CMS
Report to Congress

Medicare Gainsharing Demonstration: Report to Congress on Quality Improvement and Savings

March 28, 2011

INTRODUCTION

This Report to Congress is the Secretary's response to the requirement under Section 5007(e)(3) of the Deficit Reduction Act (DRA) of 2005, as amended by Section 3027 of the Affordable Care Act, that the Centers for Medicare & Medicaid Services (CMS) conduct a qualified gainsharing demonstration program (the Gainsharing Demonstration) to test and evaluate methods and arrangements between hospitals and physicians designed to govern the utilization of inpatient hospital resources and physician work to improve the quality and efficiency of care provided to Medicare beneficiaries and to develop improved operational and financial hospital performance with sharing of remuneration. This is a 3-year demonstration that began operation on October 1, 2008 and will operate until September 30, 2011. As part of the statutory mandate, the Secretary is required to submit this report to Congress on quality improvement and savings in the Gainsharing Demonstration. This report presents an analysis of budget neutrality for the first year of this demonstration and a review of baseline quality of care. The information presented is summarized from CMS's budget neutrality monitoring activity for this demonstration conducted under contract to CMS by Actuarial Research Corporation (ARC) (the implementation and monitoring contractor for this demonstration), and an interim evaluation report conducted under contract to CMS by Research Triangle International (RTI) (the evaluation contractor for this demonstration). RTI's supporting study is included with this report to Congress as Appendix I and ARC's supporting reports are included as Appendix II.

Gainsharing is a contractual arrangement that sets up a formal reward system in which participants share in cost savings resulting directly from either productivity gains or increased efficiency. Thus physicians participating in a gainsharing arrangement will have a financial stake in controlling hospital costs. In the traditional hospital setting, although physicians use

hospital facilities, they bill and are paid independently from the hospital. Thus, they can affect hospital costs but are not necessarily subject to incentives to be efficient.

Under the Medicare Fee-for-Service program, hospitals and physicians are paid separately for care provided in hospitals under Part A and Part B, respectively, which adds to the misalignment between the incentives facing hospitals and those facing physicians. Under the prospective payment system for inpatient hospitals, generally hospitals are paid a fixed amount for items and services as set forth in section 1861(b) of the Act. Meanwhile, Medicare generally pays physicians per procedure and, implicitly, for volume. There are no direct financial gains to physicians, who often control the use of supplies and selection of devices which are paid for by the hospital, for providing more efficient care and decreasing hospital costs. A physician paid under a fee-for-service model who provides more services to a hospitalized patient will typically receive more in reimbursement. Consequently, physicians may not have an incentive to use hospital resources efficiently.

Gainsharing in Medicare

Gainsharing programs provide an avenue for improvement in efficiency which should result in savings to both hospitals and third party payers such as Medicare. Gainsharing has had a slow start in federally funded health care due in part to certain fraud and abuse laws, including the Civil Monetary Penalty Law (CMPL), which prohibits hospitals from knowingly making payments to physicians as an inducement to reduce or limit services to Medicare and Medicaid beneficiaries. However, under the DRA, these laws do not apply for purposes of the Gainsharing Demonstration.

CMS has engaged in several prior demonstrations seeking to better align physician and hospital incentives in the provision of hospital care. In 2001, the New Jersey Hospital

Association (NJHA) submitted an application to CMS to operate a gainsharing demonstration with eight New Jersey hospitals covering all of the All Patient Refined (APR) DRGs. The New Jersey plan proposed maximum pools of Part A hospital savings for each APR-DRG treated in the hospital to be shared with the medical staff. These pools were limited to 25 percent of total Part B payments received by a physician. Also the pools were converted to a per-discharge cost for each APR-DRG, based on average costs of the lowest 90 percent of cases (so-called best practice norms). Responsible physicians were identified for each hospitalization and they became eligible for gainsharing bonuses if the average cost of their cases did not exceed the mean cost of the 90 percent baseline group of cases. Baseline and demonstration cases were to be standardized for case severity and inflation. Process and outcome indicators were to be used to restrict gainsharing to physicians maintaining high quality standards. Unfortunately conclusive results could not be obtained from the New Jersey demonstration since it was terminated in its early implementation period (April, 2004). This demonstration is described in greater detail in Appendix I.

Another CMS demonstration examining collaboration between physicians and hospitals is the Physician Group Practice (PGP) Demonstration authorized by section 412 of the Medicare, Medicaid, and SCHIP Benefits Improvement and Protection Act of 2000 (BIPA). Although the demonstration deals with primarily group practice payment (since group practices rather than individual physicians received performance-based payments based on realized savings), it examines collaboration between physician groups and hospitals to better align their incentives. In the first two years of the demonstration, Medicare expenditure savings were achieved net of performance payments. Also, the performance payments were based on the PGPs improvement in the quality of care attributable to the demonstration.

CMS is currently conducting a companion gainsharing demonstration, the Physician Hospital Collaboration Demonstration (PHC), authorized under section 646 of the Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003. Although both share a similar implementation methodology, the PHC Demonstration differs from the Gainsharing Demonstration in that the PHC Demonstration emphasizes participation in integrated delivery systems and coalitions of physicians collaborating with hospitals. In comparison to the Gainsharing Demonstration which examines efficiency and quality of care during an episode that includes 30 days of post-acute care, the PHC demonstration examines r a longer episode of care that includes 90 days of post acute services. The PHC demonstration is currently in its first year of operation.

The Acute Care Episode (ACE) Demonstration (also authorized under the MMA) is a 3-year demonstration that will primarily test the use of a global payment covering all Medicare Part A and Part B services provided during the acute care hospitalization for specified cardiovascular and/or orthopedic procedures. Five health systems were selected to participate and all had begun participation by November 1, 2010. Gainsharing arrangements for participating sites and their physicians are allowed under this demonstration and four of the five participating sites have implemented gainsharing arrangements.

The following sections will present an overview of the Gainsharing Demonstration, its participants and its methodology, including selection of comparison hospitals. This report will then present the budget neutrality analysis for participating hospitals for the first year of the demonstration and a review of baseline performance for several quality of care measures for participating and comparison group hospitals.

OVERVIEW OF THE GAINSHARING DEMONSTRATION

The Congress required that the Centers for Medicare & Medicaid Services (CMS) conduct a qualified gainsharing program demonstration to test and evaluate methods and arrangements by which hospitals and physicians can financially share in gains from more efficient provision of care, improve quality and efficiency of care provided to Medicare beneficiaries, and improve operational and financial hospital performance. The Gainsharing Demonstration differs from previous gainsharing models used in hospitals because it is directed toward improvement in overall care management and efficiency rather than just focusing on cost savings related to device purchases and use of supplies. The savings gained by hospitals from increased management efficiencies should return some measure of savings to the Medicare program and other third party payers. The episode of care under this demonstration is defined as including a 14 day pre-admission period and a 30 days post discharge period.

CMS solicited applications for participating sites for the Gainsharing Demonstration in the fall of 2006. CMS selected five sites as potential Medicare Gainsharing Demonstration participants in July 2008. Three of the chosen sites dropped out prior to the start of the demonstration. Two of these three sites dropped out due to concerns about exposure to financial risk associated with post-acute care utilization. The other site could not meet the Demonstration's implementation and evaluation requirements. Further details concerning site selection and participation are in Appendix I.

When the demonstration began operations on October 1, 2008, only two sites were participating: Beth Israel Medical Center (BIMC), New York, New York and Charleston Area Medical Center (CAMC), Charleston, West Virginia. The Gainsharing Demonstration was initially scheduled to end on December 31, 2009 but it was extended through September 30, 2011 for the sites that were in operation as of October 1, 2008, as part of the Affordable Care Act

(enacted on March 23, 2010). BIMC elected to continue participation through September 30, 2011 but CAMC elected to end its participation in the demonstration as of December 31, 2009.

The Medicare Gainsharing Demonstration Participating Sites

Charleston Area Medical Center, Charleston, West Virginia (CAMC)

CAMC is the main tertiary care hospital serving West Virginia, northeastern Kentucky, and southeastern Ohio. CAMC has 893 beds and is by far the largest of the 6 acute care hospitals in the Charleston, WV area. The CAMC demonstration was limited to cardiac DRGs. The DRGs included in the demonstration are listed in Appendix I. Physician participation was voluntary. CAMC established savings initiatives for each DRG in the demonstration plan. The CAMC demonstration plan assured that they would not award Gainsharing bonus payments to physicians if no internal cost savings per episode were found. Quality of care for participating physicians was examined to ensure that quality of patient care was not adversely affected. Performance with respect to quality that is significantly worse than it was prior to the Demonstration would have made an individual physician ineligible to receive a gainsharing bonus payment.

Beth Israel Medical Center, New York, New York (BIMC)

BIMC is a large, urban, academic hospital with 1,106 beds on 2 campuses: one in downtown Manhattan and one community hospital in Brooklyn. BIMC includes all DRGs (except psychiatric, pediatric and obstetric DRGs) in its demonstration. Enrollment is voluntary for physicians. Only physicians employed on the BIMC medical staff for one year or more are allowed to participate in the demonstration. A pool of bonus funds is prospectively estimated from hospital savings. The methodology used is described in Appendix I. If there are no internal hospital cost savings, no bonus payments will be made to physicians.

In the BIMC model, each patient is assigned to one practitioner who takes financial responsibility for the care of the patient. For medical patients, the responsible physician is the attending physician. For surgical patients, the responsible physician is the surgeon. The maximum performance incentive is equal to the APR-DRG adjusted portion of the total incentive pool allotted to an individual responsible physician. The bonus paid to physicians is calculated as a percentage of the maximum performance incentive, based on performance. Gainsharing payments are capped at 25 percent of the physician's affiliated Part B reimbursements.

BIMC has adopted several standards, which, if not met by individual physicians, would make them ineligible for a gainsharing bonus. These standards are:

- Overall readmission rates within 7 days must not increase.
- Adverse events and malpractice experience must not increase.
- Physicians must attain standards set for selected quality measures and administrative requirements.
- Increased post-acute care use by participating physicians will be reviewed for appropriateness.

The BIMC model is explained in detail in Appendix I.

Comparison Site Selection

CMS is using a trended-baseline methodology to determine whether participating hospitals have achieved budget neutrality and if there are changes in costs and quality of care during the demonstration. This model is often referred to as a difference-in-differences model. Comparison groups are necessary because the demonstration applicants otherwise can only compare their own demonstration year experience to that of a base year (i.e., a simple pre/post analysis). Unfortunately observing only pre-post differences does not control for changes

experienced by similar non-participants during the demonstration period. One must observe both types of differences in order to determine the effects attributable to the gainsharing demonstration.

Basic to the process of selecting comparison hospitals is that they be similar to the hospitals participating in the Demonstration with respect to specific criteria. There are a large number of characteristics from which to choose. RTI set initial standards for comparison site selections that are described below.

Beth Israel Medical Center—Since BIMC will likely be subject to the same pressures on growth of Medicare payments as other hospitals in its market, its comparison hospitals were selected from the 52 other short-term, acute-care hospitals in the New York City area. RTI ranked these hospitals using selected variables that would best reflect the factors associated with the growth of all Medicare payments rather than just payments from the Medicare Inpatient Prospective Payment System and the cost structure of the hospitals. A weighted score was calculated for each comparison hospital using a propensity score model indicating the degree of similarity to BIMC on 7 criteria. The minimum score value (0) indicates complete similarity with BIMC on the criteria used. Increasing score values indicate greater dissimilarity with BIMC. Thus, the 15 hospitals with the lowest scores were selected as comparison hospitals for BIMC. The selection criteria and the list of comparison hospitals are presented in Table 8 of Appendix I.

Charleston Area Medical Center– For CAMC's comparison hospitals, RTI selected those that like CAMC have similar market dominance in cardiac surgery. These hospitals must annually perform at least 200 major heart procedures (i.e., coronary artery bypass grafts and heart valve procedures) and at least 400 percutaneous coronary interventions (PCIs) (angioplasty and

insertion of stents). They must also have at least a 75 percent market share of either major heart procedures or PCIs.

A weighted score was calculated for each comparison hospital using a propensity score model indicating the degree of similarity to CAMC on 15 criteria. The minimum score value (0) indicates complete similarity with CAMC on the criteria used. Increasing score values indicate greater dissimilarity with CAMC. Ten of the 14 hospitals with the lowest scores were selected as comparison hospitals for CAMC. All but two of CAMC's comparison hospitals are also located in the South. The selection criteria and the list of comparison hospitals are presented in Table 7 of Appendix I.

DEMONSTRATION SAVINGS AND BONUS PAYMENTS

Both BIMC and CAMC distributed bonus payments, based on estimated savings, to physicians participating in the demonstration who they determined to have maintained acceptable quality of care performance. Bonus payments could not be based on the volume or value of referrals. Bonus payments were capped at 25 percent of the fee schedule payment amount for similar cases, and all payments had to be linked to quality improvements.

BIMC has distributed $585,000 in incentive payments to date. Approximately 309 physicians are currently participating. BIMC staff suggested that lowering length of stay (LOS) was a likely explanation for their estimated savings. Process and performance changes that possibly may be linked to contributing to savings and LOS reduction include: use of electronic health records, more efficient use of consults, improved communication and management of imaging choices, streamlining evidence-based care through implementation of protocols, implementation of interdisciplinary rounds, more efficient operating room management, and more appropriate use of intensive care unit beds.

CAMC distributed approximately $165,000 in incentive payments to physicians. Approximately 100 physicians participated in the program. Changes that may have produced estimated savings are surgical cost reductions made via negotiated rates on devices and implants, reduced physician variation in practice patterns; and reductions in infections, complications, and readmissions for cardiac and orthopedic procedures that were included in the demonstration according to CAMC staff.

BUDGET NEUTRALITY

CMS required that participating sites in the Gainsharing Demonstration maintain per discharge payments that do not exceed the amount the hospitals otherwise would be paid if the demonstration were not in place. The monitoring and implementation contractor for the Gainsharing Demonstration, (Actuarial Research Corporation (ARC)) performed the analysis to determine whether Medicare payments per discharge increased for the first year of the demonstration as a result of a hospital's participation. The evaluations for Medicare costs for episodes of care at BIMC for their intervention period (October 1, 2008 through June 30, 2009) and at CAMC for their intervention period (December 1, 2008 through June 30, 2009) are summarized below. Additional details about the methodology are in Appendix II.

Overview

The Budget Neutrality Analysis Reconciliation Payment protocols (BNP) executed by BIMC and CAMC with CMS describe how spending under the demonstration will be measured and how the budget neutrality requirement will be enforced for each site. The cost per relevant episode during the intervention period (i.e. demonstration year) is compared to the cost per relevant episode in the hospital's base period. If the cost per episode in the intervention period exceeds the cost in the base period by more than the allowance for trend and an allowance for uncertainty, the hospital must reimburse Medicare for the excess. The allowable trend is the measured expenditure trend for episodes at a set of comparison hospitals for the same procedure codes and covering the same set of services. The allowance for uncertainty has been established in the BNP.

All Medicare costs (with some enumerated exceptions) during the episode are included in the calculation of base period costs, intervention period costs, and trends. This includes all Medicare Part A and Part B payments made to any provider for care to patients at a participating

site including, but not limited to, the hospital participating in the Demonstration, other hospitals, skilled nursing facilities, home health agencies, physicians participating in the demonstration, and other physicians. Facilities participating in the demonstration are accountable for all Medicare payments within the episode of care, including the 14 day pre-admission and 30 day post-discharge period.

Except for conditions specified in the BNP, all Medicare fee for service patients with the procedure codes specified by the hospital participating in the demonstration in the BNP as being relevant to the interventions proposed are included in this monitoring analysis. Costs for patients treated by physicians participating in the Demonstration as well as physicians who are not participating are included in the monitoring analysis. The protocols for each site specify that:

- Diagnosis Related Groups (DRGs) are to be used to define relevant episodes of care.
- Medicare claims and enrollment data are to be the basis for calculating the Medicare reimbursement amounts per episode.[1]
- The liability of the hospital for excess Medicare reimbursement is calculated as the excess of the actual measured costs compared to the cost that would have been incurred in the absence of the demonstration.

In order to estimate the cost per episode that would have occurred in the absence of the demonstration, the cost per episode at a facility participating in the Demonstration in the base period and the cost per episode at comparison facilities during the same period are calculated. An episode of care is defined as the period beginning 14 days prior to the date of a qualifying admission and ending 30 days after discharge. However if the Medicare beneficiary is an inpatient of a hospital or skilled nursing facility or a patient in a Medicare covered home health

[1] Coinsurance amounts will not be included in the analysis.

period on the day that an episode would otherwise begin, the episode will begin on the day following discharge and prior to the date of a target admission. Episode of care cost outliers were truncated at the 5th and 95th percentile for both the intervention period analysis and the baseline (CY 2007). For a description of the truncation methodology, please see Appendix II, p. 20. For both sites, the comparison sites are as selected by RTI (and listed in Appendix II). The monitoring analyses for both participants are described below. Both sites were determined to be within criteria specified in the BNP and not liable for payments to Medicare.

BETH ISRAEL HOSPITAL

The following describes ARC's determination of the liability of BIMC for the period from October 1, 2008 through June 30, 2009. [2] The target rate for BIMC is its base year (CY 2007) cost per episode ($22,260.78) increased by the rate of increase (11.3 percent or $2,504.93) in the cost per episode at comparison hospitals between the base period and the intervention period. If the actual Medicare cost per episode for BIMC during the intervention period is less than the target cost ($24,765.71), then BIMC has no liability to repay Medicare. Since BIMC's actual cost per episode adjusted for episode mix and Medicare geographic reimbursement rates ($24,532.70) is lower than the target cost per episode ($24,765.71), BIMC did not incur overruns to CMS for the demonstration period covered during this report. A final budget neutrality analysis will be conducted for the entire demonstration period for the forthcoming final Report to Congress.

[2] For this analysis, data from September 17, 2008 through September 30, 2008 covered the 14 day pre-admission period. The intervention period for this report was nine months. Data from July 31 through October 31, 2009 were used to capture post-discharge claims from the 30 day post-discharge period. The list of DRGs included in this analysis is in Appendix II. Appendix II also describes the adjustments to BIMC costs needed to adjust for changes in case-mix, age-sex composition, and changes in Medicare payment rates between the base period and the intervention period to the extent that these changes affect the participating hospital and the comparison hospitals differently.

CHARLESTON AREA MEDICAL CENTER

The following describes ARC's determination of the liability of CAMC for the period from December 1, 2008 through June 30, 2009.[3] The target rate for CAMC is its base year cost per episode ($32,058.13) increased by the rate of increase (5 percent or $1,623.30) in the cost per episode at comparison hospitals between the base period and the intervention period. Since CAMC's actual cost per episode during the intervention period adjusted for episode mix and Medicare geographic reimbursement rates ($34,089.59) exceeds the target cost per episode ($33,690.43), ARC needed to determine whether CAMC's excess costs were within the authorized allowance for uncertainty. For the Gainsharing Demonstration, CMS has authorized an allowance corridor for uncertainty[4]. If the adjusted actual cost per episode exceeds the target cost plus the uncertainty allowance (for CAMC, this was 3.3 percent of the target cost ($33,690.43) which is $1,121.81), CAMC would be liable for the amount by which the actual cost exceeds the sum of the target cost plus the uncertainty allowance, multiplied by the number of relevant cases in the intervention period. CAMC is not liable for any overruns to CMS because CAMC's cost per episode ($34,089.59) is below the allowed uncertainty limit of $34,812.24 ($33,690.43 + $1,121.81). A final budget neutrality analysis will be conducted for CAMC's entire period of participation in the demonstration for the forthcoming final Report to Congress.

[3] Data from November 17, 2008 through November 30, 2008 covered the 14 day pre-admission period. The intervention period for this report was seven months. Data from July 31 through October 31 were used to capture post-discharge claims from the 30 day post-discharge period as well as for claims run out. The list of intervention DRGs and ICD-9-CM procedure codes provided by Charleston Area Medical Center is the basis for determining which procedures were be included in the analysis and they are listed in Appendix II, p. 19.

[4] . CMS has implemented a demonstration design which includes a specific allowance for uncertainty in estimating whether excess cost has been incurred. The allowance is based a on 90 percent two-tailed confidence interval surrounding the estimated *mean* cost.

BASELINE QUALITY OF CARE

The strategies introduced in the Gainsharing Demonstration to reduce hospital costs should not result in a decline in quality of care. Indeed, demonstration participants are required to participate in Hospital Compare and the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey. This section examines differences in quality of care between participants and comparison hospitals in the Gainsharing Demonstration. Since individual measures often present a limited view of quality of care, we present a review of several measures of quality of care at baseline (CY 2007) to obtain a comprehensive review of quality of care at participant and comparison hospitals. First, we examine three common outcomes available from claims data (length of stay, 30-day mortality and readmissions). We also examine inpatient quality indicator scales and 13 indicators of patient safety developed by the Agency for Healthcare Research and Quality (AHRQ) as well as self-reported hospital quality data and HCAHPS survey data. Each of these sources of data provides one with different pictures of hospital quality of care. Subsequent analyses will compare the base year and post-implementation data from these sources to assess whether the demonstration affected the quality of care provided.

Length of Stay, Mortality, Readmissions

RTI analyzed baseline (CY 2007) measures of length of stay (LOS), 30-day mortality, and readmissions. DRG relative weights are used to adjust the LOS measures for hospitals' case mix to control for variation in the patient population. In addition, RTI stratified adjusted LOS and 30-day mortality by three levels of patient severity obtained from the APR-DRGs: Low (APR-DRG severity score of 0), Moderate (APR-DRG severity score of 1 or 2), and Severe

(APR-DRG severity score of 3 or 4)[5]. Since only 3 quarters of claims rather than a full year was used to calculate this measure, the scores calculated for hospitals may differ from the scores for the condition specific 30-day readmission measures reported on Hospital Compare. This process is described in Appendix I. A readmission is defined as an inpatient hospital admission to any facility that occurs at least 1 day after and within 30 days of the related discharge. A summary of these results are presented in the following paragraphs. A detailed presentation of these results can be found in Appendix I.

Baseline measures of average LOS by patient severity for CAMC and the comparison hospitals were examined. For each stratum of severity, patients at CAMC had a longer LOS than expected, given its case mix. This is also true for the CAMC comparison group for both the moderate and severe strata. For patients in the lowest severity stratum, the comparison group had a LOS close to what was expected given the case mix.

For rates of 30-day mortality by level of severity after adjusting for case mix, both CAMC and the comparison hospitals had more patients categorized as low severity who died within 30 days of admission than would be expected. For baseline readmissions for CAMC and the comparison hospitals, nearly all of the readmissions are for a different DRG than for the initial hospitalization (99.2 percent for CAMC and 98.7 percent for the comparison group).

Patients at BIMC, given its case mix, had a longer average LOS than expected at all levels of severity. This is also true for the comparison group's low and moderate severity strata. Among the highest severity patients in the comparison group, the average LOS was approximately what was expected given its case mix.

[5] The severity levels are calculated using 3M's APR-DRG software.

For rates of 30-day mortality by level of severity, both BIMC and the comparison hospitals had more low severity patients who died within 30 days of admission than would be expected based on the case mix. Among moderately severe patients, BIMC had more deaths within 30 days of admission than expected, but it did better than expected (as indicated by a lower weighted measure) for the severe episodes. The comparison group had lower mortality rates among moderate and severe episodes of care than would be expected given the case mix. As with CAMC, a large portion of readmissions for both BIMC and the comparison hospitals are for a different DRG than for the initial hospitalization (83.4 percent for BIMC and 85.4 percent for the comparison group).

AHRQ Inpatient Quality Indicator (IQI) Findings

The full set of AHRQ IQIs provide rates of specific high-technology, or highly complex, procedures; mortality for certain inpatient procedures and conditions; and utilization rates for certain procedures that vary greatly across hospitals. These measures are listed and described in Appendix I. The RTI analysis presented here is focused only on condition-specific IQI mortality rates and augments the claims-based mortality analysis presented earlier. IQI procedure rates are not examined here. The AHRQ software generates observed, expected, risk-adjusted, and smoothed mortality rates. RTI's analysis focused on the observed rates for the hospitals participating in the Gainsharing Demonstration during the base year (CY 2007) and will, in future analyses, analyze how these rates change in the demonstration and comparison sites after gainsharing is implemented. These measures are listed and described in Appendix I.

