CENTER FOR HEALTH INFORMATION AND ANALYSIS

HOSPITAL-WIDE ADULT ALL-PAYER READMISSIONS

IN MASSACHUSETTS: SFY 2011-2015

TECHNICAL APPENDIX

DECEMBER 2016

CHIA

Hospital-Wide Adult All-Payer Readmissions in Massachusetts: SFY 2011-2015

TECHNICAL APPENDIX

Table of Contents

Introduction

This technical appendix provides details on the methodology used for CHIA's third annual readmission report, Hospital-Wide Adult All-Payer Readmissions in Massachusetts: SFY 2011-2015, released in December 2016. This Appendix comprises three sections: a detailed description of the readmissions methodology, a table listing the characteristics of the hospitals that are reported on in the report, and a small section with details on several of the categorizations used in the report.

Readmissions Methodology

History of the HWR Measure

Since 2009, CMS has been publicly reporting a set of 30-day disease-specific readmission measures for hospitals. Realizing the need for a broader measure that could capture a greater proportion of readmissions than these disease-specific measures, CMS contracted with the Yale New Haven Health Services Corporation/Center for Outcomes Research and Evaluation (YNHHSC/CORE) to develop a hospital-wide all-cause unplanned readmissions measure (the HWR measure). The Yale team, building on the methodology of the disease-specific measures, in 2011 developed the hospital-wide measure based on claims data for fee-for-service Medicare enrollees age 65 and older. The hospital-wide measure was endorsed by the National Quality Forum (#1789) and CMS started reporting the measure publicly in 2013. For the 2013 public reporting, the Yale team updated the measure slightly (to version 2.0) and released an updated specification report and accompanying SAS software to facilitate measure calculation. For 2014 public reporting, the Yale team updated the planned readmissions algorithm slightly, and made no substantive changes in 2015. The measure used in this report follows this 2015, version 4.0, specification[1].

Overview of the Methodology

The logic of the HWR measure requires the specification of a denominator, the number of eligible hospital admissions during a given time period that might possibly have resulted in a readmission (termed "index" admissions), and a numerator, the number of actual readmissions that occurred during the time period. The first two steps in the calculations are to identify these two sets of records. Dividing the number of readmissions by the number of index admissions and multiplying by 100 gives the readmission rate as a percentage. This rate is called an "observed" readmission rate because it is derived directly from what was observed during the study period. In the fourth step, observed rates calculated for each hospital under study are standardized to control for background factors that might influence readmission rates, but not be indicators of healthcare quality. The risk-standardized readmission rate (RSRR) controls for differences among hospitals in patient age, patient comorbidities, and hospital service mix.

This report includes observed and risk-standardized readmission rates calculated separately by Massachusetts fiscal years, which run from July 1 to June 30, for the 2011- 2015 fiscal years (i.e. the data included runs from July1, 2010 to June 30, 2015). We present observed rates for the historical data and risk-standardized rates for the latest year, SFY 2015.

Data Source

In the original development of the HWR measure, Mathematica Policy Research (MPR) prepared the required input data from CMS Medicare claims data[2]. The MPR team developed processing algorithms to produce three types of input data that are required by the HWR measure:

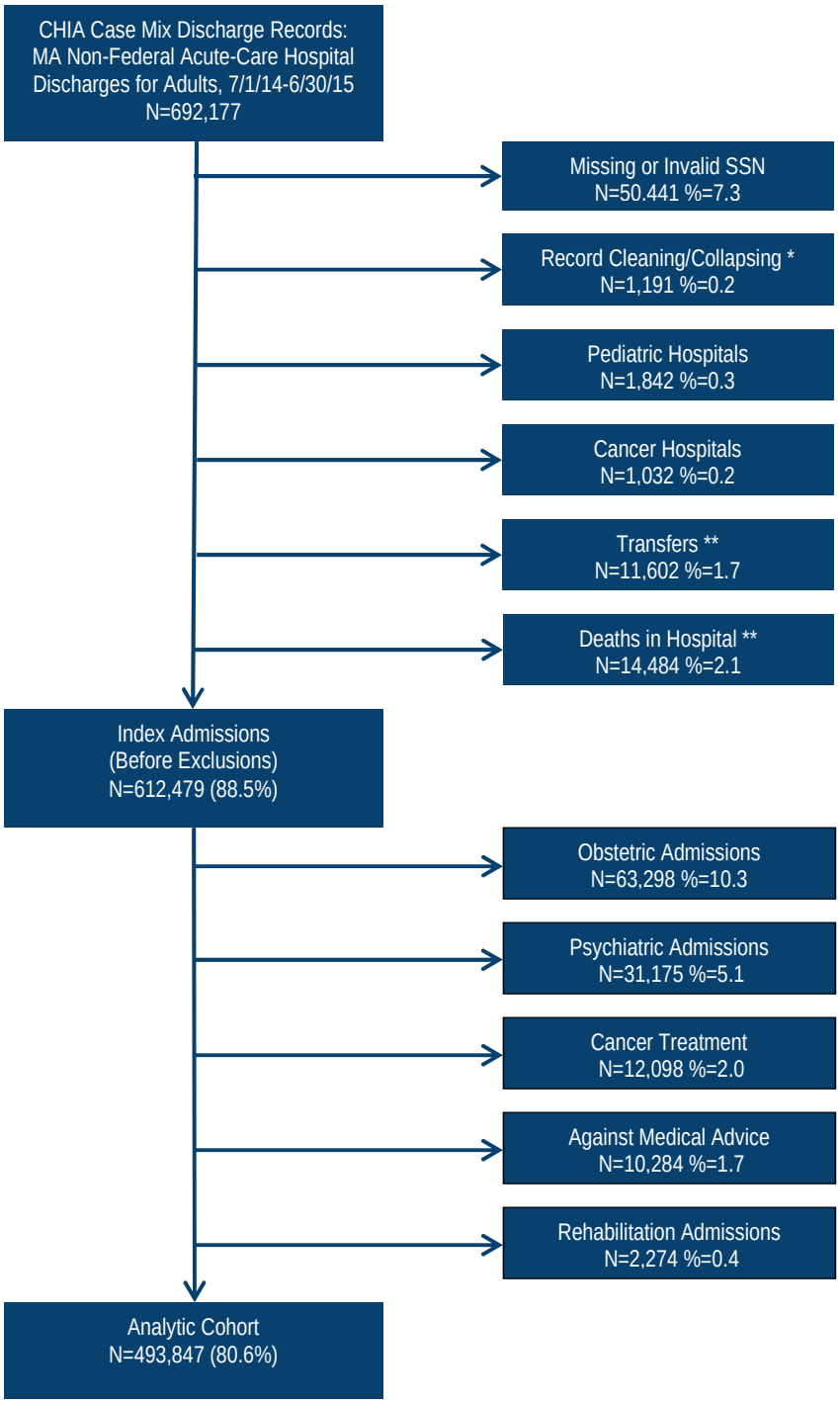
- A main "index" file that contains a record for each index admission (used primarily to calculate the measure's denominator).
- A "follow-up" file that includes admissions that occurred within 30 days of an index admission and might therefore be deemed to be readmissions if they are not categorized as planned (forms the measure numerator).
- A "history/diagnosis" file that includes information on patients' diagnoses within the year prior to an index admission, which is used to form measures of comorbidities for the risk-standardization procedure.

To use the HWR measure for public reporting in Massachusetts, we modified MPR's processing logic to draw upon discharge summary data from CHIA's Acute Hospital Case Mix Charge Database 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.[3] The data is submitted 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 based on federal fiscal years (FFY, that run from 10/1 to 9/30). For the FFY 2015 data collection and moving forward, CHIA is allowing hospitals to report unlimited numbers of procedures and diagnoses per discharge, whereas in previous years, the data submissions were capped at 15 procedures and 15 diagnoses per discharge. After investigating the impact of these changes on readmissions calculations, we included FFY 2015 data in this report that are based on 15 unduplicated diagnosis codes and all the available procedure codes from each discharge record.

