Descriptive exploration of overdose codes in hospital and emergency department discharge data to inform development of drug overdose morbidity surveillance indicator definitions in ICD-10-CM

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ABSTRACT

Background In October 2015, discharge data coding in the USA shifted to the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM), necessitating new indicator definitions for drug overdose morbidity. Amid the drug overdose crisis, characterising discharge records that have ICD-10-CM drug overdose codes can inform the development of standardised drug overdose morbidity indicator definitions for epidemiological surveillance.

Methods Eight states submitted aggregated data involving hospital and emergency department (ED) discharge records with ICD-10-CM codes starting with T36–T50, for visits occurring from October 2015 to December 2016. Frequencies were calculated for (1) the position within the diagnosis billing fields where the drug overdose code occurred; (2) primary diagnosis code grouped by ICD-10-CM chapter; (3) encounter types; and (4) intents, underdosing and adverse effects.

Results Among all records with a drug overdose code, the primary diagnosis field captured 70.6% of hospitalisations (median=69.5%, range=66.2%–76.8%) and 79.9% of ED visits (median=80.7%; range=69.8%–88.0%) on average across participating states. The most frequent primary diagnosis chapters included injury and mental disorder chapters. Among visits with codes for drug overdose initial encounters, subsequent encounters and sequelae, on average 94.6% of hospitalisation records (median=98.3%; range=68.8%–98.8%) and 95.5% of ED records (median=99.5%; range=79.2%–99.8%), represented initial encounters. Among records with drug overdose of any intent, adverse effect and underdosing codes, adverse effects comprised an average of 74.9% of hospitalisation records (median=76.3%; range=57.6%–81.1%) and 50.8% of ED records (median=48.9%; range=42.3%–66.8%), while unintentional intent comprised an average of 11.1% of hospitalisation records (median=11.0%; range=8.3%–14.5%) and 28.2% of ED records (median=25.6%; range=20.8%–40.7%).

Conclusion Results highlight considerations for adapting and standardising drug overdose indicator definitions in ICD-10-CM.

INTRODUCTION

Background

The International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM), a coding system for all claims billing in the USA, went into effect on 1 October 2015, replacing the 9th Revision (ICD-9-CM).[1 2] The coding transition brought with it benefits and challenges for drug overdose surveillance using hospital and emergency department (ED) discharge data. Increases in specificity of drug codes, the ability to distinguish initial encounters from subsequent encounters and sequelae, the inclusion of external cause information within drug overdose diagnosis codes and new concepts like 'underdosing' provide epidemiologists with richer data.[1] However, these new features impact how injuries, including drug overdose, should be measured and interpreted using ICD-10-CM coded discharge data.[1 3] Amid a continuing drug overdose epidemic in the USA, high-quality data and standardised surveillance methods are key for tracking and assessing drug overdose burden.[4]

Several studies have characterised drug overdoses using ICD-10-CM coded discharge data, but have used varying selection criteria and indicator definitions to ascertain drug overdose cases.[5–8] Specifically, these indicator definitions differ on the number of diagnosis fields searched, the encounter types included, the manner of injury/intent selected and the specific ICD-10-CM codes included. Some studies searched all diagnosis fields (ie, primary diagnosis field, secondary diagnosis and all other fields available)[6 7] and others only included cases with a primary diagnosis of injury.[8]

ICD-10-CM introduced the differentiation of encounter type, with codes for initial encounter, subsequent encounter and sequelae.[1 9] Initial encounters represent active treatment of drug overdose, while subsequent encounters represent encounters taking place 'after the patient has completed active treatment of the condition and is receiving routine care for the condition during the healing or recovery phase'.[9] Sequelae are new medical conditions or complications, occurring at any point after the acute phase of the injury, which

are residual effects of the original injury.[9] Some studies have included all encounters,[5–7] while others have limited inclusion to initial encounter type.[8]

