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# **Evaluation of the Extended Medicare Care Management for High Cost Beneficiaries (CMHCB) Demonstration: Massachusetts General Hospital (MGH)**

## **Final Report**

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EVALUATION OF THE EXTENDED MEDICARE CARE MANAGEMENT FOR HIGH  
COST BENEFICIARIES (CMHCB) DEMONSTRATION: MASSACHUSETTS GENERAL  
HOSPITAL (MGH)

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## EXECUTIVE SUMMARY

The purpose of this report is to present the findings from RTI International's evaluation of the Massachusetts General Hospital (MGH) and the Massachusetts General Physicians Organization (MGPO) Care Management Program (CMP) operated under the Center for Medicare & Medicaid Services' (CMS) Care Management for High Cost Beneficiaries (CMHCB) demonstration. On July 6, 2005, the CMS announced the selection of six care management organizations (CMOs) to operate programs in the CMHCB Demonstration. These programs offered a variety of models, including "support programs for healthcare coordination, physician and nurse home visits, use of in-home monitoring devices, provider office electronic medical records, self-care and caregiver support, education and outreach, behavioral health care management, and transportation services" (CMS, 2005).

On January 13, 2009, CMS announced that it was granting 3-year extensions (Phase II), subject to annual renewal, for three participants in the CMHCB Demonstration that had demonstrated some success managing the care of their selected beneficiaries: Key to Better Health, a division of Village Health; MGH Care Management Program; and Robert Bosch Healthcare System's Inc.'s Health Buddy<sup>®</sup> Program. In Phase II, MGH expanded their program to two additional institutions within the Partners' network: North Shore Medical Center (NSMC) and Brigham and Women's and Faulkner Hospitals (BW/F). MGH was responsible for program expansion implementation during Phase II.

MGH's CMHCB demonstration program involves providing practice-based care management (PBCM) services to high-cost Medicare fee for service (FFS) beneficiaries. Care managers, who are assigned to each MGH physician office, develop relationships with program participants to provide support across the continuum of care. The MGPO, the largest multi-specialty group practice in New England, provides the overall administration and underlying structure in delivering integrated care management services under the CMP. Care managers provide patient education and connect patients with resources to address medical and psychosocial needs to help prevent acute exacerbations of disease and associated inpatient admissions and emergency room visits. The program also includes components to address mental health issues, evaluate complex pharmaceutical regimens, and support end-of-life decision making.

In addition to improving the quality of care and outcomes for Medicare beneficiaries, MGH's CMP aims to improve the quality of work life of primary care physicians and ultimately attract more physicians to the field of primary care. It is one of several initiatives in development at MGH to improve the challenging work life of primary care physicians. Ultimately, these initiatives are part of a larger vision for Partners to restructure the model for primary care practice characterized by high patient and physician satisfaction, work flow and process improvement, and the delivery of evidence-based care.

The principal objective of the CMHCB demonstration is to test a pay-for-performance contracting model and new intervention strategies for Medicare fee-for-service (FFS) beneficiaries, who are high cost and/or who have complex chronic conditions, with the goals of reducing future costs, improving quality of care and quality of life, and improving beneficiary and provider satisfaction. The desired outcomes include a reduction in unnecessary emergency

room visits and hospitalizations, improvement in evidence-based care, and avoidance of acute exacerbations and complications. In addition, this demonstration provided the opportunity to evaluate the success of the “fee at risk” contracting model, a relatively new pay-for-performance model, for CMS. This model provided MGH’s CMP with flexibility in its operations and strong incentives to keep evolving toward the outreach and intervention strategies that are the most effective in improving population-based outcomes.

The overall design of the CMHCB demonstration follows an intent-to-treat (ITT) model, and like the other demonstration programs, MGH’s CMP was held at risk for its monthly management fees based on the performance of the full population of eligible beneficiaries assigned to its intervention group and as compared with all eligible beneficiaries assigned to its comparison group. Beneficiary participation in the CMHCB demonstration was voluntary and did not change the scope, duration, or amount of Medicare FFS benefits received. All Medicare FFS benefits continued to be covered, administered, and paid for by the traditional Medicare FFS program. Beneficiaries did not pay any charge to receive CMHCB program services.

Our evaluation focuses upon three broad domains of inquiry:

**Implementation.** To what extent was MGH able to implement its Phase II CMP?

**Reach.** How well did the Phase II MGH CMP engage its intended audiences?

**Effectiveness.** To what degree was the Phase II MGH CMP able to improve health outcomes and achieve targeted cost savings?

Organizing the evaluation into these areas focuses our work on CMS’s policy needs as it considers the future of population-based care management programs or other interventions in Medicare structured as pay-for-performance initiatives. We use both qualitative and quantitative research methods to address a comprehensive set of research questions within these three broad domains of inquiry.

## **E.1 Scope of Implementation**

MGH launched its Phase II MGH CMP CMHCB Demonstration on August 1, 2009. Phase II began on February 1, 2010 for BW/F and on March 1, 2010 for NSMC. MGH worked with its CMS project officer and analysts from Actuarial Research Corporation (ARC) to develop a methodology for selecting the populations for the Phase II MGH CMP CMHCB Demonstration. Beneficiary selection for all three institutions was based on the patient selection criteria developed by MGH, including annual cost, loyalty, and risk criteria. Detailed discussion of the identification of the intervention and comparison populations for each of the three institutions is provided in *Supplement 1A*.

For Phase II, six new cohorts of beneficiaries were drawn – Phase II original population for MGH, BW/F, and NSMC followed by a Phase II refresh for all three institutions. Further, MGH’s Phase I beneficiaries could continue participating in the CMP demonstration as long as they continued to meet demonstration eligibility criteria. For Phase II, we evaluated the performance of four cohorts of CMP beneficiaries: Cohort 1 comprised of 1,686 MGH beneficiaries that continued from the Phase I original population; Cohort 2 comprised of 2,321

MGH Phase I refresh and Phase II original and refresh beneficiaries; Cohort 3 comprised of 1,363 BW/F Phase II original and refresh beneficiaries; and Cohort 4 comprised of 1,619 NSMC Phase II original and refresh beneficiaries. These beneficiaries met a set of inclusion criteria developed by MGH and were determined to have received the plurality of their primary care from the respective institutions and had at least one day of eligibility during the baseline period and 3 months of eligibility during Phase II. Performance was evaluated against four groups of propensity score matched comparison beneficiaries drawn from similar geographic areas as the three institutions and who met the same set of inclusion criteria: Cohort 1 comprised of 1,659 MGH comparison beneficiaries that continued from the Phase I original population; Cohort 2 comprised of 2,291 MGH Phase I refresh and Phase II original and refresh comparison beneficiaries; Cohort 3 comprised of 1,380 BW/F Phase II original and refresh comparison beneficiaries; and Cohort 4 comprised of 1,675 NSMC Phase II original and refresh comparison beneficiaries. All 4 cohorts in the Phase II MGH CMP Demonstration had very high participation rates, ranging from 89% for Cohort 1 to 90% for Cohorts 2 and 3 and 93% for Cohort 4.

At the start of Phase II, MGH accrued a monthly fee of \$123 (an increase from \$120 during Phase I) for each intervention group member who was a participant and eligible for the demonstration (at least one day during the month). The monthly fee was increased to \$126 in August 2010 and then to \$129 in August 2011. The savings threshold remained 5% for the Phase I original cohort and 2.5% for all other cohorts.

## **E.2 Overview of the MGH, BW/F, and NSMC Care Management Programs**

MGH's CMP is a provider-based care management program intended to provide an enhanced level of care to a high-risk patient population through comprehensive outpatient practice-based care management. The core element of MGH's CMP is the one-on-one relationship between patients and their practice-based care managers, supplemented by support received from the program's mental health, pharmacist, and end-of-life components. MGH's CMP is designed so that care managers become staff members of primary care physician practices. According to MGH leadership, this association with the primary care provider engenders patient trust and willingness to discuss health care and psychosocial problems with these nurses. Care managers developed relationships with patients over time through telephone calls and in-person interactions during physician office visits or at the hospital, if they are admitted for an inpatient service. Care managers also conducted visits to patient homes on an as-needed basis. Overall, care managers assessed patient needs, collaborated with physicians to develop treatment plans, educated patients about options for medical treatment and support services, facilitated patient access to services, and supported patient self-management of medical conditions.

Care managers conducted a comprehensive assessment to evaluate the unique needs of each patient. Care managers focused the assessment on issues that were relevant to each patient and evaluated medical and psychosocial problems, the resources used to address these issues, and patient needs for additional support. The tool used to conduct these assessments was developed by MGH and includes several externally validated instruments, such as questions to evaluate challenges encountered with activities of daily living (ADL). Using information collected from the assessment, care managers developed a care plan for each patient in

conjunction with the primary care provider and the practice's clinical team. They implemented care plans over time by addressing urgent patient issues, conducting patient education, and providing referrals to support services. Throughout the program period, care managers continued to evaluate patients as their issues and need for support evolved over time.

Care managers educated patients about resources available and lifestyle changes that could help to prevent exacerbations of disease and to prevent or delay hospitalization. They reviewed self-management activities, such as getting exercise and eating a low-salt diet, during a series of calls over a week or two to help patients adopt new behaviors. Care managers also educated patients about the purpose of their medications and other treatment interventions to help increase patient adherence to care plans.

Care managers also facilitated coordination of patient care across the continuum of health care services. They received paged messages when their patients were admitted to the emergency room and an email indicating an inpatient admission. Using these real-time alerts, care managers could visit their patients in the hospital and research the cause of the hospitalization to inform refinements to the patient's care plan that may prevent future inpatient stays. Following hospital discharge, care managers contacted patients to make sure that they understood and could comply with discharge plans and coordinated with home health care providers to stay informed of patient health status.

Care managers also facilitated patient access to health care resources through patient education and referrals to other hospital or community services. For example, they informed patients that instead of going to the emergency room if they have a health problem, they could contact the physician's office at any time and may be able to see the doctor on the day of the call. Each week care managers received a list of patients scheduled to attend a physician office visit, and care managers contacted patients prior to their scheduled physician visits to find out if they needed assistance with transportation to the office. In addition, care managers followed up with patients via telephone if they missed their appointments to determine the issues involved and to provide support needed for patients to see their physician.

MGH enlisted physician support to help ensure the success of its CMP in providing high-quality care to patients. Physicians were asked to conduct the following activities: encourage beneficiaries to participate in the program and enroll them in the program when possible; collaborate with care managers to review initial assessment findings and develop care plans for each patient; inform care managers about patient events and refinements to patient care plans during the demonstration period; and discuss advance directives with enrolled patients.

### **E.3 Overview of the MGH, BW/F, and NSMC Care Management Programs**

MGH introduced a number of changes and enhancements to its MGH CMP program and operations and added two additional CMPs for Phase II. While the three CMPs were evaluated as one program overall, we describe the changes to the MGH CMP and a description of the BW/F and NSMC CMPs.

### **E.3.1 MGH CMP Changes**

#### *Components and Delivery Process.*

MGH implemented several programmatic changes to enhance the CMP during Phase II. To improve the efficiency of tracking and monitoring, it developed a skilled nursing facility (SNF) tracking component to monitor beneficiaries admitted to SNFs with the primary goal of reducing unnecessary readmission to MGH. It also adopted Morrissey Continuum, a database for tracking enrollment and patient-level activity, and added two monthly patient-level reports pertaining to admissions and high cost beneficiaries. Internal data were used to prepare monthly reports for staff on high cost beneficiaries and beneficiaries who were readmitted during the prior month.

Program staff made efforts to improve communication with providers by including Physician Advocates (i.e., physicians appointed as liaisons to facilitate communication between the practice and CMP project staff) in case reviews on a rotating basis. CMP staff also began more aggressive outreach to non-acute providers including nursing facilities, long-term acute care (LTACs) facilities, and elder service agencies in metro Boston, to identify common patients, develop a communication protocol, and participate in the discharge planning process.

The program piloted a pre-discharge medication review with beneficiaries on three floors at MGH in an effort to facilitate medication reconciliation and beneficiary education about their prescriptions. The pre-discharge visit entailed the Pharmacist identifying in-house medication changes, communicating with the beneficiary's Care Manager on the day of discharge, and reviewing the list of medications, instructions, and any changes with the beneficiary. Within 24–72 hours post-discharge, the Pharmacy Assistant called the beneficiary to see how the beneficiary was doing with their medication management.

The SNF waiver program marked another noteworthy initiative implemented during the extension period. CMS approved a request submitted by MGH that eliminated the 72-hour inpatient stay eligibility requirement for using Medicare benefits to pay for skilled nursing services. The waiver targeted beneficiaries with non-acute conditions (e.g., beneficiaries with a urinary tract infection) and those without a diagnostic dilemma that would otherwise require hospitalization. Although these beneficiaries required some acute care, intensive acute care was not needed, which potentially avoided additional unnecessary hospitalization costs. MGH expanded the waiver to BW/F and NSMC during the final year of the program. MGH developed a “telerounding” program enabling their CMP team to conference with the SNF teams on a weekly basis to analyze their patients in the waiver program. CMP staff reported that the process led to enhanced relationships with the SNFs. The effort served as a trigger institutionally for beginning the development of a preferred provider network with SNFs in northeast New England.

#### *MGH Staffing and Management*

MGH added a 0.25 FTE Associate Medical Director during Phase II to assist with daily operations and program development. The Medical Director maintained oversight of strategic initiatives and supported the expansion while the Associate Medical Director largely focused on

inpatient care and worked on continuity of care, pre-discharge planning and management of program participants without a MGH PCP.

Also new in Phase II, MGH hired a third clinical Social Worker and assigned Social Workers to specific primary care practices to allow the program to develop a multi-disciplinary team model for addressing beneficiaries' psychosocial needs. The team included the PCP, RN Care Manager, and Social Worker, as needed. The MGH CMP also supplemented the Community Resource Specialist with additional staff to allow for centralization of resources. The Community Resource Specialists operated primarily out of MGH; however, they also provided telephonic and virtual support to the BW/F and NSMC CMP staff and periodically visited the sites in-person. Other resources shared by MGH, BW/F, and NSMC included time of the MGH Care Manager Team Lead and Program Manager, a Data Analyst, and a small portion of an Information Systems Specialists' time to assist with Morrissey issues and infrastructure development.

Over the course of Phase II, MGH increased hours allotted for post-acute episode care management, increased the pharmacist's hours, and added additional RN Care Managers. Site visit participants noted that the embedded Care Managers added value to the entire office experience by being able to schedule patients for timely interventions and foster in-person relationships with patients and their PCP. The Care Managers ensured that PCPs were briefed about patients' recent medical issues prior the PCP visit, a service, which according to patient reports, improved patients' knowledge retention and resulted in more dynamic patient-provider conversations.

### **E.3.2 BW/F CMP Overview**

#### *Components and Delivery Process*

The CMP at BW/F was a collaboration sponsored by Brigham and Women's Hospital (BWH) and the Brigham and Women's Physician Organization (BWPO) and implemented across two institutions: BWH (a tertiary care teaching hospital) and Faulkner Hospital (a community teaching hospital) for high-risk, medically complex FFS Medicare beneficiaries in 11 BW/F primary care practices. Care Managers assisted beneficiaries with adhering to recommended treatments, accessing additional medical services and community resources, and navigating the health care system. In addition to the services provided by Care Managers, program participants also benefitted from the services provided by a Social Worker, Community Resource Specialist, and Pharmacist.

BW/F did not have any subcontractors or subsidiaries involved as part of its CMP. However, program leaders noted that their key partners included the array of providers who interfaced with their enrolled beneficiaries such as hospitalists and emergency department (ED) providers at BW/F. Membership of the BW/F CMP Leadership Committee included the core program management team (Medical Director, Program Manager, and Care Manager Team Lead), the Mental Health Team Lead, decision makers from BWPO, Primary Care, Care Coordination, Information Technology, ED, and Social Work.

The CMP at BW/F largely followed the same program model as the MGH CMP; however, some differences existed in IT capabilities, staff responsibilities, and staffing

allocation. Most, but not all of the IT systems at BWH and Faulkner hospital were linked. Post-discharge contacts were completed by RN Care Managers in the BW/F program and by a dedicated discharge nurse in the MGH program. Moreover, a larger number of RN Care Managers at BW/F worked with multiple practices. Working with three and, in one case, four practices presented an additional challenge for the Care Managers at BW/F. BWH and Faulkner Hospital mirrored one another in terms of Care Manager staffing.

The program augmented its staffing level to more adequately accommodate the needs of both beneficiaries and staff. Upon recognizing the prominence of mental health issues amongst their patient population, the program added a second social worker to support the care managers and to better meet the needs of beneficiaries.

The BW/F CMP had approximately 20 beneficiaries participate in the SNF waiver program. Primary conditions included falls, medical decompensation, and discharge from surgical day centers. Staff felt that it was very helpful for their high-risk population, ED care facilitators, and PCPs to have another discharge option besides returning home.

### *Staffing and Management*

Each BW/F CMP Care Manager was assigned to one or more of 11 primary care practices, with a case load of 200–250 beneficiaries per Care Manager. The 11 practices included approximately 130 physicians and 80 residents. BW/F leaders were each budgeted part time in the CMP and also held other positions within the organization. The BW/F CMP Medical Director oversaw the clinical and program operations in concert with the Care Manager Team Lead and the Project Manager. An Administrative Assistant provided support for operations and special projects.

Over the course of Phase II, BW/F CMP staff recognized the need for an additional part-time social worker based on the volume of mental health referrals and the intensity of the social worker's role and services. They also observed that the program was understaffed in the area of Care Managers. At the time of the closeout call, they reported a significant increase in staff size from 5 Care Managers and 2 Social Workers to 15 Care Managers in the practices with the intent to hire more social work staff. They also increased time of the Program Manager and Medical Director from part-time to full-time positions and increased the psychiatric support to a 0.4 FTE position.

### **E.3.3 NSMC CMP Overview**

#### *Components and Delivery Process*

In developing the CMP at NSMC, program leaders felt that they benefitted tremendously from MGH's previous experience. Similar to BW/F, NSMC used the core structure of the MGH CMP and made adaptations to more accurately reflect the North Shore environment. For example, Care Managers who were integrated into the PCP practices were employees of the North Shore Physician Group (NSPG), not NSMC, to allow the Care Managers to represent themselves as members of the PCP practice to beneficiaries and to further reinforce the PCP practice-based model concept. Another change targeted data monitoring. As a result of data lags associated with Medicare claims data, NSMC built a local database to track patients' movement

through the healthcare continuum, including ED, observation status, inpatient, sub-acute, and home.

A key finding from the analysis of NSMC data revealed an increase in use of LTAC facilities within the intervention group compared to comparison group use during the demonstration period. NSMC is physically connected to Spaulding Hospital for Continuing Medical Care/North Shore, an LTAC facility. NSMC CMP leaders expressed concern that patients discharged to Spaulding may have had longer lengths of stay than absolutely necessary to allow the LTAC facility to maintain its required average length of stay. CMP leaders reported that the NSMC Care Management Team Lead engaged in a collaborative process with Spaulding leadership to redesign the LTAC referral process such that a CMP participant's inpatient Care Manager, outpatient Care Manager, and the CMP Care Management Team Leader discussed a potential LTAC referral before it was made. They also added a hard stop in the computer system for the Spaulding screeners to notify the admissions staff that the potential referral involved a CMP participant. Ongoing discussion with CMP, hospital, and Spaulding staff continued until a decision was made about the transfer of a patient. The Care Management Team Lead noted that the collaboration led to a significant change in culture and that the process was very collegial.

In addition to improving communication with partnering organizations, Care Managers also increased efforts to provide more education and follow-up calls to congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD) patients to help program participants self-manage at home. NSMC CMP staff also made significant effort to enhance communication with hospitalists and between inpatient and outpatient Care Managers, areas that they felt they did not place sufficient emphasis on earlier in the program. Staff felt that Care Managers and hospitalists became more fully engaged. Care Managers better understood the value that the information they provided could have on the discharge plans, and hospitalists recognized the benefit that the information and services provided could have for their other patients who were CMP participants.

The SNF waiver marked another noteworthy addition to the NSMC CMP. NSMC had 16 SNF waiver participants with lengths of stay averaging 2–3 weeks. CMP staff described the relationship with the SNFs as collaborative and noted that they conducted telephonic rounds with four SNF waiver facilities to remain informed on patient status and to ensure appropriateness of lengths of stay. The majority of the SNF waiver cases involved orthopedic issues. NSMC encountered a few operational issues with the SNF waiver. Unlike MGH, NSMC did not have sufficient staffing to allocate a dedicated staff member to managing the SNF waiver cases. In addition, operationally, patients needed to be in the ED or in observation bed status in order to qualify for the waiver. CMP leaders found it difficult to institute the program given their very small population and the challenges posed by not fully integrating the assessment process into the workflow of the hospital.

### *Staffing and Management*

NSMC CMP Care Managers were assigned to work with a primary care practice and a caseload of approximately 200 beneficiaries. If the practice had more than 200 program participants, additional Care Managers were assigned to the practice. Part-time staff included a Medical Director, Associate Medical Director, Project Manager, Associate Project Manager, geriatric Psychiatrist, Pharmacist, and Administrative Assistant.

The CMP at NSMC staffing and management structure was quite similar to that of BW/F and MGH. However, differences did exist, including NSMC's use of a Post-Episode Care Manager to assess beneficiaries post-discharge from the hospital, as opposed to BW/F's use of Care Managers. Moreover, NSMC and MGH used the term "Mental Health Care Manager" to describe the licensed Social Workers that served as the program's link to the mental health team, whereas BW/F used the term "Clinical Social Worker" for the same position.

NSMC CMP staff reported minimal staff turnover within the program; however, one Care Manager was replaced within the first week of program implementation and another Care Manager moved out of state. A per-diem Care Manager was added in 2011 to assist with SNF Waiver implementation and post-episode assessments. At the time of the program closeout call, NSMC reported that they had increased the number of Care Managers from 6 Care Managers in 12 practices to 15 Care Managers in 25 practices.

#### **E.4 Key Findings**

In this section, we present key findings based upon the 29 months of MGH's Phase II CMP Demonstration operations with its Phase I original, Phase I refresh, and Phase II original MGH populations, 23 months with the Phase II original BW/F population, 22 months with the Phase II original NSMC population and 15-17 months of Phase II refresh MGH, BW/F, and NSMC experience. Our findings are based on the experience of approximately 14,000 ill Medicare beneficiaries split across 4 cohorts of intervention and comparison groups for analysis purposes, increasing statistical power by combining the substantially smaller Phase II refresh populations with the Phase II original populations to detect differences. Seven key findings on implementation, beneficiary participation, provider satisfaction, acute care utilization, health outcomes, and financial outcomes have important policy implications for CMS and future care coordination efforts among Medicare FFS beneficiaries. The CMHCB demonstration program held MGH financially responsible for financial savings but not for quality of care improvements.

**Key Finding #1: Full integration of the CMP into MGH's health care system was easier to accomplish than integration of the CMP into the NSMC's or BW/F's health care systems because of program scalability.**

With smaller numbers of assigned beneficiaries, both NSMC and BW/F, identified several challenges with implementation. A key challenge was related to their ability to fully embed care managers into primary care practices. All three institutions felt that care managers embedded in physician practices is an essential component of the CMP and that ample concentration of beneficiaries within a physician practice is pivotal to ensuring that each practice feels the Care Manager's presence and appreciates the Care Manager's value. It was felt that a low concentration of CMP patients leads to a lower level of engagement with Care Managers, and providers and beneficiaries are less likely to experience the benefits of the program. Further, relatively small numbers of beneficiaries make it somewhat difficult to keep the CMP "on the radar screen" for some providers.

Second, it is difficult to implement a program like CMP on a small scale because of budget and staffing constraints. Particular challenges include finding sufficient resources to ensure development of an appropriate IT infrastructure, hiring an adequate number of Care

Managers and other team members at the outset of the program, and provide sufficient funding for program and operational leadership prior to program launch.

**Key Finding #2: Transitioning a successful program to other institutions requires significant infrastructure and program development.**

Very small physician practices may not be well equipped to implement the MGH care management model. Of particular concern is the ability to embed Care Managers in small primary care practices. Conglomerates of practices may provide a structure that enables small practices to share resources such as Care Managers more effectively. Further, full-time program leadership is likely needed to customize the program to their institution's unique characteristics, serve as the champion within the organization, and build relationships and understanding of the program among a disparate set of providers, including hospitalists, specialists, post-acute care providers, etc. Finally, building the IT infrastructure before program roll-out is a critical element to success. It is likely that many community hospitals and physician practices do not have ready access to the expertise or IT infrastructure needed to successfully implement the CMP model.

**Key Finding #3: The Phase II MGH CMP Demonstration achieved a high participation level that reached broadly across its intervention population in terms of beneficiary demographic characteristics, prior health status and health care costs, and health status measured during the early months of its demonstration.**

The Phase II MGH CMP Demonstration was successful in recruiting a very high percentage of intervention beneficiaries (ranging from 89% to 93%). We found few statistically significant differences between participants and nonparticipants in any of the four cohorts, but our explanatory power of the studied beneficiary characteristics was extremely low, in part due to the low number of nonparticipants. Medicare beneficiaries who were institutionalized during the Phase II Demonstration period were less likely to be participants for three of the four cohorts. At the same time, we observed beneficiaries in Cohorts 1, 3, and 4 who were the sickest or who were predicted to be the most costly during the year prior to the start of Phase II were more likely to participate. These results suggest that the Phase II MGH CMP Demonstration was successful at engaging the sicker and more costly beneficiaries in their Phase II program.

**Key Finding #4: Phase I of MGH's CMP Demonstration improved primary care provider (PCP) assessment of the quality of medical practice and quality of care for their patients.**

In addition to improving the quality of care and outcomes for Medicare beneficiaries, Phase I of MGH's CMP aimed to improve the quality of work life of primary care physicians and ultimately attract more physicians to the field of primary care. It is one of several initiatives in development at MGH to improve the challenging work life of primary care physicians. Ultimately, these initiatives are part of a larger vision for Partners HealthCare to restructure the practice model for primary care practice characterized by high patient and physician satisfaction, work flow and process improvement, and the delivery of evidence-based care.

During two site visits RTI conducted during Phase I to MGH's CMP, staff spoke with a small number of primary care physicians during each site visit to gauge their assessment of satisfaction with the demonstration program. At the time of the first Phase I site visit, a small

number of physicians expressed concerns about the program. For example, they had questions about whether CMP patients would divert services from other patients in their practices. And, some physicians did not have a full understanding of the role of the care managers. However, as physicians gained experience working with the care managers, the most common concern they voiced was frustration about their inability to include additional patients in the program. One provider noted that for each patient eligible for the program, there are two additional patients in the practice who could benefit from such care management support.

At the time of the second Phase I site visit, physicians gathered for the focus group reported great overall satisfaction with the CMP. The following first three quotes highlight the essence of their satisfaction with MGH's CMP with the fourth quote expressing a widely held view among the interviewed physicians:

- “The program ‘wraps its arms’ around the most difficult and complex patients.”
- “The program signifies a move towards a true medical home model—it is a team of providers. The program does what every PCP needs to be doing but cannot do anymore because of the medicine practice and reimbursement realities and primary care provider shortages.”
- “The program has done a remarkable job in training and cultivating case managers who are very good at breaking barriers and making it work for the most difficult patients.”
- “We do not want the program to end—it is very valuable! Once the program is gone, participants will become ‘frequent flyers’ in the emergency department and hospital.”

**Key Finding #5: For some its Medicare beneficiaries, the Phase II MGH CMP Demonstration was successful at reducing the rate of increase in acute care hospitalizations, but not ER visits or 30-day readmissions.**

During the course of the Phase II MGH CMP Demonstration, in general, we observed increasing rates of all-cause and ACSC hospitalizations, ER visits, and 30-day readmissions in both the intervention and comparison groups and for all four cohorts. The Cohort 2 intervention beneficiaries had a statistically significant lower rate of growth for all-cause and ACSC hospitalizations as well as lower percentages of beneficiaries hospitalized for all causes and ACSCs. The Cohort 4 intervention beneficiaries had a statistically significant lower rate of all-cause hospitalizations, driven by a decrease in the intervention population's rate of all-cause hospitalizations with a corresponding increase in the comparison group's rate. We also observe lower percentages of beneficiaries hospitalized for all causes and ACSCs. None of the differences in ER visits or readmission rates were statistically significant. However, we did observe 7% ( $p < 0.2$ ) fewer ACSC readmissions among the Cohort 1 beneficiaries.

**Key Finding #6: The Phase II MGH CMP was successful at reducing the mortality rate within the intervention group of Medicare beneficiaries.**

Another key outcome metric is mortality. Over the course of the Phase II MGH CMP Demonstration period for the original population, we observed a statistically significant differential rate of mortality between the intervention and comparison groups for the Cohort 2 and Cohort 4 populations. In both instances, the intervention beneficiaries had a lower mortality rate than that of the comparison group. Similarly, in a multivariate survival model, whereby we control for potential imbalances in beneficiary characteristics at the start of the demonstration period between the intervention and comparison group, we observed a survival benefit for the Phase II intervention group relative to the comparison group for the Cohort 1 and Cohort 2 populations.

**Key Finding #7: The Phase II MGH CMP Demonstration achieved substantial, statistically significant savings. The Medicare program's overall return on investment (ROI) was 2.6: MGH Cohort 2 had the highest return on investment of 4.23 followed by MGH Cohort 1 at 2.33 and BW/F at 1.72.**

According to multivariate analysis, the Phase II MGH demonstration saved Medicare \$42.7 million in Part A&B expenditures. Savings varied by cohort depending upon cohort size and savings percentage. All four cohorts produced savings to the Medicare program, although only the two MGH cohorts generated statistically significant gross savings at conventional levels of significance. Percentage savings ranged from 4.1% for NSMC Cohort 4 to 19.9% for MGH Cohort 2. The overall beneficiary-month weighted savings percentage in the Phase II demonstration was 11.8%. Net savings, or the difference between gross savings and accrued fees, was \$26.2 million in total.

Slower growth in Medicare expenditures, or costs, was achieved primarily through lower acute care hospital payments. The only other service showing consistent negative growth—relative to a comparison group—was home health. Thus, it would not appear that the three hospital groups were saving on acute inpatient services through more expensive use of home health services. MGH Cohort 2 stands out, not only overall, but in the amounts it saved on physician spending and spending on other rehabilitation, LTAC, and psychiatric hospitals.

The Phase II MGH, BW/F, NSMC demonstration exhibited strong regression to the mean effects in costs while overall costs per comparison beneficiary were increasing in the market area (the BW/F comparison group was a notable exception). The large churning of beneficiaries from lower (higher) to higher (lower) cost groups over time adds considerable statistical noise to the test of savings. Costs continued to rise because any reduction in costs in the baseline high cost group was more than offset by smaller increases among the greater majority of initially lower cost beneficiaries. Regression to the mean presents a challenge for intervention staff targeting beneficiaries at highest risk of increasing costs. Algorithms for identifying potentially high cost beneficiaries often key in on base period use; yet, it is beneficiaries with modest use and costs that present the greatest opportunities for savings in future months or years. Nevertheless, it appears that the MGH, BW/F, and NSMC CMP staff was able to work successfully across a broad cost range of their patients, intervening quickly when health problems arise and resulting in a financially successful outcome.

## E.5 Conclusion

Based on extensive qualitative and quantitative analysis of performance, we find that the Phase II MGH CMP Demonstration had success reducing the rate of growth of acute care hospitalizations, decreasing the rates of mortality, and achieving substantial cost savings. The financial savings is particularly noteworthy given the regression to the mean effects. PBPM costs showed considerable variability because of the nature of the population selected for the demonstration, including a few very high cost beneficiaries with short spells of eligibility. Even after combining the eight Phase II populations into four cohorts, there were only roughly 1,700 beneficiaries in each of the Cohort 1 intervention and comparison groups, 2,300 beneficiaries in the Cohort 2 intervention and comparison groups, 1,400 beneficiaries in the Cohort 3 intervention and comparison groups, and around 1,600 beneficiaries in the Cohort 4 intervention and comparison groups. All four cohorts produced savings to the Medicare program, although only the two MGH cohorts generated statistically significant gross savings at conventional levels of significance. Percentage savings ranged from 4.1% for NSMC Cohort 4 to 19.9% for MGH Cohort 2. The overall beneficiary-month weighted savings percentage in the Phase II demonstration was 11.8%.

What might explain the observed success in MGH's demonstration program? Two explanations may be (1) the depth of institutional support to fully integrate the CMP into MGH's, BW/F's, and NSMC's health care systems, of which there are numerous key components, and (2) the high rate of Medicare beneficiary participation. Based upon interviews with senior leadership at all three institutions, it was noted that from the beginning the CMP had the complete backing from the Partners HealthCare's Board of Trustees and MGH hospital and physician leadership. The same degree of senior leadership support existed for expansion to the BW/F and NSMC and within the expansion institutions.

### E.5.1 Institutional Support

**Physician Champions.** Identifying physician champions for the CMP eased the transitions involved in the introduction of a Care Manager into primary care practices and roll-out of other elements of the CMP. At the time of our first site visit to MGH during Phase I, a small number of physicians expressed concerns about the program. However, as physicians became more familiar with all aspects of the CMP and gained experience working with the Care Managers, the most common concern they voiced was frustration about their inability to include additional patients in the program. At the time of the second site visit to MGH, physicians included in the focus group reported great overall satisfaction with the CMP. Acquiring buy-in from participating physician practices was viewed as very important.

**Embedded Care Managers.** And strong integration support from MGH, BW/F, and NSMC leadership afforded the Care Managers physical entry into the primary care practice settings whereby the Care Managers were embedded with the primary care physicians ultimately becoming a part of the beneficiaries' primary health care teams. Thus, Care Managers could participate in joint appointments with the primary care provider and follow-up with patients who missed appointments. Further, CMP leadership at all three institutions recognized that their populations would require Care Managers with substantial experience in dealing with frail and medically complex patients. The CMP selected nurses with *strong clinical skills, critical thinking abilities, and the ability to work independently*; thus, embracing an expensive business

model as labor costs for experienced RNs are high in the greater Boston area. Discussions with primary care physicians during the Phase I focus groups revealed an appreciation of the skills of the selected Care Managers.

***Available Internal Resources.*** With leadership support for CMP integration within all three institutions, the CMP was able to marshal a wide range of internal resources to more fully develop particular aspects of their program that were tailored to the needs of each of their patient populations. Of particular note were programs for mental health and substance abuse developed by MGH and BW/F CMP staff jointly with the Psychiatrist Department within each institution. And, MGH CMP staff provided in-kind training, analytic and infrastructure support and resources to the development and implementation of the NSMC and BW/F's CMP programs. MGH's Phase I success also provided a level of confidence that the CMP could be replicated successfully at NSMC and BW/F.

***Health Information Technology (IT).*** Another critical element of integration was the use of *MGH's IT system to support CMP operations.* By gaining access to MGH's existing IT system and MGH internal resources to make necessary modifications during early stages of Phase I implementation, the CMP was able to draw upon existing infrastructure and augment it to provide immediate decision management support for its care managers. Further, MGH's IT systems span all care settings at MGH, including all MGH physician practice settings. And, according to CMP leadership, MGH patients are very loyal to MGH and receive the vast majority of their health care from the large network of MGH-affiliated providers. Thus, CMP care managers had access to real-time patient information across virtually their patients' entire continuum of care. This was most important in the area of emergency room services. Care Managers were immediately notified through the Partners' IT system and could intervene prior to admission. This may be one of the driving forces for the observed lower rate of hospital admissions among some of the CMP beneficiaries.

Yet, the MGH IT systems required several iterations of data system enhancements at considerable expense as the CMP sought to increase usefulness of MGH's IT systems for managing patient care and reducing documentation burden at MGH. Expanding to the other institutions within Partners HealthCare allowed for some IT synergy with the enhanced shared data systems but there were numerous additional IT challenges because BW/F and NSMC had multiple, unrelated IT systems. Partners HealthCare recognized the need for an integrated IT strategy across the Partners institutions, which necessitated a phase out of old systems. NSMC had the additional burden of dealing with multiple electronic medical record systems across hospitals and private practices.

In evaluations of other Medicare chronic care management programs, we have observed other programs that exhibited *strong program leadership*, yet we have not generally observed the same degree of *integration* of the care management program into the collective and individual health systems and physician practices. MGH's CMP beneficiaries were sufficiently concentrated in the primary care practices making placement of *full-time Care Managers, in general, in the practices* economically feasible. Both, BW/F and NSMC, also achieved a level of integration of Care Managers into practices that generally went beyond what we have observed in other demonstrations despite smaller numbers of participating beneficiaries and a greater number of private practices.

### **E.5.2 High Participation Rate**

A second possible explanation for the observed success is the high rate of Medicare beneficiary participation. The Phase II MGH CMP Demonstration was successful in recruiting a very high percentage of intervention beneficiaries (ranging from 89% to 93%). This is in stark contrast to other CMS demonstrations we have evaluated in which participation rates generally were much lower. Lower participation rates require larger effects on participating beneficiaries under an intent-to-treat evaluation design. Because of a high level of participation, the MGH Care Management Programs had wider latitude to broadly tailor the degree of their interventions across a large population of beneficiaries than programs with low participation rates. To be financially successful, programs with low participant rates are forced to prospectively identify accurately a smaller number of beneficiaries that are likely to be very costly in the near future and successfully intervene. This approach has not been successful to date for reducing Medicare costs.

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**CHAPTER 1**  
**INTRODUCTION TO THE MEDICARE CARE MANAGEMENT FOR HIGH COST BENEFICIARIES (CMHCB) DEMONSTRATION AND THE MASSACHUSETTS GENERAL HOSPITAL (MGH) AND THE MASSACHUSETTS GENERAL PHYSICIANS ORGANIZATION (MGPO) CARE MANAGEMENT PROGRAM (CMP)**

**1.1 Background on the CMHCB Demonstration and Evaluation**

The purpose of this report is to present the findings from RTI International’s evaluation of the Massachusetts General Hospital (MGH) and the Massachusetts General Physicians Organization (MGPO) Care Management for High Cost Beneficiaries (CMHCB) Demonstration program. On July 6, 2005, the Centers for Medicare & Medicaid Services (CMS) announced the selection of six care management organizations (CMOs) to operate programs in the CMHCB Demonstration. These programs offered a variety of models, including “support programs for healthcare coordination, physician and nurse home visits, use of in-home monitoring devices, provider office electronic medical records, self-care and caregiver support, education and outreach, behavioral health care management, and transportation services” (CMS, 2005).

The principal objective of this demonstration was to test a pay-for-performance contracting model and new intervention strategies for Medicare fee-for-service (FFS) beneficiaries, who are high cost and/or who have complex chronic conditions, with the goals of reducing future costs, improving quality of care and quality of life, and improving beneficiary and provider satisfaction. The desired outcomes included a reduction in unnecessary emergency room visits and hospitalizations, improvement in evidence-based care, and avoidance of acute exacerbations and complications. In addition, this demonstration provided the opportunity to evaluate the success of the “fee at risk” contracting model, a relatively new pay-for-performance model, for CMS. This model provided the CMOs with flexibility in their operations and strong incentives to keep evolving toward the outreach and intervention strategies that are the most effective in improving population outcomes.

The overall design of the CMHCB Demonstration followed an intent-to-treat (ITT) model, and the CMOs were held at risk for their monthly management fees based on the performance of the full population of eligible beneficiaries assigned to their intervention group and as compared with all eligible beneficiaries assigned to their comparison group. Beneficiary participation in the CMHCB Demonstration was voluntary and did not change the scope, duration, or amount of Medicare FFS benefits received. All Medicare FFS benefits continued to be covered, administered, and paid for by the traditional Medicare FFS program. Beneficiaries did not pay any charge to receive CMHCB Demonstration program services.

The CMOs received from CMS a monthly administrative fee per participant, contingent on intervention group savings in Medicare payments being equal to fees paid to the CMO plus an additional 5% (or 2.5%) savings calculated as a percentage of its comparison group’s Medicare payments. CMS developed the CMHCB initiative with considerable administrative risk as an incentive to reach assigned beneficiaries and their providers and to improve care management. If the CMOs were able to achieve net savings beyond the noted financial requirements, they would share with CMS the additional savings.

On January 13, 2009, CMS announced that it was granting 3-year extensions (Phase II), subject to annual renewal, for three participants in the CMHCB Demonstration that had demonstrated some success managing the care of their selected beneficiaries: Key to Better Health, a division of Village Health; Massachusetts General Hospital (MGH) Care Management Program (CMP); and Robert Bosch Healthcare Inc.'s (RBHC) Health Buddy<sup>®</sup> Program. In Phase II, MGH expanded their program to two additional institutions within the Partners' network: North Shore Medical Center (NSMC) and Brigham and Women's and Faulkner Hospitals (BW/F). MGH was responsible for program expansion implementation during Phase II.

RTI International was hired by CMS to be the evaluator of the CMHCB Demonstration and has previously reported to CMS findings from Phase I (McCall *et al.*, 2010). For the Phase II evaluation, RTI conducted two site visits to MGH and its expansion sites in 2010 and 2011. Two RTI evaluation team members participated in RTI's first site visit to the MGH CMP during the extension period in June 2010. The site visit marked RTI's initial meeting with the MGH expansion sites. During the two-day visit, RTI evaluators met with MGH, BW/F, and NSMC senior management, administrative and clinical program staff, and other key supporting staff including data analysts, social workers, and community resource specialists. The interviews included a range of questions related to: program implementation since the extension period began, performance monitoring/outcomes, and implementation experience/lessons learned to date. BW/F and NSMC used the basic MGH CMP, with adaptations, to implement the CMHCB Demonstration program at their institutions.

The second site visit, conducted in July 2011, included an in-person visit to MGH, BW/F, and NSMC. During the two-day site visit, two RTI evaluators met with MGH, BW/F, and NSMC senior management, administrative and clinical program staff, and other key supporting staff. In addition, RTI conducted two focus groups with patients participating in the MGH CMP. The focus groups included a total of fourteen patients. Half of the focus group participants were enrolled during Phase I of the program and thus had upwards of 4 years of experience with the program, while the remainder was enrolled as part of the Phase II refresh population.

MGH, BW/F and NSMC, referred to as the "institutions," are considered one program in which the CMP was implemented to provide clinical support for beneficiaries to manage their clinical conditions and prevent complications from their illness, facilitate coordination of care and beneficiary adherence to treatment plans, and reduce barriers to receipt of timely medical care. The core element of the CMP was the one-on-one relationship between beneficiaries and their practice-based Care Managers, supplemented by support received from the program's mental health, pharmacist, and end-of-life components. Care Managers were assigned to MGH, BW/F and NSMC physician offices and developed relationships with program participants to: provide beneficiary education and support for management of chronic conditions; connect beneficiaries with resources to address medical and psychosocial needs; and help prevent acute exacerbations of disease associated inpatient admissions and emergency room visits.

This final report presents evaluation findings of the MGH, BW/F, and NSMC CMP operations with their Phase I and Phase II original and refresh populations during the extension period. The report also includes summary information obtained from program close out calls

conducted by telephone with key staff from the MGH, BW/F, and NSMC CMPs in November and December 2012.

## **1.2 Organizational Characteristics**

### **1.2.1 MGH Organizational Characteristics**

Founded in 1811, MGH is the third oldest general hospital in the United States and the oldest and second largest hospital in New England. MGH's mission is to provide high-quality health care; advance care through innovative research and education; and to improve the health and well-being of the diverse communities it serves. The 900-bed facility is the original and largest teaching hospital of Harvard Medical School and one of the founding members of Partners HealthCare (Partners), an integrated health care system in Boston, Massachusetts, established in 1994. The system is composed of two academic medical centers, community hospitals, specialty hospitals, community health centers, a physician network, home health and long-term care services, and other health-related entities.

The MGH CMP was launched on August 1, 2006. The Massachusetts General Physicians Organization (MGPO), the largest multi-specialty group practice in New England, provided the overall administration and the underlying structure in delivering integrated care management services under the CMP and employed Care Managers participating in the program. The MGPO includes 1,200 physicians, 190 of which are primary care physicians (PCPs). Approximately 180 PCPs were involved with the 19 participating PCP practices in the MGH CMP. A mean of 7.5 PCPs per practice were involved in the MGH CMP.

### **1.2.2 Brigham and Women's/Faulkner Hospital (BW/F) Organizational Characteristics**

In 1980, Brigham and Women's Hospital (BWH), a nonprofit teaching affiliate of Harvard Medical School and a founding member of Partners HealthCare, opened its doors, six years after the formal affiliation of its three distinguished predecessor hospitals—the Boston Hospital for Women, the Peter Bent Brigham Hospital, and the Robert Breck Brigham Hospital. The hospital has 793 licensed beds and specializes in adult medicine, surgery, obstetrics, and newborn care. BWH formed an affiliation with a community teaching hospital, Faulkner Hospital in 1998, and the Dana Farber Cancer Institute in 2002. BWH currently has 40 affiliated practices. The Brigham and Women's Physicians Organization (BWPO) consists of 1,417 physicians and includes 147 PCPs. Faulkner Hospital is a 153-bed non-profit, community teaching hospital partner of BWH located in Jamaica Plains, MA. In 2011, Faulkner Hospital had more than 7,500 discharges and 195,000 ambulatory patient visits. The hospital employs more than 1,600 full- and part-time employees.

### **1.2.3 North Shore Medical Center (NSMC) Organizational Characteristics**

The founding hospitals of the NSMC were established in the 1800s with Salem Hospital first opening its doors in 1874, followed by Lynn Hospital in 1883 and Union Hospital in 1900. After the closure of Lynn Hospital in 1983, Union Hospital grew to service the needs of its newly expanded community in Lynn. The communities first served by these facilities have been expanded into what is now North Shore Medical Center, serving more than 200,000 patients each

year. NSMC is comprised of NSMC Salem Hospital, NSMC Union Hospital, Mass General for Children at North Shore Medical Center, NSMC Heart Center, and NSMC Women's Center. NSMC has more than 200 physicians, nurse practitioners and healthcare professionals in its North Shore Physician Group (NSPG) network. NSMC currently provides acute inpatient care in Salem, Lynn, and Danvers, including cardiac surgery and inpatient pediatric, adolescent, adult and geriatric psychiatric services.

### **1.3 Market Characteristics**

MGH's CMP was targeted to patients who were loyal to MGH (i.e., receive most of their care at MGH and its affiliated physician practices). MGH serves a diverse population in the city of Boston and its surrounding suburban communities. Although the majority of the population is Caucasian, there are substantial populations of African American, Asian, and Hispanic residents. Boston also has significant socioeconomic diversity that encompasses highly affluent as well as low-income individuals.

The BWH market differs from that of MGH in that BWH has a smaller primary care base and is more of a referral hospital with fewer Medicare beneficiaries. BWH's community partner, Faulkner Hospital, has a substantially larger Medicare population than BWH, which helped increase the enrollment numbers in the BW/F CMP.

The NSMC market services a generally older population compared to other eastern Massachusetts community hospitals. Unlike many other community hospitals, NSMC offers cardiac surgery and a robust residency program. In addition, given the proximity of NSMC to Boston and other hospitals, a significant number of beneficiaries are cared for in multiple facilities making coordination of care more difficult.

### **1.4 Evolution and Goals of the MGH, BW/F, and NSMC Care Management Programs**

Upon demonstrating improved clinical and financial performance during the original demonstration period, MGH CMP leaders identified three primary reasons for applying for an extension of their demonstration program: 1) there was still more to be learned about how to manage the "sickest of the sick" and additional ideas for improving care that warranted piloting; 2) an extension provided the opportunity to test whether the CMP model could be replicated; and 3) an extension facilitated the opportunity to address hospital re-admission and end-of-life issues. A key component of the extension period entailed adaptation and implementation of the MGH CMP in two additional locations, BW/F in Boston and Jamaica Plains, Massachusetts and NSMC in Salem, Massachusetts.

In the summer of 2009, the BWPO and the BWH became interested in starting a care management program. BWH leaders were impressed with the MGH CMP and viewed replication of the MGH program as an opportunity to 1) try an alternative model of care management that allowed BWH to test itself in a financial risk model, and 2) to develop an infrastructure for implementing care coordination and augmented services in the primary care setting. The focus of the program fit well with an identified need within BWH's primary care practices to better coordinate care in order to operate more efficiently and to provide higher quality care for their beneficiaries.

Similarly, NSMC senior leadership also found the opportunity to provide care differently and more efficiently using an alternative care model appealing, and was excited about the potential to be part of the solution to the national healthcare crisis. Participation in the CMP provided an opportunity for NSMC to scrutinize care transitions, improve processes of care, reduce possible adverse events, and enhance the quality of care provided and the quality of life of its patients.

MGH leaders garnered the support of leadership from both institutions. Upon receiving CMS approval of the expansion, MGH leaders assisted the expansion sites in determining the necessary management team members to facilitate the replication effort. MGH provided the expansion sites with a starting template for their program, yet MGH CMP leaders urged the expansion site leaders to expand on the template and customize their programs to optimize the likelihood of success. MGH also viewed the expansion sites as opportunities to discover new knowledge and approaches that they had not considered for the original MGH program.