CHIA modified the MPR processing logic, which was designed for claims and enrollment data, to adapt the measure for use with hospital discharge data as the source data. The primary modifications were around the merging of patient demographic information with visit information. The original CMS data for which the HWR measure was developed included information on Medicare eligibility. The MPR processing logic limits eligible index admissions to those for patients with at least 12 months of enrollment in Medicare Part A before an index admission, so as to have adequate diagnosis data for case-mix adjustment, and at least 30 days of enrollment in Medicare after the index admission, so as to have had the possibility of experiencing a readmission that would appear in the data. For the CHIA measure, which is based on hospital discharge summaries, all patients seeking inpatient care at any acute care hospital in Massachusetts are included in the calculation.

Figure 1: Construction of the SFY 2015 Analytic Cohort



Note: Exclusions are not mutually exclusive.
* Cleaning/collapsing includes: Removing duplicate records, collapsing overlapping stays, removing stays > 1 year, and combining adjacent admissions.
** The exclusions for transfer and death were implemented after making the exclusions above them in the figure.

Calculation Steps

Calculating the CMS/Yale Hospital-Wide All-Cause Unplanned 30-day Readmission measure involves four steps:

1. Identifying the set of index visits during the designated time period,
2. Identifying readmissions,
3. Calculating observed readmission rates, and
4. Calculating risk-standardized readmission rates.

The section of the report titled About the Readmissions Methodology describes these four steps briefly. This Methodology Appendix describes the steps in greater detail.

Step 1: Definition of Index Admissions

Figure A.1 illustrates the construction of the readmissions analytic cohort for the July 2014 to June 2015 study period. The processing for the other study years is parallel. The data preparation involves two conceptual steps, 1) preparation of a base "index admission" cohort (top portion of the figure, originally developed by both the MPR team and the Yale team), and 2) application of a series of exclusions to refine the cohort to a final analytic file used for calculations (bottom portion of the figure, developed by the Yale team).

The base index admission cohort, produced at the end of the first broad step of processing, comprises:

- Discharges from non-federal acute-care hospitals in Massachusetts,
- for adults,
- within the study time period, which is July 1, 2010 to June 30, 2015?,
- that had valid SSN information on the record (so that matching across records could be attempted),
- were not from pediatric or cancer hospitals,
- were not transfers to other acute hospitals, and
- in which the patient did not die while in the hospital.

This set of records constitutes the conceptual base on which the measure may be calculated and excludes records which are incompatible with the logic of the measure (e.g. if a patient dies in the hospital they are not at risk of having a subsequent readmission). There were 692,177 discharge records in CHIA's Acute Hospital Case Mix Charge Database for adults (age 18+) during the time period from July 1, 2014 to June 30, 2015. Of the exclusions applied in this first phase of processing, the exclusion due to the lack of a valid SSN was the most significant (50,441 records, 7.3%). The exclusions because of in-hospital death (n=14,484, 2.1%) and transfer to another acute care hospital (n=11,602, 1.7%) also applied to a sizable number of records. The final base cohort includes 612,479 discharges, or 88.5% of the original adult discharges during the time period.

