Behavioral Health & Readmissions
In Massachusetts
Acute Care Hospitals
SFY 2020

October 2022

Technical Appendix

CHIA.

Behavioral Health and Readmissions
in Massachusetts Acute Care Hospitals, SFY 2020

(October 2022)

TECHNICAL APPENDIX

Table of Contents

Introduction

This technical appendix provides an overview of the data source and analytic methods that were used in the report, *Behavioral Health and Readmissions in Massachusetts Acute Care Hospitals SFY 2020 (October 2022)*, by the Center for Health Information and Analysis (CHIA).

The aforementioned publication reports on the prevalence of behavioral health comorbidities and readmission rates among hospitalized patients in Massachusetts acute care hospitals on an all-payer, all-condition basis.

Data Source

For this report, the Hospital Inpatient Discharge Database (HIDD) of CHIA's Acute Hospital Case Mix Database was used as the source data. This case mix discharge dataset is a stay-level file including patient socio-demographics, diagnostic information, treatment and service information, and hospital charges. The data is submitted to CHIA quarterly by all Massachusetts acute care hospitals and undergoes a cleaning and verification process at CHIA that includes the feedback of verification reports to hospitals for confirmation of their information. Once data has been processed and verified, CHIA produces and makes available annual files.

Patient Identification

To link patient records, CHIA utilizes an enhanced patient identifier (EPI) for its readmissions analyses. In reports published prior to 2019, patients were identified and linked using Social Security Number (SSN), and patients with missing or invalid SSN were dropped from the analysis. However, the quality and completeness of SSN on patient records has deteriorated over time. In SFY 2020, 18.5% of adult discharges had missing or invalid SSN, up from 9.5% in SFY 2018. To address this issue, CHIA transitioned to the use of an EPI for patient identification. The EPI is created by CHIA using Master Data Management (MDM) techniques by employing an industry-leading MDM software solution, IBM Initiate Master Data Service. It utilizes probabilistic matching on all available and valid patient demographic information to identify records belonging to the same patient. Patient demographic information was sourced from CHIA's Acute Hospital Case Mix Databases which include hospital inpatient discharge data, outpatient observation data, and emergency department data dating back to 2006. For more information on the EPI, please see the technical appendix to CHIA's *Hospital-wide Adult All-Payer Readmissions in Massachusetts: 2011-2020.*

Study Population

The study population for this report is adult patients (age 18+) who were discharged from Massachusetts acute care hospitals from July 1, 2019 to June 30, 2020 (SFY 2020). The databook accompanying the report also provides new, parallel analyses for this population for SFY 2019 (July 1, 2018 to June 30, 2019). Discharges from Massachusetts psychiatric hospitals were not included in this study.

For this report, exclusion criteria were adapted from the Yale/CMS readmissions methodology (for details, see Readmissions Methodology in the technical appendix to the annual readmission report). Exclusion criteria included the following cases: obstetric admission, treatment for cancer, leave against medical advice, and rehabilitative admission. Unlike the Yale/CMS readmission methodology, discharges from acute care hospitals for primary psychiatric admissions were included. After exclusions were applied, a total of 355,746 unique patients, representing 524,205 eligible index admissions and 83,760 readmissions, were included in the SFY 2020 analytic dataset.

Unit of Analysis

With the exception of the analyses by discharge setting and length of stay, the unit of analysis for this study is the patient. In the discharge setting and length of stay analyses, it is more appropriate to calculate prevalence and readmission rates at the discharge level because discharge setting and length of stay can vary from visit to visit for the same patient.

For patients, the values of age, sex, region of residence, and payer type were taken from the most recent visit in the discharge analytic dataset.

