Use of Locally Derived Data to Design, Develop, and Implement Population Health Management Interventions

Lessons from CHART Hospitals

Health Policy Commission

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About HPC

Established through the Commonwealth of Massachusetts' landmark cost containment law, Chapter 224 of the Acts of 2012, the Health Policy Commission (HPC) is an independent state agency governed by an 11-member board with diverse experience in health care. The HPC is leading efforts to advance Chapter 224's ambitious goal of health care cost containment. The agency works to stimulate informed dialogue, develop evidence-based policy, and encourage innovative delivery and payment models to accelerate transformation in the Massachusetts health care system.

The HPC's various policy committees engage in health care market research through publication of the Annual Cost Trends Reports; market monitoring through Notices of Material Change and Cost and Market Impact Reviews; analysis of structure of the delivery system through the creation of criteria for Accountable Care Organizations and the Registration of Provider Organizations Program; and investment through the CHART and Innovation Investment Programs. Through these and other policy initiatives, the HPC strives to promote and incentivize the development of a high-value health care system in the Commonwealth.

CHART Program

Established by Chapter 224, the Community Hospital Acceleration, Revitalization, and Transformation (CHART) Investment Program is a $120 million reinvestment program funded by an assessment on large health systems and commercial insurers that will make phased investments for certain Massachusetts community hospitals to enhance their delivery of efficient, effective care. CHART hospitals share the common characteristics of being non-profit, non-teaching, and having relatively lower prices than many other hospitals. The goal of the program is to promote care coordination, integration, and delivery transformations; advance electronic health records adoption and information exchange among providers; increase alternative payment methods and accountable care organizations; and enhance patient safety, access to behavioral health services, and coordination between hospitals and community-based providers and organizations. In October 2013, the HPC solicited responses from eligible community hospitals to participate in CHART Phase 1 funding. A total of $10 million was distributed to 28 community hospitals to support short term, high-need expenditures. The HPC awarded a total of $60 million in CHART Phase 2 funding in October 2014.

CHART Case Study Series

Through CHART-funded Phase 1 initiatives, the HPC built a foundation for system transformation by assessing the capability and capacity of participating institutions to lead and implement delivery system change, providing technical assistance to awardees, and fostering engagement and learning among CHART-eligible hospitals. In turn, participating awardees designed and implemented capacity building programs and marshaled internal leadership and resources to design initiatives. The following case study is part of a series focusing on promising practices among CHART hospitals toward successful implementation of improvement initiatives and achievement of results. The HPC, together with CHART hospitals, intends for the experiences and lessons exhibited in this series to assist other providers, the public, and policy makers in designing and promoting similar short-term, high-impact improvement initiatives in their communities and organizations.

Introduction

Policy makers, payers, and providers have increasingly focused their attention on improving health outcomes and reducing waste and inefficiency in the health care system. Nationally, the Affordable Care Act included significant investments to test health care payment and delivery system reforms that can demonstrate health care savings while maintaining or improving health care quality. Massachusetts' efforts to contain health care costs, spearheaded by passage and implementation of Chapter 224, are driven in part by the state's highest-in-the-nation ranking in per capita health care spending, which is 36 percent higher than the national average.[1] Estimates of wasted health care spending in Massachusetts associated with overtreatment (e.g., delivery of unnecessary services or treatment in a care setting that is more intensive than needed) range from $6.6 to $8.3 billion annually.[2]

Because hospital services typically account for the largest share of total health care expenditures,[3] the Health Policy Commission (HPC) sees the potential to curb spending by reducing unnecessary utilization of hospital services and moving utilization of services from higher-priced hospitals to equal quality lower-priced community hospitals. Through the Community Hospital Acceleration, Revitalization, and Transformation (CHART) Investment program, the HPC is investing in community hospitals' capacity to use data-driven strategies to deliver more efficient and cost-effective care.

Use of Locally-Derived Data to Design, Develop, and Implement Population Health Management Interventions

Massachusetts community hospitals typically have lower operating margins than the Commonwealth's teaching hospitals[4] and therefore have fewer resources to make substantial investments in analytic infrastructure, including information technology and human resources. The HPC has found, through its work with CHART awardees, that there is substantial opportunity to leverage *locally-derived quantitative and qualitative sources of data* to design, develop, and implement population health management interventions to promote care coordination, integration, and delivery transformation. Local sources of data can provide timely and specific information to accurately identify and develop population health management interventions, particularly for high-risk, high cost groups. As these populations tend to have an outsized influence on total health care spending, focused interventions hold promise for improved health outcomes and lower costs.[5] These approaches can also be implemented with minimal resource burden and are therefore relatively low cost.

CHART's emphasis on timely and actionable community hospital interventions requires CHART hospitals to rely on a variety of data sources that these organizations have at their disposal. Examples of locally-derived data include:

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1   Centers for Medicare & Medicaid Services, Office of the Actuary, National Health Statistics Group. National Health Expenditure Data: Health Expenditures by State of Residence, December 2011. Available from Kaiser Family Foundation at KFF.org.

2   Massachusetts Health Policy Commission. Technical Appendix A3: Wasteful Spending, Addendum to 2013 Cost Trends Report. Available from: http://www.mass.gov/anf/docs/hpc/2013-cost-trends-report-technical-appendix-a3-wasteful-spending.pdf.

3   In Massachusetts, hospital spending accounts for nearly 38 percent of health care expenditures, the largest category of health care spending by service provider. See: Centers for Medicare & Medicaid Services, Office of the Actuary, National Health Statistics Group. National Health Expenditure Data: Health Expenditures by State of Residence, December 2011. Available from Kaiser Family Foundation at KFF.org.

4   Massachusetts Division of Health Finance and Policy. Study of the Reserves, Endowments, and Surpluses of Hospitals in Massachusetts. May 2010.

5   Nationally, one-fourth of all patients represent over 85 percent of total health care expenditures. Similarly, an HPC analysis of 2010 Massachusetts data found that the top 5 percent of patients account for 45 percent of spending among the commercial population and 42 percent among the Medicare population. See: Health Policy Commission. 2013 Cost Trends Report. p. 42.

