EMERGENCY DEPARTMENT VISITS AFTER INPATIENT DISCHARGE IN MASSACHUSETTS

SYF 2017

TECHNICAL APPENDIX

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CHIA.

Emergency Department Visits after Inpatient Discharge in Massachusetts: SFY 2017 (June 2019)

TECHNICAL APPENDIX

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Introduction

This technical appendix describes the methods used for the Center for Health Information and Analysis (CHIA) report, *Emergency Department Visits after Inpatient Discharge in Massachusetts: SFY 2017,* released in June 2019. This Appendix comprises four sections: a description of the revisits data sources and data processing to create the analytic datasets, a description of the primary measures, a table listing the characteristics of hospitals reported on, and a section with details on other data categorizations used in the report.[i]

Data Source and Data Processing

The data source for the revisit analyses is CHIA's Massachusetts Acute Care Hospital Case Mix Database, which is comprised of three components - Hospital Inpatient Discharge Database (HIDD), Emergency Department Database (EDD), and Outpatient Observation Database (OOD) - and is collected from non-federal, acute care hospitals in Massachusetts. The Case Mix discharge data are stay-level files including patient socio-demographics, diagnostic information, treatment and service information, and hospital charges.[ii] The data is submitted quarterly by all Massachusetts acute care hospitals, and undergoes a cleaning and verification process 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 based on federal fiscal years (FFY, that run from 10/1 to 9/30). Data from federal fiscal years 2016 and 2017 are used for this revisit analysis.

Two source datasets are created as a first step in preparing the analytic datasets: 1) an index dataset of eligible inpatient discharges; and 2) a follow-up dataset of emergency department visits. Both datasets are limited to records pertaining to all adults aged 18 years or older. The main analytic dataset is created by merging the index dataset and follow-up dataset on unique patient ID (encrypted patient social security number) for emergency department (ED) admission dates within 90 days of the inpatient discharge date.

Index Dataset of Eligible Inpatient Discharges

The index dataset of eligible inpatient discharges started with the analytic cohort from CHIA's readmission analyses for state fiscal year 2017 (July 1, 2016 – June 30, 2017), which adopted the Yale/CMS Hospital-wide All-Cause Unplanned Readmission methodology.[iii] Following CHIA's readmissions analysis, the index dataset for this revisits analysis excluded patients under age 18, those who died, those discharged against medical advice, those with missing or bad social security numbers, those treated in pediatric or cancer hospitals, and those with medical conditions of obstetric care, cancer treatment, or rehabilitation services. CHIA expanded the cohort to include inpatient discharges with a primary psychiatric diagnosis. The total number of eligible inpatient discharges in SFY 2017 was 528,948.

Follow-up Dataset of Emergency Department Visits

The follow-up dataset of ED visits was constructed from all three datasets in the Massachusetts Case-Mix Database: HIDD, EDD, and OOD. Using all three datasets, we attempted to capture all the emergency department visits, whether the patient visited the ED and was discharged (EDD), visited the ED and was subsequently admitted to the hospital (HIDD), or visited the ED and was subsequently placed in an observation stay (OOD).

The Case Mix data for HIDD includes a flag variable to indicate whether an inpatient admission was preceded immediately by an emergency department visit. Similarly, the OOD data has an emergency department flag variable to indicate that an observation stay was preceded immediately by an emergency department visit. De-duplicating logic was used to avoid counting a given ED visit more than once if it appeared in more than one Case Mix dataset.

However, in reviewing this data, we found that HIDD and OOD records often had other variables (admission type, admission source, or revenue codes) on the record that indicated emergency department use when the ED flag was **not** set. For example, a variable on admission type could be set to "emergency", the admission source could have been set to the emergency room, or revenue codes for emergency department use. To better identify the universe of emergency department use, we used both the ED flag and other indicators of ED use on a record, as described below.

