

Massachusetts Acute Care Hospital Inpatient Discharge Data

FFY 2016-2019

December 2020

Technical Appendix



Massachusetts Acute Care Hospital Inpatient Discharge Data: FFY 2016 to 2019

(December 2020)

TECHNICAL APPENDIX

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Introduction

This technical appendix provides details on the methodology used for the report, [Massachusetts Acute Care Hospital Inpatient Discharge Data: FFY 2016 to 2019](#), released by the Massachusetts Center for Health Information and Analysis (CHIA) in December 2020. This appendix describes the main characteristics of Massachusetts acute care hospitals, as well as details on several of the calculated measures, data categorizations, and groupings used in the report.

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 quarterly data has been processed and verified, CHIA produces and makes available annual files. For general information about CHIA's Case Mix Data, including an overview of the Hospital Inpatient Discharge Database (HIDD) and other Case Mix databases, please see the [Overview of the Massachusetts Acute Hospital Case Mix Databases](#) and additional information about the Case Mix data on [CHIA's website](#).

Hospital Characteristics

Hospital Cohort

Each of the 61 acute care hospitals in Massachusetts is assigned to one of five mutually exclusive groups of similar hospitals: Academic Medical Centers (AMCs), teaching hospitals, community-High Public Payer (HPP) hospitals, other community hospitals, and specialty hospitals. Hospital characteristics are assessed at the end of the state fiscal year.

- AMCs are characterized by extensive research and teaching programs, comprehensive resources for tertiary and quaternary care, being principal teaching hospitals for their respective medical schools, and being full service hospitals with case mix intensity greater than 5% above the statewide average.
- Teaching hospitals are hospitals that report at least 25 full-time equivalent medical school residents per one hundred inpatient beds in accordance with the Medicare Payment Advisory Commission (MedPAC) and are not classified as AMCs.
- Community-High Public Payer (HPP) hospitals are hospitals that do not meet the MedPAC definition to be classified as teaching hospitals and have 63% or greater of Gross Patient Service Revenue (GPSR) attributable to Medicare, MassHealth, and other government payers, including the Health Safety Net.
- Community hospitals are hospitals that do not meet the MedPAC definition to be classified as teaching hospitals and have a public payer mix of less than 63%.
- Specialty hospitals are hospitals that serve unique patient populations or provide unique sets of services.

High Public Payer Hospitals

A hospital is classified as High Public Payer (HPP) if 63% or greater of its GPSR come from public or government payers such as Medicare, MassHealth or other government payers, as determined by the Executive Office of Health and Human Services (EOHHS) based on the hospital's Massachusetts Hospital Cost Report. Not all hospitals defined as HPP are Community-HPP; some non-Community hospitals are classified as HPP, but this distinction is not made in the cohort classification.

Calculated Measures

Age

Patient age in years was calculated from the date of the inpatient admission and the patient's date of birth. Discharges were suppressed from the report if the date of birth was missing or invalid, or if the calculated age exceeded 115 years. The number of discharges missing age data was 8 in FFY 2016, 18 in FFY 2017, 16 in FFY 2018, and 17 in FFY 2019.

Discharges per 100,000 Persons

Discharge rates per 100,000 persons were calculated for each of the 15 regions in Massachusetts by dividing the number of discharges for each Massachusetts region in 2019 by the total number of people, based on population estimates from 2019 American Community Survey 5-Year Population Estimates, then multiplying by 100,000 people.¹ The ACS 5-Year estimates are provided at the ZIP Code Tabulation Area (ZCTA), and then aggregated to the Massachusetts region of residence.

Notes about the discharge per 100,000 measure used in the report:

- The calculated discharge rates for 2019 excluded 7,566 discharges with out-of-state, missing, or invalid address information. Because some of these discharges may have been for patients who were Massachusetts residents, the calculated discharge rates may slightly underestimate the true discharge rates.
- The discharge rate reflects only discharges from Massachusetts acute care hospitals. It does not include discharges for Massachusetts residents in out-of-state hospitals.
- The number of discharges were aggregated using the ZIP code provided on the discharge, whereas the 2019 5-Year ACS estimates were aggregated using the ZCTA. In most instances the ZCTA code is the same as the ZIP Code for an area, but these may differ in rare instances, particularly in sparsely populated areas.

Length of Stay and Inpatient Days

Length of stay (LOS) is calculated by subtracting the admission date from the discharge date. Stays for which the admission and discharge dates were the same would be coded as having a length of stay of 0 days. Average length of stay (ALOS) is an aggregate measure of the mean LOS within a certain category or group. Inpatient days is an aggregate measure of the sum of the LOS, or the days of care associated with a discharge within a category or group.

