ECONOMETRICA, INC.

REPORT

Annual Report 2015

Evaluation and Monitoring of the Bundled Payments for Care Improvement Model 1 Initiative

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HHSM-500-2011-00015I

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Project No.:
2248-000

Submitted To:

Centers for Medicare & Medicaid Services
Attn.: Arpit Misra
Contracting Officer's Representative
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May 18, 2016

ECONOMETRICA, INC.

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Mr. Arpit Misra
Contracting Officer's Representative
Centers for Medicare & Medicaid Services
Center for Medicare & Medicaid Innovation
7500 Security Boulevard, Mail Stop 06-05
Baltimore, MD 21244

Reference: Contract No. HHSM-500-2011-00015I; Order No. HHSM-500-T0008; "Evaluation and Monitoring of the Bundled Payments for Care Improvement Model 1 Initiative" (Project No. 2248-000).

Dear Mr. Misra:

Econometrica is pleased to submit this Annual Report to the Centers for Medicare & Medicaid Services, Center for Medicare & Medicaid Innovation, regarding work being conducted under the above-referenced contract.

Appendix A is submitted as a separate file.

If you wish to discuss any aspect of this submission, please feel free to contact me at (301) 395-2281.

Sincerely,

Econometrica, Inc.

Monique Sheppard, Ph.D.
Project Director

cc: Contract File

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List of Acronyms

Acronym	Definition
ACH	acute care inpatient hospital
AHA	American Hospital Association
AMS	Applied Medical Software
BPCI	Bundled Payments for Care Improvement
CAH	critical access hospital
CAUTI	catheter-associated urinary tract infection
CC	chronic condition
CCW	Chronic Conditions Data Warehouse
CMMI	Center for Medicare & Medicaid Innovation
CMS	Centers for Medicare & Medicaid Services
DiD	difference-in-differences
DME	durable medical equipment
EACH	Essential Access Community Hospital
ED	emergency department
ESRD	end-stage renal disease
FC	Facilitator Convener
FFS	fee-for-service
FY	fiscal year
HCC	Hierarchical Condition Category
HF	heart failure
HHA	home health agency
HHS	U.S. Department of Health and Human Services
HMO	health maintenance organization
ICU	intensive care unit
IPPS	Inpatient Prospective Payment System
IRH	inpatient rehabilitation hospital
KRSC	Kansas Surgery & Recovery Center
LOS	length of stay
LTCH	long-term care hospital
MBSF	master beneficiary summary file
MDH	Medicare Dependent Hospital
MS-DRG	Medicare Severity Diagnosis Related Group
NJHA	New Jersey Hospital Association
PAC	post-acute care
PC	Program Coordinator
PFS	Physician fee schedule
PHC	Physician Hospital Collaboration
PQ	Performance Quarter
PY	Performance Year
RRC	Rural Referral Center

Acronym	Definition
SAM	standardized allowed amount
SCH	Sole Community Hospital
SCIP	Surgical Care Improvement Project
SNF	skilled nursing facility
TPM	two-part model
TPN	total parenteral nutrition
VTE	venous thromboembolism

Executive Summary

Section 1115A of the Social Security Act (added by Section 3021 of the Affordable Care Act) authorizes the Innovation Center to test innovative health care payment and service delivery models that have the potential to lower Medicare, Medicaid, and Children's Health Insurance Program expenditures while maintaining or improving the quality of Medicare beneficiaries' care (42 U.S.C. 1315a). Under the law, preference is to be given to models that improve coordination, efficiency, and quality.

The Bundled Payments for Care Improvement (BPCI) Model 1 initiative is one such model. Econometrica, Inc., and its partners—IMPAQ International, LLC; Optimity Advisors, LLC; and Pacific Institute for Research and Evaluation—are contracted under the Centers for Medicare & Medicaid Services (CMS) to evaluate and monitor BPCI Model 1. This Annual Report of BPCI Model 1 presents interim findings for performance years (PYs) 1 and 2 of this model, from its inception on April 1, 2013, through March 31, 2015.

The Executive Summary includes a high-level model description, model Awardee characteristics, and an overview of evaluation and monitoring activities under this contract, as well as a synthesis and discussion of interim findings.

BPCI Model 1 Roles

This Annual Report considers the following BPCI Model 1 roles:

- **Awardees.** Awardees are acute care inpatient hospitals that submit applications to CMS for enrollment in BPCI Model 1. Once accepted, these hospitals sign an Awardee Agreement with CMS to participate in BPCI Model 1.
- **Facilitator Conveners (FCs).** FC organizations serve an administrative or technical assistance function for one or more Awardees. They assist in redesigning care without bearing risk or receiving payment from CMS.
- **Enrolled Practitioners.** Enrolled practitioners are physician or non-physician practitioners who furnish health care services to BPCI Model 1 Awardee Medicare beneficiaries, receive Medicare payments under the Medicare Physician Fee Schedule, engage in BPCI Model 1 care redesign, and have a gainsharing agreement.[1] CMS vets practitioners that Awardees propose for enrollment. Currently, only physicians are enrolled across participating Awardees.

BPCI Model 1 Description

BPCI Model 1 focuses on care received at Awardee hospitals during an acute care inpatient hospitalization ("episode") for all Medicare Severity Diagnosis Related Groups. Through care redesign, Awardees attempt to achieve efficiency gains in health care delivery, primarily in the form of reduced health care redundancies, improved care processes, and internal hospital cost-savings. These efficiency gains may translate to reduced Medicare costs while maintaining or improving quality of care for Medicare beneficiaries. Awardees are allowed to share internal

[1] See Section 1.2 for further detail.

hospital cost-savings engendered under this model with enrolled practitioners ("gainsharing"). Gainsharing is expected to promote alignment between Awardees and enrolled practitioners for successful implementation of care redesign and model requirements.

Awardees face an automatic, predetermined discount to their Medicare Inpatient Prospective Payment System (IPPS) operating payments for episodes at their hospital. Moreover, Awardees are financially at risk for increases in both aggregate Medicare Parts A and B payments 30 days after an episode and face quality and activity reporting requirements. These requirements and periods of financial risk in BPCI Model 1 ensures that any additional costs are not passed back to CMS via other points in the health care continuum and that quality of care is maintained or improved.

Model Awardees

The BPCI Model 1 performance period began on April 1, 2013, with 23 Awardee hospitals (all located in New Jersey) under 1 FC, the New Jersey Hospital Association. Of the 23 Awardees, 6 participated in the Physician Hospital Collaborative (PHC), a gainsharing demonstration similar to BPCI Model 1 that ended in July 2012. Those same six Awardees opted to participate in an extension of PHC from July 2012 to March 2013 that led up to the BPCI Model 1 performance period. On January 1, 2014, 1 Awardee hospital located in Kansas initiated an Awardee Agreement with CMS for BPCI Model 1 for a total of 24 Awardees; this hospital does not have an FC.

As of November 1, 2015, 13 of the 24 Awardees had terminated their Awardee Agreement and only 11 active Awardees remain in the Model. This report considers all 24 BPCI Model 1 Awardees and subsets of these Awardees.

Highlights and Lessons Learned

The results of BPCI Model 1 provide valuable lessons to those engaged in health system transformation, particularly providers implementing bundled payment models. BPCI Model 1 includes hospitalizations for all clinical conditions, and the bundled payment provides payment for episodes lasting the duration of just the hospitalization itself. In addition, BPCI Model 1 used the gainsharing of internal cost savings to engage physicians in care redesign across a broad range of clinical conditions, and provided information on successful Awardee strategies to improve physician engagement in the bundled payment model. The lessons learned from the evaluation of BPCI Model 1 may influence future CMS models and set up participants for greater success in engaging physicians in the care redesign that is essential to improving the quality and efficiency of episode care.

The majority of BPCI Model 1 Awardees that remained active through PY2 reported being satisfied with the level of physician enrollment and engagement in the model. They noted that the main drivers of such increased enrollment and engagement included repeat presentations of educational materials, clarity on gainsharing payments to physicians, and performance statistics. However, Awardees did initially struggle with physician enrollment and engagement. Interview and focus group data from PY1 indicated that a primary concern across most Awardees was low physician enrollment in the model and/or lackluster engagement in care redesign. Improving physician engagement was a key focus of Awardees.