Behavioral Health Comorbidity

To examine the prevalence of behavioral health comorbidity among hospitalized patients, CHIA developed a list of behavioral health-related diagnoses, including ten categories of mental health-related diagnoses and eight categories of substance use disorders (see detail below). Diagnosis information from patient's discharge records was used to classify patients into these four mutually exclusive categories of behavioral health:

- Mental health conditions (MH) only
- Substance use disorders (SUD) only
- Both MH and SUD or co-occurring behavioral health conditions (CO)
- No mention of MH or SUD (None)

Development of List of Behavioral Health-Related Diagnoses

CHIA uses the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications Software-Refined (CCSR) for ICD-10-CM (v. 2022.1) categories within the Mental, Behavioral, and Neurodevelopmental Disorders (MBD) ICD-10-CM diagnosis chapter to identify behavioral health-related codes. This is updated from previous cycles, when the AHRQ's Beta Clinical Classifications Software (CCS) was still in development and the CCSR was not yet available, in consultation with subject matter experts at AHRQ. In previous reporting, CHIA used a combination of three sources: AHRQ Beta Clinical Classifications Software (CCS) for ICD-10-CM (v. 2017.1 and 2018.1): categories 650-670, Condition Categories (CCs) from the CMS-HCC risk adjustment model for ICD-10-CM (v. 2018 7.0) categories 54, 55, 57-59, 61, 63, and AHRQ Statistical Brief # 249, Appendix B (ICD-10-CM). A sensitivity analysis performed by CHIA of the behavioral health code lists using CCSR alone compared to using the previous code list input sources, with updates of the Beta CCS v. 2017.1 and 2018.1 to CCSR v. 2022.1, indicated that the calculated discharge volumes using these lists differed by less than 1%.

The CCSR is a diagnosis and procedure categorization scheme[1] based on ICD-10-CM. All codes classified as being behavioral health-related in CCSR were included. CHIA adapted this list in the following ways:

1. Consistent with the analytic approach of AHRQ, neurodevelopmental disorders (CCSR=MBD014) are not classified as mental health conditions in this analysis and all ICD-10-CM codes in these CCSR categories were excluded.

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[1] HCUP CCS Fact Sheet. Healthcare Cost and Utilization Project (HCUP). January 2012. Agency for Healthcare Research and Quality, Rockville, MD. Available from www.hcup-us.ahrq.gov/toolssoftware/ccs/ccsfactsheet.jsp

2. Although tobacco use represents an important public health and personal health issue, we excluded codes pertaining to tobacco or nicotine (ICD-10-CM: F17.-, O99.33-) for the purposes of describing the prevalence of comorbid behavioral health conditions among the adult hospitalized population in Massachusetts, except where the code represented intentional self-harm (T65.212-, T65.222-, T65.292). These were retained and classified as mental health-related under the sub-category of 'Intentional Self-harm, suicidal ideation, or suicide attempt. CHIA determined that after combining source lists, substance types were handled inconsistently for diagnoses pertaining to subsequent encounters, sequelae, and underdosing. To maintain consistency of reporting across all types of substance use disorders, and in consultation with clinicians, CHIA included diagnosis codes for subsequent encounters, sequelae, and underdosing events in cases where the equivalent diagnoses for other substance types were already present.

Development of Sub-Type Classifications for Behavioral Health Diagnoses

Mutually exclusive sub-categories of behavioral health-related codes were adapted from the Clinical Classifications Software Refined (CCSR). All codes were classified within their Mental, Behavioral, and Neurodevelopmental Disorders (MBD) diagnosis chapter. ICD-10-CM codes with multiple MBD categories were assigned to their inpatient default category.

