *Am J Psychiatry*. 2005;162(2):297–303. [PubMed: 15677594]
7. Hawton K, Zahl D, Weatherall R. Suicide following deliberate self-harm: long-term follow-up of patients who presented to a general hospital. *Br J Psychiatry*. 2003;182:537–542. [PubMed: 12777346]
8. Owens D, Wood C, Greenwood DC, Hughes T, Dennis M. Mortality and suicide after non-fatal self-poisoning: 16-year outcome study. *Br J Psychiatry*. 2005;187:470–475. [PubMed: 16260824]
9. Suokas J, Suominen K, Isometsä E, Ostamo A, Lonnqvist J. Long-term risk factors for suicide mortality after attempted suicide—findings of a 14-year follow-up study. *Acta Psychiatr Scand*. 2001;104(2):117–121. [PubMed: 11473505]
10. Zahl DL, Hawton K. Repetition of deliberate self-harm and subsequent suicide risk: long-term follow-up study of 11,583 patients. *Br J Psychiatry*. 2004;185:70–75. [PubMed: 15231558]
11. Miller M, Hempstead K, Nguyen T, Barber C, Rosenberg-Wohl S, Azrael D. Method choice in nonfatal self-harm as a predictor of subsequent episodes of self-harm and suicide: implications for clinical practice. *Am J Public Health*. 2013;103(6):e61–68.
12. Budnitz DS, Shehab N, Lovegrove MC, Geller AI, Lind JN, Pollock DA. US Emergency Department Visits Attributed to Medication Harms, 2017–2019. *JAMA*. 2021;326(13):1299–1309. [PubMed: 34609453]
13. Stanley B, Currier GW, Chesin M, et al. Suicidal Behavior and Non-Suicidal Self-Injury in Emergency Departments Underestimated by Administrative Claims Data. *Crisis*. 2018;39(5):318–325. [PubMed: 29256268]
14. Jung MA, Budnitz DS, Mendelsohn AB, Weidenbach KN, Nelson TD, Pollock DA. Evaluation and overview of the National Electronic Injury Surveillance System-Cooperative Adverse Drug Event Surveillance Project (NEISS-CADES). *Med Care*. 2007;45(10 Suppl 2):S96–102. [PubMed: 17909391]
15. Schroeder TAK. The NEISS sample (design and implementation) 1997 to present. 2001; [https://www.cpsc.gov/s3fs-public/pdfs/blk\\_media\\_2001d011-6b6.pdf](https://www.cpsc.gov/s3fs-public/pdfs/blk_media_2001d011-6b6.pdf). Accessed March 30, 2022.
16. US Department of Health and Human Services, Centers for Disease Control and Prevention. Distinguishing public health research and public health nonresearch. 2010; <https://www.cdc.gov/os/integrity/docs/cdc-policy-distinguishing-public-health-research-nonresearch.pdf>. Accessed March 30, 2022.
17. United States Government. Federal Regulations and Codes. See e.g., 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq.
18. Miller TR, Swedler DI, Lawrence BA, et al. Incidence and Lethality of Suicidal Overdoses by Drug Class. *JAMA Netw Open*. 2020;3(3):e200607. [PubMed: 32202643]
19. Spiller HA, Ackerman JP, Smith GA, et al. Suicide attempts by self-poisoning in the United States among 10–25 year olds from 2000 to 2018: substances used, temporal changes and demographics. *Clin Toxicol (Phila)*. 2020;58(7):676–687. [PubMed: 31587583]
20. Bohnert KM, Ilgen MA, Louzon S, McCarthy JF, Katz IR. Substance use disorders and the risk of suicide mortality among men and women in the US Veterans Health Administration. *Addiction*. 2017;112(7):1193–1201. [PubMed: 28301070]
21. Lynch FL, Peterson EL, Lu CY, et al. Substance use disorders and risk of suicide in a general US population: a case control study. *Addict Sci Clin Pract*. 2020;15(1):14. [PubMed: 32085800]