The analysis of PY1 and PY2 risk-adjusted Medicare payments per episode found no consistent negative or positive statistically significant impacts. Despite the lack of statistically significant findings, results show that the IPPS discount produced a direct savings of $7.3 million on episodes affected by this discount. In addition, as measured by all-cause readmissions, post-episode emergency department (ED) utilization, beneficiary discharge destinations, and all-cause mortality rates, results indicate that BPCI Model 1 Awardees active through PY2 did not exhibit any consistent statistically significant unintended negative—or positive—effects on Medicare beneficiaries. Throughout the evaluation of BPCI Model 1, Awardees have characterized their care redesign as being quality focused with the expectation that improved quality will lead to increased cost-efficiencies and overall value of care. Given that Awardees still active in the model reported having significant physician enrollment and engagement in PY2, BPCI Model 1 may result in the translation of the efforts in to quantifiable impacts in future years.

BPCI Model 1 is an important test of bundled payment models that supports the goals of better care, smarter spending, and healthier people. The lessons learned from this model will help inform health care transformation efforts particularly related to hospitals effectively engaging with physicians to improve care.

ES.1. Evaluation and Monitoring Motivations

Two overarching evaluation and monitoring questions guided the analytical framework, data collection, and analyses presented in this report.

1. What is the impact of BPCI Model 1 on Medicare costs (payments to hospital providers) and the quality of care provided to Medicare beneficiaries?
2. What are characteristics of the model, providers, or environment that influenced model impacts?

These questions are addressed for the first two PYs through a study of Awardee hospital characteristics (e.g., financial stability, clinical staff mix and longevity, and patient populations); care redesign implemented; clinical staff engagement; and impacts on Medicare costs, quality of care, outcomes, and resource utilization. These characteristics, activities, and quantifiable measures are grouped into domains, the development of which has been informed by Center for Medicare & Medicaid Innovation (CMMI) evaluation and monitoring measures,[2] defined later.

Given BPCI Model 1 design, if Awardees are able to align physicians with their care redesign pursuits and achieve internal hospital efficiencies, these efficiencies may translate to a reduction in Medicare payments and an increase in the value of health care provided. It is also possible that Awardee incentives to reduce internal costs—in part, to offset the IPPS discount—could result in care stinting that may lead to adverse outcomes such as increased patient mortality or less intensive care during the post-episode period. Under the assumption that Awardees are able to align physicians to adopt their quality- and value-focused care redesign, one might expect to see decreases in Medicare expenditures coupled with decreases in negative health outcomes for Medicare beneficiaries.

[2] These domains and measures are based on measure and domain guidance from the Innovation Center's Rapid Cycle Evaluation. CMMI. (2013, March 28). *Core Measures Version 9*. Baltimore, MD: CMS.

Findings are presented within and across the following areas:

- **Awardee Implementation and Organizational Responses** include analyses on Awardee organization and infrastructure changes in response to BPCI Model 1, physician engagement, and care redesign implementation.
- **Episode Case Mix and Patient Characteristics** include descriptive analyses of episode and patient characteristics such as episode intensity and patient demographics.
- **Medicare Expenditures and Health Care Utilization** include analyses of Medicare episode and post-episode expenditures, service utilization, and hospital cost-savings.
- **Health Care Outcomes** include analyses of mortality and readmission rates and Awardee discharge patterns.

ES.2. Data and Methods

Both quantitative and qualitative analyses include data from various sources, such as Awardee interviews, focus groups, enrollment data, and Medicare claims across BPCI Model 1 Awardee hospitals and similar non-Awardee hospitals.

ES.2.1. Interviews and Focus Groups

Awardee and enrolled practitioner interview and focus group data enriched understanding of care redesign implementation processes, successes, and issues. These data further provided insight into unanticipated BPCI- and non-BPCI related issues that Awardees faced during model implementation. These data also contextualized the quantitative findings of BPCI Model 1 impacts on measures assessed. Generally, these data were triangulated over multiple periods and are summarized below:

- **Telephone interview data** were collected over four periods ("waves") to date. The first wave completed in November 2013, the second by July 2014, and the third and fourth waves occurred in May and October of 2015, respectively. This report focuses on data in the third and fourth waves, as available, and includes information from the first two waves as needed for context.[3]
- **Focus group data** were collected during visits to distinct Awardee hospitals ("site visits") at six points in time: July 2013, one Awardee (pilot visit); October 2013, four Awardees; March 2014, two Awardees; October 2014, two Awardees; June 2015, one Awardee; and November 2015, three Awardees. This report focuses on data in the June 2015 and November 2015 site visits and includes information from the first two waves as needed for context.[4]

ES.2.2. Quantitative Analyses

Quantitative analyses primarily relied on Medicare administrative and claims data, specifically:

- **Medicare claims data** included the 100-percent research identifiable Medicare Claims and Enrollment Database from the Chronic Conditions Data Warehouse covering a

[3] Previously reported in the 2014 BPCI Model 1 Annual Report.
[4] Previously reported in the 2014 BPCI Model 1 Annual Report.

baseline period of January 1, 2011, through March 31, 2013 ("Baseline") and a model performance period of April 1, 2013, through March 31, 2015 ("Since BPCI inception").[5]

- **Other data** included hospital characteristics data (e.g., Provider of Service file) or hospital and physician/practitioner enrollment data provided by CMS.

Descriptive and multivariate analyses, controlling for patient and hospital characteristics, were conducted on all Awardees as well as sub-cohorts of Awardees. The sub-cohorts examined included those that (1) remained active through PY2, (2) had withdrawn from BPCI Model 1 by terminating their Awardee Agreement with CMS, and (3) had previously participated in the PHC.

Each of these Awardee cohorts was *matched* to acute care hospitals that did not participate in BPCI Model 1. Construction of the matched comparison hospital cohorts began with identification of a pool of these non-Awardee hospitals and required winnowing this pool down to non-Awardee hospitals that were similar to Awardees. Similarity was determined by statistical examination of observable patient and hospital characteristics for Awardee and non-Awardee hospitals over a baseline period (used in this evaluation's analyses) from January 1, 2011, through March 31, 2013. Observable patient and hospital characteristics examined included the number of hospital beds, patient case mix, and outcomes such as average length of stay (LOS) and mortality rates. For each Awardee, four non-Awardees deemed most statistically similar were matched. The rationale for matching multiple non-Awardees to each Awardee came from a desire to minimize anomalous performance of any singular non-Awardee hospital over time.

This report presents results for each Awardee (cohort) relative to their matched comparison cohorts. Unadjusted, (risk) adjusted, and difference-in-differences (DiD) regression models were employed to determine impacts attributable to BPCI Model 1. Unadjusted measures were adjusted by controlling for hospital, patient, and time characteristics to account for residual differences in observable characteristics from the aforementioned comparison matching process. DiD estimates—also adjusted for these characteristics—compared Awardee measure changes from baseline through BPCI Model 1 implementation periods to like changes for comparison cohorts and provided BPCI Model 1 impact estimates.

ES.3. Results and Discussion

BPCI Model 1's episode of care focuses on the inpatient hospitalization and discounts a portion of IPPS payments to participating acute care hospitals. The model affords Awardees to share internal hospital cost-savings with enrolled practitioners to incentivize practitioner adoption of care redesign.

Proper care redesign may translate to reduction in Medicare payments and, potentially, reductions in health care utilization during the episode. Ideally, these efficiencies would also occur without shifting care required by Medicare beneficiaries—or corresponding costs—to

[5] Medicare claims data were pulled on October 1, 2015, to allow for a minimum of 4 months of maturation for claims data pulled through March 31, 2015. Medicare data are expected to be 80- to 96-percent complete for a 3- to 6-month runout period.

post-episode periods. By design, BPCI Model 1 maintains a safety net on 30-day post-episode spending. The following are evaluation findings of BPCI Model 1 through PY2.

Awardees initially struggled with physician enrollment and engagement. Interview and focus group data from PY1 indicated that a primary concern across most Awardees was low physician enrollment in the model and/or lackluster engagement in care redesign. Reasons were mixed but generally included physician skepticism or misinformation of BPCI Model 1 components (e.g., gainsharing payment methodologies), structural issues such as non-employed physicians with privileges at an Awardee hospital adhering to their own practice standards, or even physicians exhibiting unwillingness to change from long-established practice patterns.

Of Awardees that remained active through PY2, the majority—in June 2015—had reportedly become satisfied with the level of physician enrollment and engagement, noting that the main drivers of such increased enrollment and engagement included repeat presentations of educational materials, clarity on gainsharing payments to physicians, and performance statistics.