1) Adult (age 18+) records from the HIDD with an indication of emergency department use defined as any of the following present on the record:

    a. ED flag variable indicates patient was admitted from the facility's ED (value is either 1=" Not admitted from the ED, but ED visit(s) reflected in this record" or 2=" Admitted from the ED");
    b. Admission type variable equals "emergency";
    c. Admission source variables indicate that admission source is either: 7 - Outside Hospital Emergency Room Transfer; R - Within Hospital Emergency Room Transfer; or M – Self-referred;
    d. Revenue codes equal to 045x (x is wildcard from 0 to 9) or 0981 (emergency department codes).

2) Adult (age 18+) records from the OOD with an indication of emergency department defined as any of the following present on the record:

    a. ED flag indicates patient was placed in outpatient observation stay from the facility's ED (value is either 1="Not admitted from the ED, but ED visit(s) reflected in this record" or 2= "Admitted from the ED");
    b. Admission type variable equals "emergency";
    c. Admission source variables indicate that admission source is either: 7 - Outside Hospital Emergency Room Transfer; R - Within Hospital Emergency Room Transfer; or M – Self-referred;
    d. CPT code is between 99281 and 99285 (emergency department codes).

The time period selected for the emergency department visits was admission dates from July 1, 2016 to September 28, 2017 (90 days after June 30, 2017). Records with missing or invalid social security numbers were excluded. The final follow-up dataset for SFY 2017 contained a total of 4,119,018 ED visits with:

- 3,037,520 from EDD,
- 813,160 from HIDD, and
- 268,338 from OOD.

Identifying Revisits

The index dataset of eligible inpatient discharges was merged with the follow-up dataset of emergency department visits by a patient's encrypted social security number to identify potential revisits. ED visits having an admission date within 30 days of the inpatient discharge date were identified as revisits.

Figure 1 depicts the different scenarios when linking inpatient discharges to ED visits. The 30-day window is represented in blue. Time goes from left to right. Rectangles show the various types of acute care hospital admissions.

- Group A are ED visits that were discharged. These records come from the EDD data file.
- Group B are ED visits with an immediate subsequent inpatient admission and are represented using two boxes next to each other. These records are contained in the HIDD data file.
- Group C are ED visits with an immediate subsequent observation stay admission and are represented by two boxes next to each other. These records come from the OOD data file.

When two eligible inpatient discharges and an ED visit occur within a 30 day time frame, the ED visit is counted against the second inpatient discharge (see de-duplicating logic depiction). However, if the second inpatient discharge is not-eligible (for example, it is for rehabilitation services), the ED visit is linked to the first inpatient discharge.