Because CAMC chose to limit its focus to specific cardiac DRGs, RTI examined observed and expected mortality rates for the following conditions: acute myocardial infarction (AMI), congestive heart failure (CHF) and coronary artery bypass graft (CABG) and examined

the ratio of observed/expected mortality for each condition. CAMC had an observed mortality rate of 60.7 deaths per 1,000 heart attack (AMI) patients. The comparison group had an observed mortality rate of 60.9 deaths per 1,000 AMI patients. However, since the expected mortality rate for the comparison group was substantially lower, the ratio of observed/expected mortality was 0.68 for CAMC and 0.85 for the comparison hospital group. The observed mortality rate among patients with CHF was different for CAMC than for the comparison hospitals. The rate of death among CHF patients at CAMC was 64.9 per 1,000 patients. Within the group of comparison hospitals, there were 20.6 deaths per 1,000 CHF patients. The ratio of observed/expected mortality was 1.04 for CAMC and 0.34 for comparison group hospitals. Among patients admitted for CABG, the mortality rates were 39.3 deaths per 1,000 patients at CAMC and 44.2 deaths per 1,000 patients at the comparison hospitals. The ratio of observed/ expected mortality was 0.84 for CAMC and 1.05 for comparison group hospitals.

For BIMC, RTI examined the following six condition-specific mortality rates: acute myocardial infarction (AMI), congestive heart failure (CHF), stroke, gastrointestinal hemorrhage, hip fracture and pneumonia. Among patients admitted for AMI, the mortality rate was 93.5 per 1,000 patients at BIMC and 123.53 per 1,000 patients for the comparison hospitals. The ratio of observed/ expected mortality was 0.77 for BIMC and 0.97 for comparison group hospitals. The mortality rate among patients admitted for CHF was 63.2 per 1,000 patients at BIMC and 58.6 per 1,000 patients at the comparison hospitals. The ratio of observed/ expected mortality was 1.28 for BIMC and 0.98 for the comparison group hospitals. The rate of death per 1,000 stroke patients is 163.3 per 1,000 patients at BIMC compared to 186.8 per 1,000 patients at the comparison hospitals. The ratio of observed/expected mortality was 1.28 for both CAMC and for its comparison group hospitals. For patients admitted to BIMC for gastrointestinal

hemorrhage, the mortality rate is 31.0 per 1,000 patients, while the rate for the group of comparison hospitals is 79.0 per 1,000 patients. The ratio of observed/expected mortality was 0.57 for BIMC but was 1.40 for its comparison group hospitals. Patients admitted with a hip fracture had a mortality rate of 11.9 per 1,000 patients at BIMC, while patients at the comparison hospitals had a rate of 53.5 per 1,000 patients. The ratio of observed/ expected mortality was 0.46 for BIMC and 1.40 for comparison group hospitals. Pneumonia patients at BIMC had a mortality rate of 137.2 per 1,000 patients while the rate at the comparison hospitals was 125.2 per 1,000 patients. The ratio of observed/expected mortality was 1.05 for BIMC and 0.90 for comparison group hospitals.

Patient Safety Indicator Findings

The AHRQ Patient Safety Indicators (PSIs) are a set of measures providing rates of potentially preventable complications and other iatrogenic events (e.g., postoperative complications, death in low-mortality DRGs, and decubitous ulcers) that occur in the hospital setting. RTI focused on the 13 PSI indicators that are appropriate for the Medicare population.

For the relevant PSI measures for CAMC and the group of its comparison hospitals, CAMC had lower than expected death rates among surgical patients and rates of accidental puncture/laceration than did their comparison facilities. Otherwise, PSI item rates between CAMC and its comparison group showed little substantive difference.

Both BIMC and the group of comparison hospitals have mixed results on the 13 indicators examined, in some cases doing better than expected and in others much worse. While BIMC had a higher rate of pressure ulcers than expected, this ratio was higher for their comparison hospitals. BIMC had lower than expected death rates among surgical patients, rates of postoperative hemorrhage/hematoma, rates of postoperative wound dehiscence and rates of

accidental puncture/laceration than did their comparison facilities. BIMC had higher than expected rates of postoperative respiratory failure, exceeding the rate observed for the comparison group. Other PSI item rates showed little substantive difference between BIMC and its comparison group.

Hospital Inpatient Quality Reporting Program

Under the Hospital Inpatient Quality Reporting (IQR) program (formerly the Reporting Hospital Quality Data for Annual Payment Update (RHQDAPU) program), CMS collects data on designated measures from hospitals. Hospital IQR data being collected for FY 2011 include 27 measures related to process of care for three conditions that are common to Medicare beneficiaries that often require hospitalization (acute myocardial infarction (AMI), heart failure (HF), pneumonia) and one set of measures (SCIP) dealing with reduction in surgical infections. For their evaluation analysis, RTI calculated a composite summary adherence rate for each condition group (AMI, HF, pneumonia, and SCIP) from these publicly reported data as indicated in Appendix I, section 5.

The Hospital IQR data for CAMC and its comparison hospitals show similarly high ratings for almost all of the individual process measures and all of the composite scores. Likewise, the Hospital IQR data for BIMC and its comparison hospitals show similarly high ratings for almost all of the individual process measures and all of the composite scores. These results are discussed in Section 5 of the RTI study (Appendix I).

HCAHPS Quality Results

The HCAHPS survey contains 27 questions that result in 10 survey-based quality indicators. Reporting of HCAHPS data was voluntary under the IQR Program during the study period, although the Gainsharing Demonstration sites were required, as a condition of

participation in the demonstration, to report HCAHPS data. Thus, not all of the comparison group hospitals reported HCAHPS data. The HCAHPS results for CAMC and its comparison hospitals that reported such data show that CAMC and these comparison hospitals received similar ratings from patients completing the survey. Overall, the survey results indicated very good perceived levels of quality of care at both CAMC and these comparison hospitals. The HCAHPS results for BIMC and its comparison hospitals that reported such data show that BIMC and these comparison hospitals received similar ratings from patients completing the survey. The survey results indicated the quality of care at both BIMC and these comparison hospitals was perceived by respondents as good. These results are discussed in Section 5 of the RTI study (Appendix I).

CONCLUSIONS

This report to Congress presents a summary of the first year of operation of the Gainsharing Demonstration. It describes the purpose and operation of the demonstration, the evaluation and monitoring process (including selection of comparison groups), a comparison of baseline quality measures (with their comparison hospitals) for each facility and an analysis of budget neutrality for each site.

The two sites participating during the first year met the requirement of budget neutrality as specified in the demonstration budget neutrality protocols for the first year of the demonstration. Based on ARC's calculations, Beth Israel Medical Center did not incur excess costs to the Medicare program during the period from October 1, 2008 through June 30, 2009 and Charleston Area Medical Center is not liable for excess costs to the Medicare program during the period from December 1, 2008 through June 30, 2009.

At baseline, the two participating sites are similar to their comparison groups with regard to several measures of quality of care. Overall, RTI found few areas where poor quality of care

was indicated for the demonstration participants and few discrepancies in quality of care between sites and their comparison groups for length of stay, mortality, readmissions, AHRQ Inpatient Quality and Patient Safety Indicators, and Hospital IQR Program measures.

FUTURE ANALYSES

Future analyses will address a range of research questions such as hospital efficiency, physician practice patterns, Medicare expenditures, quality of care, and beneficiary satisfaction. A summary of these analytic tasks follows.

***Site Visits and Physician Focus Groups*—**During September/October 2010, RTI conducted site visits and physician focus groups at both BIMC and CAMC to document and analyze initial implementation and ongoing operations at each Gainsharing Demonstration site. RTI will conduct an additional site visit and round of physician focus groups at BIMC near the end of the demonstration.

***Financial Analyses*—** Depending on the availability of internal cost savings data, future evaluation activities will determine financial impacts of gainsharing on providers, adjust for patient severity and substitution of post-acute care for inpatient care, identify sources of facility cost savings by department, analyze the proportion of hospital savings going to physicians, and determine the sources of Medicare savings.

***Quality of Care and Patient Satisfaction*—**RTI will update the analyses of quality of care measures and patient satisfaction presented in this report.

***Referral Patterns and Market Competition*—**To monitor potential referral patterns and market competition impacts due to gainsharing, RTI will conduct descriptive analyses that will include tabulating and statistically testing differences between demonstration hospitals and hospitals that compete with participating sites for patients before and during the demonstration.

April 2011

Evaluation of the Medicare Gainsharing Demonstration

Interim Report for Quality Improvement and Savings Report to Congress

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EVALUATION OF THE MEDICARE GAINSHARING DEMONSTRATION

INTERIM REPORT FOR QUALITY IMPROVEMENT AND SAVINGS REPORT TO CONGRESS

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SECTION 1
LEGISLATIVE MANDATE AND OVERVIEW OF THE GAINSHARING MODEL

1.1 Legislative Mandates for the Medicare Gainsharing Demonstration

The Congress, under Section 5007 of the Deficit Reduction Act (DRA) in 2005, required that the Centers for Medicare & Medicaid Services (CMS) conduct a qualified gainsharing program to test alternative ways that hospitals and physicians can share in efficiency gains. The primary goal of the demonstration was to evaluate gainsharing as means to align physician and hospital incentives to improve quality and efficiency. The DRA-mandated gainsharing demonstration was later extended under the Affordable Care Act of 2010. The DRA also mandated two reports to Congress: a quality improvement and savings report and a final report. This report, which supports the quality improvement and saving reports, presents early baseline results available as of fall 2010 for the two sites participating in the demonstration at the time of implementation:

- Beth Israel Medical Center (BIMC), New York, New York
- Charleston Area Medical Center (CAMC), Charleston, West Virginia

CMS solicited volunteer participating sites for the gainsharing demonstration in the fall of 2006. Applications were due to CMS on November 17, 2006. The DRA legislation originally mandated participation of a total of 6 sites (4 urban and 2 rural). CMS initially selected four sites from this solicitation for demonstration participation though no rural sites were selected from this first round. CMS issued a new announcement to solicit additional rural demonstration applications.

CMS ultimately designated 4 urban sites for participation in the demonstration: BIMC, CAMC, Saint Joseph's Hospital in Syracuse, New York and Deaconess Hospital in Evanston, Illinois. The follow up rural solicitation resulted in the additional designation of Lake Cumberland Regional Hospital in Kentucky. A total of three sites moved from the initial selection phase to sign terms and conditions, including the mandated rural site. Two sites (Saint Joseph's and Deaconess) withdrew from the participation in the demonstration for various reasons, though primarily due to concerns about their potential exposure to postacute care financial risk. Later, the Lake Cumberland rural site voluntarily determined that its proposed model for gainsharing could not meet the implementation and evaluation requirements of the demonstration. At time of implementation in October 2008, only two sites participated in the demonstration (BIMC and CAMC, and CAMC elected not to continue participation in the demonstration past December 2009).

Section 2 in this report summarizes each site's gainsharing approach as envisioned in their original demonstration application. Major departures from the planned approaches are noted. Additional detail on postimplementation experiences of the gainsharing sites will be outlines in the forthcoming site visit and physician focus group analyses. Although the anticipated start date for the demonstration was January 1, 2007, demonstration sites did not begin the implementation process until October 1, 2008; they operated until December 31, 2009.

At that point, the original legislative authorization for the demonstration ended, although the sites were allowed to continue all operations except for actually making gainsharing payments to physicians. The demonstration was officially extended through September 30, 2011, as a result of the PPACA enacted on March 23, 2010. BIMC elected to continue implementation through the extended end date. CAMC elected to end its participation in the demonstration as of December 31, 2009, and will therefore be evaluated only through this time period.

1.2 Overview and History of the Gainsharing Model

The PPACA health care reform legislation emphasizes moving the health care system toward models that hold health care providers more accountable for the costs and quality of the care they provide, thereby encouraging greater efficiency and improved outcomes. The gainsharing model is one variant of these systems emphasized under health care reform. Gainsharing is a contractual arrangement that sets up a formal reward system in which participating workers share in any cost savings resulting directly from either workers' productivity gains or increased efficiency. While gainsharing has a long history in manufacturing going back to the 1930s and possibly even as far back as the 19th century (Welbourne and Gomez-Meija 1995), gainsharing in health care is much more recent, dating only to the 1990s (Jain and Roble 2008).

Gainsharing models developed in health care because of the misalignment of incentives between hospitals and physicians.[1] In the traditional hospital setting, physicians are independent agents who not only use hospital facilities, but can directly or indirectly, knowingly or unknowingly, affect hospital costs. Physicians may unknowingly increase hospital costs through unnecessary use of supplies such as disposable surgical supplies, use of expensive devices such as stents and implants, and inefficient use of hospital resources such as operating room time. Physicians may also knowingly increase hospital costs by, for example, ordering additional testing. Additional tests could be duplicative and/or inefficient, but they are ordered because the physician always orders that test or feels the need to practice defensive medicine. Local practice patterns, not necessarily consistent with evidence-based or best clinical practice guidelines, may also influence physician behavior and lead to less than efficient clinical care.

The introduction of diagnosis related groups (DRGs) in Medicare added to the misalignment between the incentives facing hospitals and those facing physicians. Under the DRG system, hospitals are paid a fixed amount, depending on admitting diagnosis that covers most of the associated hospital costs, including those under a physician's control. However, Medicare generally pays physicians for more volume; there are no financial gains to the physician for providing more efficient care in order to lower hospital costs. Physicians control the treatment and diagnosis of patients. A physician paid on a fee-for-service model who provides more services to a hospitalized patient will typically receive more in reimbursement. Physicians also often control the use of supplies and selection of devices, which are paid for by the hospital. Consequently, physicians have limited incentives to use facilities and supplies efficiently or bargain for greater efficiency (e.g., lower-cost devices with manufacturers).

[1] Gainsharing can also exist between payers and physicians as well as payers and patients. In the next section, we discuss some gainsharing programs that try to address these different incentive problems.

Gainsharing is one potential solution to remedy this misalignment of hospital and physician incentives. In a hospital-physician gainsharing program, hospitals offer physicians a share of any cost savings achieved by the hospital as a result of the physicians' behavior or decisions. Gainsharing works by providing physicians with a financial stake in controlling hospital costs. It is an arrangement where savings are shared. Therefore it differs from a pay-for-performance, or incentive, program, in which payments are made for a certain behavior (such as meeting certain quality standards of adhering to quality protocols).

Gainsharing's Beginnings—Though of current interest in the context of health care, gainsharing began in the manufacturing industry in the 1930s when Joe Scanlon, a union organizer in steelworks, designed a simple Scanlon Plan at the Empire Steel and Tin Plate Company of Cleveland. Under the Scanlon Plan, employees shared a proportion of the costs saved in some failing steelworks. In manufacturing and service industries, workers often have little economic incentive to reduce production and sales costs because the savings are enjoyed entirely by management, not workers. Exacerbating the problem is that improvements in efficiency can be seen by employees as potential threats to job security. Therefore, workers need an incentive to be productive. A gainsharing program that ties savings to bonuses for workers can provide workers with just such an incentive. Another example can be found in the 1980s, when Whirlpool implemented a gainsharing program. Workers were given significant financial incentives to participate in quality improvement initiatives. According to Whirlpool's chief operating officer, William Marohn, the incentives payments at one plant exceeded $2,500 per person for 3 years (Marohn 1993). The success of gainsharing in manufacturing has helped it spread from manufacturing to service industries to the public sector. A 1990 Towers Perrin survey found that 39% of Fortune 1000 firms used some type of gainsharing program (Kim, 1999). Many major companies, including Motorola, General Electric, 3M, Whirlpool, and Dreyer's Grand Ice Cream, have implemented at least one gainsharing program.

Legislation—While gainsharing has a history of successful implementation in the private sector, application in federal health programs have been limited by regulatory restrictions. The main limiting statute is the Civil Monetary Penalty Law.[2] Aspects of the Anti-Kickback Statute[3] and the Physician Self-Referral Law[4] also may be applicable. We briefly discuss each of these regulations and their relationship to gainsharing.

- Civil Monetary Penalty Law (CMP): The CMP prohibits hospitals and physicians from knowingly making or receiving a payment, either directly or indirectly, to a physician as an incentive to reduce or limit services to Medicare or Medicaid fee-for-service beneficiaries. A gainsharing model that aimed to save money by having physicians negotiate lower prices for supplies with one manufacturer in exchange for reducing or eliminating the options from other manufacturers could violate CMP if a reduction in choices of supplies could lower the quality of care to beneficiaries.

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2 42 C.F.R. Sect. 1003

3 42 C.F.R. Sect. 1001.952 et seq.

4 42 C.F.R. Sect. 411.350 et seq.

There are few exceptions to CMP. Hospitals have a financial incentive not to violate CMP. Each violation is subject to a $2,000 fine, up to $100,000.

- Anti-Kickback Statute (AKS): The AKS prohibits hospitals from knowingly and willfully paying, soliciting, or receiving any remuneration to induce referrals of items or services provided under any federally funded program. A gainsharing model in which hospitals pay physicians for cost savings from changes in physician behavior (such as ordering of tests or treatments) for Medicare beneficiaries could violate AKS. Although AKS includes a safe harbor provision, it is a criminal statute, whereas CMP is a civil statute. A violation of AKS could result in up to 5 years in prison, a $25,000 fine, and mandatory exclusion from participation in Medicare or Medicaid.

- Physician Self-Referral Law (Stark): The Stark Law prohibits physicians from referring Medicare and Medicaid patients to entities with which the physician has a financial relationship unless the activity falls within a regulatory exception. Most gainsharing programs include a financial relationship between the hospital and physicians to which physicians are referring patients for inpatient or outpatient hospital services. Therefore, the gainsharing program must meet a Stark exception (unless it is part of a CMS demonstration). If not, Stark is a strict liability statute and does not require intent for a violation. A violation of Stark provisions can result in up to a $15,000 fine, damages up to three times the fine, and exclusion from participating in Medicare and Medicaid.

OIG-Approved Hospital–Physician Gainsharing— In order to implement a gainsharing model within the federal health care system, waivers or exemptions from limiting regulations are necessary. In theory, the Office of the Inspector General (OIG) can offer a safe harbor exemption under the CMP. In 1999, the OIG issued its first advisory opinion regarding gainsharing (Gainsharing Arrangements and CMPs 1999); it said that the gainsharing program in question violated the CMP. Furthermore, the OIG stated that gainsharing arrangements "may offer significant benefits where there is no adverse impact on the quality of care received by patients" and that the CMP is violated even if the hospital's payment to the physician "need not be tied to an actual diminution in care, so long as the hospital knows that the payment may influence the physician to reduce or limit services." However, in 2001, the OIG issued an advisory opinion allowing a limited gainsharing program at St. Joseph's Hospital in Atlanta (OIG Advisory Opinion No. 01-1). The hospital proposed 19 operating room practices to curb the inappropriate use or waste of medical supplies. The OIG stated that, although many of the recommendations would violate CMP, it would not seek sanctions because sufficient safeguards were in place. Any hospital hoping to implement a gainsharing program would need to have the OIG make a determination based on the specific facts of the program.

In 2005, the OIG issued six advisory opinions allowing gainsharing programs to go forward. The programs, at six different hospitals, were also limited to 1 year and involved only cardiac surgeons and cardiologists who already had privileges at the hospital. In all six programs, the source of savings would be from a reduction in waste of medical supplies and standardization of devices, including stents, heart valves, pacemakers, balloons, and diagnostic devices. This was followed by additional advisory opinions issued by the OIG between 2006

and 2009 allowing additional gainsharing programs in anesthesiology and orthopedics. These gainsharing programs also focused on cardiology and cardiac catheter laboratories, but expanded the set of eligible physicians to include anesthesiologists and radiologists. The first orthopedic gainsharing program was approved in 2008, although, as with the earlier demonstrations, a portion of the savings was to come from standardization of devices. Also in 2008, OIG first granted approval to gainsharing programs lasting more than 1 year. It had previously regarded the limited duration of the gainsharing programs as a safeguard against potential patient harm. ***Table 1*** summarizes the OIG advisory opinions from 2005 to 2009.

Table 1
Gainsharing programs approved by the Office of the Inspector General, 2005–2009

OIG opinion	Physicians eligible to participate	Source of savings	Distribution of savings
05-01	Cardiac surgeons	• opening surgical supplies (trays and similar) as needed • blood cross-matching only as needed • substitution, in whole or in part, of less costly items • product standardization for certain cardiac devices	50% of savings to the surgical group, who will then distribute to individual physicians
05-02	Multiple cardiology groups	• standardization of cardiac catheterization devices • use of certain vascular devices as needed	50% of savings attributable to each specific group
05-03	Cardiac surgeons	• opening surgical supplies (trays and similar) as needed • blood cross-matching only as needed	50% of savings attributable to the group
05-04	5 cardiology groups	• standardization of cardiac catheterization devices • use of certain vascular devices as needed	50% of savings attributable to each specific group
05-05	Cardiology group	• standardization of cardiac catheterization devices • use of certain vascular devices as needed	50% of savings from curbing use or waste in current cardiac catheter lab practice

(continued)

Table 1 (continued)
Gainsharing programs approved by the Office of the Inspector General, 2005–2009

OIG opinion	Physicians eligible to participate	Source of savings	Distribution of savings
05-06	Cardiac surgery group	• opening surgical supplies (trays and similar) as needed • use of certain vascular devices as needed • substitution, in whole or in part, of less costly items • product standardization for certain cardiac devices	50% of savings from operating room efficiencies and standardization of certain cardiac devices
06-22	Cardiac surgery group	• opening surgical supplies (trays and similar) as needed • substitution, in whole or in part, of less costly items • product standardization for certain cardiac devices	50% of savings
07-21 A	Cardiac surgery group	• opening disposable cell saver components only when excessive bleeding • opening surgical supplies (trays and similar) as needed • substitution, in whole or in part, of less costly items • product standardization for certain cardiac devices	50% of cost savings
07-22 A	Anesthesiologists	• limit the use of a specific drug and a device used to monitor patients' brain function to only as needed • substitution, in whole or in part, of less costly items • product standardization for certain cardiac devices	50% of cost savings
08-09B	Orthopedic surgery groups Neurosurgery group	• limiting use of bone morphogenetic protein to as needed • standardize the use of certain spine fusion devices and supplies where medically appropriate	No more than 50% of savings

(continued)

Table 1 (continued)
Gainsharing programs approved by the Office of the Inspector General, 2005–2009

OIG opinion	Physicians eligible to participate	Source of savings	Distribution of savings
08-15	2 cardiology groups	• standardization of cardiac catheterization devices • use of certain vascular devices as needed • substitution for less costly antithrombotic medications	Share of savings for 3 years
08-21.2	4 cardiology groups 1 radiology group	• standardization of cardiac catheterization devices • use of certain vascular devices as needed • substitution for less costly contrast agents and antithrombotic medications	Share of savings for 2 years
09-06	Cardiology group Vascular surgical group Interventional radiology group	Standardize the types of cardiac catheterization devices and supplies (stents, balloons, interventional guidewires and catheters, vascular closure devices, diagnostic devices, pacemakers, and defibrillators)	50% of savings, separately for each group

SOURCE: Office of the Inspector General, http://oig.hhs.gov/.

Analysis of Gainsharing Savings in the Literature—Review of literature reporting the results of gainsharing models as applied to the health care setting show some promise. In a 5-year study of more than 220,000 patients at 6 cardiac catheterization laboratories, Ketcham and Furkawa (2008) found that gainsharing programs cut costs by 7.4%, or $315 per patient. They examined the effect that financial incentives had on the cost of devices and drugs, as well as on the volume of patients per physician in each hospital. They also measured whether gainsharing programs led doctors to select healthier patients. They found that the majority of savings from gainsharing programs could be attributed to lower prices for coronary stents, savings that came without altering referral patterns via cherry picking, steering, or increased caseloads. They also found that the gainsharing programs did not increase the risk of in-laboratory complications and were associated with significant decreases in three specific types of complications. A second study, by Montgomery and Schneller (2007), found similar results when analyzing hospital-physician gainsharing programs. They found that gainsharing hospitals reduced costs by 7.4% per patient, with 91% of the savings from lower prices and 9% from lower utilization. At the same time, they found that neither access nor quality was reduced, nor was access to drug-eluting stents before 2006.