Another difference of ICD-10-CM is that it includes manner of injury/intent within the drug overdose diagnosis code itself, while ICD-9-CM captured this information with a separate external cause of injury code.[1 9] In addition to standard intent categories for injury (unintentional, intentional self-harm, assault and undetermined), the drug overdose codes can indicate an adverse effect or underdosing.[9] Adverse effects are pharmacological effects from medication correctly prescribed and properly administered, while underdosing is the effect of using less of a drug than was prescribed.[9] Another change introduced is that guidance instructs coders to choose unintentional intent if no other intent is explicitly noted in the medical record, whereas ICD-9-CM instructs coders to default to undetermined intent.[1 9] These changes in guidance could result in systematic changes of drug overdose intent categorisation that will affect counts when stratifying drug overdoses by intent. In two studies, by Heslin *et al* and Moore and Barrett, intentional self-harm and assault cases were excluded in the drug overdose definitions. However, in other studies, Slavova *et al* and CDC researchers included these cases.[5–8]

ICD-10-CM codes T36–T50 (poisoning by, adverse effect of, and underdosing of drugs, medicaments and biological substances) have been used frequently to study and surveil acute drug overdose.[6–8 10–13] However, several codes from outside of the injury chapter ('Injury, poisoning and certain other consequences of external causes') could be relevant for drug overdose surveillance when coded as co-occurring conditions on the medical record. One example is O9A.2, 'Injury, poisoning and certain other consequences of external causes complicating pregnancy, childbirth and the puerperium'. In the event that someone experiences a drug overdose during pregnancy, ICD-10-CM mandates placement of O9A.2 as the primary diagnosis.[9] Another example is codes for substance use with intoxication from the mental health chapter of ICD-10-CM, such as F11.22, 'Opioid dependence with intoxication', which has been used in syndrome definitions for rapidly identifying suspected drug overdose cases.[14]

The varying indicator definitions and selection criteria across studies reflect a lack of standardised guidance for drug overdose surveillance and variations in the structure of discharge datasets. The findings presented in this paper supported the development of several standardised guidance documents for drug overdose morbidity surveillance methods: the CSTE ICD-10-CM Injury Surveillance Toolkit, the CSTE Nonfatal Opioid Overdose Standardized Surveillance Case Definition position statement, and Drug Overdose Surveillance and Epidemiology system indicator guidance for CDC's Overdose Data to Action cooperative agreements.[11 15 16]

This study provides a descriptive exploration of the new features in ICD-10-CM drug overdose codes and how variations in indicator definitions would affect drug overdose counts when using discharge data for drug overdose surveillance. These analyses answered the following questions:

1. How many diagnosis fields should be searched for drug overdose indicators?
2. Should drug-related ICD-10-CM codes from outside of the injury chapter be included?
3. Which encounter types should be included?
4. Which manners of injury/intents should be included?

METHODS
Data
This study employs a cross-sectional descriptive analysis of state-wide hospital and ED discharge datasets from New Jersey, Montana, New Mexico, Tennessee, Louisiana, North Carolina, Kentucky and Colorado.[17–27] Hospital discharge databases use the standard uniform billing form (UB-04), created by the National Uniform Billing Committee, to standardise billing data for reimbursement. ICD-10-CM codes are assigned for reimbursement by certified, trained medical coders. Data were representative of all patient records from acute care facilities and excluded records from federal, non-acute care and psychiatric facilities. Records included all ages, sexes and admission types. Records from non-state residents were excluded.[28] The nature of this non-research, secondary data analysis of de-identified data precluded patient and public involvement.

Table 1 describes the characteristics of participating states and their data.

Data preparation and analyses
Hospitalisation and ED datasets were analysed separately. To avoid duplication, patients who presented to the ED and were subsequently hospitalised were excluded from the ED datasets. These analyses used a provisional ICD-10-CM definition for drug overdose proposed by a workgroup of the national Council of State and Territorial Epidemiologists and the National Center for Injury Prevention and Control which included a diagnosis code in any field starting with T36–T50, with unintentional, intentional harm, assault or undetermined intent, and initial, subsequent or missing encounter type, (hereafter 'drug overdose codes'). The proposed definition for drug overdose excluded adverse effects and underdosing, and sequelae. Intents, including adverse effects and underdosing