Formulating the contract terms entailed a lengthy and complex process when factoring in numerous variables and gainsharing scenarios. MGH assumed primary financial risk for the project and served as the prime contractor to CMS. The program essentially had four budgets. The three institutions operated under Partners HealthCare and shared a bottom line and budget for shared resources. However, each of the three institutions also managed its own budget independently. They encountered challenges in trying to determine shared risk arrangements if one partner failed to achieve the savings goals. Another complicating issue involved determining the amount that Partners HealthCare should receive in gainsharing as a fourth entity in the partnership. The three sites acknowledged that considerable deference was given to MGH based on its prior experience with the program. Notably, MGH and NSMC share the same Chief Financial Officer (CFO), which was regarded by the site visit participants as an advantage given the CFO's intimate knowledge of both institutions. One site visit participant explained, "The three sites are all invested in being successful and it's not like we're looking over our shoulders to see if anyone is taking advantage here. Everyone wants it to be successful."

## **1.5 CMP Population Overviews**

Beneficiary selection for all three program sites was based on the patient selection criteria developed by MGH, including annual cost, loyalty, and risk criteria. Detailed discussion of the identification of the intervention and comparison populations for each of the three institutions is provided in *Supplement 1A*.

### **1.5.1 MGH Population**

MGH CMP staff reported that their patient population characteristics were similar to those of the general MGH population, including patients with multiple co-morbidities and medications. Similarly, they shared ADL/IADL limitations and many suffered from psychosocial issues.

When asked whether the Phase I original and refresh populations served by the CMP during the demonstration period were the right populations for their program model, program leaders noted that while they believed that their model addressed the needs of an older (65 years of age and older), medically complex population, it was unclear if the model best met the needs

of a younger disabled population, those with chronic mental illness, and/or substance abuse. They suggested that a different set of clinical skills and experience may be needed to fully address the psychosocial needs of these groups. They reported that the Phase II participants were receptive to shared decision making with their providers and relied on the internet for much of their health information. Care Managers also observed that this cohort was more demanding than the other cohorts in wanting to know about their available options. They found it easier to enroll the Phase II beneficiaries because Care Managers were already familiar with the physicians, beneficiaries were already familiar with the program, and beneficiaries saw the Care Managers in the office.

### **1.5.2 BW/F Population**

BW/F staff generally characterized their CMP population as advanced age or disabled with significant cardiac and cancer co-morbidities. The overall BW/F inpatient population is younger, although BW/F still serves beneficiaries with cardiac and oncological issues. They also identified a higher than expected level of alcohol abuse and psychiatric disorders within the population. Impacting these patients proved to be a considerable challenge requiring increased involvement of the BW/F psychiatric services and social workers.

The lower than expected number of beneficiaries in BW/F's initial Phase II target population presented operational and financial challenges to its CMP; however the challenges were partially alleviated with the addition of 220 beneficiaries resulting from an increase in the number of physicians participating in the program. BW/F requested a first year, rather than a second year, refresh panel.

### **1.5.3 NSMC Population**

NSMC CMP staff identified the following primary co-morbidities in their CMP beneficiaries: diabetes, heart failure (HF), chronic obstructive pulmonary disease (COPD), dementia, malignancies, and psychiatric illness. In selecting their Phase II population, three groups of beneficiaries were additionally disqualified from participation in the CMP prior to their program's launch on March 1, 2010: beneficiaries who were not being cared for by a PCP participating in the program; beneficiaries who opted to use their hospice benefit; and beneficiaries who were receiving long-term care in facilities not covered by the NSPG Extended Care Program (a team of physicians, nurse practitioners (NPs) and physician assistants (PAs) who serve as primary care providers for patients while they are in a facility, and transition them back to their original primary care provider when they leave the facility).

NSMC CMP staff reported that it was difficult to characterize active vs. inactive participants because many non-participants should have been identified as disqualified. Between 11 and 18% of total non-participants were in long-term care facilities, which were staffed by physicians and nurse practitioners employed by the NSPG. Staff felt that it was difficult for Care Managers to have an impact on this population. As with BW/F, NSMC also anticipated financial and programmatic challenges with their smaller than original expected Phase II population. It too asked for and received an early refresh population.

## 1.6 Overview of the MGH, BW/F, and NSMC Care Management Programs

While the three CMPs were evaluated as one program overall, we describe each program separately in this report. In addition, the three institutions refer to persons delivering care management services as “care managers,” “case managers,” and “case coordinators.” We refer to persons serving in this capacity as “Care Managers” throughout this report.

The overarching goal of the CMP was to provide an enhanced level of care to a high-risk patient population through comprehensive outpatient care management, and aimed to:

- reduce health care costs through reduction of preventable hospitalizations and emergency room visits,
- improve physician work life, and
- generate increased understanding of delivering effective practice-based care management programs, including the development of a satisfying and manageable role for care managers.

To achieve all of these goals, the CMP was structured to facilitate communication and leverage relationships (a) between beneficiaries and Care Managers, (b) between beneficiaries and physicians, (c) between Care Managers and physicians, and (d) among Care Managers.

**Care management.** The CMP was designed in such a way that Care Managers became integral members of each physician practice. Staff believed that this association with the PCP engendered beneficiary trust and willingness to discuss health care and psychosocial problems with these nurses. Care Managers developed relationships with beneficiaries over time through telephone calls and in-person interactions during physician office visits or at the hospital, if patients were admitted for an inpatient service. In addition, they conducted beneficiary enrollment and comprehensive physical status and needs assessments; documented enrollee status; created care plans; educated beneficiaries about options for medical treatment and support services; facilitated beneficiary access to services; and supported beneficiary self-management of medical conditions.

Community Resource Specialists worked collaboratively with the Care Managers and performed non-clinical beneficiary and caregiver assessments to identify barriers to care and identify resources that met beneficiary needs including transportation, Meals on Wheels, adult day and personal care assistance programs. The Community Resource Specialists answered the majority of calls that did not require care management, such as arranging and scheduling appointments, arranging transportation for hospital visits, as well as handling requests for assistance in completing applications for Medicaid coverage (MassHealth) and transportation programs.

**Mental health program.** Social Workers served as the link to the program’s Mental Health Team and accepted referrals from CMP Care Managers. They triaged and worked with the Mental Health Team to consider such interventions as psychopharmacology consultation, psychosocial support, and telephonic reassurance. As Phase II rolled out, the MGH program

added additional mental health support linking social workers more directly with Care Managers and practices, allowing practices to identify a particular Social Worker as their own. They found this strategy helpful in engaging PCPs to use social work services. Over time, many physicians knew the Social Workers by name and requested their assistance through their Care Manager. As a result, MGH CMP site visit participants observed that embedding care managers in the physician practices and the team concept (collaboration and coordination) were very important aspects of the program design.

**Outpatient Pharmacist.** The outpatient Pharmacist assisted beneficiaries by providing medication review and reconciliation, monitoring drug interactions and compliance, obtaining prior authorizations, and examining formulary issues. The Pharmacist also provided assistance with financial issues as well as information and education on Medicare Part D plans. CMP staff could either refer the outpatient Pharmacist to the program participant or contact her directly for information on the participant's behalf.

### **1.6.1 Additions to the MGH CMP and Delivery Process**

MGH implemented several programmatic changes to enhance the CMP during the extension period. To improve the efficiency of tracking and monitoring, it developed a skilled nursing facility (SNF) tracking component to monitor beneficiaries admitted to SNFs. It also adopted Morrissey Continuum, a database for tracking enrollment and patient-level activity, and added two monthly patient-level reports pertaining to admissions and high cost beneficiaries. Internal data were used to prepare monthly reports for staff on high cost beneficiaries and beneficiaries who were readmitted during the prior month.

Program staff made efforts to improve communication with providers by including Physician Advocates (i.e., physicians appointed as liaisons to facilitate communication between the practice and CMP project staff) in case reviews on a rotating basis. CMP staff also began more aggressive outreach to non-acute providers including nursing facilities, long-term acute care (LTACs) facilities, and elder service agencies in metro Boston, to identify common patients, develop a communication protocol, and participate in the discharge planning process.

The program piloted a pre-discharge medication review with beneficiaries on three floors at MGH in an effort to facilitate medication reconciliation and beneficiary education about their prescriptions. The pre-discharge visit entailed the Pharmacist identifying in-house medication changes, communicating with the beneficiary's Care Manager on the day of discharge, and reviewing the list of medications, instructions, and any changes with the beneficiary. Within 24–72 hours post-discharge, the Pharmacy Assistant called the beneficiary to see how the beneficiary was doing with their medication management.

The SNF waiver program marked another noteworthy initiative implemented during the extension period. CMS approved a request submitted by MGH that eliminated the 72-hour inpatient stay eligibility requirement for using Medicare benefits to pay for skilled nursing services. The waiver targeted beneficiaries with non-acute conditions (e.g., beneficiaries with a urinary tract infection) and those without a diagnostic dilemma that would otherwise require hospitalization. Although these beneficiaries required some acute care, intensive acute care was not needed, which potentially avoided additional unnecessary hospitalization costs. MGH

expanded the waiver to BW/F and NSMC during the final year of the program. MGH developed a “telerounding” program enabling their CMP team to conference with the SNF teams on a weekly basis to analyze their patients in the waiver program. CMP staff reported that the process led to enhanced relationships with the SNFs. The effort served as a trigger institutionally for beginning the development of a preferred provider network with SNFs in northeast New England.

MGH CMP leaders noted that successful participation in the CMHCB Demonstration has served as a justification to hospital leaders for taking new leaps of faith. Partners Healthcare has begun discussions about the potential for developing care management programs in specialty practices such as transplants and liver disease. As one CMP leader noted:

*The success of the MGH demo...gave confidence that we can actually successfully implement and get a return on investment. It is hard to imagine the organization doing what it's doing without the history of the CMS demo as the guiding light. It's extended the confidence...the fact that we pulled it off once has been instrumental in the psychology of transformation in the organization. It has shown that different organizations can collaborate as opposed to just working in parallel.*

### **1.6.2 BW/F CMP Components and Delivery Process**

The CMP at BW/F was a collaboration sponsored by BWH and BWPO across two institutions: BWH (a tertiary care teaching hospital) and Faulkner Hospital (a community teaching hospital). The program involved Care Managers providing care management services for high-risk, medically complex fee-for-service Medicare beneficiaries identified by CMS in 11 BW/F primary care practices. Care Managers assisted beneficiaries with adhering to recommended treatments, accessing additional medical services and community resources, and navigating the health care system. In addition to the services provided by Care Managers, program participants also benefitted from the services provided by a Social Worker, Community Resource Specialist, and Pharmacist.

BW/F did not have any subcontractors or subsidiaries involved as part of its CMP. However, program leaders noted that their key partners included the array of providers who interfaced with their enrolled beneficiaries such as hospitalists and emergency department (ED) providers at BW/F. Membership of the BW/F CMP Leadership Committee included the core program management team (Medical Director, Program Manager, and Care Manager Team Lead), the Mental Health Team Lead, decision makers from BWPO, Primary Care, Care Coordination, Information Technology, ED, and Social Work.

The CMP at BW/F largely followed the same program model as the MGH CMP; however, some differences existed in IT capabilities, staff responsibilities, and staffing allocation. Most, but not all of the IT systems at BWH and Faulkner hospital were linked. Post-discharge contacts were completed by RN Care Managers in the BW/F program and by a dedicated discharge nurse in the MGH program. Moreover, a larger number of RN Care Managers at BW/F worked with multiple practices. Working with three and, in one case, four practices presented an additional challenge for the Care Managers at BW/F. BWH and Faulkner Hospital mirrored one another in terms of Care Manager staffing.

The program identified ED utilization as an area in which BW/F patients exceeded the comparison group, and began identifying patients whose utilization was not amenable to the CMP intervention for additional intervention. BW/F CMP leadership began working with a BWH data analyst to develop a monthly dashboard to supplement reports prepared by MGH to monitor topics such as ED utilization. CMP staff also worked with acute care hospitalists and ED staff to develop acute care plans for patients that frequently visited the ED. The goal was to have the outpatient team document relevant information about these beneficiaries (e.g., substance abuse, pharmacy issues) in an easily located note that would be beneficial in decisions to admit or safely discharge a patient from the inpatient unit or ED. Such information could also be helpful in avoiding patterns of reinforcing behavior that may not be positive for the patient (e.g., controlled substance prescriptions). BW/F shared templates for the acute care plans with MGH with the idea of creating a uniform template across institutions.

The program augmented its staffing level to more adequately accommodate the needs of both beneficiaries and staff. Upon recognizing the prominence of mental health issues amongst their patient population, the program added a second social worker to support the care managers and to better meet the needs of beneficiaries.

The BW/F CMP had approximately 20 beneficiaries participate in the SNF waiver program. Primary conditions included falls, medical decompensation, and discharge from surgical day centers. Staff felt that it was very helpful for their high-risk population, ED care facilitators, and PCPs to have another discharge option besides returning home.

### **1.6.3 NSMC CMP Components and Delivery Process**

In developing the CMP at NSMC, program leaders felt that they benefitted tremendously from MGH's previous experience. Similar to BW/F, NSMC used the core structure of the MGH CMP and made adaptations to more accurately reflect the North Shore environment. For example, Care Managers who were integrated into the primary care physician (PCP) practices were employees of the NSPG, not NSMC, to allow the Care Managers to represent themselves as members of the PCP practice to beneficiaries and to further reinforce the PCP practice-based model concept. Another change targeted data monitoring. As a result of data lags associated with Medicare claims data, NSMC built a local database to track patients' movement through the healthcare continuum, including ED, observation status, inpatient, sub-acute, and home.

A key finding from the analysis of NSMC data revealed an increase in use of LTAC facilities within the intervention group compared to comparison group use during the demonstration period. NSMC is physically connected to Spaulding Hospital for Continuing Medical Care/North Shore, an LTAC facility. NSMC CMP leaders expressed concern that patients discharged to Spaulding may have had longer lengths of stay than absolutely necessary to allow the LTAC facility to maintain its required average length of stay. CMP leaders reported that the NSMC Care Management Team Lead engaged in a collaborative process with Spaulding leadership to redesign the LTAC referral process such that a CMP participant's inpatient Care Manager, outpatient Care Manager, and the CMP Care Management Team Leader discussed a potential LTAC referral before it was made. They also added a hard stop in the computer system for the Spaulding screeners to notify the admissions staff that the potential referral involved a CMP participant. Ongoing discussion with CMP, hospital, and Spaulding staff continued until a

decision was made about the transfer of a patient. The Care Management Team Lead noted that the collaboration led to a significant change in culture and that the process was very collegial.

In addition to improving communication with partnering organizations, Care Managers also increased efforts to provide more education and follow-up calls to congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD) patients to help program participants self-manage at home. NSMC CMP staff also made significant effort to enhance communication with hospitalists and between inpatient and outpatient Care Managers, areas that they felt they did not place sufficient emphasis on earlier in the program. Staff felt that Care Managers and hospitalists became more fully engaged. Care Managers better understood the value that the information they provided could have on the discharge plans, and hospitalists recognized the benefit that the information and services provided could have for their other patients who were CMP participants.

The SNF waiver marked another noteworthy addition to the NSMC CMP. NSMC had 16 SNF waiver participants with lengths of stay averaging 2–3 weeks. CMP staff described the relationship with the SNFs as collaborative and noted that they conducted telephonic rounds with four SNF waiver facilities to remain informed on patient status and to ensure appropriateness of lengths of stay. The majority of the SNF waiver cases involved orthopedic issues. NSMC encountered a few operational issues with the SNF waiver. Unlike MGH, NSMC did not have sufficient staffing to allocate a dedicated staff member to managing the SNF waiver cases. In addition, operationally, patients needed to be in the ED or in observation bed status in order to qualify for the waiver. CMP leaders found it difficult to institute the program given their very small population and the challenges posed by not fully integrating the assessment process into the workflow of the hospital.

NSMC has applied lessons learned from the CMHCB demonstration and expanded their program to include some commercial patients. They also began offering care management services in some private practices.

## **1.7 Staffing and Management Structure**

### **1.7.1 MGH Staffing and Management**

MGH CMP staff reported a high level of job satisfaction despite the demanding nature of the work and high volume caseloads. CMP staff noted having no issues with Care Manager turnover or retention. Care Managers carried a beneficiary load that included Phase I original, Phase I refresh, and Phase II participants. During Phase II, the Care Managers remained with their Phase I practices, although some Care Managers worked with two practices out of the 18 participating primary care practices and approximately 190 attending physicians and residents.

MGH added a 0.25 FTE Associate Medical Director during the extension period to assist with daily operations and program development. The Medical Director maintained oversight of strategic initiatives and supported the expansion while the Associate Medical Director largely focused on inpatient care and worked on continuity of care, pre-discharge planning and management of program participants without a MGH PCP.

Also new in Phase II, MGH hired a third clinical Social Worker and assigned Social Workers to specific primary care practices to allow the program to develop a multi-disciplinary team model for addressing beneficiaries' psychosocial needs. The team included the PCP, RN Care Manager, and Social Worker, as needed. The MGH CMP also supplemented the Community Resource Specialist with additional staff to allow for centralization of resources. The Community Resource Specialists operated primarily out of MGH; however, they also provided telephonic and virtual support to the BW/F and NSMC CMP staff and periodically visited the sites in-person. Other resources shared by MGH, BW/F, and NSMC included time of the MGH Care Manager Team Lead and Program Manager, a Data Analyst, and a small portion of an Information Systems Specialists' time to assist with Morrisey issues and infrastructure development.

Over the course of the extension period, MGH increased hours allotted for post-acute episode care management, increased the pharmacist's hours, and added additional RN Care Managers. Site visit participants noted that the embedded Care Managers added value to the entire office experience by being able to schedule patients for timely interventions and foster in-person relationships with patients and their PCP. The Care Managers ensured that PCPs were briefed about patients' recent medical issues prior the PCP visit, a service which according to patient reports improved patients' knowledge retention and resulted in more dynamic patient-provider conversations.

At the time of the closeout call, MGH CMP staff included 24 Care Managers, 5 Social Workers, 5 Community Resource Specialists, and a full-time pharmacist. Staff noted that although program growth facilitated economies of scale, the program appeared to lose some of the intimacy it had as a smaller program.

### **1.7.2 BW/F Staffing and Management**

Each BW/F CMP Care Manager was assigned to one or more of 11 primary care practices, with a case load of 200–250 beneficiaries per Care Manager. The 11 practices include approximately 130 physicians and 80 residents. BW/F leaders were each budgeted part time in the CMP and also held other positions within the organization. The BW/F CMP Medical Director oversaw the clinical and program operations in concert with the Care Manager Team Lead and the Project Manager. An Administrative Assistant provided support for operations and special projects.

Over the course of the demonstration, BW/F CMP staff recognized the need for an additional part-time social worker based on the volume of mental health referrals and the intensity of the social worker's role and services. They also observed that the program was understaffed in the area of Care Managers. Data analysis by BW/F indicated that periods of low staffing were associated with a decrease in activities, a decline in communication, and an increase in hospital utilization and ED visits. At the time of the closeout call, they reported a significant increase in staff size from 5 Care Managers and 2 Social Workers to 15 Care Managers in the practices with the intent to hire more social work staff. They also increased time of the Program Manager and Medical Director from part-time to full-time positions and increased the psychiatric support to a 0.4 FTE position.

### **1.7.3 NSMC Staffing and Management**

NSMC CMP Care Managers were assigned to work with a primary care practice and a caseload of approximately 200 beneficiaries. If the practice had more than 200 program participants, additional Care Managers were assigned to the practice. Part-time staff included a Medical Director, Associate Medical Director, Project Manager, Associate Project Manager, geriatric Psychiatrist, Pharmacist, and Administrative Assistant.

The CMP at NSMC staffing and management structure was quite similar to that of BW/F and MGH. However, differences did exist, including NSMC's use of a Post-Episode Care Manager to assess beneficiaries post-discharge from the hospital, as opposed to BW/F's use of Care Managers. Moreover, NSMC and MGH used the term "Mental Health Care Manager" to describe the licensed Social Workers that served as the program's link to the mental health team, whereas BW/F used the term "Clinical Social Worker" for the same position.

NSMC CMP staff reported minimal staff turnover within the program; however, one Care Manager was replaced within the first week of program implementation and another Care Manager moved out of state. A per-diem Care Manager was added in 2011 to assist with SNF Waiver implementation and post-episode assessments. At the time of the program closeout call, NSMC reported that they had increased the number of Care Managers from 6 Care Managers in 12 practices to 15 Care Managers in 25 practices.

### **1.8 Training and Support**

The MGH Care Managers provided a three-week preceptorship to the expansion site Care Managers. Examples of training modules included: the Morrisey case management database; documentation on the Longitudinal Medical Record (LMR); enrollment; prioritization of the work list; face-to-face interactions with beneficiaries; and discussions about end-of-life care. The new Care Managers found the onsite, first-hand experience of learning the program's concepts and expectations to be extremely valuable. MGH staff demonstrated their methodologies and strategies, yet they did not mandate that processes occur in a particular manner. The expansion programs, in turn, incorporated aspects of what they learned from MGH into their own programs and made slight modifications to better suit their needs and organizational culture.

BW/F's CMP included training on Morrisey, LMR, and Brigham Integrated Computing System (BICS) (BWH's inpatient electronic medical record system). The care management teams did not have access to electronic systems specific to the other hospitals; however, all CMP staff members, regardless of hospital, had access to the LMR (the electronic medical record used by PCPs throughout the Partners network). Staff also participated in team case reviews on a weekly basis. In addition, at the close of each week, staff received an email reminder to complete the Virtual Rounds template to assess the week's events and, as needed, request feedback on recent admissions, new resources, and outcomes. In addition, CMP staff received a one-hour clinically or resource-based training on a bi-monthly basis.

NSMC's CMP orientation included disease management modules, LMR, Morrisey, elder care services, detox resources, homelessness resources, pastoral care, and translation services.

Some trainings were held jointly with the inpatient Care Managers on crossover issues such as guardianship.

## **1.9 Beneficiary Outreach and Engagement**

A six-month engagement period began with the receipt of the intervention groups from CMS. The engagement period for MGH's Phase II original cohort began on August 2, 2009. The engagement period for Phase II began on February 1, 2010 for BW/F and on March 1, 2010 for NSMC.

The BW/F outreach and engagement processes were modeled after the MGH processes. When the CMP at BW/F staff received the list of eligible beneficiaries from CMS, Care Managers prioritized beneficiaries by reviewing the medical record and discussing the beneficiary with the PCP. They then assigned a risk (high, medium, low, has not been seen/cannot assess) status to each beneficiary, reviewed beneficiary status with each PCP, and adjusted the risk assignment, as necessary. The CMP sent a letter from CMS to eligible beneficiaries describing the program and encouraging them to contact the CMP for additional information and to participate. Approximately two weeks later, the CMP sent a letter to beneficiaries from their PCP about the CMP, referencing the CMS letter and welcoming the beneficiary to participate in the program. The assigned RN Care Manager began contacting beneficiaries prioritizing highest risk beneficiaries first. Providers and Care Managers in each practice followed up with beneficiaries via personal telephone contact and in some cases, face-to-face communication. They made an effort to meet with each beneficiary during scheduled office visits to obtain informed consent to participate in the program.

The NSMC CMP outreach process was similar to that used by BW/F. Upon receipt of the initial list of beneficiaries, the participating PCPs were asked to review their beneficiaries and stratify the beneficiaries into high, medium and low risk categories in an effort to prioritize those beneficiaries identified as high risk. CMP staff found physician response to the joint effort to be inconsistent. As a second course of action, the Care Managers, once placed in the PCP practices, talked with office staff and reviewed medical records to stratify beneficiaries and prioritize calls.

One of the most significant challenges associated with enrollment involved the mailing of the letters to beneficiaries. On March 1, 2010, approximately 1,200 letters were sent to prospective beneficiaries. In some cases, by the time the Care Managers got around to calling the beneficiaries close to three months after the letter was sent, beneficiaries did not recall receiving the letter or were surprised by the length of time that it took to receive a call. Unlike BW/F, NSMC did not send a letter to prospective beneficiaries from their PCP. Site visit participants felt that a letter from the PCP in conjunction with a face-to-face visit in the office would have greatly increased the likelihood of successful enrollment.

## **1.10 Beneficiary Assessment Process**

The MGH, BW/F, and NSMC beneficiary assessment process included six assessment modules: functional, mental health, advance directives, transportation, pharmacy and post-episode. Unlike the assessment process in Phase I, which occurred over an extended period of time, in Phase II MGH integrated the beneficiary's initial assessment and development of a care

plan into the engagement period. Although this effort required six months to complete, staff felt that it improved their ability to intervene with beneficiaries earlier. At BW/F, the Care Manager completed the assessment modules and post-episode assessment for inpatient and ED admissions. At NSMC, the Care Manager generally completed the assessment modules and the Post-Episode Care Manager completed the post-episode assessment for inpatient and ED admissions.

The full baseline assessments were generally completed within three months of the beneficiary's initial enrollment in the program. Beneficiary assessment occurred during a scheduled appointment, during follow-up of a missed or cancelled visit, or through direct outreach/phone call. Assessments occurred first for beneficiaries who were flagged due to an admission or another clinical event. BW/F CMP leaders followed the advice of MGH CMP leaders and began conducting the functional assessments upfront. Although this strategy contributed to a more-time consuming enrollment process, Care Managers felt that they knew the beneficiaries when they came in and felt more equipped since they had a care plan that was accessible to inpatient and ED staff when needed. NSMC CMP staff initially conducted more face-to-face enrollments rather than telephone enrollments. As the in-person enrollments became more time-consuming, the program shifted toward telephonic enrollments to facilitate greater efficiency.

### **1.11 Provider Outreach and Engagement**

MGH CMP staff noted that the CMP increased in visibility and credibility at MGH. Care management staff was viewed by providers as a valuable asset to the care team and the CMP received numerous hospital and system-wide awards for its contributions to individual beneficiary care and improving the model of care. In Phase II, MGH reduced the fees paid out to CMP participating physicians from \$150 PMPM to \$50 PMPM. They eventually eliminated physician fees from the budget. MGH CMP leaders heard varying opinions on the issue. There were vocal PCPs who felt that physicians should be reimbursed appropriately for beneficiaries that required management. A larger group of PCPs did not express an opinion on the fee restructuring, and a smaller subset of physicians felt that the money could be used more appropriately elsewhere since the services provided saved the physicians' time and helped their beneficiaries.

Prior to the start of the BW/F CMP and during the first six months of operation, outreach to primary care practices was an important focus. Site visit participants reported that providers were generally very receptive to the program, particularly since participation did not entail a monetary cost to them for participating. Site visit participants felt that the prior MGH program experience also contributed to physicians' willingness to participate in the program. The program provided a small stipend (\$1500–5000) per year to a Physician Advocate in each primary care practice to assist with implementation of the program at the local level within his/her practice. Responsibilities included regular meetings with the CMP Care Manager; troubleshooting of CMP-related problems within the practice; collaboration with the practice manager to support the CMP within the practice; and reporting on CMP issues and cases at practice meetings.

BW/F staff noted that some of the most successful practices had the medical director as their Physician Advocate and acknowledged that in other cases, it seemed that although many physicians appreciated the program and provided positive feedback, it still felt like something that was added to the practice rather than something that the practice directors were part of and able to champion. Staff reported that having a good relationship and effective communication between the PCPs and Care Managers facilitated the ability to identify beneficiaries who may have been at increased risk of a clinical event.

In the 6 months prior to go-live, the NSMC CMP operational leadership conducted an extensive outreach effort to introduce the program to all clinicians who may provide care to the program participants. NSMC solicited a Physician Advocate within each of the large primary care practices and provided approximately \$5,000 to each advocate per year. Staff reported that providers' reception of NSMC's CMP was very positive. The leadership anticipated that relationships with providers would remain positive as the value of the services provided by the CMP continued to evolve and emerge over time.

## **1.12 Partner Relationship Management**

In addition to examining changes and enhancements to program operations over the course of the extension period, RTI explored relational aspects of the program during the site, including:

- Relationships among MGH, BW/F, and NSMC
- Relationship with local program partners
- Relationship with CMS
- Changes in corporate support for CMP

### **1.12.1 Relationships among MGH, BW/F, and NSMC**

BW/F and NSMC CMP leaders felt that MGH CMP leadership made a substantial effort to share knowledge with them quickly and provide support in a non-authoritarian way. The three institutions voted on risk sharing terms of their contract and despite votes being split between MGH and BW/F and NSMC, with the latter two institutions voting for one risk sharing arrangement and MGH another, all felt that the relationship was very collaborative and that the agreement reached was satisfactory to all parties.

Care Managers reported similar cohesiveness across the three institutions and occasionally attended meals and training together. Program staff from the three institutions continue to work on protocols to support patients that are admitted to each other's facilities to provide a sense that they truly are working as part of one program. They developed a cross-coverage program that, for example, sent an automated alert to MGH CMP staff if an NSMC patient was admitted to MGH and link the MGH inpatient Care Manager with the NSMC outpatient Care Manager. One MGH CMP leader described the evolution of the relationship among the institutions saying:

*Both of their programs were very dependent on us, especially in the beginning, but were able to mature into their own programs over time. Their teams are more collaborators with our team rather than dependent on us. The Brigham will meet and tell us how their program staff are interacting differently with their social workers and in their ED, and we anticipate what they're doing there may work here. We're having similar conversations with the North Shore and we're becoming collaborators in this process.*

### **1.12.2 Relationship with local program partners**

MGH CMP staff mentioned reaching out to community organizations and other care agency partners including home health agencies, hospice programs, and elder service agencies to develop collaborative care protocols. MGH site visit participants reported that the SNF waiver offered considerable opportunity to enhance communication and collaboration with high-admitting SNFs. This relationship increased MGH CMP staff's understanding of variables that impacted quality of SNF care and the CMP's role in improving patient outcomes during the SNF stay.

In January 2011, members of the MGH CMP management team were selected to participate in the Partners Clinical Process Improvement Leadership Program, a five-month course on theory, models and tools for process improvement. As a course project, the MGH CMP team selected improving hospital discharge paperwork to SNFs, and through this process CMP staff and two SNFs piloted a "telerounding" communication model that entailed a weekly conference call with the SNF to discuss shared patients. MGH CMP staff began other work with community partners as well, including the launch of an elder service community provider workgroup with BW/F and NSMC to develop a communication protocol for shared patients. Work in the area of end-of-life services primarily involved collaboration with Hospice of the North Shore and Greater Boston.

BW/F initiated outreach to community organizations such as elder service agencies and organizations including the Alzheimer's Association, the Boston Visiting Nurse Association (VNA), and the Boston Center for Independent Living to create and/or strengthen linkages to better coordinate beneficiary care, receive feedback on their design, and solicit recommendations. The NSMC CMP operational leadership conducted a number of presentations to VNAs, sub-acute facilities, and senior services agencies to reinforce existing relationships and develop protocols for communication. NSMC's key partners included Partners Continuing Care (including Shaughnessy-Kaplan Rehabilitation Hospital and Partners Home Care), the Extended Care Program under NSPG, and local senior service agencies.

NSMC CMP staff found that forging relationships with outside entities including VNAs, sub-acute facilities, and senior service agencies was somewhat easier than with internal partners. This is due to extant models of long-term patient care within these organizations, whereas NSMC had encountered difficulty shifting its culture and business model to one focused on care management as opposed to episodic acute care.

### **1.12.3 Relationship with CMS**

MGH CMP staff described CMS as a valued partner and felt that CMS communicated well through frequent conference calls throughout the demonstration period. They believed that

CMS made every effort to be flexible and responsive to MGH requests. One MGH CMP staff member expressed appreciation for the collaboration and support from CMS.

*We had a really terrific team at CMS and they went out of their way to remove administrative hurdles that otherwise could've really been problematic for us... Our initial perception was that we'd need to follow specific rules without much flexibility to do the innovations we hoped to do. We've made a real effort to demonstrate our intentions were for the right reasons and the people from CMS responded; and when they did, we were able to make progress. The 72-hour waiver was a perfect example. They made an extra effort to help us do it and I'd like to think it has made a real difference. This type of collaboration was very effective.*

BW/F and NSMC CMP staff noted that because their programs were an expansion of the original MGH program, they generally did not communicate directly with CMS.

#### **1.12.4 Changes in corporate support for CMP**

Throughout the demonstration period, BW/F and NSMC CMP leaders felt that the leadership of each partner hospital consistently demonstrated a high level of support for the CMP. MGH site visit participants reported that the CMP continued to receive a high level of support from both the MGPO and MGH. BW/F site visit participants also acknowledged the value of and appreciation for the vocal support and endorsement by BW/F leadership. However, in retrospect, they felt that it may have been more effective to identify the core program leadership team earlier in the process so that the team could have been involved in program planning from the start. NSMC site visit participants admired their senior leadership's commitment to full program implementation, despite the potential for this new model of care delivery to result in a CMP operating deficit and decrease in service volume and revenue.

In addition to strong corporate support from each partner hospital's leadership teams, CMP leaders also valued the backing of their parent organization, Partners Healthcare. Partners developed an initiative to develop a model to support care for all high-risk patients, led by Dr. Eric Weil, Medical Director of the CMP. Lessons learned from the CMS demonstration program have been used to inform the Partners High Risk Initiative.

Partners levied a 1.5% tax on clinical revenue in the system that generated the required finances to fund a system-wide care management program for commercial and Medicare patients. One MGH CMP leader described the synergistic effect that Partners' support and the CMHCB demonstration have on expanding the CMP:

*What we've done has served as an effective core for the larger program now, and the fact that we have a program that's centralized to Partners and there's a council of operational leaders and care management leaders means that we're going to be more effective in expanding this more efficiently... With a little bit of success under our belt, people feel confident that it's an investment worth making.*

### **1.13 Data Management and Technology**

In Phase II, MGH replaced the Medical Information Data Systems (MIDAS) program (an application used by the MGH Case Management Department to track beneficiary activities and generate reports on overall CMP intervention activities) with Morrissey Continuum software for managing both inpatient and outpatient populations. Inpatient and outpatient Care Managers collaborated on the design of the web-based software, basing many of the features on their likes and dislikes of the MIDAS design. The Care Managers reported that the new software provided a more user-friendly work list that enabled them to structure their workflow more effectively.

The CMP Patient Panel database provided staff with basic information on their panel. The database included all original and refresh beneficiaries and could be exported to Microsoft Excel. Linking the CMP Patient Panel database with the hospital's registration system enabled real-time alerts when a CMP participant registers in the ED and/or is admitted inpatient.

Using the CMP Patient Panel database as a building block, an icon was developed for the electronic medical record (LMR) to alert providers of the beneficiary's CMP enrollment and to provide ease of communication with the beneficiary's Care Manager. The icon was available in all electronic medical records used for clinical care at MGH, BW/F, and NSMC. However, the icon could not be imported directly into the Faulkner Hospital inpatient medical record system.

At NSMC, a CMP icon appeared in the LMR indicating that a particular beneficiary was enrolled in the CMP. However, NSMC inpatient Care Managers had read-only access and were unable to use the automatic CMP Care Manager contact feature.

Site visit participants from the three CMPs acknowledged that there were more challenges than initially anticipated with integrating the IT systems developed by MGH into the BW/F and NSMC systems. Despite the challenges encountered with the IT system integration, site visit participants noted that integration may have been facilitated by the fact that all three institutions are part of Partners HealthCare. All program sites had access to Morrissey and had the ability to view each other's notes, when needed.

### **1.14 Outcomes**

#### **1.14.1 MGH CMP Staff Perceptions of the CMP**

During both site visits, the RTI evaluators participated in a large group discussion with care management team members (e.g., Care Managers, Pharmacist, Pharmacy Assistant, Social Workers, Community Resource Specialists). The following observations were noted during the discussions.

- MGH CMP Care Managers reported feeling more integrated and involved with physicians in the practice during Phase II. Enrollment occurred more efficiently as a result of the knowledge and familiarity gained from Phase I enrollment efforts.
- The Care Managers and Pharmacist observed that the pharmacy pre-discharge program made it easier to review medications with elderly beneficiaries in-person, pre-discharge rather than over the phone, post-discharge.

- Care Managers found the participant education component to be particularly fulfilling. The back and forth communication enabled the Care Managers to evaluate beneficiaries more accurately, obtain a baseline measure of participants' understanding of their conditions, and to develop appropriate strategies to increase their knowledge.
- MGH Care Managers found the interaction with Care Managers at BW/F and NSMC to be particularly helpful. One Care Manager commented on how such interaction prevents patients from falling through the cracks:

*If patients go to one of their facilities, we can contact them and they help us know what's going on. That's been invaluable that we have a contact now. They help us and we do the same thing for them...I've had a couple patients who have transferred PCPs to The Brigham and the Care Manager there has been able to pick them up.*

- Care Managers believed that patients benefitted from the relationship between Care Managers and patients, particularly once the relationships were securely established.

*That's where the relationship comes in where we know the patient and the family so well, so while the patient may be nodding 'yes' we know what's going on in the home—if they have food in the fridge, if they have a neighbor, or a kid...We make sure all the loose ends and glitches are worked out.*

#### **1.14.2 Physicians' Perceptions of the CMP**

- Physicians appreciated that Care Managers were embedded within practices and able to assist with patient communication.

*[Care Manager] has taken on a tremendous amount of the communication—not medical communication but keeping people to the fore of getting their medical care...We're supposed to do the care coordination role but we really don't have time so she has been really valuable.*

- Physician responses varied regarding whether Care Managers saved them time:

*They're not [just] saving us time; they're providing the kind of care that primary care offices should. I'm a big believer in the medical home model. This kind of help in the office is what we need.*

*I think it saves me time, not with the patient, but makes me more aware of everything that went on during the last hospitalization without having to prowl through the charts. I'm aware without having to read everything.*

- Physician recommendations included a desire for patient referrals based on medical complexity and a shift to all payers, as opposed to Medicare claims data identification only.

### 1.14.3 Program Participants' Perceptions of the CMP

- Participants took great comfort in knowing that they had immediate access to Care Managers who would call them back in a timely manner:

*The big advantage really is that you have someone to call who will answer the phone. Most times you call a doctor's office and they don't know you and then you listen to music...The program has a lot of worth particularly for people who don't want to waste time on the telephone and want to feel satisfied.*

*My case managers, when I call, always reduce my stress levels, which contributes immensely to my well-being.*

- Participants valued the Care Managers' focus on participants' overall health and well-being:

*They're interested in your social life and what you do. They're not just interested in your medical being; it makes it feel like they're truly interested in you. They ask about your children.*

*They supported me physically and emotionally. I expected help and concern for my physical well-being because it is what they do. What I didn't expect was the emotional support I received from them when I needed it.*

- Participants valued services provided through the social workers and Community Resource Specialists:

*I also have gone to the social worker for things I didn't know I could have. [Social Worker] was able to get me a Safelink phone for rides.*

- Participants believed that their communication with physicians improved as result of Care Managers:

*We cover more topics because of the conversations that I have with [Care Manager]. The fact that [care manager] is sending information there helps me remember. She's letting the doctor know what's going on before you come in.*

*I see a major difference. I suspect it's [Care Manager] putting her two cents in and giving a rundown all the time and maybe thoughts and suggestions. My rapport with the doctor is much better and more content-focused. The doctor is listening better and she hadn't been before.*

### 1.14.4 Data Used to Monitor Performance

The CMPs at MGH, BW/F, and NSMC used internally-derived data generated by MGH, as well as claims data from CMS to monitor program performance, utilization of health services, support data exchange, and provide insight on beneficiary needs and areas for improving care. Site visit participants cited internally-derived data as essential to tracking patients' movement

across acute and sub-acute settings for the purpose of real-time data review. The quarterly monitoring reports from CMS were considered extremely valuable because they provided the only data that compared the intervention and comparison populations. However, significant limitations with CMS monitoring reports were reported due to significant lag time and limited data capabilities.

At MGH, clinical outcomes were reviewed monthly by a clinical team and an advisory board composed of an internal strategic planning group of hospital leaders and people from community-based partners (not including beneficiaries). Summary intervention and participation/outreach reports were provided on a monthly and quarterly basis to CMS. In addition, quarterly intervention data were submitted to RTI and quarterly participation data were sent to ARC.

Standard reports prepared by MGH CMP staff included: weekly and monthly dashboards, participation report, activity report, leakage report (pertains to participants treated at other institutions), high-cost participants, and readmission report. They produced a monthly clinical dashboard on ED and inpatient admissions, length of stay, 15 and 31-day readmissions, preventable hospitalizations, and high cost/frequency diagnosis-related group (DRG) admissions. The CMP relied on monitoring report data to create trend analysis and a review of the full scope of utilization patterns.

#### **1.14.5 Fees and Financial Risk**

As of July 2011, the three institutions had voted to establish a governance structure and risk sharing (gain sharing) plan. From the point of view of CMS, the three institutions were viewed as one program for financial reconciliation. However, MGH was to reapportion and distribute funds to BW/F and NSMC based upon the elected risk sharing model. The goal of the governance structure was to ensure reasonable equity between the three institutions, yet acknowledge that MGH, as the signing institution with CMS, had more at risk. As a result, MGH had four voting representatives on the governance committee whereas BW/F and NSMC each had three voting representatives.

The model was based on shared risk and limited the liability each organization would assume for individual and overall program shortfall in savings. The model assumed that one or more institutions may not have a surplus or a shortfall. In the event of an overall gain, the institution(s) with a shortfall would be held harmless for the shortfall but would not share in any of the gain. Rather, the institution(s) with a surplus would contribute its surplus to the overall shortfall, but would not be required to contribute anything more. Gain sharing between two institutions with surpluses would be based on a formula of 50% of the surplus and 50% of share of total fee payments. If two institutions had a shortfall, a similar apportionment of the liability of the shortfall would be made based on 50% of the total shortfall and 50% of share of total fee payments. If an overall shortfall were to occur, a similar calculation would be performed to apportion the shortfall across the institutions if more than one institution had a shortfall and after the surplus of the third institution was applied to the shortfall.

MGH CMP staff noted a revenue increase in the PMPM fee from \$123 in Year 4 (the first year of the extension period), to \$126 and \$129 in Years 5 and 6, respectively.

## 1.15 Implementation Experience and Lessons Learned

### 1.15.1 Unforeseen Challenges

#### MGH:

- A review of the MGH CMP readmissions indicated a need for greater communication, education, and follow-up on medication plans. They piloted a pre-discharge pharmacy intervention targeting beneficiaries at high-risk for readmission and conducted post-discharge assessment work in response to this need.
- In examining transitions of care and participant admissions, MGH CMP staff recognized the increasing need for physicians to address end-of-life options and decisions with beneficiaries on the outpatient side early enough to avoid hospital bounce back visits/admissions and to implement the end-of-life options desired by program participants.

#### BW/F:

- BW/F CMP leaders were initially under the impression that their task was to replicate the exact MGH CMP model. They did not realize that they had flexibility to integrate customizations which may have increased the number of participants (e.g., include geriatricians as PCPs).
- Also contributing to BW/F's smaller than anticipated enrollment numbers was BWH's loss of a longstanding contract with Harvard Vanguard/Pilgrim/Atrius, which decreased BWH's primary care base. They felt fortunate to be able to pull from Faulkner Hospital's large primary care population.
- The relatively small number of enrolled beneficiaries made it somewhat difficult to keep the program "on the radar screen" for some providers (e.g., individual ED physicians). BW/F CMP staff attempted to overcome this barrier by taking the responsibility for reaching out to inpatient teams or the ED care facilitator, when relevant (e.g., when beneficiaries were admitted). They also participated in meetings with various provider groups to report on progress and maintain program awareness.
- BW/F had multiple, unrelated computer systems. As a result, some IT infrastructure components were phased in gradually. They continued to working with the IT department at the two hospitals during the demonstration period to achieve the necessary modifications.
- Rolling the program out and establishing relationships with providers and staff at multiple physician practices increased the workload and logistical burden of both program leadership and Care Managers.
- There was a steep training and learning curve for the Care Managers given that the program was new and required specialized work. The CMP environment was a

particularly challenging adjustment for RN Care Managers without previous experience in a care management role.

- End-of-life care, coordination of care for heart failure patients, and management of patients with complex mental health problems continued to pose challenges.
- Medication reconciliation continued to be complex and challenging. Frequent errors and inconsistencies during hospital or post-acute admissions led to significant confusion for patients and providers. Sorting through this was extremely important but also very time consuming for Care Managers.

#### NSMC:

- Multiple, unaligned documentation systems internal to both NSMC and Partners Healthcare added to the Care Managers' workload.
- Enrollment was more challenging than initially anticipated.
- Ensuring that each practice felt the Care Manager's presence and appreciated the Care Managers' value remained a considerable challenge in physician practices with a low concentration of CMP beneficiaries.
- The wide geographic distribution of patients increased travel time between practices, greater travel expenses, and less time spent on direct care management for Care Managers.
- Through reporting provided by MGH, NSMC became aware that their Care Managers were underutilizing Morrissey documentation capabilities. They provided supplemental education to improve documentation and capture all activities and efforts made by the Care Managers.
- NSMC CMP staff believed there was likely a significant disparity in long term acute care (LTAC) utilization between the intervention and control populations, a key driver in their financial performance.
- NSMC noted experiencing challenges with a number of Medicare policies that provided incentives that were counter to the CMP goals. One such policy was addressed through the SNF waiver, which eliminated CMS' mandatory 3-day inpatient stay prior to start of the SNF benefit.
- Despite observing improvements in patient ED utilization, they observed an unexplained cost savings in the control group (as high as four percent). This had implications for achieving program success according to CMS definitions, and had a detrimental effect on Care Managers' morale.

## 1.15.2 Lessons Learned and Recommendations

### MGH:

- From a scheduling perspective, MGH CMP site visit participants would rethink the timing of new work. At the beginning of Phase II, they took on a number of time-consuming tasks that added to the workload of the care management staff: transferring data and learning a new database, orienting care management staff from the two expansion hospitals, and accepting 900 new beneficiaries.
- A different set of clinical skills and experience may be needed to fully address the psychosocial needs of a young, disabled population, and/or beneficiaries with chronic mental illness and/or substance abuse.
- When rolling out the program model to smaller practices, consideration should be given to the volume of potential participants and the ability of smaller practices to support care management for the beneficiary population. The amount of obligate integration of IT systems is also a significant factor to consider for small practices, particularly in areas in which networks are not as strong.
- Care Managers reported that the CMP is best delivered by nurses who are embedded within practices (as opposed to provision of telephonic support to beneficiaries). Very small physician practices may not be equipped to implement the MGH care management model. Conglomerates of practices may provide a structure that enables small practices to share resources more effectively. Physician buy-in, however, is critical.
- Centralized assessment, referral coordination and monitoring for the SNF waiver increased program exposure in the ED and Department of Medicine.
- Changes such as the receipt of a new cohort or the addition of new staff or new patients resulted in a 3–6 month adjustment period for Care Managers as they ramped up and determine how to juggle the addition of new program components with their existing patient panels.
- Program leaders should assess their program's and staff's needs and remain flexible to adapt the program to meet the changing needs of their program participants, staff, and market characteristics.

*While we have our core model down, each cohort requires us to think about what we need to have and what's different. Thinking about our original cohort, the support we needed to provide them in Year 1 vs. now is different in intensity and the need to engage providers across the continuum of care providers is so apparent. Each phase has had a focus. The first three years focused on engaging and solidifying our role in primary care. The second phase was with SNFs and non-acute providers and how we identify ourselves in that process of care for our patients. In this next phase, it's thinking about how do we hardwire our*

*relationship with commercial care? How do we more effectively engage with providers outside our system?*

*Our team present in 2006 has changed over time and the skills they had then are much different than the people who have come on board now, so we have to think about how to change our curriculum and approach to see that there's still enrichment that will engage veteran and new members of the team and make them effective in their roles. There's a life cycle for team members and we continue to think about what pieces of curriculum we need to add to keep them sharp, engaged, and enriched.*

- The MGH CMP staff would offer the following recommendations to other physician group practices initiating a care management program:
  - Identify a physician champion that will act as a liaison between the practice and the program.
  - Identify and distinguish the Care Manager's role and responsibilities upfront.
  - Provide physical space for the Care Manager to enable him/her to be seen as part of the team.
  - PCPs should review shared beneficiaries with the Care Manager every six months.
- Additional lessons learned that were identified by MGH CMP staff include:
  - Need for RN Care Managers with strong and extensive clinical experience.
  - The transition points in care are critical and cannot be overemphasized.
  - Collaboration with community providers is critical for meeting the needs of older beneficiaries.
  - End-of-life work is challenging and wishes are difficult to communicate. The earlier the conversations take place, the better.
  - Need to address and provide a space for acknowledging beneficiary loss.

BW/F:

- MGH's in-kind training, analytic and infrastructure contributions were extremely valuable to the development of the BW/F program.
- Appoint operational leaders earlier in the process so that they are more involved and knowledgeable about the program and budget from the start.