- **Hospital administrative data** (billing records) provide patient-level demographic and diagnostic information based on widely-used health information coding systems. As such, administrative data are used by state and federal policy makers, researchers, payers, and providers to summarize and analyze service utilization, patient diagnoses, and cost. Administrative data are increasingly used to develop performance measures such as quality and patient safety indicators developed by the Agency for Healthcare Research and Quality (AHRQ).[6] National, state, and industry databases and registries allow hospitals, and increasingly consumers, to compare performance on these indicators across hospitals. Because most administrative data were originally developed for financial management purposes rather than quality assessment, they contain varying degrees of clinical detail and can be limited in content and timeliness. However, studies analyzing the validity of administrative data for quality assessment at the hospital level have generally found that administrative data are sufficiently sensitive and specific to estimate certain performance measures.[7]

- **Medical records** are another important source of information that can be used to design and develop population health management interventions at the hospital level. Medical records provide detailed clinical data with a richer description of care than can be obtained from hospital administrative data. When stored in an electronic health record (EHR), the information can be accessed efficiently.

- **Patient, family, and provider interviews** are another source of informative and detailed data. Hospitals already conduct general patient satisfaction surveys, and these results can be used to identify broad trends and comparisons across hospitals. Other diagnostic assessment tools can help hospitals collect detailed information on a patient's health status and social factors affecting health care utilization. When targeted to a specific population, such as high-risk patients, these interviews can provide rich information on why patients seek out hospital care and services.[8][9]

- **Publicly available demographic information**, such as social, economic, and health indicators can also assist hospitals to identify local community health needs. The Affordable Care Act requires hospitals to conduct triennial community health needs assessments and adopt related implementation strategies that address priority health needs. A variety of public datasets provide access to population health indicators at the community level including the Massachusetts Department of Public Health, the American Communities Survey, Healthy People 2020, and the Behavioral Risk Factor Surveillance System.

The use of locally-derived data has several advantages. First, locally-derived data is not dependent on a third-party for data collection and analysis. Although many improvement experts view payer data as the preferred alternative to locally derived data when designing population health management interventions, hospitals and other health care providers have historically had significant difficulty in accessing usable and timely payer data. This has resulted in delays, interruptions, and added costs in moving forward with population health management interventions. Rather than wait for an external organization to deliver relevant and accurate data, the CHART program encourages hospitals to use information and data that are readily available within their organizations.

Locally-derived data can also help hospitals better understand the unique needs of a specific community. When community hospitals rely on national or statewide literature and data to design interventions, there is a risk

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6 Agency for Healthcare Research and Quality (AHRQ) quality indicators are used in free software distributed by AHRQ. The software can be used to help hospitals identify quality of care events that might need further study. The software programs can be applied to any hospital inpatient administrative data. These data are readily available and relatively inexpensive to use.

7 Joint Commission on Accreditation of Healthcare Organizations. Strategies to ease data collection burden. Hosp Peer Rev 2006 Jan;31(1):6, 11.

8 An example of a readmissions diagnostic worksheet was developed by the Institute for Healthcare Improvement's State Action on Avoidable Rehospitalizations (STAAR) initiative. Available from: http://www.ihi.org/resources/Pages/Tools/ReadmissionsDiagnosticWorksheet.aspx

9 United States of America. Agency for Healthcare Research and Quality. Hospital Guide to Reducing Medicaid Readmissions. Available from: http://www.ahrq.gov/professionals/systems/hospital/medicaidreadmitguide/medread-tools.pdf

that the intervention will not be sensitive to the needs and resources available in a community. For example, a community with a higher incidence of substance use disorders and socioeconomic barriers will require a different set of interventions to reduce unnecessary hospital utilization than a community with a more economically stable population. Locally-derived data allows hospitals to identify the unique barriers of the community's high-cost patient population — such as lack of transportation, medication non-adherence, or family conflict — and create targeted interventions to reduce unneccesary hospitalization and cost.[10] Such person-level data is not readily found in external sources.

Lastly, locally-derived data can be updated and monitored in short cycles, which supports trend analysis and tightly managed "Plan-Do-Study-Act" (PDSA) quality and operational improvement activities. The PDSA cycle, a best practice found throughout quality improvement methodologies, tests a change in the real world setting — by planning it, trying it, observing the results, and acting on what is learned. This is the scientific method adapted for action-oriented learning. Locally-derived data enable significantly shorter data lags and allows program managers and clinical personnel to adjust interventions and more quickly respond to new information.

Goals of this Case Study Report

To learn how select CHART hospitals have used locally-derived data to design, develop, and implement population health management interventions, the HPC supported the development of the following case study to summarize hospital efforts, report findings, and identify lessons learned. The hospitals highlighted here were selected based on discussions with the HPC staff and expert consultants who have worked with CHART hospitals and monitored their activities. These organizations represent just a few examples of hospitals with notably strong efforts to utilize locally-derived data to plan and drive improvement during CHART Phase 1. They include: Beverly Hospital, Addison Gilbert Hospital, and Hallmark Health System (comprised of Lawrence Memorial Hospital and Melrose-Wakefield Hospital).[11] The information presented is based on reviews of the hospitals' CHART reports and proposals, discussions with HPC staff and expert consultants, and semi-structured interviews with key informants at the hospitals. Through the lessons and conclusions highlighted below, the HPC seeks to promote analysis and improvement in other hospitals and inform the development and evaluation of CHART Phase 2.

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10   Bates DW, Saria S, Ohno-Machado L, Shah A, Escobar G. Developing public policy to advance the use of big data In health care. Health Aff. 2014 Sept; 33(7):91523-1530.
11   The selection of CHART hospitals in this case study does not confer a competitive advantage for future CHART investment opportunities. While many hospitals could have been highlighted in this study, the choice of these three hospitals is intended to offer insight into promising practices.

CHART Hospital Initiatives Using Locally-Derived Data to Design, Develop, and Implement Population Health Management Interventions

Addison Gilbert Hospital: Local and Hospital Data Analysis to Pilot and Assess High Risk Intervention Team

Addison Gilbert Hospital received $294,000 in CHART Phase 1 funding to implement a High Risk Intervention Team (HRIT) pilot to provide patient education, medication management and discharge planning to patients admitted with certain complex chronic illnesses. The goals of the HRIT were to reduce all-cause 30-day readmissions, hospital length of stay, and medication errors while increasing follow-up appointment within seven days of discharge. The team intervened when a patient was readmitted to Addison Gilbert Hospital medical unit as an inpatient or observation patient.

Addison Gilbert Hospital
Addison Gilbert Hospital is a full-service, 58-bed medical/surgical acute care facility located in Gloucester, MA. The hospital provides inpatient and outpatient care to residents of the Cape Ann community in specialties such as cancer care, surgical day care, critical care and emergency medicine. Addison Gilbert Hospital and Beverly Hospital share organizational, clinical, and operational leadership. Both hospitals are part of the Lahey Health System formed in 2012.

The HRIT consisted of a nurse navigator with expertise in chronic disease management, a social worker with training in mental health counseling, a clinical pharmacist who conducted medication reconciliation and education, a diabetes educator if warranted, and an "access services representative" who coordinated and tracked primary care and specialist visits post-discharge.