Table 1 Characteristics of participating states and their data

	Hospitalisation data		
	Contributed data	**Time span**	**Diagnosis code fields**
State 1	Yes	1 Oct 2015–31 Dec 2016	30
State 2	Yes	1 Oct 2015–31 Dec 2016	25+3 ECI fields*
State 3	Yes	1 Jan 2016–31 Dec 2016	18+3 ECI fields
State 4	Yes	1 Oct 2015–31 Dec 2016	31+5 ECI fields
State 5	Yes	1 Oct 2015–31 Dec 2016	18+3 ECI fields
State 6	Yes	1 Oct 2015–31 Dec 2016	9+3 ECI fields
State 7	Yes	1 Oct 2015–31 Dec 2016	95
State 8	Yes	1 Oct 2015–31 Dec 2016	25+6 ECI fields
	Emergency department data		
	Contributed data	**Time span**	**Diagnosis code fields**
State 1	Yes	1 Jan 2016–31 Dec 2016	15
State 2	Yes	1 Oct 2015–30 Jun 2016	25+3 ECI fields
State 3	Yes	1 Jan 2016–31 Dec 2016	48+6 ECI fields
State 4	Yes	1 Jan 2016–31 Dec 2016	26
State 5	Yes	1 Oct 2015–31 Dec 2016	18+3 ECI fields
State 6	No	NA	NA
State 7	No	NA	NA
State 8	No	NA	NA

*ECI fields refer to dedicated external cause of injury code fields separate from other diagnosis codes.
ECI, external cause of injury; NA, not applicable.

were categorised using the fifth/sixth character of the ICD-10-CM code, and encounter types, including sequelae, were categorised using the seventh character.

Analysis 1: diagnosis fields

Discharge datasets contain a primary diagnosis followed by an array of secondary diagnosis fields allowing comorbid diagnoses to be sequenced together in a single record. To examine frequency of the first position (field) of the drug overdose codes, records with a drug overdose code according to the proposed definition were identified searching the primary diagnosis first, then secondary diagnosis fields, then external cause fields. The position of the first-mentioned drug overdose code in the record was identified. These code positions were categorised (1, 2–5, 6–10, 11–15, 16+).

Analysis 2: other chapters

The ICD-10-CM codes are organised by major clinical conditions. To parsimoniously characterise possible broad co-occurring conditions among records with a drug overdose code in any field, the ICD-10-CM chapters of the coding manual (eg, 'A00–B99', 'C00–D99' and so on) of the primary diagnosis codes were examined. The primary diagnosis codes were categorised into ICD-10-CM coding chapters and quantified.

Analysis 3: encounter type

To examine the distribution of encounter types among drug overdose codes and their sequelae, records with a drug overdose code or sequelae to a drug overdose code were identified by searching all diagnosis fields, and the encounter type was categorised into initial (A), subsequent (D), sequela (S) or missing encounters based on the seventh character of the code.

Analysis 4: intent

To examine the distribution of intents among drug overdose, adverse effect and underdosing codes, records with a drug overdose, adverse effect or underdosing code were identified by searching all diagnosis fields, and the intent for the drug overdose code was categorised into unintentional, intentional self-harm, assault, undetermined, adverse effect, underdosing

or missing based on the fifth/sixth character of the code. All categories of intent were analysed for completeness, though adverse effect and underdose are by definition not considered drug overdoses in this manuscript.

State staff tabulated frequencies and percentages for code position categories, encounter types, intents and primary diagnosis chapters using SAS V.9.4.[29] State-specific results and averages of all state results are presented.

RESULTS

Hospitalisations from 1 October 2015 through 31 December 2016 with drug overdose codes in any field ranged from 976 records per state to 9565 records per state across eight states. ED visits with drug overdose codes in any field ranged from 9086 records per state to 36 326 records per state across five states during the time periods examined in each state.

Analysis 1: diagnosis fields

The distribution of the field-position of the first-mentioned drug overdose code in each record for hospitalisation (A) and ED visit (B) data are shown in figure 1 and online supplemental table 1. Among hospitalisations with a drug overdose code, the primary diagnosis field captured 70.6% of hospitalisations (median=69.5%; range=66.2%–76.8%) on average across participating states. Among ED visits with a drug overdose code, the primary diagnosis field captured 79.9% (median=80.7%; range=69.8%–88.0%) on average across participating states. The first 10 fields captured 94.3% of hospitalisations (median=94.1; range=90.8%–100.0%) and 99.2% of ED visits (median=99.7%; range=97.2%–99.9%).