Awardee participation was a balancing act between actual/perceived profitability under BPCI Model 1 and the need to align physicians with care redesign. By the third performance quarter (PQ), when the BPCI Model 1 IPPS discount was 0.5 percent, three Awardees withdrew from BPCI Model 1. Two of these three Awardees were previously enrolled in the PHC demonstration. Their predominant sentiment was that different care redesign would need to be initiated and the time required to identify and implement such care redesign would not allow sufficient time to engender hospital cost-savings and offset the IPPS discount to their Medicare revenue.

By PQ5, when the IPPS discount increased to 1 percent, six more Awardees withdrew from the model, four of which were also in the PHC demonstration. Around this time, most if not all Awardees had an idea of their cost-savings, with some actually distributing gainsharing payments to physicians. The perception that the IPPS discount to their revenue was unsustainable remained. Some of the exiting Awardees also noted the belief that they had a strong enough infrastructure to continue pursuit of their care redesign without an automatic discount to their Medicare revenue. Additional reasons, such as previously noted lackluster physician enrollment and engagement, were also of issue. Despite four more withdrawals since PQ5, Awardees that remained noted that they believed the BPCI Model 1 gainsharing component could still benefit hospital–physician alignment for care redesign at their hospitals, even at the expense of a discount to their revenue.

Medicare savings came from the BPCI Model 1 IPPS discount. Analysis of PY1 and PY2 risk-adjusted Medicare payments per episode found no consistent negative or positive statistically significant impacts. Exiting Awardees exhibited per-episode savings to Medicare in PY1 ($p < 0.05$), while still active in BPCI Model 1.[6] These savings did not extend into PY2, as Medicare payments per episode impact estimates were no longer statistically different from zero. Conversely, Awardees that remained active through PY2 had a marginal increase in Medicare payments per episode in PY2 from an elevated PY1 impact estimate—neither PY1 nor PY2 DiD

[6] 12 Awardees terminated their CMS Awardee Agreement, 6 of which were previously enrolled in the similar PHC demonstration.

estimates were statistically significant at conventional levels. However, when combined into a PY1 and PY2 aggregate, marginal statistical significance was achieved at the 10-percent level in the hospital-specific portion of the Medicare payment per episode of +$119 ($p < 0.01$). Further analyses indicated that the non-statistically significant but elevated impact estimates in PY2 across cohorts were influenced by changes in IPPS outlier payments per episode, a component of the Medicare (hospital-specific) episode payments. Specifically, the active Awardee cohort exhibited a statistically significant positive IPPS outlier payment per episode impact estimate (PY1 and PY2 combined: +$55; $p < 0.01$) while exiting Awardees exhibited a decrease in outlier payment impact estimates from PY1 (-$86, $p < 0.01$) to PY2 (-$13, not statistically significant).

In attempting to engender hospital cost-savings to offset the BPCI Model 1 IPPS discount, Awardees may have decreased the amount of care that Medicare beneficiaries actually received and shifted that burden to post-acute care facilities. Evaluation results indicated that 30-day post-episode Medicare payments did increase, driven by statistically significant increases in Medicare payments to skilled nursing facilities (SNFs). Specifically, Medicare payments to SNFs from Medicare beneficiaries discharged from Awardee hospitals active through PY2 exhibited a per-episode DiD estimate of $169 ($p < 0.1$), an increase in Medicare payments to SNFs when comparing the adjusted aggregate PY1 and PY2 periods to baseline and comparison Medicare beneficiaries. While this finding may be indicative of cost shifting or even care stinting, other data indicate that this is not likely. Despite an emphasis of some Awardees on increasing patient throughput and decreasing beneficiary length of stay, analysis of beneficiary length of stay exhibited no such persistent decreases. Furthermore, analysis of the percentage of Medicare beneficiaries who received intensive care, as measured by intensive care unit (ICU) utilization during their episode, actually increased among these active Awardees, relative to baseline and comparison hospitals. Moreover, the average percentage of Medicare beneficiaries having any SNF utilization during this post-episode period did not statistically differ from baseline or comparison hospitals. Further research is needed to determine whether this finding is an artifact of the intensity or duration of SNF stays and whether such aspects are out of Awardee control.

BPCI Model 1 does have a safety net for excess post-episode spending. A different CMS contractor monitors standardized post-episode Medicare payments for active BPCI Awardees, comparing individual Awardee spending in a program year to a baseline benchmark and risk threshold for that Awardee. If an Awardee's post-episode expenditure were to surpass the combined benchmark and risk threshold, then that Awardee would be liable to pay Medicare the excess. Information from CMS indicates that Awardees did not surpass expenditure thresholds.

Medicare payment analyses did not directly adjust for regional factors that may influence Medicare payments (e.g., differing wage indexes) and instead relied on regression methods to account for such factors, with one exception—the hospital-specific Medicare episode payment. Specifically, the hospital-specific episode payment was also standardized. Medicare payments to acute care hospitals are adjusted by hospital- and locale-specific adjustments, while standardized payments are calculated without such adjustments. The most notable adjustment left out of the standardized allowed amount (SAM) calculation is the wage index, but other adjustments include disproportionate share payments, adjustments for inpatient medical education, and incentives or penalties due to value-based purchasing, hospital readmissions reduction initiatives, or other CMS demonstrations and programs. As with nonstandardized allowed amounts, there were no

statistically significant impact estimates in PY1 or PY2 on IPPS SAMs per episode (with the IPPS discount applied) across Awardee cohorts.

The Full BPCI Model 1 cohort exhibited an impact estimate of -$46 per episode for Medicare Part A and B nonstandardized payments that was not statistically significant significant at conventional levels. This translated to an aggregate impact estimate (Table ES-1) of -$10.5 million (in 2013 dollars)—also not statistically different from zero at conventional levels. Despite the lack of statistical significance in nonstandardized Medicare payments per episode or available SAM counterparts, Medicare did save an estimated $7.3 million (in 2013 dollars; Table ES-3)[7] through the BPCI Model 1 IPPS discount across PY1 and PY2.

No consistent negative or positive impacts on claims-based health outcomes were observed. As measured by all-cause readmissions, post-episode emergency department (ED) utilization, beneficiary discharge destinations, and all-cause mortality rates, results indicate that BPCI Model 1 Awardees active through PY2 did not exhibit any consistent statistically significant unintended negative—or positive—effects on Medicare beneficiaries. DiD impact estimates for the all-cause mortality or readmission measures were not statistically significant for the Full or subset Awardee cohorts in PY1, PY2, or PY1 and PY2 combined. However, one Awardee active through PY2 exhibited a statistically significant DiD impact estimate in their mortality rate, driven by in-hospital mortality events. This Awardee noted a decrease in the incidence of sepsis and mortality rates specific to sepsis when interviewed in PY1,[8] which they credited to the use of a sepsis bundle for all patients admitted with a sepsis diagnosis. The percent of episodes with any sepsis diagnoses present on admission and the rate of in-hospital mortality events associated with such episodes followed a U-shaped pattern across study years from April 2011 through March 2015,[9] with the first year in the baseline period and PY2 having the highest sepsis-related unadjusted mortality rates. Mortality associated with sepsis diagnoses—present and not present on admission—accounted for about one-third of this Awardee's in-hospital mortality events over the study period. In telephone interviews, this Awardee also noted that it had established a palliative care program in 2011, with the goal of expanding this program to encompass all impacted patients and families in both the inpatient and outpatient settings. While there is no specific evidence to link the palliative care initiative with higher mortality, it is another factor for consideration. Taken together, there is no clear indication that the increase in this Awardee's mortality rate was directly associated with BPCI Model 1.

The following tables summarize aggregated impact estimates of expenditures, utilization, and health outcomes key measures assessed in this evaluation report for PY1, PY2, and PY1 and PY2 combined. These tables were constructed by multiplying aforementioned DiD impact estimates, which provide average episode (or post-episode) findings, by the number of BPCI Model 1 episodes affected in a given performance period. Hence, aggregate estimates in Table ES-1 and Table ES-2 should be interpreted as the additional expected increases or decreases resulting from the application of BPCI Model 1 since baseline and relative to comparison

[7] This is a conservative estimate; some episodes affected by the IPPS discount are excluded by evaluation design. Additionally, this discount only applied to episodes from Awardees while they were active within the model; BPCI Model 1 initiated approximately 60 percent of study episodes occurring.
[8] This particular interview was conducted in September 28, 2013, indicating that this particular care redesign may have been initiated prior to the start of BPCI Model 1.
[9] Measured from April 1 of one year to March 31 of the subsequent year.

hospitals.[10] By construction, statistical significance at the 10-percent level is consistent with aforementioned estimates and statistical significance. Table ES-3 highlights the portion of the Medicare episode payment recouped by Medicare from the IPPS discount.