- It would have been preferable to know the actual number of eligible beneficiaries per practice before hiring nurses.
- IT infrastructure that facilitates data sharing is critical. BW/F had multiple, unrelated IT systems. Partners Health System recognized the need for an integrated IT strategy across Partners, which necessitated phasing out old systems.
- BW/F CMP's social worker did more traveling between patients than expected based on the experience of MGH. However, they concluded that the higher-than-expected expense for mileage and parking incurred from her travels were more than offset by her success in managing patients with mental health issues.
- BW/F is historically a referral hospital with a limited primary care base, which posed a challenge for integrating the CMP model into primary care. However, BW/F opened two new primary care practices and expanded several others within the past two years in an effort to build their primary care base and establish a patient-centered medical home model to ensure continuity of care for patients. BW/F CMP leaders felt that the CMP was an excellent learning experience.
- Patient demographics, as opposed to patient numbers alone, should be considered when assigning Care Managers to practices. They noted that 100–150 patients is a full-time assignment in one practice, whereas 200–250 is full time in another.
- It is difficult to implement a program like CMP on a small scale, particularly on a small budget and tight staffing. Staff felt that they could have achieved greater results with more funding and staff. However, they are pleased that the program success they had has enabled them to build a credible case for investing in programs like CMP with emphasis on local embedding of Care Managers in physician practices.
- Other lessons learned include:
  - Do not underestimate the infrastructure needed. Increasing the time of a dedicated Program Manager from part-time to full-time was very beneficial in managing the multitude of program tasks and responsibilities.
  - Progress can move at a glacial pace without champions with the time and mandate to see it through. Having a team at the top and on the ground is important so that people are willing to try new things and make changes that are not always easy.
  - It is difficult to imagine proceeding down the path of an ACO without this type of learning experience.

NSMC:

- The ability to learn from the MGH experience and benefit from their extensive system development was invaluable.

- Sending outreach letters to beneficiaries in smaller batches, rather than a single large mailing would allow Care Managers the opportunity to contact beneficiaries closer to the time that the letter is sent.
- Ask PCPs and Physician Advocates to make a concerted effort to talk with their beneficiaries about participating in the program.
- In general, community hospitals do not have ready access to the expertise needed to implement the CMP model. Thus, infrastructure development should be a major consideration in attempting to replicate the program in other community settings.
- When rolling out the program to other community settings, consideration should be given to the underlying differences between academic and community settings, specifically the availability of physician resources because community hospitals do not have built-in time for teaching, research and other professional activities related to changing clinical practice.
- Ample concentration of beneficiaries within a physician practice is pivotal to ensuring that each practice feels the Care Manager's presence and appreciates the Care Manager's value. Practices with low concentration of CMP patients are less likely to actively engage Care Managers, as well as less likely to experience the benefits of the program.
- From a staffing perspective, success is dependent upon the quality of Care Managers hired to implement the program. Seasoned Care Managers with a variety of experiences (inpatient, VNA, hospice, etc.) and who are not intimidated by busy physicians are most successful in the Care Manager role.
- Having Care Managers embedded in physician practice is essential.
- Build the IT infrastructure before program roll-out is a tremendous advantage. It is difficult to deal with multiple electronic medical record systems across hospitals and private practices.

*We've built in a lot of workarounds that are manual. A lot of community venues will have the same kinds of issues. You can't look at MGH and say that their program can be scaled easily. You have to look at what we have here and ask how do we scale the program? To inform the inpatient care managers with the information of our CMP care managers is a major project because we don't have systems that talk to each other. Building that infrastructure is a critical element to success.*

- As Partners expands this model through its entire network, one significant challenge involves physician groups that use hospitalists who are not part of the Partners network.

*You cannot make a post-episode follow up phone call if you don't know that your patient has been discharged or even admitted... So those groups are very challenged if they don't have a hospital willing to partner with them to build at least minimal bridges that are available to us.*

The following comments were heard regarding the ability to transfer/expand the CMP to other settings:

- In terms of scaling back on costs associated with the program in order to facilitate replicability of the program at other sites, MGH site visit participants indicated that practices in other areas of the state or country could potentially save money in lower cost of living areas by hiring less experienced RNs or LPNs. In the Boston area, however, labor costs will always be high.
- Given that the IT components are so critical to the CMP model, adequate consideration should be given to the cost of establishing the requisite IT capabilities. Similarly, the CMP model implemented within health systems spanning several institutions would work optimally when all constituent institutions function on the same, integrated IT platform.
- Having practices within close proximity of each other to share resources greatly facilitates the implementation of the CMP model.
- If using a paper-based system, collaboration between the primary Care Manager and the inpatient Care Manager would be very valuable.
- There are some responsibilities that only a Care Manager can oversee, such as developing a care plan. However, it is possible that some tasks included in the plan may be delegated to a Community Resource Specialist or another team member (e.g., remind beneficiaries to come in for an appointment).

## **1.16 Organization of Report**

In Chapter 2, we provide an overview of our evaluation design and a description of the data and methods used to conduct our analyses. Chapter 3 provides the results of our analyses of participation levels in the Phase II MGH CMP Demonstration. In Chapter 4, we provide the results of our analyses of changes in health outcomes. Chapter 5 presents our analyses of financial outcomes. We conclude with an overall summary of key findings and a discussion of the policy implications of these findings for future Medicare care management initiatives. Supplements to chapters 1 and 2 are available from the CMS Project Officer upon request.

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## CHAPTER 2 EVALUATION DESIGN AND DATA

### 2.1 Overview of Evaluation Design

#### 2.1.1 Gaps in Quality of Care for Chronically Ill

Medicare beneficiaries with multiple progressive chronic diseases are a large and costly subgroup of the Medicare population. The Congressional Budget Office (CBO) estimated that in 2001 high-cost beneficiaries (i.e., those in the top 25% of spending) accounted for 85% of annual Medicare expenditures (CBO, 2005). Three categories of high-cost users—beneficiaries who had multiple chronic conditions, were hospitalized, or had high total costs—were identified by CBO for study of persistence of Medicare expenditures over time. Beneficiaries that were selected based upon hospitalization or being in the high total cost groups had baseline expenditures that were four times as high as expenditures for a reference group. Beneficiaries selected based upon presence of multiple comorbid conditions had baseline expenditures that were roughly twice as high as expenditures for a reference group. Subsequent years of costs remained higher for all three cohorts than the reference group; however, total expenditures declined the most for those beneficiaries who were identified as high cost due to a hospitalization followed by beneficiaries who had had high total costs in the base year. Subsequent costs were virtually unchanged for beneficiaries with multiple chronic conditions.

Further, these beneficiaries currently must navigate a health care system that has been structured and financed to manage their acute, rather than chronic, health problems. When older patients seek medical care, their problems are typically treated in discrete settings rather than managed in a holistic fashion (Anderson, 2002; Todd and Nash, 2001). Because Medicare beneficiaries have multiple conditions, see a variety of providers, and often receive conflicting advice from them, there is concern that there is a significant gap between what is appropriate care for these patients and the care that they actually receive (Jencks, Huff, and Cuerdon, 2003; McGlynn et al., 2003). The CMHCB Demonstration has been designed to address current failings of the health care system for chronically ill Medicare fee-for-service (FFS) beneficiaries.

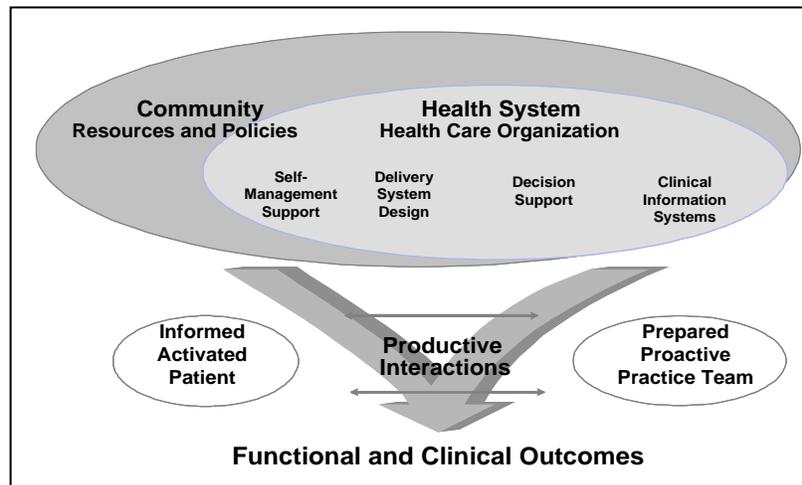
#### 2.1.2 Emerging Approaches to Chronic Care

**The Chronic Care Model**—The concept of chronic care management as a patient-centered and cost-effective approach to managing chronic illness has been evolving for years. The Chronic Care Model (CCM), developed by Wagner (1998), has become a familiar approach to chronic illness care (*Figure 2-1*). This model is designed to address systematic deficiencies and offers a conceptual foundation for improving chronic illness care. The model identifies six elements of a delivery system that lead to improved care for individuals with chronic conditions (Glasgow et al., 2001; Wagner, 2002; Wagner et al., 2001):

- the community,
- the health system,
- self-management support,

- delivery system design,
- decision support, and
- clinical information systems.

**Figure 2-1**  
**Chronic care model**



SOURCE: Wagner (1998). Reprinted with permission.

According to the model, patients are better able to actively take part in their own care and interact productively with providers when these components are developed, leading to improved functional and clinical outcomes.

**Disease management and case management**—The two most common approaches to coordinating care for people with chronic conditions are disease management and intensive case management programs (Medicare Payment Advisory Commission [MedPAC], 2004). Disease management programs teach patients to manage their chronic conditions and are often provided on a broader scale than case management programs. Services provided under a disease management program may include health promotion activities, patient education, use of clinical practice guidelines, telephone monitoring, use of home monitoring equipment, registries for providers, and access to drugs and treatments. Most disease management programs target persons with specific medical conditions but then take the responsibility for managing all of their additional chronic conditions. Case management programs typically involve fewer people than disease management programs (Vladek, 2001). Case management programs also tend to be more intensive and individualized, requiring the coordination of both medical and social support services for high-risk individuals. Typically, disease management programs are used with intensive case management for high-risk individuals who have multiple chronic conditions and complex medical management situations.

The empirical research on the effectiveness of disease management and case management approaches is mixed. Some studies have shown support for the clinical improvements and cost-effectiveness of disease management programs (Lorig, 1999; Norris et al., 2002; Plocher and Wilson, 2002; Centers for Disease Control and Prevention [CDC], 2002). Other programs, such as the CMS case management demonstration programs in the early 1990s, which required physician consent for patient participation, resulted in increased beneficiary satisfaction but failed to achieve any improvement in health outcomes, patient self-care management, or cost savings (Schore, Brown, and Cheh, 1999). In 2002, CMS selected 15 demonstration programs of varying sizes and intervention strategies as part of the Medicare Coordinated Care Demonstration (MCCD). None of the 15 programs produced any statistical savings in Medicare outlays on services relative to the comparison group, and two had higher costs (Peikes et al., 2009).<sup>1</sup> There were a few, scattered quality of care improvement effects. Two programs did show some promise in reducing hospitalizations and costs, suggesting that care coordination might at least be cost neutral. A major reason given for the lack of success in both Medicare savings and better health outcomes is attributed to the absence of a true transitional care model in which patients were enrolled during their hospitalizations. Studies have shown that approach to significantly reduce admissions within 30/60 days post-discharge, when patients are at high risk of being readmitted (Coleman et al., 2006; Naylor et al., 1999; Rich et al., 1995).

### **2.1.3 Conceptual Framework and CMHCB Demonstration Approaches**

The care management organizations (CMOs) awarded contracts under this CMS initiative offered approaches that blend features of the chronic care management, disease management, and case management models. Their approaches relied, albeit to varying degrees, on engaging both physicians and beneficiaries and supporting the care processes with additional systems and staff. They proposed to improve chronic illness care by providing the resources and support directly to beneficiaries through their relationships with insurers, physicians, and communities in their efforts. The CMOs also planned to use all available information about beneficiaries to tailor their interventions across the spectrum of diseases that the participants exhibited.

Although each of the CMOs has unique program characteristics, all have some common features. These features include educating beneficiaries and their families on improving self-management skills, teaching beneficiaries how to respond to adverse symptoms and problems, providing care plans and goals, ongoing monitoring of beneficiary health status and progress, and providing a range of resources and support for self-management. Features of the CMHCB programs include:

- *Individualized assessment.* Several CMOs use proprietary algorithms to calculate a risk score or risk scores, while others depend on judgment of clinical staff. The scores are used to customize interventions to the participants' needs.
- *Education and skills.* A key step in improving self-management is educating beneficiaries and their families about their illnesses, how to react to symptoms, and

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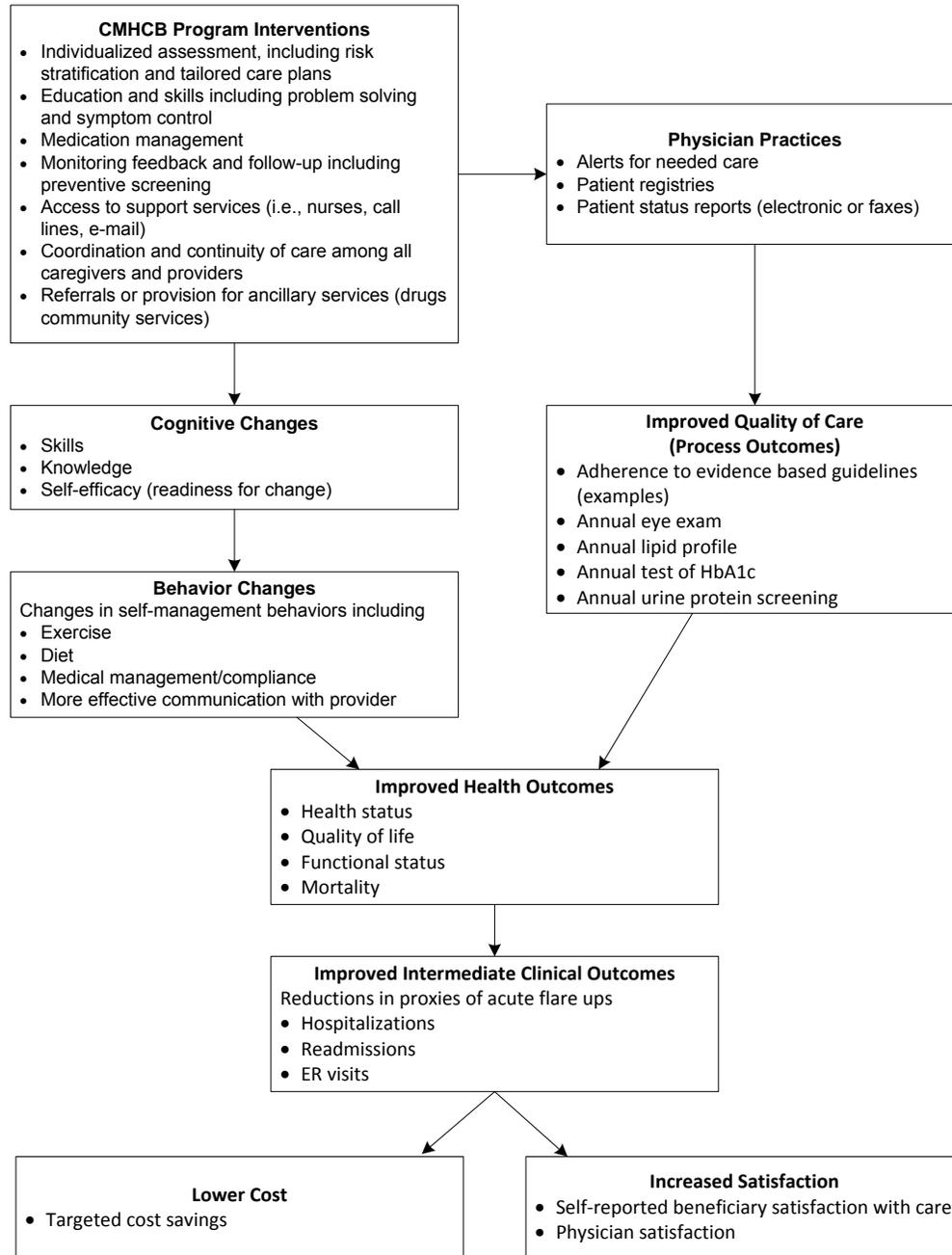
<sup>1</sup> These findings were based on regressions controlling for age, gender, race, disabled/aged entitlement, Medicaid coverage, and whether beneficiaries used skilled nursing facility (SNF) or hospital services prior to the demonstration.

what lifestyle changes to make. All of the CMOs provide a range of educational resources.

- *Medication management and support.* All of the CMO programs include efforts to optimize the medication regimens of participating beneficiaries. Some monitor compliance, some facilitate access to low-cost pharmaceuticals, and others offer face-to-face meetings with pharmacists.
- *Monitoring, feedback, and follow-up.* Activities in this domain include ongoing biomonitoring of beneficiaries by placing scales or other equipment in their homes or by having the beneficiaries self-report their weights, blood sugars, or other measures. When data on preventive services, screenings, or recommended tests are available, the programs remind beneficiaries and/or their doctors to have them done. Flu shots are just one example.
- *Coordination and continuity of care.* One hallmark of the care management model is that it uses data from all available sources to disseminate information to providers and caregivers involved with a beneficiary's care. A limited number of the CMOs have care managers directly embedded in the physician practices, allowing for day-to-day and face-to-face interactions. Several CMOs also have direct communication with physicians via a shared electronic medical record. However, the majority of CMOs must engage physicians or physician practices more indirectly through telephone and fax communication.
- *Referrals or provision for community-based ancillary services.* Not all of a participant's needs are provided directly by the CMOs. All CMOs have recognized the need for transportation, low-cost prescriptions, or other services typically provided by community service organizations (e.g., social workers, dieticians). The CMOs developed relationships with other service providers and programs and helped selected beneficiaries receive these services through their participation in the CMHCB program.

**Figure 2-2** presents RTI's conceptual framework for the overall CMHCB Demonstration evaluation. It synthesizes the common features of the CMHCB Demonstration implemented interventions and the broad areas of assessment within our evaluation design. The CMHCB Demonstration programs employ strategies to improve quality of care while reducing costs by empowering Medicare beneficiaries to better manage their care. The programs do so in three ways: (1) by enhancing beneficiaries' knowledge of their chronic condition through educational and coaching interventions, (2) by improving beneficiaries' communication with their care providers, and (3) by improving beneficiaries' self-management skills. Successful interventions should alter beneficiaries' use of medications, eating habits, and exercise and should allow beneficiaries to interact more effectively with their primary health care providers. All of the CMHCB Demonstration programs hypothesized that lifestyle changes and better communication with providers as well as improved adherence to evidence-based quality of care should improve health and functional status, which will mitigate acute flare-ups in chronic conditions, thereby reducing hospital admissions and readmissions and the use of other costly health services such as emergency rooms and visits to specialists. Experiencing better health and less acute care

**Figure 2-2**  
**Conceptual framework for the CMHCB programs**



NOTE: CMHCB = Care Management for High Cost Beneficiaries; CMO = Care Management Organization; ER = emergency room.

SOURCE: RTI conceptual framework for the Medicare Care Management for High Cost Beneficiaries evaluation. Portions of this model are adapted from other sources, including the Chronic Care Model and the disease management model described in CBO (2004).

utilization, beneficiaries should also be more satisfied that their health care providers are effectively helping them cope with their chronic medical conditions, and providers should be more satisfied with the outcomes of care for their chronically ill Medicare FFS beneficiaries.

In this report, we present our findings with respect to the degree to which the Phase II MGH CMP Demonstration was able to engage its intervention population and achieve four outcomes. *Table 2-1* presents a summary of research questions and data sources, organized by three evaluation domains: Reach, Implementation, and Effectiveness. The Phase II MGH CMP Demonstration implementation experience was reported in Chapter 1.

**Table 2-1**  
**Evaluation research questions and data sources**

Research questions	Site visits	CMO data	Claims
<b>IMPLEMENTATION: To what extent was MGH able to implement its Phase II CMP?</b>			
1. To what extent were specific program features implemented as planned? What changes were made to make implementation more effective? How was implementation related to organizational characteristics of the Phase II MGH CMP?	Yes	Yes	No
2. What were the roles of physicians, the community, the family, and other clinical caregivers? What was learned about how to provide this support effectively?	Yes	No	No
3. To what extent did the Phase II MGH CMP engage physicians and physician practices in their programs?	Yes	No	No
<b>REACH: How well did the Phase II MGH CMP engage its intended audiences?</b>			
1. Were there systematic baseline differences in demographic characteristics and disease burden between the intervention and comparison group beneficiaries at the start of the demonstration?	No	No	Yes
2. How many individuals were engaged and what were the characteristics of the participants versus nonparticipants (in terms of baseline clinical measures, demographics, and health status)?	No	Yes	Yes
3. What beneficiary characteristics predict participation?	No	Yes	Yes
<b>EFFECTIVENESS: To what degree was the Phase II MGH CMP able to improve health outcomes and achieve targeted cost savings?</b>			
<b><i>Health outcomes and utilization</i></b>			
1. Did the Phase II MGH CMP improve intermediate health outcomes by reducing acute hospitalizations, readmissions, and emergency room (ER) utilization?	No	No	Yes
2. Did the Phase II MGH CMP improve health outcomes by decreasing mortality?	No	No	Yes

(continued)

**Table 2-1 (continued)**  
**Evaluation research questions and data sources**

Research questions	Site visits	CMO data	Claims
<i><b>Financial outcomes</b></i>			
1. How variable are Medicare per beneficiary per month (PBPM) costs in this high cost, high risk, population? What was the minimal detectable savings rate given the variability in beneficiary PBPM costs?	No	No	Yes
2. How balanced were the intervention and comparison group samples prior to Phase II's start date? How important were any measured imbalances to the estimate of savings?	No	No	Yes
3. What were the Medicare PBPM costs in the base year versus Phase II of the demonstration for the intervention and the comparison groups?	No	No	Yes
4. What were the levels and trends in PBPM costs for intervention group participants and nonparticipants? Did nonparticipation materially reduce the intervention's overall cost savings?	No	No	Yes
5. What were MGH's gross savings based on multivariate regression with adjustments for differences in intervention and comparison beneficiaries?	No	No	Yes
6. How sensitive are estimated savings to capping costs, weighting observations, and deleting beneficiaries with limited exposure to the demonstration?	No	No	Yes
7. How did Medicare savings in the demonstration compare with the fees that were paid out?	No	No	Yes
8. Did intervention savings differ by major type of health care service?	No	No	Yes
9. What evidence exists for regression-to-the-mean (RtoM) in Medicare costs for beneficiaries in the intervention and comparison groups?	No	No	Yes

NOTE: CMO = care management organization; CMS = Centers for Medicare & Medicaid Services; CMHCB = Care Management for High Cost Beneficiaries; ER = emergency room; PBPM = per beneficiary per month.

#### **2.1.4 General Analytic Approach**

The CMHCB initiative is what is commonly called a “community experimental trial” (Piantadosi, 1997). It is a “community” in the sense of being population based for a prespecified geographic area. It is “experimental” because it tests different CMHCB Demonstration program interventions in different areas. It is a “trial” that employs randomization (or selection of a comparison population) following an “intent-to-treat” (ITT) model. The initiative is unusual because it employs a “pre-randomized” scheme, wherein CMS assigns eligible beneficiaries to an intervention or comparison stratum before gaining their consent to participate. In fact, comparison beneficiaries are not contacted at all. Further, beneficiaries opting out of the intervention are assigned to the intervention group, even though they will receive no CMO services. These refusals are included in the same stratum as those receiving care coordination services on an ITT basis.

Beneficiaries who become ineligible during the Phase II Demonstration program are removed from the intervention and comparison groups for the remainder of the demonstration for purposes of assessing cost savings and quality, outcomes, and satisfaction improvement. Our evaluation includes only months in which a beneficiary is eligible for the initiative, up until they become ineligible for any reason. We accounted for differential periods of eligibility in the analysis.

Further, the CMOs differentially engaged and interacted more with beneficiaries for whom they believe their programs will result in the greatest benefit, either in terms of health outcomes or cost savings. Thus, not all intervention beneficiaries participated nor did all beneficiaries receive the same level of intervention. In fact, some participants received very few services.

The CMHCB Demonstration programs reflect a dynamic process of system change leading to behavioral change leading to improved clinical outcomes, and the type of experimental design within this demonstration calls for a pre/post, intervention/comparison analytic approach—sometimes referred to as a difference-in-differences approach—to provide maximum analytic flexibility. The strategy will be used to construct estimates of all performance outcomes of each demonstration program.

Our proposed model specification to explain any particular outcome variable,  $Y_{t+1}$ , measured during the intervention program follow-up period:

$$Y_{t+1} = \alpha + \beta_1 I + \beta_2 Y_t + \beta_3 I \bullet Y_t + \beta_4 X + \varepsilon \tag{2.1}$$

where

$\alpha$  = the intercept term, or reference group;

$I = 0,1$  intervention indicator;

$Y_t$  = the outcome measured during a base or predemonstration period;

$X$  = a vector of beneficiary covariates; and

$\varepsilon$  = a regression error term.

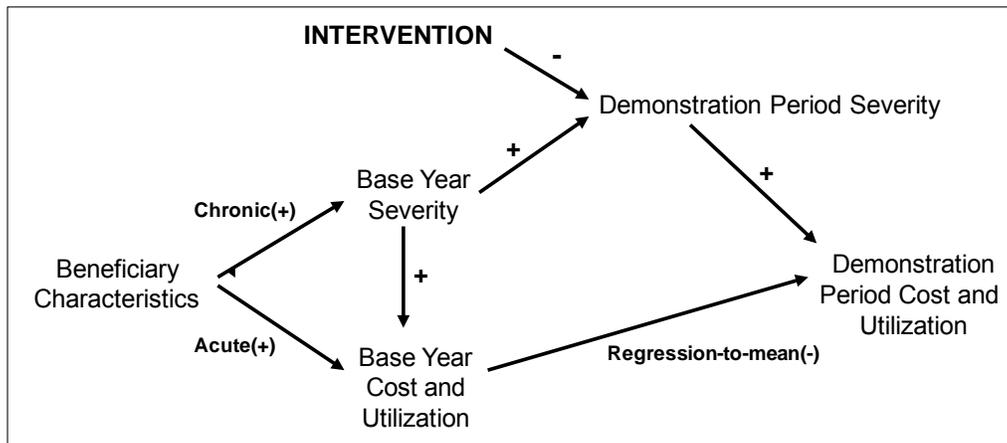
This model uses three sets of variables in analysis of covariance (ANCOVA) format to capture differences between intervention and comparison beneficiaries. The  $\beta_1$  coefficient provides a test of the difference between the intervention group and comparison group in the base period for a particular outcome variable. (The reference comparison group mean value is in the  $\alpha$  intercept.) If preprogram random assignment is successful,  $\beta_1$  will be approximately zero before controlling for beneficiary-specific ( $X$ ) factors. The  $\beta_2$  coefficient tests for temporal changes between pre- and post-demonstration outcomes, while the  $\beta_3$  interaction coefficient tests whether the intervention group's performance profile differs over time from the comparison group's performance. The vector of  $\beta_4$  coefficients controls for beneficiary-specific covariates influencing individual differences in the dependent variable of interest. Including covariates

should set the estimated  $\beta_1$  equal to 0, if selection of a comparable comparison population is contravened in some way. Program effects during the demonstration are reflected in the interaction coefficients. The null hypothesis is that the coefficient for  $\beta_3$  is zero, implying no CMHCB Demonstration program impact. Estimates that are significant at the 95% confidence level imply distinct program effects. The model may also be expanded to conduct analyses across beneficiary subpopulations and CMHCB Demonstration intervention characteristics.

Because we will be analyzing change over time, it is important to consider the likely trajectory in our outcome measures as a function of beneficiary characteristics at baseline. **Figure 2-3** displays an alternative conceptualization of how the CMHCB Demonstration intervention could alter the expected demonstration period outcomes of interest. At baseline, beneficiaries were selected for the demonstration because of higher baseline risk scores as well as high baseline expenditures as a proxy for clinical severity. These beneficiaries also have a multiplicity of other health care issues—chronic and acute—leading to high baseline costs and acute care utilization. The bottom half of **Figure 2-3** displays the statistical phenomenon observed in cohort studies of regression-to-the-mean. Beneficiaries with high costs and utilization are likely to regress toward average levels in a subsequent period and vice versa. Because we start with beneficiaries with high costs and utilization, our expectation is that there would be significant negative regression to the mean; thus, we would observe lower costs and utilization in the demonstration period absent an intervention effect.

Prior research has shown that physical health status declines rather substantially over time for elderly populations, and in particular, for chronically ill elderly populations (Ware 1996). The top half of **Figure 2-3** displays the expected positive relationship between base year and demonstration period severity and the positive relationship between increasing severity of illness and medical costs and utilization during the demonstration period absent an intervention effect. The Phase II CMHCB Demonstration is aimed at improving or preventing further deterioration in health and functional status. Thus, our expectation is that the Phase II CMHCB Demonstration intervention would have a negative or moderating influence on growing patient severity during the demonstration period, thereby reducing the expected positive relationship between demonstration period severity and costs and utilization.

**Figure 2-3**  
**Conceptualization of influence of beneficiary baseline health status and cost and utilization patterns on Phase II CMHCB Demonstration acute care utilization and costs**



## 2.2 Participation, Clinical Quality and Health Outcomes, and Financial Outcomes Data and Analytic Variables

This section provides a description of the data used to evaluate participation in and the effectiveness of the Phase II MGH CMP CMHCB Demonstration.

### 2.2.1 Data

We used six types of data for our evaluation analyses related to participation, clinical quality and health outcomes, and financial outcomes. Specifically, we used the following data sources:

- *Participant status files.* We received participant status files from ARC. The participant status information originated from the Phase II MGH CMP and was submitted to ARC. This file was updated quarterly and logged status changes within the intervention group. Participation status was determined on a monthly basis using three monthly indicators on a given quarterly file, and we used these indicators to determine the participation decision of the original and refresh intervention beneficiaries during each month of the demonstration.
- *Finder file.* RTI used this file, produced by ARC, to identify the group into which each Phase II MGH CMP Demonstration beneficiary was assigned—intervention or comparison—for the Phase I Original and Refresh populations and Phase II populations Original and Refresh populations.
- Enrollment Data Base (EDB) daily eligibility files.
  - ARC provided RTI with an EDB file for the Phase II MGH CMP Demonstration comprised of all assigned Phase I Original and Refresh beneficiaries that were

eligible for the extended evaluation and all the assigned Phase II population beneficiaries. RTI used this file to determine daily eligibility based on the Phase II MGH CMP Demonstration eligibility criteria (*Table 2-2*). The EDB file, in conjunction with the eligibility criteria, allowed us to identify beneficiaries as eligible or ineligible for each day of the intervention period and retrospectively for each day one-year prior to the Phase II MGH CMP Demonstration launch date. We used the files to identify days of eligibility during the 12-month baseline period and the intervention periods of the demonstration and to select claims data during periods of eligibility in both the baseline and intervention periods. *Only beneficiaries who had at least 1 day of eligibility in the baseline period and at least 3 months of eligibility during the Phase II demonstration period are included in our evaluation.*

- RTI conducted an EDB extract to obtain demographic characteristics at the time of Phase II eligibility determination by ARC (July 1, 2009) for the Phase I Original and Refresh populations.
- RTI conducted an EDB extract to obtain demographic characteristics at the time of assignment (July 1, 2009) for the Phase II original MGH population.
- RTI conducted an EDB extract to obtain demographic characteristics at the time of assignment (January 18, 2010) for the Phase II original BW/F and NSMC populations.
- RTI conducted an EDB extract to obtain demographic characteristics at the time of assignment (July 23, 2010) for the Phase II refresh MGH, BW/F, and NSMC populations.
- *Medicare claims data produced by ARC.* In keeping with the financial reconciliation, CMS requested that RTI use the ARC claims files for all analyses. Monthly, ARC received claims data from a CMS prospective claims tap, and on a quarterly basis created netted claims files. For each quarter's processing, ARC updated prior quarterly netted claims files with claims data processed after the prior cutoff dates. These files contained the claims experience for Phase I Original and Refresh and Phase II Original and Refresh population intervention and comparison beneficiaries during the 12 months prior to the Phase II MGH CMP Demonstration start dates and claims with processing dates that span the full intervention period and 9 months thereafter (or claims run out).
- *Long Term Indicator (LTI) file created by FU Associates.* Information in this file was obtained from the Minimum Data Set (MDS) of nursing home assessments and contained data on which Medicare beneficiaries are residents of nursing homes. We used this file to determine institutionalization status during the Phase II intervention periods for the participation analysis.

**Table 2-2**  
**Criteria used for determining daily eligibility during the MGH CMP CMHCB Demonstration**

Ineligibility reasons	Description
Death	Ineligible beginning on day following date of death.
ESRD	Ineligible beginning on day of ESRD enrollment.
MA plan	Ineligible on day of MA plan enrollment when GHO contract number does not equal the contract number for the MGH CMP Demonstration.
Medicare secondary payer	Eligible on day following Medicare secondary payer end date. Ineligible on day Medicare becomes secondary payer for working-aged beneficiary with an employer group health plan (primary payer code A) or for working disabled beneficiary (primary payer code G).
Residence	Ineligible on residence change date indicating that a beneficiary has moved out of the service area determined by state code or state and county codes.
Part A/Part B enrollment	Ineligible on day after Part A/Part B coverage ends.

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; ESRD = end-stage renal disease; MA = Medicare Advantage; GHO = Group Health Organization.

*Table 2-3* contains the Phase II MGH CMP Demonstration’s evaluation start and end dates, both baseline and intervention periods, for the Phase I Original and Refresh populations and the Phase II populations. The last column provides the cohort to which these beneficiaries were assigned for our analyses.

### 2.2.2 Analytic Variables

To conduct our participation, utilization, health outcomes, and financial analyses, we constructed seven sets of analytic variables from the aforementioned files. All variables were created for each of the 8 Phase II populations and then combined to report by the four cohorts shown in *Table 2-3*. Historically, we have analyzed all of the cohorts separately for each demonstration evaluation, but for this report, we combined these into the following four cohorts: Cohort 1 = MGH Phase I original population, Cohort 2 = MGH Phase I refresh and Phase II populations, Cohort 3 = BW/F populations, and Cohort 4 = NSMC populations. Our findings are based on the experience of approximately 14,000 ill Medicare beneficiaries split across 4 cohorts of intervention and comparison groups for analysis purposes, increasing statistical power by combining the substantially smaller Phase II refresh populations with the Phase II original populations (the BW/F and NSMC Phase II refresh populations were only about 40% the size of their Phase II original populations) to detect differences. Even after combining the eight Phase II

populations into four cohorts, there were only roughly 1,700 beneficiaries in each of the Cohort 1 intervention and comparison groups, 2,300 beneficiaries in the Cohort 2 intervention and comparison groups, 1,400 beneficiaries in the Cohort 3 intervention and comparison groups, and around 1,600 beneficiaries in the Cohort 4 intervention and comparison groups.

**Table 2-3**  
**Analysis periods used in the Phase II MGH CMP CMHCB Demonstration analysis of performance**

Intervention period start date	Intervention period final end date	Intervention period months of intervention data	Baseline period start date	Baseline period end date	Cohort
<b>Phase I Original population</b>					
8/1/09	12/31/11	29	8/1/08	7/31/09	1
<b>Phase I Refresh population</b>					
8/1/09	12/31/11	29	8/1/08	7/31/09	2
<b>Phase II Original MGH population</b>					
8/1/09	12/31/11	29	8/1/08	7/31/09	2
<b>Phase II Original BW/F population</b>					
2/1/10	12/31/11	23	2/1/09	1/31/10	3
<b>Phase II Original NSMC population</b>					
3/1/10	12/31/11	22	3/1/09	2/28/10	4
<b>Phase II Refresh MGH population</b>					
8/1/10	12/31/11	17	8/1/09	7/31/10	2
<b>Phase II Refresh BW/F population</b>					
8/1/10	12/31/11	17	8/1/09	7/31/10	3
<b>Phase II Refresh NSMC population</b>					
10/1/10	12/31/11	15	10/1/09	9/30/10	4

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; MGH = Massachusetts General Hospital; BW/F = Brigham and Women’s and Faulkner Hospitals; NSMC = North Shore Medical Center.

- 1) ***Demographic Characteristics and Eligibility.*** For the Phase I Original and Refresh populations, age, gender, race, and Medicare status (aged-in versus disabled) were obtained from the EDB and determined as of the date of ARC's Phase II eligibility determination for the financial reconciliation report (July 1, 2009). For the Phase II populations, these variables were created using the date of assignment; July 1, 2009 for the MGH Phase II original population; January 18, 2010 for the Phase II original BW/F and NSMC populations; July 23, 2010 for the Phase II refresh populations. Medicaid enrollment was determined at any time during the baseline period and was also determined using the EDB.

Daily eligibility variables were used to create analytic variables representing the fraction of the Phase II baseline and demonstration periods that the intervention and comparison beneficiaries were CMHCB Demonstration program eligible. These eligibility fractions were created based on the time period of the analysis. For example, the baseline eligibility fraction is constructed using the number of eligible days divided by 365. For the full intervention period, the denominator is adjusted based on the number of days that the Phase II MGH CMP CMHCB Demonstration program was active. The numerator is the number of days the beneficiary is eligible during that time period. The Phase I Original and Refresh populations participated in the Phase II demonstration for 29 months, so the number of days in the denominator for each Phase I Original and Refresh population beneficiary in the Phase II demonstration is 883 (MGH CMP end date minus MGH CMP start date + 1). If a beneficiary died 420 days into the intervention period, the eligibility fraction for the participation analysis would be 420 divided by 883, or 0.476. The Phase II MGH original population was also active for 29 months. The Phase II BW/F original population was active 23 months (699 days), and the NSMC original population was active 22 months (671 days). The Phase II MGH and BW/F refresh populations participated in the demonstration for 17 months (518 days) and the Phase II NSMC refresh population was active for 15 months (457 days).

- 2) ***Institutionalized Status.*** Three binary indicators of institutionalization were created for all beneficiaries:
- Whether a beneficiary was in a nursing home for any one or more months of the initial 6 months of the demonstration period using the Long Term Indicator (LTI) file created by FU Associates. This measure of institutionalization is used in all but the financial analyses.
  - Whether a beneficiary had any baseline long-term-care (LTC) hospital costs in the baseline year. LTC hospitals are identified if the last four digits of the provider ID ranged from 2000 to 2299.
  - Whether a beneficiary had any baseline skilled nursing facility (SNF) costs.
- 3) ***Hierarchical Condition Category (HCC) Risk Score.*** A prospective HCC score for each beneficiary was calculated by RTI for a 12-month period prior to the *start* of the

Phase II demonstration program using the 2006 CMS-HCC risk-adjustment payment model.

- 4) **Health Status.** We constructed three sets of analytic variables to reflect health status prior to and during the demonstration:
- *Charlson index.* We constructed the Charlson comorbidity index using claims data from the inpatient, outpatient, physician, and home health claims files. We created an index for the year prior to the start of the Phase II MGH CMP Demonstration. **Supplement 2A** contains the SAS code used to create this index.
  - *Comorbid conditions.* RTI created indicators of frequently occurring comorbid conditions: heart failure; coronary artery disease; other respiratory disease; diabetes without complications; diabetes with complications; essential hypertension; valve disorders; cardiomyopathy; acute and chronic renal disease; renal failure; peripheral vascular disease; lipid metabolism disorders; cardiac dysrhythmias and conduction disorders; dementias; strokes; chest pain; urinary tract infection; anemia; malaise and fatigue (including chronic fatigue syndrome); dizziness, syncope, and convulsions; disorders of joint; and hypothyroidism. Beneficiaries were identified as having a comorbid condition if they had one inpatient claim with the clinical condition as the principal diagnosis or had two or more physician or outpatient department (OPD) claims for an Evaluation & Management (E&M) service (CPT codes 99201–99429) with an appropriate principal or secondary diagnosis. The physician and/or OPD claims had to have occurred on different days. The diagnosis codes used to identify these clinical conditions are in **Supplement 2A**.
  - *Ambulatory Care Sensitive Conditions (ACSCs).* We constructed 34 variables to indicate the presence of an ACSC in the year prior to the demonstration and during the demonstration, using the primary diagnosis on a claim. ACSCs include Acute renal failure, Altered mental status, Anemia, Angina, Asthma, Bacterial Pneumonia, C. Difficile, Cellulitis, Congestive heart failure, Constipation/fecal impaction/obstipation, Chronic Obstructive Pulmonary Disease (COPD) and Chronic bronchitis, Dehydration/volume depletion, Diabetes, Diarrhea and gastroenteritis, Falls and trauma, Hypertension, Hypoglycemia, Hypokalemia, Hyponatremia, Hypotension, Immunization/Preventable Conditions, Influenza, Ischemic Stroke, Nutritional deficiencies, Perforated or Bleeding Ulcer, Pyelonephritis, Ruptured Appendix, Seizures, Septicemia, Severe Ear, Nose, and Throat Infections, Skin ulcers, Tuberculosis, Urinary Tract Infection (UTI), Weight Loss/Failure to thrive. The diagnosis codes used to identify these conditions are found in **Supplement 2A**.
- 5) **Utilization.** We constructed three sets of utilization variables for this evaluation as proxies for intermediate clinical outcomes. These sets of variables were also

constructed for the following principal diagnoses: all cause and the ACSCs, using the primary diagnosis (from the header portion of the claim) for claim types inpatient and outpatient:

- the number of acute hospitalizations,
- 30-day readmissions, and
- emergency room visits, including observation bed stays.

Only claims that occurred during periods of eligibility were included in the utilization measures. For both the demonstration and baseline periods, claims were included if services were started during days that the beneficiary met the Phase II MGH CMP Demonstration eligibility criteria, as determined from the ARC daily eligibility file. We flagged claims for services that occurred during a period of eligibility by comparing the eligibility period with a specific date on the claim, following the decision rules that were applied for the financial reconciliation. The exact date fields used are based on the claim type, as follows:

- inpatient and skilled nursing facility claims: *admission date*;
- all other types of services: *from date*.

Prior to conducting our final set of analyses, we critically examined the timing of readmissions using data from the year prior to the start of the demonstration.

**Figure 2-4** displays a graphic representation of time from discharge to next admission for Phase I Original population (cohort 1) comparison beneficiaries who had a subsequent admission. In this figure, we display all-cause readmission; thus, beneficiaries were not required to have the same reason for both the initial and subsequent admission for the hospitalization to be considered a readmission. The graphic shows that there is a steep trajectory of readmissions during the first 30-day period following discharge, with a gradual tapering off of number of readmissions around week 6. We constructed 30-day readmission rates, which captures 20% of subsequent admissions in our analyses<sup>2</sup>.

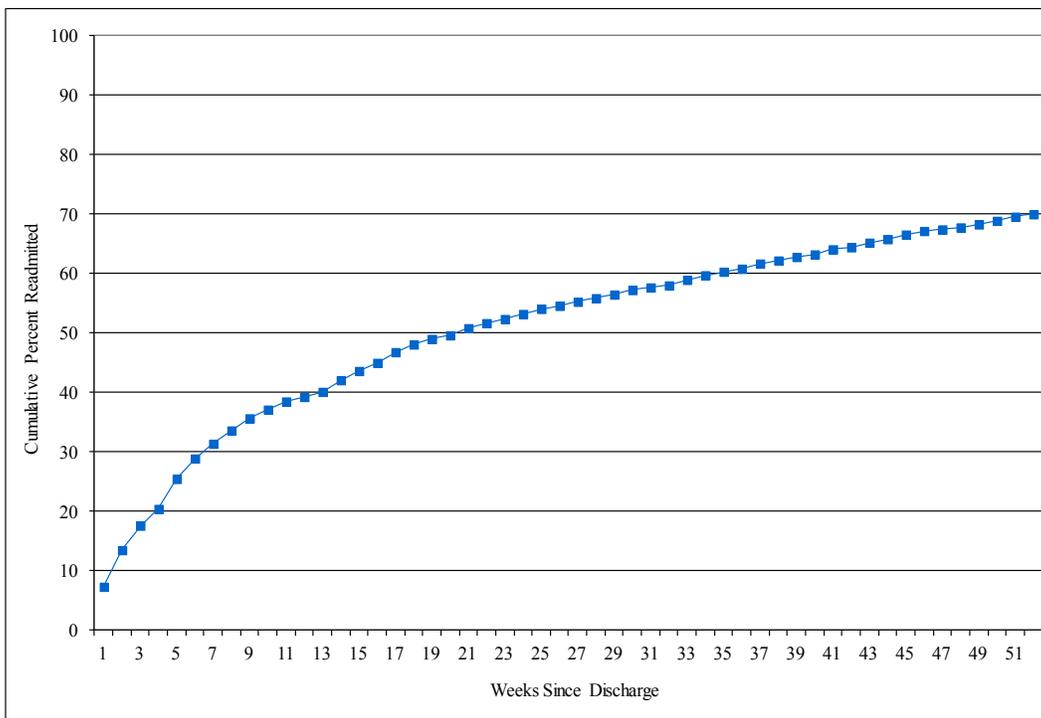
We examined readmissions following admissions that occurred during the last 12 months for the eight populations during the Phase II MGH CMP. In order to capture readmissions following admissions that occurred late in the baseline and demonstration periods, we used a total of 13 months of data for each period to identify readmissions. For the baseline period, we identified admissions during the 12 months preceding the start of the Phase II demonstration and also included readmissions through the first month of the intervention period for those admissions that occurred within 1 month of the start of the demonstration. The intervention

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<sup>2</sup> We evaluated time to readmission based upon days post sentinel hospitalization discharge; however, the graph displays time to readmission in increments of weeks for visual presentation purpose.

period for the Phase I Original and Refresh populations and the Phase II MGH population examined admissions during the periods of months 17 through 28 and included readmissions through month 29, the Phase II original BW/F population examined admissions during months 11 through 22 and included readmissions through month 23. Readmissions for the Phase II original NSMC population examined admissions in months 10–21 and included readmissions through month 22. For the Phase II refresh populations, MGH and BW/F looked at admissions in months 5 through 16 and readmissions through month 17, while the NSMC used months 3 through 14 to identify admissions and examined readmissions through month 15. A readmission was defined as an admission up to 30 days after an index hospitalization discharge date. The readmission rates are aggregated to the cohort level. We constructed all-cause readmission rates for all hospitalizations and same-cause readmission rates for the ACSCs.

**Figure 2-4**  
**Percent with readmission for any diagnosis during the Phase II MGH CMP**  
**Demonstration: Phase I Original baseline comparison population**



- 6) **Expenditures.** RTI constructed a set of Medicare payment variables to reflect payments during periods of baseline and demonstration eligibility using the claims selection decision rules discussed previously. Total Medicare payments—exclusive of beneficiary deductibles, coinsurance payments, and third-party payments—were summarized for the annual period prior to the start date of Phase II and also for the full intervention period and placed on a per beneficiary per month (PBPM) basis by

dividing total payments by the total number of eligible days divided by 30.42. We defined a month as 30.42 days (365 days in a year divided by 12 months, rounded to two decimal places). This standardizes the definition of a month. For the Phase II MGH CMP Demonstration period, total Medicare payments were summarized for the total intervention periods for each of the eight Phase II populations and then aggregated to the cohort level.

- 7) **Mortality.** Date of death during the demonstration period was obtained from the Medicare EDB and was used to create a binary mortality variable.

## 2.3 Baseline Comparison Analysis and Propensity Score Weighting

RTI conducted a series of analyses to determine whether the intervention and comparison groups were equivalent at the start of the Phase II MGH CMP Demonstration. The first step was to examine the primary reason for becoming ineligible during the demonstration period. Next, we contrasted the baseline characteristics of the intervention and comparison groups during the year prior to the start of Phase II for both the intervention and comparison populations. We evaluated these characteristics for all beneficiaries who were eligible on the first day of the Phase II intervention and for those who were eligible for at least 3 months during the Phase II intervention period. We also evaluated the comparability of the intervention and comparison groups after applying propensity score weights derived from observable data in the Medicare EDB and claims data files. This process was repeated for each cohort.

For the Phase I evaluation, geographically-based comparison groups were selected for each of the four MGH cohorts. These comparison groups were identified by subclassifying propensity scores into five strata, and randomly selecting comparison beneficiaries from each stratum to match the number found in that stratum in the intervention group. As a result, the intervention and comparison groups were the same size at the start of Phase I.

In Phase II, we re-examined the comparability of the original Phase I cohort samples. Our strategy used a different method of propensity score weighting to adjust for any group imbalances that had emerged since the beginning of the first phase.

### 2.3.1 Initial Reason for Ineligibility

**Table 2-4** summarizes the amount of beneficiary attrition occurring between the start of Phase II and the end of the performance period on December 31, 2011. The table displays the first reason a beneficiary became ineligible for analyses during Phase II, and applies the chi-square test to determine if these distributions differ between the intervention and comparison groups. Within each cohort, the size of the two groups is nearly identical at the start of Phase II.

Overall attrition rates ranged from 21% to 29%. In each cohort, the primary reason for attrition was death during the follow-up period. None of the other reasons accounted for as much as 3% attrition. The death rate was highest for cohort 1, but this cohort also had the longest follow-up period. The only highly significant difference between groups was a higher death rate for the comparison (19.3%) than the intervention group (14.4%) in cohort 2.