Analysis 2: other chapters

Figure 2 and online supplemental table 2 show the most common chapters of ICD-10-CM codes that were in the primary diagnosis field when the drug overdose code was in any field position.

Among hospitalisation records with a drug overdose code in any field position, on average, 72.5% (median=71.1%; range=68.1%–79.2%) of the primary diagnosis fields included codes from the 'S00–T88: Injury, Poisoning, and Other
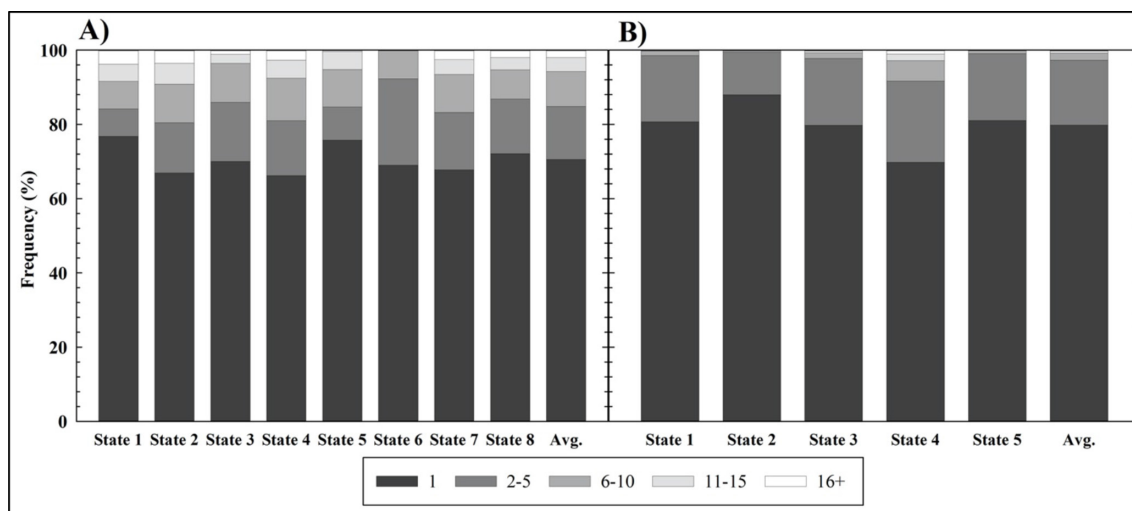

Figure 1 Analysis 1: distribution of the field position of the first-mentioned drug overdose code* in each claim record. (A) Discharge data from eight states' hospitalisation databases. (B). Discharge data from five states' ED visit databases. *Drug overdose diagnoses include ICD-10-CM codes starting with T36–T50 including unintentional, intentional harm, assault or undetermined intents, and initial, subsequent or missing encounter type. Avg., average; ED, emergency department; ICD-10-CM, International Classification of Diseases, 10th Revision, Clinical Modification.
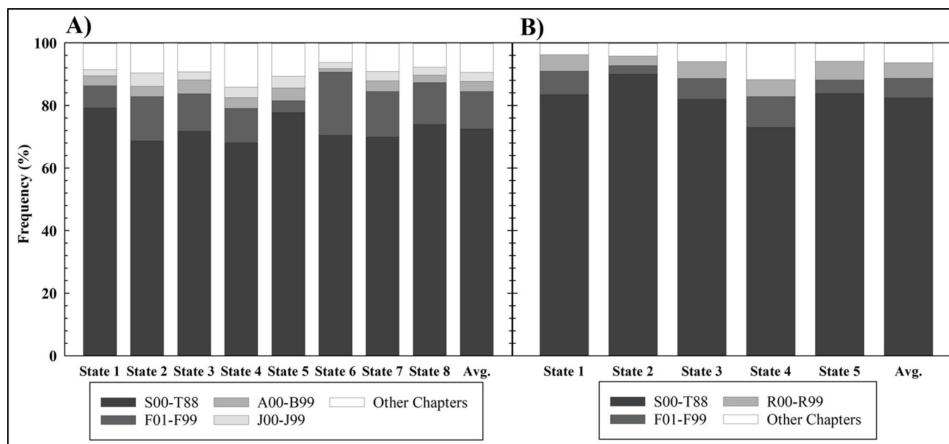
Figure 2 Analysis 2: top chapters of primary diagnosis for records with a drug overdose diagnosis code* in any field. (A) Discharge data from eight states' hospitalisation databases. Top four most common chapters are displayed. (B) Discharge data from five states' ED visit databases. Top three most common chapters are displayed. *Drug overdose diagnoses include ICD-10-CM code beginning with T36–T50 including unintentional, intentional harm, assault or undetermined intents, and initial, subsequent or missing encounter type. Avg., average; ED, emergency department; ICD-10-CM, International Classification of Diseases, 10th Revision, Clinical Modification.