[10] Example: The Full Cohort DiD impact estimate of 0.07 percentage points (not statistically significant) translates to an aggregate DiD impact estimate of +0.06 thousand (or about 60 incidents overall) expected additional mortality events (also not statistically significant).

Table ES-1. Full BPCI Cohort Aggregate Impact Estimates for Select Measures

Measure	PY1	90% CI			PY2	90% CI			PY1 and PY2 Combined	90% CI		
Total Episode Medicare Payments	-$14.02 M	-$28.24 M	to	$0.20 M	$3.67 M	-$12.71 M	to	$20.05 M	-$10.52 M	-$34.86 M	to	$13.82 M
Hospital-Specific With IPPS Discount	-$9.91 M	-$22.79 M	to	$2.98 M	$11.87 M	-$3.06 M	to	$26.80 M	$1.75 M	-$20.24 M	to	$23.74 M
Hospital Outlier Payment	-$2.91 M	-$5.69 M	to	-$0.14 M	$3.81 M	$0.93 M	to	$6.69 M	$0.82 M	-$3.72 M	to	$5.36 M
SAM – Hospital-Specific With IPPS Discount	-$0.25 M	-$6.62 M	to	$6.13 M	-$4.03 M	-$10.85 M	to	$2.78 M	-$4.26 M	-$14.83 M	to	$6.34 M
Non-Hospital Medicare Payment	-$4.11 M	-$6.40 M	to	-$1.82 M	-$8.19 M	-$11.60 M	to	-$4.78 M	-$12.27 M	-$16.90 M	to	-$7.64 M
Post-Episode Medicare Payments	$3.17 M	-$9.91 M	to	$16.24 M	$26.3 M	-$18.08 M	to	$70.68 M	$29.2 M	-$17.96 M	to	$76.36
Episode LOS (days)	-5.94k	-13.77k	to	1.88k	-9.77k	-23.83k	to	4.29k	-16.87k	-32.72k	to	-1.01k
ICU Utilization	0.52k	0.11k	to	0.93k	1.13k	0.57k	to	1.69k	1.66k	0.87k	to	2.45k
All-Cause Mortality	0.06k	-0.18k	to	0.30k	0.12k	-0.42k	to	0.67k	0.17k	-0.47k	to	0.81k
All-Cause Readmission	0.21k	-0.13k	to	0.54k	0.14k	-1.02k	to	1.30k	0.34k	-0.90k	to	1.58k
ED Utilization	0.24k	-0.06k	to	0.54k	44.18k	-0.02k	to	0.90k	0.67k	6.15k	to	126.87k

*Medicare payments are expressed in 2013 dollars.

Table ES-2. Active BPCI Cohort Aggregate Impact Estimates for Select Measures

Measure	PY1	90% CI			PY2	90% CI			PY1 and PY2 Combined	90% CI		
Total Episode Medicare Payments	$3.57 M	-$4.17 M	to	$11.31 M	$4.76 M	-$3.43 M	to	$12.94 M	$8.32 M	-$4.33 M	to	$20.97 M
Hospital-Specific With IPPS Discount	$4.49 M	-$2.59 M	to	$11.58 M	$7.14 M	-$0.30 M	to	$14.58 M	$11.64 M	$0.09 M	to	$23.19 M
Hospital Outlier Payment	$1.05 M	-$0.34 M	to	$2.44 M	$4.34 M	$2.84 M	to	$5.84 M	$5.38 M	$3.02 M	to	$7.75 M
SAM – Hospital Specific With IPPS Discount	$1.60 M	-$2.46 M	to	$5.67 M	-$0.06 M	-$3.34 M	to	$3.22 M	$1.54 M	-$4.39 M	to	$7.47 M
Non-Hospital Medicare Payment	-$0.93 M	-$2.01 M	to	$0.15 M	-$2.39 M	-$4.11 M	to	-$0.66M	-$3.31 M	-$5.55 M	to	-$1.08 M
Post-Episode Payments	$10.59 M	$1.80 M	to	$19.38 M	$23.06 M	-$2.57 M	to	$48.70 M	$33.64 M	$6.03 M	to	$61.26 M
Episode LOS (days)	-3.06k	-7.25k	to	1.13k	-4.14k	-11.81k	to	3.52k	-7.19k	-17.34k	to	2.95k
ICU Utilization	0.20k	-0.01k	to	0.41k	0.68k	0.65k	to	0.72k	0.89k	0.47k	to	1.30k
All-Cause Mortality	0.12k	-0.01k	to	0.26k	0.15k	-0.15k	to	0.45k	0.28k	-0.08k	to	0.63k
All-Cause Readmission	0.17k	-0.02k	to	0.37k	0.28k	-0.42k	to	0.99k	0.46k	-0.29k	to	1.20k
ED Utilization	0.24k	0.06k	to	0.41k	-0.01k	-0.26k	to	0.24k	0.22k	-0.11k	to	0.56k

*Medicare payments are expressed in 2013 dollars.

Table ES-3. Medicare Recoupment From the BPCI Model 1 IPPS Discount

Measure	PY1	PY2	PY1 and PY2 Combined
Savings to Medicare From IPPS Discount	$2.47 M	$4.85 M	$7.32 M

*Medicare payments are expressed in 2013 dollars.

1. Introduction

The Bundled Payments for Care Improvement (BPCI) Model 1 initiative aims to reduce Medicare costs while maintaining or improving quality of care. BPCI Model 1 is a multiyear program that started on April 1, 2013. The Center of Medicare & Medicaid Innovation (CMMI), under the Centers for Medicare & Medicaid Services (CMS), contracted Econometrica, Inc., and its partners—IMPAQ International, LLC; Optimity Advisors, LLC; and Pacific Institute for Research and Evaluation—to evaluate and monitor BPCI Model 1. This 2015 Annual Report presents interim findings on BPCI Model 1 impacts on Medicare expenditures, quality of care, health care outcomes, and resource utilization through performance years (PYs) 1 and 2, ending on March 31, 2015.

The remainder of this section provides motivation for BPCI Model 1, brief overviews of similar models, design features and requirements of BPCI Model 1, information on participating hospitals, a summary of findings from the BPCI Model 1 2014 Annual Report, and an outline of this report.

1.1. Background

Changes in health care policies are transforming the health care industry and placing more accountability on hospitals, health care systems, physicians, and payers to contain health care costs while improving access to and quality of care. In January 2015, the U.S. Department of Health and Human Services (HHS) released its timetable for transitioning Medicare away from its fee-for-service (FFS) model. HHS is aiming to tie 30 percent of traditional Medicare payments to care quality through accountable care organizations or bundled payment arrangements by the end of 2016, with 50 percent tied to care quality by the end of 2018. Altogether, the targets represent a 50-percent increase in the proportion of health care reimbursement tied to *value* as compared solely to *volume* by 2016.[11]

Currently, in Medicare's FFS payment system, hospitals are paid under the Inpatient Prospective Payment System (IPPS) for Medicare Part A services, while physicians are paid separately under the Medicare Physician Fee Schedule (PFS) for Medicare Part B services. IPPS payments to hospitals are fixed amounts per patient visit and are determined by patient Medicare Severity Diagnosis Related Groups (MS-DRGs). These payments are meant to cover the primary costs of a hospital's Medicare beneficiaries, including hospital-based services incurred or ordered by physicians during a patient's hospital stay.

The aforementioned increased accountability for the quality of care provided to Medicare beneficiaries and health care costs come from a variety of payment and reporting models. Some of these models, such as bundled payments, have mechanisms meant to encourage multiple providers to align their efforts and participate in health care redesign that reflect the broader goals of CMS. Within BPCI Model 1, gainsharing is one such alignment mechanism. With this mechanism, hospitals grant physicians a financial stake in managing and reducing hospital costs

[11] HHS. (2015, January 26). *Better, smarter, healthier: In a historic announcement, HHS sets clear goals and timeline for shifting Medicare reimbursements from volume to value* [Press Release]. Retrieved from http://www.hhs.gov/news/press/2015pres/01/20150126a.html.

by offering physicians a share in any internal hospital cost-savings generated by efficiency or productivity gains in delivering health care. Typically, the share that physicians receive depends on regulatory bounds and physician performance across hospital-determined measures (e.g., the percentage of patients on antibiotics following coronary artery bypass surgery, or patients' length of stay (LOS)).