**Table 2-4**  
**Reason for ineligibility in the Phase II MGH CMP CMHCB Demonstration**

Reasons for ineligibility	I	C	I %	C %	I%-C%	Likelihood ratio X <sup>2</sup>	p-value
<b><u>Cohort 1</u></b>							
Number of beneficiaries eligible at start of Phase II	1,735	1,715	100.0	100.0	N/A	N/A	N/A
Died	410	424	23.6	24.7	-1.1	0.56	0.45
ESRD	16	33	0.9	1.9	-1.0	6.31	0.01
Joined MA Plan	26	47	1.5	2.7	-1.2	6.51	0.01
Medicare Secondary Payer	0	2	0.0	0.1	-0.1	2.80	0.09
Loss of Part A or Part B	7	6	0.4	0.3	0.1	0.07	0.80
Moved Out of Service Area	22	25	1.3	1.5	-0.2	0.23	0.63
Number of beneficiaries eligible on 12/31/11	1,254	1,178	72.3	68.7	3.6	N/A	N/A
<b><u>Cohort 2</u></b>							
Number of beneficiaries eligible at start of Phase II	2,374	2,356	100.0	100.0	N/A	N/A	N/A
Died	341	454	14.4	19.3	-4.9	20.41	<.0001
ESRD	14	23	0.6	1.0	-0.4	2.30	0.13
Joined MA Plan	33	47	1.4	2.0	-0.6	2.61	0.11
Medicare Secondary Payer	2	5	0.1	0.2	-0.1	1.35	0.24
Loss of Part A or Part B	6	3	0.3	0.1	0.1	1.00	0.32
Moved Out of Service Area	50	35	2.1	1.5	0.6	2.59	0.11
Number of beneficiaries eligible on 12/31/11	1,928	1,789	81.2	75.9	5.3	N/A	N/A
<b><u>Cohort 3</u></b>							
Number of beneficiaries eligible at start of Phase II	1,407	1,420	100.0	100.0	N/A	N/A	N/A
Died	215	221	15.3	15.6	-0.3	0.04	0.84
ESRD	14	21	1.0	1.5	-0.5	1.36	0.24
Joined MA Plan	27	39	1.9	2.7	-0.8	2.13	0.14
Medicare Secondary Payer	1	3	0.1	0.2	-0.1	1.03	0.31
Loss of Part A or Part B	2	4	0.1	0.3	-0.1	0.66	0.42
Moved Out of Service Area	29	20	2.1	1.4	0.7	1.78	0.18
Number of beneficiaries eligible on 12/31/11	1,119	1,112	79.5	78.3	1.2	N/A	N/A

(continued)

**Table 2-4 (continued)**  
**Reason for ineligibility in the Phase II MGH CMP CMHCB Demonstration**

Reasons for ineligibility	I	C	I %	C %	I%-C%	Likelihood ratio X <sup>2</sup>	<i>p-value</i>
<b>Cohort 4</b>							
Number of beneficiaries eligible at start of Phase II	1,678	1,748	100.0	100.0	N/A	N/A	N/A
Died	314	379	18.7	21.7	-3.0	4.68	0.03
ESRD	9	9	0.5	0.5	0.0	0.01	0.93
Joined MA Plan	13	28	0.8	1.6	-0.8	5.08	0.02
Medicare Secondary Payer	1	1	0.1	0.1	0.0	0.00	0.98
Loss of Part A or Part B	1	1	0.1	0.1	0.0	0.00	0.98
Moved Out of Service Area	22	30	1.3	1.7	-0.4	0.94	0.33
Number of beneficiaries eligible on 12/31/11	1,318	1,300	78.5	74.4	4.2	N/A	N/A

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; I = Intervention Population; C = Comparison Population; ESRD = end-stage renal disease; MA = Medicare Advantage.

N/A means not applicable

Data Sources: RTI analysis of 2008–2011 Medicare enrollment, eligibility, claims and encounter data.

Program: lost\_elig; lost\_elig2c

### 2.3.2 Propensity Score Methodology

**Propensity Score Methodology.** While the MGH CMP Demonstration and comparison areas were matched on propensity score strata during the Phase I, this does not guarantee that key beneficiary characteristics will also be similar by the Phase II start date in each cohort. We conducted propensity score analyses for each cohort to assess group differences prior to Phase II. A propensity score is the probability that a beneficiary is a member of the intervention group. Propensity scores were estimated by logistic regression, regressing group status (1=intervention group, 0=comparison group) on a set of beneficiary characteristics measured during the baseline period. These characteristics consisted of chronic disease status (HCC risk and Charlson morbidity scores, prior institutionalization), demographic characteristics (age group, gender, race), Medicaid eligibility, disability status, and mean monthly Medicare expenditures.

**Inverse Propensity Score Weighting.** The propensity models estimate the probability that a beneficiary was a member of the MGH CMP Demonstration. These predicted propensity scores (PS) were then converted into weights for analysis purposes. The group-specific weights were:

PS weight = 1 for all beneficiaries in the MGH CMP Demonstration ZIP code areas in a specified cohort, and

PS weight =  $PS/(1-PS)$  for comparison beneficiaries.

To account for periods of ineligibility for Medicare, eligibility fractions were also computed. The eligibility fraction is the proportion of the baseline year in which a beneficiary was eligible for both Medicare Parts A and B FFS. Total weights were the product of the PS and eligibility values. Weighting helps to ensure that beneficiaries in each group are similar in terms of their pre-intervention or baseline characteristics. As such, the effect of weighting is similar to the effect of randomization in experimental designs.

**Group Comparability.** The primary objective of weighting is to increase the comparability of the intervention and comparison groups prior to estimating the effects of the demonstration. Comparability is reflected by the extent to which covariate means are similar (or “balanced”) between the two groups. We evaluated the comparability issue by applying the propensity weights to both groups, examining the weighted means, and assessing shifts between weighted and unweighted means in the comparison group. The results can also be displayed graphically in the form of “butterfly” graphs, which are histograms that display the intervention group means to one side and the corresponding comparison group results on the other side.

## 2.4 Propensity Model Results

When groups are well-balanced in terms of beneficiary characteristics, individual characteristics should have little influence on propensity scores. Propensity model results are examined in three different ways in *Table 2-5*. First, the table shows the mean propensity score for each group. The means should be close to 0.50 (indicating a 50–50 chance of being in the intervention group) if the groups are balanced. Second, the table reports the c-statistic for each cohort model. This statistic measures the degree to which the model correctly distinguishes between the two groups. The lowest possible value is 0.50, which indicates that no differentiation was achieved. Finally, the table lists any characteristics (out of 14 possible predictors) that had statistically significant effects ( $p < 0.001$ ) in the model.

The table shows that in each cohort, the mean propensity probability was slightly above 0.50 for the intervention group and slightly below 0.50 for the comparison group. The c-statistics were below 0.58 for three of the four cohorts, and aside from some differences in county of residence, few characteristics were associated with group status. In cohort 4, the positive effect of HCC risk scores was offset by a negative effect for the Charlson comorbidity index.

**Table 2-5**  
**Summary of Propensity Score Analyses by Cohort; MGH CMP CMHCB Demonstration**

	Cohort 1		Cohort 2		Cohort 3		Cohort 4	
	Inter.	Comp.	Inter.	Comp.	Inter.	Comp.	Inter.	Comp.
Mean propensity score	.537	0.472	0.512	0.494	0.501	0.492	0.506	0.477
c-statistic	0.645		0.576		0.553		0.571	
Significant predictors of group status	<ul style="list-style-type: none"> <li>• Minority beneficiary</li> <li>• Counties</li> </ul>		<ul style="list-style-type: none"> <li>• Medicaid status</li> <li>• Counties</li> </ul>		(None)		<ul style="list-style-type: none"> <li>• Baseline PBPM payment</li> <li>• HCC risk score</li> <li>• Charlson comorbidity</li> </ul>	

## 2.5 Comparison of Beneficiary Characteristics

Detailed characteristics for beneficiaries at baseline are shown in **Table 2-6** for each cohort with separate columns for the intervention and comparison groups. The characteristics include sample sizes, demographic characteristics, health status variables, utilization measures, total monthly Medicare expenditures during the baseline year, and the components of total expenditures. Differences between the groups were tested for statistical significance using t-tests. The table for each cohort is divided into three panels. The left panel shows results for the full cohorts weighted only by eligibility fraction (the proportion of the follow-up period that beneficiaries were eligible for both Medicare Parts A and B). The middle panel removes beneficiaries who had less than 3 months of eligibility. Members of the excluded group frequently had extremely high expenditure values because their means are based on only a few months of data. In all four cohorts, average expenditures were lower after eliminating beneficiaries with less than three months of experience. The right panel shows the results after adjustment by propensity weights.

In Cohort 1, there were initially 17 statistically significant group differences out of the 30 measures tested (left panel of **Table 2-6a**). Removing beneficiaries with less than three months of eligibility (middle panel of **Table 2-6a**) decreased the total sample size by 105 beneficiaries. This reduced mean monthly Medicare expenditures by more than \$50 per beneficiary, but had little impact on the number of significant group differences. The impact of propensity score weighting on the other hand was striking, eliminating all but four of the previous group differences (right panel, **Table 2-6a**).

**Table 2-6a**

**Characteristics of Medicare Fee-for-Service Beneficiaries assigned to the Intervention and Comparison Groups in the Phase II MGH CMP CMHCB Demonstration: Characteristics assessed in the year prior to the start of Phase II for Cohort 1**

Characteristics	Weighted by eligibility fraction				Dropping beneficiaries with less than 3 months of eligibility and weighted by eligibility fraction				Dropping beneficiaries with less than 3 months of eligibility and weighted by eligibility fraction and propensity score			
	I	C	I-C	p-value <sup>†</sup>	I	C	I-C	p-value <sup>†</sup>	I	C	I-C	p-value <sup>†</sup>
Number of eligibles	1,735	1,715	N/A	N/A	1,686	1,659	N/A	N/A	1,686	1,659	N/A	N/A
Number of FTEs	1,730	1,706	N/A	N/A	1,682	1,650	N/A	N/A	1,682	1,652	N/A	N/A
Age	77.4	75.8	1.56	**	77.3	75.7	1.64	**	77.3	77.3	-0.03	N/S
Age < 65	9.9	15.7	-5.77	**	10.1	16.0	-5.91	**	10.1	10.8	-0.71	N/S
Age 65–74	22.9	21.6	1.31	N/S	23.0	21.8	1.18	N/S	23.0	21.8	1.19	N/S
Age 75–84	43.8	39.3	4.52	**	44.1	39.6	4.47	**	44.1	42.2	1.88	N/S
Age 85+ years	23.3	23.4	-0.06	N/S	22.9	22.6	0.25	N/S	22.9	25.2	-2.37	N/S
Female	53.8	53.4	0.39	N/S	53.6	53.6	0.02	N/S	53.6	53.3	0.33	N/S
White	91.3	81.9	9.38	**	91.2	81.8	9.40	**	91.2	91.0	0.20	N/S
Disabled	10.7	16.3	-5.54	**	10.9	16.5	-5.62	**	10.9	11.1	-0.17	N/S
Medicaid	29.9	38.1	-8.17	**	29.9	38.3	-8.34	**	29.9	30.5	-0.55	N/S
Institutionalized	4.2	4.1	0.12	N/S	3.6	3.7	-0.07	N/S	3.6	3.3	0.31	N/S
Average HCC score	2.5	2.5	-0.02	N/S	2.4	2.5	-0.02	N/S	2.4	2.4	0.00	N/S
Average Charlson Index	3.4	3.3	0.15	N/S	3.4	3.2	0.13	N/S	3.4	3.4	-0.01	N/S
Rate of all-cause hospitalizations	712	883	-171	**	692	856	-164	**	692	691	1	N/S
Rate of ACSC hospitalizations	342	421	-79	**	327	398	-71	*	327	313	14	N/S
Rate of all-cause emergency room visits	1,291	1,472	-181	*	1,268	1,453	-185	*	1,268	1,202	66	N/S
Rate of ACSC emergency room visits	463	586	-123	**	449	570	-121	**	449	468	-18	N/S
Rate of all-cause 30-day readmissions	394	449	-55	N/S	380	444	-64	N/S	380	330	50	N/S
Rate of ACSC 30-day readmissions	118	90	28	N/S	118	92	27	N/S	118	60	58	*
Average PBPM Medicare Expenditures												
Total	1,729	2,027	-298	**	1,670	1,951	-282	**	1,670	1,682	-12	N/S
Long-term care	56	80	-24	N/S	53	65	-12	N/S	53	45	8	N/S
Rehabilitation	48	32	16	N/S	47	32	15	N/S	47	31	17	N/S
Psychiatric	17	20	-3	N/S	18	21	-3	N/S	18	16	2	N/S
Inpatient	632	776	-143	**	604	744	-139	**	604	588	17	N/S
Home Health	154	193	-39	**	151	191	-40	**	151	177	-26	*
DME	38	73	-35	**	38	73	-36	**	38	62	-24	**
Physician-Office Expenditures	151	169	-18	*	149	168	-19	**	149	158	-9	N/S
Physician-Hospital Expenditures	128	145	-16	*	124	140	-15	*	124	124	1	N/S
Skilled Nursing Facility	154	188	-34	N/S	149	174	-25	N/S	149	141	8	N/S
Hospital Outpatient	273	304	-31	N/S	269	301	-32	*	269	298	-30	N/S
Hospice	36	12	24	*	27	7	20	*	27	9	18	*

**Table 2-6b**

**Characteristics of Medicare Fee-for-Service Beneficiaries assigned to the Intervention and Comparison Groups in the Phase II MGH CMP CMHCB Demonstration: Characteristics assessed in the year prior to the start of Phase II for Cohort 2**

Characteristics	Weighted by eligibility fraction				Dropping beneficiaries with less than 3 months of eligibility and weighted by eligibility fraction				Dropping beneficiaries with less than 3 months of eligibility and weighted by eligibility fraction and propensity score			
	I	C	I-C	p-value <sup>†</sup>	I	C	I-C	p-value <sup>†</sup>	I	C	I-C	p-value <sup>†</sup>
Number of eligibles	2,374	2,356	N/A	N/A	2,321	2,291	N/A	N/A	2,321	2,291	N/A	N/A
Number of FTEs	2,369	2,350	N/A	N/A	2,316	2,285	N/A	N/A	2,316	2,284	N/A	N/A
Age	75.5	75.6	-0.11	N/S	75.4	75.4	-0.06	N/S	75.4	75.2	0.14	N/S
Age < 65	12.4	14.8	-2.38	*	12.5	14.9	-2.42	*	12.5	13.2	-0.65	N/S
Age 65–74	28.9	24.5	4.42	**	29.2	24.7	4.47	**	29.2	27.8	1.36	N/S
Age 75–84	37.8	36.4	1.39	N/S	37.7	36.7	0.97	N/S	37.7	37.4	0.24	N/S
Age 85+ years	20.9	24.3	-3.43	**	20.6	23.6	-3.02	*	20.6	21.6	-0.95	N/S
Female	54.2	53.2	0.99	N/S	54.3	53.0	1.30	N/S	54.3	54.4	-0.12	N/S
White	90.8	89.9	0.90	N/S	90.8	89.8	1.02	N/S	90.8	90.7	0.12	N/S
Disabled	13.2	15.4	-2.15	*	13.3	15.5	-2.20	*	13.3	13.7	-0.34	N/S
Medicaid	26.3	32.0	-5.64	**	26.3	32.1	-5.85	**	26.3	26.4	-0.12	N/S
Institutionalized	1.4	1.9	-0.56	N/S	1.2	1.8	-0.67	N/S	1.2	1.6	-0.39	N/S
Average HCC score	2.5	2.6	-0.09	*	2.5	2.5	-0.08	*	2.5	2.5	-0.01	N/S
Average Charlson Index	3.4	3.4	0.00	N/S	3.4	3.4	-0.02	N/S	3.4	3.4	-0.01	N/S
Rate of all-cause hospitalizations	722	876	-154	**	696	843	-147	**	696	708	-13	N/S
Rate of ACSC hospitalizations	297	389	-92	**	284	371	-87	**	284	307	-23	N/S
Rate of all-cause emergency room visits	1,261	1,407	-146	*	1,232	1,387	-155	*	1,232	1,243	-11	N/S
Rate of ACSC emergency room visits	398	506	-108	**	387	491	-105	**	387	427	-40	N/S
Rate of all-cause 30-day readmissions	318	468	-149	**	288	440	-152	**	288	348	-60	N/S
Rate of ACSC 30-day readmissions	57	87	-30	N/S	53	85	-32	N/S	53	67	-14	N/S
Average PBPM Medicare Expenditures												
Total	1,955	2,206	-251	**	1,892	2,134	-242	**	1,892	1,893	-2	N/S
Long-term care	62	75	-13	N/S	59	69	-9	N/S	59	50	9	N/S
Rehabilitation	59	38	21	*	59	38	21	*	59	33	26	**
Psychiatric	23	12	12	N/S	21	12	9	N/S	21	10	11	N/S
Inpatient	745	832	-86	N/S	721	802	-80	N/S	721	665	56	N/S
Home Health	169	198	-29	**	167	192	-26	*	167	169	-2	N/S
DME	35	58	-23	**	34	55	-20	**	34	50	-16	**
Physician-Office Expenditures	157	192	-35	**	155	190	-34	**	155	180	-25	**
Physician-Hospital Expenditures	156	162	-6	N/S	151	158	-7	N/S	151	144	7	N/S
Skilled Nursing Facility	130	158	-28	N/S	121	153	-32	*	121	124	-3	N/S
Hospital Outpatient	360	430	-70	**	350	418	-67	**	350	420	-70	**
Hospice	6	10	-4	N/S	2	8	-7	*	2	8	-7	N/S

**Table 2-6c**

**Characteristics of Medicare Fee-for-Service Beneficiaries assigned to the Intervention and Comparison Groups in the Phase II MGH CMP CMHCB Demonstration: Characteristics assessed in the year prior to the start of Phase II for Cohort 3**

Characteristics	Weighted by eligibility fraction				Dropping beneficiaries with less than 3 months of eligibility and weighted by eligibility fraction				Dropping beneficiaries with less than 3 months of eligibility and weighted by eligibility fraction and propensity score			
	I	C	I-C	p-value <sup>†</sup>	I	C	I-C	p-value <sup>†</sup>	I	C	I-C	p-value <sup>†</sup>
Number of eligibles	1,407	1,420	N/A	N/A	1,363	1,380	N/A	N/A	1,363	1,380	N/A	N/A
Number of FTEs	1,401	1,418	N/A	N/A	1,357	1,378	N/A	N/A	1,357	1,378	N/A	N/A
Age	75.1	74.9	0.15	N/S	75.0	74.8	0.21	N/S	75.0	74.9	0.13	N/S
Age < 65	15.2	16.7	-1.48	N/S	15.4	17.1	-1.77	N/S	15.4	15.9	-0.53	N/S
Age 65–74	27.1	25.5	1.60	N/S	27.3	25.5	1.80	N/S	27.3	26.4	0.91	N/S
Age 75–84	36.3	35.8	0.51	N/S	36.3	35.6	0.70	N/S	36.3	36.5	-0.19	N/S
Age 85+ years	21.4	22.0	-0.63	N/S	21.0	21.8	-0.74	N/S	21.0	21.2	-0.19	N/S
Female	57.8	55.6	2.14	N/S	57.7	55.9	1.79	N/S	57.7	57.5	0.22	N/S
White	71.7	73.0	-1.27	N/S	71.9	72.7	-0.81	N/S	71.9	71.7	0.20	N/S
Disabled	16.1	17.5	-1.38	N/S	16.2	17.9	-1.66	N/S	16.2	16.5	-0.30	N/S
Medicaid	38.4	41.3	-2.91	N/S	38.2	41.6	-3.40	N/S	38.2	38.0	0.16	N/S
Institutionalized	0.6	0.6	0.08	N/S	0.7	0.5	0.16	N/S	0.7	0.5	0.18	N/S
Average HCC score	2.7	2.6	0.07	N/S	2.7	2.6	0.07	N/S	2.7	2.7	-0.01	N/S
Average Charlson Index	3.7	3.7	0.05	N/S	3.7	3.6	0.06	N/S	3.7	3.7	-0.01	N/S
Rate of all-cause hospitalizations	1,188	1,219	-31	N/S	1,136	1,202	-67	N/S	1,136	1,167	-32	N/S
Rate of ACSC hospitalizations	520	519	0	N/S	498	516	-18	N/S	498	499	0	N/S
Rate of all-cause emergency room visits	1,724	1,919	-195	N/S	1,680	1,916	-236	*	1,680	1,855	-175	N/S
Rate of ACSC emergency room visits	554	632	-78	N/S	540	631	-91	*	540	607	-67	N/S
Rate of all-cause 30-day readmissions	557	638	-82	N/S	504	629	-124	N/S	504	599	-94	N/S
Rate of ACSC 30-day readmissions	75	112	-37	N/S	74	115	-41	N/S	74	103	-29	N/S
Average PBPM Medicare Expenditures												
Total	2,689	2,788	-99	N/S	2,576	2,744	-168	N/S	2,576	2,655	-79	N/S
Long-term care	105	142	-37	N/S	94	141	-47	N/S	94	127	-32	N/S
Rehabilitation	45	45	0	N/S	44	43	0	N/S	44	40	4	N/S
Psychiatric	18	17	1	N/S	19	18	1	N/S	19	16	3	N/S
Inpatient	1,120	1,203	-83	N/S	1,056	1,188	-132	N/S	1,056	1,149	-92	N/S
Home Health	266	250	16	N/S	262	250	12	N/S	262	237	24	N/S
DME	57	53	4	N/S	57	53	4	N/S	57	55	2	N/S
Physician-Office Expenditures	161	206	-46	**	158	204	-46	**	158	195	-36	**
Physician-Hospital Expenditures	208	200	7	N/S	199	197	2	N/S	199	194	5	N/S
Skilled Nursing Facility	190	139	51	**	178	135	43	*	178	123	54	**
Hospital Outpatient	479	474	5	N/S	472	462	9	N/S	472	465	6	N/S
Hospice	3	13	-11	*	1	9	-8	N/S	1	10	-9	N/S

**Table 2-6d**

**Characteristics of Medicare Fee-for-Service Beneficiaries assigned to the Intervention and Comparison Groups in the Phase II MGH CMP CMHCB Demonstration: Characteristics assessed in the year prior to the start of Phase II for Cohort 4**

Characteristics	Weighted by eligibility fraction				Dropping beneficiaries with less than 3 months of eligibility and weighted by eligibility fraction				Dropping beneficiaries with less than 3 months of eligibility and weighted by eligibility fraction and propensity score			
	I	C	I-C	p-value <sup>†</sup>	I	C	I-C	p-value <sup>†</sup>	I	C	I-C	p-value <sup>†</sup>
Number of eligibles	1,678	1,748	N/A	N/A	1,619	1,675	N/A	N/A	1,619	1,675	N/A	N/A
Number of FTEs	1,676	1,747	N/A	N/A	1,617	1,674	N/A	N/A	1,617	1,674	N/A	N/A
Age	78.2	78.2	0.08	N/S	78.2	78.0	0.17	N/S	78.2	78.4	-0.20	N/S
Age < 65	8.0	9.9	-1.93	*	8.1	10.1	-2.03	*	8.1	7.6	0.41	N/S
Age 65–74	21.8	20.7	1.11	N/S	21.8	21.2	0.62	N/S	21.8	22.7	-0.91	N/S
Age 75–84	41.8	39.1	2.68	N/S	42.2	39.0	3.18	N/S	42.2	40.5	1.68	N/S
Age 85+ years	28.5	30.3	-1.86	N/S	28.0	29.8	-1.77	N/S	28.0	29.2	-1.18	N/S
Female	56.4	56.2	0.12	N/S	56.3	56.5	-0.17	N/S	56.3	56.8	-0.48	N/S
White	95.8	96.0	-0.23	N/S	95.6	96.0	-0.39	N/S	95.6	95.6	-0.01	N/S
Disabled	8.7	10.7	-2.01	*	8.9	11.0	-2.12	*	8.9	8.3	0.60	N/S
Medicaid	20.0	22.2	-2.24	N/S	20.1	22.6	-2.44	N/S	20.1	19.6	0.50	N/S
Institutionalized	1.6	2.8	-1.14	*	1.6	2.5	-0.96	N/S	1.6	2.2	-0.64	N/S
Average HCC score	2.6	2.6	0.03	N/S	2.6	2.5	0.06	N/S	2.6	2.6	-0.01	N/S
Average Charlson Index	3.3	3.4	-0.15	N/S	3.3	3.4	-0.12	N/S	3.3	3.3	0.00	N/S
Rate of all-cause hospitalizations	962	986	-24	N/S	935	953	-18	N/S	935	916	19	N/S
Rate of ACSC hospitalizations	463	441	22	N/S	442	419	23	N/S	442	409	33	N/S
Rate of all-cause emergency room visits	1,479	1,719	-241	**	1,457	1,697	-241	**	1,457	1,599	-142	N/S
Rate of ACSC emergency room visits	617	623	-6	N/S	594	600	-6	N/S	594	574	20	N/S
Rate of all-cause 30-day readmissions	339	416	-77	N/S	326	401	-76	N/S	326	361	-35	N/S
Rate of ACSC 30-day readmissions	67	57	10	N/S	55	58	-3	N/S	55	45	10	N/S
Average PBPM Medicare Expenditures												
Total	2,154	2,356	-201	*	2,093	2,278	-185	*	2,093	2,063	31	N/S
Long-term care	106	88	18	N/S	97	89	9	N/S	97	78	19	N/S
Rehabilitation	17	46	-28	**	18	44	-26	**	18	35	-17	*
Psychiatric	14	21	-7	N/S	13	22	-8	N/S	13	18	-4	N/S
Inpatient	762	738	25	N/S	741	706	35	N/S	741	649	92	*
Home Health	219	214	5	N/S	215	210	5	N/S	215	197	18	N/S
DME	51	66	-15	N/S	51	66	-15	N/S	51	57	-6	N/S
Physician-Office Expenditures	226	287	-61	**	226	285	-59	**	226	271	-45	**
Physician-Hospital Expenditures	154	163	-9	N/S	150	158	-7	N/S	150	149	1	N/S
Skilled Nursing Facility	222	247	-25	N/S	212	231	-19	N/S	212	193	18	N/S
Hospital Outpatient	326	420	-94	**	317	407	-90	**	317	360	-43	N/S
Hospice	13	16	-3	N/S	10	13	-2	N/S	10	10	1	N/S

NOTES: MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; I = intervention population; C = comparison population; FTE = full-time equivalents; HCC = Hierarchical Condition Category (HCC) Risk Scores; ACSC = Ambulatory Care Sensitive Conditions; PBPM = per beneficiary per month; DME = durable medical equipment.

N/A means not applicable; N/S means not statistically significant

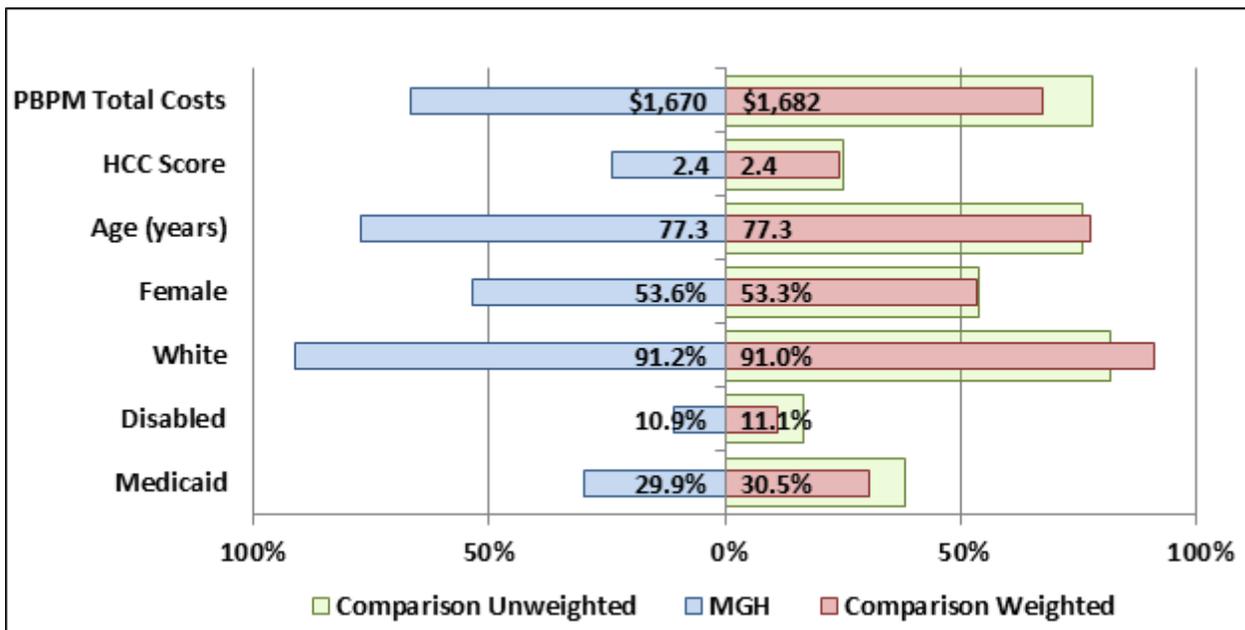
1 \* denotes statistical significance at the 5% level;\*\* denotes statistical significance at the 1% level.

Data Sources: RTI analysis of 2008-2011 Medicare enrollment, eligibility, claims and encounter data.

Programs: tableMGH-3.xls, tableMGH-3ps.xls

Propensity weights achieve this effect by giving greater influence to comparison beneficiaries who are most similar to those in the intervention group. The process is illustrated by the “butterfly” graph in *Figure 2-5* for selected beneficiary characteristics. The bars on the left side of the graph depict the intervention group means. The bars to the right show the comparison group’s means before and after propensity weighting. For each characteristic, weighting draws the comparison mean closer to the intervention group mean. Balance in mean values is nearly always achieved for characteristics that are employed as covariates in the propensity model, such as the demographic factors. However, balancing may also extend to variables that are not covariates as well. An example is total ER visit rates for Cohort 1, which are no longer statistically different after propensity adjustment. The propensity weights were used in subsequent multivariate outcome analyses to reduce potential bias when estimating the effects of the demonstration.

**Figure 2-5**  
**Group means for MGH CMP Demonstration Phase I Original Population, unweighted comparisons, and propensity-weighted comparisons**



Mean monthly Medicare expenditures were somewhat higher for the later cohorts than for cohort 1. Otherwise, beneficiary characteristics were similar in all cohorts. Results for cohorts 2 and 4 (*Tables 2-6b and 2-6d*) show that propensity weighting eliminated all but a few minor baseline differences in cost components. In cohort 3 (*Table 2-6c*), there were only three group differences to begin with. Overall, the comparison groups were generally well aligned with the intervention groups in each cohort at baseline, and propensity weighting dampened any remaining imbalances in a wide variety of expenditure, utilization, and demographic characteristics.

## CHAPTER 3

### PARTICIPATION RATES IN THE PHASE II MGH CMP CMHCB DEMONSTRATION

#### 3.1 Introduction

Our participation analysis is designed to critically evaluate the level of engagement by the Phase II MGH CMP in this population-based demonstration and to identify any characteristics that systematically predict participation versus nonparticipation. Specific research questions include the following:

- How many individuals did the Phase II MGH CMP engage, and what were the characteristics of the participants versus nonparticipants (in terms of baseline clinical measures, demographics, and health status)?
- What beneficiary characteristics predict participation?

The overall design of the CMHCB demonstration follows an intent-to-treat (ITT) model, and all CMOs are held at risk for their monthly management fees based on the performance of the full population of eligible beneficiaries randomized to the intervention group and compared with all eligible beneficiaries in the comparison group. The CMHCB demonstration was designed to provide strong incentives to gain participation by all eligible beneficiaries in the intervention group. As of June 1, 2010, 53% of the MGH Phase I original population and 65% of the MGH Phase I refresh population were actively enrolled in the program. In turn, 83% of the MGH Phase II original population was actively enrolled. (Lenfestey and McCall, June 2011). During the second site visit in July 2011, the following participation information was provided based on the completion of the Data Collection Questionnaire prior to the site visit (Lenfestey and McCall, November 2011). The MGH participation rates were 48% for the Phase I original population, 59% for the Phase I refresh population, 78% for the Phase II original population and 82% for the Phase II refresh population. The rates for BW/F were 80% for the Phase II original population and 74% for the Phase II refresh population while NSMC reported participation rates of 89% for both Phase II populations combined. Note that these rates are for a specific point in time, whereas, in this report, we examine the level of participation for the full intervention period. Participation rates are reported for the four cohorts and beneficiary characteristics that predict participation are examined.

#### 3.2 Methods

##### 3.2.1 Participation Analysis Methods

We determine participation status during the demonstration period using a monthly indicator provided to us by ARC in the *Participant Status* file to align with dates of eligibility for the Phase II MGH CMP. We report the percentage of intervention beneficiaries who consented to participate for at least 1 month during the intervention period as well as those who never consented to participate. Because beneficiaries lose eligibility for various reasons over time (e.g., loss of Part A or Part B benefits, or due to death), we report counts of full-time equivalents (FTEs) or numbers of intervention and comparison beneficiaries weighted by the fraction of the demonstration period each beneficiary was eligible. Only beneficiaries who had at least 1 day of

eligibility in the baseline period and at least 3 months of eligibility during the Phase II demonstration period are included in our analyses.

We also conduct a multivariate logistic regression analysis to determine the predictors of participation versus nonparticipation among those in the intervention group. The logistic model used in this study to identify differences in the likelihood of a beneficiary being in the participant group versus the nonparticipant group as a function of baseline and intervention period clinical factors, baseline cost, and baseline demographic factors is specified as

$$\text{Log } e (p_i / [1 - p_i]) = \beta X_i + \text{error}, \quad (3.1)$$

where  $P_i$  = the probability that the  $i$ th individual will consent to participate,  $\beta X_i$  = an index value for the  $i$ th individual based on the person's specific set of characteristics (represented by the vector), and  $e$  = the base of natural logarithms. The probability of a beneficiary being in the participant group is thus explained by the variables.

Logistic regression produces an odds ratio for every predictor variable in the model; that is, an estimate of that variable's effect on the dependent variable, after adjusting for the other variables in the model. The odds ratio is greater than 1.0 when the presence (or higher value) of the variable is associated with an increased likelihood of being in the participant group versus the nonparticipant group; odds ratios less than 1.0 mean that the variable is inversely associated with being in the participant group.

The participation regression model investigates whether group membership is influenced by beneficiary demographic attributes, clinical characteristics, and utilization and cost factors previously defined in *Chapter 2*. The demographic variables included in the model are defined as follows from the Medicare enrollment database (EDB) and determined at the date of assignment by ARC (July 1, 2009) for the Phase I Original and Refresh and the Phase II Original MGH populations; January 18, 2010 for the Phase II original BW/F and NSMC populations; and July 23, 2010 for the Phase II refresh populations.

- male, a dichotomous variable, set at 1 for males;
- African American/other/unknown, a dichotomous variable, set at 1 for beneficiaries whose race code is African American, other, or unknown;
- aged-in, a dichotomous variable, set at 1 for beneficiaries whose entitlement to Medicare benefits is based on age rather than disability;
- age, three dichotomous variables set at 1 for age less than 65 years, age 75–84, and age greater than or equal to 85 years; age 65–74 is the reference group; and
- Medicaid, a dichotomous variable, set at 1 for beneficiaries enrolled in Medicaid. Medicaid enrollment is based on a beneficiary being enrolled in Medicaid at any point 1 year prior to the go-live date.

Baseline clinical and financial characteristics included in the model are dichotomous variables set at 1 for the medium and high groups with the low group as the reference group. The categories were determined for each population based on tertiles and then the regressions run by cohort. **Table 3-1** provides the ranges for the categories by cohort:

- baseline HCC score;
- baseline Charlson score, and
- baseline PBPM costs.

Intervention period beneficiary characteristics included in the model are defined as follows:

- died, a dichotomous variable, set at 1 for beneficiaries who died during the intervention period; and
- institutionalized, a dichotomous variable, set at 1 for beneficiaries who were resident in a long-term care setting for any 1 or more months of the initial 6 months of the intervention period.

**Table 3-1**

**Baseline clinical and financial categories used in the Logistic regression modeling results comparing beneficiaries that participated during the Phase II MGH CMP intervention period to all nonparticipating intervention beneficiaries: by cohort<sup>1</sup>**

Characteristics	Low min	Low max	Medium min	Medium max	High min	High max
<b>Phase I original population</b>						
Baseline Charlson	0	1	2	3	4	17
Baseline HCC score	0.368	1.613	1.615	2.81	2.812	10.325
Baseline PBPM Medicare costs <sup>2</sup>	0	388	389	1,345	1,347	25,352
<b>Phase I refresh population</b>						
Baseline Charlson	0	1	2	3	4	14
Baseline HCC score	0.12	1.495	1.497	2.414	2.42	9.294
Baseline PBPM Medicare costs <sup>2</sup>	0	297	299	1,186	1,189	22,940
<b>Phase II original MGH</b>						
Baseline Charlson	0	2	3	4	5	16
Baseline HCC score	0.299	1.994	2.004	2.981	2.982	10.552
Baseline PBPM Medicare costs <sup>2</sup>	9	505	506	1,975	1,977	19,080
<b>Phase II original BW/F</b>						
Baseline Charlson	0	2	3	4	5	16
Baseline HCC score	0.328	2.085	2.085	2.927	2.928	10.878
Baseline PBPM Medicare costs <sup>2</sup>	56	768	769	2,488	2,496	19,963
<b>Phase II original NSMC</b>						
Baseline Charlson	0	1	2	3	4	14
Baseline HCC score	0.494	1.964	1.964	2.914	2.918	8.945
Baseline PBPM Medicare costs <sup>2</sup>	0	620	621	2,116	2,128	22,456

(continued)

**Table 3-1 (continued)**

**Baseline clinical and financial categories used in the Logistic regression modeling results comparing beneficiaries that participated during the Phase II MGH CMP intervention period to all nonparticipating intervention beneficiaries: by cohort<sup>1</sup>**

Characteristics	Low min	Low max	Medium min	Medium max	High min	High max
<b>Phase II refresh MGH</b>						
Baseline Charlson	0	1	2	3	4	15
Baseline HCC score	0.328	1.927	1.928	2.782	2.783	10.021
Baseline PBPM Medicare costs <sup>2</sup>	22	580	581	1,929	1,931	40,579
<b>Phase II refresh BW/F</b>						
Baseline Charlson	0	2	3	4	5	14
Baseline HCC score	0.488	2.122	2.123	2.898	2.905	8.902
Baseline PBPM Medicare costs <sup>2</sup>	39	1,171	1,173	3,392	3,394	31,524
<b>Phase II refresh NSMC</b>						
Baseline Charlson	0	1	2	3	4	13
Baseline HCC score	0.413	1.803	1.805	2.689	2.703	11.15
Baseline PBPM Medicare costs <sup>2</sup>	8	748	754	2,327	2,331	31,014

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; OR = odds ratio; HCC = Hierarchical Condition Category; PBPM = per beneficiary per month; BW/F = Brigham and Women’s and Faulkner Hospitals; NSMC = North Shore Medical Center.

<sup>1</sup> Numbers reported for the intervention periods include only persons who have some baseline eligibility and at least 3 months of eligibility during the Phase II demonstration period.

<sup>2</sup> Costs are in dollars

Data Sources: RTI analysis of 2008–2011 Medicare enrollment database, eligibility, and claims data.

Program: rangesa.xls

### 3.3 Findings

#### 3.3.1 Participation Rates for the Phase II MGH CMP Populations

Analyses presented in this section include only beneficiaries who had at least 1 day of eligibility in the year prior to the start of the intervention period and at least 3 months of eligibility during the Phase II demonstration period. The results are based on the full demonstration period. The number of months included in this analysis by population is as follows:

- MGH Phase I original and refresh populations and MGH Phase II original population included 29 months of Phase II experience,
- BW/F Phase II original population had 25 months of experience,
- NSMC Phase II original population had 22 months of demonstration experience.
- Phase II MGH and BW/F refresh populations had 17 months of Phase II demonstration while NSMC refresh population had 15 months.

*Table 3-2* presents participation rates for the four Phase II MGH CMP Demonstration cohorts. The number of beneficiaries included in our participation analyses for the four Phase II cohorts and the impact of loss of eligibility by reporting the FTEs are also shown. We report:

1. Number of beneficiaries. The number of beneficiaries is equal to all beneficiaries who had at least 1 day of eligibility in the 1-year baseline period and 3 months of eligibility during the Phase II demonstration period.
2. Full-time equivalents. FTEs defined as the total number of beneficiaries weighted by the number of days eligible in the intervention period divided by the total number of days in the intervention period. For example, a beneficiary in the Phase II MGH original population had a total of 29 months (or 883 days) of possible eligibility. If he/she died after 90 days, their FTE value would be 90/883 or 0.102 FTEs. If someone were eligible for all 29 months, then his or her value is 1. The sum of this value across all beneficiaries gives the total FTE value reported.

The ratio of FTEs to the total number of eligible beneficiaries in the Cohort 1 intervention population is 0.88 for the intervention period. The FTE value illustrates the effect of attrition over time of the original beneficiaries due primarily to death. Beneficiaries also became ineligible for participation in the Phase II MGH CMP Demonstration if they joined a Medicare Advantage (MA) plan, lost Medicare Part A or B eligibility or Medicare became a secondary payer, developed ESRD, or moved out of the service area. Note that beneficiaries who become ineligible during the Phase II Demonstration program are removed from the intervention and comparison groups for the remainder of the demonstration, which differs from the approach taken in Phase I. Within the Cohort 1 intervention group, eligibility was slightly lower for participants than nonparticipants. The Cohort 1 nonparticipant group was eligible 89% of all possible days—slightly higher than the 88% of days for participants.

*Table 3-2* also displays eligibility data for Cohorts 2 through 4. The ratio of FTEs to the total number of beneficiaries was 0.93 for the intervention participants for these three cohorts. In contrast, the nonparticipant groups had a much lower ratio of eligibility: 86%, 84% and 78% of eligible days for Cohorts 2 through 4, respectively.

**Participation rates for the Phase II MGH CMP Demonstration.** All 4 cohorts in the Phase II MGH CMP Demonstration had very high participation rates, ranging from 89% for Cohort 1 to 93% for Cohort 4 (*Table 3-2*). Participation rates were heavily influenced by length of eligibility during the intervention period. Cohort 1 had the lowest participation rate and the lowest FTE ratio.

**Table 3-2**  
**Number of Medicare FFS beneficiaries eligible for and participating in the Phase II MGH CMP**

Characteristics	Cohort 1	Cohort 2	Cohort 3	Cohort 4
<b>Participation Rate</b>	89%	90%	90%	93%
<b>Intervention group</b>				
Number eligible <sup>1</sup>	1,686	2,321	1,363	1,619
Full time equivalent <sup>2</sup>	1,484	2,140	1,257	1,487
<i><b>Participants</b></i>				
Number eligible	1,503	2,080	1,228	1,509
Full time equivalent	1,322	1,932	1,143	1,401
<i><b>Nonparticipants</b></i>				
Number eligible	183	241	135	110
Full time equivalent	162	207	114	86
<b>Comparison group</b>				
Number eligible	1,659	2,291	1,380	1,675
Full time equivalent	1,440	2,053	1,259	1,515

NOTES:

FFS = fee-for-service; MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries.

<sup>1</sup> Numbers reported for the intervention periods include only persons who have some baseline eligibility and at least 3 months of eligibility during the Phase II demonstration period.

<sup>2</sup> Counts of beneficiaries are adjusted for CMHCB program eligibility during the entire period the Care Management Organization (CMO) was active in the program.

SOURCES: RTI analysis of 2008–2011 Medicare enrollment, eligibility, and claims data.

Program: tableMGH-1b, table MGH-2

### 3.3.2 Characteristics of Participants in the Phase II MGH CMP Demonstration Populations

In order to better understand the characteristics that most strongly predicted participation in the demonstration, we estimated a logistic regression model for each of the Phase II cohorts examining beneficiaries who had any participation compared with nonparticipants. This model includes baseline and demonstration utilization and health status variables as described earlier.

*Table 3-3* present the results of the logistic regression analyses that predict participation based on various beneficiary characteristics for the four Phase II MGH CMP Demonstration Cohorts populations and the Phase II population. This table contains the odds ratio and associated statistical level of significance for the beneficiary characteristics, utilization and health status variables. An odds ratio less than 1 means that beneficiaries with a particular characteristic were less likely to participate; an odds ratio greater than 1 means that beneficiaries with the particular characteristic were more likely to participate. In general, the reference group comprises characteristics associated with younger and healthier beneficiaries. The explanatory power of the studied beneficiary characteristics was extremely low. Thus, the set of variables that we used were not strong predictors of likelihood of participation. Pseudo R-squares for all of the Cohorts were 0.05 or less. Another issue with estimating participation was the low number of nonparticipants.

The model for Cohort 1 found that beneficiaries with higher baseline Charlson scores were more likely to be participants. No other characteristics were found to have an impact on participation (*Table 3-3*). Examining the model for the Cohort 2 population we observed no influence of beneficiary characteristics or baseline characteristics on the likelihood of participation. However, beneficiaries who were institutionalized during the first 6-month period of the Phase II Demonstration were less likely to participate holding other factors constant. Among the Cohort 3 group, the disabled (less than 65 years of age) and institutionalized beneficiaries were less likely to participate, while medium baseline per beneficiary per month (PBPM) expenditures corresponded with beneficiaries being more likely to participate when controlling for baseline demographics and demonstration period health status. Demonstration period health status (died and institutionalization) indicated a lower likelihood of participation among Cohort 4 beneficiaries and those with high baseline HCC scores were found to be nearly three times more likely to participate.

The NSMC CMP staff (Cohort 4) reported difficulties characterizing active vs. inactive participants, indicating that many non-participants should have been identified as disqualified. They reported that between 11 and 18% of total non-participants were in long-term care facilities, which were staffed by physicians and nurse practitioners employed by the NSPG, making it difficult for Care Managers to have an impact with this population. (Lenfestey and McCall November 2011). Among the Cohort 4 group, 16% of nonparticipants were institutionalized during the first 6-month period of the Phase II Demonstration, a much higher percentage than the other three cohorts (5% or less).

**Table 3-3**  
**Logistic regression modeling results comparing beneficiaries that participated during the Phase II MGH CMP CMHCB intervention period to all nonparticipating intervention beneficiaries: by cohort<sup>1,2</sup>**

Characteristics	Cohort 1		Cohort 2		Cohort 3		Cohort 4	
	OR	<i>p</i> <sup>3</sup>						
Intercept	9.11	**	10.95	**	11.07	**	16.97	**
<b>Beneficiary characteristics</b>								
Male	0.98	N/S	0.89	N/S	0.86	N/S	1.01	N/S
African American/other/unknown	1.12	N/S	0.92	N/S	0.87	N/S	0.41	N/S
Age < 65 years	0.70	N/S	0.86	N/S	0.37	**	1.15	N/S
Age 75–84	0.76	N/S	1.12	N/S	1.72	N/S	0.99	N/S
Age 85 + years	0.94	N/S	1.03	N/S	1.86	N/S	0.85	N/S
Medicaid	0.74	N/S	1.16	N/S	0.64	N/S	1.33	N/S
<b>Baseline characteristics</b>								
Baseline HCC score medium	0.91	N/S	0.83	N/S	0.96	N/S	1.79	N/S
Baseline HCC score high	0.83	N/S	0.68	N/S	1	N/S	2.98	**
Medium baseline PBPM cost	0.88	N/S	0.86	N/S	1.84	*	0.96	N/S
High baseline PBPM cost	0.96	N/S	1.07	N/S	1.48	N/S	0.6	N/S
Baseline Charlson score medium	1.58	*	0.97	N/S	0.96	N/S	1.08	N/S
Baseline Charlson score high	1.81	*	1.48	N/S	0.93	N/S	0.81	N/S
<b>Demonstration period health status</b>								
Died	0.87	N/S	0.73	N/S	0.86	N/S	0.45	*
Institutionalized	0.56	N/S	0.24	**	0.09	**	0.03	**
Number of cases	1,686	N/A	2,321	N/A	1,363	N/A	1,619	N/A
Chi-square (p<)	15.38	N/S	18.22	N/S	69.88	**	68.19	**
Pseudo R-square	0.01	N/A	0.01	N/A	0.05	N/A	0.04	N/A

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; OR = odds ratio; HCC = Hierarchical Condition Category; PBPM = per beneficiary per month.

<sup>1</sup> Numbers reported for the intervention periods include only persons who have some baseline eligibility and at least 3 months of eligibility during the Phase II demonstration period.

<sup>2</sup> The regressions are adjusted for CMHCB program eligibility during the entire period the Care Management Organization (CMO) was active in the demonstration.

<sup>3</sup> \* denotes statistical significance at the 5% level; \*\* denotes statistical significance at the 1% level.

N/A means not applicable; N/S means not statistically significant.

The baseline HCC score, PBPM, and Charlson reference groups are the low group (see Table 3-1 for ranges). The age reference group is 65-74 years.

Data Sources: RTI analysis of 2008–2011 Medicare enrollment, eligibility, claims and encounter data.