Consequences of External Causes' chapter. The second most common chapter of primary diagnosis for all but one state was 'F01–F99: Mental, Behavioral, and Neurodevelopmental Disorders' chapter with an average of 12.0% (median=12.7%; range=3.8%–20.2%). State 5's second most common chapter was 'A00–B99: Certain Infectious and Parasitic Diseases' (4.1%). The third most common chapter varied: 'A00–B99' for states 1, 3 and 7; 'J00–J99: Diseases of the Respiratory System' for states 2, 6 and 8; 'F01–F99' for state 5 and 'I00–I99: Diseases of the Circulatory System' for state 4. All other chapters represented an average of 12.1% of primary diagnosis codes (median=12.0%; range=7.4%–17.1%).

Among ED visit records with a drug overdose code in any field position, on average, 82.4% (median=83.5%; range=73.0%–89.9%) of the primary diagnosis fields included codes from the 'S00–T88' chapter. The second most common chapter varied. States 1, 3 and 4 had 'F01–F99' as their second most

common chapter, with an average of 6.3% (median=6.7%; range=2.8%–9.9%). States 2 and 5 had 'R00–R99: Symptoms, Signs and Abnormal Clinical and Laboratory Findings, Not Elsewhere Classified' as their second most common chapter, with a participating state average of 5.0% (median=5.3%; range=3.0%–5.9%). The third most common chapter was 'R00–R99' for states 1, 3 and 4, and 'F01–F99' for states 2 and 5. All other chapters represented an average of 6.3% primary diagnosis codes (median=5.9%; range=3.8%–11.8%).

Analysis 3: encounter type

Figure 3 and online supplemental table 3 show the frequency of encounter types captured among drug overdose records, subsequent encounters and sequelae. Among hospitalisations, on average, initial encounters represented 94.6% (median=98.3%; range=68.8%–98.8%). Subsequent
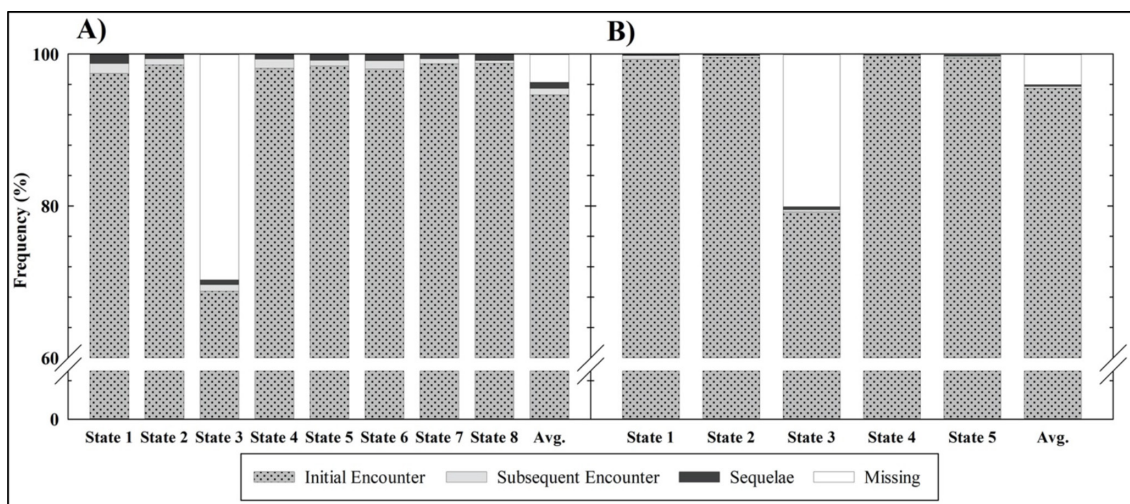