Addison Gilbert Hospital's HRIT began operating in March 2014, and it has been an important "proof of concept" pilot. The lessons of the pilot were used in the development and refinement of CHART Phase 2 plans for Addison Gilbert Hospital and Beverly Hospital, which are both members of the same health system. In designing the HRIT program, the project team reviewed the results of a regional community health needs assessment (focusing on Addison Gilbert Hospital services) and analyzed the hospital's administrative data on readmissions. During implementation, the HRIT interviewed patients and caregivers to better understand underlying factors behind readmissions, and developed dashboards to track and assess their utilization data on a weekly basis.

Community Health Needs Assessment

In designing the HRIT program, Addison Gilbert Hospital initially reviewed the results of its 2012 Community Health Needs Assessment (CHNA) for the City of Gloucester where the hospital is located. The CHNA included the results of written surveys and focus groups among people who utilize Addison Gilbert Hospital services. The CHNA also included data from the Gloucester health department and internal hospital data. Several findings were noted that illustrate Gloucester's characteristics unique to the hospital's community, underscoring the value of locally-derived data.

- **Older Population:** Gloucester has a higher rate of residents who are 65 and older (18 percent) than the state (14 percent).[12]

- **ED Visits related to Mental Health:** Gloucester has a higher rate of ED utilization by residents for mental health issues (3,176/100,000) versus the state (1,855/100,000).[13]

- **Shortage of Behavioral Health Providers:** A common theme identified through key informant interviews suggests that Gloucester has a shortage of behavioral health providers that accept public insurance.[14]

Analysis of Administrative Data

In addition to reviewing the results of the CHNA, the project team analyzed hospital administrative data for patients who were readmitted to the hospital. Given the shared organizational leadership between Addison Gilbert and Beverly hospitals, the analysis was done simultaneously across the two facilities. Analysis of Addison Gilbert Hospital's 2013 administrative data validated the needs of the community as indicated by the CHNA. For example, 47 percent of readmitted patients to Beverly Hospital had a behavioral health comorbidity, compared to 67 percent at Addison Gilbert Hospital. For Medicaid patients at Addison Gilbert, 78 percent had a behavioral health comorbidity.[15] Moreover, COPD, degenerative nerve disorders, heart failure, renal failure, and pneumonia together accounted for the majority of the readmissions in volume.

The results of the CHNA assessment and analysis of hospital administrative data underscored the importance of equipping the HRIT with team members with expertise in chronic disease management and mental health counseling. The data, particularly regarding access to providers, also supported use of an access services representative to coordinate, schedule, and track post-discharge provider visits.

Patient and Family Caregiver Interviews

The project team employed a variety of data collection tools to monitor the program and adapt its design over time. One important tool was a structured assessment guide used by HRIT social workers to interview readmitted patients in the high-risk cohort. The assessment tool helped social workers identify and better understand the reasons for each patient's readmission. The goal of the interviews was not to assign blame for the readmission, but to discover opportunities to improve care.

Readmitted patients were asked a number of questions about the clarity of instructions they received on diet and medications before leaving the hospital, whether they were able to see their doctor after discharge, and if they had any problems scheduling appointments. Patients were also asked whether there was anything that could have been done differently to help keep them out of the hospital.

Project Dashboards and Data Analysis

During the nine months of the HRIT program (April to December 2014), Addison Gilbert Hospital was able to track the needs and service utilization patterns of high-risk patients discharged from the hospital to better understand the challenges of serving the population better. The HRIT used a tracking sheet to monitor their follow-up calls, recommendations, and interventions with discharged patients. Notes from the calls were logged into the patient's medical record. Working in collaboration with the performance improvement team who pulled administrative data, the results of the data collection efforts were incorporated into weekly dashboards. Over the course of the pilot, data collection expanded to include a variety of data points including medication count, discharge disposition, 30-day readmission rate, length of stay, and a "comeback report" tracking when patients tend to reappear. (See Appendix A: High Risk Intervention Team Dashboard.)

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12   Lahey Health. Community Health Needs Assessment: Executive Summary for the City of Gloucester, Massachusetts. 2012. Available from: http://www.beverlyhospital.org/media/645906/gloucester%20comm%20health%20needs_1.pdf

13   Lahey Health. Community Health Needs Assessment: Executive Summary for the City of Gloucester, Massachusetts. 2012.

14   Lahey Health. Community Health Needs Assessment: Executive Summary for the City of Gloucester, Massachusetts. 2012.

15   Northeast Hospitals. CHART 1 Work Product 2: Northeast Hospitals Readmission Data Analysis, January – December 2013. 2014 Jul 30.

Addison Gilbert Hospital's ongoing efforts to collect and monitor HRIT data provided some valuable insights on the experiences of high-risk population who were discharged:[16]

- **Medications regimens:** Post-discharge, 37 percent of high-risk patients were taking 16-35 medications and 31 percent were taking 11-15 medications daily. For some patients, this included a variety of medication types including inhalers, injections, or oral medications. Medication regimes were often complex and time consuming resulting in patient and caregiver confusion and non-compliance.

- **Readmissions:** 26 percent of high-risk patients were readmitted within 30 days of discharge.

  o **Medication Inaccuracies:** Of patients who were readmitted, 79 percent had omissions or inaccuracies in their home medication list.

  o **Referral for Readmission:** Of patients who were readmitted, 22 percent were referred by their PCP, rehabilitation facility, or visiting nurse.

- **Patient Outreach:** Since the program began, high-risk patients have received an average of 35 touches (e.g., telephonic or in-person contact) per patient by one or more members of the HRIT, with one patient receiving 148 touches. Patients who are homeless, have substance use disorders or are in both categories are among those who receive the highest number of touches.

