

Overdoses of Formulary-Approved Medications: Implications for Policy and Practice

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Educational Objectives

- Review the existing literature on suicide and medication overdoses in community and prison settings.
- List medications which have high overdose potential and name risk factors which may put someone at higher risk of overdose.
- Discuss prison policies and procedures which may mitigate the risk of medication overdose.



Outline of talk

- Review epidemiology of overdose, suicide, and self-injurious behavior (SIB) in community and prison settings
- Review data from N.C. prisons on medication overdoses of formulary-approved medications requiring outside emergency room evaluation
- Discuss factors associated with overdose risk in prisons
- Review strategies and interventions to reduce the risk of potentially fatal medication overdoses

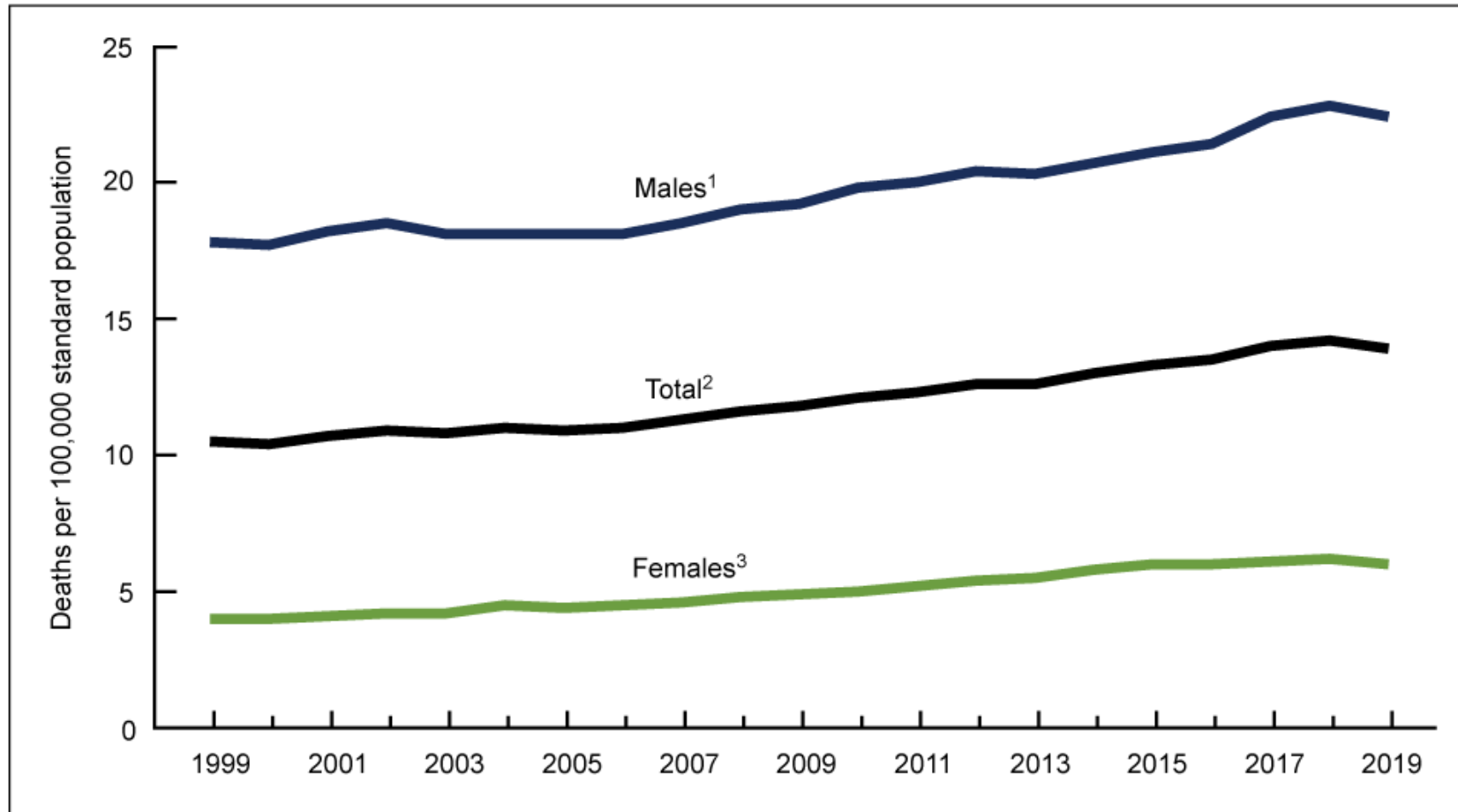


Suicide - community

- 46,000 suicides annually in the U.S.
 - ~24k by firearm, 12.5k suffocation, 5.5k poisoning
- 10th leading cause of death
 - 2nd leading cause of death in those aged 15-44 years
- Suicide rates have increased by 30% over the past two decades