22. Samples H, Stuart EA, Olfson M. Opioid Use and Misuse and Suicidal Behaviors in a Nationally Representative Sample of US Adults. *Am J Epidemiol*. 2019;188(7):1245–1253. [PubMed: 30834448]
23. Lim JS, Buckley NA, Chitty KM, Moles RJ, Cairns R. Association Between Means Restriction of Poison and Method-Specific Suicide Rates: A Systematic Review. *JAMA Health Forum*. 2021;2(10):e213042–e213042. [PubMed: 35977165]
24. Morthorst BR, Erlangsen A, Chaine M, et al. Restriction of non-opioid analgesics sold over-the-counter in Denmark: A national study of impact on poisonings. *J Affect Disord*. 2020;268:61–68. [PubMed: 32158008]
25. Miller IW, Camargo CA Jr., Arias SA, et al. Suicide Prevention in an Emergency Department Population: The ED-SAFE Study. *JAMA Psychiatry*. 2017;74(6):563–570. [PubMed: 28456130]
26. Fleischmann A, Bertolote JM, Wasserman D, et al. Effectiveness of brief intervention and contact for suicide attempters: a randomized controlled trial in five countries. *Bull World Health Organ*. 2008;86(9):703–709. [PubMed: 18797646]
27. Johnson RM, Frank EM, Ciocca M, Barber CW. Training mental healthcare providers to reduce at-risk patients' access to lethal means of suicide: evaluation of the CALM Project. *Arch Suicide Res*. 2011;15(3):259–264. [PubMed: 21827315]
28. Runyan CW, Becker A, Brandspigel S, Barber C, Trudeau A, Novins D. Lethal Means Counseling for Parents of Youth Seeking Emergency Care for Suicidality. *West J Emerg Med*. 2016;17(1):8–14. [PubMed: 26823923]
29. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Preventing suicide : a technical package of policies, programs, and practice. 2017; <https://www.cdc.gov/violenceprevention/pdf/suicidetechnicalpackage.pdf>. Accessed March 30, 2022.
30. Hunter AA, DiVietro S, Boyer M, Burnham K, Chenard D, Rogers SC. The practice of lethal means restriction counseling in US emergency departments to reduce suicide risk: a systematic review of the literature. *Inj Epidemiol*. 2021;8(Suppl 1):54. [PubMed: 34517912]
31. US Department of Health and Human Services, Office of the Surgeon General. Protecting Youth Mental Health: The U.S. Surgeon General's Advisory. 2021; <https://www.hhs.gov/sites/default/files/surgeon-general-youth-mental-health-advisory.pdf>. Accessed March 30, 2022.
32. Kalb LG, Stapp EK, Ballard ED, Holingue C, Keefer A, Riley A. Trends in Psychiatric Emergency Department Visits Among Youth and Young Adults in the US. *Pediatrics*. 2019;143(4).
33. Zuckerbrot RA, Cheung A, Jensen PS, Stein REK, Laraque D, GLAD-PC Steering Group. Guidelines for Adolescent Depression in Primary Care (GLAD-PC): Part I. Practice Preparation, Identification, Assessment, and Initial Management. *Pediatrics*. 2018;141(3).
34. The Joint Commission. R3 Report Issue 18: National Patient Safety Goal (NPSG) 15.01.01 for suicide prevention. 2019; <https://www.jointcommission.org/standards/r3-report/r3-report-issue-18-national-patient-safety-goal-for-suicide-prevention/>. Accessed March 30, 2022.
35. Betz ME, Kautzman M, Segal DL, et al. Frequency of lethal means assessment among emergency department patients with a positive suicide risk screen. *Psychiatry Res*. 2018;260:30–35. [PubMed: 29169036]
36. Betz ME, Miller M, Barber C, et al. Lethal Means Access and Assessment among Suicidal Emergency Department Patients. *Depress Anxiety*. 2016;33(6):502–511. [PubMed: 26989850]
37. Betz ME, Miller M, Barber C, et al. Lethal means restriction for suicide prevention: beliefs and behaviors of emergency department providers. *Depress Anxiety*. 2013;30(10):1013–1020. [PubMed: 23495002]
38. Zhou E, DeCou CR, Stuber J, Rowhani-Rahbar A, Kume K, Rivara FP. Usual Care for Emergency Department Patients Who Present with Suicide Risk: A Survey of Hospital Procedures in Washington State. *Arch Suicide Res*. 2020;24(3):342–354. [PubMed: 31248352]
39. Kammer J, Rahman M, Finnerty M, et al. Most Individuals Are Seen in Outpatient Medical Settings Prior to Intentional Self-Harm and Suicide Attempts Treated in a Hospital Setting. *J Behav Health Serv Res*. 2021;48(2):306–319. [PubMed: 32627095]