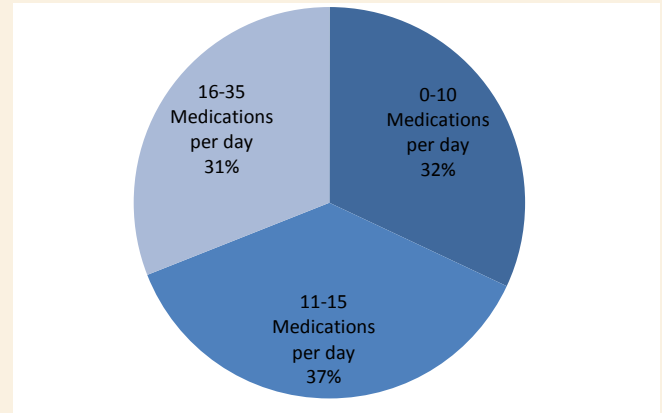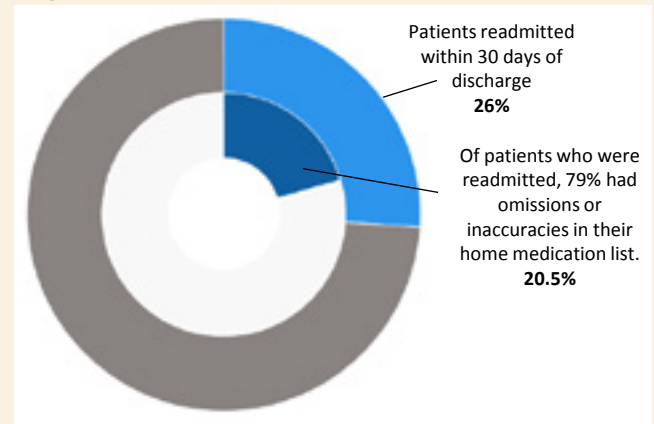Figure 1: Post Discharge Medication Regimens: Addison Gilbert High Risk Patient Cohort

Figure 2: Readmissions: Addison Gilbert Hospital, High Risk Patient Cohort

Patients readmitted within 30 days of discharge **26%**

Of patients who were readmitted, 79% had omissions or inaccuracies in their home medication list. **20.5%**

Results

As a result of the information about the high-risk population gathered through Addison Gilbert Hospital's extensive quantitative and qualitative data collection and analysis under CHART Phase 1, the hospital is incorporating a variety of program design refinements and investments with the support of CHART Phase 2 funding, including the following:

- **Risk Assessment:** The project team believes it can improve its current risk assessment of patients by identifying subsets of patients with exceptional medical and social needs, including homelessness or mental health or substance use disorders. The hospital will use an automated system to collect that data and will run regular risk assessment reports.

- **Medication Management:** Addison Gilbert Hospital will enhance support for medication management and compliance by adding a pharmacy technician to the HRIT. The pharmacy technician will collect home medication lists, check for allergies, and support the work of clinical pharmacists who do medication reconciliation, therapy management and education.

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16   Addison Gilbert Hospital. Narrative Summary Report to HPC. 2014 Sept 30. (Note: Data reported reflect April-July 2014.)

- **Home Visits:** The HRIT will also make post-acute home visits during Phase 2 of the program in order to further improve outcomes and reduce cost by coordinating care across care transitions. The results of Phase 1 data collection suggest that many patients are unable to fully comprehend all of the information discussed with them about their condition while they are in the hospital. This is a contributing factor in patient non-compliance with post-discharge care instructions. Continued readmissions by patients in the HRIT pilot as well as referrals to inpatient care by community providers suggest there is a need for structured follow-up once the patient leaves the hospital. The goal is to ensure the care plan is thoroughly implemented and issues or questions are communicated in a timely manner.

- **Health Information Technology:** Addison Gilbert Hospital will incorporate enabling technologies to ensure accurate information exchange with other providers and community partners to improve access to patient information—with attention to Health Insurance Portability and Accountability Act (HIPAA) security and privacy requirements—and achieve greater care coordination. Addison Gilbert Hospital will utilize health technologies in patients' homes and in the hospital to monitor high-risk patients, simplify medication management, ensure medication adherence, and promote patient education in self-management.

- **Staff Training:** Staff training and education will include team training for the HRIT and discharge/ "teach back" training for nurses and pharmacists. It will also be comprised of training in integrated care management and motivational coaching for the HRIT, inpatient social workers, case managers, and pharmacists.

Beverly Hospital: Data-Driven Planning for Reducing Readmissions among a High-Risk Population

Beverly Hospital received a $65,000 CHART Phase 1 award to support strategic and operational planning related to an identified community need of reducing unneccesary hospital utilization for cardiovascular issues and reducing readmissions for high-risk patients. The project resulted in the development of service delivery transformation business and operational plan to reduce unnecessary acute care utilization. The project team included hospital clinical and performance improvement leadership as well as project management staff.

Beverly Hospital leadership recognized that to reduce readmissions among high-risk patients, they needed to have a thorough understanding of this population at their hospital, including the presenting and underlying reasons for readmissions. With guidance and tools from the HPC, hospital leadership and staff conducted an in-depth review of their administrative data around readmitted patients and interviewed patients, caregivers, and providers.

Beverly Hospital

Beverly Hospital is a full service, 221-bed, community hospital providing quality, patient-centered care to residents in 13 communities on the North Shore and Cape Ann. Its services include maternity, pediatrics, surgical, orthopedics, cardiology, as well as several other specialties. The hospital has a medical staff of more than 500 physicians and its service area includes 13 communities. Beverly Hospital and Addison Gilbert Hospital share organizational, clinical, and operational leadership. Both hospitals are part of the Lahey Health System formed in 2012.

Analysis of Administrative Data

Beverly Hospital's project scope was initially envisioned to focus on cardiovascular readmissions given extensive attention paid to the congestive heart failure population in research literature,[17] public reporting of hospital readmissions for heart failure patients, and Medicare payment penalties associated with heart failure readmissions. At the time Beverly Hospital's project began in early 2014, clinical and performance improvement leaders were already regularly tracking the hospital's all-cause, all-payer readmission rate (13 percent) and had participated in

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17   Jencks S, Williams M, Coleman E. Rehospitalizations among patients in the Medicare fee-for-service program. N Engl J Med. 2009 April; 360(14):1418-1428.

the State Action on Avoidable Rehospitalizations (STAAR) initiative, which aimed to reduce hospital readmissions in three states, including Massachusetts.[18]

The CHART program encouraged the project team to analyze their hospital readmissions data across a variety of domains including discharge diagnosis, readmissions by discharge disposition (e.g., skilled nursing facility, home with services, home without services), payer, and comorbid behavioral health conditions. The HPC provided the project team with a template to populate with data across the various domains, including an analysis of high-utilizers (patients who were hospitalized three or more times in the prior 12 months). (See Appendix B: Readmission Data Analysis Template.)

"Our all-cause readmission rate was in line with other hospitals, so it didn't raise any red flags," explained Carol Jones, Director of Performance Improvement and Quality, in describing earlier analyses of Beverly Hospital's readmissions data. But once the project team began to do the analytic work required to populate the template, they realized the tool was asking them to look at data in a new way. "We always thought [the source of readmissions] was older chronic disease patients, but the answer was more nuanced," said Jones.

Analysis of the hospital's 2013 administrative data revealed the following findings (Table 1)[19]

- **Respiratory and Cardiac Conditions:** Overall, the top discharge diagnoses for readmitted patients were related to respiratory conditions and heart failure/cardiac disease.