CCSR categories were used to classify mental health conditions by ICD-10-CM codes into eight distinct sub-categories. The detailed CCSR categories used in the categorization are listed in Table 1. For these analyses, three adaptations to these categories were made to reflect the type of mental health condition over features of its clinical presentation or progression:

- Nine ICD-10-CM codes (F304, F2170, F3172, F3174, F3176, F3178, F325, F3340, F3342) categorized by CCSR as "Mental and substance use disorders in remission" (MBD026) and were recategorized as "Mood disorders".
- 26 ICD-10-CM codes related to intentional self-harm were categorized by CCSR as "Mental and substance use disorders; sequela" (MBD034). They were recategorized as "Self-Harm/Suicidal". These codes include: T400X2S, T401X2S, T402X2S, T403X2S, T40412S, T40422S, T40492S, T404X2S, T405X2S, T40602S, T40692S, T40712S, T40722S, T407X2S, T408X2S, T40902S, T40992S, T410X2S, T426X2S, T4272XS, T43602S, T43612S, T43622S, T43632S, T43642S, T43692S.
- Six ICD-10-CM codes, all related to poisoning by ecstasy, had two listed MBD categories (MBD021: Stimulant-related disorders, and MBD031: Hallucinogen-related disorders) but neither of these were their inpatient default category. In consultation with clinicians, these were categorized as "Stimulant-related disorders." These codes include: T43641A, T43641D, T43643A, T43643D, T43644A, T43644D.

Table 1. Sub-Types of Mental Health-Related Diagnoses

CCSR CODE(S)	DESCRIPTION
MBD006	Anxiety Disorders
MBD008	Impulse control disorders not elsewhere classified
MBD002, MBD003, MBD004	Mood disorders

MBD009	Personality disorders
MBD001	Schizophrenia and other psychotic disorders
MBD012, MBD027	Intentional self-harm, suicidal ideation, or suicide attempt
MBD007	Trauma- and stressor-related disorders
MBD010, MBD011, MBD013, MBD026, MBD034	Miscellaneous mental health

CCSR categories were also used to classify substance use disorders (SUD) by ICD-10-CM codes into eight distinct sub-categories. The diagnosis codes used in the categorization of SUD are listed in Table 2.

Table 2. Sub-Types of Substance-Related Diagnoses

ALCOHOL-RELATED DISORDERS

F10.-	Alcohol related disorders
G31.2	Degeneration of nervous system due to alcohol
G62.1	Alcoholic polyneuropathy
I42.6	Alcoholic cardiomyopathy
K29.2-	Alcoholic gastritis
K70.-	Alcoholic liver disease
O35.4-	Maternal care for (suspected) damage to fetus from alcohol
O99.31-	Alcohol use complicating pregnancy, childbirth, and the puerperium

CANNABIS-RELATED DISORDERS

F12.-	Cannabis related disorders
T40.711-	Poisoning by cannabis, accidental (unintentional)
T40.713-	Poisoning by cannabis, assault
T40.714-	Poisoning by cannabis, undetermined
T40.715-	Adverse effect of cannabis
T40.721-	Poisoning by synthetic cannabinoids, accidental (unintentional)
T40.723-	Poisoning by synthetic cannabinoids, assault
T40.724-	Poisoning by synthetic cannabinoids, undetermined
T40.725-	Adverse effect of synthetic cannabinoids
T40.7X1-	Poisoning by cannabis (derivatives), accidental (unintentional)
T40.7X3-	Poisoning by cannabis (derivatives), assault
T40.7X4-	Poisoning by cannabis (derivatives), undetermined
T40.7X5-	Adverse effect of cannabis (derivatives)

OPIOIDS-RELATED DISORDERS

F11.-	Opioid related disorders
T40.0X1-	Poisoning by opium, accidental (unintentional)
T40.0X3-	Poisoning by opium, assault
T40.0X4-	Poisoning by opium, undetermined
T40.0X5-	Adverse effect of opium
T40.1X1-	Poisoning by heroin, accidental (unintentional)