In the second stage of processing, records meeting any of five specific criteria were excluded from the calculations to produce the final analytic dataset. The five exclusion criteria applied were:

- Admissions for obstetric care: The Yale team recommends removing obstetric admissions when working with an all-payer population because the rate of readmission for obstetric cases is substantially lower than that for other admissions, and therefore distorts overall readmission rates. This was the largest exclusion, accounting for 63,298 records (10.3%).
- Admissions for psychiatric conditions: Since patients admitted primarily for psychiatric conditions (n=31,175, 5.1%) are typically treated in different types of facilities from acute-care hospitals, they are excluded from the measure.
- Treatment for cancer: Because cancer patients' showed different readmission and mortality profiles from other patients during the preliminary measure development research, the Yale team determined that they should not be included in the final measure. This exclusion resulted in 12,098 (2.0%) records being dropped.
- Against medical advice: Patients discharged against medical advice (AMA) are excluded because they did not necessarily receive the full care the hospital intended to provide. This criterion resulted in the exclusion of 10,284 (1.7%) records.
- Admissions for rehabilitation care: Patients admitted for rehabilitation (n=2,274, 0.4%) are typically not served in acute-care hospitals and are excluded.

Once these exclusions are applied to the SFY 2015? data, the final resulting analytic cohort includes 493,847 eligible index admissions. The process for constructing the analytic cohorts for other years is identical.

This definition of the analytic cohort differs from the original Yale specification in the following respects:

- The Yale/CMS measure includes admissions for those enrolled in Medicare fee-for-service coverage; the CHIA Massachusetts measure includes admissions covered by all payers.
- The Yale measure includes patients age 65 and older; this measure includes patients age 18 and over.
- The CHIA measure explicitly excludes obstetric cases.
- As described under Data Source above, the Yale measure limits eligible index admissions based on Medicare eligibility; the CHIA measure does not.

Table 1 shows the overall counts and percentages for the dataset creation process for the SFY 2015 data.

Table 1: Counts for the Dataset Creation Process for SFY 2015

PROCESSING STEP	N	% OF ADULT DISCHARGES	% OF INDEX ADMISSIONS BEFORE EXCLUSIONS
All discharges for adults in CHIA Case Mix Dataset	692,177	100.0%	--
Index admissions, before exclusions	612,479	88.5%	100.0%
Analytic cohort	493,847	71.3%	80.6%

Step 2: Definition of Readmissions

The second step of the HWR calculations is to count the number of readmissions. Once the index admissions have been identified, it is relatively simple to quantify the number of readmissions. Under the HWR algorithm, readmissions are defined as any admissions that occur within 30 days of an index admission, excluding those that are deemed to be planned (see below). Note that under this definition a particular hospital stay may count both as an index admission and as a readmission in relation to an earlier index admission. Patients may have multiple readmissions if they cycle in and out of the hospital with a frequency less than or equal to 30 days.

The CMS/Yale methodology includes an algorithm for excluding from the calculations those readmissions that are likely to have been planned. Yale researchers developed a list of inpatient procedures that are usually planned (e.g. knee arthroplasty, hip replacement), and revised the list following a public comment period and a subsequent chart-review validation study. A readmission is classified as planned, and therefore excluded from the readmission rate calculations, if it includes one of these procedures and the discharge condition for the readmission is a non-acute condition.

Step 3: Calculation of Observed Readmission Rates

The observed readmission rate for a hospital, or for some other defined group of patients or visits, is simply the number of readmissions that occurred during the designated time period (plus 30 days thereafter), divided by the base number of index admissions within the period, and multiplied by 100 to produce a percentage. The report features readmission rates calculated for hospitals as well as by other patient-level and visit-level characteristics such as patient age, patient gender, payer type, and discharge status.

Step 4: Calculation of Risk Standardized Readmission Rates (RSRRs)

The Yale team designed the risk-standardization procedure to adjust hospitals' observed readmission rates by potentially confounding background factors that might influence readmissions. The risk-standardized readmission rate (RSRR) accounts for differences in background factors among the patients served by different hospitals so that more meaningful comparisons among hospitals' readmission rates can be made.