- **Behavioral Health:** 47 percent of patients who were readmitted had a behavioral health comorbidity.

- **Skilled Nursing Facility and Home Care Services:** 17 percent of patients discharged to a skilled nursing facility and 16 percent of patients discharged home with home care services were readmitted.

- **High Utilizers:** A high utilizer population existed within the Northeast Hospital System (Beverly Hospital and Addison Gilbert Hospital) with 284 Medicare patients hospitalized, on average, 5.2 times per year and 71 Medicaid patients hospitalized, on average, 5.0 times per year.

Table 1: Beverly Hospital: 30-Day All-Cause Readmission Analysis (2013) – Selected Measures

	Medicare	Medicaid	Uninsured	Total*
Total number of discharges alive (exclude transfers, deceased, <18yrs, obstetric)	6,391	1,220	127	14,999
Total number of individual patients	4,991	773	59	7,767
Total number of 30-day readmissions	999	154	7	1,379
Overall readmission rate	15.6%	12.6%	7.2%	13.2%
Discharge disposition:**				
a. Home (no home health)	243 (13%)	91 (11%)	6 (7%)	486 (10%)
b. Home with home health	344 (18%)	23 (12%)	0 (0%)	417 (16%)
c. Skilled nursing facility	333 (18%)	11 (19%)	0 (0%)	352 (17%)
Percent of all readmitted patients who had a behavioral health diagnosis	48%	51%	43%	47%
High-utilizing population:***				
a. Number of people hospitalized three or more times in past 12 months	284	71	0	410
b. Number of hospitalizations	1,486	358	0	2,033
c. Average number of hospitalizations	5.2	5.0	0	5.0

* Total values do not include the commercially-insured population.
** Other settings not represented include hospice.
***Values for Northeast Hospital System (Beverly Hospital and Addison Gilbert Hospital)

18   For more information on the State Action on Avoidable Rehospitalizations (STAAR) initiative, see: Marks C, Loehrer S, McCarthy D. Hospital Readmissions: Measuring for Improvement, Accountability and Patients. Commonwealth Fund. Sept 2013. Available from: http://www.commonwealthfund.org/~/media/Files/Publications/Issue%20Brief/2013/Sep/1703_Marks_hosp_readmissions_ib_FINAL_v3.pdf
19   Northeast Hospitals. CHART 1 Work Product 2: Northeast Hospitals Readmission Data Analysis, January – December 2013. 2014 Jul 30.

The team also found value in mining their data using tools provided to them through their participation in the University HealthSystem Consortium (UHC). UHC gives each of its participating members the ability to share clinical, safety, operational, and financial data and allows users to compare performance against peer hospitals. This data source allowed the project team to stratify readmissions rates for specific populations and look at comparable benchmarks across other peer hospitals.

Patient and Family Caregiver Interviews

The project team at Beverly Hospital also sought to supplement their understanding of the high-risk population through interviews of patients, family caregivers, and providers. Patient advocates, who are staff members within the hospital, conducted approximately ten interviews with patients who had been readmitted (and their caregivers, if present) to better understand the root causes of the readmissions. The interviews revealed the following:[20]

> *"Billing data aren't going to tell you whether a patient needed a pharmacy intervention, needed a place to live, or couldn't afford their medications."*
>
> *- Jean Alden-St. Pierre, Project Manager, Addison Gilbert Hospital*

- **Patient Expectations:** Patients viewed a hospital readmission as a normal part of the course of their disease. Patients often did not make the connection between medication, diet, and compliance with other care instructions and their acute care readmission.

- **Medication Challenges:** Patients struggled significantly with compliance with prescription regimens due to several factors including financial challenges in filling prescriptions, knowledge gaps about adherence, and difficulty managing multiple medications.

- **Nutrition:** Diet restrictions were a source of confusion. For example, patients who were asked to maintain a low-sodium diet often did not understand what foods they should and should not eat.

- **Caregiver Supports:** Caregivers wanted to be involved, but they did not always receive the information they needed to support their loved ones in compliance with care plans at home, or the wrong individual was given information.

- **ED Utilization and Primary Care Access:** Insufficient access to primary care was not a driver of ED utilization. Instead, the project team found that the primary care provider often had referred the patient to the ED.

These interviews validated and expanded the project team's understanding of the causes for readmissions. "Billing data aren't going to tell you whether a patient needed a pharmacy intervention, needed a place to live, or couldn't afford their medications," said Jean Alden-St.Pierre, Project Manager, Addison Gilbert Hospital. "It's a different story when you start looking at specific patients."

Provider Interviews

The project team also interviewed a sample of primary care providers and hospitalists to gather their perspectives on why patients were being readmitted. In addition to suggesting operational and communication issues, clinicians pointed out that high-risk patients tend to have socioeconomic barriers, such as homelessness or financial hardship, that contribute to non-compliance with medications, diet, and follow-up instructions. Clinicians identified these as important factors contributing to readmissions.

Results

As a result of efforts to better understand the root causes of readmissions at Beverly Hospital using locally-derived quantitative and qualitative information, the project team was better able to inform the hospital's operational plan

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20   Beverly Hospital. CHART 1 Planning Report. 2014 Aug 18.

to implement a High Risk Intervention Team (HRIT). Initially, the project team was focused on addressing the needs of heart failure patients over age 65. Based on analysis of the hospital's own administrative data and patient, caregiver, and provider interviews, planners shifted the target high-risk population in their community to include individuals who have a comorbid behavioral health diagnosis, are homeless, or who are otherwise determined to be high-risk such as high-utilizers.

Moving into implementation, Beverly Hospital's HRIT will include individualized and patient-centered care management, medication management and reconciliation, and follow-up through home visits. Among other priorities, the HRIT will seek to address many of the underlying behavioral health issues that made follow through with post-discharge appointments and self-care difficult. Care managers and an HRIT clinical pharmacist will also help patients follow through on intended medication regimens by addressing barriers including financial issues, transportation challenges, misunderstanding of medications, duplications and missing prescriptions, etc. Staff training and education will focus on helping nurses and pharmacists use "teach back" techniques and motivational coaching.