Both studies found that the majority of savings came from substituting cheaper devices and supplies and limiting waste rather than from changing utilization. Critics consider limiting

waste and reducing supply costs to be "low-hanging fruit" for hospital savings. After a one-time reduction, they say, there is no additional gain in savings; at best savings are only maintained. Still, these savings related to negotiating lower costs for devices and supplies alone may be still substantial. The costs of supplies are escalating: between 2003 and 2005, the average hospital's supply costs grew nearly 40%, from $36 million in 2003 to more than $50.5 million in 2005 (Association for Healthcare Resource Materials Management 2005). Supply costs now represent as much as 31% of a hospital's total cost per case (Schneller and Smeltzer 2006). Gaining control of the hospital's supply chain—the flow of products and associated services to meet the needs of the hospital and those who serve patients—presents special challenges. This is because many of the most expensive materials—up to 61% of the total supply expenditures—are for items about which physicians have strong preferences (Schneller and Smeltzer 2006). And, in fact, Ketcham and Furkawa (2008) argued that if the experiences of the gainsharing programs they studied are representative, nationwide use of gainsharing would cut hospital costs for coronary stent patients by about $195 million a year. Additionally, results from BIMC's private insurer based gainsharing initiative (as well as early results from this Medicare demonstration) showed positive results. BIMC reports a $25.1 million reduction in hospital cost savings over three years (2006 – 2009), with $2 million shared with participating physicians. BIMC reported a small but not statistically significant improvement in quality of care (Leitman, et. al., 2010).

Alternative Forms of Gainsharing in the Private Sector— Gainsharing in health care is not limited to hospitals and physicians. Payers often offer incentives for hospitals and physicians to become more efficient. For example, whereas a Medicare DRG often includes all supplies and devices, some private payer contracts have a device carve-out, so that the payer pays one rate for everything related to the hospital stay and then separately for any devices. In other cases, per diem payments mean that a shorter length of stay (LOS) results in lower total payments to both the hospital and the physicians in the hospital. The hospital in such cases may have limited incentives to control costs and may even have an incentive to maintain the status quo if increases in efficiency will decrease revenue. In a payer-provider gainsharing model, however, the payer returns some of the savings.

Payers may also enter gainsharing models with patients. Because patients do not bear all the costs of their care, or even see the difference in cost between different facilities, patients may have no incentive to select lower-cost hospitals or facilities. In a payer-patient gainsharing program, the payer returns some of the savings it achieves if a patient chooses a lower-cost facility over a more expensive one. For example, in Wisconsin, individuals have access to extensive cost and quality data at http://www.wchq.org. Taking advantage of that public information, one self-insured employer set up a gainsharing program that gave patients $500 for having computed tomography and magnetic resonance scans at one lower-cost center because the employer saved $1,000 over the cost of the more expensive facility (Jain and Roble 2008).

Finally, gainsharing in the private sector has merged with pay for performance. In these cases, the savings are achieved and shared as a result of increased health care quality and efficiency. In these hybrid models of gainsharing and pay for performance, physicians are paid a share of the savings assuming that they meet certain quality standards. One example is the

Leapfrog Hospital Rewards Program.[5] Primarily a pay-for-performance program, it has certain aspects of gainsharing. Participating hospitals receive a portion of the accumulated cost savings if they meet specific quality and efficiency criteria. Health plans use the Leapfrog criteria to measure quality and resource utilization to calculate an efficiency score for hospitals. On the basis of hospitals' scores, payers can then choose among other rewards to give hospitals a fixed bonus or a share of the savings (http://www.leapfroggroup.org/media/file/LHRP-HP_Program_Bulletin.pdf).

Gainsharing in Medicare—CMS' first attempt at a hospital-physician gainsharing was in the Medicare Heart Bypass Demonstration, conducted between 1991 and 1996. All seven Centers of Excellence (CoE) had waivers to engage in gainsharing, and groups designed and implemented more or less complicated gainsharing algorithms on their own, subject to CMS' final approval. Surgeons, cardiologists, radiologists, anesthesiologists, and pathologists all received fixed, negotiated payment amounts that were included in the hospital payment (no direct Part B inpatient billing of Medicare). Under this successful demonstration (Cromwell et al., 1998), hospital costs were reduced (Cromwell, Dayhoff, Thoumaian, 1997), physicians enjoyed gainsharing bonuses, quality improved, and no negative offsets to Medicare savings occurred as a result of shifts of care to the postacute setting. RTI staff worked closely with CMS to design follow-up CoE demonstrations that included angioplasty and orthopedic surgery, but these efforts were thwarted by internal CMS data systems problems related to the conversions to calendar year 2000 (often referred to as Y2K issues).

In 2001, the New Jersey Hospital Association (NJHA) submitted an application to CMS to run an eight-hospital "all-APR-DRG" demonstration of gainsharing in its State (Marcoux 2008). This gainsharing methodology was likely the most complex ever proposed and introduced all the facets that other gainsharing proposals are likely to include. The New Jersey plan was to establish maximum pools from generated savings of Part A hospital savings for each all patient refined (APR) DRG in the hospital to be shared with the medical staff. These pools were constrained to 25% of total Part B outlays to be consistent with 42 CFR 417.479, Requirement for Physician Incentive Plans (PIP). Next, the pools were converted to a per-discharge cost for each APR-DRG, based on average costs of the lowest 90% of cases (so-called best practice norms). Excluding the most expensive cases from the target baseline cost per discharge was the primary mechanism to achieve reductions in hospital costs. Once responsible physicians were identified, they became eligible for gainsharing depending on how the average cost of their cases related to the mean cost of the 90% baseline group of cases. Baseline and demonstration cases were standardized for case severity and inflation. In the early demonstration years, responsible physicians could participate in gainsharing even if they failed the best practice norms as long as they showed reductions in their Part A costs per case. Gainsharing pools were carved out for hospital-based and consulting physicians to partially shelter them from lost billings associated with shorter stays and less testing. Process and outcome indicators were to be used to restrict gainsharing to physicians maintaining high quality standards.

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5 The Bridges to Excellence, Prometheus Payment program is another such program although it is only in the initial stages. See http://www.bridgestoexcellence.org for more information.

The NJHA gainsharing demonstration differed from its predecessor, the heart bypass CoE demonstration, in that the latter put surgeons at risk for both Part A and B billings in a single global payment only for a few cardiac DRGs. (The NJHA demonstration maintained separate Part A and B billing practices.) Also, at OMB's urging, physicians in the NJHA project were put at risk for excessive postacute care (PAC) Medicare outlays from any source (including outpatient physician services: "any absolute increase in Medicare PAC payments per discharge [must] be smaller than any absolute decrease in Part B inpatient physician payments per discharge" (Cromwell & Adamache, 2004a). The two demonstrations also differed in that CMS negotiated up-front discounts in its cardiac DRG global A and B rates, whereas New Jersey hospitals had to reduce baseline Part A and B inpatient outlays by 2% after adjusting for inflation and case mix changes.

The NJHA gainsharing program did not last long; four New Jersey–area hospitals that were excluded from the demonstration project sought an injunction in Federal court to stop it. They argued that the NJHA's program was anticompetitive and that it violated the CMP and AKS. In *Robert Wood Johnson University Hospital Inc. v. Thompson*, the U.S. District Court held that the demonstration did not violate the AKS. However, the court also held that although CMS or the Health and Human Services Secretary may waive the Stark Law restrictions neither CMS nor the Secretary can waive CMP.

Closely related to gainsharing projects, the Medicare Physician Group Practice (PGP) demonstration, one of Medicare's first projects that established incentives for quality improvement (QI) and cost efficiency, shared savings with physicians meeting these targets at the group practice level. A legislative mandate for the PGP demonstration was included in the Medicare, Medicaid, and SCHIP Benefits Improvement and Protection Act of 2000. It established several goals, including (Kautter, Pope, Trisolini, & Grund, 2007): (1) Encouraging coordination of health care furnished under Medicare Parts A and B; (2) Encouraging investment in administrative structures and processes for efficient service delivery, and (3) Rewarding physicians for improving health care processes and outcomes. The PGP demonstration began on April 1, 2005. Ten large multispecialty physician groups are participating in the PGP demonstration.

CMS is also currently running the Physician Hospital Collaboration Demonstration (PHC), authorized under Section 646 of the Medicare Modernization Act of 2003. The PHC demonstration differs from this Medicare Gainsharing Demonstration, which has a distinct hospital-based focus, in that there is an emphasis on participation in integrated delivery systems and on coalitions of physicians in collaboration with hospitals. The PHC demonstration also places a greater emphasis on improved efficiency and quality of care over a longer episode of care, including postacute services, beyond the acute-care stays. CMS solicited volunteer participating sites for the PHC demonstration. At the time of implementation, the only participant in the demonstration is the NJHA/New Jersey Care Integration (NJCI) Consortium with 12 participating hospitals. The PHC demonstration began implementation in 2009.

1.3 Overview of the Evaluation Design

An evaluation of the Medicare Gainsharing Demonstration is required by Congress under the demonstration's enabling legislation. As part of this evaluation requirement, RTI will

prepare a series of reports for this project. RTI will support CMS in the fulfillment of two reports to Congress: a mandated quality improvement and savings report, and a final report summarizing the overall evaluation findings for the gainsharing demonstration. RTI will also prepare a CMS final evaluation report, which will summarize the hypotheses and research questions, methods, data collection, findings, policy relevance of the demonstration, and overall evaluation findings.

A key evaluation design element is the definition of comparison groups. Comparison groups are necessary because the demonstration applicants' proposed designs can only compare their own demonstration year experience to that of a base year (i.e., a simple pre/post analysis). Using only a demonstration's own experience, these data cannot separate a participant effect from gainsharing effects. Therefore, RTI will also compare performance of the demonstration sites with that of independent comparison sites without gainsharing. To select comparison hospitals and areas for the purposes of the evaluation, RTI followed the following process:

- identified selection, or matching, characteristics (e.g., area, urbanicity, area utilization patterns, bed size, teaching, ownership);
- developed a weighting scheme for these characteristics;
- identified a set of potential comparison hospitals that best matched the demonstration site according to the weighted criteria; and
- refined the list of potential comparison sites on the basis of comments from the RTI team, the implementation contractor (ARC), and CMS project and evaluation staff.

A complete summary of the comparison site selection process is presented in Section 3.

The evaluation addresses a range of research questions and will assess the effects of a variety of gainsharing models on

- hospital efficiency and achieved savings,
- physician practice patterns,
- Medicare expenditures,
- quality of care, and
- beneficiary satisfaction.

1.4 Outline of This Report

This report will focus on baseline quality-of-care performance in the demonstration and comparison sites. This analysis is critical, as the primary evaluation assessment of the demonstration's impacts will be based on a difference-in-difference analytic model. Under this approach, we focus on how demonstration site performance—in quality, for example—changes

relative to the changes observed in the comparison sites. This approach allows us to account both for secular existing performance trends that may have taken place even in the absence of the demonstration and for different baseline starting positions of demonstration and comparison sites. Site visits and focus groups will be conducted in both demonstration sites to supplement our analysis of the impact of the gainsharing demonstration model on quality of care and will be discussed in a subsequent report.

The report to Congress called for findings on savings under the demonstration. Although no Medicare savings are required under this demonstration, sites are required to generate internal cost savings to make gainsharing incentive payments to participating physicians. RTI will report on savings generated by the gainsharing sites in a subsequent report.

Section 2 provides an overview of the gainsharing models as implemented by the two demonstration sites, BIMC and CAMC. Section 3 describes in detail the comparison site selection process. These comparison sites are being utilized by both the evaluation and implementation contractors for the quality of care, Medicare expenditures, and budget neutrality analyses. Section 4 presents the baseline claims-based quality-of-care findings for the demonstration and comparison sites. Section 5 presents baseline medical record abstraction and survey-based quality indicators. Section 6 summarizes the future tasks to be completed under this evaluation.

SECTION 2
SUMMARY OF MEDICARE GAINSHARING DEMONSTRATION SITE PARTICIPANTS

2.1 Charleston Area Medical Center, Charleston, West Virginia

Overview—CAMC has 893 beds and is by far the largest of the 6 acute care hospitals in the Charleston, West Virginia, area. CAMC is 4 times larger than the next largest hospital in the area, which has 189 beds. CAMC is the main tertiary care hospital serving West Virginia, northeastern Kentucky, and southeastern Ohio, including over 300,000 people in the Charleston metropolitan area. Three data systems were used to support the demonstration project: CathSource, HeartSource, and TSI Cost Accounting System. In detail:

- CathSource and HeartSource are software tools that compiled data during procedures in accordance with guidelines from the American College of Cardiology and the Society of Thoracic Surgeons.

- Data consistency in all CathSource/HeartSource users provided consistent benchmarks (national, volume-based, or best-in-class).

- Data on the following items were collected at the point of care:

  – Cost

  – Clinical quality

  – Productivity

  – Laboratory work and radiology tests

- TSI Cost Accounting was used supplementally to collect data on laboratory work and radiology tests.

Eligible DRGs, Patients, and Physicians—The CAMC gainsharing model focused on cardiac DRGs. Almost 40% of CAMC's Medicare revenue is generated from cardiovascular medicine, and cardiovascular DRGs have a direct annual cost of $31 million—more than 55% of direct costs. The following DRGs were proposed by CAMC for inclusion in the demonstration: DRGs 104–106, 117, 118, 121, 122, 127, 130, 131, 138, 139, 143, 515, 518, 535, 536, 547, 548, 549, 550, 551, 552, 555, 556, 557, and 558. Patients were identified on admission.

CAMC was motivated to participate in gainsharing by hospital cardiologists and cardiovascular surgeons. The hospital generally experienced few issues in attracting most physicians to the demonstration with the exception of the major cardiology group. The cardiologists decided to participate in the quality of care and efficiency initiatives, but declined to participate in the gainsharing payment program because they were concerned about the negative perceptions that might surround such payments.

Gainsharing Strategy—Each included DRG had established savings initiatives. A partial list of the approved savings initiatives is shown in ***Table 2***, reproduced from CAMC's application.

CAMC offered the following example of how these savings initiatives would work. Catheterization laboratory staff at CAMC work less efficiently than ideal, and are found to have an average waiting time of 13.5 minutes per case. Assuming 3,000 cases per year, this time translates to 675 hours per catheterization laboratory. Furthermore, assuming three staff per catheterization laboratory, this translates into 2,025 hours per laboratory. At an hourly rate of $30, eliminating this waiting time for catheterization laboratory staff could save $60,000 annually.

Table 2
Charleston Area Medical Center gainsharing strategy initiatives

Example of approved initiatives	Potential savings
Utilize critical care beds appropriately	$45,565
Decrease chest X-rays by an average of 1/patient	$28,532
Decrease repeat routine laboratory testing	$56,552
Bactroban Nasal® ointment—reduce utilization	$3,888
Precedex®—eliminate routine utilization	$20,592
Sevoflurane—replace with Forane®	$24,451
Induction agents—use thiopental sodium instead of etomidate/ Diprivan®	$4,815
Vancomycin—eliminate routine utilization	$7,920
Type and crossmatch—reduce number of units cross matched	$67,737
Intraoperative blood product utilization—reduce	$85,694
Albumin 25% 50cc × 2—reduce	$25,373

SOURCE: Charleston Area Medical Center gainsharing application.

Budget Neutrality Strategy—In its original application, CAMC assured budget neutrality for Medicare through internal monitoring. Gainsharing was not to be awarded if no internal savings were generated. CAMC anticipated that internal savings would be generated by the following initiatives

- examination of practice differences,
- utilization of laboratory resources as needed,
- evaluation of product usage,
- increase in patient flow, and

- negotiation of lower prices for medical devices and supplies.

In the end, CAMC relied primarily on negotiation for lower medical devices and surgical supplies for generation of internal cost savings.

Medicare Cost Impact—The CAMC proposal did not propose Medicare savings and expects costs savings to be internal to the hospital. Medicare payment, internal staff and consultant costs, and Medicare patient volume were expected to remain constant. The site offered the following cost scenario detail in their original proposal (***Table 3).***

Table 3
Charleston Area Medical Center internal savings scenario

Variable	Baseline	Year 1	Year 2	Year 3
Medicare payment	$64,735,318	$64,735,318	$64,735,318	$64,735,318
Direct costs	NA	NA	NA	NA
Patient care	$30,811,844	$29,271,252	$28,346,896	$27,730,660
Internal staff and consultant	$0	$300,000	$300,000	$300,000
Total direct costs	$30,811,844	$29,571,252	$28,646,896	$28,030,660
Cost savings (Baseline – Year X)	NA	$1,240,592	$2,165,948	$2,781,184
Medicare patient volume	4,386	4,386	4,386	4,386

SOURCE: Charleston Area Medical Center gainsharing application. NA, not applicable.

CAMC's decision to participate in the demonstration only through December 31, 2009, means that this site will potentially realize impacts through only one year of the demonstration. CAMC withdrew from the demonstration for a variety of reasons, including continued concern over financial risk for postacute care. CAMC's complete rationale for not participating in the demonstration extension will be included in RTI's summary of the site visit and physician focus group findings to be included in a subsequent report.

Quality Assurance—Gainsharing's success relies on patients' receiving quality of care that is equal to or better than that they would have received otherwise. CAMC proposed to measure physician care provided on several factors to ensure that quality of patient care remained the same. Worse performance on any of the following standards for an individual physician would make him or her ineligible to receive the gainsharing bonus:

- Readmission rates
- Repeat procedures
- Patient outcomes

- Major events during procedures

- Antithrombotic usage

2.2 Beth Israel Medical Center, New York, New York

Overview—BIMC is a large, urban, academic hospital with 1,106 beds on 2 campuses: 1 in downtown Manhattan (Petrie) and 1 a community hospital in Brooklyn (Kings Highway). In their application, BIMC argued that that they would be able to scale up the demonstration easily because they had implemented a similar gainsharing model for their private insurance patients. BIMC employs the Patient Real Time Information System (PRISM). PRISM includes computerized physician order entry, which maintains information on best prescribing practices and information such as drug interactions and maximum dose checking. A New York State billing database, SPARCS, provides cost data on best practice norms within the Continuum hospital system (BIMC's parent organizational entity).

Eligible DRGs, Patients, and Physicians—BIMC included most medical and surgical DRGs in their demonstration. Enrollment was voluntary for physicians. At the time of their application, there were 600 physicians eligible to enroll in the demonstration and BIMC anticipated that more than 70% will enroll. Physicians must have been employed by the hospital's medical staff for at least 1 year to be eligible to enroll. Ultimately, physician enrollment in the gainsharing demonstration was not a problem for BIMC.

Gainsharing Strategy—BIMC adopted a gainsharing plan designed by Applied Medical Software (AMS). A pool of bonus funds was prospectively estimated from hospital savings on the basis of the following factors:

- Total available incentive is a percentage of the best practice variance for each APR-DRG.

- Best practice variance = (actual spending – best practice cost)

- Best practice cost = spending of the lowest-cost 25th percentile

If no hospital savings are realized, no bonus are allocated to participating physicians. The total available incentive was defined as

$$\textit{total available incentive} = X\% \times (\textit{actual spending} - 25\textit{th percentile spending})$$

where X% = the percentage of spending (X%) to allot to the incentive pool.

An incentive pool calculation was made for every APR-DRG and then summed across all APR-DRGs. Put differently, for each DRG, the hospital assigns some percentage of the difference between costs incurred on each Medicare patient minus the costs per case at the 25th percentile. These were summed across all cases.

Purpose of Bonus—In the BIMC proposed strategy, the purpose of the bonus was to counteract the current incongruity between the hospital's Medicare payment and physician decision making. Prior to the gainsharing project, physicians had no direct financial incentive to use care efficiently. Gainsharing gives physicians a cumulative incentive to provide only the care that is needed to maintain quality. Physicians earn a share of the total available incentive on the basis of their own efficiency or lower costs.

Gainsharing Distribution to Physicians—In the BIMC model, each patient is assigned to one practitioner who takes financial responsibility for the care of the patient. For medical patients, the responsible physician is the attending physician. For surgical patients, the responsible physician is the surgeon. The maximum performance incentive is equal to the APR-DRG adjusted portion of the total incentive pool allotted to the responsible physician.

The actual bonus paid to physicians is called the performance incentive, which is calculated as a percentage of the maximum performance incentive, based on performance. Gainsharing payments are capped according to CMS policy at 25% of the physician's affiliated Part B reimbursements. The total incentive payment is divided into four categories:

- Performance, medical
- Performance, surgical
- Improvement, medical
- Improvement, surgical

Medical and surgical specialists have different gainsharing algorithms: one based on costs relative to their low-cost peers (performance) and another based on their own cost improvement (improvement). Total incentives are weighted toward improvement in the first year and then moves toward performance weighting during later years. By Year 3, the physician incentive depends entirely on cost performance relative to a peer group. This simulation is summarized in ***Table 4***, reproduced from the BIMC's application.

Table 4
Beth Israel Medical Center annual gainsharing incentives

Year	Improvement	Performance
1	67%	33%
2	33%	67%
3+	0%	100%

SOURCE: Beth Israel Medical Center gainsharing application.

Once actual implementation began, BIMC decided to maintain the improvement percentage (67 percent) through year two as a way to continue to emphasize improvement. As of the third year of the project, all annual gainsharing incentives became 100 percent performance based.

Performance Incentives—A physician's peer performance incentive is based on his or her average cost per case relative to the best practice cost per case of a cost-efficient peer group. The total performance incentive (PI) formula is

$$PI = \frac{90th\ percentile\ cost - MD's\ actual\ cost}{90th\ percentile\ cost - best\ practice\ cost} \times maximum\ payment$$

If physician's actual average cost per case is in the 90th percentile or higher, the performance incentive is equal to 0. If the physician is at the best practice cost, or better, the performance incentive will be the maximum payment. The best practice cost establishes a lower bound on gainsharing to discourage skimping on care.

The performance incentive is calculated by averaging patient costs for each eligible physician, then sorting them from most to least costly. The 90th percentile cost threshold is the average cost cutoff point of the physicians spending in the top 10%, on average. Best practice cost is the 25th percentile cost threshold that identifies the least costly 25% of physicians' patients. Physicians whose average cost is below the 90th percentile cost are eligible for a bonus, or a fraction of the maximum potential payment. The fraction is determined by scaling each physician's cost savings in the numerator to the maximum allowed savings in the denominator. For example, if the 90th percentile is $15,000, a physician's average cost is $12,000, and the best practice cost is $10,000, then the physician receives

$$\frac{\$15{,}000 - \$12{,}000}{\$15{,}000 - \$10{,}000} = \frac{\$3{,}000}{\$5{,}000} = 60\%\ of\ the\ maximum\ payment$$

Improvement Incentives—The improvement incentive was present to compensate physicians because reducing Part A expenditures should result in reduced Part B expenditures (or loss of income). These were defined separately for medicine and surgery. For medical specialists:

$$(base\ year\ ALOS - rate\ year\ ALOS) \times perdiem \times rate\ year\ admissions$$

where ALOS is average LOS and

$$per\ diem\ rate = \frac{medical\ improvement\ pool}{rate\ year\ total\ days - best\ practice\ days}$$

For surgeons:

$$\frac{base\ year\ cost - rate\ year\ cost}{Xth\ percentile\ base\ cost - best\ practice\ cost} \times maximum\ payment \times rate\ year\ admissions$$

As stated in the BIMC application, the percentile of base cost was set to eliminate the outlier effect caused by patients with high utilization rates.

Improvement incentive algorithms differ between medical specialists and surgeons because surgeons control costs directly by ordering services from other doctors and are paid a fixed global fee; however, their fee is seldom affected. Medical specialists exert control over costs by determining the number of inpatient days. Shorter stays reduce hospital costs but also reduce physician fees.