**Figure 1: Framework for Identifying Revisits:
Inpatient Discharges Followed by ED Visits within 30 Days**
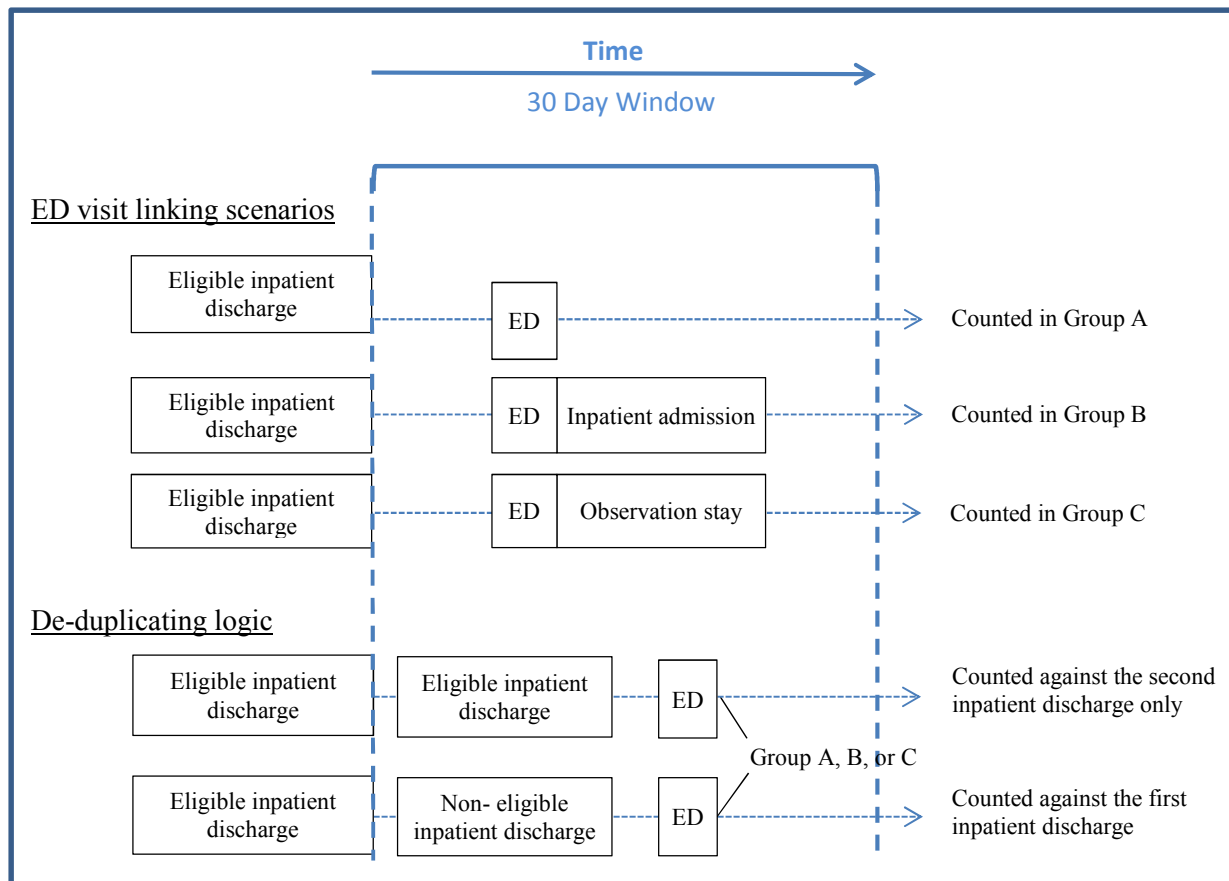
Creating Analytic Datasets

In summary, two main analytic files were created for this revisit analyses. The first analytic file created merges the index dataset of eligible inpatient discharges with the follow-up ED visit information. Each record represents an index discharge. Variables created include the number of days to first revisit and the number of revisits.

A second analytic file was created that sums to the total number of revisits. Each record in this analytic file represents a visit to the ED that followed an inpatient discharge. That is, there could be one inpatient discharge that is associated with multiple revisits. Variables created in this analytic file include the number of days to the ED visit, the ED visit payer, the ED disposition, and the facility identifier for the ED visit.

Analysis

The 30-day revisit rate measure is defined as the proportion of eligible inpatient discharges that were followed by a hospital emergency department (ED) visit within 30 days of discharge in Massachusetts acute care hospitals. In the report, the 30-day revisit rate is examined by patient characteristics such as age, payer type, and patient region; hospitalization characteristics such as the discharge diagnosis and discharge setting; and hospital characteristics such as the hospital system and cohort.

For some inpatient discharges, a person may return to the emergency department more than once. Both the number of first revisits as well as the total number of revisits are presented. In addition, the following statewide statistics are presented in the report using the total number of 30-day revisits as the denominator:

- the percentage of revisits that went to a different facility;
- the percentage of revisits that resulted in a subsequent inpatient admission, observation, and discharge;
- the percentage of revisits funded by Medicare, Medicaid, and commercial insurance.

The 90-day revisit rate was also calculated and is reported at the statewide level.

Hospital Characteristics

Hospital characteristics are assessed at the end of the reporting period, state fiscal year 2017.