Program: bene04a rangesa partab1

### **3.4 Summary**

For the Phase II MGH CMP Demonstration, we found a very high percentage of intervention beneficiaries that participated (ranging from 89% to 93%). This is in stark contrast to other CMS demonstrations we have evaluated with very low participation rates. We examined determinants of participation, but our explanatory power of the studied beneficiary characteristics was extremely low, in part due to the low number of nonparticipants. Medicare beneficiaries who were institutionalized during the Phase II Demonstration period were less likely to be participants for three of the four cohorts. At the same time, we observed beneficiaries in Cohorts 1, 3, and 4 who were the sickest or who were predicted to be the most costly during the year prior to the start of Phase II were more likely to participate. Within the Cohort 1 population, beneficiaries with medium and high baseline Charlson index scores were more likely to participate, indicating that MGH CMP staff did engage the sicker Medicare beneficiaries. Similar results were found for the Cohort 3 population – beneficiaries with medium baseline PBPM expenditures were more likely to participate – and the Cohort 4 population – beneficiaries with high baseline HCC scores were more likely to participate. These results suggest that the Phase II MGH CMP Demonstration was successful at engaging the sicker and more costly beneficiaries in their Phase II program.

## **CHAPTER 4 HEALTH OUTCOMES**

### **4.1 Introduction**

RTI's analysis of health outcomes focuses on answering the following two evaluation questions:

- Did the Phase II MGH CMP Demonstration improve intermediate health outcomes by reducing acute hospitalizations, readmissions, or emergency room (ER) utilization?
- Did the Phase II MGH CMP Demonstration improve health outcomes by decreasing mortality?

In this chapter, we present analyses related to intermediate clinical health outcomes by examining changes in the rate of hospitalizations, ER visits, and readmissions for the Phase II MGH CMP Demonstration population during the last 12 months of the demonstration period for the four cohort populations relative to a 12-month baseline period. We also examine differences in the rate of mortality between the intervention and comparison populations for all four cohorts during the entire Phase II demonstration period. For all analyses, we present the results separately for beneficiaries within the four cohorts.

### **4.2 Methodology**

#### **4.2.1 Rates of Hospitalizations and Emergency Room Visits**

For Phase II, rates of hospitalization and ER visits were constructed for the 12-month period immediately prior to the Phase II demonstration program launch date and for the last 12 months of the demonstration (*Table 4-1*). We constructed rates of all-cause hospitalization and all-cause ER visits. We also created a utilization measure that includes 34 ambulatory care sensitive conditions (ACSC) as reasons for hospitalization—acute renal failure, altered mental status, anemia, angina, asthma, bacterial pneumonia, *C. difficile*, cellulitis, congestive heart failure (CHF), constipation/fecal impaction/obstipation, chronic obstructive pulmonary disease (COPD) and chronic bronchitis, dehydration/volume depletion, diabetes, diarrhea and gastroenteritis, falls and trauma, hypertension, hypoglycemia, hypokalemia, hyponatremia, hypotension, immunization/preventable conditions, influenza, ischemic stroke, nutritional deficiencies, perforated or bleeding ulcer, pyelonephritis, ruptured appendix, seizures, septicemia, severe ear, nose, and throat infections, skin ulcers, tuberculosis, urinary tract infection (UTI), weight loss/failure to thrive— identified using the primary diagnosis on the claim, and generated an hospitalization rate and an ER visit rate based on all ACSCs. Only claims that occurred during periods of eligibility were included in the utilization measures, and only beneficiaries who had at least 3 months of eligibility during the Phase II demonstration period are included in these analyses. All rates are reported at the cohort level.

**Table 4-1**  
**Utilization Analyses Time Periods for the Phase II MGH CMP CMHCB Demonstration**

Population	Baseline <sup>1</sup>	Hospitalization & ER <sup>1</sup>	Readmission <sup>1</sup>	Mortality <sup>1</sup>	Cohort
<b>Phase I Original Population</b>	8/1/08–7/31/09	18–29	17–28 +1	1–29	1
<b>Phase I Refresh Population</b>	8/1/08–7/31/09	18–29	17–28 +1	1–29	2
<b>Phase II Original Populations</b>					
MGH	8/1/08–7/31/09	18–29	17–28 +1	1–29	2
BW/F	2/1/09–1/31/10	12–23	11–22 +1	1–23	3
NSMC	3/1/09–2/28/10	11–22	10–21 +1	1–22	4
<b>Phase II Refresh Populations</b>					
MGH	8/1/09–7/31/10	6–17	5–16 +1	1–17	2
BW/F	8/1/09–7/31/10	6–17	5–16 +1	1–17	3
NSMC	10/1/09–9/30/10	4–15	3–14 +1	1–15	4

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries. BW/F = Brigham and Women’s and Faulkner Hospitals; NSMC = North Shore Medical Center.

<sup>1</sup> By month in Demonstration

*Table 4-2* displays the number of beneficiaries included in these utilization analyses. All-cause and ACSC rates of hospitalization and ER visits per 1,000 beneficiaries are reported for the intervention and comparison groups for the baseline and intervention periods. Two weights are used to adjust the utilization analyses described above: the propensity score weight as described in *Section 2.3.2* and the eligibility weight as described in *Section 2.2.2*. The final analytic weight is the product of these two weights in each time period. For each measure, the difference-in-differences (D-in-D) rate is reported and reflects the decline (or growth) in the intervention group’s mean rate of utilization relative to the decline (or growth) in the comparison group’s mean rate. A positive intervention effect for the acute care utilization measures occurs if the intervention group’s mean rate decreased more, or increased less, than the comparison group’s mean rate during the demonstration period. A negative intervention effect occurs if the intervention group’s mean rate declined less, or grew more, than the comparison group’s mean rate during the demonstration period.

We performed statistical testing of the change in the utilization rates at the individual beneficiary level. The distributional properties of the data led us to select a negative binomial generalized linear model, which accounts for the presence of beneficiaries with no hospitalizations or ER visits in either time period, as well as heterogeneity in rates of acute care service use. As with the process-of-care measures, STATA SVY was used to fit the model with robust variance estimation to adjust for the repeated (pre- and post-) measures and multiple hospitalizations or ER visits observed for sample members within a nested experimental design. In addition, the product of the eligibility fraction ranging from 0 to 1 and the propensity weight was included as the weight to reflect the period of time during which the beneficiary met the Phase II MGH CMP Demonstration eligibility criteria in the baseline and demonstration periods and to adjust for potential baseline differences in the comparison group.

**Table 4-2**  
**Number of beneficiaries included in analyses of acute care utilization for the Phase II MGH  
 CMP CMHCB Demonstration**

Statistics	Cohort 1	Cohort 2	Cohort 3	Cohort 4
<b>Intervention</b>				
Total number of beneficiaries	1,448	2,133	1,272	1,525
Full time equivalents <sup>1</sup>	1,444	2,130	1,266	1,523
<b>Comparison</b>				
Total number of beneficiaries	1,387	2,041	1,268	1,565
Full time equivalents <sup>1</sup>	1,379	2,036	1,266	1,564

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries.

<sup>1</sup> Full Time Equivalent for the intervention group during the baseline period is the total number of beneficiaries weighted by their period of eligibility for the demonstration.

SOURCE: RTI analysis of 2008–2011 Medicare enrollment, eligibility, claims and encounter data; Computer runs: gcc01, gcc02, gcctab, gcc\_rob, gcctabx, gcctab1, acstab1, acsc02.

Negative binomial regression models produce an incidence rate ratio (IRR), which is an estimate of that intervention’s effect on the outcome. An IRR greater than 1.0 is associated with an increased likelihood of acute care utilization, and an IRR less than 1.0 is associated with a decreased likelihood of acute care utilization. We report the IRR associated with the D-in-D rates of hospitalizations and ER visits in addition to the IRR’s associated *p*-value and 95% confidence interval.

#### **4.2.2 Rates of 30-Day Readmissions**

We estimated the percent of beneficiaries with at least one readmission within 30 days of discharge and the readmission rate per 1,000 beneficiaries with an index hospitalization. Readmissions are identified for index hospitalizations that occurred during 12-month spans in both the baseline and demonstration periods. For the baseline period, we included index hospitalizations in the 12-month period immediately prior to the Phase II go-live date for all eight populations’ demonstration periods. Therefore, 30-day readmissions for baseline period hospitalizations were counted through the first month of the demonstration period. The intervention period for the Phase I Original and Refresh populations examined admissions during the periods of months 17 through 28 and included readmissions through months 29 (see *Table 4-1* for all population dates).

For all hospitalizations, we calculated readmissions for any diagnosis (all-cause readmissions). For the ACSCs, a subset of the hospitalizations, we calculated readmissions with a primary diagnosis in the same ACSC category (same cause readmissions). Because readmissions can only occur if there is an initial hospitalization, hospitalization rates can

influence readmission rates. To provide context for readmission rate estimates, we estimated the percent of beneficiaries with a hospitalization for any diagnosis and the percent with a hospitalization for one of the 34 ACSCs. All rates are reported at the cohort level.

Readmission estimates were weighted by the fraction of days eligible until a readmission occurred or up to 30 days following an index hospitalization discharge, if there were no readmissions within 30 days. For beneficiaries with more than one index hospitalization, the fraction was calculated by summing eligible days following each hospitalization. To equalize the impact of differences in days of eligibility on readmission rates per 1,000 beneficiaries, counts of hospitalizations were inflated by the fraction of days eligible following index hospitalizations. Propensity score weights were also applied.

The percent of beneficiaries with a hospitalization, the percent with a readmission, and the readmission rate per 1,000 beneficiaries with an index hospitalization are presented for the intervention and comparison groups during both the baseline and demonstration periods. For each measure, we compare the change between the baseline and demonstration periods for the intervention group relative to the comparison group, and test for the significance of the D-in-D between the groups. If the Phase II MGH CMP Demonstration reduced hospitalizations and readmissions, we expect to observe a negative D-in-D, reflecting greater reductions (or smaller increases) in the intervention group relative to the comparison group.

Logistic regression was used to estimate the likelihood of having a hospitalization, and a negative binomial generalized linear model was used for readmission rate estimates. STATA SVY was used to fit the model with robust variance estimation. Regression models were weighted by the eligibility fractions described above. We report the odds ratio (OR) from the logistic regressions and the IRR from the negative binomial regressions of the D-in-D test, along with the associated *p-value* and 95% confidence interval. ORs and IRRs less than 1.0 are associated with a negative D-in-D, indicating that the Phase II MGH CMP Demonstration reduced hospitalizations or readmissions for the intervention group relative to the comparison or slowed the growth in rates.

### **4.2.3 Mortality**

Another outcome metric in this evaluation is mortality. We constructed mortality rates per 100 beneficiaries and compared differences in mortality rates between all four cohorts' intervention and comparison groups between the Phase II go-live dates and the end of the Phase II demonstration period. Statistical comparison of the mortality rates was made using a *t-test* of differences in mean rates between the intervention and comparison groups and the propensity score weights described in **Section 2.3.2**. We further explored the potential impact of the intervention on mortality by estimating a multivariate Cox proportional hazard model of survival. Date of death was obtained from the Medicare Enrollment Data Base (EDB). We estimated the survival model comparing all intervention and comparison group beneficiaries using a propensity score weight to adjust for any potential differences in baseline characteristics.

## 4.3 Findings

### 4.3.1 Rates of Hospitalizations and Emergency Room Visits

Hospitalization and ER visit rates per 1,000 for beneficiaries in all four cohorts for the year prior to go-live and the Phase II demonstration periods are presented in **Table 4-3**. Rates of hospitalization and ER visits are presented for all causes and for a subset of ACSCs. Next to the utilization rate columns are the D-in-D rates of change observed between the baseline period and the demonstration period for the intervention and comparison groups. Negative D-in-D rates indicate that the intervention group's mean rate of hospitalization or ER visits declined more, or grew more slowly, than the comparison group's mean hospitalization or ER visit rates. Positive D-in-D rates indicate that the comparison group exhibited either lower rates of growth, or a greater rate of decline, for hospitalization or ER visits than the intervention group. The last four columns contain the IRR, its respective statistical level of significance (*p-value*) as well as the high and low 95% confidence interval thresholds for the IRR.

Not unexpectedly, the baseline rates of hospitalization and ER visits were high in the Cohort 1 intervention and comparison populations. The baseline rate of all-cause hospitalization was 606 per 1,000 Cohort 1 intervention beneficiaries. The baseline rate of all-cause ER visits was 1,189 per 1,000 Cohort 1 intervention beneficiaries. The ACSC reasons for hospitalization combined accounted for 46 percent of all-cause hospitalizations and approximately one-third of all-cause ER visits. Thus, Medicare FFS beneficiaries in the program were being treated in acute care settings for prevalent chronic medical conditions such as heart failure, diabetes, and COPD, or prevalent acute medical conditions such as pneumonia.

The rates of all-cause and ACSC hospitalizations and ER visits increased between the baseline and demonstration periods for both the Cohort 1 intervention and comparison beneficiaries. The D-in-D rate was negative for the all-cause hospitalization measure indicating that the rate for the intervention group grew more slowly than the comparison group's rate. The ACSC hospitalizations and both ER rates also had negative D-in-D values, indicating a slower increase in rates for the intervention group than the comparison group. None of the differences are statistically significant.

For Cohort 2, we observe the same high rates of baseline utilization. Similar to growth patterns observed within the Cohort 1 population, we observe a slower rate of growth for all four hospitalization and ER visit measures within the intervention group compared with the comparison group. In contrast to Cohort 1, we observe statistically significant slower rates of growth in the intervention group's all-cause and ACSC hospitalization rates, -195 and -94 hospitalizations per 1,000 beneficiaries, respectively, than the comparison group's utilization rates. We observe statistically insignificant lower rates of growth in the two ER visit measures among the intervention group's beneficiaries.

Cohort 3 beneficiaries had substantially higher baseline utilization rates than the other 3 cohorts. In contrast to the growth patterns in the first two cohorts, the intervention and comparison groups both show a decrease in all-cause hospitalization rates during the demonstration period, although the difference between the two groups is not statistically significant. Unlike Cohorts 1 and 2, Cohort 3 intervention group beneficiaries had a faster rate

of growth in the other three utilization measures relative to beneficiaries in the comparison group; but all differences are not statistically significant.

Lastly, **Table 4-3** presents hospitalization and ER visits rates per 1,000 Cohort 4 beneficiaries. The intervention group’s all-cause hospitalization rate decreases while the comparison group’s increases, leading to a large negative D-in-D rate that is statistically significant, -222 hospitalizations per 1,000 beneficiaries. The other three utilization measures have negative D-in-D rates which indicate slower utilization growth among the intervention beneficiaries relative to the comparison beneficiaries, but the differences are not statistically significant.

**Table 4-3**  
**Comparison of rates of utilization for the last 12 months of the Phase II MGH CMP**  
**CMHCB Demonstration with rates of utilization for a 1-year period prior to the start of the**  
**Phase II Demonstration**

Utilization	Baseline rate per 1,000 I <sup>1,2,3</sup>	Baseline rate per 1,000 C <sup>1,2,3</sup>	Demo period rate per 1,000 I <sup>1,2,3</sup>	Demo period rate per 1,000 C <sup>1,2,3</sup>	D-in-D	IRR <sup>4</sup>	p-value	Low CI	High CI
<b>Cohort 1</b>									
Hospitalizations									
All-cause	606	628	866	994	-106	0.90	0.28	0.75	1.09
All ACSCs <sup>5</sup>	280	266	475	530	-68	0.85	0.22	0.66	1.10
ER/Obs visits									
All-cause	1,189	1,133	1,520	1,628	-164	0.89	0.16	0.76	1.05
All ACSCs <sup>5</sup>	405	423	600	686	-68	0.91	0.44	0.73	1.15
<b>Cohort 2</b>									
Hospitalizations									
All-cause	647	675	704	927	-195	0.79	0.00	0.69	0.92
All ACSCs <sup>5</sup>	253	285	337	463	-94	0.82	0.05	0.67	1.00
ER/Obs visits									
All-cause	1,182	1,194	1,346	1,497	-139	0.91	0.17	0.79	1.04
All ACSCs <sup>5</sup>	357	401	471	596	-82	0.89	0.19	0.74	1.06
<b>Cohort 3</b>									
Hospitalizations									
All-cause	1,097	1,125	1,035	1,017	45	1.04	0.65	0.87	1.25
All ACSCs <sup>5</sup>	474	474	539	527	13	1.02	0.84	0.82	1.28
ER/Obs visits									
All-cause	1,674	1,801	1,877	1,813	191	1.11	0.23	0.93	1.33
All ACSCs <sup>5</sup>	520	581	690	699	52	1.10	0.35	0.90	1.35

(continued)

**Table 4-3 (continued)**  
**Comparison of rates of utilization for the last 12 months of the Phase II MGH CMP**  
**CMHCB Demonstration with rates of utilization for a 1-year period prior to the start of the**  
**Phase II Demonstration**

Utilization	Baseline rate per 1,000 I <sup>1,2,3</sup>	Baseline rate per 1,000 C <sup>1,2,3</sup>	Demo period rate per 1,000 I <sup>1,2,3</sup>	Demo period rate per 1,000 C <sup>1,2,3</sup>	D-in-D	IRR <sup>4</sup>	<i>p-value</i>	Low CI	High CI
<b>Cohort 4</b>									
Hospitalizations									
All-cause	899	872	886	1,082	-222	0.80	0.00	0.68	0.92
All ACSCs <sup>5</sup>	418	389	503	562	-87	0.83	0.08	0.68	1.02
ER/Obs visits									
All-cause	1,428	1,555	1,505	1,784	-152	0.92	0.28	0.79	1.07
All ACSCs <sup>5</sup>	570	554	656	724	-84	0.88	0.21	0.72	1.08

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program.; CMHCB = Care Management for High Cost Beneficiaries; I= intervention population; C = comparison population; D-in-D = difference-in-differences; IRR = incidence rate ratio; CI = confidence interval; ACSC = ambulatory care sensitive condition; ER/Obs = emergency room visits, including observation bed stays.

<sup>1</sup> The baseline period is the one-year period prior to the go-live date of the Phase II MGH CMP Demonstration.

<sup>2</sup> Rates are per 1,000 beneficiaries adjusted for periods of Phase II MGH CMP Demonstration eligibility for the 1-year period prior to the start of the demonstration and for Phase II MGH CMP Demonstration eligibility during the intervention period.

<sup>3</sup> Only beneficiaries who at least 1 day of eligibility in the baseline and at least 3 months of eligibility in the Phase II demonstration period are included in this analysis.

<sup>4</sup> Statistical testing of the difference-in-differences is conducted in STATA using negative binomial regression for rates/1,000 beneficiaries with robust variance estimation. The IRR is reported for negative binomial regressions. The *p-value* and confidence interval is reported for the IRRs.

<sup>5</sup> The 34 ambulatory care sensitive conditions are as follows: Acute renal failure, Altered mental status, Anemia, Angina, Asthma, Bacterial Pneumonia, C. Difficile, Cellulitis, Congestive heart failure, Constipation/fecal impaction/obstipation, Chronic obstructive pulmonary disease and Chronic bronchitis, Dehydration/volume depletion, Diabetes, Diarrhea and gastroenteritis, Falls and trauma, Hypertension, Hypoglycemia, Hypokalemia, Hyponatremia, Hypotension, Immunization/Preventable Conditions, Influenza, Ischemic Stroke, Nutritional deficiencies, Perforated or Bleeding Ulcer, Pyelonephritis, Ruptured Appendix, Seizures, Septicemia, Severe Ear, Nose, and Throat Infections, Skin ulcers, Tuberculosis, Urinary Tract Infection, Weight Loss/Failure to thrive.

SOURCE: RTI analysis of 2008–2011 Medicare enrollment, eligibility, claims and encounter data; Computer runs: acsc01a acsc02a acstab acsc acstab1

### 4.3.2 Rates of 30-Day Readmissions

**Table 4-4** displays the total number of beneficiaries included in the readmission analyses for all four cohort populations. **Table 4-5** displays the percent of all four populations' beneficiaries with a hospitalization, the percent of beneficiaries with readmission within 30 days, and the rate of 30-day readmission per 1,000 beneficiaries with an index hospitalization. Data are displayed for all-cause hospitalizations and readmissions, and ACSC hospitalizations and readmissions.

Across all four cohorts, we observe no statistically significant differences in the rate of growth in readmissions between the intervention and comparison group beneficiaries. However, we do observe a decline in the percentage of Cohort 1 intervention beneficiaries with an ACSC same-cause readmission with an increase in the readmission percentage among Cohort 1 comparison beneficiaries leading to a statistically significant 7% difference-in-differences value ( $p=.02$ ). We also observe statistically significant lower percentages of Cohort 2 and Cohort 4 intervention beneficiaries being hospitalized for all causes and ACSCs relative to their respective comparison group; in the range of -4% to -11%.

**Table 4-4**  
**Number of beneficiaries included in analysis of readmissions for the Phase II MGH CMP CMHCB Demonstration**

Statistics	Cohort 1	Cohort 2	Cohort 3	Cohort 4
<b>Intervention</b>				
Total number of beneficiaries	1,472	2,154	1,289	1,546
Full time equivalents <sup>1</sup>	1,468	2,151	1,283	1,544
<b>Comparison</b>				
Total number of beneficiaries	1,418	2,074	1,286	1,587
Full time equivalents <sup>1</sup>	1,401	2,077	1,283	1,585

NOTES: MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries.

<sup>1</sup> Full Time Equivalent for the intervention group during the baseline period is the total number of beneficiaries weighted by their period of eligibility for the demonstration.

SOURCE: RTI analysis of 2008–2011 Medicare enrollment, eligibility, claims and encounter data; Computer runs: readm01a, readmtab, readm, readmtab1 (2)

**Table 4-5**  
**Change in 30-day readmission<sup>1</sup> rates between the year prior to the Phase II MGH CMP CMHCB Demonstration and the last 12 months of the demonstration**

Utilization	Baseline rate		Demo period		D-in-D	OR/IRR <sup>4</sup>	<i>p-value</i>	Low CI	High CI
	per 1,000 <sup>1,2,3</sup>	per 1,000 <sup>1,2,3</sup>	rate per 1,000 <sup>1,2,3</sup>	rate per 1,000 <sup>1,2,3</sup>					
	I	C	I	C					
<b>Cohort 1</b>									
Hospitalizations									
Percent with hospitalization	34	37	39	42	-1	0.95	0.62	0.76	1.18
Percent with ACSC hospitalization <sup>5</sup>	18	19	25	27	-2	0.93	0.56	0.72	1.20
All-cause 30-day readmission									
Percent with readmission	22	21	31	31	-1	0.96	0.83	0.65	1.42
Readmission rate / 1,000	337	455	491	647	-38	1.03	0.90	0.70	1.51
ACSC same-cause 30-day readmission <sup>5</sup>									
Percent with readmission	10	5	7	9	-7	0.37	0.02	0.16	0.87
Readmission rate / 1,000	124	99	107	157	-75	0.54	0.16	0.23	1.28
<b>Cohort 2</b>									
Hospitalizations									
Percent with hospitalization	39	39	34	42	-8	0.71	0.00	0.60	0.85
Percent with ACSC hospitalization <sup>5</sup>	19	20	19	24	-4	0.80	0.04	0.65	0.99
All-cause 30-day readmission									
Percent with readmission	18	22	25	29	-1	1.01	0.95	0.73	1.41
Readmission rate / 1,000	254	448	424	545	73	1.37	0.07	0.98	1.92
ACSC same-cause 30-day readmission <sup>5</sup>									
Percent with readmission	4	6	6	8	0	1.02	0.96	0.46	2.28
Readmission rate / 1,000	49	94	85	125	5	1.32	0.49	0.61	2.85
<b>Cohort 3</b>									
Hospitalizations									
Percent with hospitalization	55	51	46	42	1	1.04	0.75	0.83	1.30
Percent with ACSC hospitalization <sup>5</sup>	31	30	29	27	1	1.03	0.79	0.81	1.32
All-cause 30-day readmission									
Percent with readmission	27	31	30	35	0	1.00	0.98	0.71	1.42
Readmission rate / 1,000	473	613	555	700	-6	1.03	0.90	0.69	1.52
ACSC same-cause 30-day readmission <sup>5</sup>									
Percent with readmission	6	8	8	9	1	1.21	0.62	0.56	2.61
Readmission rate / 1,000	72	105	112	133	12	1.23	0.60	0.56	2.70

**Table 4-5 (continued)**  
**Change in 30-day readmission<sup>1</sup> rates between the year prior to the Phase II MGH CMP CMHCB Demonstration and the last 12 months of the demonstration**

Utilization	Baseline rate		Demo period		D-in-D	OR/IRR <sup>4</sup>	<i>p-value</i>	Low	High
	per 1,000 <sup>1,2,3</sup>	per 1,000 <sup>1,2,3</sup>	rate per 1,000 <sup>1,2,3</sup>	rate per 1,000 <sup>1,2,3</sup>					
	I	C	I	C				CI	CI
<b>Cohort 4</b>									
Hospitalizations									
Percent with hospitalization	51	48	41	49	-11	0.65	0.00	0.53	0.80
Percent with ACSC hospitalization <sup>5</sup>	30	27	27	30	-6	0.73	0.01	0.58	0.91
All-cause 30-day readmission									
Percent with readmission	23	22	26	26	-1	0.97	0.84	0.69	1.36
Readmission rate / 1,000	332	381	450	498	1	1.04	0.84	0.74	1.46
ACSC same-cause 30-day readmission <sup>5</sup>									
Percent with readmission	4	3	7	9	-2	0.64	0.32	0.27	1.54
Readmission rate / 1,000	53	61	73	118	-36	0.73	0.55	0.25	2.07

NOTES: MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; I= intervention population; C = comparison population; D-in-D = difference-in-differences; OR = odd ratio; IRR = incidence rate ratio; CI = confidence interval; ACSC = ambulatory care sensitive condition.

- 1 Readmissions are defined as hospitalizations that occur within 30 days after the discharge date of an index hospitalization.
- 2 Rates are per 1,000 beneficiaries adjusted for periods of CMHCB program eligibility for the one-year period prior to the start of the demonstration and for CMHCB program eligibility during the demonstration period. Rates are further weighted by the mean propensity score weight.
- 3 Only beneficiaries who had at least 1 day of eligibility in the baseline period and at least 3 months of eligibility in the Phase II demonstration period are included in the analysis.
- 4 Statistical testing of the difference-in-differences is conducted in STATA using logistic regression for percentages and negative binomial regression for rates/1,000 beneficiaries. Robust variance estimation is used for both logistic and negative binomial regressions. The OR is reported for logistic regressions; the IRR is reported for negative binomial regressions. The *p-value* and confidence interval is reported for ORs and IRRs.
- 5 The 10 ambulatory care sensitive conditions are as follows: Acute renal failure, Altered mental status, Anemia, Angina, Asthma, Bacterial Pneumonia, C. Difficile, Cellulitis, Congestive heart failure, Constipation/fecal impaction/obstipation, Chronic obstructive pulmonary disease (COPD) and Chronic bronchitis, Dehydration/volume depletion, Diabetes, Diarrhea and gastroenteritis, Falls and trauma, Hypertension, Hypoglycemia, Hypokalemia, Hyponatremia, Hypotension, Immunization/Preventable Conditions, Influenza, Ischemic Stroke, Nutritional deficiencies, Perforated or Bleeding Ulcer, Pyelonephritis, Ruptured Appendix, Seizures, Septicemia, Severe Ear, Nose, and Throat Infections, Skin ulcers, Tuberculosis, Urinary tract infection (UTI), Weight Loss/Failure to thrive.

SOURCE: RTI analysis of Medicare enrollment, eligibility, claims and intervention data; Computer runs: readm01a readm02 readmtab readmtab1

### 4.3.3 Mortality

Mortality rates for intervention and comparison groups for the four Phase II MGH CMP Demonstration cohorts are displayed in **Table 4-6**. As would be expected, the mortality rates for Cohort 1 are higher due to the longer period of analysis – all the Cohort 1 beneficiaries were eligible on the start date of the Phase II demonstration, while some beneficiaries in Cohort 2 became eligible one year into the Phase II Demonstration, and all Cohort 3, and 4 beneficiaries were analyzed starting February 2010 or later. Over the Phase II demonstration period, the mortality rate for the intervention group was consistently lower than the comparison group propensity score weighted mortality rate. The differences ranged from -0.5% for Cohort 3 to -4.2% for Cohort 2. The lower mortality rates are statistically significant for Cohorts 2 and 4 at a *p-value* of 0.05 or less. These statistical differences indicate that the Phase II MGH CMP had an impact on lowering mortality among several of its the intervention populations.

**Table 4-6**  
**Mortality rates during the Phase II MGH CMP CMHCB Demonstration: Four Phase II cohort populations**

Description	Intervention number of deaths	Percent	Comparison number of deaths <sup>1</sup>	Percent	Difference	<i>p-value</i>
Cohort 1	375	22%	414	25%	-2.7%	0.06
Cohort 2	305	13%	397	17%	-4.2%	0.00
Cohort 3	193	14%	202	15%	-0.5%	0.74
Cohort 4	269	17%	321	19%	-2.6%	0.05

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries.

<sup>1</sup> Comparison group mean adjusted by beneficiary propensity score weight.

SOURCE: RTI analysis of Medicare enrollment, eligibility, claims and intervention data; Computer runs: mortality.sas

We further explored the impact of the CMP on mortality in both the original and comparison populations by estimating a propensity score weighted multivariate Cox proportional hazard model of survival. **Table 4-7** displays four Cox Proportional Hazard multivariate models of survival for each of the four Phase II demonstration cohorts. The censoring variable is death and the survival model includes a dichotomous variable for intervention group status (=1 for intervention group beneficiaries and =0 for comparison group beneficiaries). To further guard against any remaining imbalances between the intervention and comparison group beneficiaries, as well as better isolating demonstration effects, we also include beneficiary baseline demographic and health status characteristics and baseline PBPM Medicare costs in the regression specifications. These are the same variables that were used to estimate the propensity score model. A combination of the two approaches is doubly robust to model misspecification

**Table 4-7**  
**Propensity score weighted multivariate Cox proportional hazard survival models for the Phase II MGH CMP CMHCB Demonstration populations**

Characteristics	Cohort 1 hazard ratio	<i>p</i> - <i>value</i>	Cohort 2 hazard ratio	<i>p</i> - <i>value</i>	Cohort 3 hazard ratio	<i>p</i> - <i>value</i>	Cohort 4 hazard ratio	<i>p</i> - <i>value</i>
Intervention	0.840	0.02	0.748	0.00	0.976	0.81	0.880	0.12
Age <65 <sup>1</sup>	1.016	0.12	1.018	0.08	1.007	0.41	1.119	0.96
Age 75–84 <sup>1</sup>	1.004	0.00	1.003	0.01	1.003	0.04	1.003	0.01
Age ≥ 85 <sup>1</sup>	1.010	0.00	1.012	0.00	1.010	0.00	1.010	0.00
Charlson Index score <sup>2</sup>	1.063	0.00	1.100	0.00	1.085	0.00	1.104	0.00
Baseline PBPM cost <sup>3</sup>	1.000	0.01	1.000	0.01	1.000	0.03	1.000	0.33
Baseline HCC score <sup>4</sup>	1.199	0.00	1.170	0.00	1.229	0.00	1.206	0.00
Medicaid	0.998	0.06	1.000	0.66	1.001	0.58	1.000	0.97
Disability original reason	0.980	0.05	0.980	0.06	0.990	0.20	0.888	0.96
White	0.999	0.44	1.002	0.21	1.004	0.01	1.002	0.39
Female	0.998	0.03	0.999	0.38	0.999	0.16	0.999	0.12
Institutionalized	1.009	0.00	1.010	0.00	1.003	0.53	1.008	0.00

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries.

Only beneficiaries who had at least 1 day of eligibility in the baseline period and at least 3 months of eligibility in the Phase II demonstration period are included in the analysis. HCC = Hierarchical Condition Category; PBPM = per beneficiary per month.

<sup>1</sup> The age reference group is 65–74 years.

(Jaen et al., 2010; Lunceford & Davidian, 2004; Robins & Rotnitzky, 1995). The hazard ratios and associated *p-values* are displayed for the models' independent variables. The hazard ratio can be interpreted as the odds that an individual in the group with the higher hazard reaches the endpoint first, and vice versa. In our case, the endpoint is death.

In each of the four survival models, the intervention variable has a hazard ratio of ranging from 0.840 to 0.976. The Cohort 1 and Cohort 2 hazard ratios are statistically significant implying a survival advantage for the intervention group for these two populations. In general, we observe that older beneficiaries (ages 75 and older) and sicker beneficiaries (those with higher Charlson index and baseline HCC scores and higher baseline expenditures) are far more likely to die than those without these characteristics. With the exception of cohort 3, being institutionalized increased the likelihood of death. Cohort 1 beneficiaries whose original reason for Medicare benefits was disability were found to have a decreased likelihood of death compared to those that aged into the program.

#### **4.4 Conclusions**

RTI's analysis of health outcomes focuses on measuring effectiveness of the Phase II MGH CMP Demonstration intervention by answering the following evaluation questions:

- Did the Phase II MGH CMP Demonstration improve intermediate health outcomes by reducing acute hospitalizations, readmissions, and ER utilization?
- Did the Phase II MGH CMP Demonstration improve health outcomes by decreasing mortality?

During the course of the Phase II MGH CMP Demonstration, in general we observed increasing rates of all-cause and ACSC hospitalizations, ER visits, and 30-day readmissions in both the intervention and comparison groups and for all four cohorts. The Cohort 2 intervention beneficiaries had a statistically significant lower rate of growth for all-cause and ACSC hospitalizations as well as lower percentages of beneficiaries hospitalized for all causes and ACSCs. The Cohort 4 intervention beneficiaries had a statistically significant lower rate of growth in all-cause hospitalizations, driven by a decrease in the intervention population's rate of all-cause hospitalizations with a corresponding increase in the comparison group's rate. We also observe lower percentages of beneficiaries hospitalized for all causes and ACSCs than the comparison population for Cohorts 1, 2 and 4. None of the differences in readmission rates were statistically significant. However, we did observe 7% ( $p < 0.2$ ) fewer ACSC readmissions among the Cohort 1 beneficiaries.

We also observed a statistically significant differential rate of mortality between the intervention and comparison groups for the Cohort 2 and Cohort 4 populations. In both instances, the intervention beneficiaries had a lower mortality rate than that of the comparison group. Similarly, in a multivariate survival model, whereby we control for potential imbalances in beneficiary characteristics at the start of the demonstration period between the intervention and comparison group, we observed a survival benefit for the Phase II intervention group relative to the comparison group for the Cohort 1 and Cohort 2 populations.

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## CHAPTER 5 FINANCIAL OUTCOMES

### 5.1 Introduction

In this section, we present *final* evaluation findings on levels and trends in Medicare costs for the year prior to the go-live date and over all of the Phase II months that the MGH CMP Demonstration was in operation. The financial evaluation questions are:

- How variable are Medicare per beneficiary per month (PBPM) costs in this high cost, high risk, population? What was the minimal detectable savings rate given the variability in beneficiary PBPM costs?
- How balanced were the intervention and comparison group samples prior to Phase II's start date? How important were any measured imbalances to the estimate of savings?
- What were the Medicare PBPM costs in the base year versus Phase II of the demonstration for the intervention and the comparison groups?
- What were the levels and trends in PBPM costs for intervention group participants and nonparticipants? Did nonparticipation materially reduce the intervention's overall cost savings?
- What were MGH's gross savings based on multivariate regression with adjustments for differences in intervention and comparison beneficiaries?
- How sensitive are estimated savings to capping costs, weighting observations, and deleting beneficiaries with limited exposure to the demonstration?
- How did Medicare savings in the demonstration compare with the fees that were paid out?
- Did intervention savings differ by major type of health care service?
- What evidence exists for regression-to-the-mean (RtoM) in Medicare costs for beneficiaries in the intervention and comparison groups?

The cost analyses presented in this section differ from those conducted for financial reconciliation by Actuarial Research Corporation (ARC) under contract to CMS. ARC determined savings based on the demonstration's terms and conditions negotiated between CMS and MGH. RTI's estimation of savings, detailed subsequently, differs in that:

- savings rates between intervention and comparison groups are first determined at the beneficiary level and are then tested using statistical confidence intervals;

- ARC determined gross savings for 8 separate cohorts while RTI combined samples and evaluated 4 cohorts;
- beneficiary PBPM costs are not trimmed using a 1% outlier dollar threshold;
- RTI deleted beneficiaries with less than 3 months eligibility during the Phase II period;
- both base year and demonstration period PBPM costs are weighted by each beneficiary's fraction of eligible days during the Phase II demonstration period; and
- RTI also weighted the change in beneficiary costs by each comparison beneficiary's likelihood of participating in the intervention using logistic propensity scores while ARC (implicitly) assumed that characteristics of intervention and comparison beneficiaries were similar.

A more detailed explanation and justification for these differences is provided in *Section 5.3*.

The rest of this chapter has eight sections. The next two sections describe our data sources, variable construction, and analytic methods. We also present our results of testing for imbalances between intervention and comparison groups. *Section 5.4* presents findings on trends in PBPM costs between base and demonstration periods using standard difference-in-differences methods. *Section 5.5* decomposes savings in Medicare spending by major type of health service. *Section 5.6* reports estimates of gross savings by cohort using multivariate regression methods. *Section 5.7* documents strong regression-to-the-mean (RtoM) effects among low and high cost beneficiaries. *Section 5.8* summarizes results of sensitivity tests of RTI estimates of gross savings. The chapter concludes in *Section 5.9* with a summary of key findings. It relates gross savings to accrued fees to produce net savings and returns on investment of MGH's CMP to the Medicare program.

## **5.2 Data and Key Variables**

### **5.2.1 Population Frame and Data**

The data used in RTI's analysis of PBPM costs are Medicare Parts A and B claims extracted for all eligible beneficiaries in the original and refresh intervention and comparison groups as described in *Chapter 1*. Four distinct cohorts of beneficiaries were analyzed as listed below along with the number of months of eligibility in parentheses:

- Cohort 1: MGH Phase I original population (29 months)
- Cohort 2: MGH Phase I 1<sup>st</sup> refresh and Phase II 2<sup>nd</sup> and 3<sup>rd</sup> refresh populations (29, 29, and 17 months)
- Cohort 3: BW/F Phase II original and refresh populations (17-23 months)
- Cohort 4: NSMC Phase II original and refresh populations (15-22 months).

Although three major Boston area hospitals and physicians participated in the demonstration during Phase II, we continue to use the MGH designation when reporting savings in this chapter.

We restricted all analyses to beneficiaries who were alive at the start date of Phase II of the demonstration. Claims costs were accumulated until a beneficiary died or otherwise became ineligible (e.g., joined a Medicare Advantage plan). Claims represented utilization *anywhere* in the United States, not just the target area of the Phase II MGH CMP Demonstration. Medicare costs were based on eligible claims submitted during the full demonstration period plus 12 months prior to the start date. A 9-month “run-out” period after the demonstration ended assured a complete set of costs.

### **5.2.2 Constructing PBPM costs**

All financial analyses were conducted on a PBPM cost basis, or the ratio of eligible Medicare costs to eligible months.

Medicare program costs in the numerator of PBPM costs include:

- only Medicare program Part A and B payments; patient obligations and Part C (managed care) and D (drugs) are excluded; and
- only claims for utilization of beneficiaries when they are eligible for the demonstration.

To statistically test hypotheses regarding *trends* in beneficiary costs, average PBPM costs first must be calculated at the beneficiary level. Constructing individual PBPM costs required dividing a beneficiary’s total cost during eligible periods by his or her own fraction of eligible months during the base year and the demonstration period. Most beneficiaries had 12 months of base year eligibility and between 15 and 29 months of demonstration period eligibility. However, some beneficiaries had fewer than the maximum number of eligible months (or days), usually due to death. At the extreme, a beneficiary could have a 10-day hospital admission at the beginning of the intervention period with a combined Part A and B payment of \$30,000 before dying. If this \$30,000 outlay is divided by approximately 1/3 (10 days / 30.42 days), the result is an adjusted PBPM cost outlay of \$90,000. To avoid biasing estimates of gross savings against the intervention, all intervention and comparison group beneficiaries with less than 3 months of Phase II eligibility were deleted.

Variation can be reduced further by trimming high PBPM cost outliers at the 99th percentile, as done by ARC for financial reconciliation during Phase I. While the 1% trim reduces the MGH CMP’s financial risk, we wanted to avoid biasing comparisons against interventions that constrained spending among the most expensive beneficiaries. Instead of trimming or deleting outliers, which might bias demonstration savings towards zero, RTI weighted PBPM mean costs and standard errors by each beneficiary’s eligible fraction of days, or exposure to the intervention.

### 5.2.3 Monthly Fees

Demonstration Care Management Organizations (CMOs) proposed monthly fees when submitting their applications for the demonstration program to the CMS Office of Demonstrations. CMS then negotiated final fees as part of each CMO's agreed-upon contract terms and conditions. MGH cohorts accrued monthly fees at a rate of \$123 per eligible beneficiary between August 1, 2009 and July 31, 2010; \$126 per beneficiary between August 1, 2010 and July 31, 2011; and \$129 per beneficiary between August 1, 2011 and December 31, 2011. All cohorts received the same fees for beneficiaries in each time period. An average fee is constructed by weighting fees accrued per month by the number of beneficiary-months for each cohort in each period.

### 5.3 Analytic Methods

RTI used an Intent-to-Treat (ITT) evaluation design that put MGH at risk for assigned beneficiaries who did or did not participate in the intervention. To isolate the intervention effect, we formed separate comparison groups for each of the 8 original and refresh samples at MGH, BW/F, and NSMC. See *Supplement 1A* for a detailed description of how the comparison groups were selected.

We then compared the growth rates in PBPM costs between intervention and comparison samples at the individual beneficiary level.<sup>3</sup> This approach has two principal strengths:

- First, it controls in a more precise, beneficiary-specific manner for any differences in PBPM costs between the base year and the demonstration period that are not accounted for through the selection process of the intervention and comparison groups.
- Second, by calculating changes in PBPM costs at the beneficiary level (i.e., “paired” base-demonstration period PBPM costs), we can conduct statistical *t*-tests of the differences in spending growth rates between intervention and comparison groups.

In addition to answering the question of whether any or all of the CMHCB demonstration programs achieved budget neutrality (or even any savings), CMS also is interested in *generalizing* results to future care management activities by answering the question, “What savings are likely to be realized if the demonstration is expanded?” This question necessarily requires testing the hypothesis that any savings in a sample of beneficiaries during a particular time period could have been caused by chance with no long-run implications. RTI conducted a range of analyses to answer the key financial questions.

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<sup>3</sup> In ARC's Phase 1 financial reconciliation, a simple difference in intervention and base year adjusted comparison costs was determined after averaging across all beneficiaries in each group. No statistical test of cost differences was possible using this method.

### 5.3.1 Tests of Gross Savings

RTI derived estimates of gross savings using both non-parametric and parametric methods. Parametric regression methods were used for final reconciliation, but we also include results based on a non-parametric difference-in-differences approach. ARC, in its Phase II analysis of gross savings, used yet a third, actuarial, method (ARC, Dec. 20, 2012). Comparisons of RTI with ARC results are presented later in this chapter.

*Non-Parametric Tests of Savings.* Gross savings to Medicare is defined as the difference between the claims costs of the intervention and comparison groups. Because we wanted to conduct statistical tests of intervention effects, it was necessary to construct PBPM cost estimates at the beneficiary level and then use variation in the observations to produce confidence intervals around the estimates. Recognizing that base year costs may be different between intervention and comparison populations, we used a mixed paired sample approach. First, we used each beneficiary's own mean PBPM costs in the base year just prior to the MGH CMP's start date and the intervention period to construct a change in costs. This was done for all beneficiaries in both the intervention and comparison groups, thereby producing a paired comparison within group. Next, we determined the mean difference in the differences in PBPM cost growth rates for each group, treating the mean differences as independent samples.<sup>4</sup> The strength of first calculating the change in PBPM costs at the beneficiary level is that it completely controls for any unique clinical and socioeconomic characteristics that might differ between the intervention and comparison groups. Any imbalances in beneficiary characteristics that might produce inter-temporal differences in medical utilization or costs are factored out using first-differencing. Our gross savings rate, in equation form, is

$$Gross\ Savings = Diff[I] - Diff[C] = [I_t * - I_b *] - [C_t * - C_b *] = \Delta I * - \Delta C * \quad (5.1a)$$

or equivalently,

$$Gross\ Savings = [I_t * - C_t *] - [I_b * - C_b *], \quad (5.1b)$$

where \* = the mean difference in PBPM costs within all intervention (I) or comparison (C) beneficiaries, t and b = demonstration and base periods, and  $\Delta$  = the change in PBPM costs between the base and demonstration periods. Savings, as the difference-in-(paired) differences, is equivalent to adjusting the difference in intervention and comparison means during the demonstration by the mean difference that existed in the base year (eq. 5.1b).

In calculating mean changes in PBPM costs across beneficiaries, each beneficiary's *change* needs to be weighted to produce an unbiased estimate of the overall mean change. We used a compound weight based on each beneficiary's fraction of eligible days during the demonstration period times his/her propensity score. Weighting each beneficiary's *change* in PBPM costs between base and demonstration periods effectively weights each beneficiary's *base period* PBPM costs by their exposure to the demonstration. As early demonstration dropouts

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<sup>4</sup> For a more detailed description of this approach, see Rosner (2006, chapter 8).

tend to be more costly in the base period, our mean base year costs will appear lower than actuarial means based on their proportion of days during the base period. It did not seem reasonable to give beneficiaries with only a few months involvement in the Phase II demonstration full credit in calculating mean base year costs even if they had 12 months of base year Medicare eligibility. RTI also further adjusts comparison beneficiary base year costs by his/her likelihood of participating in the demonstration had they been given the opportunity.

*Table 5-1* shows the variation that exists in the (unweighted) PBPM costs in the base year prior to the start date and the demonstration period for the MGH intervention and comparison Cohort 1 population. Mean PBPM costs in the base period ranged from a low of \$0 to a high of \$25,587. The coefficient of variation (CV), or the standard deviation of beneficiary-level PBPM costs divided by the mean, is fairly large (about 1.43) in the base year (standard deviations roughly 43% greater than mean costs). Mean PBPM costs in the base period for the intervention group ranged from \$0 to a high of \$25,352 with a CV of 1.49. During the demonstration period the comparison population had a mean PBPM range from \$0 to \$50,568 while the intervention population had a mean PBPM range from \$0 to \$26,184. The percentage change in mean intervention costs was 56% compared with 53% for its comparison group.

**Table 5-1**  
**Phase II MGH CMP CMHCB Demonstration PBPM cost thresholds in base and demonstration periods for intervention and comparison groups: Cohort 1**

Quantiles <sup>1</sup>	Base year Comparison	Base year Intervention	Demonstration period Comparison	Demonstration period Intervention
(N)	(1,659)	(1,686)	(1,659)	(1,686)
Minimum	\$0	\$0	\$0	\$0
<10%	155	141	275	259
<25%	332	275	609	513
Median	882	695	1,635	1,419
>75%	2,378	1,996	4,145	3,404
>90%	4,979	4,525	7,071	6,615
Maximum	25,587	25,352	50,568	26,184
Mean	1,947	1,669	2,975	2,605
CV	1.43	1.49	1.29	1.24

NOTES: Observations unweighted. MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; N = number of beneficiaries; CV = coefficient of variation.

<sup>1</sup> <10%, <25%, >75%, >90%: PBPMs below or above percentage.

SOURCE: Medicare 2009-2011 Part A & B claims; COSTRUN2 (3/28/13).

**Table 5-2** shows the variation in PBPM costs for the Cohort 2 population. During the base year time period, the comparison group had a mean PBPM range from a low of \$0 to a high of \$24,121 with a CV of 1.27. The intervention group had a mean PBPM range from \$0 to \$40,579 with a CV of 1.43. During the demonstration period, the comparison group had a mean PBPM range from a low of \$0 to a high of \$29,902 with a CV of 1.25. The intervention group had a mean PBPM range from \$0 to \$55,164 with a CV of 1.52. The percentage change in mean intervention costs was 13% compared with 31% for its comparison group.

**Table 5-2**  
**Phase II MGH CMP CMHCB Demonstration PBPM cost thresholds in base and demonstration periods for intervention and comparison groups: Cohort 2**

Quantiles <sup>1</sup>	Base year Comparison	Base year Intervention	Demonstration period Comparison	Demonstration period Intervention
(N)	(2,291)	(2,321)	(2,291)	(2,321)
Minimum	\$0	\$0	\$0	\$0
<10%	242	176	246	191
<25%	422	328	537	387
Median	1,063	833	1,543	1,032
>75%	2,773	2,356	3,706	2,593
>90%	5,403	5,002	6,825	5,328
Maximum	24,121	40,579	29,902	55,164
Mean	2,133	1,896	2,784	2,145
CV	1.27	1.43	1.25	1.52

NOTES: Observations unweighted. MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; N = number of beneficiaries; CV = coefficient of variation.

<sup>1</sup> <10%, <25%, >75%, >90%: PBPMs below or above percentage.