Prior to BPCI Model 1, CMS included gainsharing mechanisms in several programs, including the Medicare Heart Bypass Demonstration (1991–1996) and the Medicare Physician Group Practice Demonstration (2005–2013). In the former, physicians received fixed payment amounts, whereas in the latter, physicians in a group practice could receive shares of savings if they met predefined targets. The Medicare Heart Bypass Demonstration reportedly reduced hospital costs, improved quality of care, and did not result in any negative offsets to Medicare savings because of shifts to post-acute care (PAC). The Medicare Physician Group Practice demonstration reportedly led to minor reductions in Medicare expenditures and inpatient utilization, and higher quality-of-care scores.[12] CMS also conducted two hospital-based gainsharing demonstrations—namely, the Medicare Gainsharing Program (2008–2011) and the Physician Hospital Collaboration (PHC; 2009–July 2012/March 2013). An evaluation of the Medicare Gainsharing Program found evidence of internal hospital savings, found no evidence of statistically significant changes to Medicare inpatient payments, and could not associate statistically significant changes in quality of care. Meanwhile, an evaluation of the PHC demonstration found that the program did not generate Medicare savings, but did generate sufficient internal cost-savings to allow hospitals to make incentive payments. Additionally, there was no evidence that the gainsharing program resulted in increased spending for PAC or negatively affected quality of care.[13]

1.2. BPCI Model 1

This Annual Report considers the following BPCI Model 1 roles:

- **Awardees.** Awardees are acute care inpatient hospitals (ACHs) that submit applications to CMS for enrollment in BPCI Model 1. Once accepted, these hospitals sign an Awardee Agreement with CMS to enroll in BPCI Model 1.
- **Facilitator Conveners (FCs).** FC organizations serve an administrative or technical assistance function for one or more Awardees. They assist in redesigning care without bearing risk or receiving payment from CMS.
- **Enrolled Practitioners.** Enrolled practitioners are physician or non-physician practitioners that furnish health care services to BPCI Model 1 Awardee Medicare beneficiaries, receive Medicare payments under the PFS, engage in BPCI Model 1 care redesign, and have a gainsharing agreement. CMS vets practitioners that Awardees propose for enrollment. Currently, only physicians are enrolled across Awardees.

[12] Pope, G., Kautter, J., Leung, M., Trisolini, M., Adamache, W., & Smith, K. (2014). Financial and quality impacts of the Medicare Physician Group Practice Demonstration. *Medicare & Medicaid Research Review, 4*(3), E1–E22. Retrieved from https://www.cms.gov/mmrr/Downloads/MMRR2014_004_03_a01.pdf.

[13] CMS. (2014, September). *Evaluation of the Medicare Physician Hospital Collaboration Demonstration.* RTI International. Retrieved from http://downloads.cms.gov/files/cmmi/PHC_FINAL-RPT_September2014.pdf.

Under BPCI Model 1, Awardees redesign existing care processes to achieve efficiency gains in health care that may potentially translate into decreases in Medicare expenditures (Medicare payments to Awardees) while not adversely affecting patient quality and experience of care. Such efficiency gains could translate into reduced internal hospital costs for Awardees. Waivers under BPCI Model 1 allow Awardees to distribute a portion of these internal cost-savings to enrolled practitioners (i.e., gainsharing) as a financial incentive to encourage participation,[14] identify and implement care redesign, and achieve BPCI Model 1 goals.

BPCI Model 1 participants face an automatic predetermined discount to their Medicare IPPS payments for inpatient stays,[15] defined as an episode of care for each MS-DRG. Moreover, Awardees are financially at risk for increases in both aggregate Medicare Part A and Part B costs up to 30 days after an episode, and they face quality and activity reporting requirements. These requirements and periods of financial risk in BPCI Model 1 are meant to ensure that any additional costs incurred are not passed back to CMS via other points in the health care continuum, and that quality of care is maintained or improved.

Physician payments under this model are unaffected and are reimbursed separately under the PFS for Medicare Part B services. The financial implication of participation for Awardees will vary, in part, by their volume of Medicare beneficiaries, as the IPPS discount is applied to each eligible episode. The BPCI Model 1 IPPS discount was 0 percent for performance quarter (PQ) 1 and PQ2, 0.5 percent from the start of PQ3 to PQ4, and 1 percent in PQ5. The IPPS discount percentage was set to rise to 2.0 percent on April 1, 2015, but was capped indefinitely at 1 percent in 2015.[16] Additional payment requirements include:[17]

- **Episode monitoring.** Medicare Part A and Part B payment for the inpatient hospital stay that exceeds trended historical aggregate Part A and Part B payment beyond a risk threshold (considering the discount) must be paid by the Awardee to Medicare.
- **Post-episode monitoring.** Medicare Part A and Part B payment during the 30-day post-episode monitoring period that exceeds trended historical aggregate Part A and Part B payment beyond a risk threshold must be paid by the Awardee to Medicare.

Other BPCI Model 1 key features include:

- **Enrolled practitioner requirements.** Each Awardee provides CMS with a list of practitioners for enrollment in BPCI Model 1 under the Awardee hospital. CMS accepts practitioners based on a series of requirements (e.g., eligible to furnish Medicare services, valid National Provider Identifier). Awardee-specific requirements for practitioner enrollment may vary.

[14] Non-physician clinical staff may also be engaged in BPCI Model 1 implementation of care redesign.
[15] Physicians at Awardee hospitals are paid separately under the Medicare PFS.
[16] The IPPS discount freezing came from discussions between the New Jersey Hospital Association and CMS.
[17] A different CMS contractor assesses these requirements.

- **Care redesign.** Awardees identify and implement care redesign to achieve cost-savings to the Awardee and Medicare and potentially improve quality of care through improved efficiency or productivity of health care provided at hospitals. The care redesign Awardees pursue typically affect processes of care. These redesigns are hospital-driven changes that require physician and non-physician clinical staff participation. Some examples of care redesign under this model include enhancing process efficiency to resolve or prevent bottlenecks of patients waiting to be admitted to the emergency department (ED); engaging social workers or outpatient therapy earlier for patients in need of post-discharge assistance; and requiring physicians to engage in electronic entry of patient treatment instructions to potentially decrease errors in patient care orders and increase hospital efficiency (e.g., billing).
- **Quality monitoring requirements.** CMS requires BPCI Model 1 Awardees to report on all Hospital Inpatient Quality Reporting program measures and other measures agreed upon between CMS and Awardees.
- **Gainsharing/incentive payments guidelines.** Guidelines for gainsharing to physicians and non-physician practitioners providing Medicare services are broad; Awardees propose specific calculations in their Implementation Protocol and CMS accepts them. Gainsharing guidelines do impose the following restrictions:
    - Total incentive payments to an individual enrolled practitioner must be limited to 50 percent of the aggregate Medicare payment amount (determined under the PFS)[18] for services furnished to Medicare beneficiaries at a BPCI Model 1 Awardee hospital in the prior year.
    - An incentive payment to an enrolled practitioner or BPCI entity must be derived solely from internal hospital cost-savings the Awardee generated during a time period when the enrolled practitioner or BPCI entity had been deemed eligible by CMS to receive incentive payments.
    - The BPCI Model 1 Awardee is responsible for monitoring and enforcing payment restrictions.

Each Awardee maintains a Steering Committee that is responsible for developing its own set of conditions that participants must meet to receive gainsharing payments, but all Awardees employ consistent methodologies to calculate that amount using cost-to-charge ratios and medical claims data. CMS requires that Awardees outline their Care Redesign, Management and Staffing, Gainsharing, and Beneficiary Notification processes in their Implementation Protocols. For additional detail, please see the 2014 BPCI Model 1 Annual Report.[19]

1.2.1. BPCI Model 1 Awardee Hospitals

The BPCI Model 1 program period began on April 1, 2013, with 23 Awardees, all located in New Jersey, under 1 FC, the New Jersey Hospital Association (NJHA). Of the 23 Awardees, 6 had previously participated in the PHC, a gainsharing demonstration similar to BPCI Model 1

[18] This is an increase from 25 percent under prior demonstrations.