40. Richards JE, Whiteside U, Ludman EJ, et al. Understanding Why Patients May Not Report Suicidal Ideation at a Health Care Visit Prior to a Suicide Attempt: A Qualitative Study. *Psychiatr Serv.* 2019;70(1):40–45. [PubMed: 30453860]
41. Boudreaux ED, Camargo CA Jr., Arias SA, et al. Improving Suicide Risk Screening and Detection in the Emergency Department. *Am J Prev Med.* 2016;50(4):445–453. [PubMed: 26654691]
42. Boudreaux ED, Larkin C, Camargo CA Jr., Miller IW. Validation of a Secondary Screener for Suicide Risk: Results from the Emergency Department Safety Assessment and Follow-up Evaluation (ED-SAFE). *Jt Comm J Qual Patient Saf.* 2020;46(6):342–352. [PubMed: 32417230]
43. DeVylder JE, Ryan TC, Cwik M, et al. Assessment of Selective and Universal Screening for Suicide Risk in a Pediatric Emergency Department. *JAMA Netw Open.* 2019;2(10):e1914070. [PubMed: 31651971]
44. Brucker K, Duggan C, Niezer J, et al. Assessing Risk of Future Suicidality in Emergency Department Patients. *Acad Emerg Med.* 2019;26(4):376–383. [PubMed: 30375082]
45. Boudreaux ED, Haskins BL, Larkin C, et al. Emergency department safety assessment and follow-up evaluation 2: An implementation trial to improve suicide prevention. *Contemp Clin Trials.* 2020;95:106075. [PubMed: 32565041]
46. Dunlap LJ, Orme S, Zarkin GA, et al. Screening and Intervention for Suicide Prevention: A Cost-Effectiveness Analysis of the ED-SAFE Interventions. *Psychiatr Serv.* 2019;70(12):1082–1087. [PubMed: 31451063]
47. Cervantes PE, Seag DEM, Baroni A, et al. Universal Suicide Risk Screening for Youths in the Emergency Department: A Systematic Review. *Psychiatr Serv.* 2021:appips202000881.
48. Simpson SA, Goans C, Loh R, Ryall K, Middleton MCA, Dalton A. Suicidal ideation is insensitive to suicide risk after emergency department discharge: Performance characteristics of the Columbia-Suicide Severity Rating Scale Screener. *Acad Emerg Med.* 2021;28(6):621–629. [PubMed: 33346922]
49. Rozel JS. Broken promise: Challenges in achieving effective universal suicide screening. *Acad Emerg Med.* 2021;28(6):705–706. [PubMed: 33349999]
50. Horowitz L, Tipton MV, Pao M. Primary and Secondary Prevention of Youth Suicide. *Pediatrics.* 2020;145(Suppl 2):S195–S203. [PubMed: 32358211]
51. Adams JM, van Dahlen B. Preventing Suicide in the United States. *Public Health Rep.* 2021;136(1):3–5. [PubMed: 33271058]
52. Iskander JK, Crosby AE. Implementing the national suicide prevention strategy: Time for action to flatten the curve. *Prev Med.* 2021;152(Pt 1):106734. [PubMed: 34344523]
53. US Department of Health and Human Services, Office of the Surgeon General. The Surgeon General's Call to Action to Implement the National Strategy for Suicide Prevention: A Report of the U.S. Surgeon General and of the National Action Alliance for Suicide Prevention. 2021; <https://www.hhs.gov/sites/default/files/sprc-call-to-action.pdf>. Accessed March 30, 2022.
54. US Department of Health and Human Services, Office of the Surgeon General, National Action Alliance for Suicide Prevention. In: *National Strategy for Suicide Prevention: Goals and Objectives for Action: A Report of the U.S. Surgeon General and of the National Action Alliance for Suicide Prevention.* Washington, D.C. 2012.
55. Yard E, Radhakrishnan L, Ballesteros MF, et al. Emergency Department Visits for Suspected Suicide Attempts Among Persons Aged 12–25 Years Before and During the COVID-19 Pandemic - United States, January 2019-May 2021. *MMWR Morb Mortal Wkly Rep.* 2021;70(24):888–894. [PubMed: 34138833]