SOURCE: Medicare 2009-2011 Part A & B claims; COSTRUN2 (3/28/13).

In **Table 5-3**, we present the variation in PBPM costs for the Cohort 3 population. During the base year time period, the comparison group had a mean PBPM range from a low of \$27 to a high of \$42,126 with a CV of 1.31. During the same time period, the intervention group had a PBPM range from \$39 to \$28,461 with a CV of 1.18. In the demonstration time period, the comparison group had a mean PBPM range from \$0 to \$47,139 with a CV of 1.42. The intervention group had a mean PBPM range from \$0 to \$31,580 during the same time period, with a CV of 1.31. The percentage change in mean intervention costs was 1.4% compared with 6.5% for its comparison group.

**Table 5-3**  
**Phase II MGH CMP CMHCB Demonstration PBPM cost thresholds in base and demonstration periods for intervention and comparison groups: Cohort 3**

Quantiles <sup>1</sup>	Base year Comparison	Base year Intervention	Demonstration period Comparison	Demonstration period Intervention
(N)	(1,380)	(1,363)	(1,380)	(1,363)
Minimum	\$27	\$39	\$0	\$0
<10%	276	308	224	226
<25%	560	624	518	499
Median	1,494	1,509	1,510	1,437
>75%	3,586	3,388	3,839	3,504
>90%	6,623	6,158	7,160	6,355
Maximum	42,126	28,461	47,139	31,580
Mean	2,746	2,589	2,925	2,624
CV	1.31	1.18	1.42	1.31

NOTES: Observations unweighted. MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; N = number of beneficiaries; CV = coefficient of variation.

<sup>1</sup> <10%, <25%, >75%, >90%: PBPMs below or above percentage.

SOURCE: Medicare 2009-2011 Part A & B claims; COSTRUN2 (3/28/13).

Finally, **Table 5-4** shows the variation in PBPM costs for the Cohort 4 population. During the base year time period, the comparison group had a mean PBPM range from a low of \$14 to a high of \$28,971 with a CV of 1.21. During the same time period, the intervention group had mean PBPM range from \$0 to \$31,014 with a CV of 1.22. In the demonstration time period, the comparison group had a mean PBPM range from a low of \$0 to a high of \$44,839 with a CV of 1.27. The intervention group had a mean PBPM range from \$0 to \$32,929 and a CV of 1.33. The percentage change in mean intervention costs was 19% compared with 14% for its comparison group.

**Table 5-4**  
**Phase II MGH CMP CMHCB Demonstration PBPM cost thresholds in base and demonstration periods for intervention and comparison groups: Cohort 4**

Quantiles <sup>1</sup>	Base year Comparison	Base year Intervention	Demonstration period Comparison	Demonstration period Intervention
(N)	(1,675)	(1,619)	(1,675)	(1,619)
Minimum	\$14	\$0	\$0	\$0
<10%	259	196	231	177
<25%	500	444	486	373
Median	1,240	1,175	1,459	1,225
>75%	3,016	2,838	3,502	3,398
>90%	5,665	5,142	6,437	6,319
Maximum	28,971	31,014	44,839	32,929
Mean	2,278	2,094	2,589	2,481
CV	1.21	1.22	1.27	1.33

NOTES: Observations unweighted. MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; N = number of beneficiaries; CV = coefficient of variation.

<sup>1</sup> <10%, <25%, >75%, >90%: PBPMs below or above percentage.

SOURCE: Medicare 2009-2011 Part A & B claims; COSTRUN2 (3/28/13).

The difference between median and mean PBPM costs indicates how skewed costs actually are. As an example, mean costs are more than double median costs in the Cohort 1 population's base year with little change during the intervention period, indicating a strong right tail of very high costs. Costs were similarly skewed in the other three population groups. Maximum values show how high PBPM costs can be before weighting. These costs are often incurred by beneficiaries with very short eligibility who died very early in the demonstration period. Deleting these short-eligible, very high cost, beneficiaries reduces overall variance and produces more accurate estimates of intervention effects. Focusing on median, as opposed to mean, changes in costs can also give a different impression of intervention effects. For example, in NSMC Cohort 4, mean costs, unweighted, grew faster in the intervention group, but median costs grew considerably slower (i.e., intervention: 4.3%; comparison: 18%).

*Parametric Tests of Savings.* In a second method to estimating savings, RTI used multivariate regression to quantify the effects of the intervention and any imbalances on trends in PBPM costs. We pooled base and demonstration period observations and regressed each beneficiary's (p) own demonstration period PBPM cost on group status (Inter: 1 = intervention, 0

= comparison); each beneficiary's own base (b) period PBPM<sub>pb</sub> cost; the beneficiary's Medicare prospective HCC risk score (HCC<sub>pb</sub>) in the base year; and a vector of base period beneficiary characteristics (CHAR):

$$PBPM_{pt} = \alpha + \gamma PBPM_{pb} + \beta Inter_p + \rho HCC_{pb} + \psi HCC_{pb} \bullet PBPM_{pb} + \sum_k \delta_k CHAR_{kpb} + \varepsilon_{pt} \quad (5.2)$$

The intercept,  $\alpha$ , is the original comparison group's average PBPM cost in the base year, while  $\gamma$  = each beneficiary's average dollar increase in demonstration period PBPM costs per \$1 increase in base year costs. The  $\gamma$  coefficient provides a test of regression to the mean (R-to-M) effects. (See **Section 5.7** for details.) The smaller the  $\gamma$ , the greater the R-to-M.

When controlling for each beneficiary's base year cost, the coefficients of other variables in the model are interpreted as *changes* in costs between the base and demonstration period. The *t*-value for  $\beta$  tests for differences in intervention and comparison demonstration cost *growth* while  $\rho$  and  $\psi$  test for differences in growth rates depending on each beneficiary's risk score. By including each beneficiary's age, gender, race, urban/rural residence, disabled status, Medicaid eligibility, and institutionalized status (i.e., in a SNF or long-term care facility) at the start of the demonstration, we purge the group status (intervention or comparison) and other coefficients of any systematic differences between the intervention and comparison groups that remained at the start of the demonstration. Inclusion of these variables also narrows the confidence intervals around the other coefficients and gives more precise estimates of mean intervention effects (Greene, 2000, chapter 6).

### 5.3.2 Correcting for Imbalances in Intervention and Comparison Populations

Because demonstration beneficiaries were not randomly selected, it is possible that material imbalances in their characteristics exist between intervention and comparison groups. RTI corrected for imbalances using a compound weight that included a propensity score (ps) for each intervention and comparison beneficiary. The score was based on a logistic regression using observable characteristics (see following tables). All intervention beneficiaries were given a ps = 1 with comparison beneficiary costs weighted by ps/(1-ps). (See **Section 2.3.2** for details on methods.)

**Tables 5-5 through 5-8** show frequency distributions of beneficiary characteristics after applying ps-weights and deleting beneficiaries with less than 3 months eligibility in Phase II. After weighting, no material differences remain in the mix of comparison and intervention beneficiaries. Differences in beneficiary mix do exist between MGH Cohorts 1 and 2 compared with BW/F and NSMC Cohorts 3 and 4. BW/F's Cohort 3 has a much higher ratio of minority beneficiaries and those with dual Medicaid coverage. NSMC's beneficiaries are older and less likely to be disabled. They are also more likely than beneficiaries in the other three cohorts to be white without dual Medicaid coverage.

**Table 5-5**  
**Phase II MGH CMP CMHCB Demonstration percentages and means of beneficiary characteristics of intervention and comparison groups in the base year: Cohort 1**

Characteristic	Intervention (%)	Comparison (%)
<b>Age group</b>		
<65	10.7	11.9
65–69	6.8	5.6
70–74	16.8	16.8
75–79	21.3	20.6
80-84	23.1	21.9
85+	21.4	23.2
<b>Gender</b>		
Female	54.4	53.8
Male	45.6	46.2
<b>Race</b>		
Minority	8.8	9.1
White	91.3	90.9
<b>Medicaid eligible</b>		
No	69.8	68.9
Yes	30.2	31.1
<b>Disabled</b>		
No	88.4	87.8
Yes	11.6	12.2
<b>Urban residence</b>		
No	0.0	0.3
Yes	100.0	99.7
<b>Long-term care facility</b>		
No	97.9	98.4
Yes	2.1	1.6
<b>Skilled Nursing Facility</b>		
No	89.6	89.9
Yes	10.4	10.2

NOTE: Beneficiaries weighted by fraction of eligible days and propensity scores in demonstration period. MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries.

SOURCE: Medicare 2009-2011 Part A & B claims; computer Cost4b1 (3/12/13).

**Table 5-6**  
**Phase II MGH CMP CMHCB Demonstration percentages and means of beneficiary characteristics of intervention and comparison groups in the base year: Cohort 2**

Characteristic	Intervention (%)	Comparison (%)
<b>Age group</b>		
<65	12.9	13.6
65–69	12.8	12.3
70–74	16.9	16.4
75–79	19.2	18.5
80-84	19.0	19.0
85+	19.2	20.1
<b>Gender</b>		
Female	54.2	55.0
Male	45.8	45.0
<b>Race</b>		
Minority	9.1	9.5
White	90.9	90.5
<b>Medicaid eligible</b>		
No	73.6	73.2
Yes	26.4	26.9
<b>Disabled</b>		
No	86.2	85.8
Yes	13.8	14.2
<b>Urban residence</b>		
No	0.0	0.0
Yes	100.0	100.0
<b>Long-term care facility</b>		
No	97.5	98.3
Yes	2.5	1.8
<b>Skilled Nursing Facility</b>		
No	89.7	90.7
Yes	10.3	9.3

NOTE: Beneficiaries weighted by fraction of eligible days and propensity scores in demonstration period. MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries.

SOURCE: Medicare 2009-2011 Part A & B claims; computer Cost4b1 (3/12/13).

**Table 5-7**  
**Phase II MGH CMP CMHCB Demonstration percentages and means of beneficiary characteristics of intervention and comparison groups in the base year: Cohort 3**

Characteristic	Intervention (%)	Comparison (%)
<b>Age group</b>		
<65	15.6	16.2
65–69	12.4	11.3
70–74	15.3	15.3
75–79	16.8	17.5
80-84	19.9	19.4
85+	20.0	20.4
<b>Gender</b>		
Female	58.1	57.3
Male	41.9	42.7
<b>Race</b>		
Minority	28.3	28.3
White	71.7	71.7
<b>Medicaid eligible</b>		
No	61.7	62.1
Yes	38.3	37.9
<b>Disabled</b>		
No	83.5	83.2
Yes	16.5	16.9
<b>Urban residence</b>		
No	0.1	0.1
Yes	99.9	99.9
<b>Long-term care facility</b>		
No	97.1	96.6
Yes	2.9	3.4
<b>Skilled Nursing Facility</b>		
No	83.3	89.0
Yes	16.7	11.0

NOTE: Beneficiaries weighted by fraction of eligible days and propensity scores in demonstration period. MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries.

SOURCE: Medicare 2009-2011 Part A & B claims; computer Cost4b1 (3/12/13).

**Table 5-8**  
**Phase II MGH CMP CMHCB Demonstration percentages and means of beneficiary characteristics of intervention and comparison groups in the base year: Cohort 4**

Characteristic	Intervention (%)	Comparison (%)
<b>Age group</b>		
<65	8.6	8.1
65–69	9.5	9.2
70–74	12.9	14.1
75–79	20.0	18.0
80–84	22.2	23.0
85+	26.8	27.6
<b>Gender</b>		
Female	56.4	56.9
Male	43.6	43.1
<b>Race</b>		
Minority	4.5	4.4
White	95.5	95.6
<b>Medicaid eligible</b>		
No	79.5	80.1
Yes	20.5	19.9
<b>Disabled</b>		
No	90.6	91.2
Yes	9.4	8.8
<b>Urban residence</b>		
No	0.1	0.0
Yes	99.9	100.0
<b>Long-term care facility</b>		
No	95.9	97.7
Yes	4.1	2.3
<b>Skilled Nursing Facility</b>		
No	82.8	84.9
Yes	17.2	15.1

NOTE: Beneficiaries weighted by fraction of eligible days and propensity scores in demonstration period. MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries.

SOURCE: Medicare 2009-2011 Part A & B claims; computer Cost4b1 (3/12/13).

## 5.4 PBPM Cost Levels and Trends

This section includes a tabular analysis of the difference-in-differences in Medicare expenditures comparing intervention with comparison beneficiaries between each cohort's baseline and demonstration periods. Four tables are shown, one for each cohort.

### 5.4.1 Cohort 1: MGH Original Population

*Table 5-9* displays PBPM cost levels and rates of growth in average PBPM costs between the 12-month base year and the 29-month demonstration period for the original MGH population that began in Phase I of the demonstration. Results are shown for the entire intervention group and for participating and nonparticipating beneficiaries, separately. PBPM costs in both periods have been weighted by a multiplicative variable composed of the fraction of days beneficiaries were eligible in the demonstration period times the propensity score weight for each beneficiary. Weighting by the demonstration period eligibility fraction was done to avoid overweighting beneficiaries who were exposed to the intervention for shorter periods. Beneficiaries with less than 3 months of demonstration eligibility in both periods were excluded to further adjust for limited exposure to the intervention.

**Table 5-9**  
**Phase II MGH CMP CMHCB Demonstration PBPM cost growth rates between base year and demonstration period, intervention and comparison groups: Cohort 1**

Study group	Beneficiaries	Base year PBPM Mean <sup>1</sup>	Base year PBPM SE	Demo PBPM Mean <sup>1</sup>	Demo PBPM SE	Differences in means	SE
<b>Intervention</b>	1,686	\$1,508	\$55.0	\$2,174	\$63.0	\$666**	\$67.1
Participants	1,503	1,517	58.6	2,198	66.7	681**	71.4
Nonparticipants	183	1,440	158.3	1,983	191.6	544**	194.4
<b>Comparison</b>	1,659	1,585	55.2	2,471	72.9	887**	73.6
<b>Differences</b>							
I – C	—	-77	78.0	-297**	96.2	-220*	99.5
Participants – C	—	-68	80.5	-274	99.3	-205*	102.5
Nonparticipants – C	—	-145	172.9	-488*	226.5	-343	228.7
Participants – Nonparticipants	—	77	176.6	214	202.0	138	215.6

NOTES: MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; I = intervention; C = comparison; SE = standard error; participants = beneficiaries assigned to the intervention who agreed to participate in care management.

<sup>1</sup> Means weighted by beneficiary fraction of eligible days times propensity score weight in demonstration period.

\* $p < 0.05$ ; \*\* $p < 0.01$ .

SOURCE: Medicare 2009-2011 Part A&B claims; computer run Bene04a (4/15/13).

Starting in Phase II and after deleting beneficiaries with less than 3 months eligibility, there were 1,686 beneficiaries in the intervention group (compared with 2,584 at the beginning of Phase I). The number of comparison beneficiaries was very similar.

**Overall Cost Differences.** In the base year prior to the start of Phase II, the weighted average PBPM cost was -\$77 (4.9%;  $p$ =insig) less in the intervention group than in the comparison group (\$1,508 versus \$1,585). The difference in PBPM Medicare costs increased to -\$297 ( $p$ <0.01) in the demonstration period (intervention: \$2,174 versus comparison: \$2,471). Intervention beneficiaries, who were 4.9% less costly on a weighted basis at baseline, became 12% less costly, on average, than the comparison group during the Phase II period.

Between the base year and demonstration period, the average comparison group PBPM cost increased significantly by \$887 ( $p$ <0.01), while the intervention group's PBPM average Medicare costs rose more slowly by \$666 ( $p$ <0.01). Consequently, the intervention group's PBPM mean cost rose -\$220 more slowly ( $p$ <0.05) than the comparison group's PBPM mean cost. For comparison, during Phase I, intervention mean costs rose -\$288 slower than in the comparison group. Thus, MGH's original population continued to show statistically significant cost reductions over the full 6-year demonstration period.

**Participation Cost Differences.** The intervention participation rate, based on beneficiaries used in this cost analysis, was 89% (\$1,503/\$1,686). Participant base period costs in MGH's intervention group were about 4% lower (-\$68;  $p$ =insig) than in the comparison group. Nonparticipants were -\$145 less costly ( $p$ =insig). Participant costs rose \$681 averaged over the demonstration period compared with \$887 in the comparison group, resulting in a statistically significant growth difference of -\$205 ( $p$ <0.05). Nonparticipants became -\$343 less costly during the demonstration period, but the change was statistically insignificant.

#### 5.4.2 Cohort 2: MGH Refresh Populations

**Overall Cost Differences.** Starting in Phase II, *Table 5-10*, there were 2,321 beneficiaries combined in MGH's 3 refresh groups with slightly fewer comparison beneficiaries (2,291). Beneficiaries with less than 3 months eligibility were deleted. The weighted base year average PBPM cost was \$-2 less ( $p$ =insig) in the intervention versus comparison group (\$1,806 versus \$1,808). The intervention-comparison group difference in PBPM Medicare costs widened to -\$473 ( $p$ <0.01) in the demonstration period (intervention: \$1,845 versus comparison: \$2,318).

The average comparison group PBPM costs increased \$510 ( $p$ <0.01) while the intervention group's PBPM average Medicare costs increased \$39 ( $p$ =insig). As a result, the intervention group's PBPM costs increased -\$471 slower ( $p$ <0.01) relative to the change in comparison group PBPM costs. Intervention beneficiaries, who were no different in costs at baseline, were 20% less costly than the comparison group, on average, during the Phase II demonstration period.

**Table 5-10**  
**Phase II MGH CMP CMHCB Demonstration PBPM cost growth rates between base year and demonstration period, intervention and comparison groups: Cohort 2**

Study group	Beneficiaries	Base year PBPM Mean <sup>1</sup>	Base year PBPM SE	Demo PBPM Mean <sup>1</sup>	Demo PBPM SE	Differences in means	SE
<b>Intervention</b>	2,321	\$1,806	\$52.9	\$1,845	\$52.9	\$39	\$63.3
Participants	2,080	1,800	55.5	1,835	53.0	35	64.6
Nonparticipants	241	1,864	174.8	1,941	229.5	77	252.7
<b>Comparison</b>	2,291	1,808	48.2	2,318	61.2	510**	66.8
<b>Differences</b>							
I – C	—	-2	71.7	-473**	80.8	-471**	92.0
Participants – C	—	-8	73.2	-483**	81.5	-475**	93.1
Nonparticipants – C	—	56	162.0	-378	206.4	-433*	225.5
Participants – Nonparticipants	—	-64	178.8	-105	178.9	-42	221.1

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; I = intervention; C = comparison; SE = standard error; participants = beneficiaries assigned to the intervention who agreed to participate in care management.

<sup>1</sup> Means weighted by beneficiary fraction of eligible days times propensity score weight in demonstration period.

\*p<0.05; \*\*p<0.01.

SOURCE: Medicare 2009–2011 Part A&B claims; computer run Bene04a (4/15/13).

**Participation Cost Differences.** The participation rate, based on beneficiaries used in this cost analysis, was 90% (\$2,080/\$2,321). Participants in the base period were -\$8 less costly ( $p$ =insig) than comparison group beneficiaries. Nonparticipants were \$56 more costly ( $p$ =insig). Participants became -\$483 less costly ( $p$ <0.01) during the demonstration period. Nonparticipants became \$378 less costly ( $p$ =insig) during the demonstration period. Consequently, the participant group’s PBPM cost rose -\$475 more slowly ( $p$ <0.01) than the comparison group’s cost. The nonparticipant group’s PBPM cost rose -\$433 ( $p$ <.05) slower than the comparison group’s PBPM cost.

### 5.4.3 Cohort 3: BW/F Original and Refresh Populations

**Overall Cost Differences.** Starting in Phase II, *Table 5-11*, there were 1,363 beneficiaries combined in BW/F’s original and refresh groups with slightly more comparison beneficiaries (1,380). Beneficiaries with less than 3 months eligibility have been deleted. The weighted base year average PBPM cost was -\$48 less ( $p$ =insig) in the intervention versus comparison group (intervention: \$2,477 versus comparison: \$2,525). The intervention-comparison difference in PBPM Medicare costs widen to -\$176 ( $p$ =insig) in the demonstration period (intervention: \$2,332 versus comparison: \$2,508).

**Table 5-11**  
**Phase II MGH CMP CMHCB Demonstration PBPM cost growth rates between base year and demonstration period, intervention and comparison groups: Cohort 3**

Study group	Beneficiaries	Base year PBPM Mean <sup>1</sup>	Base year PBPM SE	Demo PBPM Mean <sup>1</sup>	Demo PBPM SE	Differences in means	SE
<b>Intervention</b>	1,363	\$2,477	\$78.4	\$2,332	\$80.7	-\$145	\$92.0
Participants	1,228	2,453	80.4	2,356	82.6	-96	93.1
Nonparticipants	135	2,723	306	2,087	320.4	-636	389.9
<b>Comparison</b>	1,380	2,525	89.8	2,508	91.8	-17	107.7
<b>Differences</b>							
I – C	—	-48	119.3	-176	122.2	-128	142.2
Participants - C	—	-73	121.6	-152	124.4	-79	143.6
Nonparticipants - C	—	198	312.8	-421	320.1	-619	377.4
Participants - Nonparticipants	—	-270	273.1	270	281.1	540	321.4

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; I = intervention; C = comparison; SE = standard error; participants = beneficiaries assigned to the intervention who agreed to participate in care management.

<sup>1</sup> Means weighted by beneficiary fraction of eligible days times propensity score weight in demonstration period.

\* $p < 0.05$ ; \*\* $p < 0.01$ .

SOURCE: Medicare 2009–2011 Part A&B claims; computer run Bene04a (4/15/13).

The average comparison group PBPM costs decreased -\$17 ( $p = \text{insig}$ ) while the intervention group’s PBPM average Medicare costs decreased -\$145 ( $p = \text{insig}$ ). As a result, the intervention group’s PBPM costs increased -\$128 slower ( $p = \text{insig}$ ) relative to the change in comparison group PBPM costs. Intervention beneficiaries, who were 2% less costly at baseline, were 7% less costly (\$2,332/\$2,508) than the comparison group, on average, during the Phase II demonstration period.

**Participation Cost Differences.** The BW/F Cohort 3 participation rate, based on beneficiaries used in this cost analysis, was 90% (\$1,228/\$1,363). Participants in the base period were -\$73 less costly ( $p = \text{insig}$ ) than comparison group beneficiaries. Nonparticipants were \$198 more costly ( $p = \text{insig}$ ). Participants became -\$152 less costly ( $p = \text{insig}$ ) during the demonstration period. Nonparticipants became -\$421 less costly ( $p = \text{insig}$ ) during the demonstration period. Consequently, the participant group’s PBPM cost rose -\$79 more slowly ( $p = \text{insig}$ ) than the comparison group’s cost. The nonparticipant group’s PBPM cost rose -\$619 ( $p < .10$ ) slower than the comparison group’s PBPM cost.

#### 5.4.4 Cohort 4: NSMC Original and Refresh Populations

**Overall Cost Differences.** Starting in Phase II, *Table 5-12*, there were 1,619 beneficiaries combined in NSMC’s original and refresh groups with 3% more comparison beneficiaries (1,675). Beneficiaries with less than 3 months eligibility have been deleted. The

weighted base year average PBPM cost was \$30 more ( $p$ =insig) in the intervention versus comparison group (intervention: \$2,011 versus comparison: \$1,981). The intervention-comparison difference in PBPM Medicare costs was -\$94 ( $p$ =insig) less in the demonstration period (intervention: \$2,150 versus comparison: \$2,243).

**Table 5-12**  
**Phase II MGH CMP CMHCB Demonstration PBPM cost growth rates between base year and demonstration period, intervention and comparison groups: Cohort 4**

Study group	Beneficiaries	Base year PBPM Mean <sup>1</sup>	Base year PBPM SE	Demo PBPM Mean <sup>1</sup>	Demo PBPM SE	Differences in means	SE
<b>Intervention</b>	1,619	\$2,011	\$62.3	\$2,150	\$69.7	\$139	\$79.5
Participants	1,509	1,986	63.6	2,159	72.1	173*	81.7
Nonparticipants	110	2,410	64.0	2,001	277.3	-409	342.0
<b>Comparison</b>	1,675	1,981	60.7	2,243	65.4	263**	77.3
<b>Differences</b>							
I – C	—	30	87.0	-94	95.5	-124	111.0
Participants – C	—	5	63.6	-85	97.0	-90	112.5
Nonparticipants – C	—	430	264.9	-242	282.8	-672*	336.0
Participants – Nonparticipants	—	-424	267.5	158	299.5	582	340.4

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; I = intervention; C = comparison; SE = standard error; participants = beneficiaries assigned to the intervention who agreed to participate in care management.

<sup>1</sup> Means weighted by beneficiary fraction of eligible days times propensity score weight in demonstration period.

\* $p$ <0.05; \*\* $p$ <0.01.

SOURCE: Medicare 2009-2011 Part A&B claims; computer run Bene04a (4/15/13).

The average comparison group PBPM costs increased \$263 ( $p$ <0.01) while the intervention group’s PBPM average Medicare costs increased \$139 ( $p$ =insig). As a result, the intervention group’s PBPM costs increased -\$124 slower ( $p$ =insig) relative to the change in comparison group PBPM costs. Intervention beneficiaries, who were 1.5% more costly at baseline, were 4.2% less costly than the comparison group, on average, during the Phase II demonstration period.

**Participation Cost Differences.** The NSMC Cohort 4 participation rate, based on beneficiaries used in this cost analysis, was 93% (\$1,509/\$1,619). Participants in the base period were \$5 more costly ( $p$ =insig) than comparison group beneficiaries. Nonparticipants were \$430 more costly ( $p$ =insig). Participants became -\$85 less costly ( $p$ =insig) during the demonstration period. Nonparticipants became -\$242 less costly ( $p$ =insig) during the demonstration period. Consequently, the participant group’s PBPM cost rose -\$90 more slowly ( $p$ =insig) than the comparison group’s cost. The nonparticipant group’s PBPM cost rose -\$672 ( $p$ < .05) slower than the comparison group’s PBPM cost.

## **5.5 PBPM Cost Trends by Major Type of Health Care Service**

*Tables 5-13 through 5-16* display average PBPM costs and difference-indifferences results (D-in-D) during the baseline and intervention time periods for the comparison and intervention groups for all four cohort populations by major types of health care services. PBPM costs in both periods have been weighted by the fraction of days beneficiaries were eligible in the demonstration period so as not to overweight beneficiaries who were exposed to the intervention for shorter periods. Only beneficiaries with at least 1 day of demonstration eligibility in both periods and at least 3 months of eligibility in the Phase II demonstration period were included.

### **5.5.1 Cohort 1: MGH Original Population**

In *Table 5-13*, we present mean PBPM Medicare payments and D-in-D results for the Cohort 1 population. Acute hospital inpatient costs constituted 35% (\$528/\$1,508) of PBPM costs in the base year for the intervention sample. The two physician components, together, contributed another 17% as did hospital outpatient costs. Home health services added another 9% to costs. Comparison beneficiaries had the same cost structure. Other services contributed relatively minor amounts. For example, all four imaging services billed by physicians amounted to less than \$50 in the intervention group.

PBPM costs grew -\$220 slower in intervention versus comparison groups. Slower growth in acute inpatient costs with another 5% added from slower inpatient physician payments accounted for 63% of the decline. Home health and hospital outpatient costs contributed another 9% and 7%, respectively, to savings.

### **5.5.2 Cohort 2: MGH Refresh Populations**

In *Table 5-14*, we present mean PBPM Medicare payments and D-in-D results for the Cohort 2 population. Base year costs for the Cohort 2 intervention group are quite similar to those in MGH's Cohort 1. Comparison group costs are also quite similar and reflect the close similarity of the two groups.

Reductions in acute inpatient use accounted for 56% of the \$470 in savings for Cohort 2. Long-term care accounted for another 10% in savings and inpatient physician, rehabilitation, and home health each contributed another 6-7% to savings.

### **5.5.3 Cohort 3: BW/F Original and Refresh Populations**

In *Table 5-15*, acute inpatient costs comprise 41% percent of PBPM costs in the intervention's base year which is slightly higher than for the two MGH cohorts. Other service percentages are quite similar to MGH's service mix.

**Table 5-13**

**Phase II MGH CMP CMHCB Demonstration PBPM mean costs between base year and demonstration period, intervention and comparison groups, by major service categories: Cohort 1**

Cost Category	Baseline Time Period			Demonstration Time Period			Difference		
	I <sup>1</sup>	C <sup>1</sup>	Difference	I <sup>1</sup>	C <sup>1</sup>	Difference	I	C	D-in-D
(N)	(1,686)	(1,659)	N/A	(1,686)	(1,659)	N/A	N/A	N/A	N/A
Total	1508.1	1585.0	-76.9	2174.2	2471.5	-297.3	666.1	886.5	-220.4
Acute Hospital Inpatient	527.8	553.7	-25.9	779.6	944.7	-165.1	251.8	391.0	-139.2
Inpatient Physician	114.1	120.6	-6.5	150.5	168.2	-17.7	36.4	47.6	-11.2
Outpatient Physician	145.5	155.2	-9.7	176.7	183.5	-6.8	31.2	28.3	2.9
Outpatient Department	259.8	292.5	-32.7	297.9	346.3	-48.4	38.1	53.8	-15.7
Standard Imaging	8.1	8.6	-0.5	8.4	9.2	-0.8	0.3	0.6	-0.3
Advanced Imaging	25.0	14.9	10.1	19.7	14.2	5.5	-5.3	-0.7	-4.6
Echo/Ultrasound Imaging	4.5	7.4	-2.9	5.1	7.5	-2.4	0.6	0.1	0.5
Catheter Imaging	1.6	1.7	-0.1	1.5	1.1	0.4	-0.1	-0.6	0.5
Rehabilitation	45.8	28.0	17.8	51.3	27.7	23.6	5.5	-0.3	5.8
Long-term Care	38.4	43.1	-4.7	87.0	96.6	-9.6	48.6	53.5	-4.9
Psychiatric	18.0	15.3	2.7	34.7	28.9	5.8	16.7	13.6	3.1
Home Health	137.5	163.5	-26.0	199.9	246.0	-46.1	62.4	82.5	-20.1
Hospice	15.8	4.3	11.5	41.4	43.9	-2.5	25.6	39.6	-14.0
DME	34.6	58.9	-24.3	41.6	60.4	-18.8	7.0	1.5	5.5

NOTE: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; I = intervention; C = comparison; N=number of beneficiaries; total=average total PBPM costs; inpatient physician= physician acute inpatient; outpatient physician= non-hospital physician; outpatient department=hospital outpatient & ER; standard imaging= standard radiology; echo/ultrasound imaging= echocardiography, ultrasound; catheter imaging=diagnostic catheter imaging; rehabilitation= rehabilitation hospital; long-term care=long-term care facility; psychiatric=psychiatric facility; DME=durable medical equipment.

<sup>1</sup> Means weighted by beneficiary fraction of eligible days times beneficiary propensity score in demonstration period.

\**p*<0.05; \*\**p*<0.01. SOURCE: Medicare 2008-2011 Part A&B claims; run benemghjc2 (3/23/13)

**Table 5-14**  
**Phase II MGH CMP CMHCB Demonstration PBPM mean costs between base year and demonstration period, intervention and comparison groups, by major service categories: Cohort 2**

Cost Category	Baseline Time Period			Demonstration Time Period			Difference		
	I <sup>1</sup>	C <sup>1</sup>	Difference	I <sup>1</sup>	C <sup>1</sup>	Difference	I	C	D-in-D
(N)	(2,321)	(2,291)	N/A	(2,321)	(2,291)	N/A	N/A	N/A	N/A
Total	1,806.0	1,807.9	-1.9	1,845.4	2,318.2	-472.8	39.4	510.3	-470.9
Acute Hospital Inpatient	669.8	638.7	31.1	671.2	904.3	-233.1	1.4	265.6	-264.2
Inpatient Physician	147.6	140.6	7.0	131.1	158.9	-27.8	-16.5	18.3	-34.8
Outpatient Physician	154.1	180.5	-26.4	158.7	183.0	-24.3	4.6	2.5	2.1
Outpatient Department	342.1	400.3	-58.2	315.5	368.6	-53.1	-26.6	-31.7	5.1
Standard Imaging	9.3	9.0	0.3	7.8	8.8	-1.0	-1.5	-0.2	-1.3
Advanced Imaging	32.3	18.8	13.5	21.4	15.5	5.9	-10.9	-3.3	-7.6
Echo/Ultrasound Imaging	5.8	8.6	-2.8	4.9	7.2	-2.3	-0.9	-1.4	0.5
Catheter Imaging	1.8	2.3	-0.5	1.4	1.2	0.2	-0.4	-1.1	0.7
Rehabilitation	57.6	32.1	25.5	41.1	49.1	-8.0	-16.5	17.0	-33.5
Long-term Care	58.4	46.8	11.6	44.9	81.1	-36.2	-13.5	34.3	-47.8
Psychiatric	21.1	7.5	13.6	28.2	19.4	8.8	7.1	11.9	-4.8
Home Health	158.5	159.6	-1.1	163.1	191.9	-28.8	4.6	32.3	-27.7
Hospice	1.3	4.0	-2.7	28.2	34.1	-5.9	26.9	30.1	-3.2
DME	33.8	47.0	-13.2	37.7	57.7	-20.0	3.9	10.7	-6.8

NOTE: MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; I = intervention; C = comparison; N=number of beneficiaries; total=average total PBPM costs; inpatient physician= physician acute inpatient; outpatient physician= non-hospital physician; outpatient department=hospital outpatient & ER; standard imaging= standard radiology; echo/ultrasound imaging= echocardiography, ultrasound; catheter imaging=diagnostic catheter imaging; rehabilitation= rehabilitation hospital; long-term care=long-term care facility; psychiatric=psychiatric facility; DME=durable medical equipment.

1 Means weighted by beneficiary fraction of eligible days times beneficiary propensity score in demonstration period.

\* $p < 0.05$ ; \*\* $p < 0.01$ .

SOURCE: Medicare 2008-2011 Part A&B claims; run benemghjc2 (3/23/13).

**Table 5-15**

**Phase II MGH CMP CMHCB Demonstration PBPM mean costs between base year and demonstration period, intervention and comparison groups, by major service categories: Cohort 3**

Cost Category	Baseline Time Period			Demonstration Time Period			Difference		
	I <sup>1</sup>	C <sup>1</sup>	Difference	I <sup>1</sup>	C <sup>1</sup>	Difference	I	C	D-in-D
(N)	(1,363)	(1,380)	N/A	(1,363)	(1,380)	N/A	N/A	N/A	N/A
Total	2,477.0	2,525.0	-48.0	2,331.9	2,507.8	-175.9	-145.1	-17.2	-127.9
Acute Hospital Inpatient	1,008.1	1,093.9	-85.8	902.9	1,041.7	-138.8	-105.2	-52.2	-53.0
Inpatient Physician	194.1	186.5	7.6	164.0	173.1	-9.1	-30.1	-13.4	-16.7
Outpatient Physician	156.1	195.0	-38.9	163.8	183.0	-19.2	7.7	-12.0	19.7
Outpatient Department	463.2	449.9	13.3	381.3	367.7	13.6	-81.9	-82.2	0.3
Standard Imaging	8.0	9.7	-1.7	6.5	8.5	-2.0	-1.5	-1.2	-0.3
Advanced Imaging	19.1	22.4	-3.3	12.3	14.8	-2.5	-6.8	-7.6	0.8
Echo/Ultrasound Imaging	7.4	9.0	-1.6	5.7	6.9	-1.2	-1.7	-2.1	0.4
Catheter Imaging	2.1	2.1	0.0	1.0	1.2	-0.2	-1.1	-0.9	-0.2
Rehabilitation	43.9	33.8	10.1	36.4	29.7	6.7	-7.5	-4.1	-3.4
Long-term Care	80.5	101.7	-21.2	76.8	104.7	-27.9	-3.7	3.0	-6.7
Psychiatric	19.6	15.4	4.2	21.5	14.3	7.2	1.9	-1.1	3.0
Home Health	248.1	228.9	19.2	221.1	215.0	6.1	-27.0	-13.9	-13.1
Hospice	0.5	6.9	-6.4	34.2	55.8	-21.6	33.7	48.9	-15.2
DME	56.1	56.8	-0.7	57.3	61.3	-4.0	1.2	4.5	-3.3

NOTE: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; I = intervention; C = comparison; N=number of beneficiaries; total=average total PBPM costs; inpatient physician= physician acute inpatient; outpatient physician= non-hospital physician; outpatient department=hospital outpatient & ER; standard imaging= standard radiology; echo/ultrasound imaging= echocardiography, ultrasound; catheter imaging=diagnostic catheter imaging; rehabilitation= rehabilitation hospital; long-term care=long-term care facility; psychiatric=psychiatric facility; DME=durable medical equipment.

<sup>1</sup> Means weighted by beneficiary fraction of eligible days times beneficiary propensity score in demonstration period.

\**p*<0.05; \*\**p*<0.01.

SOURCE: Medicare 2008-2011 Part A&B claims; run benemghjc2 (3/23/13).

Reductions in acute hospital costs (-\$53) explain 42% of the \$128 slower cost growth in the intervention population, a share somewhat less than in the two MGH cohorts. Reductions in inpatient physician costs explain more of the slower cost increases. Reductions in home health and hospice costs each explain 10% of the slower cost increase in the intervention group.

#### **5.5.4 Cohort 4: NSMC Original and Refresh Populations**

In *Table 5-16*, acute inpatient costs account for 36% of intervention PBPM costs in the base year, a rate comparable with the other three cohorts. The spending mix for the other major services is also similar.

Unlike the other three cohorts, slower cost growth in acute inpatient services explains over 100% (\$151) of the \$124 slower overall spending growth in the intervention population. Compared with the two MGH cohorts, NSMC Cohort 4 actually showed faster cost increases in hospital outpatient department and long-term care services. Had NSMC been able to match spending increases in these two sectors to its comparison group, average cost savings would have been \$180 instead of \$124. Also, savings on inpatient physician costs were minimal given the apparent savings on inpatient hospital costs.

### **5.6 Multivariate Regression Results of Intervention Savings**

This section presents weighted least squares regression results that report gross savings for each of the four cohorts separately. Three stepwise models are shown. Model 1 regresses each beneficiary's average PBPM cost during the demonstration period on his/her own PBPM cost in the base period. Model 2 adds the intervention indicator. Model 3 then adds the remaining beneficiary characteristics. Observations are weighted by each beneficiary's eligibility factor times his/her propensity score factor. Thus, changes in costs between base and demonstration periods are given greater weight if the beneficiary (a) is exposed to the demonstration period longer, (b) is more likely to have participated in the demonstration (relevant only for comparison beneficiaries because intervention  $ps = 1$ ), or (c) both. The  $R^2$  statistic explains how much of the variation in the change in costs at the beneficiary level is explained by the model.

#### **5.6.1 Cohort 1: MGH Phase I Original Population**

*Table 5-17*, Model 1, shows that each beneficiary's own base period cost is a highly significant, positive, predictor of demonstration period costs. The base period PBPM cost coefficient (0.45;  $p < .01$ ), when combined with the intercept coefficient, implies substantial regression-to-the-mean effects on costs. For every \$100 increase in beneficiary base year PBPM costs above the base year mean cost, demonstration period costs are \$55 less ( $\$100 \times (1 - 0.45)$ ). Beneficiaries with base year costs equal to the mean have predicted demonstration period PBPM costs of \$1,629.

**Table 5-16**

**Phase II MGH CMP CMHCB Demonstration PBPM mean costs between base year and demonstration period, intervention and comparison groups, by major service categories: Cohort 4**

Cost Category	Baseline Time Period			Demonstration Time Period			Difference		
	I	C	Difference	I	C	Difference	I	C	D-in-D
(N)	(1,619)	(1,675)	N/A	(1,619)	(1,675)	N/A	N/A	N/A	N/A
Total	2,010.7	1,980.7	30.0	2,149.7	2,243.4	-93.7	139.0	262.7	-123.7
Acute Hospital Inpatient	716.3	617.9	98.4	725.2	778.1	-52.9	8.9	160.2	-151.3
Inpatient Physician	146.1	143.7	2.4	135.2	136.4	-1.2	-10.9	-7.3	-3.6
Outpatient Physician	222.8	268.3	-45.5	212.8	251.1	-38.3	-10.0	-17.2	7.2
Outpatient Department	312.1	340.5	-28.4	276.0	278.5	-2.5	-36.1	-62.0	25.9
Standard Imaging	11.9	12.0	-0.1	10.3	10.3	0.0	-1.6	-1.7	0.1
Advanced Imaging	19.3	20.6	-1.3	14.5	14.4	0.1	-4.8	-6.2	1.4
Echo/Ultrasound Imaging	8.0	10.6	-2.6	5.7	8.3	-2.6	-2.3	-2.3	0.0
Catheter Imaging	1.7	1.2	0.5	1.2	1.1	0.1	-0.5	-0.1	-0.4
Rehabilitation	13.8	36.4	-22.6	15.2	43.2	-28.0	1.4	6.8	-5.4
Long-term Care	96.0	76.7	19.3	125.7	76.6	49.1	29.7	-0.1	29.8
Psychiatric	12.4	15.7	-3.3	15.8	22.0	-6.2	3.4	6.3	-2.9
Home Health	199.2	189.5	9.7	194.2	198.3	-4.1	-5.0	8.8	-13.8
Hospice	6.5	7.2	-0.7	77.5	59.3	18.2	71.0	52.1	18.9
DME	50.1	56.5	-6.4	53.5	56.0	-2.5	3.4	-0.5	3.9

NOTE: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; PBPM = per beneficiary per month; I = intervention; C = comparison; N=number of beneficiaries; total=average total PBPM costs; inpatient physician= physician acute inpatient; outpatient physician= non-hospital physician; outpatient department=hospital outpatient & ER; standard imaging= standard radiology; echo/ultrasound imaging= echocardiography, ultrasound; catheter imaging=diagnostic catheter imaging; rehabilitation= rehabilitation hospital; long-term care=long-term care facility; psychiatric=psychiatric facility; DME=durable medical equipment.

<sup>1</sup> Means weighted by beneficiary fraction of eligible days times beneficiary propensity score in demonstration period.

\* $p < 0.05$ ; \*\* $p < 0.01$ .

SOURCE: Medicare 2008-2011 Part A&B claims; run benemghjc2 (3/23/13).

**Table 5-17**  
**Phase II MGH CMP CMHCB Demonstration regression results for PBPM cost savings: Cohort 1**

Parameter	Model 1			Model 2			Model 3		
	Estimate	Std. error	Pr >  t	Estimate	Std. error	Pr >  t	Estimate	Std. error	Pr >  t
Intercept	1,629.11	54.42	<.0001	1,764.33	71.28	<.0001	-574.45	1,132.30	0.6120
Base period PBPM cost	0.45	0.02	<.0001	0.45	0.02	<.0001	0.43	0.1	<.0001
<b>Intervention</b>	<b>N/I</b>	<b>N/I</b>	<b>N/I</b>	<b>-262.96</b>	<b>89.67</b>	<b>0.0034</b>	<b>-257.05</b>	<b>88.2</b>	<b>0.0036</b>
HCC score	N/I	N/I	N/I	N/I	N/I	N/I	515.69	47.3	<.0001
HCC score and base PBPM cost interaction	N/I	N/I	N/I	N/I	N/I	N/I	-0.03	0.0	0.0040
Age group									
70–74	N/I	N/I	N/I	N/I	N/I	N/I	299.91	216.5	0.1661
75–79	N/I	N/I	N/I	N/I	N/I	N/I	194.01	212.4	0.3612
80–84	N/I	N/I	N/I	N/I	N/I	N/I	219.24	211.3	0.2995
85+	N/I	N/I	N/I	N/I	N/I	N/I	427.93	211.9	0.0435
Disabled	N/I	N/I	N/I	N/I	N/I	N/I	27.03	227.1	0.9053
Male	N/I	N/I	N/I	N/I	N/I	N/I	155.14	89.6	0.0835
Minority	N/I	N/I	N/I	N/I	N/I	N/I	-62.73	161.4	0.6976
Medicaid	N/I	N/I	N/I	N/I	N/I	N/I	-3.78	108.6	0.9722
Urban	N/I	N/I	N/I	N/I	N/I	N/I	1,023.45	1,111.5	0.3572
Skilled Nursing Facility	N/I	N/I	N/I	N/I	N/I	N/I	-171.45	177.1	0.3331
LTCB	N/I	N/I	N/I	N/I	N/I	N/I	-1,590.29	1,289.0	0.2174
R-squared	0.131	N/A	N/A	0.133	N/A	N/A	0.17	N/A	N/A
Degrees of freedom	3,343	N/A	N/A	3,342	N/A	N/A	3,329	N/A	N/A

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; Dependent Variable: Beneficiary demonstration period average Per Beneficiary Per Month (PBPM) cost; HCC score: prospective Hierarchical Conditions Category Score; skilled nursing facility = beneficiary use of long-term hospital or skilled nursing facility in 3 months prior to Phase 2; LTCB = Long-term care beneficiary; base period PBPM cost: beneficiary base year average cost.

Observations weighted by beneficiary eligibility fraction x propensity score weight

N/I means not included; N/A means not applicable

SOURCE: Medicare Part A&B 2009-2011 claims; computer run bene06mghjc3.

When controlling for each beneficiary's base year PBPM cost, the coefficients of other variables in the model are interpreted as changes in costs between the base and demonstration periods. Holding each beneficiary's base year costs constant in Model 2, Cohort 1 intervention beneficiaries are predicted to have demonstration period PBPM costs that are \$263 less than are comparison group beneficiaries. In other words, intervention PBPM costs grew \$263 slower than comparison group costs for the MGH Phase I original cohort during Phase II. This estimate is significant at less than 1%.

When including the vector of other beneficiary characteristics in Model 3, the intervention estimate declines marginally to  $-\$257$  ( $p < 0.01$ ), implying that propensity score weighting has balanced comparison with intervention beneficiaries to a substantial degree (i.e., little correlation of intervention-comparison status with beneficiary characteristics). The 95% confidence interval for estimated savings is  $-\$84$  to  $-\$430$ , or between 4% and 17% of average comparison PBPM costs ( $\$2,472$ ) in the demonstration period. A one-sided lower confidence limit is  $-\$145$ , implying a higher degree of confidence that gross savings were achieved.

A beneficiary's HCC score is positively related to higher demonstration period costs and is interacted with base year costs. Every one unit increase in HCC score results in \$516 more demonstration period costs relative to base year costs. This effect is offset to some degree depending upon the size of the beneficiary's base year costs. For example, a beneficiary with a base year PBPM equal to \$1,000 would have expected demonstration period costs \$486 higher ( $\$516 - 0.03 \times \$1,000$ ) if his/her HCC score was one unit greater. After controlling for base period costs, HCC scores, and participation in the intervention, the only remaining significant variable at the 5% level is age 85 years and older. Compared with beneficiary's aged 65 to 69, beneficiaries age 85 and older are predicted to experience a greater cost increase over baseline of \$428. Males relative to females show greater cost increases of \$155 at the 8% level.

### **5.6.2 Cohort 2: MGH Refresh Populations**

*Table 5-18*, Model 1, shows that each beneficiary's own base period cost is a highly significant predictor of demonstration period costs. The base period PBPM cost coefficient (0.31;  $p < 0.0001$ ), when combined with the intercept coefficient, implies substantially greater regression-to-the-mean effects on costs than in the MGH Cohort 1. For every \$100 increase in beneficiary base year PBPM costs above the mean, demonstration period costs are \$69 less ( $\$100 \times (1 - 0.31)$ ). Beneficiaries with base year costs equal to the mean would have predicted demonstration period PBPM costs of \$1,515.

Holding each beneficiary's base year costs constant in Model 2, Cohort 2 intervention beneficiaries are predicted to have demonstration period PBPM costs that are \$472 less than are comparison group beneficiaries. That is, intervention costs grew \$472 more slowly than in Cohort 2's comparison group. This estimate is significant at less than one-tenth of a percent.