T40.1X3-	Poisoning by heroin, assault
T40.1X4-	Poisoning by heroin, undetermined
T40.2X1-	Poisoning by other opioids, accidental (unintentional)
T40.2X3-	Poisoning by other opioids, assault
T40.2X4-	Poisoning by other opioids, undetermined
T40.2X5-	Adverse effect of other opioids
T40.3X1-	Poisoning by methadone, accidental (unintentional)
T40.3X3-	Poisoning by methadone, assault
T40.3X4-	Poisoning by methadone, undetermined
T40.3X5-	Adverse effect of methadone
T40.411-	Poisoning by fentanyl or fentanyl analogs, accidental (unintentional)
T40.413-	Poisoning by fentanyl or fentanyl analogs, assault
T40.414-	Poisoning by fentanyl or fentanyl analogs, undetermined
T40.415-	Adverse effect of fentanyl or fentanyl analogs
T40.421-	Poisoning by tramadol, accidental (unintentional)
T40.423-	Poisoning by tramadol, assault
T40.424-	Poisoning by tramadol, undetermined
T40.425-	Adverse effect of tramadol
T40.491-	Poisoning by other synthetic narcotics, accidental (unintentional)
T40.493-	Poisoning by other synthetic narcotics, assault
T40.494-	Poisoning by other synthetic narcotics, undetermined
T40.495-	Adverse effect of other synthetic narcotics
T40.4X1-	Poisoning by other synthetic narcotics, accidental (unintentional)
T40.4X3-	Poisoning by other synthetic narcotics, assault
T40.4X4-	Poisoning by other synthetic narcotics, undetermined
T40.4X5-	Adverse effect of other synthetic narcotics
T40.601-	Poisoning by unspecified narcotics, accidental (unintentional)
T40.603-	Poisoning by unspecified narcotics, assault
T40.604-	Poisoning by unspecified narcotics, undetermined
T40.605-	Adverse effect of unspecified narcotics
T40.691-	Poisoning by other narcotics, accidental (unintentional)
T40.693-	Poisoning by other narcotics, assault
T40.694-	Poisoning by other narcotics, undetermined
T40.695-	Adverse effect of other narcotics
SEDATIVES-RELATED DISORDERS	
F13.-	Sedative, hypnotic, or anxiolytic related disorders
T42.6X1-	Poisoning by other antiepileptic and sedative-hypnotic drugs, accidental (unintentional)
T42.6X3-	Poisoning by other antiepileptic and sedative-hypnotic drugs, assault
T42.6X4-	Poisoning by other antiepileptic and sedative-hypnotic drugs, undetermined
T42.6X5-	Adverse effect of other antiepileptic and sedative-hypnotic drugs
T42.71X-	Poisoning by unspecified antiepileptic and sedative-hypnotic drugs, accidental (unintentional)
T42.73X-	Poisoning by unspecified antiepileptic and sedative-hypnotic drugs, assault
T42.74X-	Poisoning by unspecified antiepileptic and sedative-hypnotic drugs, undetermined

T42.75X-	Adverse effect of unspecified antiepileptic and sedative-hypnotic drugs

COCAINE-RELATED DISORDERS

F14.-	Cocaine related disorders
T40.5X1-	Poisoning by cocaine, accidental (unintentional)
T40.5X3-	Poisoning by cocaine, assault
T40.5X4-	Poisoning by cocaine, undetermined
T40.5X5-	Adverse effect of cocaine

OTHER STIMULANT-RELATED DISORDERS

F15.-	Other stimulant related disorders
T43.601-	Poisoning by unspecified psychostimulants, accidental (unintentional)
T43.603-	Poisoning by unspecified psychostimulants, assault
T43.604-	Poisoning by unspecified psychostimulants, undetermined
T43.605-	Adverse effect of unspecified psychostimulants
T43.611-	Poisoning by caffeine, accidental (unintentional)
T43.613-	Poisoning by caffeine, assault
T43.614-	Poisoning by caffeine, undetermined
T43.615-	Adverse effect of caffeine
T43.621-	Poisoning by amphetamines, accidental (unintentional)
T43.623-	Poisoning by amphetamines, assault
T43.624-	Poisoning by amphetamines, undetermined
T43.625-	Adverse effect of amphetamines
T43.631-	Poisoning by methylphenidate, accidental (unintentional)
T43.633-	Poisoning by methylphenidate, assault
T43.634-	Poisoning by methylphenidate, undetermined
T43.635-	Adverse effect of methylphenidate
T43.641-	Poisoning by ecstasy, accidental (unintentional)
T43.643-	Poisoning by ecstasy, assault
T43.644-	Poisoning by ecstasy, undetermined
T43.691-	Poisoning by other psychostimulants, accidental (unintentional)
T43.693-	Poisoning by other psychostimulants, assault
T43.694-	Poisoning by other psychostimulants, undetermined
T43.695-	Adverse effect of other psychostimulants