Hallmark Health System: Medical Record Review to Design, Develop, and Implement Clinical Practice Guideline for Prescribing Opioids in the ED

Hallmark Health System received two CHART Phase 1 awards totaling $750,000 to implement a pilot program to prevent and reduce the rate of opioid use for patients presenting in their emergency departments and urgent care center with lower back pain. The pilot was implemented at Hallmark Health System's two sites: Lawrence Memorial Hospital and Melrose-Wakefield Hospital. The "prevent-detect-intervene-refine" model sought to enhance the clinical understanding of the connection between substance use disorders and pain management strategies, heighten prescriber awareness, and develop a new, integrated model for a coordinated community based care plan. The goals of the pilot program included:

> Hallmark Health System
> *The network of two hospitals, 400 physicians, 64 mental health clinicians, and other service providers serve nine communities in the metro-north/ Mystic Valley area of greater Boston. In the Hallmark Health System service area, there are six core towns consisting of Malden, Medford, Melrose, Reading, Stoneham, and Wakefield and three secondary towns of Everett, North Reading, and Saugus. Hallmark Health System is an active member of the Mystic Valley Public Health Coalition's Opioid Abuse Prevention Collaborative and the other substance use prevention coalitions.*

- Lowering the rate of opioid prescriptions for patients with back pain by developing a standardized approach to improving the care of patients who might require potentially addictive medication in ED or urgent care settings;

- Training providers on substance use disorders, pain management and alternatives to opioid prescriptions;

- Decreasing imaging rates for patients with back pain;

- Enhancing communication between ED and primary care providers; and

- Standardizing the use of the state's Prescription Drug Monitoring Program.

Community Health Needs Assessment

The prevalence of opioid-related ED visits and deaths has been a serious problem in the communities served by Hallmark Health System. Providers in the health system's EDs and urgent care center have increasingly been treating patients with opioid-related conditions. When Hallmark Health System's clinical and administrative leadership reviewed the results of its most recent CHNA from 2013, substance use disorders arose as one of the top health concerns in the service area (Table 2).

Looking at the nine individual towns in Hallmark Health System's service area, all had higher rates of opioid-related ED visits compared to the state, and all towns except North Reading had higher rates of opioid-related mortality. In addition, Everett, Malden, Medford, Saugus and Wakefield had a higher rate of alcohol and other substance-related ED visits.

Stakeholders interviewed as part of the CHNA described a need for increased substance abuse prevention and treatment services. Community surveys conducted for the CHNA identified substance abuse as a top community health concern, and respondents also indicated desire for increased substance abuse education and awareness. As opioids are the predominant medication class typically prescribed for back pain, Hallmark Health System decided that the intervention would focus on ED patients presenting with back pain.

Medical Record Review

Recognizing there was a local problem, Hallmark Health System, under the leadership of Chief Medical Officer Steven Sbardella, MD, sought to understand how and why decisions to prescribe opioids in the ED were being made. The project team developed a chart abstraction tool and scoring rubric. The team conducted an exhaustive medical record review to identify the patients, providers, and practice patterns that resulted in opioid prescriptions within their own system. The medical record review consisted of over 1,000 charts. The team discovered variation in practice patterns including uneven use of the state's Prescription Drug Monitoring Program by clinicians and inconsistent reasons for prescribing opioids to ED patients. The phenomenon of practice variation in medicine suggests that standards of care are not clear and that different physicians will adopt different approaches on the basis of their beliefs, training, and incentives.[21]

Clinical Practice Guideline Development

In order to address the variation that was apparent in results of the medical record review, Hallmark Health System leadership sought to develop and measure adherence to a clinical practice guideline for prescribing opioids to ED patients. From April to June 2014, the clinical practice guideline was implemented and monitored for 668 ED and urgent care patients who presented with low back pain. The guideline comprised a bundle of practices that included patient education, documentation of the need for an imaging study (if one was ordered), and documentation of the clinical rationale for not prescribing first and second course non-opioid medications. Prescribers were also directed to check the Massachusetts' online Prescription Drug Monitoring Program, which allows prescribers to view the prescription history of a patient for the past year. Additionally, prescribers were directed to check the Hallmark Health System ED record and the patient's primary care history for past use of opioids. If opioids were ultimately chosen as the appropriate course of treatment, prescribers needed to document the rationale and prescribe not more than a three-day supply.

Project Dashboards and Data Analysis

The development of the clinical practice guideline enabled Hallmark Health System to extract and compile metrics, which together represented the "elements of compliance bundle." This bundle served as a measure of complete adherence to the entire guideline. Individual elements from the compliance bundle were also monitored. The project team created dashboards that displayed how all providers were doing, so providers would have the opportunity to help their peers with the project. This was a key factor as Hallmark Health System employed the

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21   Hlatky M, DeMaria D. Does Practice Variation Matter? J Am Coll Cardiol. 2013;62(5):447-448

Plan-Do-Study-Act model during the project. The weekly reports provided an opportunity to correct course. Trends from the report, like those depicted in Figures 3 and 4 below, were used in conjunction with feedback from clinical teams to refine the care plan for treatment of patients with back pain.

"The data [were] live and always changing," reported Hallmark Health System in its final CHART Phase 1 report. "We found great success with being able to react to the data and adjust and tweak our behavior as it was happening. The quick capabilities in generating and reporting on this data and feeding them back to the providers were instrumental in the success of the project."

Figure 3: Use of the Prescription Monitoring Program increased at Lawrence Memorial when prescribing opioids to patients with back pain
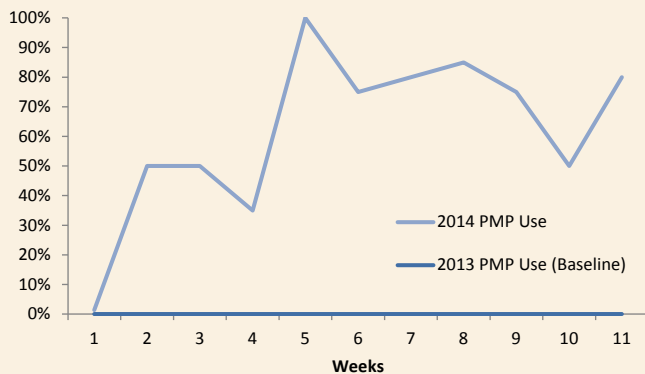
Figure 4: The Hallmark Hospitals reduced opioid prescription use by 26% from baseline at the Melrose-Wakefield Hospital Emergency Department and 43% at the Lawrence Memorial Hospital Emergency Department as of July 2014
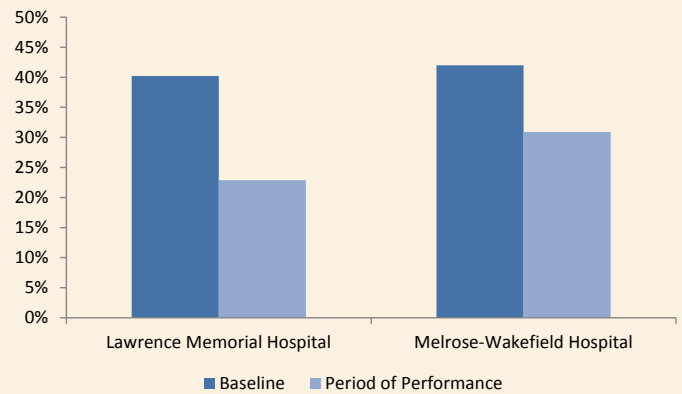
Results

CHART Phase 1 funding enabled Hallmark Health System to conduct an in-depth analysis of opioid prescribing patterns in the ED and begin to address the overall rate of opioid prescriptions. The data collected through the initial medical record review provided managerial and clinical insights that facilitated development of a clinical practice guideline and supported comprehensive workflow redesign. Through weekly dashboards, Hallmark Health System continued to review prescribing practices after the research and design phase.