**Table 5-18**  
**Phase II MGH CMP CMHCB Demonstration regression results for PBPM cost savings: Cohort 2**

Parameter	Model 1			Model 2			Model 3		
	Estimate	Std. error	Pr >  t	Estimate	Std. error	Pr >  t	Estimate	Std. error	Pr >  t
Intercept	1,515.48	48.54	<.0001	1,756.06	62.48	<.0001	-117.26	2,888.65	0.9676
Base period PBPM cost	0.31	0.02	<.0001	0.31	0.02	<.0001	0.36	0.04	<.0001
<b>Intervention</b>	<b>N/I</b>	<b>N/I</b>	<b>N/I</b>	<b>-472.15</b>	<b>77.65</b>	<b>&lt;.0001</b>	<b>-460.15</b>	<b>76.93</b>	<b>&lt;.0001</b>
HCC score	N/I	N/I	N/I	N/I	N/I	N/I	431.39	44.54	<.0001
HCC score and base PBPM cost interaction	N/I	N/I	N/I	N/I	N/I	N/I	-0.03	0.01	<.0001
Age group									
70–74	N/I	N/I	N/I	N/I	N/I	N/I	-354.89	146.30	0.0153
75–79	N/I	N/I	N/I	N/I	N/I	N/I	-347.41	143.06	0.0152
80–84	N/I	N/I	N/I	N/I	N/I	N/I	-214.58	143.07	0.1337
85+	N/I	N/I	N/I	N/I	N/I	N/I	-9.76	142.99	0.9456
Disabled	N/I	N/I	N/I	N/I	N/I	N/I	-253.54	156.48	0.1052
Male	N/I	N/I	N/I	N/I	N/I	N/I	-32.21	78.15	0.6802
Minority	N/I	N/I	N/I	N/I	N/I	N/I	-121.47	136.23	0.3726
Medicaid	N/I	N/I	N/I	N/I	N/I	N/I	70.93	96.54	0.4626
Urban	N/I	N/I	N/I	N/I	N/I	N/I	1,183.87	2,884.97	0.6816
Skilled Nursing Facility	N/I	N/I	N/I	N/I	N/I	N/I	-256.60	152.91	0.0934
LTCB	N/I	N/I	N/I	N/I	N/I	N/I	156.01	923.40	0.8658
R-squared	0.076	N/A	N/A	0.083	N/A	N/A	0.105	N/A	N/A
Degrees of freedom	4,610	N/A	N/A	4,609	N/A	N/A	4,596	N/A	N/A

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; Dependent Variable: Beneficiary demonstration period average Per Beneficiary Per Month (PBPM) cost; HCC score: prospective Hierarchical Conditions Category Score; skilled nursing facility = beneficiary use of long-term hospital or skilled nursing facility in 3 months prior to Phase 2; LTCB = Long-term care beneficiary; base period PBPM cost: beneficiary base year average cost.

Observations weighted by beneficiary eligibility fraction x propensity score weight

N/I means not included; N/A means not applicable

SOURCE: Medicare Part A&B 2009-2011 claims; computer run bene06mghjc3.

When including the vector of other beneficiary characteristics in Model 3, the intervention estimate declines marginally to -\$460 ( $p < 0.0001$ ), again implying that propensity score weighting has balanced comparison with intervention beneficiaries to a substantial degree. The 95% confidence interval for estimated savings is -\$309 to -\$611, or between 13.3% and 26.4% of average comparison PBPM costs in the demonstration period. A one-sided lower confidence limit is -\$333, implying a higher degree of confidence that gross savings were achieved.

A beneficiary's HCC score is positively related to higher demonstration period costs and is interacted with base year costs. Every one unit increase in HCC score results in \$431 more demonstration period costs relative to base year costs. This effect is offset depending upon size of the beneficiary's base year costs. For example, a beneficiary with a base year PBPM equal to \$1,000 would have expected demonstration period costs \$401 higher ( $\$431 - 0.03 \times \$1,000$ ) if his/her HCC score was one unit greater. After controlling for base period costs, HCC scores, and participation in the intervention, the only remaining significant variables at the 5% level are age 70 to 74 and age 75 to 79. Compared with beneficiaries aged 65 to 69, beneficiaries between the ages of 70 and 79 are predicted to experience a smaller cost increase over baseline of approximately \$350. Beneficiaries in a SNF prior to joining the demonstration were also experiencing smaller cost increases than other patients ( $p \leq 0.10$ ).

### 5.6.3 Cohort 3: BW/F Original and Refresh Populations

*Table 5-19*, Model 1, shows that each beneficiary's own base period cost is a highly significant predictor of demonstration period costs. The base period PBPM cost coefficient (0.32;  $p < 0.01$ ), when combined with the intercept coefficient, implies substantial regression-to-the-mean effects on costs. For every \$100 increase in beneficiary base year PBPM costs above the mean, demonstration period costs are \$68 less ( $\$100 \times (1 - 0.32)$ ). Beneficiaries with base year costs equal to the mean would have predicted demonstration period PBPM costs of \$1,623.

Holding each beneficiary's base year costs constant in Model 2, Cohort 3 intervention beneficiaries are predicted to have demonstration period PBPM costs that are \$161 less than are comparison group beneficiaries. In other words, intervention PBPM costs grew \$161 slower on average than in the comparison group. This estimate is insignificant at the 5% or 10% level. To achieve significance, intervention savings would have had to exceed \$227 per beneficiary-month (approximately a 41% increase over \$161).

When including the vector of other beneficiary characteristics in Model 3, the intervention estimate increases 10% to -\$177 ( $p < 0.12$ ). However, the savings estimate remains statistically insignificant at conventional levels. The 95% confidence interval for estimated savings is +\$48 to -\$402, or between +1.9% and -16% of average comparison PBPM costs in the demonstration period. A one-sided lower confidence limit is +\$13, implying a limited degree of confidence that gross savings were not achieved.

**Table 5-19**  
**Phase II MGH CMP CMHCB Demonstration regression results for PBPM cost savings: Cohort 3**

Parameter	Model 1			Model 2			Model 3		
	Estimate	Std. error	Pr >  t	Estimate	Std. error	Pr >  t	Estimate	Std. error	Pr >  t
Intercept	1,622.67	74.44	<.0001	1,703.40	94.62	<.0001	-2,014.52	1,785.56	0.259
Base period PBPM cost	0.32	0.02	<.0001	0.32	0.02	<.0001	0.41	0.04	<.0001
<b>Intervention</b>	<b>N/I</b>	<b>N/I</b>	<b>N/I</b>	<b>-160.58</b>	<b>116.19</b>	<b>0.1671</b>	<b>-176.60</b>	<b>114.75</b>	<b>0.124</b>
HCC score	N/I	N/I	N/I	N/I	N/I	N/I	595.03	64.34	<.0001
HCC score and base PBPM cost interaction	N/I	N/I	N/I	N/I	N/I	N/I	-0.04	0.01	<.0001
Age group									
70–74	N/I	N/I	N/I	N/I	N/I	N/I	-17.61	225.24	0.938
75–79	N/I	N/I	N/I	N/I	N/I	N/I	-58.08	221.49	0.793
80–84	N/I	N/I	N/I	N/I	N/I	N/I	187.70	217.19	0.388
85+	N/I	N/I	N/I	N/I	N/I	N/I	479.68	216.96	0.027
Disabled	N/I	N/I	N/I	N/I	N/I	N/I	184.07	223.28	0.410
Male	N/I	N/I	N/I	N/I	N/I	N/I	-1.46	117.18	0.990
Minority	N/I	N/I	N/I	N/I	N/I	N/I	108.57	142.20	0.445
Medicaid	N/I	N/I	N/I	N/I	N/I	N/I	-92.57	139.17	0.506
Urban	N/I	N/I	N/I	N/I	N/I	N/I	2,174.52	1,763.34	0.218
Skilled Nursing Facility	N/I	N/I	N/I	N/I	N/I	N/I	-123.73	189.92	0.515
LTCB	N/I	N/I	N/I	N/I	N/I	N/I	-470.51	908.91	0.605
R-squared	0.097	N/A	N/A	0.097	N/A	N/A	0.132	N/A	N/A
Degrees of freedom	2,741	N/A	N/A	2,740	N/A	N/A	2,727	N/A	N/A

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; Dependent Variable: Beneficiary demonstration period average Per Beneficiary Per Month (PBPM) cost; HCC score: prospective Hierarchical Conditions Category Score; skilled nursing facility = beneficiary use of long-term hospital or skilled nursing facility in 3 months prior to Phase 2; LTCB = Long-term care beneficiary; base period PBPM cost: beneficiary base year average cost.

Observations weighted by beneficiary eligibility fraction x propensity score weight

N/I means not included; N/A means not applicable

SOURCE: Medicare Part A&B 2009-2011 claims; computer run bene06mghjc3.

A beneficiary's HCC score is positively related to higher demonstration period costs and is interacted with base year costs. Every one unit increase in HCC score results in \$595 more demonstration period costs relative to base year costs. This effect is offset depending upon size of the beneficiary's base year costs. For example, a beneficiary with a base year PBPM equal to \$1,000 would have expected demonstration period costs \$555 higher ( $\$595 - 0.04 \times \$1,000$ ) if his/her HCC score was one unit greater. After controlling for base period costs, HCC scores, and participation in the intervention, the only remaining significant variable is age 85 and older. Compared with beneficiaries aged 65 to 69, beneficiaries aged 85 and older experience a greater cost increase over baseline of \$480 ( $p=0.027$ ).

#### **5.6.4 Cohort 4: NSMC Original and Refresh Populations**

*Table 5-20*, Model 1, shows that each beneficiary's own base period cost is a highly significant predictor of demonstration period costs. The base period PBPM cost coefficient (0.29;  $p<0.0001$ ), when combined with the intercept coefficient, implies greater regression-to-the-mean effects on costs than for the other three cohorts. For every \$100 increase in beneficiary base year PBPM costs above the mean, demonstration period costs are \$71 less ( $\$100 \times (1 - 0.29)$ ). Beneficiaries with base year costs equal to the mean would have predicted demonstration period PBPM costs of \$1,617.

Holding each beneficiary's base year costs constant in Model 2, Cohort 4 intervention beneficiaries are predicted to have demonstration period PBPM costs that are \$102 less than are comparison group beneficiaries. This suggests that intervention costs increased \$102 slower than comparison group costs. This estimate is insignificant at the 5% or 10% level. To achieve significance, intervention savings would have had to exceed \$180 per beneficiary-month (approximately a 75% increase over \$102).

When including the vector of other beneficiary characteristics, Model 3, the intervention estimate declines 10% to -\$92 ( $p<0.31$ ). However, the savings estimate remains statistically insignificant at conventional levels. The 95% confidence interval for estimated savings is +\$86 to -\$270, or between +3.8% and -12% of average comparison PBPM costs in the demonstration period. A one-sided lower confidence limit is +\$58, or +2.6% of demonstration comparison costs, implying a degree of confidence that gross savings were not achieved.

A beneficiary's HCC score is positively related to higher demonstration period costs and is interacted with base year costs. Every one unit increase in HCC score results in \$475 more demonstration period costs relative to base year costs. This effect is offset only slightly depending upon size of the beneficiary's base year costs. For example, a beneficiary with a base year PBPM equal to \$1,000 would have expected demonstration period costs \$465 higher ( $\$475 - 0.01 \times \$1,000$ ) if his/her HCC score were one unit greater. After controlling for base period costs, HCC scores, and participation in the intervention, the only remaining significant variable is dual Medicaid eligibility. Compared with beneficiaries age 65 to 69 not covered by Medicaid, Medicaid beneficiaries experienced a greater cost increase over baseline of \$374 ( $p<0.01$ ).

**Table 5-20**  
**Phase II MGH CMP CMHCB Demonstration regression results for PBPM cost savings: Cohort 4**

Parameter	Model 1			Model 2			Model 3		
	Estimate	Std. error	Pr >  t	Estimate	Std. error	Pr >  t	Estimate	Std. error	Pr >  t
Intercept	1,616.87	58.98	<.0001	1,667.36	74.45	<.0001	-1,526.34	2,506.56	0.5426
Base period PBPM cost	0.29	0.02	<.0001	0.29	0.02	<.0001	0.23	0.04	<.0001
<b>Intervention</b>	<b>N/I</b>	<b>N/I</b>	<b>N/I</b>	<b>-102.39</b>	<b>92.14</b>	<b>0.2665</b>	<b>-92.26</b>	<b>90.99</b>	<b>0.3107</b>
HCC score	N/I	N/I	N/I	N/I	N/I	N/I	474.53	50.94	<.0001
HCC score and base PBPM cost interaction	N/I	N/I	N/I	N/I	N/I	N/I	-0.01	0.01	0.0564
Age group									
70–74	N/I	N/I	N/I	N/I	N/I	N/I	-60.52	198.44	0.7604
75–79	N/I	N/I	N/I	N/I	N/I	N/I	-70.04	187.62	0.7089
80–84	N/I	N/I	N/I	N/I	N/I	N/I	58.82	183.34	0.7483
85+	N/I	N/I	N/I	N/I	N/I	N/I	178.91	180.74	0.3223
Disabled	N/I	N/I	N/I	N/I	N/I	N/I	-174.83	221.07	0.4291
Male	N/I	N/I	N/I	N/I	N/I	N/I	71.36	93.11	0.4435
Minority	N/I	N/I	N/I	N/I	N/I	N/I	-164.22	226.94	0.4693
Medicaid	N/I	N/I	N/I	N/I	N/I	N/I	373.58	126.87	0.0033
Urban	N/I	N/I	N/I	N/I	N/I	N/I	2,127.38	2494.17	0.3938
Skilled Nursing Facility	N/I	N/I	N/I	N/I	N/I	N/I	-235.20	149.99	0.1170
LTCB	N/I	N/I	N/I	N/I	N/I	N/I	-248.49	733.75	0.7349
R-squared	0.07	N/A	N/A	0.07	N/A	N/A	0.099	N/A	N/A
Degrees of freedom	3,292	N/A	N/A	3,291	N/A	N/A	3,278	N/A	N/A

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries; Dependent Variable: Beneficiary demonstration period average Per Beneficiary Per Month (PBPM) cost; HCC score: prospective Hierarchical Conditions Category Score; skilled nursing facility = beneficiary use of long-term hospital or skilled nursing facility in 3 months prior to Phase 2; LTCB = Long-term care beneficiary; base period PBPM cost: beneficiary base year average cost.

Observations weighted by beneficiary eligibility fraction x propensity score weight

N/I means not included; N/A means not applicable

SOURCE: Medicare Part A&B 2009-2011 claims; computer run bene06mghjc3.

## 5.7 Regression to the Mean (R-to-M) Effects

Regression to the mean effects involving costs is generally considered the effect that relatively low or high base year costs have on the change in costs in the follow-up demonstration period. Formally,

$$PBPM_{pt} - PBPM_{pb} = \alpha + \pi[PBPM_{pb} - Mean(PBPM_b)] + \varepsilon_{pt} \quad (5.3)$$

A negative  $\pi$  estimate reflects the strength of regression to the mean as observations above the base year mean cost exhibit negative change around a constant amount,  $\alpha$ . With no R-to-M,  $\alpha$  measures the secular growth in PBPM costs. Solving for beneficiary costs in the demonstration period, t:

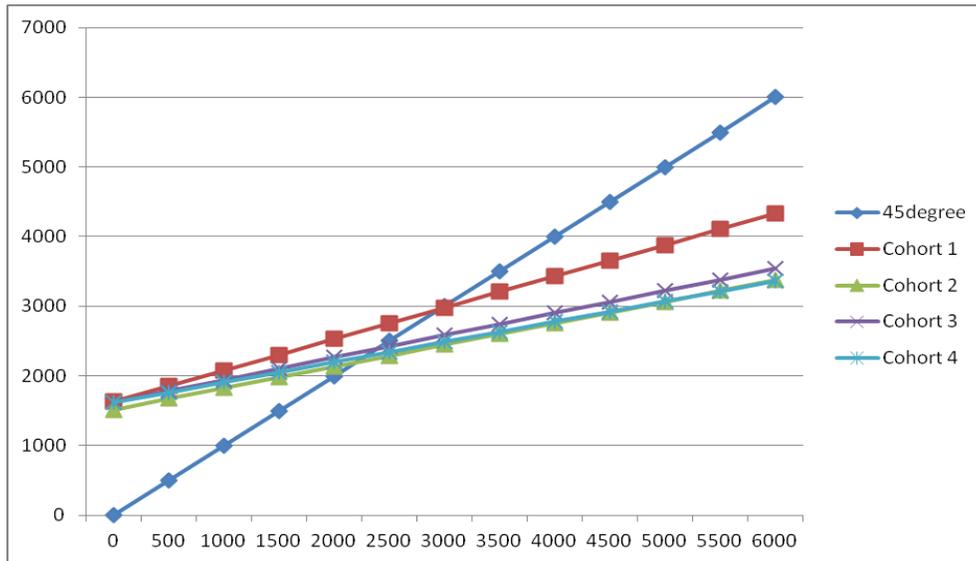
$$PBPM_{pt} = [\alpha - \pi Mean(PBPM_b)] + (1 + \pi)PBPM_{pb} + \varepsilon_{pt} \quad (5.4)$$

$$PBPM_{pt} = \lambda + \Theta PBPM_{pb} + \varepsilon_{pt}$$

Equation (5.4) is Model 1 in the previous regression tables. The intercept,  $\lambda$ , reflects both the mean base year PBPM costs, weighted by the R-to-M coefficient, plus the intercept of the underlying R-to-M equation (5.4). The  $\theta$  coefficient for base year costs is equal to  $(1 + \pi)$ , so  $\pi = \theta - 1$ . Model 1 estimates of the regression to the mean effects are: Cohort 1: -0.55; Cohort 2: -0.69; Cohort 3: -0.68; Cohort 4: -0.71. The estimate of  $\lambda$  for Cohort 1 is \$1,629 which means that the underlying secular increase in costs  $\alpha = \$780$  ( $\$1,629 - 0.55(\$1,545)$ ) over a 2-year period between the midpoints of the base and demonstration period.

**Figure 5-1** illustrates the strong effects of R-to-M on predicted costs in the demonstration period relative to the 45-degree line of zero R-to-M. Demonstration period costs are plotted on the vertical axis and base costs on the horizontal axis. Cohort 1 shows the least R-to-M with the highest slope. Any beneficiaries with roughly less than \$3,000, on average, in monthly costs in the base year would be expected to have higher costs in the demonstration year. The opposite is true for Cohort 1 beneficiaries with base year costs in excess of \$3,000. A beneficiary with base year PBPM costs of \$6,000 is predicted to incur “only” about \$4,330 costs in the demonstration period. The gap at the base of \$6,000 is considerably greater for the other three cohorts.

**Figure 5-1**  
**Phase II MGH CMP CMHCB demonstration regression to the mean effects: All cohorts**



SOURCE: Medicare Part A&B 2009-2011 claims; derived from Tables 5-17 to 5-20.

## 5.8 Savings Sensitivity Analyses

*Tables 5-21 to 5-24* provide results of testing the sensitivity of RTI’s calculation of savings to changes in the way the regression modeling is performed. The baseline regression results on intervention cost savings are taken from fully specified Model 3 in the previous tables. The model, first, is re-estimated by capping beneficiary base year and demonstration period PBPM costs at the top 1% as was done by ARC. Next, the baseline model is rerun, uncapped, but with either no weighting or using only eligibility fraction weighting. Finally, the baseline model is rerun by including beneficiaries with less than three months demonstration eligibility. A gross savings rate also is provided based on ARC’s *Final Reconciliation Report* (December 20, 2012).<sup>5</sup>

Beginning with Cohort 1 in *Table 5-21*, MGH’s Phase I original population, the baseline intervention savings coefficient (-\$257) is fairly insensitive to capping, using only eligibility weighting, and including beneficiaries with less than 3 months eligibility. Intervention savings are 18% greater (-\$301.6/- \$257.1) than baseline estimates without any weighting and 31% greater (-\$301.6/- \$231.1) than with eligibility fraction weighting alone. This implies that RTI’s results are somewhat sensitive to RTI’s method for weighting each comparison beneficiary by his/her likelihood of participating in the demonstration, or similarity to intervention beneficiaries. Adjusting for comparison beneficiaries with different characteristics than in the MGH Phase I original sample produces somewhat greater estimates of savings (i.e., \$257/\$231 = 1.11).

<sup>5</sup> ARC’s calculation of savings was done for 8 cohorts separately. We combined ARC’s 8 savings estimates into 4 cohorts using ARC’s shares of member months as weights.

**Table 5-21**  
**Phase II MGH CMP CMHCB Demonstration sensitivity tests of gross savings estimates:**  
**Cohort 1 regression models**

Model statistics	Baseline	Capped PBPMs	Unweighted estimates	Eligibility fraction- only weights	Including <3month beneficiaries
No. beneficiaries	3,344	3,344	3,344	3,330	2,449
R-squared	0.169	0.181	0.175	0.187	0.16
Base period PBPM cost	0.43	0.45	0.40	0.42	0.41
Intervention Coefficient	-257.1	-239.7	-301.6	-231.1	-265.7
<i>p-value</i>	0.0036	0.0039	0.0077	0.0097	0.0038
Comparison PBPM cost	2,471	2,471	2,471	2,471	2,471
Coeff/P1c pbpm (%)	-10.4	-9.7	-12.2	-9.4	-10.8
ARC savings rate (%)	-7.2	-7.2	-7.2	-7.2	-7.2
RTI-ARC saving (%)	-3.2	-2.5	-5.0	-2.2	-3.6

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries

Model Definitions

Baseline: Uncapped PBPM costs, eligibility fraction X ps weights, excluding <3month beneficiaries

Capped PBPMs: Capped PBPM costs at 99<sup>th</sup> percentile, eligibility fraction X ps weights, excluding <3month beneficiaries

Unweighted estimates: Uncapped PBPM costs, unweighted observations, excluding <3month beneficiaries

Eligibility fraction-only weights: Uncapped PBPM costs, eligibility fraction without ps weights, excluding <3month beneficiaries

Including<3month beneficiaries: Uncapped PBPM costs, eligibility fraction X ps weights, including <3month beneficiaries

SOURCE: Medicare Part A&B claims, 8/1/08 to 12/31/11; computer runs bene06mgjhc3 and Bene04a (4/15/13); ARC’s Final Reconciliation Report (December 20, 2012).

ARC’s savings rate for Cohort 1, calculated by RTI, was 7.2% compared with RTI’s 10.4%. ARC’s savings estimate is well within the confidence interval of RTI’s estimate. The 3.2 percentage point difference between RTI and ARC’s savings estimates would have been 5 points higher without weighting by eligibility fraction or propensity score (unweighted 12.2% versus 7.2%). In all tests, the regression models show larger gross savings than found by ARC’s methods. RTI and ARC estimates of gross savings differ least (2.2%) when not adjusting for differences in beneficiary characteristics between the intervention and comparison groups (eligibility fraction only weighted 9.4% versus 7.2%).

Sensitivity results for Cohort 2 in **Table 5-22** are similar to those reported for Cohort 1. RTI's estimates of savings are 4.8 percentage points greater than ARC's. Capping costs lowers RTI savings by only one-half of a percentage point (19.4% versus 19.9%). With no weighting for duration of eligibility or propensity scoring, RTI savings would have been 2.5 percentage points greater than with weighting.

**Table 5-22**  
**Phase II MGH CMP CMHCB Demonstration sensitivity tests of gross savings estimates:**  
**Cohort 2 regression models**

Model statistics	Baseline	Capped PBPMs	Unweighted estimates	Eligibility fraction-only weights	Including <3month beneficiaries
No. beneficiaries	4,611	4,611	4,611	4,611	4,729
R-squared	0.105	0.116	0.114	0.11	0.103
Base period PBPM cost	0.36	0.34	0.32	0.34	0.36
Intervention Coefficient	-460.2	-449.1	-522.1	-454.7	-469.9
<i>p-value</i>	0.0001	0.0001	0.0001	0.0001	0.0001
Comparison PBPM cost	2,318	2,318	2,318	2,318	2,318
Coeff/P1c pbpm (%)	-19.9	19.4	-22.5	-19.6	-20.3
ARC savings rate (%)	-15.1	-15.1	-15.1	-15.1	-15.1
RTI-ARC saving (%)	-4.8	-4.3	-7.4	-4.5	-5.2

NOTES: MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries

Model Definitions

Baseline: Uncapped PBPM costs, eligibility fraction X ps weights, excluding <3month beneficiaries

Capped PBPMs: Capped PBPM costs at 99<sup>th</sup> percentile, eligibility fraction X ps weights, excluding <3month beneficiaries

Unweighted estimates: Uncapped PBPM costs, unweighted observations, excluding <3month beneficiaries

Eligibility fraction-only weights: Uncapped PBPM costs, eligibility fraction without ps weights, excluding <3month beneficiaries

Including <3month beneficiaries: Uncapped PBPM costs, eligibility fraction X ps weights, including <3month beneficiaries

SOURCE: Medicare Part A&B claims, 8/1/08 to 12/31/11; computer runs bene06mgjhc3 and Bene04a (4/15/13); ARC's Final Reconciliation Report (December 20, 2012)

Sensitivity results for Cohort 3 in **Table 5-23** show a similar pattern to the first two cohorts with uniformly greater savings using RTI's regression method. However, without any weighting, the savings would be roughly double the baseline estimate and highly significant.

**Table 5-23**  
**Phase II MGH CMP CMHCB Demonstration sensitivity tests of gross savings estimates:**  
**Cohort 3 regression models**

Model statistics	Baseline	Capped PBPMs	Unweighted estimates	Eligibility fraction- only weights	Including <3month beneficiaries
No. beneficiaries	2,742	2,742	2,742	2,742	2,826
R-squared	0.132	0.151	0.135	0.129	0.126
Base period PBPM cost	0.41	0.39	0.40	0.40	0.41
Intervention Coefficient	-176.6	-140.2	-313.3	-162.6	-177.2
<i>p-value</i>	0.124	0.1759	0.022	0.1578	0.1351
Comparison PBPM cost	2,508	2,508	2,508	2,508	2,508
Coeff/P1c pbpm (%)	-7.0	-5.6	-12.5	-6.5	-7.1
ARC savings rate (%)	-3.9	-3.9	-3.9	-3.9	-3.9
RTI-ARC saving (%)	-3.1	-1.7	-8.6	-2.6	-3.2

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries

Model Definitions

Baseline: Uncapped PBPM costs, eligibility fraction X ps weights, excluding <3month beneficiaries

Capped PBPMs: Capped PBPM costs at 99<sup>th</sup> percentile, eligibility fraction X ps weights, excluding <3month beneficiaries

Unweighted estimates: Uncapped PBPM costs, unweighted observations, excluding <3month beneficiaries

Eligibility fraction-only weights: Uncapped PBPM costs, eligibility fraction without ps weights, excluding <3month beneficiaries

Including <3month beneficiaries: Uncapped PBPM costs, eligibility fraction X ps weights, including <3month beneficiaries

SOURCE: Medicare Part A&B claims, 8/1/08 to 12/31/11; computer runs bene06mgjhc3 and Bene04a (4/15/13); ARC’s Final Reconciliation Report (December 20, 2012)

Sensitivity results for Cohort 4 in **Table 5-24** show consistent savings regardless of capping, weighting, and 3-month inclusion decisions. All point estimates imply cost savings, but all estimates are also statistically insignificant. RTI and ARC estimates of savings differ the most for Cohort 4 (over 6 percentage points). ARC estimated negative savings (or dissavings) for Cohort 4 while RTI estimated savings of \$92 per beneficiary month. ARC found dissavings of \$1.5 million for NSMC’s Phase II original (2<sup>nd</sup> refresh) group and very small positive savings for its refresh (3<sup>rd</sup> refresh) group. The \$1.5 million in dissavings was primarily the result of a large, 7% reduction in the PBPM cost of the comparison group due to ARC’s base year adjustment. A 5% reduction would have produced slight savings for this group.

**Table 5-24**  
**Phase II MGH CMP CMHCB Demonstration sensitivity tests of gross savings estimates:**  
**Cohort 4 regression models**

Model statistics	Baseline	Capped PBPMs	Unweighted estimates	Eligibility fraction-only weights	Including <3month beneficiaries
No. beneficiaries	3,293	3,293	3,293	3,279	3,425
R-squared	0.099	0.107	0.105	0.098	0.089
Base period PBPM cost	0.23	0.22	0.27	0.25	0.24
Intervention					
Coefficient	-92.3	-102.8	-85.5	-85.0	-87.4
<i>p-value</i>	0.3107	0.2303	0.4353	0.353	0.368
Comparison PBPM cost	2,243	2,243	2,243	2,243	2,243
Coeff/P1c pbpm (%)	-4.1	-4.6	-3.8	-3.8	-3.9
ARC (dis)savings rate (%)	2.3	2.3	2.3	2.3	2.3
RTI-ARC saving (%)	-6.4	-6.9	-6.1	-6.1	-6.2

NOTES: MGH CMP = Massachusetts General Hospital’s Care Management Program; CMHCB = Care Management for High Cost Beneficiaries

Model Definitions

Baseline: Uncapped PBPM costs, eligibility fraction X ps weights, excluding <3month beneficiaries

Capped PBPMs: Capped PBPM costs at 99<sup>th</sup> percentile, eligibility fraction X ps weights, excluding <3month beneficiaries

Unweighted estimates: Uncapped PBPM costs, unweighted observations, excluding <3month beneficiaries

Eligibility fraction-only weights: Uncapped PBPM costs, eligibility fraction without ps weights, excluding <3month beneficiaries

Including <3month beneficiaries: Uncapped PBPM costs, eligibility fraction X ps weights, including <3month beneficiaries

SOURCE: Medicare Part A&B claims, 8/1/08 to 12/31/11; computer runs bene06mgjhc3 and Bene04a (4/15/13); ARC’s Final Reconciliation Report (December 20, 2012)

ARC, using different methods from RTI, estimated gross savings in Phase II of the MGH demonstration to be \$25,504,285. Based on regression point estimates, RTI estimates gross savings of \$42,664,590, or \$17,160,305 (67%) greater than ARC’s estimate. RTI’s beneficiary-weighted average difference in savings is 4.4 percentage points higher than ARC’s estimate. Cohort 2 explains 40% of the difference, Cohort 4, 24%, Cohort 1, 22%, and Cohort 3, 13%.

**5.9 Conclusion**

According to multivariate analysis, the Phase II MGH demonstration saved Medicare \$42.7 million in Part A&B expenditures (see **Table 5-25**). These savings were realized between a one-year base period and a maximum of three demonstration years depending upon cohort.

**Table 5-25**  
**Phase II MGH CMP CMHCB Demonstration gross & net savings & return on investment by Cohort**

	Cohort 1	Cohort 2	Cohort 3	Cohort 4	Total
Gross Savings per beneficiary month	\$257.05	\$460.15	\$176.60	\$92.26	
Total beneficiary months	42113.29	52413.92	26677.21	29838.03	152042.45
Total Gross savings	\$11,082,271	\$24,118,257	\$4,711,196	\$2,752,856	\$42,664,580
% Gross savings	10.4%	19.9%	7.0%	4.1%	11.8%
Accrued fees	4,755,582	5,700,759	2,743,476	3,218,520	16,418,337
Net savings	6,326,689	18,417,498	1,967,720	(465,664)	26,246,243
Return on investment: GS/Fees	2.33	4.23	1.72	0.86	2.60

NOTES: MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries

Gross Savings (GS) per beneficiary month = estimated difference in the change in mean PBPM costs for comparison minus intervention beneficiaries (intervention Model 3 coefficient)

Total beneficiary months = total fee-bearing months of intervention eligible beneficiaries

Total Gross savings = Intervention Model 3 coefficient times cohort beneficiary-months in Phase II

% Gross savings = Total gross savings times cohort beneficiary-months in Phase II

Accrued fees = monthly fees accrued based on reported eligible beneficiary-months in Phase II

Net savings = total gross savings minus accrued fees

Return on investment = the ratio of total gross savings divided by accrued fees

SOURCES: Based on multivariate regression estimates using Medicare 2009-2011 Part A&B claims; Total beneficiary months & Accrued fees: ARC Final Reconciliation Report, Tables 2&3, December 20, 2012.

Savings varied by cohort depending upon cohort size and savings percentage. MGH Cohort 2 with refresh populations was considerably larger than the other three cohorts with over 52,000 beneficiary months. Both BW/F Cohort 3 and NSMC Cohort 4 were considerably smaller with approximately 27,000 to 30,000 beneficiary months.

All four cohorts produced savings to the Medicare program, although only the two MGH cohorts generated statistically significant gross savings at conventional levels of significance. Percentage savings ranged from 4.1% for NSMC Cohort 4 to 19.9% for MGH Cohort 2. The overall beneficiary-month weighted savings percentage in the Phase II demonstration was 11.8%.

Accrued fees in Phase II were \$16.4 million. Paid fees were slightly higher: \$17.3 million (ARC Final Reconciliation Report, Dec. 20, 2012 Table 1). Accrued fees varied by cohort again due to the number of intervention beneficiaries and the length of the intervention during Phase II.

Net savings, or the difference between gross savings and accrued fees, was \$26.2 million in total. MGH Cohort 2 contributed \$18.4 million, or 70%, to intervention net savings. After subtracting accrued fees, both MGH and the BW/F Cohort 3 had positive net savings while NSMC Cohort 4 had negative net savings of slightly less than \$500,000.

Medicare's overall return on the investment of accrued fees was 2.6, implying that for every dollar of fees paid out, the program saved \$2.60 in expenditures on Part A&B services. MGH Cohort 2 had the highest return on investment of 4.23 followed by MGH Cohort 1 at 2.33 and BW/F at 1.72.

The cost analyses presented in this section differ from those conducted for financial reconciliation by Actuarial Research Corporation (ARC) under contract to CMS. ARC determined savings based on the demonstration's terms and conditions negotiated between CMS and MGH. RTI's estimate of savings per beneficiary month differs from savings estimated by ARC due to the following reasons:

- ARC capped annual beneficiary costs in the base and demonstration periods at the top 1% for intervention and comparison groups while RTI did not;
- ARC gross savings were based on 8 separate cohorts while RTI estimates are based on 4 cohorts (2 RTI instead of 4 MGH cohorts, and 1 cohort each for BW/F and NSMC instead of 2 for ARC);

ARC gross savings were based on the difference in mean PBPM costs between the intervention and comparison groups during the demonstration period after multiplying comparison group mean PBPM costs by the ratio of intervention to comparison costs in the base period. RTI gross savings were based on a pooled weighted least squares regression of each intervention and comparison beneficiary's mean PBPM cost in the demonstration period on mean PBPM cost in the base period and a set of 13 other beneficiary characteristics that capture any differential changes in cost over time between intervention and comparison groups;

- RTI deleted any intervention or comparison beneficiary in the estimation process with less than 3 months eligibility during the demonstration period while ARC did not;
- RTI weighted the change in beneficiary costs by the fraction of time exposed to the intervention during the demonstration period. This resulted in a reduced base year cost weight for beneficiaries with less exposure to the intervention. ARC gave full weight to base year costs for any beneficiary with 12 months of base year eligibility regardless of duration of exposure to the intervention;
- RTI also weighted the change in beneficiary costs by each comparison beneficiary's likelihood of participating in the intervention using logistic propensity scores while ARC (implicitly) assumed that characteristics of intervention and comparison beneficiaries were similar;
- RTI's regression specification produced larger savings compared with ARC's method when base year mean PBPM costs were lower on average than the comparison groups, which was the case for all 4 cohorts.

Slower growth in Medicare expenditures or costs were achieved primarily through lower acute hospital payments (see **Table 5-26**). In the two MGH cohorts, gross savings from acute inpatient hospital spending comprised about 55% of overall savings while in BW/F Cohort 3 slower acute hospital spending contributed 41%. NSMC Cohort 4 was exceptional in contributing over 100% of its gross savings through slower growth in acute hospital spending. (A percentage greater than 100% is possible if other service spending is growing faster than the comparison group.) NSMC Cohort 4's savings were not statistically robust, however, and savings from hospital use may be much less in repeated interventions. The only other service showing consistent negative growth—relative to a comparison group—was home health. Thus, it would not appear that the three hospital groups were saving on acute inpatient services through more expensive use of home health services. MGH Cohort 2 stands out, not only overall, but in the amounts it saved on physician spending and spending on other rehabilitation, LTC, and psychiatric hospitals. Conversely, NSMC Cohort 4, unlike the other three cohorts, spent relatively more on hospital outpatient department, long-term care hospital, and hospice services.

Diagnostic imaging has been of financial concern to the Medicare program and was given special attention in tracking cost increases during Phase II. At least for the sicker, costly, populations eligible for the MGH demonstration, these costs were quite minor (i.e., less than 2% of average beneficiary costs). Thus, it is reasonable to expect little in the way of savings from imaging services, as seen in **Table 5-26**. RTI's cost estimates for imaging are certainly understated, however, as an unknown amount appear either in the outpatient department bills or bundled in prospective hospital payments.

**Table 5-26**  
**Phase II MGH CMP CMHCB Demonstration gross savings by major type of health care service by Cohort**

Service	Cohort 1	Cohort 2	Cohort 3	Cohort 4
Total	-220	-471	-128	-124
Acute Hospital	-139	-264	-53	-151
Physician	-8	-33	3	4
OPD	-16	5	0	26
Imaging	-4	-8	1	1
Other Hospital	4	-86	-7	22
Home Health	-20	-28	-13	-14
Hospice	-14	-3	-15	19
Durable Medical Equipment	6	-7	-3	4
Other Services	-29	-48	-40	-34

NOTES: MGH CMP = Massachusetts General Hospital's Care Management Program; CMHCB = Care Management for High Cost Beneficiaries.

SOURCE: Medicare Part A&B 2009-2011 claims; computer run bene06mghjc3

The Phase II MGH, BW/F, NSMC demonstration exhibited strong regression to the mean effects in costs while overall costs per comparison beneficiary were increasing in the market area (the BW/F comparison group was a notable exception). The large churning of beneficiaries from lower (higher) to higher (lower) cost groups over time adds considerable statistical noise to the test of savings. Costs continued to rise because any reduction in costs in the baseline high cost group was more than offset by smaller increases among the greater majority of initially lower cost beneficiaries. Regression to the mean presents a challenge for intervention staff targeting beneficiaries at highest risk of increasing costs. Algorithms for identifying potentially high cost beneficiaries often key in on base period use; yet, it is beneficiaries with modest use and costs that present the greatest opportunities for savings in future months or years. Nevertheless, it appears that the MGH CMP staff was able to work successfully across a broad cost range of their patients, intervening quickly when health problems arise and resulting in a financially successful outcome.

## **CHAPTER 6**

### **EVALUATION OF THE MGH SKILLED NURSING FACILITY (SNF) WAIVER**

#### **6.1 Background on SNF Waiver and Overview of Analysis**

In July 2010, MGH was granted a 72-hour rule waiver to pilot test direct admission to a SNF for Medicare beneficiaries participating in MGH's CMP. MGH began direct SNF admission in August 2010. BW/F and NSMC began direct SNF admissions in August 2011. The three institutions partnered with 18 high performing SNFs in an effort to collectively raise the quality bar through the SNF waiver. Other considerations included geographic proximity to the acute care facilities, history of productive collaboration with the three institutions, and a high historical rate of referrals.

Under current Medicare SNF payment policy, Medicare beneficiaries must be hospitalized in an acute care hospital for at least 72 hours prior to transfer to a SNF for CMS to make payment to the SNF. The waiver targeted beneficiaries with non-acute conditions and those without a diagnostic dilemma that would otherwise require hospitalization. Although these beneficiaries required some acute care, intensive acute care was not needed, which potentially avoided additional unnecessary hospitalization costs. Care Managers reported during a site visit that pneumonias, falls, and urinary tract infections accounted for the largest proportion of conditions resulting in utilization of the waiver.

Under the pilot, CMP patients could be directly admitted to a SNF from one of five locations: home, a primary care physician's office, the ER, an ER observation unit, or an admit-to-observation unit. Patients, who are directly admitted from home, must have been evaluated by a physician within three days prior to the SNF admission. Medicare beneficiaries were eligible for the waiver if they met the following four criteria:

1. Medically stable
2. Have certain and confirmed diagnoses
3. Do not require inpatient hospital evaluation and treatment
4. Have an identified skilled nursing or rehabilitation need with specific goals toward improvement that cannot be provided as an outpatient.

MGH developed a "telerounding" program enabling their CMP team to conference with the SNF teams on a weekly basis to monitor their patients' progress and to work with the patients' families during the SNF stay to address social issues and ensure patient success upon discharge from the SNF. CMP staff reported that the process led to enhanced relationships with the SNFs. The effort served as a trigger institutionally for beginning the development of a preferred provider network with SNFs in northeast New England.

From MGH's perspective, the primary outcome of the SNF waiver pilot was successful direct admission to a SNF without hospitalization within 7 days. Secondary outcomes included successful discharge to home from the SNF, MGH and post-acute facilities' satisfaction with the SNF waiver process, and SNF length of stay. However, under the CMHCB Demonstration,

MGH is required to reduce Medicare expenditures for CMP beneficiaries to achieve budget neutrality as discussed in Chapter 5. Thus, CMS granted the SNF waiver under the premise that costs would not increase and that cost savings would be generated. In discussions with MGH CMP staff, they opined that reduced hospital utilization and related acute care costs could occur among three sets of patients: (1) those at home clinically declining who would present to the ER for treatment; (2) those who present to the ER and remain in the ER or observation bed status for an extended period of time; and (3) those that are hospitalized but discharged in less than 72 hours. To be cost savings, however, Medicare payments for SNF services must be less than what Medicare payments would have been absent the SNF waiver. Finding the counterfactual will be a significant challenge.

## **6.2 Research Questions, Data, and Methods**

### **6.2.1 Research Questions**

In this analysis, we seek to answer the following three research questions directly related to the primary and secondary outcomes that MGH specified as its goals:

1. What percentage of beneficiaries directly admitted to a SNF were subsequently admitted to an acute care hospital within 7-, 30-, and 60 days?
2. What percentage of beneficiaries directly admitted to a SNF were successfully discharged to home?
3. What was the average length of stay in the SNF for beneficiaries directly admitted to a SNF and is it an appropriate length of stay?

Although MGH had a secondary outcome related to satisfaction with the SNF waiver process, we are unable to conduct a beneficiary assessment of this outcome. The primary motivation for studying the first two research questions was to determine the degree to which cost efficiencies could be achieved by avoiding a costly pre-SNF admission hospitalization and sending patients directly home without subsequent admission to the hospital. MGH's third goal was to ensure an appropriate length of stay. Prior to the SNF waiver, there was concern that some SNFs had very long average lengths of stay. While MGH was clearly aware that long lengths of stay would reduce the cost-effectiveness of the direct SNF admission, they were also concerned that patients not be discharged before they were clinically ready and appropriate support was in place at home; thereby preventing beneficiaries from failing successful discharge home by needing acute care in the short term.

CMS granted the SNF waiver under the premise that costs would not increase and that cost savings would be generated. Thus, we also seek to answer two additional research questions:

4. What are the acute care utilization and Medicare expenditure patterns of CMP beneficiaries that are directly admitted to a SNF versus beneficiaries evaluated for the SNF waiver and discharged home?

5. Are Medicare expenditures lower for CMP beneficiaries who are directly admitted to a SNF than expenditures these beneficiaries would have otherwise incurred in the absence of the SNF waiver?

### **6.2.2 Data and Methods**

We use four sources of data for this analysis: (1) MGH SNF waiver database; (2) Medicare EDB; (3) Long Term Indicator (LTI) file created by FU Associates; and (4) Medicare claims.

**MGH SNF Waiver Database.** The MGH SNF waiver database contains the assessment and disposition information for all CMP beneficiaries evaluated for the SNF waiver. Key analytic variables include:

- Date of evaluation
- Referral source
- Originating location
- Diagnosis at time of evaluation and comments on diagnosis
- Four candidate criteria (met/did not meet)
- Verbatim reasons for not being a candidate
- Disposition if not a candidate for waiver
- SNF bed availability
- Date of SNF admission

The database contains assessment and disposition information for 379 beneficiaries evaluated across the three institutions from the beginning of the SNF waiver implementation in August 2010 through December 2012. More detail on the effective sample sizes for various analyses is provided below under Samples of Beneficiaries for Analysis.

**Medicare EDB.** The Medicare EDB was used to identify demographic characteristics of the CMP beneficiaries evaluated for the SNF waiver as described in Section 2.2.2. In this analysis, we report mean age and percentage of beneficiaries within four age categories (<65 years of age, 65-74 years of age, 75-84 years of age, and 85 years of age and older), female white, disabled, and Medicaid/Medicare dual enrollees.

**LTI File.** In our baseline analysis, we report percentage of beneficiaries institutionalized if they met the following criterion: a beneficiary was in a nursing home for any one or more months of the initial 6 months of the demonstration period using the Long Term Indicator (LTI) file created by FU Associates.

**Medicare Claims.** An episode of care file was created from Medicare claims for beneficiaries who were evaluated before November 1, 2011. The beginning of the episode of care is one year prior to the completion of the SNF evaluation (contained in the SNF waiver database) and the end of the episode of care is 60 days post evaluation. Only claims that occurred during periods of eligibility in the 180-day episode period were included in the episode of care file following the decision rules described in Section 2.2.2. Analytic variables constructed from the episode of care file include the following:

- Using the full one-year period of claims, we constructed HCC risk and Charlson Comorbidity scores and identified major clinical conditions present during the year prior to evaluation (selected HCCs).
- For 7-, 30-, 60- and 365 days pre-evaluation, we constructed three set of rates of acute care utilization per 1,000 beneficiaries and average Medicare payments by major types of services. Within each of the three episode of care windows, rates and average Medicare payments were weighted by the percentage of time that each beneficiary met the CMP eligibility criteria using the eligibility fraction approach previously described in Chapter 2.
- For 7-, 30-, and 60 days post-evaluation, we constructed three set of eligibility fraction weighted rates of acute care utilization per 1,000 beneficiaries and weighted average Medicare payments by major types of services.
- Using SNF claims for beneficiaries directly admitted to a SNF, we calculated average length of stay and identified discharge destination (home, acute care hospital transfer, deceased, etc.) at the time of discharge from the SNF. In the event of multiple continuous SNF claims, we used the disposition on the final claim. We also used the SNF claim for the direct admit event to determine the Resource Utilization Groups (RUG-IV) to which the beneficiary was assigned and principal diagnosis.
- We used the acute care hospital claim for the admission linked to the SNF waiver evaluation to identify the principal diagnosis for beneficiaries admitted to the hospital after evaluation.

**Samples of Beneficiaries for Analysis.** As noted above, the database contains assessment and disposition information for 379 beneficiaries evaluated across the three institutions from the beginning of the SNF waiver implementation in August 2010 through December 2012. However, Medicare claims were provided to RTI by ARC for this Phase II evaluation only through December 2011, the endpoint of Phase II. Thus, we restrict our analyses to the 179 CMP beneficiaries who were evaluated before November 1, 2011 so that we are able to observe a 60-day post-evaluation period for acute care utilization and Medicare expenditures.

In linking the SNF waiver database and the episode of care file, additional reductions in the effective sample sizes for claims-based analyses occurred as follows:

- The 179 SNF evaluations prior to 11/1/2011 represent 159 unique CMP beneficiaries. Because of over-lapping episode of care periods, we retained the first SNF waiver

evaluation so that we could observe all subsequent costs, including SNF costs, within the 60-day post-evaluation window of the first direct admit evaluation. This reduces our sample size to 159 beneficiaries.

- 158 unique CMP beneficiaries were eligible at the start of the Phase II demonstration reducing our sample size by 1 beneficiary.
- 88 candidate beneficiaries had a valid date of admission to a SNF. We were able to link a SNF claim (+ 2 days around date of SNF evaluation completed) to 81 beneficiaries reducing our effective sample size by 7 beneficiaries.
- Of the 158 unique CMP beneficiaries, 70 unique beneficiaries were not admitted to a SNF either because they were determined to not be candidates or were not admitted to a SNF for a small number of other reasons (e.g., refused direct admission, no SNF bed available, etc.).
- Of the 70 unique beneficiaries not admitted to a SNF, 18 beneficiaries had a disposition of home and 33 had a disposition of admission to the hospital. Nineteen beneficiaries had missing disposition. We use the subset of beneficiaries with a disposition of home to conduct our cost savings analyses.

### **6.3 SNF Waiver Evaluation Process, Disposition, and Characteristics of Beneficiaries Admitted to a SNF Versus those Not Admitted to a SNF Following Evaluation**

Prior to answering the research questions posted in Section 6.2.1, we describe the evaluation process for beneficiaries considered for the SNF waiver using information from the SNF waiver database, provide demographic and clinical characteristics of CMP beneficiaries evaluated for the SNF waiver, and report on patterns of utilization and Medicare expenditures during the year prior to the SNF evaluation. We use the full set of SNF evaluations prior to November 1, 2011, which includes multiple instances of the same beneficiaries being evaluated for the SNF waiver.

Of the 179 CMP beneficiaries evaluated for the SNF waiver, all but 2% of beneficiaries were referred for evaluation from some type of care manager; almost three-quarters were referred for evaluation from the CMP Care Manager (*Table 6-1*). Fifty percent of beneficiaries were evaluated in the ER or the ER observation bed unit with another 25% evaluated in the admit-to-observation unit. Twenty-three percent were evaluated while at home. MGH coded presenting diagnoses into one of ten mutually exclusive categories of diagnoses (CHF through wound care). Nearly 40% were classified as “other” by MGH, for which we recoded the narrative descriptions into clinically meaningful categories of diagnoses. Once the recoding was complete, the three most prominent diagnoses at the time of evaluation were falls or fractures (37%), complex medical (20%), and pain and pain management (15%).

When comparing these same characteristics between beneficiaries determined to be a candidate for the SNF direct admit waiver versus those not considered a candidate, a few differences emerge. Candidate beneficiaries were more likely to be referred by the CMP Care Manager and less likely by ER care managers and were more likely to be evaluated while at

home and less likely in the ER. Candidate beneficiaries were less likely to have complex medical diagnoses and more likely to have falls or fractures. They were also less likely to have diagnoses coded as “other,” but there is no consistent pattern of differences in the diagnoses that we recoded.