Figure 3 Analysis 3: frequency of encounter type among records with an overdose diagnosis code* or sequela in any field. (A) Discharge data from eight states' hospitalisation databases. (B) Discharge data from five states' ED visit databases. *Drug overdose diagnosis codes include ICD-10-CM codes starting with T36–T50 including unintentional, intentional harm, assault or undetermined intents, and initial, subsequent or missing encounter type. This analysis included records with overdose codes and codes for sequelae to overdose. Avg., average; ED, emergency department; ICD-10-CM, International Classification of Diseases, 10th Revision, Clinical Modification.
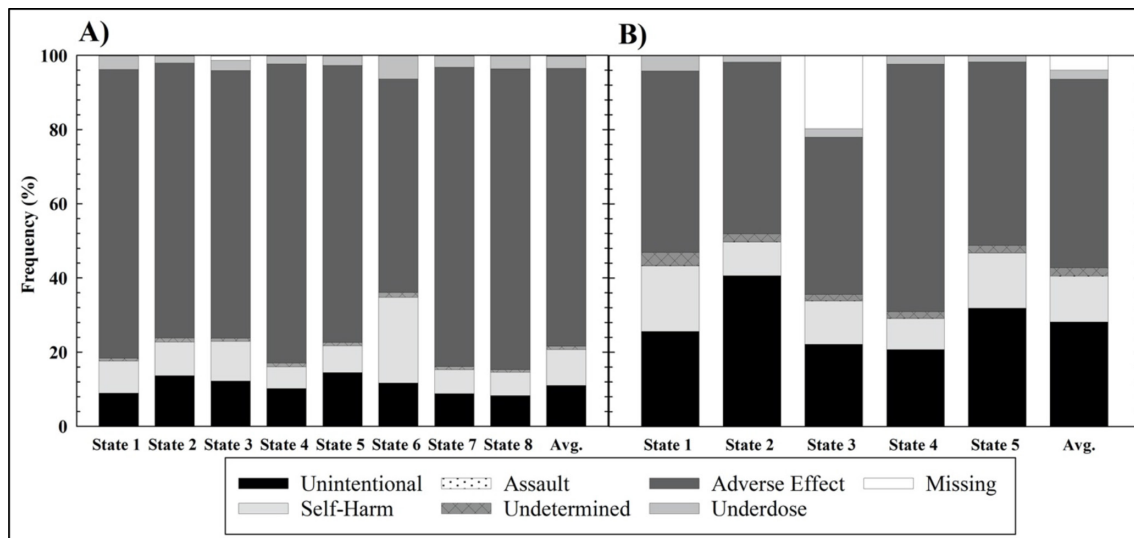
Figure 4 Analysis 4: frequency of intent among records with a drug overdose diagnosis code* in any field. (A) Discharge data from eight states' hospitalisation databases. (B) Discharge data from five states' ED visit databases. Assault category is too small to view. *Drug overdose diagnosis codes include ICD-10-CM codes starting with T36–T50 including unintentional, intentional harm, assault or undetermined intents, and initial, subsequent or missing encounter type. This analysis included overdose records with overdose codes of any intent, adverse effects codes and underdosing codes. Avg., average; ED, emergency department; ICD-10-CM, International Classification of Diseases, 10th Revision, Clinical Modification.

encounters made up an average of 0.9% (median=0.8%; range=0.4%–1.3%) and sequelae 0.8% (median=0.7%; range=0.6%–1.2%) of hospitalisations. In state 3, encounter type was missing for 29.7% of hospitalisation records.