[19] CMS. (2015, July 9). *Annual Report 2014: Evaluation and Monitoring of the Bundled Payments for Care Improvement Model 1 Initiative.* Econometrica, Inc. Retrieved from https://downloads.cms.gov/files/cmmi/BPCIM1_ARY1_Report.pdf.

that ended in July 2012. Those same six Awardees opted to participate in an extension of PHC from July 2012 to March 2013 that led up to the BPCI Model 1 program period.

On January 1, 2014, 1 Awardee hospital located in Kansas initiated a BPCI Model 1 Awardee Agreement with CMS, bringing the total participation to 24 Awardees; this hospital does not have an FC. By November 1, 2015, 13 of the 24 Awardees terminated their Awardee Agreement and were no longer active in BPCI Model 1. This report considers all 24 BPCI Model 1 Awardees and subsets of these Awardees.

NJHA works with Applied Medical Software (AMS) to provide New Jersey Awardees with internal hospital cost-savings and performance metric-related data (e.g., LOS).[20] Physician performance is measured in two ways:

1. Comparing current year's and previous year's performance.
2. Comparing individual performance against peers (statewide).

Administrators receive dashboard-like reports on enrolled physicians, which include their utilization patterns of medical supplies and hospital cost centers (e.g., emergency rooms, labs, radiology), and compare these costs with prior incurred costs and with a "best-in-class" benchmark.[21] Eleven Awardees have additional data tools/platforms to improve data specificity.[22]

Table 1 identifies BPCI Model 1 Awardees, which quarters the exiting Awardees withdrew from the model, and other Awardee characteristics. The majority of Awardees have non-employed (i.e., voluntary or privately practicing) physician staff, and the average bed size is 300, with smallest and largest at 24 and 650 beds, respectively. The average percentage of Medicare admissions for these Awardees is approximately 45 percent, indicating that a fair share of revenue may be subjected to the IPPS discount in this model. In this report, 11 Awardees are considered active through PY1 and PY2, as indicated in Table 1.

[20] More information is available at http://www.appliedmedicalsoftware.com/for-hospitals-health-systems/.
[21] Best practice norms are determined using local (statewide) practice data and minimum case volume standards. These data adjust for physician specialty and patient severity of illness to ensure comparable norms and rates.
[22] For example, Crimson, owned by The Advisory Board Company, is a provider of data, analytics, and business intelligence software to hospitals, health systems, and physicians.

Table 1. Model 1 Awardee Enrollment, Termination, and Select Characteristics*

Hospital Name (Abbreviated Name)	Active in BPCI Model 1	Exiting Quarter	Prior PHC Participation	Beds	Hospital Size**	Medicare Admissions (%)
Capital Health Medical Center – Regional ("Capital Health")		PQ7		176	Medium	46.25
Capital Health Medical Center – Hopewell ("Capital Health Hopewell")		PQ7		211	Medium	30.10
CentraState Medical Center ("CentraState")		PQ3	✓	245	Medium	48.73
Cooper Hospital/University Medical Center ("Cooper")		PQ3		488	Medium	26.54
Deborah Heart and Lung ("Deborah")		PQ5		89	Small	55.98
Hunterdon Medical Center ("Hunterdon")		PQ5	✓	170	Medium	47.13
Jersey Shore University Medical Center ("Jersey Shore")		PQ3	✓	513	Large	44.22
JFK Medical Center ("JFK")		PQ5	✓	351	Medium	46.27
Morristown Medical Center ("Morristown")		PQ5		531	Large	41.14
Overlook Medical Center ("Overlook")		PQ5	✓	423	Large	48.91
Robert Wood Johnson University Hospital ("RWJU")	✓			610	Large	38.34
Robert Wood Johnson University Hospital – Hamilton ("RWJ Hamilton")	✓	PQ8		234	Medium	49.47
Robert Wood Johnson University Hospital – Rahway ("RWJ Rahway")	✓			141	Medium	61.43
St. Joseph's Regional Medical Center ("St. Joseph's")	✓			670	Large	34.08
Saint Clare's Hospital ("Saint Clare's")	✓			337	Medium	39.55
Saint Michael's Medical Center ("Saint Michael's")		PQ6		217	Medium	45.46
Saint Peter's University Hospital ("Saint Peter's")	✓			383	Medium	26.27
Inspira Medical Center – Elmer ("Inspira Elmer")	✓			88	Small	55.60
Inspira Medical Center – Vineland ("Inspira Vineland")	✓			284	Medium	45.09

Hospital Name (Abbreviated Name)	Active in BPCI Model 1	Exiting Quarter	Prior PHC Participation	Beds	Hospital Size**	Medicare Admissions (%)
Inspira Medical Center – Woodbury ("Inspira Woodbury")	✓			219	Medium	52.11
St. Mary's Hospital Passaic ("St. Mary's")	✓			210	Medium	51.70
The Valley Hospital ("Valley")		PQ5	✓	423	Medium	52.18
University Medical Center of Princeton at Plainsboro ("UMC Princeton")	✓			206	Medium	43.62
Kansas Surgery & Recovery Center ("KSRC")	✓			24	N/A	41.75

* Only terminations that occurred prior November 2015 are noted; RWJ Hamilton is counted as active for quantitative analyses in this report. PQ = PQ starting from April 1, 2013. Data source: American Hospital Association (AHA) Annual Survey 2012 and Awardee hospitals.
** Small = less than 100 staffed beds; Medium = 101 to 499 staffed beds; Large = 500+ staffed beds.

1.2.2. Summary of BPCI Model 1 Year 1 Findings

This section provides a high-level summary of the 2014 BPCI Model 1 Annual Report that included results from the first five PQs of BPCI Model 1.[23] Note that results from the 2014 Annual Report differ in their quantitative modeling structure and Awardee cohort classifications from this 2015 Annual Report and are not directly comparable.

1.2.2.1. 2014 Awardee Participation Findings

Over the first 5 PQs, 9 Awardee hospitals withdrew from the model, leaving 15 active Awardees in the model. Exit interviews conducted with these Awardees indicated that they withdrew for the following predominant reasons:

1. BPCI Model 1 participation seemed redundant for some Awardees given that the existing employment/contractual relationship required physicians to adhere to protocols and participate in care redesign.
2. Inability to attribute perceived or realized internal hospital cost-savings to care redesign. Alternatively, some respondents indicated that the anticipated cost-savings would only be realized over an extended timeframe.
3. Low physician enrollment and engagement, resulting in insufficient critical mass to generate the change(s) in practice at the scale necessary to achieve internal hospital cost-savings from care redesign.

Awardee hospitals enrolled and engaged physicians to assist in their BPCI Model 1 activities (e.g., care redesign) through various recruitment techniques. Early in the program, these recruitment efforts were hindered in part due to physician skepticism of gainsharing, misunderstanding of model components, and/or the additional effort required to comply with model (reporting) requirements. Awardee hospitals witnessed increased physician enrollment and engagement after the initial gainsharing distribution (end of PQ3 through PQ5).

During the initial period, each Awardee implemented between two and nine care redesign. Across Awardees, these care redesign varied in type (e.g., in-hospital patient flow improvement versus fall prevention programs), ease of implementation, period required for implementation, definition of "fully implemented," and desired outcome(s) from implementation. In primary data collected early in the first year of BPCI Model 1, administrative and clinical interviewees emphasized that care redesign aim to affect quality of care first and cost of providing care second. As the PY progressed, administrators became more cost-conscious and engaged in discussions about whether the care redesign they were pursuing had resulted in sufficient savings to justify their continued, voluntary participation in BPCI Model 1, given that they faced an across-the-board IPPS discount.

1.2.2.2. 2014 Quantitative Findings

When compared to average episode and patient population characteristics of comparison hospitals, Medicare beneficiaries seen by BPCI Model 1 enrolled practitioners were slightly older, had a slightly higher average risk score, and had a lower average MS-DRG weight.

[23] CMS. (2015, July 9). *Annual Report 2014: Evaluation and Monitoring of the Bundled Payments for Care Improvement Model 1 Initiative.* Econometrica, Inc. Retrieved from https://downloads.cms.gov/files/cmmi/BPCIM1_ARY1_Report.pdf.

On average, the adjusted total Medicare episode payments increased for both Awardee and comparison hospitals.[24] However, the increase was greater for comparison hospitals when compared to Awardee hospitals and yielded a difference-in-differences (DiD) savings impact of \$123 ($p < 0.01$) per episode. Most of the savings were driven by Awardees that have since withdrawn from BPCI Model 1. However, the per-episode savings were partially offset by an increase in post-episode Medicare payments of \$95 ($p < 0.05$). Most of this dis-saving was driven by Awardees active through the first five PQs.