No outliers were removed when calculating the length of stay. The number of discharges with missing length of stay due to missing date of admission or discharge was 11 in FFY 2016, 17 in FFY 2017, 5 in FFY 2018, and 8 in FFY 2019.

Intensive Care Use and Days

A discharge was characterized as having any intensive care use if the discharge had any non-zero charge for revenue codes associated with intensive care use. This includes stays in the Intensive Care Unit (ICU), Coronary Care Unit (CCU), Neonatal Intensive Care Unit (NICU), Pediatric Intensive Care Unit (PICU), and other intensive care use.

Revenue codes associated with intensive care use are as follows:

Table 1. Revenue Codes Associated with ICU

REVENUE CODE	DESCRIPTION
173	Nursery – Newborn Level III
174	Nursery – Newborn Level IV
200	Intensive Care Unit – General
201	Intensive Care Unit – Surgical
202	Intensive Care Unit – Medical
203	Intensive Care Unit – Pediatric
204	Intensive Care Unit – Psychiatric
206	Intensive Care Unit – Intermediate ICU
207	Intensive Care Unit – Burn Care
208	Intensive Care Unit – Trauma
209	Intensive Care Unit – Other
210	Coronary Care Unit – General
211	Coronary Care Unit – Myocardial Infarction
212	Coronary Care Unit – Pulmonary Care
213	Coronary Care Unit – Heart Transplant
214	Coronary Care Unit – Intermediate CCU
219	Coronary Care Unit – Other

The number of days of care associated with intensive care was calculated by summing the units, or days of care, associated with revenue codes corresponding to intensive care use. The number of units were summed across all relevant intensive care codes. If the sum of units exceeded the length of stay, the total intensive care units was set to the length of stay. One limitation to this analysis is that there may be potential over-counting of total units if a patient utilized more than one type of intensive care and there was overlap of those types of care in a single day. Therefore,

the number of intensive care days may be an overestimate of the true number of days of care associated with intensive care use.

Data Categorizations and Groupings

Race/Ethnicity

Patient race and ethnicity were classified using a hierarchical grouping based on information entered by the facility. First, any patients of Hispanic/Latino/Spanish culture or origin regardless of race were classified as Hispanic of Any Race. Next, patients with valid primary race variables and were not multiple races were classified as non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, non-Hispanic American Indian/Alaska Native, non-Hispanic Native Hawaiian/Other Pacific Islander. Patients classified as Other Race or who had more than one race indicated were classified as non-Hispanic Other or Multiple Races. Due to small population sizes, non-Hispanic American Indian/Alaska Native and non-Hispanic Native Hawaiian/Other Pacific Islander are reported together with Other and Multiple Races in the report, but these groups are reported separately in the databook. Discharges that could not be classified into any of the above groups due to missing or invalid race/ethnicity information are reported as Missing.

Patient Region of Residence

Patient region of residence was classified using ZIP code, city/town, and state information from the permanent address of the patient as entered by the facility. ZIP codes were grouped into Massachusetts regions, defined by the Health Policy Commission (HPC). Discharges were assigned to regions based on ZIP code, if available, or by city/town and state, if a valid ZIP code was not present. Discharges with valid two-character permanent state identification codes other than Massachusetts were classified as Other United States. Discharges with foreign, invalid or missing permanent address information were classified as Other/Unknown. Discharges for Massachusetts residents in out-of-state hospitals are not included.

Payer Type

Payer type is the expected primary payer on the discharge as reported by the hospital. For this analysis, payer type categories were derived from payer source codes. Payer type categories were assigned to one of as follows:

- Medicare: Fee-for-service Medicare or managed care Medicare
- Medicaid: MassHealth, including Medicaid managed care, or Commonwealth Care
- Commercial: Blue Cross and Blue Cross Managed Care, Commercial Insurance and Commercial Managed Care, HMO, PPO/Other managed care plans not elsewhere classified, point-of-service plans, exclusive provider organizations, and other non-managed care plans
- Other: Worker's Compensation, Other Government Payment, Auto Insurance, and Dental Plans
- Self-Pay: Self-Pay, Free Care and Health Safety Net

The number of discharges with missing expected primary payer type was 31 in FFY 2016, 19 in FFY 2017, 6 in FFY 2018, and 25 in FFY 2019.

