COMMONWEALTH OF MASSACHUSETTS
HEALTH POLICY COMMISSION

TECHNICAL APPENDIX 7
HOSPITAL UTILIZATION

ADDENDUM TO 2023 COST TRENDS REPORT

Contents

1 Summary

This technical appendix describes the Health Policy Commission's (HPC) approach to examining hospital utilization in the 2023 Cost Trends Report Chartpack. Only exhibits where the HPC processed and analyzed data are described below. In exhibits where data is compiled from other reports, please see the exhibit notes and sources for more detail.

2 Emergency department (ED) utilization

2.1 Data

For the exhibits below, the HPC used the Emergency Department Database (EDD) from the Center of Information and Analysis (CHIA) for calendar year 2016 through calendar year 2022, with preliminary data for October 2022 through December 2022. This dataset is part of CHIA's Massachusetts Acute Hospital Case Mix Database and includes all outpatient emergency department visits, including Satellite Emergency Facility visits, by patients whose visits resulted in neither an outpatient observation stays nor an inpatient admission at the reporting facility. The ED database contains patient demographics, clinical characteristics, services provided, charges, and hospitals and practitioner information, as well as mode of transport.

- **All ED visits, potentially avoidable ED visits, and behavioral health ED visits per 1,000 residents, 2016-2022**
- **ED visits by visit category and quarter, January 2018 – December 2022**
- **Potentially avoidable emergency department utilization by HPC region, 2019-2022**

For the exhibit "**Potentially avoidable emergency department utilization by HPC region, 2019-2022"**, the HPC used U.S. Census Bureau Annual Estimates to calculate population rates.

2.2 Analysis

Avoidable Emergency Department Visits

The Billings algorithm is based on work by the NYU Center for Health and Public Service Research. In Billings et al. (1993),[1] the researchers, along with a panel of ED and primary care physicians, develop the following classification for ED visits:

- Non-emergent: The patient's initial complaint, presenting symptoms, vital signs, medical history, and age indicated that immediate medical care was not required within 12 hours.
- Emergent/Primary Care Treatable: Based on information in the record, treatment was required within 12 hours, but care could have been provided effectively and safely in a primary care setting. The complaint did not require continuous observation, and no procedures were performed, or resources used that are not available in a primary care setting (e.g., CAT scan or certain lab tests);
- Emergent - ED Care Needed - Preventable/Avoidable: Emergency department care was required based on the complaint or procedures performed/resources used, but the emergent nature of the condition was potentially preventable/avoidable if timely and effective

ambulatory care had been received during the episode of illness (e.g., the flare-ups of asthma, diabetes, congestive heart failure, etc.); and

- Emergent - ED Care Needed - Not Preventable/Avoidable: Emergency department care was required, and ambulatory care treatment could not have prevented the condition (e.g., trauma, appendicitis, myocardial infarction, etc.).

Potentially avoidable ED visits are based on the "patched" Billing's algorithm, which updates the original crosswalk (ICD-9) to ICD-10 and accounts for any periodic coding changes. See Johnston et al. (2017) for more information.[2] To improve classification rate, diagnosis codes unclassified by the "patched" Billing's algorithm were sequentially truncated and shortened codes were re-classified using the same algorithm. Injury-related ED visits were also identified using the Billings algorithm.

For exhibits that examined potentially avoidable ED visits by condition, potentially avoidable ED visits are defined visits that had a primary diagnosis with at least a 70% probability of being emergent - primary care treatable or non-emergent by the Billings algorithm. Top diagnosis subcategories were identified as the top five diagnosis codes by volume among these visits between March 2019 and March 2020.

All map visualizations were done with Tableau 2021.4.

3 Inpatient admissions

3.1 Data

For the exhibits "**Total inpatient hospital discharges by payer, 2016-2022"** and **"Change in average length of stay, ICU/CCU days per discharge, and "casemix index" (APR-DRG weight) for non-COVID-19 patients by quarter, 2016-2022"**, the HPC used the CHIA Hospital Inpatient Discharge Database (HIDD). This dataset is part of CHIA's Massachusetts Acute Hospital Case Mix Database. The HIDD database contains all discharges from Massachusetts acute hospitals for calendar year 2016 through calendar year 2022, with preliminary data for October 2022 through December 2022. This data set contains comprehensive patient-level information including socio-demographics, clinical data, and charge data.