Changes in beneficiary LOS and intensive care unit (ICU) utilization varied across Awardees. The adjusted likelihood of any ICU utilization was generally higher among active Awardees, relative to baseline and comparison hospitals. Changes in lengths of stay varied in direction and magnitude across Awardee and comparison hospitals, but were generally minimal, with differences (decreases or increases) of less than 0.5 days. None of these changes was statistically significant despite some statistically significant changes at the individual Awardee level.

The 2014 Annual Report noted room for concern with two Awardee mortality DiD estimates as these indicated statistically significant increased *likelihoods* of Medicare beneficiaries experiencing *post-episode* mortality events, relative to baseline and comparison hospitals. There were no statistically significant BPCI Model 1 impact findings from all-Awardee analysis of readmission likelihoods. However, the exiting Awardee sub-cohort did exhibit a statistically significant decrease in the likelihood of its Medicare beneficiaries experiencing a readmission event (0.97 odds ratio, $p < 0.1$).

1.3. Report Outline

The purpose of this Annual Report is to provide an interim evaluation of BPCI Model 1 impacts through the first two PYs, from April 1, 2013, through March 31, 2015, with a focus on PY2 (April 1, 2014, through March 31, 2015). The remainder of this report is structured as follows: Section 2 presents a methods overview for the evaluation/monitoring analyses and references previously reported information from the 2014 BPCI Model 1 Annual Report, as needed. Sections 3 through 6 present detailed methods and descriptive and multivariate results across measure domains (listed in Section 2.1), including Awardee responses to BPCI Model 1 policies and design components. Section 7 concludes with a cross-domain summary of findings.

[24] Note that unlike Medicare payment results in this annual report, the 2014 BPCI Model 1 Annual Report payment measures were winsorised at the top and bottom first percentile.

2. Methodology

The methodology employed for analyses in this report supports the question of whether BPCI Model 1 met the desired goals. This occurs through assessing model design components, how these components trigger changes in Awardee and clinical staff behavior, and how these changes translate to quantifiable outcomes. Much of the detail in this section was taken from the 2014 Annual Report and updated for this 2015 Annual Report, as needed.

Section 2.1 provides an overview of evaluative foci in this report. Section 2.2 details primary data collection (e.g., interviews and focus groups) used to inform any successes, issues, or unanticipated results that arose during the 2 years of model implementation. Section 2.3 provides an overview of Medicare claims and data and analytical methods employed for quantitative analyses in this report.

2.1. Domains and Measures for Model Evaluation

The current evaluation approach combines Awardee characteristic and model feature information with that of Awardee activities (e.g., care redesign) obtained from interviews and focus groups with stakeholders (e.g., Model 1 Awardee program coordinators and enrolled practitioners). Quantifiable data (e.g., Medicare claims, clinical staff enrollment) were used to assess BPCI Model 1 impact and their impetuses across the following domains:[25]

- **Implementation and Organizational Responses of Awardees.** This domain includes health care organizational features such as health IT infrastructure, provider capacity, systems, and other health care infrastructure support measures. These features measure variation and intensity of the implementation of care redesign in BPCI Model 1. Unlike other domains, data on organizational features are collected through primary data collection tools, including telephone interviews, and focus groups. This domain also includes insights on the number and types of care redesign pursued across Awardees that further vary in measurement of progress, success, and even objective. Section 4.1 presents findings under this domain.
- **Episode Case Mix and Medicare Beneficiary Characteristics.** This domain focuses on demographic and health characteristics of the Medicare beneficiaries. This underlying epidemiology may affect quality of care or payments and needs to be considered when examining the impact of BPCI Model 1. Case mix includes patient severity, patient risk scores, and number of chronic conditions (CCs). Patient characteristics include patient age, race/ethnicity, and Medicare–Medicaid dual-eligibility status. The data sources for these measures are available through inpatient claims data, inpatient community risk scores, and master beneficiary summary files (MBSFs). These characteristics are controlled for in multivariate analyses. Section 5 presents descriptive statistics for this domain.

[25] These domains and measures are based on measure and domain guidance from the Innovation Center's Rapid Cycle Evaluation. CMMI. (2013, March 28). *Core Measures Version 9*. Baltimore, MD: CMS.

- **Medicare Expenditures and Health Care Utilization.** This domain includes Medicare expenditure measures over the hospitalization and post-hospitalization periods and corresponding utilization. For example, this domain analyzes ICU utilization during a patient's hospitalization and post-hospitalization use of PAC facilities, such as skilled nursing facilities (SNFs). These measures examine the effect of BPCI Model 1 on Medicare payments to providers and on efficiency of care delivery.
- **Health Care Outcomes.** This domain includes measures that examine likelihoods of a patient's discharge destination, mortality rate, and readmission rate as identified from Medicare claims data.

Measure definitions are detailed within their respective domains throughout Sections 4–6.

2.2. Primary Data Collection Methods and Analyses

Primary data provide insight into the progress of BPCI Model 1 at each Awardee hospital and presents information on four domains of interest:

- Physician engagement.
- Impact of care redesign.
- Gainsharing payment process and impact.
- Patient health and care experience.

Telephone interview and focus group data include information on physician enrollment, patient population, organizational culture, implementation challenges, and the effect of gainsharing on model outcomes. Telephone interview waves occur with active BPCI Model 1 Awardees prior to focus group rounds. Focus groups are conducted with various hospital staff in order to obtain multiple stakeholder perspectives on the model; these are collectively referred to as "site visits." The site visits add validity to the data collected during telephone interviews and provide a well-rounded picture of model experience at Awardee hospitals. Table 2 and Table 3 show telephone interview and site visit methodological characteristics and Awardee participation since BPCI Model 1 inception.

Telephone interview data from Waves 1 and 2 (Table 3) and site visit data from July 2013, October 2013, March 2014, and October 2014 were included in the 2014 Annual Report. This 2015 Annual Report focuses on data from 2015, as available,[26] and includes information from the 2014 Annual Report as needed for context.

[26] Until November 2015.

Table 2. Telephone Interview and Site Visit Characteristics and Participation

Characteristic	Telephone Interview	Site Visit (Focus Group)[27]	Exit Interview
Frequency	Semiannually	Average of four per year	As needed
Instrument	Semi-structured	Semi-structured guides	Semi-structured
Duration	45 minutes	60 minutes per session	45 minutes
Content	Physician Engagement, Progress Toward BPCI Model 1 Goals, Impact of Physician Incentive Mechanisms	Physician Engagement, Progress on Care redesign, Implementation Challenges and Successes, Physician Incentive Mechanisms, Future Goals	Primary Reasons for Withdrawal, including Physician Engagement, Progress on Care redesign, Physician Incentive Mechanisms
Stakeholder Participation	Program Coordinator (PC) and/or Awardee Hospital Administrators[28] (1–3)	Awardee Hospital Administrators (5–7) Physicians (4–6) Surgeons (4-6) Non-Physician Clinical[29] (7–10)	Awardee Hospital Administrators (1–3)

[27] In situations where three or fewer participants attend a session, the moderator switched to an in-person interview format.
[28] Awardee hospital administrators include BPCI Model 1 PCs and/or Chief Medical Officers.
[29] Non-physician clinical staff includes registered nurses, care coordinators, patient navigators, and discharge planners.

Table 3. Telephone Interview and Site Visit Participation

Awardee Name	Telephone Interview				Site Visits					
	Wave 1 Nov 2013	Wave 2 July 2014	Wave 3 May 2015	Wave 4 Oct 2015	July 2013	Oct 2013	March 2014	Oct 2014	June 2015	Nov 2015
Capital Health and Capital Health Hopewell	✓	✓								
CentraState	✓				✓ (Pilot)					
Cooper	✓									
Deborah	✓									
Hunterdon	✓									
Jersey Shore	✓									
JFK	✓					✓				
Morristown	✓									
Overlook	✓						✓			
RWJU	✓	✓	✓	✓		✓				
RWJ Hamilton	✓	✓	✓			✓				
RWJ Rahway	✓	✓	✓	✓				✓		
St. Joseph's	✓	✓	✓	✓		✓				
Saint Clare's	✓	✓	✓	✓						
Saint Michael's	✓	✓					✓			
Saint Peter's	✓	✓	✓	✓				✓		
Inspira Elmer	✓	✓	✓	✓						✓
Inspira Vineland	✓	✓	✓	✓						✓
Inspira Woodbury	✓	✓	✓	✓						✓
St. Mary's	✓	✓	✓	✓						
The Valley	✓									
UMC Plainsboro	✓	✓		✓						
KSRC		✓	✓	✓					✓	

2.2.1. Telephone Interviews

This report includes data collected and analyzed from telephone interviews over two waves. Wave 3 (May 2015) included interviews with 10 Awardee hospitals,[30] and Wave 4 (October 2015) included interviews with 11 Awardees.