Discharge Setting

For this analysis, discharge setting information reported by the facility was classified into one of six mutually exclusive categories:

- **Home:** Home or self-care, rest home, or shelter
- **Skilled Nursing Facility (SNF):** Skilled nursing facilities
- **Home with Home Health Agency Care (HHA):** Home under care of organized home health service organization or home under care of a home IV drug therapy provider
- **Hospice:** Home hospice care or hospice medical facility
- **Rehabilitation:** Intermediate care facility, inpatient rehabilitation facility, rehabilitation hospital or Medicare-certified long-term care hospital
- **Other:** Critical access hospital, psychiatric hospital, federal healthcare facility, another short-term general hospital for inpatient care, another type of institution not defined elsewhere, or other discharge setting

The number of discharges with missing discharge setting was 217 in FFY 2016, 23 in FFY 2017, 29 in FFY 2018, and 56 in FFY 2019.

All Patient Refined – Diagnosis Related Groups (APR-DRGs) and Severity of Illness (SOI)²

For this report, CHIA performed data grouping using the 3M™ APR-DRG Grouper. The All Patient Refined DRGs (3M APR-DRG) classifies patients into diagnostic groups based on severity of illness and risk of mortality to provide an accurate means of adjusting for hospital case mix differences for evaluating inpatient care across all hospitals. CHIA used version 30.0 of the 3M APR-DRGs for this report.

- The Diagnosis Related Group (DRG) places a patient into a clinically relevant medical category.
- The Major Diagnostic Categories (MDC) is a classification system that parses all principal diagnoses into one of 25 categories primarily for use with DRGs and reimbursement activity. Each category relates to a physical system, disease, or contributing health factor.
- Severity of Illness (SOI) relates to the extent of physiologic decompensation or systematic loss of organ function experienced by the patient. In the APR-DRG system, a patient is assigned four distinct descriptors for SOI calculated using the patient's provided secondary diagnoses as well as the patient's age and non-operating room procedures (1="Minor", 2="Moderate", 3="Major" and 4="Extreme").³

Clinical Classifications Software Refined (CCSR) for ICD-10-CM Diagnoses⁴

The CCSR for ICD-10-CM diagnoses was developed by Agency for Healthcare Research and Quality (AHRQ) and aggregates over 70,000 ICD-10-CM diagnosis codes into over 530 clinically meaningful categories, organized across 21 body systems. For this analysis, discharges are classified into mutual exclusive categories based on the listed primary ICD-10-CM diagnosis code. This report uses CCSR v. 2021.1.

Clinical Classifications Software (CCS) for ICD-10-PCS Procedures⁵

The CCS for ICD-10-PCS procedures was developed by AHRQ and aggregates over 80,000 ICD-10-PCS procedure codes into over 320 clinically meaningful categories, organized across 31 clinical domains. For this analysis, discharges are classified into mutual exclusive categories based on the listed principal ICD-10-PCS procedure code. This report uses CCS v. 2020.1.

Age Group and Obstetric Status

Discharges were grouped into one of three mutually exclusive groups: age 0-17, age 18 or older with an obstetric primary diagnosis, and age 18 or older without an obstetric primary diagnosis. The number of discharges missing age data was 8 in FFY 2016, 18 in FFY 2017, 16 in FFY 2018 and 17 in FFY 2019.

Discharges were classified into one of these groups based on age at the time of the admission (0-17 or 18+) and whether the discharge was identified as an obstetric discharge using the Clinical Classifications Software Refined (CCSR)⁶ for the principal ICD-10-CM diagnosis. [CCSR categories used to identify obstetric care](#) were defined as follows:

Table 2. CCSR Categories Associated with Obstetric Care

CCSR CATEGORY	DESCRIPTION
FAC013	Contraceptive and procreative management
PRG001	Antenatal screening
PRG002	Gestational weeks
PRG003	Spontaneous abortion and complications of spontaneous abortion
PRG004	Induced abortion and complications of termination of pregnancy
PRG005	Ectopic pregnancy and complications of ectopic pregnancy
PRG006	Molar pregnancy and other abnormal products of conception
PRG007	Complications following ectopic and/or molar pregnancy
PRG008	Supervision of high-risk pregnancy
PRG009	Early, first or unspecified trimester hemorrhage
PRG010	Hemorrhage after first trimester
PRG011	Early or threatened labor
PRG012	Multiple gestation
PRG013	Maternal care related to fetal conditions
PRG014	Polyhydramnios and other problems of amniotic cavity
PRG015	Obstetric history affecting care in pregnancy
PRG016	Previous C-section
PRG017	Maternal care for abnormality of pelvic organs
PRG018	Maternal care related to disorders of the placenta and placental implantation
PRG019	Diabetes or abnormal glucose tolerance complicating pregnancy; childbirth; or the puerperium
PRG020	Hypertension and hypertensive-related conditions complicating pregnancy; childbirth; and the puerperium
PRG021	Maternal intrauterine infection
PRG022	Prolonged pregnancy
PRG023	Complications specified during childbirth