Figure 1. Age-adjusted suicide rates, by sex: United States, 1999–2019



¹Stable trend from 1999 through 2006; significant increasing trend from 2006 through 2019, $p < 0.05$. The rate in 2019 was significantly lower than the rate in 2018, $p < 0.05$.

²Significant increasing trend from 1999 through 2019, with different rates of change over time, $p < 0.05$. The rate in 2019 was significantly lower than the rate in 2018, $p < 0.05$.

³Significant increasing trend from 1999 through 2015, with different rates of change over time; stable trend from 2015 through 2019, $p < 0.05$. The rate in 2019 was significantly lower than the rate in 2018, $p < 0.05$.

NOTES: Suicides are identified using *International Classification of Diseases, 10th Revision* underlying cause-of-death codes U03, X60–X84, and Y87.0. Age-adjusted death rates were calculated using the direct method and the 2000 U.S. standard population.

Access data table for Figure 1 at: <https://www.cdc.gov/nchs/data/databriefs/db398-tables-508.pdf#1>.

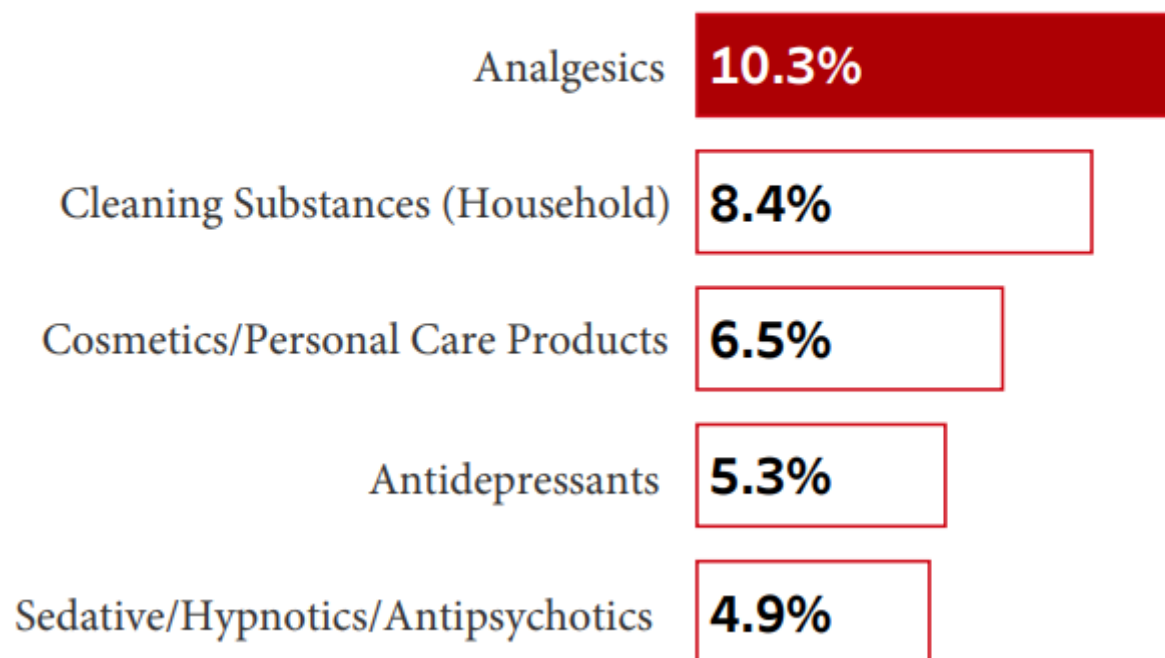
SOURCE: National Center for Health Statistics, National Vital Statistics System, Mortality.