## KEY MESSAGES

### What is already known on this topic

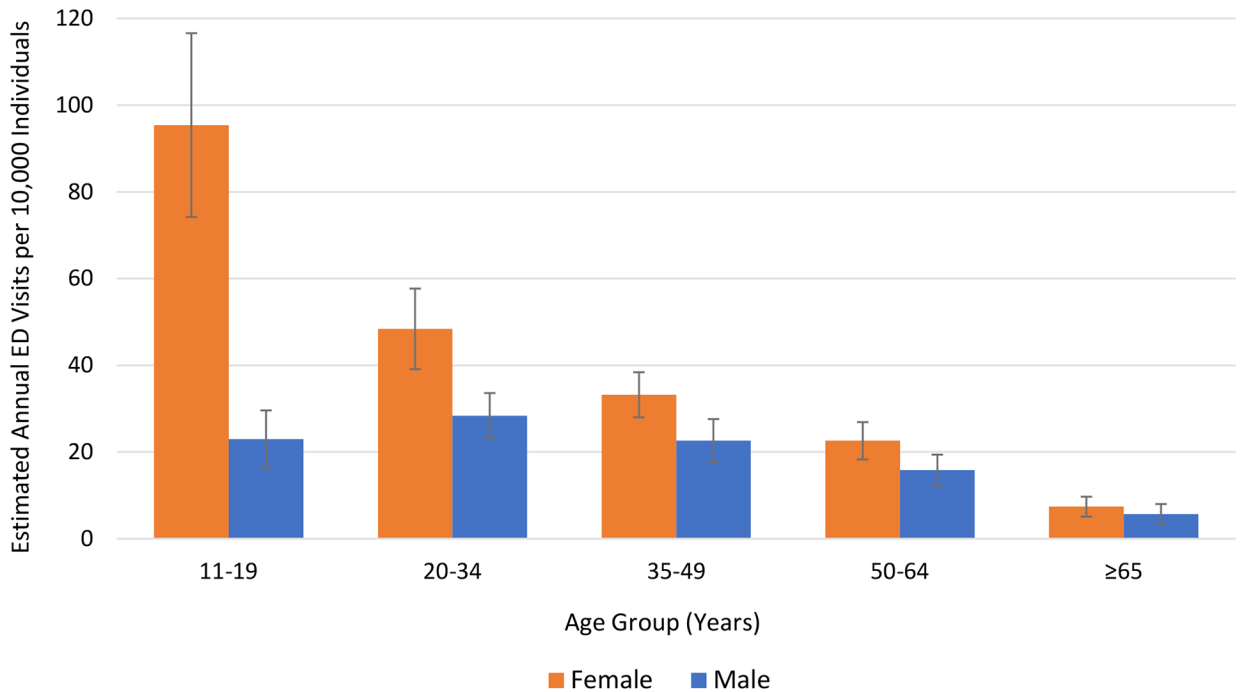
- Medication poisoning is a common form of self-harm injury.
- In the USA, increases in injuries due to self-harm, including suicide attempts, have been reported over the last two decades.