The table below summarizes Hallmark Health System's compliance with the clinical practice guideline for patients who received opioids over the course of the project at Lawrence Memorial Hospital and Melrose-Wakefield Hospital. While there was some variation between the two sites, both experienced substantial declines in the overall opioid prescription rate for patients who presented with lower back pain between 2013 (baseline) and 2014.

Table 3: Hallmark Health System CHART Phase 1 Project Indicators

	Lawrence Memorial Hospital	Melrose-Wakefield Hospital
Total patients who presented with lower back pain to the Hallmark Health System EDs and urgent care center from April to June of 2014	267	401
Patients who received opioids:	50	95
Complete adherence to bundle compliance	60%	31%
Narcotic justification documentation	90%	84%
Imaging justification for patients who did not receive imaging studies	88%	86%
Documented use of the PDMP for patients receiving opioids	60%	36%
Documented review of past medical history	76%	43%
Documentation of type of medication, dosage and pill count	88%	81%
Narcotic prescription rate (2013 = baseline, 2014 = April to June)	2013: 40% 2014: 23%	2013: 42% 2014: 31%

Lessons Learned

The experiences of the hospitals highlighted in this case study provide several important lessons for other Massachusetts hospitals seeking to implement population health management approaches within their own communities. The following are lessons gleaned from experiences at the CHART hospitals, described above:

Locally-derived data can support sophisticated and rapid interventions that yield demonstrable improvements

The CHART hospitals in this case study each uniquely embraced use of local data to successfully design, develop, and implement strategies to address the needs of high-risk populations seeking care from their institutions. These hospitals stand out from the experiences of other CHART hospitals that faced barriers in planning and implementing interventions. For example, one CHART hospital waited on payer claims data for much of the Phase 1 project period, and the delay substantially hindered its ability to plan and test an intervention. Hallmark Health System, by contrast, was able to demonstrate how a hospital can collect and use its own data to rapidly implement a population health management intervention with demonstrable results on opioid prescribing patterns in the ED. Moreover, data collection efforts need not be large to learn valuable insights. Beverly Hospital conducted approximately ten in-depth patient and family caregiver interviews to gain important information about the reasons why patients returned to the hospital following discharge, and this information was valuable in developing its HRIT operational plan.

Programmatic design and care interventions should evolve based on rigorous and continuous analysis

The hospitals described in this case study were particularly adept at analyzing data and being open to new conclusions based on what they were learning. Beverly and Addison Gilbert Hospitals, for example, refocused their efforts to prevent readmissions to address not just older patients with chronic health conditions, but more specifically to address the needs of patients with comorbid behavioral health conditions and other high-risk social factors such as homelessness. By contrast, one CHART hospital not profiled in this study faced challenges when it did not refocus its intervention efforts after determining that its original project plan did not address the specific needs of the hospital's highest need population. In that case, the hospital's clinical and administrative leadership resisted changing their programmatic design and missed an opportunity to maximize the benefits of its investment in staff and financial resources.

For CHART projects in the implementation phase, Hallmark Health System and Addison Gilbert Hospital show how monitoring data trends and reporting on them helps clinical and non-clinical staff understand whether interventions are succeeding and modify responses to meet the needs of their target populations. Hallmark Health System employed the Plan-Do-Study-Act model during its project and used weekly dashboards to continually improve provider habits in the emergency department.

Multiple sources of quantitative and qualitative data should be used identify and validate community and individual patient needs

There is significant value in looking at multiple sources of quantitative and qualitative data to understand the root causes and needs of communities and individual patients. Hospital administrative data, for example, rarely explain the root cause of patient behavior. Beverly Hospital and Addison Gilbert Hospital used structured patient interviews to help identify and understand the economic and social factors that resulted in readmission—such as homelessness, inability to afford medications, or confusion over medication regimens. Similarly, Hallmark Health System combined the results of its CHNA and an in-depth medical record review to identify and prioritize opioid-related problems and interventions. Over time, Hallmark Health System will be able to monitor the impact of its intervention on community-level indicators of substance use disorders. These experiences illustrate that hospitals have access to a multitude of datasets and information that can be used to validate findings and influence population health management interventions.

Conclusion

As part of its statutory mandate, the HPC seeks to identify sustainable, scalable interventions that foster innovation and a positive return on investment. As CHART-funded hospitals continue into Phase 2, and as other hospitals engage in transformation initiatives, they may benefit from the examples and lessons presented in this case study. The HPC encourages hospitals to use local sources of data to test and implement interventions targeting high-risk, high-cost populations. In CHART Phase 2, all awardees are required to analyze their locally derived data to support a target population for their intervention.

The examples presented demonstrate that hospitals can move forward with data-driven population health management strategies and begin implementing delivery system reforms. As hospitals develop experience in these areas, they can bring their expertise and knowledge to bear in developing longer-term, data-driven partnerships and collaborations with other community providers, payers, and stakeholders.

Appendix A: Addison Gilbert Hospital High Risk Intervention Team Dashboard

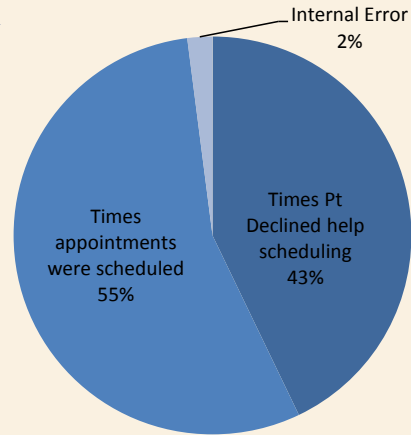## Figure A-1: Admission Statistics of 30 day Readmissions

Patients with readmissions 16%

Patients discharged less than 30 days ago 37%

Patients without readmissions 47%
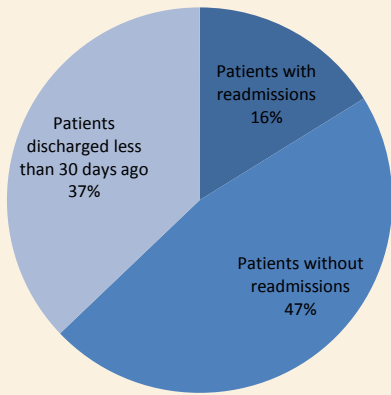
Figure A-2: PCP Appointment Booked for Eligible Population

Internal Error 2%

Times appointments were scheduled 55%

Times Pt Declined help scheduling 43%

Note: Patients went to 100% of appointments that were scheduled by HRIT staff.