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Community overdoses

Top 5 Exposure Substance Categories



Suicide risk factors

- Prior attempt
- Mental illness
- Substance use disorder
- Adverse childhood experiences
- Legal/financial problems
- Relationship/employment problems
- Poor impulse control, h/o aggression
- Family history
- Social isolation

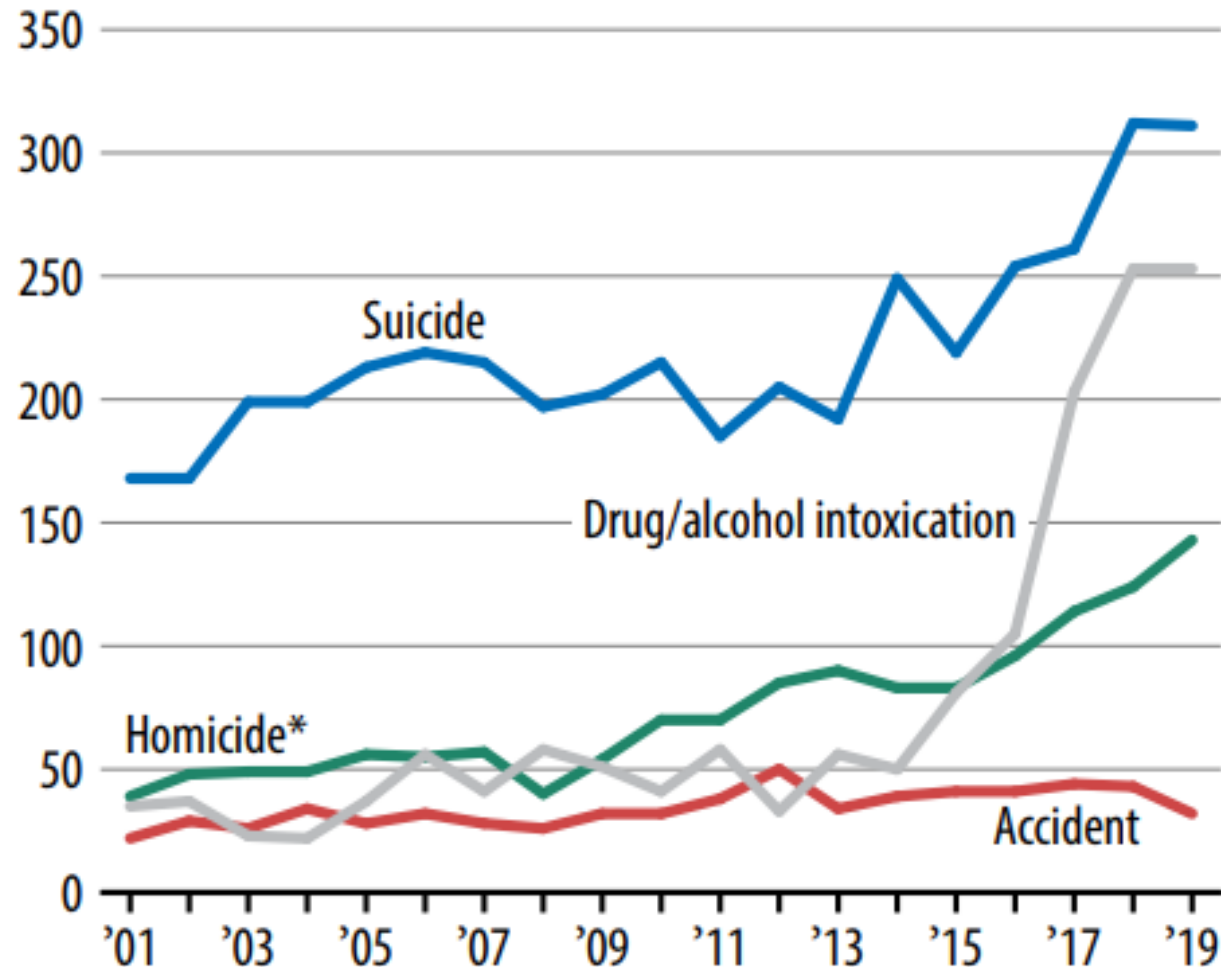


Suicide – jails/prisons

- Suicide is the single leading cause of death in jails (30%)
- Suicide accounted for 8% of prison deaths in 2019 (highest on record)
- 2001 to 2019:
 - 4,183 deaths by suicide in state prisons
 - 342 in federal prisons
- Means (state prisons):
 - Suffocation (88%), exsanguination (4%), poisoning (3.5%)

Number of unnatural deaths of state prisoners, by cause of death, 2001–2019

Number of unnatural deaths



Suicide attempts in correctional facilities

- No national prevalence estimates
- Prison-specific risk factors:
 - Newly incarcerated (jail)
 - Violent offense