### What this study adds

- Medication-related self-harm injuries are an important contributor to the overall burden of emergency department (ED) visits and hospitalizations for medication-related harm in the USA.
- Rates are highest among adolescent and young adult females aged 11–19 years, among whom there was one ED visit for medication self-harm for every 105 persons each year (95.4 [95% CI, 74.2–116.7] per 10,000).
- Involvement of alcohol and/or illicit substances was common (40.2%; 95% CI, 36.8%–43.7%) in ED visits for medication self-harm.

### How this study might affect research, practice or policy

- The findings support continued prevention efforts targeting patients at risk for self-harm.



**Figure: Estimated Population Rate of Emergency Department Visits for Medication-related Self-harm, by Patient Age and Sex, 2016–2019**

Estimates of emergency department (ED) visits for medication-related nonfatal self-harm are from the National Electronic Injury Surveillance System–Cooperative Adverse Drug Event Surveillance project, Centers for Disease Control and Prevention; population estimates are from the US Census Bureau. ‘Medication’ includes prescription and over-the-counter medications, dietary supplements (e.g., herbals, vitamins, minerals), homeopathic products, and vaccines. Error bars display 95% confidence intervals. Not shown: patients aged <11 years, as the coefficient of variation for the estimate of ED visits for medication-related nonfatal self-harm among patients aged <11 years exceeds 30 percent and may therefore be considered statistically unstable, 2 cases with age not documented, and 1 case with sex not documented.

**Table 1.**

Numbers of Cases and Annualized National Estimates of Emergency Department (ED) Visits for Medication-related Self-harm and Harms from Therapeutic Use—United States, 2016–2019<sup>a</sup>

Case Characteristics	ED Visits for Self-Harm			ED Visits for Harms from Therapeutic Use		
	Cases No.	Annualized National Estimate No. (95% CI)	% (95% CI)	Cases No.	Annualized National Estimate No. (95% CI)	% (95% CI)
<b>Patient Age, y<sup>b</sup></b>						
<11	51	~	~	9,253	78,866 (59,557–98,175)	5.6 (4.1–7.1)
11–19	6,655	73,498 (56,539–90,457)	27.3 (23.8–30.8)	4,813	58,896 (45,845–71,947)	4.2 (3.3–5.1)
20–34	5,059	85,815 (70,152–101,477)	31.9 (30.1–33.6)	9,874	170,389 (131,814–208,965)	12.1 (10.5–13.8)
35–49	3,342	57,571 (47,472–67,670)	21.4 (19.7–23.0)	10,889	188,254 (148,015–228,493)	13.4 (11.8–15.0)
50–64	2,353	40,632 (32,827–48,436)	15.1 (13.8–16.4)	18,171	304,355 (226,019–382,690)	21.7 (20.2–23.1)
65–79	498	9,518 (6,036–12,999)	3.5 (2.4–4.7)	21,101	375,828 (228,923–522,732)	26.8 (23.3–30.3)
80	114	1,858 (1,323–2,394)	0.7 (0.5–0.9)	13,116	227,474 (128,903–326,045)	16.2 (13.4–19.0)
<b>Patient Sex<sup>c</sup></b>						
Female	12,147	178,129 (146,778–209,479)	66.2 (64.1–68.2)	47,463	776,942 (569,686–984,199)	55.3 (53.3–57.3)
Male	5,926	91,068 (73,915–108,220)	33.8 (31.8–35.9)	39,755	627,142 (427,618–826,665)	44.7 (42.7–46.7)
<b>Discharge Disposition<sup>d</sup></b>						
Admitted or Transferred	14,285	202,259 (160,820–243,699)	75.1 (70.0–80.2)	26,675	392,620 (211,263–573,976)	28.0 (22.3–33.6)
Observed	755	13,732 (4,946–22,518) <sup>e</sup>	5.1 (1.9–8.3) <sup>e</sup>	1,912	32,175 (17,400–46,950)	2.3 (1.2–3.4)
Not Hospitalized	3,025	53,053 (38,819–67,285)	19.7 (14.7–24.8)	58,628	979,272 (746,702–1,211,842)	69.7 (64.7–74.8)
<b>No. of Implicated Medication Products</b>						
1	11,408	165,359 (136,436–194,282)	61.4 (59.6–63.2)	55,966	1,227,170 (864,288–1,590,053)	86.4 (84.9–87.9)
2	4,050	62,822 (51,757–73,887)	23.3 (22.4–24.3)	6,919	154,009 (111,516–196,503)	10.8 (9.6–12.1)
3	1,590	25,015 (20,077–29,952)	9.3 (8.5–10.1)	1,336	26,438 (19,262–33,614)	1.9 (1.6–2.1)
4 or More	1026	16,003 (12,134–19,871)	5.9 (5.2–6.6)	722	12,715 (9,864–15,566)	0.9 (0.7–1.1)
<b>Concurrent Nonpharmaceutical Substances Documented</b>						
Alcohol or illicit substances	6,617	108,312 (85,787–130,836)	40.2 (36.8–43.7)	1,656	26,563 (18,996–34,129)	1.9 (1.4–2.4)
Alcohol	3,408	59,282 (47,478–71,087)	22.0 (20.6–23.5)	1057	17,338 (12,220–22,455)	1.2 (0.9–1.5)
Illicit substances	3,672	55,917 (42,396–69,438)	20.8 (17.6–24.0)	682	10,408 (7,242–13,573)	0.7 (0.5–1.0)