Budget Neutrality Strategy—CMS and Congress are concerned that gainsharing may encourage physicians to change their inpatient discharge patterns, resulting potentially in increased overall PAC costs. This is of particularly concern when gainsharing models, such as the one proposed by BIMC, focus on reduced lengths of inpatient stays. Should this occur, the demonstration would not be budget neutral. If patients are discharged sooner under the demonstration, Part B and outlier payments may fall, but PAC costs will likely rise. BIMC implemented a communications system with PAC providers to study patterns of postdischarge outcomes. BIMC emphasizes strategies to reduce internal facility costs and Part B costs. BIMC's budget neutrality strategy includes overall shorter inpatient stays, facilitated by conducting patient rounds on weekends, writing of discharge orders early in the morning, and decreasing consultation waiting time. BIMC also envisions use of fewer marginal diagnostic tests, a reduction in pharmacy expenses, and more efficient use of operating rooms. BIMC proposes more cost-effective use of critical care, evidence-based selection of medical devices, and avoidance of duplicative care. Finally, BIMC proposes to improve the quality and timeliness of medical records, which should have an overall impact on improved efficiency.

Medicare Cost Impacts—No savings to Medicare are required or envisioned under this demonstration. BIMC initially proposed a trial year and did not guarantee budget neutrality during the trial year: 1% savings expected in trial year. BIMC reserved the right to terminate the program after the trial year with no financial penalties. BIMC expected in Year 2 to achieve a 3% of (base hospital costs – inpatient costs) guaranteed savings (case-mix adjusted difference).

Quality Assurances—BIMC proposed a range of physician quality standards, which, if not met by individual physicians, would make them ineligible for the gainsharing bonus. These overall standards are as follows:

- Overall readmission rate within 7 days must not increase.
- Adverse events and malpractice experience must not increase.
- Physicians must comply with available quality measures.

BIMC also proposed to track patient complaints related to premature release, track readmission rates, and implement systematic communications with PAC providers to ensure that postdischarge outcomes improve.

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SECTION 3
COMPARISON SITE SELECTION

3.1 Overview of Comparison Site Selection Methodology

The purpose of the evaluation is to isolate the impacts attributable to gainsharing arrangements in demonstration hospitals. The role of a comparison group is to represent trends in the major impact variables that are then debited from observed demonstration hospital trends to produce final estimates of gainsharing impacts alone. The following describes the process RTI followed and summarizes the comparison sites selected.

Comparison hospitals will be critical to both the budget neutrality analysis and the overall evaluation of the demonstration. The gainsharing demonstration is required to be budget neutral (i.e., overall Medicare expenditures under the demonstration cannot exceed projected costs in the absence of the gainsharing initiative). A trended-baseline methodology will be used by CMS to determine whether participating hospitals have achieved budget neutrality.

In the trended-baseline methodology, average actual Medicare payments for the demonstration period are compared with a target. Average actual Medicare payments that are less than the target satisfy the budget neutrality requirement. The target is equal to a participant's actual baseline average payments trended forward by the participant's expected growth rate.[6] Each participant's expected growth rate is based on the actual growth rates in average Medicare payments for the comparison hospitals. Thus, by comparing spending growth to comparison hospitals, demonstration sites will be held harmless to growth trends in services such as PAC that are occurring in the absence of the gainsharing demonstration. Aside from the budget neutrality assessment, the comparison hospitals will be used to assess performance.

Basic to the process of the selecting comparison hospitals is that they be representative of or similar to the participants. There are a large number of characteristics from which to choose. We believe that the salient economic ones are

- the growth rates of the comparison hospitals that are used to assess attainment of budget neutrality by the participants;
- factors (e.g., graduate medical education, Medicare case mix, and disproportionate share of low-income patients) that influence both the level of Medicare payments and costs (selected factors should also influence the growth of payments and costs); and
- the competitiveness of the markets in which the participants are located.

6 In some situations, the participant has had low growth rates and wishes to join the demonstration to be paid for past performance. This situation does not seem to be present among the applicants.

These demonstration characteristics for the two sites are elaborated upon in ***Table 5***:

Table 5
Summary of key gainsharing site features for site selection purposes

Variable	Beth Israel Medical Center New York, New York	Charleston Area Medical Center Charleston, West Virginia
Diagnosis-related groups	All	Cardiac only
Medicare savings	Year 1: 1% Year 2: 3% (Year 2 guaranteed)	No Medicare savings proposed
PAC budget neutrality strategy	NA	Reduced readmission rate
Physician payment incentive system	NJ system: improvement and performance incentives	NA
Internal hospital savings	NA	Year 1: 5% Year 2: 8% Year 3: 10%
Number of acute-care hospitals in market owned by parent organization	2 (main: Manhattan; other: Brooklyn)	4 (main: General; other: Memorial, Women and Children's, CAMC Teays Valley)
Acute-care beds in main hospital	1,106	710
Other hospitals in local market	Many	3
Number of local hospitals in market that might be important rivals	Many	0

SOURCE: RTI International analysis. PAC is postacute care.

Comparison hospitals should have growth rates that are representative of an attainable growth rate that will influence participant behavior. For instance, a participant's historical growth may be too high, and the participant may wish to have a lower growth rate. What are attainable growth rates? Because there are an infinite number of attainable growth rates, one way to specify attainable growth rates is to define them by the growth rates of comparable or peer hospitals. Comparable hospitals should be subject to cost structures and growth forces that are similar to those of the participants.

For participants located in markets in which there are many other hospitals (e.g., BIMC), peer hospitals can be all of the nonparticipating hospitals in the local area because none of the individual hospitals in the market has much power to influence the collective growth rate of the market hospitals. And each hospital, if judiciously chosen, will have similar cost structures, which, in turn, will be subject to similar growth pressure. Participants located in markets in which they have near monopoly power (e.g., CAMC) can have great influence on the behavior or

growth rates of the other hospitals in their markets. Such participants can behave with little fear of competitive responses from the other local hospitals. Additionally, the cost structures of monopoly participants may differ greatly from those of other local hospitals. In such cases, the peer hospitals should be selected from external markets. These peer hospitals should be subject to the same growth pressures as the participants. They also should be in markets in which they have the same type of market power as the participants.

In selecting the actual comparison hospitals, a number of problems arise if nonrepresentative hospitals are selected. If the comparison growth rates are too high, participants can more readily attain the required budget neutrality. Conversely, comparison growth rates that are too low can result in bonuses that are not necessarily the result of improved care efficiencies at the hospital level. For this reason, the comparison hospitals should not be limited to just one or two hospitals. Instead, using a larger number of comparison hospitals will help to limit the influence of idiosyncratic factors (e.g., regression to the mean) from each hospital.

One effect of using growth rates in the budget neutrality assessment is to reduce the influence of levels of Medicare payments. Nonetheless, it is important to select comparison hospitals with cost structures similar to those of participants because cost structures can affect growth rates. The influence of cost structures on growth rates is probably more important in markets with many hospitals than in markets with a few hospitals. Another reason to select comparison hospitals with cost structures similar to those of participants is that when growth rates are not observable, information on cost structures becomes the best predictor of growth rates.

Factors that can influence hospital cost structures include Medicare volume, the number of short-term acute care beds, the Medicare case mix index, graduate medical education (e.g., indirect medical education), and the share of low-income patients (i.e., disproportionate share hospitals [DSH]). An additional set of issues is related to growth rates in the assessment of budget neutrality. The Medicare Gainsharing Demonstration protocol indicates that payments for the participants and comparison hospitals should be standardized for Medicare case mix, gender, and age group. Differential changes in the area wage index, indirect medical education rates, and DSH rates may also differentially affect the growth rates of the participating and comparison hospitals and may need to be controlled for.

On the basis of this overall approach, RTI set the initial standards for comparison site selections that are shown in ***Table 6***.

Table 6
Approaches to selecting comparison hospitals

Hospital	Approach
Beth Israel Medical Center	Select peer hospitals from the greater New York City area.
Charleston Area Medical Center	Select large, dominant hospitals located in small urban areas. During 2006, the prospective comparison hospital must have performed at least 200 coronary artery bypass grafts or heart valves and at least 400 percutaneous coronary interventions, stents, etc. "Dominant hospital" is defined as one that has a local market share of at least 75% for one of these two sets of cardiac-related procedures.

SOURCE: RTI International analysis.

3.2 Selection of Specific Comparison Site Hospitals

***Core Ranking Variables*—**The following core variables and methodology were used in selecting potential comparison hospitals for both CAMC and BIMC. Data were obtained from the 2008 Impact File.

- For each of the following variables, the absolute value of the potential comparison hospitals value minus the CAMC/BIMC value was calculated: Residents per bed, beds, residents, Medicare discharges, Medicare share of inpatient days, Medicare case mix, and operating DSH adjustment factor.

- For each of the above variables, the hospital that was closest to CAMC/BIMC received a rank of 1, the second closest received a rank of 2, and so forth.

- A weighted mean rank score was calculated for each comparison hospital. The weights used when creating each hospital's mean rank score were as follows:

  - Beds, Medicare share of inpatient days, and residents had a weight of 3 each.

  - All of the other variables had a weight of 1 each.

Hospitals with the lowest mean rank scores were those most similar to CAMC/BIMC. In creating this list of hospitals with the lowest mean rank scores, we were attempting to best reflect the factors associated with the growth of Medicare payments (all, not just IPPS) and the cost structure of the hospitals.

***Charleston Area Medical Center*—**For CAMC's comparison hospitals, we selected those that have similar market dominance in cardiac surgery as does CAMC. To be considered a candidate comparison hospital for CAMC, a hospital must annually perform at least 200 major heart procedures (i.e., CABGs and heart valve procedures) and at least 400 PCIs. It must also have at least a 75% market share of either the major heart procedures or the PCIs.

Candidate comparison hospitals were ranked in terms of similarity to CAMC. Core ranking variables (described above) were used plus four additional variables: CABG/valve volume, PTCA/stent volume, CABG/valve market share, and PTCA/stent market share. The weights of these four new variables were 6 for each of the cardiac volume measures and 4 for each of the cardiac market share variables. Ten of the 14 hospitals with the lowest mean rank scores were selected as comparison hospitals for CAMC. All but two of CAMC's comparison hospitals are located in the South. The application of the above criteria yielded the 10 comparison sites for CAMC shown in ***Table 7***.

Beth Israel Medical Center—BIMC is a large urban hospital with its main location in lower Manhattan. It is affiliated with an academic medical center and has a large resident program. It proposes to cover all DRGs during the demonstration. Because BIMC is located in a market in which it is but one of many hospitals, it will likely be subject to the same pressures on growth of Medicare payments as the other hospitals. To help select candidate comparison hospitals from the 52 other short-term, acute-care hospitals in the New York City area, used data compiled from the core ranking variables (described above) to identify a potential list. Of the 52 New York City hospitals, the 15 with the lowest mean rank scores were selected as potential comparison hospitals for BIMC. These 15 hospitals are shown in ***Table 8***.

Table 7
Charleston Area Medical Center comparison hospitals

Medicare provider ID	Hospital name	City	State	MSA code	Mean rank score	Market hospitals	Acute-care beds	Medicare discharges number	Medicare discharges share	CABGs & heart valves, hospital volume	CABGs & heart valves, market volume	CABGs & heart valves, hospital share	PTCA & stents hospital volume	PTCA & stents market volume	PTCA & stents hospital share	DSH Adj Factor	No. of residents	Medicare inpatient share	Residents per bed	Medicare case mix index
—	—	**weight:**	—	—	—	0	3	1	0	6	0	4	6	0	4	1	3	3	1	1
510022	Charleston Area Medical Center	Charleston	WV	16620		4	718	13,824	62%	751	751	100%	1,120	1,261	89%	0.12	116	0.52	0.16	1.82
490024	Carilion Medical Center	Roanoke	VA	40220	7.6	3	664	13,381	66%	386	484	80%	1,066	1,308	81%	0.07	83	0.55	0.12	1.76
200009	Maine Medical Center	Portland	ME	38860	8.5	7	581	11,033	47%	424	424	100%	896	949	94%	0.08	171	0.46	0.30	1.95
340002	Memorial Mission Hospital and Asheville Surgery Center	Asheville	NC	11700	8.6	4	646	16,194	65%	571	571	100%	750	750	100%	0.13	39	0.53	0.06	1.79
440002	Jackson-Madison County General Hospital	Jackson	TN	27180	9.6	2	558	12,635	82%	326	326	100%	1,315	1,355	97%	0.16	18	0.54	0.03	1.74
010039	Huntsville Hospital	Huntsville	AL	26620	10.7	3	786	16,256	73%	359	359	100%	684	736	93%	0.07	31	0.48	0.04	1.66
340040	Pitt County Memorial Hospital	Greenville	NC	24780	11.5	1	618	12,619	100%	492	492	100%	749	749	100%	0.24	155	0.48	0.27	1.96
110107	Medical Center of Central Georgia	Macon	GA	31420	12.8	3	534	11,606	68%	493	598	82%	1,323	1,710	77%	0.21	88	0.46	0.16	1.92
440063	Johnson City Medical Center	Johnson City	TN	27740	15.5	4	478	10,734	77%	286	286	100%	755	755	100%	0.16	62	0.45	0.14	1.55
200033	Eastern Maine Medical Center	Bangor	ME	12620	15.6	2	302	8,388	76%	329	329	100%	658	659	100%	0.16	24	0.49	0.08	1.85
340141	New Hanover Regional Medical Center	Wilmington	NC	48900	15.9	3	539	13,331	84%	245	245	100%	563	564	100%	0.12	54	0.54	0.11	1.65

NOTE: MSA = major service area; CABG = coronary artery bypass graft; PTCA = percutaneous transluminal coronary angioplasty; DSH = disproportionate share hospital.

SOURCE: RTI Analysis of CMS 2008 Impact File.

Table 8
Beth Israel Medical Center comparison hospitals

Rank	Provider ID	Hospital name	Borough	Mean rank, score (weighted)	Residents per bed	Beds	Residents	Medicare discharges	Medicare share of IP days	Medicare case mix	Operating DSH adj factor
—	330169	Beth Israel Medical Center	Manhattan	—	0.35	994	349	12,914	0.39	1.39	0.37
1	330194	Maimonides Medical Center	Brooklyn	9.6	0.63	569	356	10,179	0.38	1.75	0.38
2	330236	New York Methodist Hospital	Brooklyn	11.5	0.44	495	217	7,841	0.39	1.57	0.30
3	330119	Lenox Hill Hospital	Manhattan	13.2	0.36	570	203	9,196	0.40	1.78	0.07
4	330357	SVCMC—Catholic Medical Center of Brooklyn Queens	Queens	13.2	0.18	886	157	6,337	0.36	1.27	0.37
5	330055	New York Hospital Medical Center of Queens	Queens	13.8	0.38	439	168	9,295	0.39	1.57	0.24
6	330024	Mount Sinai Hospital	Manhattan	14.3	0.58	901	524	17,350	0.40	1.81	0.24
7	330214	NYU Hospitals Center	Manhattan	15.2	0.55	528	290	8,708	0.42	1.88	0.05
8	330290	SVCMC—St. Vincent's Ctrs NY & West Branches	Manhattan	15.4	0.69	441	305	5,179	0.35	1.71	0.29
9	330306	Lutheran Medical Center	Brooklyn	15.8	0.63	322	203	5,261	0.38	1.44	0.40
10	330160	Staten Island University Hospital	Staten Island	16.5	0.37	557	204	8,265	0.29	1.53	0.21
11	330056	Brooklyn Hospital Center at Downtown Campus	Brooklyn	16.8	0.46	428	197	4,066	0.33	1.43	0.46
12	330195	Long Island Jewish Medical Center	Queens	18.2	0.79	578	459	9,077	0.32	1.70	0.14
13	330193	Flushing Hospital Medical Center	Queens	20.1	0.42	274	116	3,325	0.41	1.40	0.33
14	330233	Brookdale Hospital Medical Center	Brooklyn	20.2	0.53	455	240	3,343	0.25	1.48	0.52
15	330221	Wyckoff Heights Medical Center	Brooklyn	21.6	0.43	294	127	4,419	0.33	1.36	0.54

NOTE: IP, inpatient; DSH, disproportionate share hospital.

SOURCE: RTI Analysis of CMS 2008 Impact File.

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SECTION 4
BASELINE QUALITY OF CARE: CLAIMS-BASED INDICATORS

One goal of the Medicare Gainsharing Demonstration is to evaluate mechanisms for hospitals and physicians to join forces to improve quality and efficiency of care, establish effective means to govern use of inpatient resources, reduce costs, and share the rewards. Evaluation of the demonstration therefore requires an assessment of the impact of gainsharing on quality of care. When designing an evaluation of quality, we need to understand the incentives of each gainsharing methodology on hospital and physician behavior. Incentives introduced to reduce hospital costs could include reduced LOS, reduced inpatient diagnostic testing, and reduced use of specialist consultations. Other incentives may include increased coordination of care, improved transitions of patients across care settings, and the development of targeted case management of high-risk patients. These activities should not result in a decline in quality of care.

Since these incentives may affect quality of care across multiple dimensions of care, we analyzed a range of quality measures. Three data sources have been used in previous CMS quality monitoring efforts: (1) Medicare claims, (2) medical records abstractions, and (3) beneficiary surveys. For this analysis, we utilize each of these data sources: claims-based quality measures (presented below) as well as measures based on data abstracted from medical records or data from patient surveys (presented in the following chapter). The quality measures presented below and in the following chapter are for the base year (calendar year 2007) before the introduction of gainsharing at each hospital. Subsequent analyses will compare the base year to postimplementation years to assess the impact of the demonstration on these measures of quality.

4.1 Methods and Data

Quality Indicators from the Agency for Healthcare Quality and Research— Administrative claims are a cost-effective means of measuring provider quality. Claims data are routinely collected as part of the delivery of hospital services and are therefore widely available and do not require additional data collection. These data include information on diagnoses, procedures, age, gender, admission source, and discharge status. AHRQ developed quality indicators (QIs), four modules that rely solely on inpatient claims data, to measure quality of care in inpatient or outpatient settings.

Two QI modules are relevant to the current analysis: inpatient quality indicators (IQIs) and patient safety indicators (PSIs). IQIs include inpatient mortality for selected medical conditions and surgical procedures, utilization rates for selected procedures (where there may be a question of over-, under-, or misuse), and volume rates for selected procedures (where a high volume may be associated with lower mortality). PSIs are risk-adjusted rates of potentially avoidable complications and iatrogenic events (e.g., postoperative complications, death in low-mortality DRGs, and decubitous ulcers).[7] We recalibrated the software to use the 2007-2008

[7] See: http://www.qualityindicators.ahrq.gov/ for more information.

Medicare population as the reference population.[8] In addition to inpatient mortality (IQIs) and complications (PSIs), we examine simpler measures as well: LOS, 30-day mortality, and readmissions. We stratified LOS and 30-day mortality by patient severity (described below).

Data used for the quality outcomes and analyses come from Medicare Part A inpatient claims from December 2006 through January 2008. The baseline evaluation period is calendar year 2007. The level of analysis is the episode of care. We built quality analytical files from the episode of care finder files jointly developed with Medicare claims (standardized to CMS DRG Version 24 codes) from the Data Extraction System (DESY) pulls by RTI and ARC. An episode of care is generally defined as the period beginning 14 days before the date of a qualifying admission and ending 30 days after discharge (thus requiring some data from December 2006 and January 2008).[9] Claims data were pulled for beneficiaries receiving care from either the intervention hospitals (CAMC and BIMC) or their comparison hospitals. At CAMC and its 10 comparison hospitals, on the basis of the demonstration design, the episodes were limited to those with specific cardiac DRGs, resulting in 882 episodes for CAMC and 6,099 for its comparison group. BIMC had 9,089 episodes and its 16 comparison hospitals had 77,768.

The sample consists of Medicare fee-for-service beneficiaries who have been continuously enrolled in both Medicare Part A and Part B and who have Medicare as the primary payer. Excluded from the analysis are beneficiaries enrolled in Medicare Part C; beneficiaries with end-stage renal disease; and beneficiaries receiving hospice care. Using the ID established for each episode of care, as well as the associated admission and discharge dates, we merged additional data needed to construct the quality analytical files (such as information on beneficiary race, State and county of residence, discharge status, details of admission, diagnoses coded, and procedures performed) from Standard Analytical File claims.

A number of variables were then constructed (including LOS, 30-day mortality, and discharge quarter). Certain variables (such as race, admissions source, and primary payer) were then recoded to match the AHRQ QI software specifications. Once constructed and validated, the quality analytic file was then processed with the QI software to risk-adjust the data and calculate the quality measures.

30-day Postdischarge Methodology—As described above, the Medicare Gainsharing Demonstration could potentially provide an incentive to reduce patients' LOS. Although there are likely many cases in which a patient's LOS is longer than medically necessary because of hospital inefficiencies (e.g., the physician not being available to sign discharge orders) that could be improved as a result of the gainsharing agreement between hospitals and physicians, there are also possibly cases in which a shorter LOS may not be medically appropriate (a quality consideration) and could lead to readmission or shifting of care to another facility (which would affect the cost to Medicare).

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8 See: http://www.qualitynet.org for more information.

9 In the case of a beneficiary who is an inpatient of a hospital or skilled nursing facility, or who is covered by home health on the date that an episode of care would otherwise begin, the episode will begin on the day after discharge. Same-day transfers in from another IPPS hospital are excluded. Transfers from a skilled nursing facility or home health create a new episode. Same-day IPPS transfers out terminate the episode of care.

To account for these possibilities, the demonstration design utilizes a 30-day postdischarge methodology to define an episode of care. This accounts for readmissions to the same hospital as well as costs associated with postdischarge care. Thus, when considering savings to Medicare, the costs for the entire episode, and not simply the hospital stay, are considered. Because quality is an issue as well, indicators such as LOS, 30-day mortality, and readmissions within 30 days of discharge can be measured in addition to IQIs.[10]

***Risk Adjustment*—**The AHRQ QI software uses the APR-DRG risk adjustment grouper developed by 3M Corporation to risk-adjust all data for patient severity (mortality risk). The grouper generates a severity score for each episode of care. There are four subclasses of mortality risk, 1 through 4, with 1 representing minor risk of mortality and 4 representing extreme risk of mortality.[11]

***Limitations*—**Although claims provide a cost-effective, easily accessible source of quality data, they are not without limitations. There is particular concern about the limitations of claims for measuring many process measures (and patient risk factors) because of their limited clinical information. We address this concern by balancing use of claims-based quality measures with those based on medical chart abstraction and patient surveys; these are both presented in the following chapter. In addition, the measures generated by the QI software are not standardized, and therefore they are not appropriate for direct comparison between hospitals. The software generates observed, expected, and risk-adjusted rates of mortality or other outcome (described below). Although employing an indirect standardization (by focusing on the ratio of observed to expected rates) is ideal to address the lack of standardization and allow for some comparison, it becomes an issue when dealing with a sample that is not comparable to the Healthcare Cost and Utilization Project (HCUP) population used to calculated the expected and risk-adjusted rates. Because this study is on the Medicare population at selected hospitals, we present the observed rates below. Our future analysis will focus on relative *changes* in quality indicator performance, comparing the demonstration and comparison sites. Our focus is not, therefore, on the actual rates per se. Finally, many conditions and procedures have only a small

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10 30-day mortality is calculated on the basis of date of admission, not date of discharge.

11 APR-DRGs are an enhanced extension of the basic DRG concept developed by 3M's Clinical Research Group, the National Association of Children's Hospitals and Research Institutes, and several physician groups.

Whereas DRGs focus on the Medicare population, APR-DRGs describe a complete cross-section of acute care patients and are specifically designed to adjust data for severity of illness (How sick is the patient?) and risk of mortality (How likely is it that the patient will die?). The fundamental principle of APR-DRGs is that the severity of illness and risk of mortality are both dependent on the patient's underlying condition. High severity of illness and risk of mortality are characterized by multiple serious diseases and the interactions between the disorders.

The 3M APR-DRG methodology is the most widely used severity-of-illness and risk-of-mortality adjustment tool available today. It has become the standard for adjusting large volumes of data to account for differences related to the individual's severity of illness or risk of mortality. As a result, the focus can be on the differences in clinical care, thus providing equitable comparisons of quality and cost of care. APR-DRGs are also recognized as the tool of choice by commissions, State agencies, and others who disseminate comparative performance data to regulators, payers, and the general public.

number of observations at the provider level. Small numbers are an issue, as the resulting confidence intervals of any estimate are wide and the estimate may not be very precise.