Figure A-3: Alcohol/Substance Abuse

Yes* 25%

No 75%
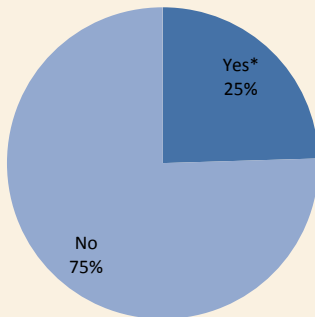
*Indicates current and former abuse/dependency.

Figure A-4: Nicotine Dependency

No 29%

Yes* 71%
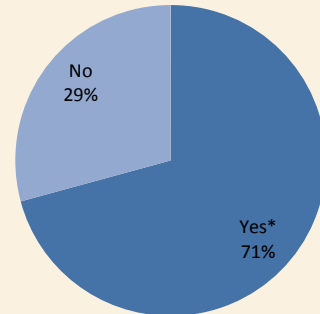
*Indicates current and former abuse/dependency.

Figure A-5: Length of Stay through 8/1/14
Average LOS: 3.8 nights

Number of Patients (y-axis: 0, 5, 10, 15, 20, 25, 30, 35)

Nights (x-axis: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25)
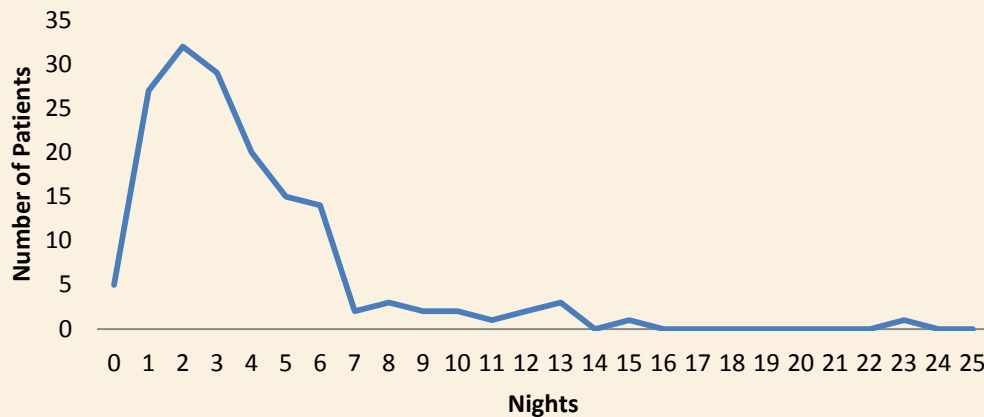
APPENDIX B: READMISSIONS DATA ANALYSIS TEMPLATE[i]

Use the most recent 12 months of data available, calendar or fiscal year. Identify readmissions as any return to the inpatient setting for any reason within 30 days of discharge from the inpatient setting. This analysis is for non-obstetric, non-pediatric, adult medical/surgical/behavioral health patients. Exclude discharges that are coded as deaths or transfers to another acute care hospital.

Data Element	Medicare	Medicaid	Self-Pay	Total
1. Total number of discharges alive (exclude transfers, deceased, <18yrs, obstetric)				
2. Total number of individual patients				
3. Total number of 30-day readmissions				
4. Overall readmission rate (#3/#1)				
5. Discharge disposition (from #1): a. Home (no home health) (#, %) b. Home with home health (#, %) c. Skilled nursing facility (#, %)				
6. Average number of days between discharge and readmission for all readmissions, days 0-30 (or #, % of readmissions within 0-6, 7-14, 15-30 days, respectively)				
7. Top 10 discharge diagnoses resulting in readmission (based on index DRG) a. List top 10 diagnoses b. Report number of readmissions per diagnosis c. Report readmission rate per diagnosis (readmissions for diagnosis/discharges for diagnosis)				
8. Top 10 readmission discharge diagnoses (based on readmission discharge DRG) a. List top 10 diagnoses b. Report number of readmissions per diagnosis c. Report % of all readmissions accounted for by each top 10 readmission diagnosis				
9. Proportion of top 10 readmission diagnoses as a percentage of all readmissions (sum of readmissions in top 10/total readmissions)				
10. High-utilizing population (H.U.) a. Number of people hospitalized three or more times in past 12 months (H.U.) b. Number of hospitalizations among H.U. c. Discharge disposition of H.U. (home, home health, skilled nursing facility) d. Top 10 discharge diagnoses among H.U. 30-day readmission rate among H.U.				

i   United States of America. Agency for Healthcare Research and Quality. Hospital Guide to Reducing Medicaid Readmissions. Available from: http://www.ahrq.gov/professionals/systems/hospital/medicaidreadmitguide/medread-tools.pdf

About the Authors

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Sharon Silow-Caroll, MBA, MSW, is a managing principal at Health Management Associates with more than 20 years of experience in health policy research and analysis. She works with foundations, government entities, and private stakeholders to identify, assess, or evaluate health system payment and delivery reforms; strategies by hospitals and health plans to improve quality and performance; and initiatives to improve access to care and meet the needs of underserved populations. Prior to joining Health Management Associates, Sharon was senior vice president at the Economic and Social Research Institute, where she directed and conducted research studies and authored numerous reports and articles on a range of health care issues.

Tom Dehner, JD, is a managing principal at Health Management Associations working with states, health plans, providers and foundations in the areas of health care policy and operations, health reform implementation, and strategic planning. Tom was previously director of the Massachusetts Medicaid program, where he oversaw the MassHealth program covering 1.1 million members, a $9 billion budget and a workforce of more than 800 people. He led federal approval and implementation of the Medicaid-related components of the Massachusetts health care reform law and was on the board for the Commonwealth Health Insurance Connector. Tom has served on the executive committee of the National Association of State Medicaid Directors, the board of directors of the Boston Health Care for the Homeless Program, and the advisory committee of the Massachusetts Medicaid Policy Institute.