Cohort Assignment

The risk-standardization procedure is carried out separately on five clinically-defined cohorts of patients. By standardizing separately for different groups of patients, the procedure allows the adjustments made to be different for different types of patients, rather than assuming that one adjustment works well for all patients. Also, patients who have the same broad category of illness are likely to be treated by the same broad provider team, and care for patients within these groups is likely to be more homogeneous than care provided to patients across groups. The measure assigns patients to one of five clinically-defined cohorts:

- Surgery/gynecology
- Cardiorespiratory
- Cardiovascular
- Neurology
- Medicine

Assignment to these five cohorts is based on the AHRQ Clinical Classifications Software (CCS) grouper that aggregates ICD-9-CM procedure and diagnosis codes into a much smaller number of clinically coherent categories (approximately 230 procedures and 280 diagnoses). Cohort assignment proceeds first by procedure code, and then by diagnosis code. First, patients with a procedure code indicative of having had a major surgery while in the hospital are assigned to the surgery/gynecology cohort. Then, remaining patients are assigned to one of the four other cohorts based on their principal discharge condition. Patients are assigned to the Medicine cohort when their condition does not correspond to any of the three more narrowly defined cohorts (cardiorespiratory, cardiovascular, neurology).

Statistical Models

Once patients are assigned to cohorts, a separate risk-adjustment model is fit for each cohort. The HWR methodology uses hierarchical logistic regression models, with discharges nested within hospitals, to estimate hospitals' impact on readmissions, controlling for patient case mix and hospital service mix.

The hierarchical logistic regression models predict readmission at the discharge level (coded 0/1) from discharge-level and hospital-level factors. At the discharge level, three factors are controlled for:

- Patient age: Age is measured in years.
- Patient case mix: Patient case mix is operationalized as a set of 31 indicators for comorbid conditions based on diagnosis information from the 12 months preceding the index hospitalization and the index hospitalization itself. The comorbidity indicators are based on the CMS Condition Categories grouper. The Yale team selected conditions by starting from those used in previous hospital-specific readmissions measures, and then conducting a clinical review and a statistical modeling process to identify conditions that were both predictive of readmission as well as clinically meaningful. The comorbidity indicators include

conditions such as metastatic cancer/acute leukemia, diabetes mellitus, end-stage liver disease, drug and alcohol disorders, and congestive heart failure.

- Hospital service mix: Hospital service mix is operationalized as a set of variables indicating the patient's specific discharge condition within each of the five clinical cohorts. These measures are based on the AHRQ Clinical Classifications Software (CCS) grouper, the same classification system used to define overall cohort membership. The Yale team reasoned that different conditions will have different base probabilities of readmission, that hospitals are likely to differ in the mix of conditions that they tend to treat, and therefore specific discharge condition should be controlled.

At the hospital level, a random intercept term for hospital is included in each model. This term allows the predicted probability of readmission for all the patients in a hospital to be increased or decreased by a fixed amount. Inclusion of this term has two important effects. First, it properly accounts for the grouping of patients within hospitals. Without this term, the model would violate one of the statistical assumptions of regression analysis, that cases are independent of one-another. Second, since this term represents an increase or decrease in the probability of readmission for the patients in each hospital, controlling for the above patient factors, it directly indexes the impact of hospital on readmissions. Therefore, it plays a central role in the calculations. Each model produces two numbers for each hospital:

- The predicted number of readmissions: This estimate comes from the full model, including both the discharge-level variables and the hospital term. It represents the model-based prediction of the number of readmissions, including both the background characteristics of the patients, and which hospital they attend.

- The expected number of readmissions: This estimate is predicted from the model excluding the hospital term. It represents the number of readmissions that would be expected given only the patient background factors, and ignoring the effect of hospital.

The ratio of these two numbers, the predicted number divided by the expected number, gives the standardized readmission ratio (SRR) for each cohort and hospital. This number represents the extent to which a hospital has more (numbers > 1) or fewer (numbers < 1) readmissions for the cohort than one would expect based on the characteristics of the patients they treat.