**Table 6-1**  
**Medicare FFS beneficiaries evaluated for the SNF waiver before November 1, 2011**

	Beneficiaries Evaluated		Candidate for SNF Waiver		Not Candidate for SNF Waiver	
	(#)	(%)	(#)	(%)	(#)	(%)
	179	100	98	55	80	45
<b>Referral Source</b>						
Emergency Room Care Manager	13	7	5	5	8	10
Emergency Room-Observation Unit Care Manager	17	10	5	5	12	15
Inpatient Care Manager	14	8	11	11	3	4
Primary Care Physician	4	2	1	1	3	4
Primary Care Physician Care Manager	131	73	76	76	54	68
<b>Patient Location</b>						
Emergency Room	44	25	18	18	26	33
Emergency Room-Observation Unit	41	23	21	21	20	25
Home	41	23	30	31	10	13
Inpatient Observation Unit	43	24	23	23	20	25
Primary Care Physician Office	8	4	5	5	3	4
Pre-admit area	2	1	1	1	1	1
<b>Confirmed Diagnosis</b>						
CHF	3	2	1	1	2	3
COPD	4	2	2	0	2	3
Complex Medical	35	20	16	16	19	24
Fall or Fracture	66	37	48	43	22	28
UTI	11	6	8	6	3	4
Upper Respiratory	6	3	1	1	5	6
Wound Care	8	4	6	4	2	3
Gait Instability/Mobility	13	7	7	7	6	8
Neurologic	4	2	1	1	3	4
Pain and Pain Management	27	15	17	17	10	13
Weakness	4	2	0	0	4	5
Dizziness	7	4	4	4	3	4

(continued)

**Table 6-1 (continued)**  
**Medicare FFS beneficiaries evaluated for the SNF waiver before November 1, 2011**

	Beneficiaries Evaluated		Candidate for SNF Waiver		Not Candidate for SNF Waiver	
	(#)	(%)	(#)	(%)	(#)	(%)
	179	100	98	55	80	45
Self-care Issues	4	2	1	1	3	4
Lung nodule	1	1	1	1	0	0
Cardiac	2	1	1	1	1	1
Gastrointestinal	2	1	1	1	1	1
Hypertension	1	1	0	0	1	1
Change in Mental Status	3	2	1	1	2	3
Weight Loss	1	1	0	0	1	1
Orthopedic/Joint Issues	5	3	3	3	2	3
Hyponatremia	1	1	0	0	1	1
Renal	1	1	0	0	1	1
Status Post- Surgery	5	3	5	5	0	0

NOTE: 179 Medicare FFS Beneficiaries evaluated for the SNF Waiver before 11/1/2011

1 Beneficiary had missing candidate for waiver status.

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Of the 179 CMP beneficiaries evaluated, 62% met all four SNF waiver criteria (**Table 6-2**). Of the 111 beneficiaries that met all four criteria, 98 beneficiaries were determined to be a candidate for the SNF waiver and 91 beneficiaries were admitted to a SNF. Thus, about one-half of all evaluated beneficiaries were directly admitted to a SNF. **Table 6-3** provides categories of narrative descriptions for not being a candidate for a direct SNF admission. About one-half of beneficiaries were determined to require an acute inpatient stay, a medical work-up, or not stable for the waiver program. Nine percent refused the waiver program while another 13% chose to go home or were cleared to go home. A small number of beneficiaries were determined to require other institutional services, such as LTC or a rehabilitation hospital. The bottom of **Table 6-3** displays the disposition of beneficiaries not directly admitted to a SNF. The two dominant dispositions were home (35%) and acute inpatient care (40%).

**Table 6-2**  
**Number and percentage of Medicare FFS beneficiaries evaluated for the SNF waiver that met the four criteria for beneficiaries evaluated prior to November 1, 2011**

SNF Waiver Criteria	Number of Beneficiaries Met Criteria	
	(#)	(%)
Medically Stable	154	87
Certain and Confirmed Diagnosis	163	92
Did not require hospital-based evaluation	120	68
Identified SNF or rehabilitation need	162	91
Met all four criteria	111	62
Candidate for SNF Waiver	98	55
SNF Bed Available	97	55
Admitted to a SNF	91	51

NOTE: 179 Medicare FFS Beneficiaries evaluated for the SNF Waiver before November 1, 2011; one missing candidate for waiver status.

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**Table 6-3**  
**Reasons that Medicare FFS beneficiaries evaluated for the SNF Waiver did not get direct**  
**admitted and disposition for beneficiaries evaluated prior to**  
**November 1, 2011**

Reasons and Disposition	Number of Beneficiaries	
	(#)	(%)
<b>Reasons</b>		
Did not meet criteria	4	7
Requires Acute Inpatient Stay	24	44
Requires Medical Workup	1	2
Patient Condition Improved/Returned to Baseline	1	2
Not stable for Waiver Program	2	4
Medical Condition Does Not Meet Criteria for SNF	1	2
Requires LTC	4	7
Requires Hospice versus Short-Term Rehabilitation	1	2
Candidate for Rehabilitation Hospital	0	0
Not a Candidate for Rehabilitation Hospital	1	2
Candidate for SNF Waiver Facility	1	2
Refused Waiver Program	5	9
Chose to go Home/Cleared to go Home	7	13
No Waiver Required/ Patient Admission Within or Less than 30 Days	0	0
Reason Not Stated	2	4
<b>Disposition</b>		
Home	28	35
Hospice	1	1
Inpatient	32	40
LTAC	1	1
Rehab	4	5

NOTE: 80 Medicare FFS Beneficiaries determined not to be a candidate for SNF Waiver, representing 70 unique beneficiaries as some beneficiaries had multiple evaluations. Not all beneficiaries had a disposition in the SNF waiver database. snfwav1a.xls

Next, we describe the demographic and clinical characteristics of CMP beneficiaries evaluated for the SNF waiver during the year prior to being evaluated for the SNF waiver using the Medicare EBD and claims. We also report on patterns of utilization and Medicare expenditures during the baseline period. We report the statistics stratified by whether the candidate beneficiary was admitted to a SNF, hospitalized in an acute care hospital, LTAC, or rehabilitation hospital, or was not hospitalized and either returned home or entered hospice. For beneficiaries admitted to a SNF, we report the Resource Utilization Groups (RUG-IV) to which they were assigned. We then compare principal diagnoses for beneficiaries admitted to a SNF versus those hospitalized. For this set of analyses, we use the subset of 151 beneficiaries: 81 beneficiaries admitted to a SNF and 70 beneficiaries not admitted to a SNF. Of the 70 beneficiaries not admitted to a SNF, 33 beneficiaries were hospitalized in an acute care hospital, LTAC, or rehabilitation hospital, 18 beneficiaries had a disposition of home, and 19 beneficiaries had a missing disposition. We exclude beneficiaries with a missing disposition from this set of analyses.

**Table 6-4** displays demographic and clinical characteristics of CMP beneficiaries evaluated for the SNF waiver stratified by SNF admission and hospitalization status. We conducted statistical testing of the differences between the three sets of beneficiaries and none of the differences are statistically significant. None of the demographic or health status characteristics are different among the three sets of beneficiaries. Although there are considerable differences across the three subsets of beneficiaries in the percentage of beneficiaries having received treatment for a wide range of chronic conditions in the year prior to their SNF waiver evaluation, only one difference is statistically significant.

During the year prior to the evaluation for the SNF waiver, however, we do observe statistically significant and substantive utilization and Medicare payment differences between beneficiaries who are admitted versus those not admitted (**Table 6-5**).

- Both sets of beneficiaries who were not admitted to a SNF had significantly higher rates of all-cause hospitalizations and ACSC hospitalizations than beneficiaries admitted to a SNF during the 7 days that preceded the SNF evaluation.
- Beneficiaries hospitalized after evaluation for the SNF waiver also had a significantly higher rate of ACSC ER visits than beneficiaries admitted to a SNF during the 7 days that preceded the SNF evaluation.
- Both sets of beneficiaries not admitted to a SNF had higher average Medicare payments for inpatient services but lower Medicare payments for SNF services.
- Beneficiaries whose disposition was home after the SNF waiver evaluation had lower total Medicare payments than beneficiaries admitted to a SNF due to the very large difference in average SNF payments in the preceding 7 day period.

**Table 6-4**  
**Demographic and health status characteristics of Medicare FFS beneficiaries during the**  
**1-year period prior to being evaluated for the SNF waiver before November 1, 2011**

	Admitted to a SNF	Not Admitted to a SNF and hospitalized	<i>p-value</i>	Not admitted to a SNF and not hospitalized	<i>p-value</i>
<b>Number of Beneficiaries</b>	81	33	—	18	—
<b>Demographic Characteristics</b>					
Mean age	81	80	—	79	—
Percent < 65 years of age	2	6	—	11	—
Percent 65-74 years of age	19	12	—	17	—
Percent 75-84 years of age	44	48	—	33	—
Percent 85+ years of age	35	33	—	39	—
Percent Female	69	61	—	61	—
Percent White	91	94	—	94	—
Percent Disabled	5	6	—	11	—
Percent Medicaid	27	36	—	22	—
Percent Institutionalized	2	0	—	0	—
Average HCC Score	2.63	2.40	—	2.89	—
Average Charlson Index	3.19	3.15	—	3.67	—
<b>Percentage of Beneficiaries with specific clinical conditions during year prior to SNF waiver evaluation</b>					
Diabetes with complications	35	39		50	
Arrhythmias	33	21		50	
Congestive Heart Failure	32	21		50	*
Vascular Disease	27	15		33	
Renal Failure	17	21		33	
Chronic Pulmonary Disease	16	18		11	
Metastatic Cancers	16	21		11	
Major Depressive, Bipolar, and Paranoid Disorders	11	3		6	
Disorders of Immunity	10	0		11	
Polyneuropathy	9	6		6	
Vetebral Fracture	9	3		0	
Cardiofailure and Shock	9	3		17	
Pancreatic Disease	7	6		6	
Seizure and Convulsions	11	3		6	
Hemilpegia/Hemiparesis	10	0		11	
Rheumatoid Arthritis	9	6		6	
Unstable Angina, MI, and other ischemic heart disease	7	9		22	
Ischemic or unspecified stroke	7	6		0	
Chronic Ulcer of Skin	7	6		6	
Major Complications of Medical Care and Trauma	7	9		11	
Multiple Sclerosis, Parkinsons, Huntingtons Diseases	6	3		6	
Hip Fracture/Dislocation	5	6		11	
Pneumonia	4	12		17	

NOTE: Clinical conditions identified using the HCC categories.

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**Table 6-5**  
**Rates of utilization and average Medicare payments for Medicare FFS beneficiaries during the 1-year period prior to being evaluated for the SNF waiver prior to November 1, 2011**

	Admitted to a SNF	Not admitted to a SNF and hospitalized	<i>p-value</i>	Not admitted to a SNF and not hospitalized	<i>p-value</i>
<b>Number of Beneficiaries</b>	81	33	—	18	—
7 Days prior to SNF Evaluation					
Rates of Utilization per 1,000 Beneficiaries					
Rate of all-cause hospitalizations	25	727	**	389	**
Rate of ACSC hospitalizations	0	636	**	222	**
Rate of all-cause emergency room visits	790	939	—	778	
Rate of ACSC emergency room visits	259	727	**	333	
Average Medicare Payments					
Long-term care	0	0		0	
Rehabilitation	0	773		0	
Psychiatric	0	0		0	
Inpatient	54	5,979	**	3,788	**
Home Health	306	109		756	
Durable Medical Equipment	5	33		34	**
Physician	771	1,004	*	609	
Skilled Nursing Facility	9,497	1,175	**	0	**
Hospital Outpatient	1,356	415	**	515	*
Hospice	0	0		0	
Total	11,990	9,487		5,702	**
30 Days prior to SNF Evaluation					
Rates of Utilization per 1,000 Beneficiaries					
Rate of all-cause hospitalizations	37	1030	**	556	**
Rate of ACSC hospitalizations	12	737	**	333	**
Rate of all-cause emergency room visits	975	1,364	**	1,111	
Rate of ACSC emergency room visits	321	818	**	556	

(continued)

**Table 6-5 (continued)**  
**Rates of utilization and average Medicare payments for Medicare FFS beneficiaries during the 1-year period prior to being evaluated for the SNF waiver prior to November 1, 2011**

	Admitted to a SNF	Not admitted to a SNF and hospitalized	<i>p-value</i>	Not admitted to a SNF and not hospitalized	<i>p-value</i>
<b>Average Medicare Payments</b>					
Long-term care	0	0		0	
Rehabilitation	0	2,234	*	0	
Psychiatric	0	0		0	
Inpatient	128	9,730	**	5,048	**
Home Health	707	414		1,055	
Durable Medical Equipment	35	62		91	*
Physician	1,087	1,851	**	1,007	
Skilled Nursing Facility	10,133	1,512	**	0	**
Hospital Outpatient	1,762	725	**	788	*
Hospice	65	0		0	
Total	13,916	16,529		7,989	**
<b>60 Days prior to SNF Evaluation</b>					
<b>Rates of Utilization per 1,000 Beneficiaries</b>					
Rate of all-cause hospitalizations	86	1,152	**	556	**
Rate of ACSC hospitalizations	37	818	**	333	**
Rate of all-cause emergency room visits	1,111	1,697	**	1,278	
Rate of ACSC emergency room visits	358	1,000	**	556	
<b>Average Medicare Payments</b>					
Long-term care	0	0		0	
Rehabilitation	0	2,234	*	0	
Psychiatric	0	0		0	
Inpatient	539	10,753	**	5,048	**
Home Health	1,089	1,108		1,346	
Durable Medical Equipment	66	120		222	**
Physician	1,452	2,304	**	1,346	
Skilled Nursing Facility	10,178	2,001	**	0	**
Hospital Outpatient	2,015	1,907	*	1,143	
Hospice	65	0		0	
Total	15,403	19,616		9,088	**

(continued)

**Table 6-5 (continued)**  
**Rates of utilization and average Medicare payments for Medicare FFS beneficiaries during the 1-year period prior to being evaluated for the SNF waiver prior to November 1, 2011**

	Admitted to a SNF	Not admitted to a SNF and hospitalized	<i>p-value</i>	Not admitted to a SNF and not hospitalized	<i>p-value</i>
1-year prior to SNF Evaluation					
Rates of Utilization per 1,000 Beneficiaries					
Rate of all-cause hospitalizations	889	2,455	**	1,889	**
Rate of ACSC hospitalizations	481	1,576	**	1,222	**
Rate of all-cause emergency room visits	2,691	4,000	*	4,278	**
Rate of ACSC emergency room visits	1,000	1,818	*	1,778	*
Average Medicare Payments					
Long-term care	605	899		3,132	
Rehabilitation	1,356	3,068		594	
Psychiatric	0	0		184	*
Inpatient	8,318	24,306	**	20,706	**
Home Health	5,649	5,828		5,422	
Durable Medical Equipment	435	744		967	*
Physician	5,583	7,275		6,098	
Skilled Nursing Facility	13,506	8,933		8,798	
Hospital Outpatient	4,998	3,379		3,822	
Hospice	65	0		0	
Total	40,513	54,431		49,724	

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Within 30-, 60-, and 365 days of evaluation for the SNF waiver, the utilization and Medicare payment patterns remained essentially unchanged with two noted exceptions.

- The rate of all-cause ER visits among beneficiaries hospitalized became statistically higher than beneficiaries admitted to a SNF in the 30-day period prior to the SNF waiver evaluation and remained higher through the full year prior.
- The difference in total Medicare payments between beneficiaries admitted to a SNF versus those whose disposition was home became statistically insignificant in later time periods and when considering the full one-year period prior to SNF wavier evaluation total Medicare payments became \$9,000 higher among beneficiaries not admitted to a SNF.

The vast majority of beneficiaries directly admitted to a SNF were assigned to the RUG-IV classification of rehabilitation (**Table 6-6**). Beneficiaries may have more than 1 RUG assignment on the same SNF claim; our sample had 181 RUG assignments. Not surprisingly, one-third of beneficiaries admitted to a SNF had a principal diagnosis related to rehabilitation with a wide variety of other principal diagnoses (**Table 6-7**). In contrast, there was little tendency toward any particular principal diagnoses among beneficiaries admitted to an acute care hospital following the SNF waiver evaluation (**Table 6-8**).

**Table 6-6**  
**Resource utilization groups (RUG-IV) assignments for SNF waiver admissions**

RUG-IV Assignment	Number
Clinically Complex	3
Special Care High	3
Reduced Physical Function	4
Rehabilitation	165
Rehabilitation plus Extensive Services	6

NOTE: 81 patients with 181 RUG assignments

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**Table 6-7**  
**Freq of principal diagnosis for SNF patients**

Principal diagnosis	Frequency	Percent
1629 Mal neo bronch/lung NOS	1	1.23
2410 Nontox uninodular goiter	1	1.23
2449 Hypothyroidism NOS	1	1.23
25000 DMII wo cmp nt st uncntr	1	1.23
25001 DMI wo cmp nt st uncntrl	1	1.23
2724 Hyperlipidemia NEC/NOS	1	1.23
34500 Gen noncv ep w/o intr ep	1	1.23
4280 CHF NOS	1	1.23
43411 Crbl emblsm w infrcr	1	1.23
486 Pneumonia, organism NOS	2	2.47
49300 Extrinsic asthma NOS	1	1.23
5225 Periapical abscess	1	1.23
5889 Impaired renal funct NOS	1	1.23
5990 Urin tract infection NOS	2	2.47

(continued)

**Table 6-7 (continued)**  
**Freq of principal diagnosis for SNF patients**

Principal diagnosis	Frequency	Percent
6826 Cellulitis of leg	2	2.47
71515 Loc prim osteoart-pelvis	1	1.23
71945 Joint pain-pelvis	3	3.70
71947 Joint pain-ankle	1	1.23
7197 Difficulty in walking	1	1.23
72887 Muscle weakness-general	1	1.23
72992 Nontrauma hema soft tiss	1	1.23
73310 Path fx unspecified site	1	1.23
78079 Malaise and fatigue NEC	1	1.23
7812 Abnormality of gait	5	6.17
7837 Failure to thrive-adult	1	1.23
7906 Abn blood chemistry NEC	1	1.23
8058 Vertebral fx NOS-closed	1	1.23
8068 Vert fx NOS-cl w crd inj	1	1.23
80700 Fracture rib NOS-closed	1	1.23
81110 Fx scapula NOS-open	1	1.23
81200 Fx up end humerus NOS-cl	1	1.23
81220 Fx humerus NOS-closed	3	3.70
8439 Sprain hip & thigh NOS	1	1.23
84500 Sprain of ankle NOS	1	1.23
92411 Contusion of knee	1	1.23
V5411 Aftrcare traum fx up arm	1	1.23
V5419 Aftree traum fx bone NEC	2	2.47
V5427 Aftrcare path fx vertebr	1	1.23
V5789 Rehabilitation proc NEC	26	32.10
V579 Rehabilitation proc NOS	3	3.70
V5872 Aftcre surg nerv sys NEC	1	1.23
V5878 Aftreere surg MS syst NEC	1	1.23

snfwav8.xls

**Table 6-8**  
**Principal diagnosis for candidates for waiver admitted to MGH**

Principal Diagnosis	Number
Other anthropod-borne disease	1
Hearing loss	1
Diabetes with other specified manifestations	1
Gout	1
Disorders of fluid, electrolyte, and acid-base balance	2
Drug-induced mental disorders	1
Essential hypertension	1
Heart Failure	2
Atherosclerosis	1
Pneumonia	1
Influenza	1
Chronic bronchitis	1
Acute kidney failure	1
Other disorders of urethra and urinary tract	2
Other cellulitis and abscess	6
Pathologic fracture of tibia and fibula	1
Fracture of vertebral column	1
Open wound of scalp	1
Other specific rehabilitation procedure	1

NOTE: 33 beneficiaries were not a candidate for waiver and admitted to a hospital.

5 beneficiaries did not have a claim within 60 days of evaluation.

snfwav5.xls

In summary, about one-half of all evaluated beneficiaries were directly admitted to a SNF. Of the beneficiaries determined to be a candidate for a direct SNF admission, 13% declined to be admitted or improved sufficiently during the evaluation process to be able to return to or stay at home. Of the beneficiaries determined to not be a candidate for a direct admission to a SNF, 35% had a disposition of home and 40% were admitted to the hospital. Thus, the non-candidate group is comprised of two sets of very different beneficiaries; those well enough to return home and those requiring hospitalization. It is likely that the former group is not as sick and the latter group sicker than beneficiaries directly admitted to the SNF. Although we did not observe any substantive differences in demographic or health status characteristics between beneficiaries admitted to a SNF and those not admitted to a SNF, there were considerably different patterns of health care utilization and Medicare expenditures during the pre-evaluation period and reasons for admission. Beneficiaries directly admitted to SNF were more likely to be

admitted for rehabilitation and have been SNF users prior to the SNF waiver evaluation in contrast with beneficiaries not admitted to the SNF who were admitted for many different clinical reasons and more likely to have been users of acute care services during the pre-evaluation period. This does raise a question as to whether or not we are observing continuing episodes of care from prior SNF or hospital treatment. A closer examination of this issue may be warranted.

#### 6.4 Analysis of MGH’s Primary and Secondary Outcomes

From MGH’s perspective, the primary outcome of the SNF waiver pilot was successful direct admission to a SNF without hospitalization within 7 days, with a goal of greater than 90% of beneficiaries without hospitalization within 7 days. We extend our evaluation to include longer periods of time, 30 and 60 days post-evaluation. The percentage of beneficiaries admitted to a hospital was 5% within 7 days, 9% within 30 days, and 20% within 60 days of the SNF evaluation date. Thus, MGH exceeded their goal of 10% or fewer hospitalizations within 7 days. National risk-adjusted data shows the percentage of SNF cases that result in hospitalization ranges from 10% for the top 25th percentile of SNF performers in terms of rate of hospitalization to 25% for the bottom 25th percentile of performers (MedPAC, 2012).

A secondary outcome was successful discharge to home from the SNF. Using the discharge destination from the final claim in the cases of multiple continuous SNF claims for a beneficiary, we observe 78% of beneficiaries were discharged home with either self-care or home care services; 11% of beneficiaries were discharged from the SNF to a hospital for inpatient care; and 5% of beneficiaries were discharged to another institution (*Table 6-9*). One beneficiary died during the SNF admission, three beneficiaries were still a patient at the end of the 60-day period, and one beneficiary was discharged to hospice.

**Table 6-9**  
**Discharge destination after a SNF waiver admission**

	Number and Percent of Beneficiaries	
	(#)	(%)
	81	100
Discharge Destination		
Home/Self care	55	68
Hospital for inpatient care	9	11
Other type of institution	4	5
Home/Home care services	8	10
Deceased	1	1
Still patient	3	4
Hospice	1	1

NOTE: Discharge destination is determined for the final claim in cases of multiple continuous SNF claims for a beneficiary

snfwav5.xls

Length of stay in the SNF varied considerably, ranging from 3 day to 58 days. The average length of stay was 20 days, which is shorter than the average length of stay of 27 days observed among Medicare FFS beneficiaries who have had a 3-day qualifying hospital stay (CMS 2010; <http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MedicareMedicaidStatSupp/2011.html>). Of course, there is likely to be a difference in the health status of patients directly admitted to a SNF versus those transferred to a SNF from an acute care hospital. MGH's goal was to ensure an appropriate length of stay. Determining appropriateness from claims data is difficult; however, the low rate of hospitalization post-SNF admission and the high rate of successful discharges home suggest appropriate lengths of stay across the 81 beneficiaries we included in this analysis.

## 6.5 Analysis of Acute Care Utilization MGH's Primary and Secondary Outcomes

CMS granted the SNF waiver under the premise that costs would not increase and that cost savings would be generated. Thus, we also seek to answer two additional research questions:

1. *What are the acute care utilization and Medicare expenditure patterns of CMP beneficiaries that are directly admitted to a SNF versus beneficiaries evaluated for the SNF waiver and discharged home?*
2. *Are Medicare expenditures lower for CMP beneficiaries who are directly admitted to a SNF than expenditures these beneficiaries would have otherwise incurred in the absence of the SNF waiver?*

Our original analysis plan called for the development of a comparison group by which to determine the counterfactual – or what Medicare expenditures would have been absent the SNF waiver – and conducting a simulation analysis. However, because of a very small number of beneficiaries included in this analysis, we were unable to identify a robust comparison group of beneficiaries using common propensity score matching or model-based risk adjustment approaches. Rather, we take a modified approach to assessing the counterfactual in Medicare expenditures by using Medicare acute care utilization and expenditures profiles of the very small number of beneficiaries evaluated for the SNF waiver but discharged home. This comparison group has 18 beneficiaries. This group was derived from the 28 in **Table 6.3** and reflects unique beneficiaries. **Table 6.3** contains multiple evaluations for the same beneficiary.

We selected this group of beneficiaries for two reasons. First, it contains a small number of beneficiaries that were identified as candidates for a direct SNF admission but chose not to be admitted. We do not know if these beneficiaries are substantively different in any meaningful way that would affect post-evaluation use of health care services, but presumably they would be the closest match to the beneficiaries directly admitted to a SNF. Second, another subset of this small group were determined to not meet the SNF criteria but were also cleared to return home. It was determined that their health care needs could be met on an outpatient basis and did not require the level of skilled nursing care available in a SNF. Thus, these beneficiaries may be healthier than beneficiaries directly admitted to a SNF. A review of the demographic characteristics of beneficiaries in our small comparison group with the beneficiaries directly

admitted to a SNF reveals no clear pattern of better or worse health status between the two groups. None of these differences are statistically significant.

We also evaluated whether we could identify a subset of beneficiaries from the group of beneficiaries not candidates for the SNF waiver and admitted to the hospital but stayed for less than 3 days. Presumably, these beneficiaries would be the closest to the SNF direct admission beneficiaries due to a lower level of acute care need. Only one beneficiary met this criterion.

**Table 6-10** presents the rate of acute care utilization and Medicare expenditures during three post-SNF evaluation windows of 7-, 30-, and 60 days for beneficiaries admitted to a SNF versus beneficiaries that were evaluated but with a disposition of home. Within 7-days of SNF waiver evaluation, we observe few statistically significant differences. Not surprising, beneficiaries with a disposition of home had higher average home health costs than beneficiaries admitted to a SNF (\$1,018 versus \$212,  $p < 0.01$ ) and higher average DME costs (\$31 versus \$0,  $p < 0.05$ ). Total Medicare expenditures were \$2,137 higher among the beneficiaries with a disposition of home, although it is not a statistically significant difference. It is likely that we are not observing all of the Medicare costs for beneficiaries admitted to a SNF as the average length of stay was 20 days; thus many SNF bills would not have been submitted to CMS for payment within 7 days of evaluation. Although the comparison group of beneficiaries was not directly admitted to a SNF at the time of their evaluation, we do observe higher average SNF payments than for those that were directly admitted; a finding not directly explainable.

Over the ensuing 30- and 60-day periods, we observe a pattern of substantively greater acute care utilization and higher inpatient costs among the comparison group of beneficiaries not directly admitted to a SNF. Rate of all-cause inpatient hospitalization and all-cause ER visits were 236 and 338 per 1,000 beneficiaries higher at 30 days and 427 and 526 per 1,000 beneficiaries higher at 60 days, respectively. Average Medicare payments for inpatient services were \$3,185 and \$4,102 higher at 30- and 60-days, respectively, and average DME payments were \$130 and \$218 higher at 30- and 60-days, respectively. Although not statistically significant, average Medicare SNF payments and average total Medicare payments were also higher in both time periods among beneficiaries with a disposition of home.

## **6.6 Discussion**

The guiding principles for the MGH SNF waiver were to provide the “right care, at the right place, at the right time” (Presentation at CMS by Kaufman, Neagle, Thompson, 2011). To do so, MGH developed a set of criteria for identifying appropriate patients and protocols for evaluation, communication, and transfer to the appropriate setting. Approximately, one-half of all evaluated CMP beneficiaries were directly admitted to a SNF. Roughly, one-in-ten beneficiaries determined clinically to be a candidate for direct admission to a SNF declined the admission.

**Table 6-10**  
**Utilization and Medicare expenditures during the 7-, 30-, and 60 days post evaluation for the SNF waiver by waiver status:**  
**Admitted to SNF or disposition home**

	Number of Days post-evaluation for the SNF waiver											
	7			30			60			Pval		
	Admitted to SNF	Disposition Home	Diff	P-val	Admitted to SNF	Disposition Home	Diff	P-val	Admitted to SNF		Disposition Home	Diff
Number of Beneficiaries	81	18	.	.	81	18	.	.	81		18	.
Rates of Utilization per 1,000 Beneficiaries	46	59	13		90	353	263	**	210	647	437	**
Rate of all-cause hospitalizations												
Rate of ACSC hospitalizations	21	0	-21		40	176	137		124	353	229	
Rate of all-cause emergency room visits	71	176	106		191	529	338	*	356	882	526	*
Rate of ACSC emergency room visits	46	59	13		90	235	145		188	412	224	
Average Medicare Payments	0	0	0	.	417	0	-417		422	738	316	
Long-term care												
Rehabilitation	0	0	0	.	0	0	0	.	0	0	0	.
Psychiatric	0	0	0	.	0	0	0	.	0	0	0	.
Inpatient	323	505	182		934	4,118	3,185	**	2,051	6,153	4,102	**
Home Health	212	1,018	806	**	1,698	1,413	-284		2,860	1,966	-894	
Durable Medical Equipment	0	31	31	*	35	165	130	**	79	297	218	**
Physician	318	281	-37		813	1,123	310		1,283	1,934	651	
Skilled Nursing Facility	482	1,692	1,211		1,698	4,168	2,470		3,379	5,720	2,341	
Hospital Outpatient	96	116	20		338	207	-132		536	574	37	
Hospice	75	0	-75		155	0	-155		271	0	-271	
Total	1,506	3,643	2,137		6,087	11,194	5,106		10,882	17,381	6,499	

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From MGH's perspective, the primary outcome of the SNF waiver pilot was successful direct admission to a SNF without hospitalization within 7 days, with a goal of greater than 90% of beneficiaries without hospitalization within 7 days. MGH exceeded its goal of 10% or fewer hospitalizations within 7 days with a 5% admission rate. Secondary outcomes were successful discharge to home from the SNF and appropriate length of stay. Seventy-eight percent of beneficiaries were discharged home with either self-care or home care services. Average length of stay was 20 days. Determining appropriateness from claims data is difficult; however, the low rate of hospitalization post-SNF admission and the high rate of successful discharges home suggest, in the aggregate, appropriate lengths of stay across the 81 beneficiaries we included in this analysis. We believe these data provide evidence that MGH met the goals they set for the SNF waiver pilot.

CMS granted the SNF waiver under the premise that costs would not increase and that cost savings would be generated. To be cost savings, however, Medicare payments for SNF services must be less than what Medicare payments would have been absent the SNF waiver. Small numbers of CMP beneficiaries considered for the SNF waiver during the Phase II demonstration period precluded our ability to use standard comparison group matching techniques. Rather, we compared the performance of the beneficiaries directly admitted to a SNF with those considered for a direct SNF admission but with a disposition home, or a set of beneficiaries that did not require intensive acute care.

During the post-evaluation time period that spanned up to 60 days, we observed a pattern of statistically significant lower rates of acute care utilization and lower inpatient costs among the beneficiaries directly admitted to a SNF relative to a comparison group of beneficiaries not directly admitted to a SNF. Although not statistically significant, average total Medicare payments were always lower among the beneficiaries directly admitted to a SNF relative to beneficiaries with a disposition of home. These data suggest that Medicare expenditures were likely lower for CMP beneficiaries who were directly admitted to a SNF than what expenditures would have been in the absence of the SNF waiver.

There are several major caveats to this analysis. First is the design of the pilot. A detailed clinical evaluation was conducted to determine whether or not a CMP beneficiary met the four criteria established prior to the launch of the pilot. However, in all likelihood, subjective information led to the identification of patients for evaluation and augmented the objective information collected on the patients being evaluated and used in making the disposition determination. There were many verbatim comments in the SNF Waiver Database providing additional information on reasons not a candidate. Thus, replicating the MGH process of identification and disposition determination may be difficult in other settings and could lead to other results.

Second was the inability to develop a robust comparison group due to small numbers of beneficiaries included in the pilot during Phase II of the demonstration and the likely influence of unobserved information in the identification of patients for evaluation and disposition determination. Traditional propensity score methods require sufficiently large samples of both intervention and potential comparison beneficiaries to estimate models with reasonable predictive power, and are limited to observed data, and in our case, claims data. A retrospective, case-control type of approach might provide the best opportunity to identify a suitable

comparison group through the use of detailed clinical and social information from the medical record and clinicians familiar with the CMP beneficiaries. Thus, better matching of comparison beneficiaries to those directly admitted to a SNF could lead to different findings.

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## CHAPTER 7

### KEY FINDINGS FROM THE PHASE II MGH CMP CMHCB DEMONSTRATION EVALUATION

The purpose of this report is to present the findings from RTI International's evaluation of the Massachusetts General Hospital (MGH) Care Management Program (CMP). Our evaluation focuses upon three broad domains of inquiry:

**Implementation.** To what extent was MGH able to implement its Phase II CMP?

**Reach.** How well did the Phase II MGH CMP engage its intended audiences?

**Effectiveness.** To what degree was the Phase II MGH CMP able to improve health outcomes and achieve targeted cost savings?

Organizing the evaluation into these areas focuses our work on the policy needs of the Centers for Medicare & Medicaid Services (CMS) as it considers the future of population-based care management programs or other interventions in Medicare structured as pay-for-performance initiatives. We used both qualitative and quantitative research methods to address a comprehensive set of research questions within these three broad domains of inquiry.

#### 7.1 Key Findings

In this section, we present key findings based upon the 29 months of MGH's Phase II CMP Demonstration operations with its Phase I original, Phase I refresh, and Phase II original MGH populations, 23 months with the Phase II original BW/F population, 22 months with the Phase II original NSMC population and 15-17 months of Phase II refresh MGH, BW/F, and NSMC experience. Our findings are based on the experience of approximately 14,000 ill Medicare beneficiaries split across 4 cohorts of intervention and comparison groups for analysis purposes, increasing statistical power by combining the substantially smaller Phase II refresh populations with the Phase II original populations (the BW/F and NSMC Phase II refresh populations were only about 40% the size of their Phase II original populations) to detect differences. Seven key findings on implementation, beneficiary participation, provider satisfaction, acute care utilization, health outcomes, and financial outcomes have important policy implications for CMS and future care coordination efforts among Medicare fee-for-service (FFS) beneficiaries. The CMHCB demonstration program held MGH financially responsible for financial savings but not for quality of care improvements.

**Key Finding #1: Full integration of the CMP into MGH's health care system was easier to accomplish than integration of the CMP into the NSMC's or BW/F's health care systems because of program scalability.**

With smaller numbers of assigned beneficiaries, both NSMC and BW/F, identified several challenges with implementation. A key challenge was related to their ability to fully embed care managers into primary care practices. All three institutions felt that care managers embedded in physician practices is an essential component of the CMP and that ample concentration of beneficiaries within a physician practice is pivotal to ensuring that each practice

feels the Care Manager's presence and appreciates the Care Manager's value. It was felt that a low concentration of CMP patients leads to a lower level of engagement with Care Managers, and providers and beneficiaries are less likely to experience the benefits of the program. Further, relatively small numbers of beneficiaries make it somewhat difficult to keep the CMP "on the radar screen" for some providers.

Second, it is difficult to implement a program like CMP on a small scale because of budget and staffing constraints. Particular challenges include finding sufficient resources to ensure development of an appropriate IT infrastructure, hiring an adequate number of Care Managers and other team members at the outset of the program, and provide sufficient funding for program and operational leadership prior to program launch.

**Key Finding #2: Transitioning a successful program to other institutions requires significant infrastructure and program development.**

Very small physician practices may not be well equipped to implement the MGH care management model. Of particular concern is the ability to embed Care Managers in small primary care practices. Conglomerates of practices may provide a structure that enables small practices to share resources such as Care Managers more effectively. Further, full-time program leadership is likely needed to customize the program to their institution's unique characteristics, serve as the champion within the organization, and build relationships and understanding of the program among a disparate set of providers, including hospitalists, specialists, post-acute care providers, etc. Finally, building the IT infrastructure before program roll-out is a critical element to success. It is likely that many community hospitals and physician practices do not have ready access to the expertise or IT infrastructure needed to successfully implement the CMP model.

**Key Finding #3: The Phase II MGH CMP Demonstration achieved a high participation level that reached broadly across its intervention population in terms of beneficiary demographic characteristics, prior health status and health care costs, and health status measured during the early months of its demonstration.**

The Phase II MGH CMP Demonstration was successful in recruiting a very high percentage of intervention beneficiaries (ranging from 89% to 93%). We found few statistically significant differences between participants and nonparticipants in any of the four cohorts, but our explanatory power of the studied beneficiary characteristics was extremely low, in part due to the low number of nonparticipants. Medicare beneficiaries who were institutionalized during the Phase II Demonstration period were less likely to be participants for three of the four cohorts. At the same time, we observed beneficiaries in Cohorts 1, 3, and 4 who were the sickest or who were predicted to be the most costly during the year prior to the start of Phase II were more likely to participate. These results suggest that the Phase II MGH CMP Demonstration was successful at engaging the sicker and more costly beneficiaries in their Phase II program.

**Key Finding #4: Phase I of MGH's CMP Demonstration improved primary care provider (PCP) assessment of the quality of medical practice and quality of care for their patients.**

In addition to improving the quality of care and outcomes for Medicare beneficiaries, Phase I of MGH's CMP aimed to improve the quality of work life of primary care physicians

and ultimately attract more physicians to the field of primary care. It is one of several initiatives in development at MGH to improve the challenging work life of primary care physicians. Ultimately, these initiatives are part of a larger vision for Partners HealthCare to restructure the practice model for primary care practice characterized by high patient and physician satisfaction, work flow and process improvement, and the delivery of evidence-based care.

During two site visits RTI conducted during Phase I to MGH's CMP, staff spoke with a small number of primary care physicians during each site visit to gauge their assessment of satisfaction with the demonstration program. At the time of the first Phase I site visit, a small number of physicians expressed concerns about the program. For example, they had questions about whether CMP patients would divert services from other patients in their practices. And, some physicians did not have a full understanding of the role of the care managers. However, as physicians gained experience working with the care managers, the most common concern they voiced was frustration about their inability to include additional patients in the program. One provider noted that for each patient eligible for the program, there are two additional patients in the practice who could benefit from such care management support.

At the time of the second Phase I site visit, physicians gathered for the focus group reported great overall satisfaction with the CMP. The following first three quotes highlight the essence of their satisfaction with MGH's CMP with the fourth quote expressing a widely held view among the interviewed physicians:

- “The program ‘wraps its arms’ around the most difficult and complex patients.”
- “The program signifies a move towards a true medical home model—it is a team of providers. The program does what every PCP needs to be doing but cannot do anymore because of the medicine practice and reimbursement realities and primary care provider shortages.”
- “The program has done a remarkable job in training and cultivating case managers who are very good at breaking barriers and making it work for the most difficult patients.”
- “We do not want the program to end—it is very valuable! Once the program is gone, participants will become ‘frequent flyers’ in the emergency department and hospital.”

**Key Finding #5: For some its Medicare beneficiaries, the Phase II MGH CMP Demonstration was successful at reducing the rate of increase in acute care hospitalizations, but not ER visits or 30-day readmissions.**

During the course of the Phase II MGH CMP Demonstration, in general, we observed increasing rates of all-cause and ACSC hospitalizations, ER visits, and 30-day readmissions in both the intervention and comparison groups and for all four cohorts. The Cohort 2 intervention beneficiaries had a statistically significant lower rate of growth for all-cause and ACSC hospitalizations as well as lower percentages of beneficiaries hospitalized for all causes and ACSCs. The Cohort 4 intervention beneficiaries had a statistically significant lower rate of all-cause hospitalizations, driven by a decrease in the intervention population's rate of all-cause

hospitalizations with a corresponding increase in the comparison group's rate. We also observe lower percentages of beneficiaries hospitalized for all causes and ACSCs. None of the differences in ER visits or readmission rates were statistically significant. However, we did observe 7% ( $p < 0.2$ ) fewer ACSC readmissions among the Cohort 1 beneficiaries.

**Key Finding #6: The Phase II MGH CMP was successful at reducing the mortality rate within the intervention group of Medicare beneficiaries.**

Another key outcome metric is mortality. Over the course of the Phase II MGH CMP Demonstration period for the original population, we observed a statistically significant differential rate of mortality between the intervention and comparison groups for the Cohort 2 and Cohort 4 populations. In both instances, the intervention beneficiaries had a lower mortality rate than that of the comparison group. Similarly, in a multivariate survival model, whereby we control for potential imbalances in beneficiary characteristics at the start of the demonstration period between the intervention and comparison group, we observed a survival benefit for the Phase II intervention group relative to the comparison group for the Cohort 1 and Cohort 2 populations.

**Key Finding #7: The Phase II MGH CMP Demonstration achieved substantial, statistically significant savings. The Medicare program's overall return on investment (ROI) was 2.6: MGH Cohort 2 had the highest return on investment of 4.23 followed by MGH Cohort 1 at 2.33 and BW/F at 1.72.**

According to multivariate analysis, the Phase II MGH demonstration saved Medicare \$42.7 million in Part A&B expenditures. Savings varied by cohort depending upon cohort size and savings percentage. All four cohorts produced savings to the Medicare program, although only the two MGH cohorts generated statistically significant gross savings at conventional levels of significance. Percentage savings ranged from 4.1% for NSMC Cohort 4 to 19.9% for MGH Cohort 2. The overall beneficiary-month weighted savings percentage in the Phase II demonstration was 11.8%. Net savings, or the difference between gross savings and accrued fees, was \$26.2 million in total.

Slower growth in Medicare expenditures, or costs, was achieved primarily through lower acute care hospital payments. The only other service showing consistent negative growth—relative to a comparison group—was home health. Thus, it would not appear that the three hospital groups were saving on acute inpatient services through more expensive use of home health services. MGH Cohort 2 stands out, not only overall, but in the amounts it saved on physician spending and spending on other rehabilitation, LTAC, and psychiatric hospitals.

The Phase II MGH, BW/F, NSMC demonstration exhibited strong regression to the mean effects in costs while overall costs per comparison beneficiary were increasing in the market area (the BW/F comparison group was a notable exception). The large churning of beneficiaries from lower (higher) to higher (lower) cost groups over time adds considerable statistical noise to the test of savings. Costs continued to rise because any reduction in costs in the baseline high cost group was more than offset by smaller increases among the greater majority of initially lower cost beneficiaries. Regression to the mean presents a challenge for intervention staff targeting beneficiaries at highest risk of increasing costs. Algorithms for identifying potentially high cost

beneficiaries often key on base period use; yet, it is beneficiaries with modest use and costs that present the greatest opportunities for savings in future months or years. Nevertheless, it appears that the MGH, BW/F, and NSMC CMP staff was able to work successfully across a broad cost range of their patients, intervening quickly when health problems arise and resulting in a financially successful outcome.

## **7.2 Conclusion**

Based on extensive qualitative and quantitative analysis of performance, we find that the Phase II MGH CMP Demonstration had success reducing the rate of growth of acute care hospitalizations, decreasing the rates of mortality, and achieving substantial cost savings. The financial savings is particularly noteworthy given the regression to the mean effects. PBPM costs showed considerable variability because of the nature of the population selected for the demonstration, including a few very high cost beneficiaries with short spells of eligibility. Even after combining the eight Phase II populations into four cohorts, there were only roughly 1,700 beneficiaries in each of the Cohort 1 intervention and comparison groups, 2,300 beneficiaries in the Cohort 2 intervention and comparison groups, 1,400 beneficiaries in the Cohort 3 intervention and comparison groups, and around 1,600 beneficiaries in the Cohort 4 intervention and comparison groups. All four cohorts produced savings to the Medicare program, although only the two MGH cohorts generated statistically significant gross savings at conventional levels of significance. Percentage savings ranged from 4.1% for NSMC Cohort 4 to 19.9% for MGH Cohort 2. The overall beneficiary-month weighted savings percentage in the Phase II demonstration was 11.8%.

What might explain the observed success in MGH's demonstration program? Two explanations may be (1) the depth of institutional support to fully integrate the CMP into MGH's, BW/F's, and NSMC's health care systems, of which there are numerous key components, and (2) the high rate of Medicare beneficiary participation. Based upon interviews with senior leadership at all three institutions, it was noted that from the beginning the CMP had the complete backing from the Partners HealthCare's Board of Trustees and MGH hospital and physician leadership. The same degree of senior leadership support existed for expansion to the BW/F and NSMC and within the expansion institutions.

### **7.2.1 Institutional Support**

**Physician Champions.** Identifying physician champions for the CMP eased the transitions involved in the introduction of a Care Manager into primary care practices and roll-out of other elements of the CMP. At the time of our first site visit to MGH during Phase I, a small number of physicians expressed concerns about the program. However, as physicians became more familiar with all aspects of the CMP and gained experience working with the Care Managers, the most common concern they voiced was frustration about their inability to include additional patients in the program. At the time of the second site visit to MGH, physicians included in the focus group reported great overall satisfaction with the CMP. Acquiring buy-in from participating physician practices was viewed as very important.

**Embedded Care Managers.** And strong integration support from MGH, BW/F, and NSMC leadership afforded the Care Managers physical entry into the primary care practice settings whereby the Care Managers were embedded with the primary care physicians ultimately

becoming a part of the beneficiaries' primary health care teams. Thus, Care Managers could participate in joint appointments with the primary care provider and follow-up with patients who missed appointments. Further, CMP leadership at all three institutions recognized that their populations would require Care Managers with substantial experience in dealing with frail and medically complex patients. The CMP selected nurses with *strong clinical skills, critical thinking abilities, and the ability to work independently*; thus, embracing an expensive business model as labor costs for experienced RNs are high in the greater Boston area. Discussions with primary care physicians during the Phase I focus groups revealed an appreciation of the skills of the selected Care Managers.

***Available Internal Resources.*** With leadership support for CMP integration within all three institutions, the CMP was able to marshal a wide range of internal resources to more fully develop particular aspects of their program that were tailored to the needs of each of their patient populations. Of particular note were programs for mental health and substance abuse developed by MGH and BW/F CMP staff jointly with the Psychiatrist Department within each institution. And, MGH CMP staff provided in-kind training, analytic and infrastructure support and resources to the development and implementation of the NSMC and BW/F's CMP programs. MGH's Phase I success also provided a level of confidence that the CMP could be replicated successfully at NSMC and BW/F.

***Health Information Technology (IT).*** Another critical element of integration was the use of *MGH's IT system to support CMP operations*. By gaining access to MGH's existing IT system and MGH internal resources to make necessary modifications during early stages of Phase I implementation, the CMP was able to draw upon existing infrastructure and augment it to provide immediate decision management support for its care managers. Further, MGH's IT systems span all care settings at MGH, including all MGH physician practice settings. And, according to CMP leadership, MGH patients are very loyal to MGH and receive the vast majority of their health care from the large network of MGH-affiliated providers. Thus, CMP care managers had access to real-time patient information across virtually their patients' entire continuum of care. This was most important in the area of emergency room services. Care Managers were immediately notified through the Partners' IT system and could intervene prior to admission. This may be one of the driving forces for the observed lower rate of hospital admissions among some of the CMP beneficiaries.

Yet, the MGH IT systems required several iterations of data system enhancements at considerable expense as the CMP sought to increase usefulness of MGH's IT systems for managing patient care and reducing documentation burden at MGH. Expanding to the other institutions within Partners HealthCare allowed for some IT synergy with the enhanced shared data systems but there were numerous additional IT challenges because BW/F and NSMC had multiple, unrelated IT systems. Partners HealthCare recognized the need for an integrated IT strategy across the Partners institutions, which necessitated a phase out of old systems. NSMC had the additional burden of dealing with multiple electronic medical record systems across hospitals and private practices.

In evaluations of other Medicare chronic care management programs, we have observed other programs that exhibited *strong program leadership*, yet we have not generally observed the same degree of *integration* of the care management program into the collective and individual

health systems and physician practices. MGH's CMP beneficiaries were sufficiently concentrated in the primary care practices making placement of *full-time Care Managers, in general, in the practices* economically feasible. Both, BW/F and NSMC, also achieved a level of integration of Care Managers into practices that generally went beyond what we have observed in other demonstrations despite smaller numbers of participating beneficiaries and a greater number of private practices.

### **7.2.2 High Participation Rate**

A second possible explanation for the observed success is the high rate of Medicare beneficiary participation. The Phase II MGH CMP Demonstration was successful in recruiting a very high percentage of intervention beneficiaries (ranging from 89% to 93%). This is in stark contrast to other CMS demonstrations we have evaluated in which participation rates generally were much lower. Lower participation rates require larger effects on participating beneficiaries under an intent-to-treat evaluation design. Because of a high level of participation, the MGH Care Management Programs had wider latitude to broadly tailor the degree of their interventions across a large population of beneficiaries than programs with low participation rates. To be financially successful, programs with low participant rates are forced to prospectively identify accurately a smaller number of beneficiaries that are likely to be very costly in the near future and successfully intervene. This approach has not been successful to date for reducing Medicare costs.

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