Case Characteristics	<u>ED Visits for Self-Harm</u>			<u>ED Visits for Harms from Therapeutic Use</u>		
	Cases	Annualized National Estimate		Cases	Annualized National Estimate	
	No.	No. (95% CI)	% (95% CI)	No.	No. (95% CI)	% (95% CI)
Marijuana	2,584	39,990 (29,977–50,002)	14.9 (12.5–17.2)	428	7,018 (5,011–9,024)	0.5 (0.4–0.6)
Cocaine	1,149	16,675 (10,588–22,761)	6.2 (4.2–8.2)	186	2,368 (1,407–3,330)	0.2 (0.1–0.2)
Heroin	172	2,951 (1,770–4,132)	1.1 (0.7–1.5)	59	779 (118–1,439)	0.1 (0.0–0.1)
Methamphetamine	296	5,226 (3,290–7,162)	1.9 (1.3–2.6)	40	831 (246–1,415) <sup>e</sup>	0.1 (0.0–0.1) <sup>e</sup>
Other or unspecified <sup>f</sup>	881	15,283 (10,750–19,815)	5.7 (4.4–6.9)	38	437 (190–684)	0.0 (0.0–0.0)
No concurrent substances	11,457	160,887 (132,790–188,984)	59.8 (56.3–63.2)	85,563	1,377,528 (977,511–1,777,544)	98.0 (97.6–98.6)
<b>Total</b>	<b>18,074</b>	<b>269,198 (222,059–316,337)</b>	<b>100.0</b>	<b>87,219</b>	<b>1,404,090 (999,613–1,808,567)</b>	<b>100.0</b>

<sup>a</sup> Surveillance case counts and national estimates are from the National Electronic Injury Surveillance System–Cooperative Adverse Drug Event Surveillance project, CDC. ‘Medication’ includes prescription and over-the-counter medications, dietary supplements (e.g., herbals, vitamins, minerals), homeopathic products, and vaccines. Excludes cases involving medication misuse or abuse, overdose without indication of intent, and unsupervised exposures by children.

<sup>b</sup> Age not documented for 2 cases of medication-related self-harm and 2 cases of therapeutic adverse drug events.