 - Life sentence
 - Solitary confinement / single cell
 - Overrepresentation of community risk factors:
 - Mental disorder, SUD, childhood trauma, prior attempts, etc.



Self-injurious behavior (SIB)

- Intentional, deliberate harm to one's body without intent to die
- Often begins in children between the ages of 12-14 years
- Lifetime prevalence estimated at 22.1%
 - However, depends on definition
 - Moderate, repetitive SIB: 1-5%

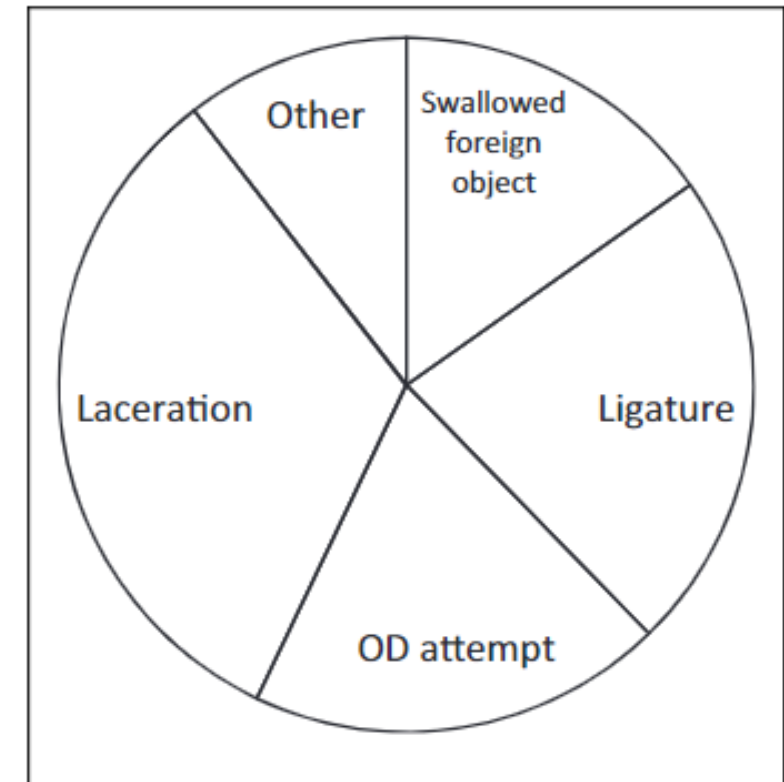


SIB in prisons

- Prevalence of 2-24%
- 85% of prison systems report weekly occurrences of SIB
- Functions: emotion regulation, control, attention, change environment/setting, self-punishment, revenge, feel pain
- Risk factors:
 - Younger age, white, lower education level, history of childhood trauma, history of violence, history of mental health dx (especially borderline PD), and placement in restrictive housing
- SIB, in turn, is a risk factor for completed suicide and violence.
- It is costly, disruptive, and diverts resources