CCSR CATEGORY	DESCRIPTION
PRG024	Malposition, disproportion or other labor complications
PRG025	Anesthesia complications during pregnancy
PRG026	OB-related trauma to perineum and vulva
PRG027	Complications specified during the puerperium
PRG028	Other specified complications in pregnancy
PRG029	Uncomplicated pregnancy, delivery or puerperium
PRG030	Maternal outcome of delivery

Hospitalization Type⁷

Each discharge is assigned to a mutually exclusive hierarchal hospitalization type: maternal/neonatal, mental health/substance use, injury, surgical and medical. The hospitalization type methodology was developed by AHRQ.⁸

First, maternal/neonatal and mental health/substance use discharges were classified based on the MDC associated with the discharge.

Table 3: MDC associated with Maternal/Neonatal or Mental Health/Substance Use

CATEGORY	MDC	DESCRIPTION
Maternal/Neonatal	14	Pregnancy, Childbirth and Puerperium
	15	Newborn and Other Neonates (Perinatal Period)
Mental Health/Substance Use	19	Mental Diseases and Disorders
	20	Alcohol/Drug Use or Induced Mental Disorders

Next, injury discharges were identified based on CCSR⁹ categories for the principal ICD-10-CM diagnoses.

Table 4: CCSR associated with Injury

CCSR CATEGORY	DESCRIPTION
INJ001	Fracture of head and neck, initial encounter
INJ002	Fracture of the spine and back, initial encounter
INJ003	Fracture of torso, initial encounter
INJ004	Fracture of the upper limb, initial encounter
INJ005	Fracture of the lower limb (except hip), initial encounter
INJ006	Fracture of the neck of the femur (hip), initial encounter
INJ007	Dislocations, initial encounter
INJ008	Traumatic brain injury (TBI); concussion, initial encounter
INJ009	Spinal cord injury (SCI), initial encounter
INJ010	Internal organ injury, initial encounter
INJ011	Open wounds of head and neck, initial encounter
INJ012	Open wounds to limbs, initial encounter
INJ013	Open wounds of trunk, initial encounter
INJ014	Amputation of a limb, initial encounter
INJ015	Amputation of other body parts, initial encounter

CCSR CATEGORY	DESCRIPTION
INJ016	Injury to blood vessels, initial encounter
INJ017	Superficial injury; contusion, initial encounter
INJ018	Crushing injury, initial encounter
INJ019	Burn and corrosion, initial encounter
INJ020	Effect of foreign body entering opening, initial encounter
INJ021	Effect of other external causes, initial encounter
INJ022	Poisoning by drugs, initial encounter
INJ023	Toxic effects, initial encounter
INJ024	Sprains and strains, initial encounter
INJ025	Injury to nerves, muscles and tendons, initial encounter
INJ026	Other specified injury
INJ027	Other unspecified injury
INJ032	Maltreatment/abuse

Next, surgical discharges were identified using APR-DRGs associated with surgical or operating room procedures. All other discharges with a valid non-surgical APR-DRG were classified as medical discharges. If the APR-DRG was not groupable, the discharge was assumed to be a medical discharge.¹⁰

¹ U.S. Census Bureau. ACS Demographic and Housing Estimates. 2016-2018 American Community Survey 5-Year Estimates (Massachusetts), Explore Census Data. Available from data.census.gov.

² 3M. 3M All Patient Refined Diagnosis Related Groups (3M APR DRG). Available from https://www.3m.com/3M/en_US/health-information-systems-us/drive-value-based-care/patient-classification-methodologies/apr-drgs/.

³ See Note 2.

⁴ Clinical Classifications Software Refined (CCSR). November 2020. Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD. Available from www.hcup-us.ahrq.gov/toolssoftware/ccsr/ccs_refined.jsp.

⁵ Clinical Classifications Software (CCS) for ICD-10-PCS (beta version). November 2019. Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD. Available from www.hcup-us.ahrq.gov/toolssoftware/ccs10/ccs10.jsp.

⁶ See Note 4.

⁷ HCUP Central Distributor SID Description of Data Elements - All States. August 2008. Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD. Available from www.hcup-us.ahrq.gov/db/vars/siddistnote.jsp?var=i10_serviceline.

⁸ See Note 7.

⁹ See Note 4.

¹⁰ 3M. 2014. All Patient Refined Diagnosis Related Groups (APR-DRGs), Version 32.0: Methodology Overview. Available from <https://medicaid.ohio.gov/Provider/ProviderTypes/HospitalProviderInformation/HospitalPaymentPolicy#1786181-inpatient-relative-weights>



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