<sup>c</sup> Sex not documented for 1 case for self-harm and 1 case of a therapeutic adverse drug event.

<sup>d</sup> ‘Admitted or Transferred’ includes inpatient admissions and transfers to other hospitals. ‘Observed’ includes observation status admissions. ‘Not Hospitalized’ includes treated-and-released and left against medical advice/without being seen. Disposition not documented for 9 cases of medication-related self-harm and 4 cases of therapeutic adverse drug events.

<sup>e</sup> Coefficient of variation >30%.

<sup>f</sup> ‘Other’ illicit substances includes other specified illicit substances (e.g., illicit fentanyl). ‘Unspecified’ illicit substances includes unspecified opioids, unspecified amphetamines, or cases specifying use of “illicit drugs” without further details.

CI = Confidence interval; N/A = Not applicable.

**Table 2.**

National Estimates of Emergency Department (ED) Visits for Medication-related Self-harm, by Implicated Medication Category—United States, 2016–2019<sup>a</sup>

Medication Category	Annualized National Estimates of ED Visits for Medication-related Self-Harm <sup>b</sup>		Annualized National Estimates of ED Visits for Medication-related Self-Harm Without Documented Involvement of Multiple Medication Categories, Alcohol, or Illicit Substances	
	No.	% (95% CI)	No.	% (95% CI)
Nonopioid Analgesics	65,680	24.4 (22.9–25.9)	29,136	44.4 (41.4–47.3)
Benzodiazepines	65,127	24.2 (21.3–27.0)	11,828	18.2 (16.0–20.4)
Antidepressants	62,559	23.2 (21.9–24.6)	16,627	26.6 (23.4–29.8)
Cough/Cold Products or Antihistamines	33,378	12.4 (11.7–13.1)	10,255	30.7 (27.9–33.6)
Antipsychotics	31,700	11.8 (10.8–12.7)	6,810	21.5 (18.7–24.2)
Prescription Opioids	30,509	11.3 (10.5–12.2)	5,947	19.5 (15.5–23.5)
Antihypertensives	17,237	6.4 (5.7–7.1)	3,921	22.7 (18.1–27.4)
Hypnotics (non-benzodiazepine)	15,411	5.7 (5.2–6.3)	2,833	18.4 (15.1–21.6)
Anticonvulsants	13,840	5.1 (4.5–5.8)	2,953	21.3 (16.4–26.3)
Gabapentinoids	12,455	4.6 (3.9–5.4)	1,617	13.0 (9.6–16.3)
Muscle Relaxants	9,813	3.6 (3.2–4.1)	1,857	18.9 (14.4–23.5)
Vitamins/Minerals or Herbs/Complementary Nutritionals	6,775	2.5 (2.1–2.9)	2,055	30.3 (24.7–36.0)
Stimulants (amphetamine)	5,216	1.9 (1.6–2.3)	1,314	25.2 (18.9–31.5)
Hypoglycemics	4,809	1.8 (1.5–2.1)	2,223	46.2 (39.3–53.2)
Other Medications	25,633	9.5 (8.5–10.6)	6,503	25.4 (22.2–28.6)

<sup>a</sup>National estimates are from the National Electronic Injury Surveillance System–Cooperative Adverse Drug Event Surveillance project, CDC. Medication<sup>a</sup> includes prescription and over-the-counter medications, dietary supplements (e.g., herbals, vitamins, minerals), homeopathic products, and vaccines.

<sup>b</sup>Implicated alone or in combination with other medications, alcohol, or illicit substances.

CI = confidence interval.