Overdoses in correctional settings

- Rarely a cause of completed suicide
- Role in suicide attempts more unclear
- More often a means of SIB
- Significant morbidity and cost
- NYC jail survey 2007-2011:
 - 8 suicides
 - 2,514 acts of self-injury



Overdoses in correctional settings

Non-U.S. studies

- Near-lethal suicide attempts in English prisons, 2007-2009
 - 67% hanging, 20% severe cutting, 5% overdose on analgesic medication
- Swiss prison suicides, 2000-2010
 - 84% strangulation, 12% TCA overdose, 4% self-immolation

Overdoses in correctional settings

- California, 2011-2013
- Analysis of poison control calls received from police custody, jail, and prison
- Total of 704 ingestions
 - Methamphetamine (14%)
 - Anticonvulsants (11%)
 - Cleaning products (10%)
 - Acetaminophen (8%)

Overdoses in correctional settings

- Ohio, 2011-2014
- People in ODRC custody presenting to The Ohio State University Wexner Medical Center ED with drug overdose
- Thought to need inpatient admission
- Positive illicit substance screens excluded

Ohio overdoses

- N=130
 - 100 intentional
 - 7 unintentional
 - 3 ADRs
 - 20 unknown intent
- 109 (86%) inpatient admissions
- 19 (17%) ICU admissions
- 1 death
- Bills: \$2,606,942
 - Mean \$20,053 / visit

Drug	Number of overdoses (%)
Phenytoin	29 (13.4)
Acetaminophen	11 (5.1)
Unknown	10 (4.6)
Carbamazepine ^a	9 (4.2)
Sertraline	9 (4.2)
Aspirin	8 (3.7)
Divalproex	8 (3.7)
Ibuprofen	8 (3.7)
Metoprolol	8 (3.7)
Lisinopril	7 (3.2)
Amitriptyline ^a	5 (2.3)
Hydrochlorothiazide	5 (2.3)
Simvastatin	5 (2.3)
Citalopram	4 (1.9)
Fluoxetine	4 (1.9)
Lamotrigine ^a	4 (1.9)
Lithium ^a	4 (1.9)
Metformin	4 (1.9)
Risperidone ^a	4 (1.9)
Venlafaxine ^a	4 (1.9)

Excludes 45 drugs with < 4 exposures.

^aDenotes Ohio Department of Rehabilitation and Correction nurse-administered medications.

N.C. prison overdose analysis

Aims:

- Which formulary medications are used in overdose?
- What are the characteristics of the individuals involved?

Methods:

- Retrospective chart review (11/1/19-4/30/20) of all individuals transferred to an outside ED for suspected overdose