Table 1: Hospital Characteristics

HOSPITAL	COHORT	AFFILIATION	REGION
Anna Jaques Hospital	Community Hospital	Not Affiliated	Upper North Shore
Athol Hospital	Community - High Public Payer Hospital	Heywood Healthcare	Central Massachusetts
Baystate Franklin Medical Center	Community - High Public Payer Hospital	Baystate Health System	Pioneer Valley/Franklin
Baystate Medical Center	Teaching Hospital	Baystate Health System	Pioneer Valley/Franklin
Baystate Noble Hospital	Community - High Public Payer Hospital	Baystate Health System	Pioneer Valley/Franklin
Baystate Wing Hospital	Community - High Public Payer Hospital	Baystate Health System	Pioneer Valley/Franklin
Baystate Wing Hospital	Community - High Public Payer Hospital	Baystate Health System	Pioneer Valley/Franklin
Berkshire Medical Center	Community - High Public Payer Hospital	Berkshire Health Systems	Berkshires
Beth Israel Deaconess Hospital - Milton	Community Hospital	CareGroup	Metro Boston
Beth Israel Deaconess Hospital - Needham	Community Hospital	CareGroup	Metro Boston
Beth Israel Deaconess Hospital - Plymouth	Community - High Public Payer Hospital	CareGroup	South Shore
Beth Israel Deaconess Medical Center	Academic Medical Center	CareGroup	Metro Boston
Boston Medical Center	Academic Medical Center	Not Affiliated	Metro Boston
Brigham and Women's Faulkner Hospital	Community Hospital	Partners Healthcare System	Metro Boston
Brigham and Women's Hospital	Academic Medical Center	Partners Healthcare System	Metro Boston
Cambridge Health Alliance	Teaching Hospital	Not Affiliated	Metro Boston
Cape Cod Hospital	Community - High Public Payer Hospital	Cape Cod Healthcare	Cape and Islands
Clinton Hospital	Community - High Public Payer Hospital	UMass Memorial Health Care	Central Massachusetts
Cooley Dickinson Hospital	Community Hospital	Partners Healthcare System	Pioneer Valley/Franklin
Dana-Farber Cancer Institute	Specialty Hospital	Not Affiliated	Metro Boston
Emerson Hospital	Community Hospital	Not Affiliated	West Merrimack/ Middlesex

HOSPITAL	COHORT	AFFILIATION	REGION
Fairview Hospital	Community - High Public Payer Hospital	Berkshire Health Systems	Berkshires
Falmouth Hospital	Community - High Public Payer Hospital	Cape Cod Healthcare	Cape and Islands
Harrington Memorial Hospital	Community - High Public Payer Hospital	Not Affiliated	Central Massachusetts
HealthAlliance Hospital	Community - High Public Payer Hospital	UMass Memorial Health Care	Central Massachusetts
Heywood Hospital	Community Hospital	Heywood Healthcare	Central Massachusetts
Holyoke Medical Center	Community - High Public Payer Hospital	Not Affiliated	Pioneer Valley/Franklin
Lahey Hospital & Medical Center	Teaching Hospital	Lahey Health System	West Merrimack/ Middlesex
Lawrence General Hospital	Community - High Public Payer Hospital	Not Affiliated	East Merrimack
Lowell General Hospital	Community - High Public Payer Hospital	Wellforce	West Merrimack/ Middlesex
Marlborough Hospital	Community - High Public Payer Hospital	UMass Memorial Health Care	Metro West
Martha's Vineyard Hospital	Community Hospital	Partners Healthcare System	Cape and Islands
Massachusetts Eye and Ear Infirmary	Specialty Hospital	Not Affiliated	Metro Boston
Massachusetts General Hospital	Academic Medical Center	Partners Healthcare System	Metro Boston
MelroseWakefield Healthcare	Community - High Public Payer Hospital	Wellforce	Metro Boston
Mercy Medical Center	Community - High Public Payer Hospital	Not Affiliated	Pioneer Valley/Franklin
MetroWest Medical Center	Community - High Public Payer Hospital	Tenet Healthcare	Metro West
Milford Regional Medical Center	Community Hospital	Not Affiliated	Metro West
Morton Hospital	Community - High Public Payer Hospital	Steward Health Care System	Metro South
Mount Auburn Hospital	Teaching Hospital	CareGroup	Metro Boston
Nantucket Cottage Hospital	Community Hospital	Partners Healthcare System	Cape and Islands
Nashoba Valley Medical Center	Community - High Public Payer Hospital	Steward Health Care System	West Merrimack/ Middlesex
New England Baptist Hospital	Specialty Hospital	CareGroup	Metro Boston
Newton-Wellesley Hospital	Community Hospital	Partners Healthcare System	Metro Boston
North Shore Medical Center	Community - High Public Payer Hospital	Partners Healthcare System	Lower North Shore