For **"Change in average length of stay, ICU/CCU days per discharge, and "casemix index" (APR-DRG weight) for non-COVID-19 patients by quarter, 2016-2022"**, "casemix index" was defined using MassHealth (Medicaid) all-payer refined diagnosis related groups (APR-DRG). The data is comprised of all medical inpatient stays at acute care hospitals in Massachusetts, excluding behavioral health stays and extremely long length of stay (5 times the geometric mean by MS-DRG severity group, and/or length of stay greater than or equal to 180 days), because these cases are usually not paid on a DRG basis. Other exclusions include transfers, patients who died, patients who went to Shriners Hospital for Children (Springfield and Boston), and discharges with some APR coding restrictions based on discrepancies with CMS major diagnostic categories. COVID-19 cases were defined as any inpatient stay with U071 for the primary or secondary diagnosis code.

4 Preventable hospitalizations among Medicare beneficiaries

4.1 Data

For the exhibit **"Annual preventable hospital admissions per 1,000 fee-for-service Medicare beneficiaries aged 65+ in 2021, by state"**, the HPC used the Centers for Medicare and Medicaid Services (CMS) Geographic Variation Public Use File, February 2023 update. The CMS Geographic Variation Public Use File is based on information from CMS's Chronic Conditions Data Warehouse (CCW) and has information on demographics, spending, and service utilization for Medicare beneficiaries in different parts of the country.

4.2 Analysis

To calculate the number of preventable hospitalizations among Medicare beneficiaries, the HPC evaluated rates of hospital admissions for certain ambulatory care-sensitive conditions among fee-for-service Medicare beneficiaries aged 65-74 and 75+ using the CMS Geographic Variation Public Use File. Ambulatory care-sensitive conditions, as identified using Prevention Quality Indicators (PQIs), are those conditions for which hospitalizations might have been prevented through access to high-quality outpatient care.[3] The conditions included in the CMS Geographic Variation Public Use File and evaluated in this analysis are diabetes, chronic obstructive pulmonary disease (COPD), asthma, hypertension, congestive heart failure (CHF), dehydration, bacterial pneumonia, urinary tract infection (UTI), and lower extremity amputation. The measures for each age group were combined into population-weighted averages using state population denominators from the 2021 American Community Survey (ACS).

5 Inpatient discharges in community hospitals

5.1 Data

For the exhibit **"Percentage of inpatient stays occurring in community hospitals, by discharge type, 2010-2022"**, the HPC used CHIA's Hospital Inpatient Discharge Database (HIDD). This dataset is part of CHIA's Massachusetts Acute Hospital Case Mix Database. The HIDD database contains all discharges from Massachusetts acute hospitals from calendar year 2016 through calendar year 2022, with preliminary data for October 2022 through December 2022.

5.2 Definitions

"Community hospitals" are general acute care hospitals that do not support large teaching and research programs. "Teaching hospitals" are defined as hospitals that report at least 25 full-time equivalent medical school residents per 100 inpatient beds in accordance with Medicare Payment Advisory Commission (MedPAC) guidelines. "Academic medical centers" are a subset of teaching hospitals characterized by (1) extensive research and teaching programs, (2) extensive resources for tertiary and quaternary care, (3) principal teaching hospitals for their respective medical schools, and (4) full-service hospitals with case mix intensity greater than 5 percent above the statewide average. These definitions are consistent with CHIA's designations in the Massachusetts Hospital Profiles, but HPC combines CHIA's community hospitals and community-high public payer hospitals into one community hospital category for purposes of this analysis. Discharges for

newborns were identified by using major diagnosis category 15 (Newborns & Other Neonates with Conditions Originating in the Perinatal Period).

6 Share of hospital-based care by hospital systems

6.1 Data

For the exhibit **"Share of inpatient and outpatient care in the five largest hospital systems and independent hospitals, FY2010-FY2021"**, the HPC used CHIA's Hospital Cost Reports for 2012-2021.

6.2 Analysis

The HPC estimated combined inpatient and outpatient hospital volume by system. Inpatient discharge volume is reported in the Hospital Cost Reports. Outpatient hospital volume was estimated by dividing outpatient gross patient service revenue (GPSR) by inpatient GPSR per discharge. For example, if inpatient GPSR divided by discharges was $10,000, then every $10,000 of outpatient GPSR would equal one adjusted outpatient discharge. See, e.g., American Hospital Association, Trendwatch Chartbook 2019: Glossary 1 (Nov. 14, 2019), available at aha.org/guidesreports/2019-10-25-trendwatch-chartbook-2019 (describing this metric using the term "adjusted admissions").

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[1] Billings et al (1993)."Impact of Socioeconomic Status on Hospital Use in New York City, Health Affairs (Spring 1993).

[2]Johnston, K. J., Allen, L., Melanson, T. A., & Pitts, S. R. (2017). A "Patch" to the NYU emergency department visit algorithm. Health services research, 52(4), 1264-1276.

[3] Prevention Quality Indicators Overview. Agency for Healthcare Research and Quality. Available at: https://qualityindicators.ahrq.gov/measures/pqi_resources