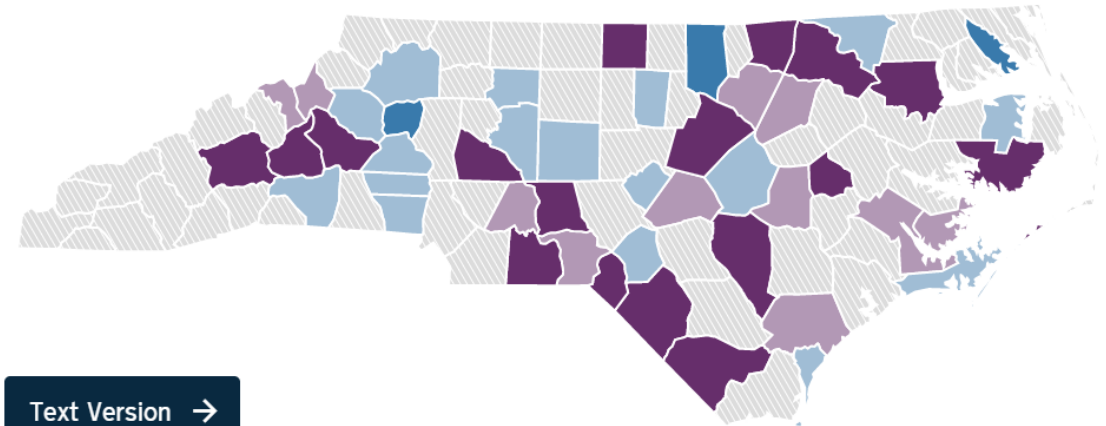
N.C. prison overdose analysis

- Utilization review (UR) required for all transfers
- Analyzed visits coded as poisoning, suicide attempt, AMS, ingestion, or any code that might suggest an overdose
- Reviewed ED records for confirmation
- Reviewed prison emergent SIB risk assessment notes



N.C. prisons snapshot

- 55 state prisons
- ~ 35,000 incarcerated people during the study period
- ~ 29,000 incarcerated people currently
- ~ 23% receiving mental health services



[Text Version](#) →

Legend

Minimum Custody =  Medium Custody =  Close Custody =  Multi-Custody Facility = 

N.C. prison overdose analysis – general results

- 47 intentional medication overdoses required an emergency department (ED) visit
- None of these overdoses was fatal
 - No completed suicides from overdose that did not involve an ED visit during the study period
- 25 individuals (54%) overdosed on medications for which they had an active prescription at the time
- 21 individuals (46%) overdosed on medications for which they did not have an active prescription at the time
- 0 individuals overdosed on medications they had obtained from the prison commissary



N.C. prison overdose analysis – general results

- 17 of the 46 overdoses resulted in inpatient medical hospitalization
- Overdoses occurred at 17 different state prison facilities throughout North Carolina
- Prisoners who overdosed were taken to 18 different medical centers located throughout North Carolina
- 12 individuals (26%) reported suicidal intent around the time of the overdose
- 35 individuals (74%) denied suicidal intent around the time of the overdose



N.C. prison overdose analysis – medications implicated

Medication	N (%)
Acetaminophen	30 (63.8)
Ibuprofen	5 (10.6)
Carbamazepine	3 (6.4)
Amlodipine	5 (10.6)
Rivaroxaban	1 (2.1)
Omeprazole	1 (2.1)
Lisinopril	1 (2.1)
Beta-blocker	1 (2.1)
Chlorthalidone	1 (2.1)
Unspecified antihypertensive	1 (2.1)
Losartan	1 (2.1)
Loratadine	1 (2.1)
Unspecified	6 (12.8)



N.C. prison overdose analysis – acetaminophen data

- 25 individuals (84%) with a reported acetaminophen overdose had blood acetaminophen levels greater than 0*
- 5 individuals (16%) with a reported acetaminophen overdose had blood acetaminophen levels of 0
- Of the total sample (n=47), 16 individuals (35%) had an active acetaminophen prescription at the time of their overdose

*In some cases, the blood acetaminophen level was much lower than expected based upon the number of ingested pills reported by the individual



N.C. prison overdose analysis – prisoner characteristics

- 41 males and 5 females in the sample
 - 1 individual required 2 ED visits for 2 separate overdoses during the study period
- Mean age of individuals reported a medication overdose = 32.4 years
- 28 individuals (61%) were white
- 17 individuals (37%) were Black
- 1 individual (2%) was Native American



N.C. prison overdose analysis – mental health services

- 29 individuals (63%) were receiving psychiatric services at the time of overdose
- 7 individuals (15%) were receiving psychological services (without concurrent psychiatric services) at the time of overdose
- 10 individuals (22%) were not receiving any mental health services at the time of overdose