4.2 Length of Stay, 30-Day Mortality, and Readmissions Findings

We analyzed baseline (2007) measures of three patient outcomes: LOS, 30-day mortality, and readmissions. LOS is an obvious target for hospitals trying to achieve savings. We define LOS as the count of days in the hospital (including day of admission and day of discharge). Administrative inefficiencies could contribute to longer-than-necessary LOS. It is possible, however, that some patients may be discharged too soon, which could result in a readmission to the hospital or even death. Therefore we considered 30-day mortality (mortality that occurs within 30 days of the relevant discharge) and readmissions to the hospital as well. The measure of 30-day mortality is a flag (yes or no) indicating whether the patient died within 30 days of the admission that triggered the qualifying episode of care. We stratified LOS and 30-day mortality by three levels of patient severity: Low (APR-DRG severity score of 0), Moderate (APR-DRG severity score of 1 or 2), and Severe (APR-DRG severity score of 3 or 4).

A readmission is based on the discharge associated with the qualifying episode of care admission. It is defined as an inpatient hospital admission, to any facility that occurs at least 1 day after and within 30 days of the related discharge. We stratified readmissions by the readmission DRG: same or different from the DRG coded in the initial admission for the episode.

4.2.1 Charleston Area Medical Center

Baseline measures of average LOS by patient severity for CAMC and its comparison hospitals (as a group) are presented in ***Table 9***. Both weighted and unweighted results are presented for each level of stratification. DRG relative weights are used to adjust the LOS measures for case mix. A comparison between the two measures (weighted and unweighted) will indicate whether the hospital has shorter or longer LOS than would be expected based on its case mix. If the weighted value for ALOS is greater than the unweighted value, then the hospital had a longer ALOS than would be expected given its case mix.

For each level of severity, the weighted ALOS is longer than the unweighted measure for CAMC. As described above, this indicates that patients at CAMC had longer ALOS than expected given its case mix. This is true of both the moderate and severe strata for the comparison group. Among episodes of low severity, the ALOS is about equal, which signifies that the comparison group had ALOS close to what was expected given the case mix.

Rates of 30-day mortality (with and without DRG relative weights) by level of severity are presented in ***Table 10***. Both CAMC and its comparison hospitals have higher weighted rates relative to their unweighted rates among low-severity episodes. This shows that more patients categorized as low severity died within 30 days of admission than would be expected based on the case mix. CAMC did better than expected (as indicated by lower weighted measures) for the moderate and severe episodes. The comparison group had higher rates among moderate and severe episodes than would be expected given the case mix.

Table 9
Average length of stay by patient severity: Charleston Area Medical Center and comparison hospitals

Severity Level	CAMC *N*	CAMC LOS	CAMC min	CAMC max	Comparison Group *N*	Comparison Group LOS	Comparison Group min	Comparison Group max
Low (APR-DRG severity 0)								
unweighted	66	10.4	5.0	37.0	664	10.2	1.0	57.0
weighted	—	*10.5*	—	—	—	*10.2*	—	—
Moderate (APR-DRG severity 1 or 2)								
unweighted	571	8.0	1.0	30.0	4,118	6.1	1.0	35.0
weighted	—	*8.9*	—	—	—	*6.9*	—	—
Severe (APR-DRG severity 3 or 4)								
unweighted	245	13.7	1.0	63.0	1,330	11.9	1.0	92.0
weighted	—	*14.2*	—	—	—	*13.2*	—	—
Overall (weighted)	**—**	**10.9**	—	—	**—**	**9.0**	—	—

NOTE: Average length of stay (LOS) for each level of severity is reported unweighted and weighted (using DRG relative weights). If the weighted measure is higher than the unweighted measure, the hospital had a longer average LOS than expected for its case mix within the severity level (hence adjusting the LOS upward). APR-DRG, all patient refined diagnosis related group.

SOURCE: 2007 Medicare IPPS claims.

Table 10
30-day mortality rates by patient severity: Charleston Area Medical Center and comparison hospitals

Severity Level	CAMC *N* died	CAMC *N*	CAMC % died	Comparison Group *N* died	Comparison Group *N*	Comparison Group % died
Low (APR-DRG severity 0)						
unweighted	2	66	3.03	32	664	4.82
weighted	—	—	*3.05*	—	—	*5.11*
Moderate (APR-DRG severity 1 or 2)						
unweighted	3	571	0.53	30	4,118	0.73
weighted	—	—	*0.45*	—	—	*0.88*
Severe (APR-DRG severity 3 or 4)						
unweighted	18	245	7.35	93	1,330	6.99
weighted	—	—	*6.97*	—	—	*7.19*
Overall (weighted)	—	—	**2.81**	—	—	**3.11**

NOTE: 30-day mortality for each level of severity is reported unweighted and weighted (using DRG relative weights). If the weighted rate is higher than the unweighted measure, the hospital had a higher rate of 30-day mortality than expected for its case mix (hence adjusting the 30-day mortality upward). APR-DRG, all patient refined diagnosis related group.

SOURCE: 2007 Medicare IPPS claims.

Table 11 presents baseline readmissions for CAMC and its comparison hospitals. Readmissions are stratified by whether they were coded with the same or a different DRG than the qualifying admission that triggered the episode of care. For both CAMC and the comparison hospitals, nearly all of the readmissions are for different DRGs (99.2% for CAMC and 98.7% for the comparison group).[12] CAMC had 882 episodes of care in the base period, with 0.11% having a readmission with the same DRG and 14.74% having a readmission with a different DRG. The 10 comparison hospitals had 6,099 episodes in total, with 0.21% having a readmission with the same DRG and 15.72% having a readmission with a different DRG.

Table 11
30-day readmission rates by readmission diagnosis related group: Charleston Area Medical Center and comparison hospitals

Readmission DRG	CAMC *882 episodes of care* *N*	CAMC *882 episodes of care* % readmit	Comparison Group *6,099 episodes of care* *N*	Comparison Group *6,099 episodes of care* % readmit
Same DRG	1	0.11	13	0.21
Different DRG	130	14.74	959	15.72
Total	**131**	**14.85**	**972**	**15.94**

NOTE: Only one readmission is counted per episode of care. % readmit is the percentage of episodes of care that had at least one readmission within 30 days of the discharge associated with the admission that triggered the episode of care.

SOURCE: 2007 Medicare IPPS claims. DRG, diagnosis related group.

4.2.2 Beth Israel Medical Center

Table 12 presents ALOS by patient severity for BIMC and its comparison hospitals (as a group) in the base year. DRG relative weights are used to adjust the LOS measures for case mix, and both weighted and unweighted results are presented for each level of stratification. The weighted ALOS is higher than the unweighted measure for BIMC at each level of severity. described above, patients at BIMC had longer ALOS than expected given its case mix. This is true of both the low and moderate levels of severity for the comparison group. Among the sickest patients, the weighted ALOS is shorter, which signifies that the comparison group had ALOS close to what was expected given the case mix.

[12] These numbers, not presented in the table, are calculated by dividing the number from the same DRG by the total number (for CAMC: 130/131 = 0.9924, or 99.2%; for the comparison group: 959/972 = 0.9866, or 98.7%).

Table 12
Average length of stay by patient severity: Beth Israel Medical Center and comparison hospitals

Severity Level	BIMC LOS	BIMC min	BIMC max	Comparison Group LOS	Comparison Group min	Comparison Group max
Low (APR-DRG severity 0)						
unweighted	6.0	1.0	88.0	6.6	1.0	321.0
weighted	*7.4*	—	—	*9.1*	—	—
Moderate (APR-DRG severity 1 or 2)						
unweighted	6.2	1.0	72.0	5.9	1.0	186.0
weighted	*7.2*	—	—	*6.6*	—	—
Severe (APR-DRG severity 3 or 4)						
unweighted	13.9	1.0	161.0	14.4	1.0	324.0
weighted	*22.5*	—	—	*11.5*	—	—
Overall (weighted)	**10.2**	—	—	**12.2**	—	—

NOTE: Average length of stay (LOS) for each level of severity is reported unweighted and weighted (using DRG relative weights). If the weighted measure is higher than the unweighted measure, the hospital had a longer average LOS than expected for its case mix (hence adjusting the LOS upward). APR-DRG, all patient refined diagnosis related group.

SOURCE: 2007 Medicare IPPS claims.

Rates of 30-day mortality (with and without DRG relative weights) by level of severity are presented in ***Table 13***. Both BIMC and its comparison hospitals have higher weighted rates relative to their unweighted rates among low-severity episodes. This indicates that more patients categorized as low severity died within 30 days of admission than would be expected based on the case mix. Among moderately severe patients, BIMC had more deaths within 30 days of admission than expected, but it did better than expected (as indicated by a lower weighted measure) for the severe episodes. The comparison group had lower rates among moderate and severe episodes of care than would be expected given the case mix.

Table 13
30-day mortality rates by patient severity: Beth Israel Medical Center and comparison hospitals

Severity Level	BIMC No. died	BIMC *N*	BIMC % died	Comparison Group No. died	Comparison Group *N*	Comparison Group % died
Low (APR-DRG severity 0)						
unweighted	96	4,635	2.07	1,139	36,025	3.16
weighted	—	—	*2.80*	—	—	*4.20*
Moderate (APR-DRG severity 1 or 2)						
unweighted	91	3,569	2.55	658	30,887	2.13
weighted	—	—	*3.00*	—	—	*2.09*
Severe (APR-DRG severity 3 or 4)						
unweighted	214	885	24.18	2,320	10,855	21.37
weighted	—	—	*24.10*	—	—	*20.50*
Overall (weighted)	—	—	**6.98**	—	—	**7.52**

NOTE: 30-day mortality for each level of severity is reported unweighted and weighted (using DRG relative weights). If the weighted rate is higher than the unweighted measure, the hospital had a higher rate of 30-day mortality than expected for its case mix (hence adjusting the 30-day mortality upward). APR-DRG, all patient refined diagnosis related group.

SOURCE: 2007 Medicare IPPS claims.

Baseline readmissions for BIMC and its comparison hospitals are shown in ***Table 14***. A large portion of readmissions for both BIMC and its comparison hospitals are for different DRGs (83.4% for BIMC and 85.4% for the comparison group).[13] BIMC had 9,089 episodes of care in the base period, with 3.15% having a readmission with the same DRG and 15.83% having a readmission with a different DRG. The comparison hospitals had a total of 77,768 episodes, with 2.69% having a readmission with the same DRG and 15.69% having a readmission with a different DRG.

Table 14
30-day readmission rates by readmission DRG: Beth Israel Medical Center and comparison hospitals

Readmission DRG	BIMC *9,089 episodes of care* *N*	BIMC *9,089 episodes of care* % readmit	Comparison Group *77,768 episodes of care* *N*	Comparison Group *77,768 episodes of care* % readmit
Same DRG	286	3.15	2,092	2.69
Different DRG	1,439	15.83	12,202	15.69
Total	**1,725**	**18.98**	**14,294**	**18.38**

NOTE: Only one readmission is counted per episode of care. % readmit is the percent of episodes that had at least one readmission within 30 days of the discharge associated with the admission that triggered the episode of care. DRG, diagnosis related group.

SOURCE: 2007 Medicare inpatient prospective payment system claims.

4.3 Inpatient Quality Indicator Findings

The AHRQ IQIs are a set of measures providing rates of volume of specific high-technology, or highly complex, procedures; mortality indicators for certain inpatient procedures; mortality indicators for certain inpatient conditions; and utilization rates for certain procedures that vary greatly across hospitals. Our analysis is focused on specific mortality rates.

Charleston Area Medical Center

Because CAMC chose to limit its focus to specific cardiac DRGs, only those cardiac-related IQIs can be measured. In particular, we measure the following three mortality rates:

- Condition-specific rates
  - Acute myocardial infarction (AMI)

[13] These numbers, not presented in the table, are calculated by dividing the number from the same DRG by the total number (for BIMC: 1,439/1,725 = 0.8342, or 83.4%; for the comparison group: 12,202/14,294 = 0.8536, or 85.4%).

- Congestive heart failure (CHF)

- Procedure-specific rates
  - Coronary artery bypass graft (CABG)

The AHRQ software generates observed, expected, risk-adjusted, and smoothed mortality rates. We focus on the observed rates and will, over time, analyze how these rates change in the demonstration and comparison sites after gainsharing is implemented. For each condition and procedure listed above, the observed rate is the actual number of deaths per 1,000 patients admitted for that condition or procedure.

We compare the ratio of observed/expected for each mortality rate between CAMC and its 10 comparison hospitals as a group (see ***Table 15***). The rates for observed and expected are presented as the number of cases per 1,000 relevant episodes. Both CAMC and the comparison group did better than expected (i.e., the ratio of observed/expected was less than one – there were fewer deaths than expected) among AMI patients. CAMC had 32% fewer deaths than expected, while the comparison group overall had 15% fewer deaths among patients treated for AMI.

Table 15
Observed and expected mortality rates per 1,000 episodes for selected cardiac conditions and procedures: Charleston Area Medical Center and comparison hospitals

Cardiac Conditions and Procedures	CAMC	Comparison Group
AMI		
Number of deaths	40	203
Population at risk	661	3,334
Observed rate	60.66	60.99
Expected rate	89.79	72.12
Observed/expected rate	***0.68***	***0.85***
CHF		
Number of deaths	14	59
Population at risk	221	2,865
Observed rate	64.92	20.54
Expected rate	62.28	60.79
Observed/expected rate	***1.04***	***0.34***
CABG		
Number of deaths	99	444
Population at risk	2,517	12,234
Observed rate	39.26	44.18
Expected rate	46.71	42.04
Observed/expected rate	***0.84***	***1.05***

NOTE: Observed/Expected <1 indicates better than expected performance or fewer than expected deaths. Expected rate based on risk-adjusted AHRQ IQI methodology, with reference population calibrated to Medicare population.

SOURCE: 2007 Medicare IPPS claims.

The ratio of observed to expected mortality rates among CHF patients varies between CAMC and the comparison group. While CAMC had slightly more deaths than expected (4%) among patients with congestive heart failure, the comparison group had 66% fewer deaths than expected. Among patients admitted to receive a CABG, however, there were 16% fewer deaths than expected at CAMC while the comparison group had approximately 5% more deaths than expected.

Beth Israel Medical Center

BIMC did not include restrictions a large number of DRGs for participation in the demonstration. Therefore, the episodes of care may come from any DRG. This allows for analysis of more IQIs than was possible for CAMC. For BIMC, we measure the following six condition-specific mortality rates, presented in ***Table 16:***

- Acute myocardial infarction (AMI)
- Congestive heart failure (CHF)
- Stroke
- Gastrointestinal hemorrhage
- Hip fracture
- Pneumonia

We compare the ratio of observed/expected mortality rate for the 6 conditions above between BIMC and the group of comparison hospitals (see ***Table 16***, below). Among patients admitted for AMI, there were fewer deaths than expected at both BIMC and the comparison hospitals. The comparison hospitals had 3% fewer deaths than expected, and BIMC had 23% fewer. This finding shifts at BIMC for CHF patients – in this case BIMC did considerably worse than expected relative to its comparison group. BIMC had more than the expected number of deaths (28%) while the comparison group had 2% fewer deaths as expected among patients admitted for CHF.

The ratio of observed/expected mortality rates among stroke patients was very similar for BIMC (1.33) and the comparison group (1.32). Among patients admitted for GI hemorrhage, BIMC did much better than expected while the comparison hospitals as a group performed considerably worse than expected. At BIMC, there were 43% fewer deaths than expected. Among the group of comparison hospitals, 40% more patients with GI hemorrhage died than was expected.

Table 16
Observed and expected mortality rates per 1,000 episodes for selected conditions: Beth Israel Medical Center and comparison hospitals

Selected Conditions and Procedures	BIMC	Comparison Group
AMI		
Number of deaths	36	397
Population at risk	388	3,216
Observed rate	93.45	123.53
Expected rate	121.70	127.98
Observed/expected rate	***0.77***	***0.97***
CHF		
Number of deaths	42	368
Population at risk	669	6,277
Observed rate	63.23	58.56
Expected rate	49.51	59.89
Observed/expected rate	***1.28***	***0.98***
CABG		
Number of deaths	42	42
Population at risk	669	669
Observed rate	63.23	63.23
Expected rate	49.51	49.51
Observed/expected rate	***1.28***	***1.28***
Stroke		
Number of deaths	48	595
Population at risk	293	3,182
Observed rate	163.29	186.83
Expected rate	122.77	141.28
Observed/expected rate	***1.33***	***1.32***
GI Hemorrhage		
Number of deaths	7	171
Population at risk	229	2,164
Observed rate	30.99	79.03
Expected rate	54.76	56.52
Observed/expected rate	***0.57***	***1.40***
Hip Fracture		
Number of deaths	3	116
Population at risk	225	2,162
Observed rate	11.87	53.46
Expected rate	25.81	46.46
Observed/expected rate	***0.46***	***1.40***
Pneumonia		
Number of deaths	68	453
Population at risk	494	3,622
Observed rate	138.17	125.18
Expected rate	132.16	138.78
Observed/expected rate	***1.05***	***0.90***

NOTE: Observed/Expected <1 indicates better than expected performance or fewer than expected deaths. Expected rate based on risk-adjusted AHRQ IQI methodology, with reference population calibrated to Medicare population

SOURCE: 2007 Medicare IPPS claims.

Similarly, BIMC's outcome were much better than expected (54% fewer deaths) among patients admitted with a hip fracture while the comparison hospitals did much worse than expected (40% more deaths) among that group of patients. The difference in performance for BIMC and the comparison hospitals was much narrower for pneumonia patients. BIMC had 5% more deaths than expected while the comparison hospitals as a group had 10% fewer deaths than expected.

4.4 Patient Safety Indicator Findings

The AHRQ PSIs are a set of measures providing rates of potentially preventable complications and other iatrogenic events that occur in the hospital setting. These are limited to cases in which a secondary diagnosis code indicates a potentially preventable complication. The PSIs include 20 provider-level indicators and 7 area-level indicators. We focus on the following 13 indicators that are appropriate for the Medicare population:

- Death in low-mortality DRGs*
- Pressure ulcer
- Death among surgical patients
- Iatrogenic pneumothorax
- Central venous catheter-related bloodstream infections
- Postoperative hip fracture
- Postoperative hemorrhage or hematoma
- Postoperative physiologic and metabolic derangements
- Postoperative respiratory failure
- Postoperative pulmonary embolism or deep vein thrombosis
- Postoperative sepsis
- Postoperative wound dehiscence
- Accidental puncture or laceration

*NOTE: Death in low-mortality DRGs is not applicable to CAMC.

The AHRQ software generates observed, expected, and risk-adjusted rates of complications. For the IQIs, we calculate an indirect standardization of the data and focus on the ratio of observed to expected rates. For each complication listed above, the observed rate is the actual number of occurrences per 10,000 patients, whereas the expected rate is an adjusted rate that uses national weights of the probability of death for all patients in the risk pool. If the observed/expected ratio is less than 1, the hospital performed better than expected given its case mix. In the case of complications, worse-than-expected performance means that more complications occurred than were expected.

Charleston Area Medical Center

As noted above, the rate of death in low-mortality DRGs is not applicable to CAMC (because of its focus on selected cardiac DRGs). ***Table 17*** presents the 12 relevant PSI measures for CAMC and the group of its comparison hospitals. There were no cases of postoperative hip fracture, respiratory failure or postoperative wound dehiscence at CAMC or any of its comparison hospitals.

Table 17
Observed and expected rates per 10,000 episodes for selected complications: Charleston Area Medical Center and comparison hospitals

Selected Complications	CAMC	Comparison Group
Pressure ulcer		
Number of deaths	29	40
Population at risk	2,968	15,455
Observed rate	96.30	25.58
Expected rate	124.54	120.64
Observed/expected rate	***0.77***	***0.21***
Death among surgical patients		
Number of deaths	5	122
Population at risk	126	629
Observed rate	366.71	1941.71
Expected rate	1054.14	1150.65
Observed/expected rate	***0.35***	***1.69***
Iatrogenic pneumothorax		
Number of deaths	29	130
Population at risk	1,410	12,484
Observed rate	204.07	103.91
Expected rate	35.38	39.78
Observed/expected rate	***5.77***	***2.61***
Central venous catheter-related bloodstream infections		
Number of deaths	5	33
Population at risk	3,389	22,515
Observed rate	14.83	14.69
Expected rate	40.57	40.51
Observed/expected rate	***0.37***	***0.36***
Postoperative hip fracture		
Number of deaths	0	0
Population at risk	2,640	18,174
Observed rate	0.00	0.00
Expected rate	4.01	3.57
Observed/expected rate	***0.00***	***0.00***
Postoperative hemorrhage or hematoma		
Number of deaths	11	20
Population at risk	2,663	18,410
Observed rate	42.69	11.08
Expected rate	37.44	38.06
Observed/expected rate	***1.14***	***0.29***
Postoperative physiologic and metabolic derangements		
Number of deaths	0	6
Population at risk	1,165	10,125
Observed rate	0.00	5.98
Expected rate	133.32	157.14
Observed/expected rate	***0.00***	***0.04***

(continued)

Table 17 (continued)
Observed and expected rates per 10,000 episodes for selected complications: Charleston Area Medical Center and comparison hospitals

Selected Complications	CAMC	Comparison Group
Postoperative respiratory failure		
Number of deaths	0	0
Population at risk	31	321
Observed rate	0.00	0.00
Expected rate	261.80	140.41
Observed/expected rate	***0.00***	***0.00***
Postoperative pulmonary embolism or deep vein thrombosis		
Number of deaths	50	168
Population at risk	2,660	18,398
Observed rate	187.33	91.12
Expected rate	114.26	118.79
Observed/expected rate	***1.64***	***0.77***
Postoperative sepsis		
Number of deaths	0	81
Population at risk	999	6,538
Observed rate	0.00	123.16
Expected rate	140.34	136.67
Observed/expected rate	***0.00***	***0.90***
Postoperative wound dehiscence		
Number of deaths	0	0
Population at risk	42	149
Observed rate	0.00	0.00
Expected rate	30.78	30.96
Observed/expected rate	***0.00***	***0.00***
Accidental puncture or laceration		
Number of deaths	12	206
Population at risk	3,612	24,251
Observed rate	33.13	84.75
Expected rate	77.71	73.67
Observed/expected rate	***0.43***	***1.15***

NOTE: Observed/Expected <1 indicates better than expected performance or fewer than expected occurrences. Expected rate based on risk-adjusted AHRQ IQI methodology, with reference population calibrated to Medicare population

SOURCE: 2007 Medicare IPPS claims.

CAMC and the group of comparison hospitals had fewer cases of pressure ulcer than expected (approximately 23% and 79% fewer, respectively). Whereas CAMC had 65% fewer than expected deaths among surgical patients, its comparison group had 69% more deaths than expected. The rates of iatrogenic pneumothorax are much higher than expected for both CAMC and the comparison hospitals (almost 6 times more and more than 2.5 times more, respectively).

Central venous catheter-related bloodstream infections occurred 63% less frequently than expected at CAMC and 64% less than expected among the comparison group hospitals. There

were 71% fewer postoperative hemorrhages or hematomas than were expected among the group of comparison hospitals, whereas CAMC had 14% more occurrences than expected.

Patients at CAMC experienced postoperative pulmonary embolism or deep vein thrombosis 64% more often than expected, whereas the comparison hospitals had 23% fewer occurrences than expected. Accidental puncture or laceration, however, occurred more often than expected in the comparison hospitals (by 15%), whereas patients at CAMC had 57% fewer cases than expected.

Beth Israel Medical Center

Observed and expected rates of the 13 PSIs listed above are presented in ***Table 18***. As in the analysis of CAMC, both BIMC and the group of comparison hospitals have mixed results, in some cases doing better than expected and in others much worse. BIMC had no cases of postoperative physiologic and metabolic derangements, whereas its comparison hospitals had 84% fewer cases than expected. There were no cases of postoperative hip fracture among surgical patients at BIMC while the group of comparison hospitals 14% fewer cases than expected. No surgical patients at BIMC experienced sepsis while 70% more patients than expected contracted sepsis among the group of comparison hospitals. The rate per 10,000 patients of deaths in low-mortality DRGs is much lower at BIMC than among the group of comparison hospitals (52.69 versus 158.93, respectively).