Among ED records, on average, initial encounters were 95.5% (median=99.5%; range=79.2%–99.8%). Subsequent encounters were 0.3% (median=0.2%; range=0.1%–0.5%) and sequelae were 0.2% (median=0.2%; range=0.1%–0.4%) of ED records. In state 3, encounter type was missing for 20.0% of ED records.

Analysis 4: intent

The frequency of the intents captured among drug overdose, adverse effect, and underdosing records is shown in figure 4 and online supplemental table 4. Among hospitalisations, adverse effects codes were present across participating states in an average of 74.9% of records with drug overdose codes (median=76.3%; range=57.6%–81.1%). Among ED visits, adverse effects codes were present across participating states in an average of 50.8% of records with drug overdose codes (median=48.9%; range=42.3%–66.8%). Unintentional intent represented an average of 11.1% of hospitalisations (median=11.0%; range=8.3%–14.5%) and 28.2% of ED visits (median=25.6%; range=20.8%–40.7%), followed by self-harm with 9.6% of hospitalisations (median=7.9%; range=5.8%–23.0%) and 12.3% of ED visits (median=11.6%; range=8.3%–17.6%). On average, undetermined, assault and underdosing intents represent 4.3% (median=3.8%; range=3.1%–7.7%) of hospitalisations and 4.8% (median=4.1%; range=3.8%–7.8%) of ED visits, respectively. State 3 had a relatively large percentage of missing intents among hospitalisations and ED visits compared with other states.

DISCUSSION

The analyses highlight key features of drug overdose indicators to consider when using ICD-10-CM coded data.

First, limiting selection to records with an ICD-10-CM drug overdose code in the primary diagnosis field included, on average, only 70.6% of hospitalisations and 79.9% of ED visits with a drug overdose code in the record. This suggests that a definition that searches only the primary diagnosis field would likely undercount drug overdose cases. While in hospital/inpatient settings, the primary diagnosis, known as the 'principal' diagnosis, has been confirmed by a physician, the same is not necessarily true in the ED setting.[9] Healthcare Cost and Utilization Project noted in a 2011 report that 'the ED visit often focuses on the symptom-based evaluation of differential diagnoses' going on to state that 'several conditions may have relevance to the 'reason' for the ED visit, and all-listed diagnoses may need to be considered.'[30] Based on their study findings, Slavova et al suggested that 'heroin or other opioid poisoning surveillance definitions that include multiple diagnoses (first-listed and secondary) would identify a high percentage of true-positive cases'.[12]

Given that the ordering of codes beyond the primary diagnosis is not standardised, any broader limitation in the number of fields to search (eg, limiting to 5 or 10 fields) could arbitrarily bias comparisons across states, which have differing dataset structures. For example, 100% of the drug overdose codes in hospitalisation data were captured in the first 10 fields for state 6, a state with nine fields. In contrast, only 93.4% of records were captured in the first 10 fields for state 7, a state with 95 fields. Among states in this study, the number of fields in the hospitalisation data ranged from 9 to 95. At least one of the participating states store their diagnosis codes in a vertical relational database without meaningful coding order past the primary diagnosis, rather than as horizontal flat files.[19] Including all available fields could minimise bias when comparing drug overdose rates across states and prevent underestimation of drug overdoses.

Second, codes from outside the injury chapter are somewhat common in the primary diagnosis field, with codes T36–T50 as secondary codes. Among the drug overdose records examined,

the primary diagnosis codes most often came from either the injury chapter or the mental health chapter. Other codes of interest, including O9A.2 (Injury or poisoning complicating pregnancy), were relatively rare, appearing as the primary diagnosis in less than 0.5% of drug overdose records across all states (see online supplemental table 2). The primary diagnosis of mental health conditions with subsequent drug overdose codes may represent co-occurring mental health and substance use disorders, or substance use with intoxication codes. Additionally, certain infectious diseases could reflect abscesses from injection drug use or unsafe sex, respiratory disease might reflect a pre-existing condition worsened by chronic smoking of a drug, and circulatory problems could be a complication of chronic drug use, particularly in the case of stimulant use. Further research, including medical record review, could characterise records with both drug overdose and substance use disorder and intoxication codes and the physician documentation that supports each. This could reveal how incorporating codes for co-occurring conditions might affect the sensitivity or specificity of indicator definitions that rely on primary diagnosis codes only. However, expanding selection criteria to all diagnosis fields could capture drug overdose cases with relevant mental disorders, organ failure or injuries during pregnancy coded as the primary diagnosis.