N.C. prison overdose analysis – history of SIB

- 23 individuals (50%) had a prior history of overdose
 - 10 individuals (22%) had a history of overdose within the preceding 6 months
- 33 individuals (72%) had a prior history of non-overdose SIB
 - 18 individuals (39%) had a history of non-overdose SIB during the preceding 6 months



N.C. prison overdose analysis – additional prisoner characteristics

- 29 individuals (63%) had a diagnosis of acute or chronic pain
- 37 individuals (80%) were in restrictive housing at the time of their overdose



Comparison of prison overdose study results

- Ohio prison study (Fuh et al.) – medications used in overdose
 - Phenytoin most common (13%), followed by acetaminophen (5%)
- North Carolina prison study (Williams and Zarzar) – medications used in overdose
 - Acetaminophen most common (64%), followed by ibuprofen (10%)
- Non-incarcerated population data – American Association of Poison Control Centers (AAPCC)
 - Analgesic medications (incl. acetaminophen) are the medication class most commonly implicated in medication overdoses (Mowry et al, Clinical Toxicology, 2014)



Strategies to reduce the potential for a medication overdose requiring ED evaluation

- Consider how medications are being dispensed to incarcerated patients
- KOP – “Keep On Person”
 - A supply of medication is provided to a patient for self-administration
- DOT – “Direct Observation Therapy”
 - A medication is administered directly to a patient by nursing staff



Examples of medications currently administered via DOT in the N.C. prison system

- DEA controlled substances
- Chemotherapeutic agents
- Class III antiarrhythmic medications
- Hepatitis C antiviral medications
- Medicated dressings
- Injectable medications
- Anticonvulsants
(excluding valproate/divalproex)
- Muscle relaxants
- Nutritionals
- Anti-tuberculosis medications
- Psychotropic medications
(with some exceptions)



Strategies to reduce the potential for a medication overdose requiring ED evaluation

- Require all medications to be administered via DOT

- or -

Require acetaminophen to be administered via DOT

- Acetaminophen is a potentially dangerous analgesic medication, which can lead to hepatic toxicity and death
- Acetaminophen poisoning is the most common cause of acute liver failure in the US
- Drawback – places a burden on correctional nursing staff in terms of medication administration and thus may not be feasible



Strategies to reduce the potential for a medication overdose requiring ED evaluation

- Reduce the overall use of restrictive housing in correctional settings
- In the N.C. prison system study, 80% of medication overdoses requiring ED evaluation involved individuals in restrictive housing
 - Restrictive housing (RH) - the practice of placing an incarcerated individual alone in a cell for 22-24 hours per day with limited human contact, limited access to property, and limited access to programming
 - AKA solitary confinement, disciplinary segregation (D-seg), administrative segregation (A-seg/ad-seg), segregated housing, special housing unit (SHU), special management unit (SMU), supermax, administrative maximum facility (ADX), “the hole”
 - RH is a risk factor for SIB and suicide in corrections



Strategies to reduce the potential for a medication overdose requiring ED evaluation

- Reduce overall access to acetaminophen among the RH population by prescribing alternative analgesic medications, such as non-steroidal anti-inflammatory drugs (NSAIDs) when medically appropriate
 - The potential medical danger associated with acetaminophen ingestion is far greater compared to NSAID overdose
 - Prisons are better positioned to provide the requisite medical monitoring of an NSAID ingestion without resorting to outside medical services



Other issues to consider

- Potential strategies directed towards individuals who are on the mental health caseload
- Potential strategies directed towards individuals with a prior history of SIB (overdose and non-overdose)
- Potential strategies directed towards individuals with acute or chronic pain



Additional considerations / next steps

- Conduct a detailed debriefing of the prisoner and responding correctional staff following an overdose
 - To identify possible motivations underlying the overdose that can be targeted for intervention
- For prisoners with a history of repeated overdose, consider devising a contingency management (CM) program to reduce the potential for future overdoses
 - Token economy, voucher program



Audience input

- Do members of the audience have any insights they would like to share?
- Are there policies implemented at your correctional facility that have been effective in reducing medication overdoses?



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Questions



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