The final risk-standardized readmission rate (RSRR) for a hospital is calculated by combining the standardized readmission ratios from the five cohort-specific models. Specifically, the volume-weighted logarithmic mean of the five SRRs is calculated to produce a hospital-wide standardized risk ratio. This weighting procedure allows larger cohorts within a hospital to have a larger impact on the final rate. In a final step, the hospital-wide SRR for each hospital is multiplied by the statewide observed readmission rate to produce the final set of risk-standardized readmission rates (RSRR's).

Calculation of Confidence Intervals for RSRRs

Because the estimated RSRRs are derived by a series of calculations from the output of multiple statistical models, and the variance of the estimates would therefore be difficult to calculate analytically, the HWR measure includes a bootstrapping algorithm for calculating RSRR confidence intervals. Under this algorithm, one draws repeated

samples of hospitals, with replacement, from the total population of hospitals under study and calculates the RSRR for each hospital in the sample. A final random sample, with equal number of calculated RSRRs from each hospital, is drawn. The final confidence intervals are found by taking the 2.5% and 97.5% percentiles from the distribution of calculated RSRRs for each hospital.

Weighting of RSRR's for Analyses of Hospital Characteristics

In order to aggregate the risk-standardized readmission rate (RSRRs) across hospitals to larger entities such as geographic regions and hospital systems, we averaged the hospital-specific RSRR's for each group and weighted each hospital's RSRR in the average by the inverse of its variance, obtained from the bootstrapping process[4]. This weighting scheme allows hospitals with higher volumes, and more precise estimates, to contribute more to the aggregated rate than those with lower volumes.

Hospital Characteristics

Hospital characteristics are assessed at the end of the reporting period, state fiscal year 2015.

Table 2: Hospital Characteristics

HOSPITAL	COHORT	AFFILIATION	REGION
Anna Jaques Hospital	Community Hospital	Not Affiliated	Upper North Shore
Athol Hospital	Community Hospital	Heywood Health Systems	Central Massachusetts
Baystate Franklin Medical Center	Community Hospital	Baystate Health System	Pioneer Valley / Franklin
Baystate Mary Lane Hospital	Community Hospital	Baystate Health System	Pioneer Valley / Franklin
Baystate Medical Center	Teaching Hospital	Baystate Health System	Pioneer Valley / Franklin
Baystate Noble Hospital	Community Hospital	Baystate Health System	Pioneer Valley / Franklin
Baystate Wing Hospital	Community Hospital	Baystate Health System	Pioneer Valley / Franklin
Berkshire Medical Center	Teaching 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 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	Teaching Hospital	Partners HealthCare System	Metro Boston

HOSPITAL	COHORT	AFFILIATION	REGION
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 Hospital	Cape Cod Healthcare	Cape and Islands
Clinton Hospital	Community Hospital	UMass Memorial Health Care	Central Massachusetts
Cooley Dickinson Hospital	Community Hospital	Partners HealthCare System	Pioneer Valley / Franklin
Emerson Hospital	Community Hospital	Not Affiliated	West Merrimack / Middlesex
Fairview Hospital	Community Hospital	Berkshire Health Systems	Berkshires
Falmouth Hospital	Community Hospital	Cape Cod Healthcare	Cape and Islands
Hallmark Health	Community Hospital	Not Affiliated	Metro Boston
Harrington Memorial Hospital	Community Hospital	Not Affiliated	Central Massachusetts
HealthAlliance Hospital	Community Hospital	UMass Memorial Health Care	Central Massachusetts
Heywood Hospital	Community Hospital	Heywood Healthcare	Central Massachusetts
Holyoke Medical Center	Community Hospital	Not Affiliated	Pioneer Valley / Franklin
Lahey Hospital & Medical Center	Teaching Hospital	Lahey Health System	West Merrimack / Middlesex
Lawrence General Hospital	Community Hospital	Not Affiliated	East Merrimack
Lowell General Hospital	Community Hospital	Wellforce	West Merrimack / Middlesex
Marlborough Hospital	Community Hospital	UMass Memorial Health Care	Metro West
Martha's Vineyard Hospital	Community Hospital	Partners HealthCare System	Cape and Islands
Massachusetts Eye and Ear Infirmary	Speciality Hospital	Not Affiliated	Metro Boston
Massachusetts General Hospital	Academic Medical Center	Partners HealthCare System	Metro Boston
Mercy Medical Center	Community Hospital	Not Affiliated	Pioneer Valley / Franklin
Merrimack Valley Hospital	Community Hospital	Steward Health Care System	East Merrimack
MetroWest Medical Center	Community Hospital	Tenet Healthcare	Metro West
Milford Regional Medical Center	Community Hospital	Not Affiliated	Metro West
Morton Hospital	Community Hospital	Steward Health Care System	Metro South
Mount Auburn Hospital	Teaching Hospital	CareGroup	Metro Boston