Third, subsequent encounters and sequelae represent a small proportion of ICD-10-CM codes in the T36–T50 range. Given that subsequent and sequela encounters do not represent new drug overdoses, their inclusion could potentially count a single drug overdose multiple times, modestly inflating measures of drug overdose incidence.

Fourth, the distribution of cases across intent categories varied across states. The change in coding guidelines that instructs coders to default to accidental intent when the intent of the injury is unspecified is likely to impact the number of cases within each intent category in ICD-10-CM coded data. Future research exploring how medical coders assign intent categories is warranted.

Adverse effects constitute a relatively large proportion of records with codes T36–T50, while codes for underdosing are relatively rare. Adverse effects could represent common side-effects which are inconsistent with a drug overdose. Including adverse effects could dramatically inflate estimates of drug overdose-related discharges. Underdosing can represent non-compliance or improper administration and is also inconsistent with a drug overdose.[9] To prevent overestimation of drug overdoses, researchers should exclude both adverse effects and underdosing.[15]

Next steps to validate drug overdose indicators include replication of these analyses with nationally representative data, and medical chart review to assess the predictive value of codes for drug overdose, adverse effects and substance use with intoxication, and to understand how medical coders categorise drug overdose intent. Appropriate training for medical coders in applying ICD-10-CM codes for drug overdose may alleviate missing data and benefit end users.

Limitations

This study had several limitations. First, differences in patient reporting, physician documentation, drug screening availability, and hospital or state reporting policies could result in differences in medical coding accuracy between hospital systems and across states. However, discharge data from hospitals, standardised using ICD-10-CM and UB-04, are generally considered complete, comparable and reliable.[30] Second, the ICD-10-CM codes were not validated through medical record review to determine the predictive value for identifying drug overdoses. Third, reporting completeness was affected by the ICD-10-CM transition, with some hospitals reporting incomplete or late data for quarter 4 2015–2016. Fourth, one state was missing the encounter type and intent portions of a large proportion of codes. Missing data were not excluded from this simple descriptive analysis, potentially distorting averages for analyses 3 and 4. Medians are presented along with averages excluding state 3's results in online supplemental table 1, for comparison. Fifth, participating states were self-selected and not representative of the USA, limiting the generalisability of the findings. There could also be heterogeneity in drug overdose patterns across states due to availability and variability of drug types, general population health and differing healthcare infrastructures, which may not be reflected in the sample of states for this project. However, these analyses were meant to inform indicator development and to test the suitability of the proposed methodologies for use in drug overdose surveillance, rather than to accurately describe characteristics of drug overdose discharges across the country. Participating epidemiologists from across the country had access to state-wide ICD-10-CM coded discharge data, informing surveillance methods development with these analyses just as these data became available.

CONCLUSIONS

Descriptive analyses of discharge data produced consistent results across states and across the two data sources which have informed the standardisation of drug overdose indicator definitions for hospital and ED discharges coded in ICD-10-CM. These standardised definitions have been shared in toolkits for epidemiologists and as guidance for CDC's funded partners.[11 15 16] Consistent instructions across all of these surveillance tools include: search all available diagnosis fields for drug overdose ICD-10-CM codes; exclude subsequent encounters and sequelae from indicators intended to approximate drug overdose incidence; exclude underdosing and adverse effects from drug overdose incidence indicators; and use codes T36–T50 for drug overdose surveillance with discharge data.

What is already known on the subject

► Use of the International Classification of Diseases, 10th Revision, Clinical Modification (ICD-10-CM) became effective on 1 October 2015.
► Without national standards, researchers and epidemiologists have used varied methods and indicator definitions to measure drug overdose morbidity in hospital and emergency department discharge data coded with ICD-10-CM codes.

What this study adds

► This manuscript presents descriptive analyses of hospital and emergency department data, discussing how the analyses informed the development of standardised ICD-10-CM drug overdose surveillance indicator definitions by national organisations.

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