**Table 3.**

Top 5 Medication Categories Implicated in Emergency Department (ED) Visits for Medication-related Self-harm, by Patient Age—United States, 2016–2019<sup>a</sup>

Rank	Annualized National Estimates of ED Visits for Medication-related Self-Harm <sup>b</sup>				
	11–19 Years [73,498 visits annually]	20–34 Years [85,815 visits annually]	35–49 Years [57,571 visits annually]	50–64 Years [40,632 visits annually]	65 Years [11,376 visits annually]
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
1	Nonopioid Analgesics 39.1% (37.3%-40.8%)	Nonopioid Analgesics 24.7% (22.6%-26.7%)	Benzodiazepines 32.3% (28.7%-36.0%)	Benzodiazepines 35.4% (29.9%-40.9%)	Benzodiazepines 40.2% (33.7%-46.7%)
2	Antidepressants 24.6% (23.1%-26.2%)	Benzodiazepines 24.0% (21.0%-27.1%)	Antidepressants 22.9% (21.0%-24.8%)	Antidepressants 21.0% (19.4%-22.6%)	Prescription Opioids 22.6% (16.0%-29.3%)
3	Cough/Cold Products or Antihistamines 15.9% (14.8%-17.0%)	Antidepressants 23.9% (21.7%-26.2%)	Nonopioid Analgesics 15.6% (14.0%-17.3%)	Prescription Opioids 16.9% (14.8%-18.9%)	Antidepressants 19.3% (15.4%-23.2%)
4	Benzodiazepines 9.4% (7.9%-10.9%)	Cough/Cold Products or Antihistamines 14.6% (13.1%-16.1%)	Antipsychotics 14.3% (12.3%-16.2%)	Nonopioid Analgesics 13.6% (11.3%-15.9%)	Antihypertensives 10.6% (7.6%-13.5%)
5	Antipsychotics 7.9% (6.8%-8.9%)	Antipsychotics 13.7% (12.7%-14.7%)	Prescription Opioids 14.2% (12.5%-16.0%)	Antipsychotics 12.5% (10.3%-14.7%)	Nonopioid Analgesics 10.3% (6.7%-14.0%)

<sup>a</sup>National estimates are from the National Electronic Injury Surveillance System–Cooperative Adverse Drug Event Surveillance project, CDC. 'Medication' includes prescription and over-the-counter medications, dietary supplements, homeopathic products, and vaccines.

<sup>b</sup>Implicated alone or in combination with other medications, alcohol, or illicit substances. Not shown: 51 cases of self-harm among patients aged <11 years and 2 cases of self-harm among males with age not documented.

CI = confidence interval.

**Table 4.**

National Estimates of Emergency Department (ED) Visits for Medication-related Self-harm, by Clinical Manifestation—United States, 2016–2019<sup>a</sup>

Manifestation <sup>b</sup>	Annualized National Estimates of ED Visits for Medication-related Self-Harm	
	No.	% (95% CI)
Unresponsive or cardiorespiratory failure	14,257	5.3 (4.5–6.1)
Altered mental status	35,314	13.1 (10.7–15.5)
Fall/injury	623	0.2 (0.1–0.3)
Presyncope/syncope/dyspnea	2,375	0.9 (0.7–1.1)
Psychiatric or other central nervous system effect	3,574	1.3 (1.0–1.7)
Cardiovascular effect	6,415	2.4 (1.5–3.3)
Gastrointestinal effect	8,649	3.2 (2.3–4.1)
Other/unspecified effect	2,026	0.8 (0.5–1.0)
Laboratory abnormality only	20,501	7.6 (6.6–8.7)
No manifestations documented	175,465	65.2 (61.2–69.2)
Total	269,198	100.0

<sup>a</sup>National estimates are from the National Electronic Injury Surveillance System–Cooperative Adverse Drug Event Surveillance project, CDC. ‘Medication’ includes prescription and over-the-counter medications, dietary supplements (e.g., herbals, vitamins, minerals), homeopathic products, and vaccines.

<sup>b</sup>Clinical manifestations were categorized in a mutually exclusive and hierarchical manner (e.g., a case involving depressed consciousness and vomiting would be classified as altered mental status based on the depressed consciousness). In these visits, medications were implicated alone or in combination with other medications, alcohol, or illicit substances.

CI = confidence interval. N/A = not applicable.