HALLUCINOGEN-RELATED DISORDERS

F16.-	Hallucinogen related disorders
R78.3	Finding of hallucinogen in blood
T40.8X1-	Poisoning by lysergide [LSD], accidental (unintentional)
T40.8X3-	Poisoning by lysergide [LSD], assault
T40.8X4-	Poisoning by lysergide [LSD], undetermined
T40.901-	Poisoning by unspecified psychodysleptics [hallucinogens], accidental (unintentional)
T40.903-	Poisoning by unspecified psychodysleptics [hallucinogens], assault
T40.904-	Poisoning by unspecified psychodysleptics [hallucinogens], undetermined
T40.905-	Adverse effect of unspecified psychodysleptics [hallucinogens]
T40.991-	Poisoning by other psychodysleptics [hallucinogens], accidental (unintentional)

T40.993-	Poisoning by other psychodysleptics [hallucinogens], assault
T40.994-	Poisoning by other psychodysleptics [hallucinogens], undetermined
T40.995-	Adverse effect of other psychodysleptics [hallucinogens]
MISCELLANEOUS SUBSTANCE-RELATED DISORDERS	
F18.-	Inhalant related disorders
F19.-	Other psychoactive substance related disorders
F55.-	Abuse of non-psychoactive substances
O35.5-	Maternal care for (suspected) damage to fetus by drugs
O99.32-	Drug use complicating pregnancy, childbirth, and the puerperium
T41.0X1-	Poisoning by inhaled anesthetics, accidental (unintentional)
T41.0X3-	Poisoning by inhaled anesthetics, assault
T41.0X4-	Poisoning by inhaled anesthetics, undetermined
T41.0X5-	Adverse effect of inhaled anesthetics

Development of Visit-Level and Patient-Level Behavioral Health Indicators

Visit-level behavioral health indicators for each of the eight categories of mental health conditions and eight categories of substance use disorder conditions were calculated from ICD-10-CM diagnoses on hospital discharge records. Each visit was assigned an indicator for each behavioral health category using secondary diagnoses on the eligible discharge within the study period, as well as any available diagnosis information for a patient within the preceding 12 months.

Patient-level behavioral health indicators were aggregated from a patient's visit-level behavioral health indicators. If a behavioral health indicator appeared on any of a patient's visits within the study period (as described above) that patient was flagged as having that behavioral health indicator.

The patient-level indicators were used to group patients into four mutually exclusive behavioral health groups:

- Mental health conditions (MH) only
- Substance use disorders (SUD) only
- Both MH and SUD or co-occurring behavioral health conditions (CO)
- No mention of MH or SUD (None)

COVID-19

A discharge was classified as being associated with COVID-19 if it had a primary or secondary ICD-10-CM diagnosis indicating confirmed (U07.1) or suspected COVID-19 (U07.2) for discharges from April to June 2020.

Readmission Methodology

For this report, CHIA amended the readmission methodology from CHIA's annual readmission report published in March 2022, *Hospital-wide Adult All-Payer Readmissions in Massachusetts: 2011-2020* to include psychiatric admissions. Admissions for obstetric care, cancer treatment, and rehabilitation care were similarly excluded for the purposes of calculating readmissions-related measures. For full specification on the readmission methodology, please see the section on Readmissions Methodology in the technical appendix to the annual readmission report.