In several cases BIMC and its comparison hospitals both did worse than expected. Pressure ulcer occurred 53% more frequently than expected at BIMC and 86% more frequently than expected at the comparison hospitals. Cases of iatrogenic pneumothorax were 127% more frequent than expected at BIMC and 71% more frequent than expected for the comparison group. Post-operative respiratory failure occurred over 2 times more frequently than expected at BIMC and 77% more frequently than expected at the comparison hospitals. There were 13% and 58% more cases of pulmonary embolism or DVT than expected at BIMC and among the comparison hospitals, respectively.

On some measures BIMC had higher than expected occurrences of adverse patient safety events relative to the comparison sites. BIMC had 28% more cases than expected of central venous catheter-related bloodstream infections, whereas the comparison group had 30% fewer cases than expected. On other PSI measures, BIMC performed better than the comparison group. Patients at BIMC experienced hemorrhage or hematoma after surgery 77% less often than expected, while at the comparison hospitals this occurred 13% more often than expected. Patients experienced postoperative wound dehiscence 18% less often than expected at BIMC and 11% more often than expected at the comparison hospitals. Deaths among surgical patients occurred 60% less frequently than expected at BIMC in contrast with 18% more often than expected at the comparison hospitals. Patients experienced accidental puncture or laceration 15% less often than expected at BIMC and 21% more frequently than expected among the comparison hospitals.

Table 18
Observed and expected rates per 10,000 episodes for selected complications: Beth Israel Medical Center and comparison hospitals

Selected Complications	BIMC	Comparison Group
Death in low-mortality DRGs		
Number of deaths	5	140
Population at risk	982	8,789
Observed rate	52.69	158.93
Expected rate	-	-
Observed/expected rate	***-***	***-***
Pressure ulcer		
Number of deaths	402	5,228
Population at risk	6740	65558
Observed rate	596.96	797.50
Expected rate	391.38	427.90
Observed/expected rate	***1.53***	***1.86***
Death among surgical patients		
Number of deaths	15	679
Population at risk	179	2970
Observed rate	829.65	2285.41
Expected rate	2056.72	1941.95
Observed/expected rate	***0.40***	***1.18***
Iatrogenic pneumothorax		
Number of deaths	21	179
Population at risk	10223	98071
Observed rate	20.82	18.28
Expected rate	9.18	10.68
Observed/expected rate	***2.27***	***1.71***
Central venous catheter-related bloodstream infections		
Number of deaths	29	197
Population at risk	8705	82646
Observed rate	33.02	23.85
Expected rate	25.72	34.18
Observed/expected rate	***1.28***	***0.70***
Postoperative hip fracture		
Number of deaths	0	17
Population at risk	2,722	35,914
Observed rate	0.00	4.67
Expected rate	5.05	5.42
Observed/expected rate	***0.00***	***0.86***
Postoperative hemorrhage or hematoma		
Number of deaths	3	192
Population at risk	3,934	48,387
Observed rate	7.21	39.66
Expected rate	31.46	35.04
Observed/expected rate	***0.23***	***1.13***

(continued)

Table 18 (continued)
Observed and expected rates per 10,000 episodes for selected complications: Beth Israel Medical Center and comparison hospitals

Selected Complications	BIMC	Comparison Group
Postoperative physiologic and metabolic derangements		
Number of deaths	0	25
Population at risk	1546	21,795
Observed rate	0.00	11.42
Expected rate	67.12	72.05
Observed/expected rate	***0.00***	***0.16***
Postoperative respiratory failure		
Number of deaths	69	501
Population at risk	1,166	12,248
Observed rate	592.36	409.41
Expected rate	184.63	231.39
Observed/expected rate	***3.21***	***1.77***
Postoperative pulmonary embolism or deep vein thrombosis		
Number of deaths	60	1,101
Population at risk	3849	47,131
Observed rate	156.06	233.55
Expected rate	138.59	147.39
Observed/expected rate	***1.13***	***1.58***
Postoperative sepsis		
Number of deaths	0	198
Population at risk	491	7,973
Observed rate	0.00	247.85
Expected rate	138.00	145.76
Observed/expected rate	***0.00***	***1.70***
Postoperative wound dehiscence		
Number of deaths	1	31
Population at risk	734	9,068
Observed rate	19.56	34.43
Expected rate	23.74	30.90
Observed/expected rate	***0.82***	***1.11***
Accidental puncture or laceration		
Number of deaths	29	541
Population at risk	11,063	110,201
Observed rate	26.29	49.06
Expected rate	30.78	40.66
Observed/expected rate	***0.85***	***1.21***

NOTE: Observed/Expected <1 indicates better than expected performance or fewer than expected occurrences. Expected rate based on risk-adjusted AHRQ IQI methodology, with reference population calibrated to Medicare population

SOURCE: 2007 Medicare IPPS claims

4.5 Summary of Findings

The findings presented above are based on 2007 Medicare IPPS claims. These represent baseline data and will be compared with data from post implementation years in future analyses to assess the impact of the demonstration. If the demonstration has the desired impact, we should see improvements in rates (both overall and relative to expectations) in BIMC and CAMC. A difference-in-differences approach will estimate the relative change in outcome performance according to these measures (positive or negative) due to the demonstration. Since it is never possible to obtain perfectly matched comparison groups, particularly across these ranges of clinical diagnoses, our future analyses will focus entirely on the relative change in performance experience by the CAMC and BIMC relative to their respective comparison groups. If the demonstration proceeds as envisioned by the sites, their change in performance on these measures should occur at the same (or improved) rates relative to the comparison groups.

SECTION 5
BASELINE QUALITY OF CARE: MEDICAL RECORD ABSTRACTIONS AND SURVEY-BASED INDICATORS

The previous section presented quality measures derived from inpatient claims data. Claims-based measures present an outcome-focused picture of quality of care. Quality of care, however, can be interpreted more broadly to include patient experience. Therefore, in this section we present baseline quality measures from two additional sources: medical records abstractions and beneficiary surveys. The measures presented represent findings for the base analysis year (calendar year 2007). Because of lag times in data collection and reporting, these are the most recent data available for this report. These analyses will be repeated for the postimplementation years (2008 through 2011) and the results will be presented in the final evaluation report to Congress.

5.1 Methods and Data

Medical Record Abstractions—although claims data are able to provide measures of various patient outcomes that result from the provision of health care, they offer only limited insight into *how* that care was provided. To fully assess the impact of the Medicare Gainsharing Demonstration on quality of care, it is also necessary to examine possible changes in how care has been delivered in the demonstration and comparison hospitals. This level of detail necessary to generate information on process of care is available in patient medical records.

Currently, CMS has a number of hospital based quality initiatives that yield data sets that were applicable for this evaluation. The first of these initiatives is the Reporting Hospital Quality Data for Annual Payment Update (RHQDAPU) program. Originally mandated by Section 501(b) of the Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003, the RHQDAPU program collects data on designated quality measures from hospitals. Hospitals that successfully report designated quality measures are eligible for a higher annual update to their payment rates. Reported to CMS quarterly, RHQDAPU data include 27 measures related to process of care for three conditions that are common to Medicare beneficiaries and often require hospitalization, as well as on processes relevant to the Surgical Care Improvement Project (SCIP).[14]

The three conditions covered by RHQDAPU are AMI, heart failure (HF), and pneumonia. There are eight measures related to AMI care, four measures related to HF care, seven measures that address pneumonia care, and seven measures related to SCIP. Each of these evidence-based measures assesses treatment processes that are related to positive outcomes. Data from a sample of patient charts are converted to rates. The construct of each measure is such that more is better (e.g., achieving a rate of 100% indicates that a particular process of care was followed for each patient in the sample). RHQDAPU data submissions must meet strict criteria. The data are validated and standardized, allowing for comparison between hospitals.

Survey-Based Indicators—In addition to understanding how care is delivered in the hospital setting, gaining insight into the patient experience is crucial to seeing a complete picture

[14] See http://www.qualitynet.org for an overview of the RHQDAPU program.

of hospital quality. Patient experience is an additional dimension of quality. Patients are consumers of health care and may have concerns in addition to those addressed by measures of outcome and process of care. Therefore, we also analyzed patient experience measures on 10 topics.

We used a second CMS quality initiative data set, the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, to measure quality from a different perspective. Endorsed by the National Quality Forum (NQF) in 2005, HCAHPS was developed through a partnership of CMS and AHRQ. HCAHPS data have been collected since 2006 and were first publicly reported in 2008. The survey is administered to a random sample of adult patients across medical conditions throughout each month of the year. It contains 27 questions that result in 10 measures: 6 summary measures, 2 individual measures, and 2 global measures. Although the data are collected by vendors hired by reporting hospitals, CMS provides quality oversight (e.g., inspecting survey administration procedures and analyzing submitted data). Four methods are available to hospitals for collecting data; CMS adjusts for this when standardizing scores for comparison across hospitals.[15]

***Limitations*—**Chart- and survey-based quality measures provide details about hospital quality that cannot be garnered from claims data, but these measures do have limitations. The data are drawn from a sample of patients that has the potential for bias. Although strict standards are upheld to ensure the quality of data and minimize the impact of bias, these methods may not succeed in eliminating all bias from the data.

The RHQDAPU and HCAHPS data are also not specific to particular service lines.[16] This is an issue because CAMC has limited its participation in the demonstration to a subset of cardiac DRGs. Insofar as quality improvements resulting from participation in the demonstration carry over to other physicians and other departments within CAMC, these measures may provide information on the impact of the demonstration. Any relationship between the demonstration and these quality measures is incomplete at best, and must be analyzed with that caveat.

5.2 Medical Record Abstraction Findings

The RHQDAPU data measure adherence to process of care standards for three conditions and SCIP. These processes are related to improved patient outcomes, and include the following:

- AMI (8 measures)
  - Aspirin at arrival
  - Aspirin prescribed at discharge

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15 See http://www.cms.gov/HospitalQualityInits/Downloads/HospitalHCAHPSFactSheet201007.pdf.

16 While AMI and HF are cardiac conditions, they may be treated in multiple departments (e.g., emergency room, cardiac unit, or medical-surgical unit).

  - Angiotensin converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB) for left ventricular systolic dysfunction (LVSD)
  - Beta blocker at discharge
  - Beta blocker at arrival
  - PCI received within 90 minutes of hospital arrival
  - Smoking cessation advice and counseling
- HF (4 measures)
  - Evaluation of left ventricular systolic (LVS) function
  - ACE inhibitor or ARB for LVSD
  - Smoking cessation advice and counseling
  - Discharge instructions
- Pneumonia (7 measures)
  - Oxygenation assessment
  - Pneumococcal vaccination
  - Blood cultures performed in the emergency department before initial antibiotic received in hospital
  - Smoking cessation advice and counseling
  - Initial antibiotic received within 6 hours of hospital arrival
  - Initial antibiotic selection for community-acquired pneumonia (CAP) in immunocompetent patient;
  - Influenza vaccination
- SCIP (7 measures)
  - Prophylactic antibiotic received within 1 hour before surgical incision
  - Prophylactic antibiotic selection for surgical patients
  - Prophylactic antibiotic discontinued within 24 hours after surgery end time
  - Surgery patients with recommended venous thromboembolism prophylaxis ordered

- Surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours before surgery to 24 hours after surgery

- Cardiac surgery patients with controlled 6:00 a.m. postoperative blood glucose

- Surgery patients with appropriate hair removal

In each case, the numerator is the number of patients receiving the intervention (e.g., aspirin at arrival for AMI patients). The denominator is the count of all relevant (e.g., AMI in the numerator example) adult patients who are eligible for inclusion in the numerator (i.e., patients with a known aspirin allergy would be excluded from the numerator and denominator in the example above). The measure is then the percentage of eligible patients who receive the intervention. In addition to the individual measures, above, we calculated a composite measure for each topic (AMI, HF, pneumonia, and SCIP). The composite measure is calculated by summing the numerator and denominator for each measure in a topic and dividing numerator by denominator to get a rate.

We used quarterly RHQDAPU data provided by CMS. The four quarters of our base year (calendar year 2007) are summed to generate an annual rate. In certain cases data are available for fewer than four quarters; this is indicated in each table where applicable. To generate a rate for the comparison group, we summed the numerator and denominator for each measure across all four quarters and across each hospital. We then divided numerator by denominator to calculate the rate, which can be interpreted as the percentage of eligible patients across all of the comparison hospitals who received the intervention.

Charleston Area Medical Center

The process of care measures for CAMC and its group of comparison hospitals appear in ***Table 19.*** The AMI composite measure for both CAMC and its comparison hospitals is high (indicating higher quality of care), at 98% and 97%, respectively. The percentage of patients receiving the intervention is similarly high for each of the AMI measures, with one exception: primary PCI within 90 minutes of hospital arrival (58% and 79%, respectively). The denominator for this measure is small for CAMC and the group of comparison hospitals, which may affect the reliability of these measures.

Table 19
Hospital process of care measures: Charleston Area Medical Center and comparison hospitals

Process of Care Measures	CAMC No. patients	CAMC % receiving	Comparison Group No. patients	Comparison Group % receiving
AMI care				
Aspirin at arrival	447	99%	2,705	98%
Aspirin prescribed at discharge	1,082	99%	6,393	98%
ACE or ARB for LVSD	289	95%	1,402	90%
Adult smoking cessation advice and counseling	582	100%	2,718	99%
Beta blocker prescribed at discharge	1,077	100%	6,902	98%
Beta blocker at arrival[a]	244	95%	1,641	95%
Primary PCI received within 90 minutes of hospital arrival	55	58%	579	79%
AMI Composite Score	***3,777***	***98%***	***22,349***	***97%***
HF care				
Discharge instructions	648	94%	4,480	70%
Evaluation of LVS function	734	98%	5,347	94%
ACE inhibitor or ARB for LVSD	316	88%	2,155	87%
Adult smoking cessation advice and counseling	174	100%	1,071	97%
HF Composite Score	***1,872***	***95%***	***13,053***	***85%***
Pneumonia care				
Oxygenation assessment	643	100%	3,340	100%
Pneumococcal vaccination	515	87%	2,918	83%
Blood cultures performed in the emergency department before initial antibiotic received in hospital	514	93%	2,361	85%
Adult smoking cessation advice and counseling	285	97%	1,468	96%
Initial antibiotic received within 6 hours of hospital arrival[b]	249	88%	1,038	88%
Initial antibiotic selection for cap in immunocompetent patient	352	86%	1,679	88%
Influenza vaccination[b]	184	81%	1,144	82%
Pneumonia Composite Score	***2,742***	***91%***	***13,948***	***90%***

(continued)

Table 19 (continued)
Hospital process of care measures: Charleston Area Medical Center and comparison hospitals

Process of Care Measures	CAMC No. patients	CAMC % receiving	Comparison Group No. patients	Comparison Group % receiving
SCIP				
Prophylactic antibiotic received within 1 hour before surgical incision	1,443	91%	10,286	87%
Prophylactic antibiotic selection for surgical patients[a]	1,364	97%	7,909	95%
Prophylactic antibiotics discontinued within 24 hours after surgery end time	1,242	95%	9,711	85%
Surgery patients with recommended venous thromboembolism prophylaxis ordered[a]	762	94%	5,425	92%
Surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours before surgery to 24 hours after surgery[a]	762	92%	5,425	85%
Cardiac surgery patients with controlled 6 a.m. postoperative blood glucose[c]	309	93%	801	90%
Surgery patients with appropriate hair removal[c]	787	97%	3,684	96%
SCIP Composite Score	***6,669***	***94%***	***43,241***	***89%***

NOTE: The composite score is calculated by summing the numerator and denominator for each measure in a topic and then dividing numerator by denominator to get the rate.

[a] Rate based on 3 quarters of data.

[b] Rate based on 2 quarters of data.

[c] Rate based on 1 quarter of data.

ACE, angiotensin converting enzyme; AMI, acute myocardial infarction; ARB, angiotensin receptor blocker; HF, heart failure; LVS, left ventricular systolic; LVSD, left ventricular systolic dysfunction; PCI, percutaneous coronary intervention; SCIP, Surgical Care Improvement Project.

SOURCE: RTI analysis of 2007 Quarterly Reporting Hospital Quality Data for Annual Payment Update data.

The composite measure for the HF topic is 95% (i.e., 95% of HF patients received appropriate interventions) for CAMC and 85% for the comparison group. More than 90% of patients received each individual intervention at CAMC, except for ACE inhibitor or ARB for LVSD, which only 88% of patients receive (the comparison group provides this to 87% of eligible patients). Only 70% of HF patients in comparison hospitals receive discharge instructions, compared with 94% of patients at CAMC.

Both individual measures and the composite measure for pneumonia care are lower than expected at CAMC and the comparison hospitals. Although 100% of patients receive an oxygenation assessment in both cases, only 87% and 83% receive the pneumococcal vaccination at CAMC and its comparison hospitals, respectively. Similarly, rates of influenza vaccination are low at both CAMC (81%) and the group of comparison hospitals (82%). The number of patients having blood cultures drawn before initial dose of antibiotic is 85% in the comparison hospitals and 93% at CAMC. Both selection of initial antibiotic for CAP and dose within 6 hours of hospital arrival occur among fewer than 90% of patients. In particular, 88% of patients receive an initial dose of antibiotic within 6 hours at both CAMC and the comparison hospitals, whereas 86% and 88% of patients initially receive the most appropriate antibiotics at CAMC and the comparison hospitals, respectively.

The SCIP composite measure for CAMC indicates that 94% of patients are receiving the appropriate interventions to prevent surgical infections. More than 90% of CAMC surgical patients receive the intervention for each of the individual measures. Among the comparison hospitals, 89% of patients receive the appropriate interventions. Most interventions are received by 90% or more patients of the comparison hospitals, with the following exceptions. At the comparison hospitals, prophylactic antibiotics are received within 1 hour before surgical incision and discontinued within 24 hours of surgery end time by 87% and 85% of patients, respectively. Appropriate venous thromboembolism prophylaxis is received by 85% of patients.

Beth Israel Medical Center

The process of care measures for BIMC and its comparison hospitals (as a group) are presented in ***Table 20*****.** The AMI composite measure for BIMC indicates that 93% of AMI patients receive appropriate interventions. Among the comparison hospitals, 95% of patients with AMI receive the appropriate intervention. Patients receive the intervention at similar rates for each of the AMI measures, with one exception: primary PCI within 90 minutes of hospital arrival (33% and 73%, respectively). The denominator for this measure is relatively small for BIMC and the comparison hospitals, which may affect the reliability of this measure.

The composite measure for HF care is 83% for BIMC and 85% for the comparison group. Although three of the four individual measures are high for both BIMC (90% or higher) and the comparison hospitals (87% or higher), the percentage of patients receiving discharge instructions is low in each case (60% for BIMC and 70% for the comparison group).

Table 20
Hospital process of care measures: Beth Israel Medical Center and comparison hospitals

Process of Care Measures	BIMC No. patients	BIMC % receiving	Comparison Group No. patients	Comparison Group % receiving
AMI care				
Aspirin at arrival	197	94%	2,435	96%
Aspirin prescribed at discharge	207	97%	2,756	97%
ACE or ARB for LVSD	56	89%	791	89%
Adult smoking cessation advice and counseling	49	86%	735	92%
Beta blocker prescribed at discharge	221	96%	2,785	96%
Beta blocker at arrival[a]	131	94%	1,394	94%
Primary PCI received within 90 minutes of hospital arrival	18	33%	237	73%
AMI Composite Score	*881*	*93%*	*11,155*	*95%*
HF care				
Discharge instructions	243	60%	4,445	70%
Evaluation of LVS function	295	97%	5,557	97%
ACE inhibitor or ARB for LVSD	109	90%	2,120	87%
Adult smoking cessation advice and counseling	39	92%	741	91%
HF Composite Score	*686*	*83%*	*12,863*	*85%*
Pneumonia care				
Oxygenation assessment	186	99%	3,166	100%
Pneumococcal vaccination	117	71%	2,508	80%
Blood cultures performed in the emergency department before initial antibiotic received in hospital	170	96%	2,585	84%
Adult smoking cessation advice and counseling	52	85%	619	93%
Initial antibiotic received within 6 hours of hospital arrival[b]	79	89%	1,279	89%
Initial antibiotic selection for cap in immunocompetent patient	107	94%	1,559	90%
Influenza vaccination[b]	41	85%	826	90%
Pneumonia Composite Score	*752*	*91%*	*12,542*	*88%*

(continued)

Table 20 (continued)
Hospital process of care measures: Beth Israel Medical Center and comparison hospitals

Process of Care Measures	BIMC No. patients	BIMC % receiving	Comparison Group No. patients	Comparison Group % receiving
SCIP				
Prophylactic antibiotic received within 1 hour before surgical incision	455	92%	6,269	91%
Prophylactic antibiotic selection for surgical patients[a]	354	99%	5,041	95%
Prophylactic antibiotics discontinued within 24 hours after surgery end time	438	90%	5,932	83%
Surgery patients with recommended venous thromboembolism prophylaxis ordered[a]	260	97%	5,002	93%
Surgery patients who received appropriate venous thromboembolism prophylaxis within 24 hours before surgery to 24 hours after surgery[a]	260	94%	5,002	89%
Cardiac surgery patients with controlled 6 a.m. postoperative blood glucose[c]	37	95%	251	89%
Surgery patients with appropriate hair removal[c]	166	99%	2,037	91%
SCIP Composite Score	*1,970*	*94%*	*29,534*	*90%*

NOTE: The composite score is calculated by summing the numerator and denominator for each measure in a topic and then dividing numerator by denominator to get the rate.

[a] Rate based on 3 quarters of data.

[b] Rate based on 2 quarters of data.

[c] Rate based on 1 quarter of data.

ACE, angiotensin converting enzyme; AMI, acute myocardial infarction; ARB, angiotensin receptor blocker; HF, heart failure; LVS, left ventricular systolic; LVSD, left ventricular systolic dysfunction; PCI, percutaneous coronary intervention; SCIP, Surgical Care Improvement Project.

SOURCE: RTI analysis of 2007 Quarterly Reporting Hospital Quality Data for Annual Payment Update data.

Both individual measures and the composite measure for pneumonia care are lower than expected at BIMC and the comparison hospitals, with 91% and 88% of patients receiving appropriate interventions, respectively. Whereas 99% of BIMC and 100% of the comparison hospital patients receive an oxygenation assessment, only 71% and 80% receive the pneumococcal vaccination at BIMC and its comparison hospitals, respectively. Similarly, rates of influenza vaccination are low at both BIMC (85%) and the group of comparison hospitals (90%). The number of patients having blood cultures drawn before initial dose of antibiotic is 96% at BIMC and 84% in the comparison hospitals. Initial dose of antibiotic within 6 hours of hospital arrival is received by 89% of patients at both BIMC and the comparison hospitals. In particular, 94% and 90% of patients initially receive the most appropriate antibiotics at CAMC and the comparison hospitals, respectively.

The SCIP composite measure for BIMC indicates that 94% of patients are receiving the appropriate interventions to prevent surgical infections, compared with 90% of patients at the comparison hospitals. BIMC provides the appropriate interventions to prevent surgical infection to 90% or more patients for the individual measures. At the comparison hospitals, the rate is as low as 83% for individual measures (discontinued use of prophylactic antibiotics within 24 hours of surgery end time).

5.3 Survey-Based Indicator Findings

The HCAHPS survey contains 27 questions that result in 10 survey-based quality indicator measures. The measures are grouped into three broad categories as follows:

- Summary measures
  - Communication with nurses
  - Communication with doctors
  - Responsiveness of hospital staff
  - Pain management
  - Communication about medication
  - Discharge information
- Individual measures
  - Cleanliness of hospital environment
  - Quietness of hospital environment

- Global measures
  - Overall rating of hospital
  - Willingness to recommend hospital

With the exception of the discharge information measure, which requires only two (yes or no) questions, each measure uses at least three questions to develop the rating. We used HCAHPS data downloaded from the Hospital Compare Web site. Data presented below are from the September 2008 release, which reports HCAHPS data collected from our baseline year (calendar year 2007). Ratings for the comparison groups were calculated as a simple average across the comparison hospitals (only a subset of the comparison group for each intervention hospital had data reported). Reporting of HCAHPS data is voluntary, although the Medicare Gainsharing Demonstration sites were required, as a condition of participation, to report HCAHPS data. Therefore, not all of the comparison site hospitals reported HCAHPS data. For CAMC, 7 of the 10 comparison hospitals reported HCAHPS data available (although, for certain measures indicated below, only 6 hospitals had data); 7 of the 15 BIMC comparison hospitals had data available.