HOSPITAL	COHORT	AFFILIATION	REGION
Northeast Hospital	Community - High Public Payer Hospital	Lahey Health System	Lower North Shore
Saint Vincent Hospital	Teaching Hospital	Tenet Healthcare	Central Massachusetts
Signature Healthcare Brockton Hospital	Community - High Public Payer Hospital	Not Affiliated	Metro South
South Shore Hospital	Community Hospital	Not Affiliated	South Shore
Southcoast Hospitals Group	Community - High Public Payer Hospital	Not Affiliated	New Bedford
Steward Carney Hospital	Teaching Hospital	Steward Health Care System	Metro Boston
Steward Good Samaritan Medical Center	Community - High Public Payer Hospital	Steward Health Care System	Metro South
Steward Holy Family Hospital	Community - High Public Payer Hospital	Steward Health Care System	East Merrimack
Steward Norwood Hospital	Community Hospital	Steward Health Care System	Norwood/ Attleboro
Steward Saint Anne's Hospital	Community - High Public Payer Hospital	Steward Health Care System	Fall River
Steward St. Elizabeth's Medical Center	Teaching Hospital	Steward Health Care System	Metro Boston
Sturdy Memorial Hospital	Community - High Public Payer Hospital	Not Affiliated	Norwood/ Attleboro
Tufts Medical Center	Academic Medical Center	Wellforce	Metro Boston
UMass Memorial Medical Center	Academic Medical Center	UMass Memorial Health Care	Central Massachusetts
Winchester Hospital	Community Hospital	Lahey Health System	West Merrimack/ Middlesex

Data Categorization and Grouping

All Payer Refined – Diagnosis Related Groups (APR-DRGs)

The analysis on the most common diagnoses is based on the inpatient discharge for those with a visit to the ED within 30 days. The 3M APR-DRG grouper was used to analyze these inpatient discharges by top discharge diagnoses for this report. The All Patient Refined – Diagnosis Related Groups (APR-DRGs, 3M) are a severity and risk adjusted classification system that provides a more effective means of adjusting for patient differences. The 3M APR-DRGs expand the basic DRG structure by adding four subclasses to each illness and risk of mortality. CHIA utilized version 30.0 of the APR-DRG, which is ICD-10-CM based, to group inpatient discharges over the study period of SFY 2017.

Payer Type

For both the inpatient discharge and ED visit data, payer type categories were created by grouping payer source codes. Payer type categories were grouped as follows:

- **Medicare:** Expected primary payer source is fee-for-service Medicare or managed care Medicare.

- **Medicaid:** Expected primary payer source is 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

Payer sources not included in the current reporting: Self-pay, Free Care, and Health Safety Net, Worker's Compensation, Other Government Payment, Auto Insurance, Dental Plans, and None (for Secondary Payer).

Discharge Setting

For the index dataset of inpatient discharges, the discharge setting variable was grouped into broader categories. They were grouped as follows:

- **Home:** home or self-care, rest home, and shelter

- **Skilled Nursing Facility (SNF):** skilled nursing facilities

- **Home with Home Health Agency Care:** home under care of organized home health service organization and home under care of a home IV drug therapy provider

- **Hospice:** home hospice care and hospice medical facility

- **Rehabilitation:** intermediate care facility, inpatient rehab facility, and 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, and other discharge settings.

Rates and number of revisits by Hospice and Other Discharge Settings are not reported.

Notes

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[i] The data processing and analysis for this report accommodates the transition from ICD-9-CM to ICD-10-CM that was implemented in October 2015.

[ii] Information on the Massachusetts Hospital Case Mix Database is available at http://www.chiamass.gov/case-mix-data/.

[iii] Center for Health Information and Analysis (CHIA), *Hospital-Wide Adult All-Payer Readmissions in Massachusetts: SFY 2011-2017*, Technical Appendix (Boston, December 2018), http://www.chiamass.gov/hospital-wide-adult-all-payer-readmissions-in-massachusetts.