HOSPITAL	COHORT	AFFILIATION	REGION
Nantucket Cottage Hospital	Community Hospital	Partners HealthCare System	Cape and Islands
Nashoba Valley Medical Center	Community Hospital	Steward Health Care System	West Merrimack / Middlesex
New England Baptist Hospital	Speciality Hospital	CareGroup	Metro Boston
Newton-Wellesley Hospital	Community Hospital	Partners HealthCare System	Metro Boston
North Shore Medical Center	Community Hospital	Partners HealthCare System	Lower North Shore
Northeast Hospital	Community Hospital	Lahey Health System	Lower North Shore
Quincy Medical Center	Community Hospital	Steward Health Care System	South Shore
Saint Vincent Hospital	Teaching Hospital	Tenet Healthcare	Central Massachusetts
Signature Healthcare Brockton Hospital	Community Hospital	Not Affiliated	Metro South
South Shore Hospital	Community Hospital	Not Affiliated	South Shore
Southcoast Hospitals Group	Community Hospital	Not Affiliated	New Bedford
Steward Carney Hospital	Teaching Hospital	Steward Health Care System	Metro Boston
Steward Good Samaritan Medical Center	Community Hospital	Steward Health Care System	Metro South
Steward Holy Family Hospital	Community Hospital	Steward Health Care System	East Merrimack
Steward Norwood Hospital	Community Hospital	Steward Health Care System	Norwood / Attleboro
Steward Saint Anne's Hospital	Community 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 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 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 was used to group inpatient discharges over the study period of SFY 2011-2015. The 3M APR-DRG grouper was used to analyze readmissions by top discharge diagnoses for this report.

Payer Type

For this analysis, broad 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 this analysis, discharge settings were 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

Notes

[1] For the original measure technical report see: Horwitz et. al. (2012). Hospital-wide all-cause unplanned readmission measure. Final technical report. Yale New Haven Health Services Corporation/Center for Outcomes Research & Evaluation. For the updated 2015 v. 4.0 specification see: Yale New Haven Health Services Corporation/Center for Outcomes Research & Evaluation (YNHHSC/CORE). (2015). 2015 Measure updates and specification report: hospital-wide all-cause unplanned readmission measure (version 4.0). YNHHSC/CORE. Both available from: http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Measure-Methodology.html. For the NCQA measure specification document see http://www.qualityforum.org/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=69324.

[2] The Mathematica Policy Research programs and documentation are available by request from the CMS Readmission Measures Mailbox at cmsreadmissionmeasures@yale.edu.

[3] Information on the Massachusetts Hospital Inpatient Discharge Database is available at http://www.chiamass.gov/case-mix-data/.

[4] For an example of this technique see: Krumholz et al. (2009). Patterns of hospital performance in acute myocardial infarction and heart failure 30-day mortality and readmission. Circulation: Cardiovascular Quality and Outcomes, 2, 407-413.

For more information, please contact:

CENTER FOR HEALTH INFORMATION AND ANALYSIS

501 Boylston Street
Boston, MA 02116

www.chiamass.gov
@Mass_CHIA

(617) 701-8100

Publication Number: 16-349-CHIA-02