Charleston Area Medical Center

The HCAHPS results for CAMC and its comparison hospitals are presented in ***Table 21***. Overall, both CAMC and its comparison hospitals received good ratings from patients completing the survey (communication about medicines was lacking, however). Ninety percent of respondents reported that CAMC nurses always or usually communicated well, whereas 95% of respondents reported this was so for the comparison hospitals. Respondents indicated that doctors usually or always communicated well 95% and 97% of the time, respectively. At CAMC, 87% of patients reported that they usually or always received help as soon as they wanted. This was true for 94% of patients at the comparison hospitals.

Pain was usually or always controlled for 92% of CAMC patients and 93% of patients at comparison hospitals. Only 77% of patients at CAMC reported that staff usually or always explained medications, compared with 78% of patients for the comparison group. Discharge information was provided to 80% and 83% of respondents at CAMC and the comparison hospitals, respectively. Patients reported that their room was usually or always clean 90% of the time for CAMC and 88% of the time for the comparison group. CAMC patients found the hospital to be always or usually quiet at night 82% of the time, compared with 87% of patients from the comparison hospitals. Patients rated the hospital medium or high overall 90% and 92% of the time at CAMC and the comparison hospitals, respectively. Finally, in both cases, 95% of patient respondents indicated that they would definitely or probably recommend the hospital to others.

Table 21
Hospital patient survey results: Charleston Area Medical Center and comparison hospitals

Patient Survey Elements	CAMC	Comparison Group
Communication with nurses*		
Nurses always communicated well	73%	78%
Nurses sometimes or never communicated well	7%	5%
Nurses usually communicated well	20%	17%
Communication with doctors*		
Doctors always communicated well	80%	83%
Doctors sometimes or never communicated well	5%	4%
Doctors usually communicated well	15%	14%
Responsiveness of hospital staff		
Patients always received help as soon as they wanted	60%	63%
Patients sometimes or never received help as soon as they wanted	13%	10%
Patients usually received help as soon as they wanted	27%	27%
Pain management		
Pain was always well controlled	68%	70%
Pain was sometimes or never well controlled	8%	7%
Pain was usually well controlled	24%	23%
Communication about medicines		
Staff always explained	60%	62%
Staff sometimes or never explained	23%	22%
Staff usually explained	17%	16%
Discharge information		
No, staff did not give patients this information	20%	17%
Yes, staff did give patients this information	80%	83%
Cleanliness of hospital environment		
Room was always clean	65%	67%
Room was sometimes or never clean	10%	12%
Room was usually clean	25%	21%
Quietness of hospital environment		
Always quiet at night	46%	57%
Sometimes or never quiet at night	18%	13%
Usually quiet at night	36%	30%
Overall rating of hospital*		
Patients who gave a rating of 6 or lower (low)	10%	8%
Patients who gave a rating of 7 or 8 (medium)	24%	24%
Patients who gave a rating of 9 or 10 (high)	66%	68%
Willingness to recommend hospital		
NO, patients would not recommend the hospital (they probably would not or definitely would not recommend it)	5%	4%
YES, patients would definitely recommend the hospital	74%	78%
YES, patients would probably recommend the hospital	21%	17%

NOTE: Comparison group data based on a simple average of data from 7 of the 10 comparison hospitals, except as noted. * Indicates measure is based on data from 6 of the 10 hospitals. Source: RTI analysis of 2007 Hospital Consumer Assessment of Healthcare Providers and Systems.

Beth Israel Medical Center

Table 22 presents the HCAHPS measures for BIMC and 7 of its 16 comparison hospitals. The ratings for BIMC and the comparison groups are generally very similar. Respondents reported that nurses usually or always communicated well 87% of the time for BIMC and 88% of the time for the comparison group. For both BIMC and the comparison hospitals, 91% of patients reported that doctors usually or always communicated well. Although patients felt that nurses and physicians communicated well, they did not find hospital staff to be as responsive. Respondents reported usually or always receiving help as soon as they wanted it 75% and 74% of the time for BIMC and the comparison group, respectively.

Patients reported that pain was usually or always well controlled 88% of the time for BIMC and 87% for the comparison hospitals. Sixty-seven percent of BIMC staff always or usually communicated about medicine, compared with 69% for the comparison group. Respondents indicated that they received discharge information 73% and 71% of the time at BIMC and the comparison hospitals, respectively. Eighty-two percent of patients reported that their hospital room was usually or always clean at both BIMC and the comparison hospitals, and 75% reported that the hospital was usually or always quiet at night in both cases. BIMC received a medium or high rating from 80% of patients, compared with 82% for the comparison hospitals. Finally, 88% of BIMC patients would probably or definitely recommend the hospital, whereas 91% of patients would probably or definitely recommend the comparison hospitals.

5.4 Summary of Findings

The data presented above are baseline data generated by analysis of two separate data sources related to current CMS quality of care initiatives. Using the RHQDAPU data, which abstracts details from patient charts and the HCAHPS, which collects patient survey information, we were able to present comparative performance information for CAMC, BIMC and their relative comparison groups. The results, which are based on these preliminary comparisons of the demonstration and comparison hospitals, show that these hospitals performed at similar levels during the baseline year (calendar year 2007). This is more true for the HCAHPS than for the RHQDAPU data, and for BIMC more so than CAMC. Although these measures are more general (i.e., not limited to the episodes of care defined for claims data) and are not specific to service lines, they do provide additional details on quality of patient care that are not available in claims data.

In presenting this information, our goal was to establish a starting point against which to determine whether the demonstration sites can show greater improvements across a range of quality of care measures than a group of similar hospitals. Future analyses will compare these baseline data to postintervention data. Given the ongoing emphases on quality of care and public reporting on health care outcomes, we might expect improvements over time among both the demonstration (CAMC and BIMC) and comparison hospitals. However, our future analysis will focus on whether the rates of improvement in the demonstration sites are better (or worse) than their comparison sites.

Table 22
Hospital patient survey results: Beth Israel Medical Center and comparison hospitals

Patient Survey Elements	BIMC	Comparison Group
Communication with nurses		
Nurses always communicated well	57%	63%
Nurses sometimes or never communicated well	13%	11%
Nurses usually communicated well	30%	25%
Communication with doctors		
Doctors always communicated well	9%	8%
Doctors sometimes or never communicated well	21%	20%
Doctors usually communicated well		
Responsiveness of hospital staff		
Patients always received help as soon as they wanted	43%	46%
Patients sometimes or never received help as soon as they wanted	25%	25%
Patients usually received help as soon as they wanted	32%	28%
Pain management		
Pain was always well controlled	58%	58%
Pain was sometimes or never well controlled	12%	14%
Pain was usually well controlled	30%	29%
Communication about medicines		
Staff always explained	49%	49%
Staff sometimes or never explained	33%	31%
Staff usually explained	18%	20%
Discharge information		
No, staff did not give patients this information	27%	29%
Yes, staff did give patients this information	73%	71%
Cleanliness of hospital environment		
Room was always clean	53%	54%
Room was sometimes or never clean	18%	17%
Room was usually clean	29%	28%
Quietness of hospital environment		
Always quiet at night	42%	42%
Sometimes or never quiet at night	25%	25%
Usually quiet at night	33%	33%
Overall rating of hospital		
Patients who gave a rating of 6 or lower (low)	20%	17%
Patients who gave a rating of 7 or 8 (medium)	37%	33%
Patients who gave a rating of 9 or 10 (high)	43%	49%
Willingness to recommend hospital		
NO, patients would not recommend the hospital (they probably would not or definitely would not recommend it)	12%	9%
YES, patients would definitely recommend the hospital	52%	57%
YES, patients would probably recommend the hospital	36%	34%

NOTE: Comparison group data are based on a simple average of data from 7 of the 16 comparison hospitals. Source: RTI analysis of 2007 Hospital Consumer Assessment of Healthcare Providers and Systems.

SECTION 6
FUTURE EVALUATION PLAN

Because of the timing of the mandate for the report to Congress, this report contains only baseline information and no postimplementation findings. A second report to Congress and a final report for CMS will be prepared after the conclusion of the demonstration; those reports will provide more comprehensive findings.

The final evaluation reports will address a range of research questions and will assess the effects of a variety of gainsharing models on

- Hospital efficiency
- Physician practice patterns
- Medicare expenditures
- Quality of care
- Beneficiary satisfaction

A summary of these analytic tasks follows. As noted in this report, the comprehensive evaluation will rely on comparisons of the performance of the two demonstration sites, BIMC and CAMC, and the comparison hospitals (summarized in Section 3).

Site Visits and Physician Focus Groups—The evaluation design includes two rounds of site visits to the demonstration sites. The site visits will document and analyze initial implementation and ongoing operations of the different gainsharing demonstrations. We will discuss the participation decision, details of the demonstration design, initial implementation, methods and evidence for cost reductions and quality impacts attributable to the intervention, and relationships with physicians and other providers.

Paralleling and in coordination with the site visits, two waves of physician focus group discussions will be conducted. The goal of the physician focus groups is to gather information on physicians' experience and satisfaction with the gainsharing arrangements. In these focus groups, RTI will collect in-depth information on physicians' behavioral responses to incentives, the evolution of gainsharing methods at each site, physician satisfaction with the arrangements, patient referral patterns, and evidence of biased selection. Depending on the organizational structure and issues found in the individual sites, this task may include small group discussions, individual interviews with key physicians, or both.

Organizational and Physician Responses—The evaluation's analysis of organization and physician responses, which will be largely qualitative, will be based on the site visits and physician focus groups. Issues to be investigated include

- overall perceptions of the gainsharing demonstration,

- rationale for participation in the gainsharing demonstration,
- perceptions of methods used to achieve savings and efficiency,
- changes in relationship between physicians and hospitals as a result of gainsharing,
- changes in clinical patterns of care (e.g., clinical pathways, shorter stays, fewer consults), and
- roles of physicians and hospitals in developing and monitoring changes in care delivery.

Medicare Expenditures and Savings—The RTI evaluation of Medicare expenditures and savings will overlap to some degree with the responsibilities of the demonstration implementation support contractor (ARC). RTI and ARC will be jointly involved in analyzing financial reconciliation and quality performance. Depending on the availability of internal cost savings data from the participating demonstration sites, the future evaluation activities will also

- determine financial impacts of gainsharing on providers,
- adjust for patient severity and substitution of PAC for inpatient care,
- identify sources of facility cost savings by department,
- analyze the proportion of hospital savings going to physicians, and
- determine the sources of Medicare savings: inpatient hospital and physician compared with PAC.

Inpatient Cost Reductions—The evaluation of inpatient cost reductions will be dependent on the availability of individual site internal cost data. These data will be collected by the implementation contractor along with other site-specific data. RTI will work with the implementation contractor to specify how sites will report their available internal cost data. The evaluation issues to be investigated include

- the level and percentage reduction in actual facility costs per case,
- potential for gainsharing "profit" driven by the difference between what Medicare paid demonstration hospitals for Part A services and what patients actually cost them,
- identification of the specific cost centers that showed the largest cost decreases, and
- reductions in Part B physician inpatient services (e.g., consults, imaging, second surgeons).

Quality of Care—A critical aspect of the evaluation is an assessment of whether quality of care has been affected by the gainsharing financial incentives. Quality-of-care analyses in the

evaluation will compare changes in quality measures for demonstration hospitals with those from comparison hospitals. Because all of these indicators are constructed from Medicare claims data, RTI will have complete data for both groups of hospitals. Quality measures analyzed will include

- inpatient and 30-day postdischarge mortality,
- readmissions within 30 days of discharge,
- AHRQ's IQIs and PSIs, and
- RHQDAPU process of care measures.

Analyses will adjust for patient severity using the APR-DRG risk adjustment grouper.

Analysis: Beneficiary Satisfaction—An important aspect of quality of care is patients' perspectives about the care they receive during their hospital stays. The HCAHPS provides annual measures on patient satisfaction for participating hospitals. CMS has made participation in HCAHPS a requirement for the demonstration sites. We will analyze the difference in beneficiary satisfaction between demonstration and comparison hospitals before and after program implementation.

Analysis: Referral Patterns and Market Competition—The potential for additional incentive payments for physicians under gainsharing may affect the decisions physicians make, including increasing the probability of certain "attractive" patients' being admitted to a demonstration hospital by participating physicians. Participating physicians may also have an incentive either to transfer very costly and difficult-to-manage cases to other acute care hospitals (IPPS transfers) or to discharge them to PAC providers. Increased transfers may, in turn, result in a reduction in demonstration hospital outlier cases. To monitor these potential referral patterns and market competition impacts due to gainsharing, RTI will conduct descriptive analyses that will include tabulating and statistically testing differences between the demonstration hospital and its competitor hospitals (before and during the demonstration) using the following indicators:

- Shares of more and less complex Medicare Severity DRG cases
- Emergency room admissions
- Overall transfers in and out
- Transfers of more and less complex Medicare Severity DRG cases
- Outliers

Complete evaluation results will be available through a report to Congress that is due in March 2013 and a final report to CMS that is due in December 2014.

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APPENDIX II

Actuarial Research Corporation Demonstration Monitoring Budget Neutrality Reports

ARC

Beth Israel Medical Center First Budget Neutrality Report for the Hospital Gainsharing Demonstration

June 14, 2010

Executive Summary

CMS is required to assure that the Medicare Hospital Gainsharing Demonstration authorized by the DRA sec. 5007 is budget neutral to the Medicare Program at each participating hospital. That is, at the conclusion of the demonstration, the Medicare Program will have spent no more than it would have spent in the absence of the demonstration. As the monitoring and implementation contractor for the Medicare Hospital Gainsharing Demonstration Actuarial Research Corporation (ARC) is tasked with performing the calculations to determine whether Medicare reimbursement increased as a result of a hospital's participation in the demonstration. This report describes the calculation to evaluate the Medicare cost for episodes of care at Beth Israel Medical Center (BIMC) for the period October 1st, 2008 through June 30, 2009 referred to as the intervention period.

Based on our calculations Beth Israel Medical Center is not liable for excess costs for the Medicare program during the period from October 1st, 2008 through June 30, 2009 based on the terms of the Budget Neutrality Analysis Reconciliation Payment Protocol agreed upon by BIMC and CMS.

Overview

The Budget Neutrality Analysis Reconciliation Payment protocol executed by Beth Israel Medical Center and CMS describes how spending under the demonstration will be measured and how the budget neutrality requirement will be enforced. The cost per relevant episode during the intervention period is compared to the cost per relevant episode in the hospital's base period. If the cost per episode in the intervention period exceeds the cost in the base period by more than the allowance for trend and an allowance for uncertainty, the hospital must reimburse Medicare for the excess. The base period covers admissions from January 1, 2007 through December 31, 2007. The allowable trend is the measured expenditure trend for episodes at a set of comparison hospitals for the same procedure codes and covering the same set of services. The allowance for uncertainty has been established in the Budget Neutrality Protocol.

All Medicare costs (except enumerated exceptions) during the episode are included in the calculation of base period costs, intervention period costs, and trends. This includes all Part A and Part B payments made to any provider including, but not limited to, the participating hospital, other hospitals, SNFs, home health agencies, the participating physician, and other physicians. The liability of the facility participating in the demonstration is not limited to payments to the participating facility or to participating physicians. Liability is also not limited to payments only for the conditions or care received for the target admission.

All Medicare fee for service patients with the diagnostic codes specified by the participating hospital at the beginning of the demonstration as being relevant to the interventions proposed are included except cases specified in the budget neutrality protocol. Both participating and non-participating patients are included.

The protocol specifies:

- Diagnosis Related Groups (DRGs) will be used to define relevant episodes of care.

- Medicare claims and enrollment data will be the basis for calculating the Medicare reimbursement amounts per episode.[1]
- The liability of the hospital for excess Medicare reimbursement will be calculated as the excess of the actual measured costs compared to the cost that would have been incurred in the absence of the demonstration.
- In order to estimate the cost per episode that would have occurred in the absence of the demonstration, the cost per episode at the participating facility that occurred in the base period and the cost per episode at comparison facilities that occurred during the same period need to be calculated.

Method

Prior to performing the budget neutrality analysis for Beth Israel Medical Center, ARC confirmed the criteria that would be employed.

1) The baseline evaluation period is defined as calendar year 2007 (January 1st 2007 through December 31st 2007).

2) The intervention period for this report is defined as October 1st, 2008 through June 30th, 2009.

3) Claims from September 17th, 2008 through October 31st, 2009 were used to prepare the intervention period data used in this analysis. Data from September 17th, 2008 through September 30th, 2008 covered the 14 day pre-admission period. The intervention period for this report was nine months. Data from July 31st through October 31st was used to capture post-discharge claims from the 30 day post-discharge period as well as for claims run out.

4) The comparison sites will be the same sites as selected by RTI and agreed upon between BIMC and CMS and as those used in the Baseline Analysis. The comparison sites are[2]:

    1. Maimonides Medical Center
    2. New York Methodist Hospital
    3. Lenox Hill Hospital
    4. SVCMA – Catholic Medical Center of Brooklyn
    5. New York Hospital Medical Center of Queens
    6. Mount Sinai Hospital
    7. NYU Hospitals Center
    8. SVCMC – St. Vincent's Centers NY and West Branches
    9. Lutheran Medical Center
    10. Staten Island University Hospital
    11. Brooklyn Hospital Center at Downtown Campus
    12. Long Island Jewish Medical Center

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1 Coinsurance amounts will not be included in the analysis.

2 St. Luke's Roosevelt Hospital and Long Island College Hospital were removed from the comparison group because both sites are part of the Continuum System and shared a common parent with BIMC. Our Lady of Mercy Medical Center was removed from the group because they were purchased by and integrated into the Montefiore Medical Center.

13. Flushing Hospital Medical Center
14. Brookdale Hospital Medical Center
15. Wyckoff Heights Medical Center

5) An episode of care is defined as the period beginning 14 days prior to the date of a qualifying admission and ending 30 days after discharge except "If the Medicare beneficiary is an inpatient of a hospital or skilled nursing facility (SNF) or a patient in a Medicare covered home health period on the day that an episode would otherwise begin, the episode will begin on the day following discharge and prior to the date of a target admission."[3]

6) Qualifying admissions are defined as admissions to the facility for a Medicare FFS beneficiary for an intervention condition or procedure specified by the facility per the protocols.

7) The list of excluded DRGs provided by Beth Israel Medical Center is the basis for determining which admissions would be included in the analysis. The identified codes appear in Appendix A.

8) Claims were standardized to CMS DRG Version 24 codes.

9) Relevant costs are calculated as the sum of all payments made by Medicare Part A or Part B during the episode of care.

10) Per the budget neutrality protocol, episode of care cost outliers were truncated at the 5^{th} and 95^{th} percentile. The same method was used for the intervention period analysis as the baseline. For a description of the truncation methodology please see Appendix B.

ARC previously provided BIMC with summary data for the base period. As was the case for the baseline analysis, ARC used Medicare claims and eligibility data to calculate Medicare costs during the intervention period. In order to determine initial and continuing demonstration eligibility of the beneficiaries being treated by the participating and comparison facilities, ARC used eligibility data from the Medicare Enrollment Database (EDB). The EDB contains records on individuals who are enrolled in Part A or Part B of Medicare

Because of the lag time associated with DESY data, ARC used Medicare claims data received from the fiscal intermediaries and carriers (referred to as TAP data) to calculate costs during the intervention period. These TAP files are organized by the state of residence of the Medicare beneficiary. Because it is not practical to include all states in the calculation only the participating hospital's patients from states normally served by the hospital are included. A similar selection is made for states served by the comparison hospitals. ARC used TAP data from the following states when preparing this first budget neutrality analysis:

1. New York
2. New Jersey

[3] Frequently home health service discharge dates fall on days after the last home health service in a home health episode of care. In situations where the home health discharge date was on or beyond the date of a potential qualified inpatient admission ARC deemed the last day of service as the day prior to that admission,

3. Florida
4. Connecticut
5. Pennsylvania
6. California
7. Massachusetts
8. Maine

We have included all claims with relevant admission dates that were received through October 2009 in the calculations.

ARC used the TAP data to pull all inpatient claims for the participating hospital and its comparison hospitals. From the claims in this data set, a list of health insurance claim numbers (HICNs) was created to query the Medicare Enrollment Database. That query returned a set of data consisting of the demographic and enrollment data for all the beneficiaries represented in the inpatient admissions. Also contained in this data was a complete list of HICNs assigned to each beneficiary that was subsequently used to select all potentially qualifying admissions.

Using the complete list of HICNs, a set of inpatient claims records were selected for the participating hospitals and comparison sites for the intervention period. Data pulled from the Medicare Enrollment Database (EDB) was used to determine the eligibility requirements for beneficiaries represented in the potential relevant admissions data. The eligibility criteria required that an episode occur during a period when the beneficiary was enrolled in both Medicare Part A and B but not during periods when the beneficiary was enrolled in a MA plan or when they were identified as being ESRD, in hospice or Medicare was the secondary payer. A data set of eligible inpatient admissions was constructed using the potential relevant admissions data and the eligibility file.

Relevant claims were selected using the criteria described in the demonstration protocols. These claims were used to construct episodes of care for the intervention period. The processes and procedures used to construct episodes of care for the intervention period were identical to those used for the baseline episodes. A truncation procedure was applied to mitigate very high or very low cost episodes within DRG classes. The same truncation procedure was applied to the comparison facilities and is identical to the process used to calculate the costs in the baseline period.

Budget Neutrality Adjustments

Certain adjustments are required when comparing the intervention period to the baseline for the budget neutrality analysis as specified in the budget neutrality protocol. These adjustments are intended to account for changes that may have occurred that are unrelated to the demonstration activity. These adjustments account for (1) changes in the mix of cases as identified by DRG and age-sex composition and (2) changes in Medicare reimbursement rates between the base period and the intervention period to the extent that these changes affect the participating hospital and the comparison hospitals differently.

In order to account for the difference in episode mix from the baseline to the intervention period, ARC first organized the base period results by average cost per episode after truncation by procedure code. Next, nine DRG groups were created which included roughly similar numbers of

episodes. Each group was subdivided into cells to account for beneficiary age group and sex.[4] The resulting baseline weights for Beth Israel were then used to adjust the baseline results from the comparison group and to normalize the results from the intervention period.

The Beth Israel Baseline Period Truncated Average $ per Episode cost was $22,260.78. After normalizing for episode mix the BIMC Intervention Period Truncated Average $ per Episode cost was $25,099.56. The percentage change was 12.75% between the baseline and intervention period.

The Comparison Sites Baseline Period Truncated Average $ per Episode cost was $24,518.67. Normalizing to the BIMC episode mix adjusted this value downwards to $22,343.95. The Comparison Sites Intervention Period Truncated Average $ per Episode cost normalized to the BIMC Baseline episode mix was $25,172.22, a percentage change of 12.66%.

Because the change in per episode costs between the base period and the intervention period may have been impacted by changes in the Medicare payment rates that affect Beth Israel and the associated comparison facilities differentially, ARC also adjusted the BIMC comparison hospitals' average cost per episode value to account for these differences. Using prospective payment system files, wage indices and other publicly available CMS payment data, ARC adjusted for Medicare geographic reimbursement for acute inpatient, outpatient, home health, and skilled nursing services as shown below. The proportion of the Medicare cost attributable to each type of service was generated using combined claims data for Beth Israel and the comparison hospitals during the baseline period. The table below shows the derivation of the geographic adjustment factors applied to the intervention episodes in the budget neutrality analysis. As all of the comparison hospitals are in the same general geographic region, certain adjustments based on wage changes were identical between Beth Israel and the comparison hospitals.

Table 1: Geographic Adjustment Factor Development

Medicare Geographic Reimbursement Adjustment **Service Type**	**Baseline Proportion of Payment**	**BIMC**	**Comparison**
1 Inpatient	75.23%	3.36%	2.00%
2 Physician	11.31%	-0.25%	-0.19%
3 Skilled Nursing Facility	8.61%	-2.10%	-2.10%
4 Home Health	3.19%	-1.78%	-1.78%
5 Outpatient	1.17%	-0.21%	-0.21%
6 Other	0.49%	0.00%	0.00%
7 Total	100.00%	—	—
8 Weighted	—	2.26%	1.25%
9 Medicare Reimbursement Geographic Adjustment Factor	—	0.9774	0.9875

[4] Age groups were set at below 65, 65 to 74, and 75 and older.

Results

The summary table below shows the calculation of the liability of Beth Israel Medical Center for the period from October 1st, 2008 through June 30th, 2009. The target rate for BIMC is its base year rate ($22,260.78) increased by the rate of increase in the cost at control hospitals between the base period and the intervention period (1.1125). If the actual Medicare cost per episode is less than the target cost ($24,765.71), BIMC has no liability to repay Medicare. Since the actual cost per episode adjusted for episode mix and Medicare geographic reimbursement rates ($24,532.70) is lower than the target cost ($24,765.71), BIMC is not liable for any budget neutrality overruns to CMS for the demonstration period covered during this report. A final budget neutrality analysis will be conducted for the entire demonstration period.

Table 2: Summary of Potential Liability

	Summary of Potential Liability for Beth Israel Medical Center	BIMC	Comparison
1	Baseline Truncated Average Medicare Payment per Episode (CAMC Base Period Weights)	$22,260.78	$22,343.95
2	Intervention Period Truncated Avg. Medicare Payment per Episode (CAMC Base Period Weights)	$25,099.56	$25,172.22
3	Difference	12.75%	12.66%
4	Geographic Payment Adjustment	0.9774	0.9875
5	Intervention Period Truncated Avg. Medicare Payment per Episode (CAMC Base Period Weights & Adjusted for Geographic Payment Differences)	$24,532.70	$24,858.24
6	Difference	10.21%	11.25%
7	Target Trended Mean	$24,765.71	—
8	Excess Cost (if Any)	$0.00	—
9	Allowance for Uncertainty	N/A	—
10	Liability for Excess Cost	$0.00	—

Appendix A: List of Excluded Procedures

CMS DRG 24 Description
003 Craniotomy age 0-17
026 Seizure & headache age 0-17
030 Traumatic stupor & coma, coma <1 hr age 0-17
033 Concussion age 0-17
041 Extraocular procedures except orbit age 0-17
048 Other disorders of the eye age 0-17
054 Sinus & mastoid procedures age 0-17
058 T & A proc, except tonsillectomy &/or adenoidectomy only, age 0-17
060 Tonsillectomy &/or adenoidectomy only, age 0-17
062 Myringotomy w tube insertion age 0-17
070 Otitis media & uri age 0-17
074 Other ear, nose, mouth & throat diagnoses age 0-17
081 Respiratory infections & inflammations age 0-17
091 Simple pneumonia & pleurisy age 0-17
098 Bronchitis & asthma age 0-17
137 Cardiac congenital & valvular disorders age 0-17
156 Stomach, esophageal & duodenal procedures age 0-17
163 Hernia procedures age 0-17
184 Esophagitis, gastroent & misc digest disorders age 0-17
186 Dental & oral dis except extractions & restorations, age 0-17
190 Other digestive system diagnoses age 0-17
212 Hip & femur procedures except major joint age 0-17
220 Lower extrem & humer proc except hip,foot,femur age 0-17
252 Fx, sprn, strn & disl of forearm, hand, foot age 0-17
255 Fx, sprn, strn & disl of uparm,lowleg ex foot age 0-17
279 Cellulitis age 0-17
282 Trauma to the skin, subcut tiss & breast age 0-17
298 Nutritional & misc metabolic disorders age 0-17
314 Urethral procedures, age 0-17
322 Kidney & urinary tract infections age 0-17
327 Kidney & urinary tract signs & symptoms age 0-17
333 Other kidney & urinary tract diagnoses age 0-17
340 Testes procedures, non-malignancy age 0-17
343 Circumcision age 0-17
370 Cesarean section w cc
371 Cesarean section w/o cc
372 Vaginal delivery w complicating diagnoses
373 Vaginal delivery w/o complicating diagnoses
374 Vaginal delivery w sterilization &/or D & C
375 Vaginal delivery w O.R. proc except steril &/or D & C
376 Postpartum & post abortion diagnoses w/o O.R. procedure
377 Postpartum & post abortion diagnoses w O.R. procedure
378 Ectopic pregnancy
379 Threatened abortion

Appendix A. List of Excluded DRGs (Continued)

CMS DRG 24 Description
380 Abortion w/o D & C
381 Abortion w D & C, aspiration curettage or hysterotomy
382 False labor
383 Other antepartum diagnoses w medical complications
384 Other antepartum diagnoses w/o medical complications
385 Neonates, died or transferred to another acute care facility
386 Extreme immaturity or respiratory distress syndrome, neonate
387 Prematurity w major problems
388 Prematurity w/o major problems
389 Full term neonate w major problems
390 Neonate w other significant problems
391 Normal newborn
393 Splenectomy age 0-17
396 Red blood cell disorders age 0-17
405 Acute leukemia w/o major O.R. procedure age 0-17
417 Septicemia age 0-17
422 Viral illness & fever of unknown origin age 0-17
425 Acute adjustment reaction & psychosocial dysfunction
426 Depressive neuroses
427 Neuroses except depressive
428 Disorders of personality & impulse control
429 Organic disturbances & mental retardation
430 Psychoses
431 Childhood mental disorders
432 Other mental disorder diagnoses
446 Traumatic injury age 0-17
448 Allergic reactions age 0-17
451 Poisoning & toxic effects of drugs age 0-17
521 Alcohol/drug abuse or dependence w cc
522 Alcohol/drug abuse or dependence w rehabilitation therapy w/o cc
523 Alcohol/drug abuse or dependence w/o rehabilitation therapy w/o cc

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Appendix B: Truncation Procedure

ARC employed a DRG weight, tier-normalized outlier truncation methodology for truncating both baseline and intervention period episode of care costs.

- The same method will be used for truncating outliers in the baseline and intervention periods.
- Truncation was performed at the 5^{th} and 95^{th} percentiles for episodes of care at each intervention facility and each comparison facility.
- A DRG weighted normalization mechanism was employed to standardize all episodes of care costs to the average for all episodes of care at a given facility across all DRGs.

The method is as follows:

- DRGs were grouped into five tiers by average DRG weight.
- Separately for each hospital:
  - Episode of care costs were assigned to the appropriate tier.
  - The mean episode of care cost for all observations within each tier was calculated.
  - Each episode of care observation was then normalized using the ratio of the mean of all observations for that specific hospital to the mean episode of care cost for each tier for that specific hospital.
  - The normalized values were then rank ordered and the 5^{th} and 95^{th} percentiles were determined.
  - Using the normalized episodes of care costs, all costs below the 5^{th} percentile were increased to the 5^{th} percentile value and all costs above the 95^{th} percentile were reduced to the 95^{th} percentile
  - The normalized values were then transformed back using the inverse of the normalization factor.
- The results from the individual comparison sites for each intervention hospital were then combined and these results will form the basis of the updated baseline calculations.

ARC

Charleston Area Medical Center First Budget Neutrality Report for the Hospital Gainsharing Demonstration

June 14, 2010

Executive Summary

CMS is required to assure that the Medicare Hospital Gainsharing Demonstration authorized by the DRA sec. 5007 is budget neutral to the Medicare Program at each participating hospital. That is, at the conclusion of the demonstration, the Medicare Program will have spent no more than it would have spent in the absence of the demonstration. As the monitoring and implementation contractor for the Medicare Hospital Gainsharing Demonstration Actuarial Research Corporation (ARC) is tasked with performing the calculations to determine whether Medicare reimbursement increased as a result of a hospital's participation in the demonstration. This report describes the calculation to evaluate the Medicare cost for episodes of care at Charleston Area Medical Center for the period December 1st, 2008 through June 30, 2009 referred to as the intervention period.

Based on our calculations Charleston Area Medical Center is not liable for excess costs for the Medicare program during the period from December 1st, 2008 through June 30, 2009 based on the terms of the Budget Neutrality Analysis Reconciliation Payment Protocol agreed upon by CAMC and CMS.

Overview

The Budget Neutrality Analysis Reconciliation Payment protocol executed by Charleston Area Medical Center (CAMC) and CMS describes how spending under the demonstration will be measured and how the budget neutrality requirement will be enforced. The cost per relevant episode during the intervention period is compared to the cost per relevant episode in the hospital's base period. If the cost per episode in the intervention period exceeds the cost in the base period by more than the allowance for trend and an allowance for uncertainty, the hospital must reimburse Medicare for the excess. The base period covers admissions from January 1, 2007 through December 31, 2007. The allowable trend is the measured expenditure trend for episodes at a set of comparison hospitals for the same procedure codes and covering the same set of services. The allowance for uncertainty has been established in the Budget Neutrality Protocol.

All Medicare costs (except enumerated exceptions) during the episode are included in the calculation of base period costs, intervention period costs, and trends. This includes all Part A and Part B payments made to any provider including, but not limited to, the participating hospital, other hospitals, SNFs, home health agencies, the participating physician, and other physicians. The liability of the facility participating in the demonstration is not limited to payments to the participating facility or to participating physicians. Liability is also not limited to payments only for the conditions or care received for the target admission.

All Medicare fee for service patients with the procedure codes specified by the participating hospital at the beginning of the demonstration as being relevant to the interventions proposed are included except cases specified in the budget neutrality protocol. Both participating and non-participating patients are included.

The protocol specifies:

- Diagnosis Related Groups (DRGs) and ICD-9-CM procedure and diagnosis codes will be used to define relevant episodes of care.

- Medicare claims and enrollment data will be the basis for calculating the Medicare reimbursement amounts per episode.[5]
- The liability of the hospital for excess Medicare reimbursement will be calculated as the excess of the actual measured costs compared to the cost that would have been incurred in the absence of the demonstration.
- In order to estimate the cost per episode that would have occurred in the absence of the demonstration, the cost per episode at the participating facility that occurred in the base period and the cost per episode at comparison facilities that occurred during the same period need to be calculated.

Method

Prior to performing the budget neutrality analysis for Charleston Area Medical Center, ARC confirmed the criteria that would be employed.

1) The baseline evaluation period is defined as calendar year 2007 (January 1st 2007 through December 31st 2007).

2) The intervention period for this report is defined as December 1st, 2008 through June 30th, 2009.

3) Claims from November 17th, 2008 through October 31st, 2009 were used to prepare the intervention period data used in this analysis. Data from November 17th, 2008 through November 30th, 2008 covered the 14 day pre-admission period. The intervention period for this report was seven months. Data from July 31st through October 31st was used to capture post-discharge claims from the 30 day post-discharge period as well as for claims run out.

4) The comparison sites will be the same sites as selected by RTI and agreed upon between CAMC and CMS and as those used in the Baseline Analysis. The comparison sites are:

1.	Carilion Medical Center	Roanoke, VA
2.	Maine Medical Center	Portland, ME
3.	Memorial Mission Hospital and Asheville Surgery CE	Asheville, NC
4.	Jackson-Madison County General Hospital	Jackson, TN
5.	Huntsville Hospital	Huntsville, AL
6.	Pitt County Memorial Hospital	Greenville, NC
7.	Medical Center of Central Georgia	Macon, GA
8.	Johnson City Medical Center	Johnson City, TN
9.	Eastern Maine Medical Center	Bangor, ME
10.	New Hanover Regional Medical Center	Wilmington, NC

5) An episode of care is defined as the period beginning 14 days prior to the date of a qualifying admission and ending 30 days after discharge except "If the Medicare beneficiary is an inpatient of a hospital or skilled nursing facility (SNF) or a patient in a Medicare covered home health

[5] Coinsurance amounts will not be included in the analysis.

period on the day that an episode would otherwise begin, the episode will begin on the day following discharge and prior to the date of a target admission."[6]

6) Qualifying admissions are defined as admissions to the facility for a Medicare Fee For Service (FFS) beneficiary for an intervention condition or procedure specified by the facility per the protocols.

7) The list of intervention DRGs and ICD-9-CM procedure codes provided by Charleston Area Medical Center is the basis for determining which procedures would be included in the analysis. The identified codes appear in Appendix A.

8) Claims were standardized to CMS DRG Version 24 codes.

9) Relevant costs are calculated as the sum of all payments made by Medicare Part A or Part B during the episode of care.

10) Per the budget neutrality protocol, episode of care cost outliers were truncated at the 5th and 95th percentile. The same method was used for the intervention period analysis as the baseline. For a description of the truncation methodology please see Appendix B.

ARC previously provided CAMC with summary data for the base period. As was the case for the baseline analysis, ARC used Medicare claims and eligibility data to calculate Medicare costs during the intervention period. In order to determine initial and continuing demonstration eligibility of the beneficiaries being treated by the participating and comparison facilities, ARC used eligibility data from the Medicare Enrollment Database (EDB). The EDB contains records on individuals who are enrolled in Part A or Part B of Medicare

Because of the lag time associated with DESY data, ARC used Medicare claims data received from the fiscal intermediaries and carriers (referred to as TAP data) to calculate costs during the intervention period. These TAP files are organized by the state of residence of the Medicare beneficiary. Because it is not practical to include all states in the calculation only the participating hospital's patients from states normally served by the hospital are included. A similar selection is made for states served by the comparison hospitals. ARC used TAP data from the following states when preparing this first budget neutrality analysis:

1. West Virginia
2. Virginia
3. Alabama
4. Tennessee
5. Georgia
6. Maine
7. North Carolina
8. Florida

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6 Frequently home health service discharge dates fall on days after the last home health service in a home health episode of care. In situations where the home health discharge date was on or beyond the date of a potential qualified inpatient admission ARC deemed the last day of service as the day prior to that admission,

We have included all claims with relevant admission dates that were received through October 2009 in the calculations.

ARC used the TAP data to pull all inpatient claims for the participating hospital and its comparison hospitals. From the claims in this data set, a list of health insurance claim numbers (HICNs) was created to query the Medicare Enrollment Database. That query returned a set of data consisting of the demographic and enrollment data for all the beneficiaries represented in the inpatient admissions. Also contained in this data was a complete list of HICNs assigned to each beneficiary that was subsequently used to select all potentially qualifying admissions.

Using the complete list of HICNs, a set of inpatient claims records were selected for the participating hospitals and comparison sites for the intervention period. Data pulled from the Medicare Enrollment Database (EDB) was used to determine the eligibility requirements for beneficiaries represented in the potential relevant admissions data. The eligibility criteria required that an episode occur during a period when the beneficiary was enrolled in both Medicare Part A and B but not during periods when the beneficiary was enrolled in a MA plan or when they were identified as being ESRD, in hospice or Medicare was the secondary payer. A data set of eligible inpatient admissions was constructed using the potential relevant admissions data and the eligibility file.

Relevant claims were selected using the criteria described in the demonstration protocols. These claims were used to construct episodes of care for the intervention period. The processes and procedures used to construct episodes of care for the intervention period were identical to those used for the baseline episodes. A truncation procedure was applied to mitigate very high or very low cost episodes within DRG classes. The same truncation procedure was applied to the comparison facilities and is identical to the process used to calculate the costs in the baseline period.

Budget Neutrality Adjustments

Certain adjustments are required when comparing the intervention period to the baseline for the budget neutrality analysis as specified in the budget neutrality protocol. These adjustments are intended to account for changes that may have occurred that are unrelated to the demonstration activity. These adjustments account for (1) changes in the mix of cases as identified by DRG and age-sex composition and (2) changes in Medicare reimbursement rates between the base period and the intervention period to the extent that these changes affect the participating hospital and the comparison hospitals differently.

In order to account for the difference in episode mix from the baseline to the intervention period, ARC first organized the base period results by average cost per episode after truncation by procedure code. Next, three groups of procedures were created which included roughly similar numbers of episodes. Each group was subdivided into cells to account for beneficiary age group.[7] The resulting baseline weights for CAMC were then used to adjust the baseline results from the comparison group and to normalize the results from the intervention period.

[7] As there were only a few hundred relevant episodes for CAMC, weights were broken down only by age group and not also by sex.

The CAMC Baseline Period Truncated Average $ per Episode cost was $32,058.13. After normalizing for episode mix the CAMC Intervention Period Truncated Average $ per Episode cost was $34,930.42. The percentage change was 8.96% between the baseline and intervention period.

The Comparison Sites Baseline Period Truncated Average $ per Episode cost was $32,942.74. Normalizing to the CAMC episode mix adjusted this value upwards to $33,678.33. The Comparison Sites Intervention Period Truncated Average $ per Episode cost normalized to the CAMC Baseline episode mix was $36,722.54, a percentage change of 9.04%.

Because the change in per episode costs between the base period and the intervention period may have been impacted by changes in the Medicare payment rates that affect CAMC and the associated comparison facilities differentially, ARC also adjusted the CAMC comparison hospitals' average cost per episode value to account for these differences. Using prospective payment system files, wage indices and other publicly available CMS payment data, ARC adjusted for Medicare geographic reimbursement for acute inpatient, outpatient, home health, and skilled nursing services as shown below. The proportion of the Medicare cost attributable to each type of service was generated using combined claims data for CAMC and the comparison hospitals during the baseline period. The table below shows the derivation of the geographic adjustment factors applied to the intervention episodes in the budget neutrality analysis.

Table 1: Geographic Adjustment Factor Development

Medicare Geographic Reimbursement Adjustment Service Type	Baseline Proportion of Payment	CAMC	Comparison
1 Inpatient	83.52%	3.03%	4.35%
2 Physician	10.98%	-0.07%	0.05%
3 Skilled Nursing Facility	2.07%	-2.40%	-0.42%
4 Home Health	1.70%	-3.13%	-0.51%
5 Outpatient	1.47%	-1.03%	0.09%
6 Other	0.26%	0.00%	0.00%
7 Total	100.00%	—	—
8 Weighted	—	2.41%	3.62%
9 Medicare Reimbursement Geographic Adjustment Factor	—	0.9759	0.9638

Results

The summary table below shows the calculation of the liability of Charleston Area Medical Center for the period from December 1st, 2008 through June 30th, 2009. The target rate for CAMC is its base year rate ($32,058.13) increased by the rate of increase in the cost at control hospitals between the base period and the intervention period (1.0509). If the actual Medicare cost per episode is less than the target cost ($33,690.43), CAMC has no liability to repay Medicare. Since the actual cost per episode adjusted for episode mix and Medicare geographic reimbursement rates ($34,089.59) exceeds the target cost ($33,690.43), ARC moved to the next phase of the budget neutrality analysis to determine whether the CAMC excess cost were within the authorized allowance for uncertainly.

For this demonstration, an allowance for uncertainty was established, that depends on the sample sizes and the variance of the Medicare costs. If the adjusted actual cost per episode exceeds the target cost plus the uncertainty allowance (which for CAMC was calculated to be $1,121.81), CAMC would be liable for the amount by which the actual cost exceeds the sum of the target cost plus the uncertainty allowance multiplied by the number of relevant cases in the intervention period. For the period from December 1st, 2008 through June 30th, 2009, CAMC is not liable for any budget neutrality overruns to CMS because the truncated and adjusted average dollar per episode value ($34,089.59) is below the allowed uncertainty limit of $34,812.24 ($33,690.43 + $1,121.81). A final budget neutrality analysis will be conducted at the end of the demonstration. The final analysis will examine cost per episode for the entire demonstration period.

Table 2: Summary of Potential Liability

	Summary of Potential Liability for Charleston Area Medical Center	CAMC	Comparison
1	Baseline Truncated Average Medicare Payment per Episode (CAMC Base Period Weights)	$32,058.13	$33,678.33
2	Intervention Period Truncated Avg. Medicare Payment per Episode (CAMC Base Period Weights)	$34,930.42	$36,722.54
3	Difference	8.96%	9.04%
4	Geographic Payment Adjustment	0.9759	0.9638
5	Intervention Period Truncated Avg. Medicare Payment per Episode (CAMC Base Period Weights & Adjusted for Geographic Payment Differences)	$34,089.59	$35,393.13
6	Difference	6.34%	5.09%
7	Target Trended Mean	$33,690.43	—
8	Excess Cost (if Any)	$399.15	—
9	Allowance for Uncertainty	$1,121.81	—
10	Liability for Excess Cost	$0.00	—

Appendix A: List of Included Procedures

Category	Old DRG or ICD-9 (ICD-9 Codes marked with *)	MS-DRG or ICD-9 (ICD-9 Codes marked with *)	Description
Valve w/Cath	104	216	Cardiac valve & other major cardiothoracic procedure with cardiac catheterization with MCC
		217	Cardiac valve & other major cardiothoracic procedure with cardiac catheterization with CC
		218	Cardiac valve & other major cardiothoracic procedure with cardiac catheterization without CC/MCC
Valve w/out Cath	105	219	Cardiac valve & other major cardiothoracic procedure without cardiac catheterization with MCC
		220	Cardiac valve & other major cardiothoracic procedure without cardiac catheterization with CC
		221	Cardiac valve & other major cardiothoracic procedure without cardiac catheterization without CC/MCC
Bypass w/Cath or PTCA	106, 547, 548	231	Coronary bypass with PTCA with MCC
		232	Coronary bypass with PTCA without MCC
		233	Coronary bypass with cardiac catheterization with MCC
		234	Coronary bypass with cardiac catheterization without MCC
Bypass w/out Cath	549, 550	235	Coronary bypass without cardiac catheterization with MCC
		236	Coronary bypass without cardiac catheterization without MCC
Defibrillator System w/Cath	535, 536	222	Cardiac defibrillator implant with cardiac catheterization with acute myocardial infarction/heart failure/shock with MCC
		223	Cardiac defibrillator implant with cardiac catheterization with acute myocardial infarction/heart failure/shock without MCC
		224	Cardiac defibrillator implant with cardiac catheterization without acute myocardial infarction/heart failure/shock with MCC
		225	Cardiac defibrillator implant with cardiac catheterization without acute myocardial infarction/heart failure/shock without MCC
Defibrillator System w/out Cath	515	226	Cardiac defibrillator implant without cardiac catheterization with MCC
		227	Cardiac defibrillator implant without cardiac catheterization without MCC
Defibrillator Device Replacement	551, 552	245	AICD lead and generator procedures
Pacemaker System	551, 552	242	Permanent cardiac pacemaker implant with MCC
		243	Permanent cardiac pacemaker implant with CC
		244	Permanent cardiac pacemaker implant without CC/MCC
Pacemaker Device Replacement	118	258	Cardiac pacemaker device replacement with MCC
		259	Cardiac pacemaker device replacement without MCC
Carotid Artery Intervention	577, 00.61*	34	Carotid artery stent procedure with MCC
		35	Carotid artery stent procedure with CC
		36	Carotid artery stent procedure without CC/MCC
		00.61*	Percutaneous angioplasty or atherectomy of precerebral (extracranial) vessels
Peripheral Vascular Intervention	39.90*, 00.55*, 39.50*	39.90*	Insertion of non-drug-eluting peripheral vessel stent(s)
		00.55*	Insertion of drug-eluting peripheral vessel stent(s)
		39.50*	Angioplasty or atherectomy of other non-coronary vessels

Appendix B: Truncation Procedure

ARC employed a DRG weight, tier-normalized outlier truncation methodology for truncating both baseline and intervention period episode of care costs.

- The same method will be used for truncating outliers in the baseline and intervention periods.
- Truncation was performed at the 5^{th} and 95^{th} percentiles for episodes of care at each intervention facility and each comparison facility.
- A DRG weighted normalization mechanism was employed to standardize all episodes of care costs to the average for all episodes of care at a given facility across all DRGs.

The method is as follows:

- DRGs were grouped into five tiers by average DRG weight.
- Separately for each hospital:
    - Episode of care costs were assigned to the appropriate tier.
    - The mean episode of care cost for all observations within each tier was calculated.
    - Each episode of care observation was then normalized using the ratio of the mean of all observations for that specific hospital to the mean episode of care cost for each tier for that specific hospital.
    - The normalized values were then rank ordered and the 5^{th} and 95^{th} percentiles were determined.
    - Using the normalized episodes of care costs, all costs below the 5^{th} percentile were increased to the 5^{th} percentile value and all costs above the 95^{th} percentile were reduced to the 95^{th} percentile
    - The normalized values were then transformed back using the inverse of the normalization factor.
- The results from the individual comparison sites for each intervention hospital were then combined and these results will form the basis of the updated baseline calculations.