Telephone interviews are conducted with Awardee hospital administrators semiannually to obtain information on implementation and organizational activities surrounding BPCI Model 1.[31] Awardee hospital administrators include PCs who coordinate BPCI Model 1 activities at a hospital and direct the program's implementation. The purpose of the 45-minute semiannual telephone interviews is to obtain a comprehensive account of model activities, including care redesign, methods used to increase physician enrollment and engagement, process for and effects of the physician incentive mechanisms, and successes and challenges encountered.

In order to assess the overall progress of the model, semi-structured guides included questions across three key domains: physician engagement, implementation of care redesign, and physician incentive mechanisms.

For Wave 3, the guides were refined from the previous year to obtain detailed information on the progress toward BPCI Model 1 goals. The framework was refined to include sections on Quality Improvement, Cost-Savings, and Operational Efficiency (e.g., reduction in duplication of services). These sections address the Awardee's process for monitoring progress toward each goal, status compared to the target set for each goal, and which staff and/or interventions most contributed to achieving each goal. Due to the shift in focus for these interviews, the Chief Financial Officer, who would have in-depth knowledge on the hospital's financial status, was requested to attend the interview along with the PC.

Between Waves 3 and 4, Awardees submitted updated Implementation Protocols to CMS. To obtain further information on the motivations for these care redesign adjustments, interview guides were refined once again for Wave 4. The new section requested information on the reasons for adding or terminating a care redesign, changing a care redesign goal, and adjusting a gainsharing payment condition.

2.2.2. Site Visits

This report includes site visit data from six Awardees: two in October 2014, one in June 2015, and three in November 2015. The Overlook and St. Peter's University Awardees were chosen for the October 2014 visits to gather information and identify differences between Awardees familiar with gainsharing and Awardees new to the program. Overlook, a PHC demonstration participant, possessed previous experience with gainsharing and selected unique care redesign. St. Peter's recently changed its PC and was in the process of revamping its engagement and enrollment strategy. KSRC was selected for a site visit in June 2015 based on its unique staffing structure and size, lack of a FC, and challenges reported during previous telephone interviews. This Awardee is a small surgical center where independently practicing surgeons admit patients.

[30] Though 11 Awardees were active at the time of the May 2015 telephone interviews, we were unable to schedule University Medical Center Princeton at Plainsboro in time for the May 2015 telephone interview round.

[31] Awardees participated in telephone interviews while active in BPCI Model 1. In instances where Awardees indicated their intention to terminate their Awardee Agreement prior to an upcoming telephone interview round, exit interviews were conducted instead.

The site visit to KSRC aimed to gather further information on how the hospital engaged its privately practicing physicians, how the Awardee tracked progress on quality improvement and cost-savings without an FC, and how the hospital attempted to remedy challenges faced during BPCI Model 1 implementation. Finally, site visits were conducted at the Inspira Medical Centers in November 2015 to further understand how Awardees under one hospital network may benefit from learning discussions between PCs, and identify any site-specific internal or external factors that influenced BPCI Model 1 engagement and progress given unified administration.

Onsite focus groups helped to gain a deeper, multiperspective understanding of the Awardee's progress. Focus group sessions were held with individuals involved in the Awardee hospital's BPCI Model 1 participation, including hospital administrators, physicians, surgeons, and care redesign team leaders.

Semi-structured interview questionnaires were developed using information gathered over previous rounds of data collection and tailored for each of the four focus group types. The domains included in the site visit guides paralleled the telephone interview guides to allow for hospital-level analysis across time and comparison across sites.

2.2.3. Exit Interviews

Semi-structured exit interviews were conducted with five Awardees that had terminated their BPCI Model 1 Awardee agreement since the start of PY2. These interviews were conducted within 30 days of withdrawal notification. As of November 2015, 13 Awardees terminated their Awardee Agreement since the start of the model.

Exit interview questionnaires aimed to solicit information on reasons for withdrawal, specifically any challenges associated with levels of engagement, care redesign, incentive payment distribution, and realizing of cost-savings from the program.

Two exit interviews (Deborah Heart and Lung Center, Hunterdon Medical Center) were conducted in May 2014, one interview was conducted with St. Michael's Medical Center in August 2014, and the most recent interviews were conducted with Capital Health in December 2014 and RWJ Hamilton in April 2015.

2.2.4. Analyses

All primary data were recorded, transcribed, organized, coded, and analyzed. A thematic codebook was developed to identify responses on physician engagement, gainsharing impacts, care redesign intervention progress, and reasons for termination.

Primary data analysis was conducted to assess Awardee stakeholder responses on the implementation of BPCI Model 1 at their hospital and the Awardee's achievements and challenges to date. This analysis relied on a triangulation process that first determined similarities and differences in responses within stakeholder types (e.g., comparing administrator responses from telephone interviews and focus groups for a given Awardee hospital). Cross-stakeholder responses were then compared within an Awardee hospital and to findings across Awardees to determine common themes. This period of data collection focused specifically on financial savings and methods for monitoring success. In looking for commonalities, differences that might reflect current or future model success (or failure) were also assessed.

2.3. Secondary Data Methods and Analyses

Data from the 100-percent research identifiable Medicare Claims and Enrollment Database from the Chronic Conditions Data Warehouse (CCW) were used. Medicare claims include inpatient, outpatient, carrier, durable medical equipment (DME), SNF, home health agency (HHA), and hospice claims. Claims from long-term care hospitals (LTCHs) and inpatient rehabilitation hospitals (IRHs) were included with other inpatient claims. The MBSF was used to extract patient demographics, program eligibility, and CC flags. Other data used included Awardee hospital-level data such as clinical staff enrolled in the model and hospital characteristics from the Provider of Service file.

Data were analyzed by quarter and the aggregate periods of Baseline, Since BPCI Inception, PY1, and PY2. Table 4 details the time period dates for the aggregate periods.[32]

Table 4. Time Period Dates for Study Periods

Time Period Name	Time Period Dates
Baseline	January 1, 2011, through March 31, 2013.
Since BPCI Inception	April 1, 2013, through March 31, 2015.
• PY1	April 1, 2013, through March 31, 2014.
• PY2	April 1, 2014, through March 31, 2015.
• Program PQs	Exclusive 3-month periods from April 1, 2013, through March 31, 2015.

The remainder of this section discusses how episodes and post-episodes were defined, methodology used to create comparison hospitals cohort, and Awardee groupings; it concludes with a discussion of how comparison hospitals and hospital groupings are utilized within presented impact analyses.

2.3.1. Episode Construction

The periods in Table 4 are composed of patient-level episodes. The episode captures data on services provided to a patient from admission into the hospital through discharge. For any given measure, episodes were included if:

1. The episode occurred at Awardee hospitals or comparison hospitals.
2. The episode occurred from January 1, 2011, through March 31, 2015.
3. The episode was not excluded from analysis by numerator or denominator defined exclusions for that measure.

Some measures rely solely on services that occur within patient episodes, while some measures focus on services utilized within 30 days after discharge. Throughout the text, these have been identified as "in episode" and "post episode," respectively.

Episodes that occur in March 2015 may utilize claims 30 days beyond March 31, 2015, for post-episode measures (such as readmissions). Medicare claims were pulled from CCW servers on October 1, 2015, to allow for a minimum of 4 months for claims to run out (adjudication and

[32] KSRC's Since BPCI Inception period begins on January 1, 2014.

data maturation). Medicare data are generally about 80- to 96-percent complete for a 3- to 6-month runout period.

2.3.2. Comparison Hospital Methodology

Although details of comparison hospital methodology can be found in the earlier 2014 Annual Report, they are briefly described here for completeness.

Impacts of BPCI Model 1 were derived from comparing outcomes of BPCI Model 1 Awardees to *similar* non-Awardee hospitals ("comparison hospitals" or "comparison group"). Construction of the comparison hospital group was a multistep process that required identifying similar non-Awardee hospitals from a pool of hospitals that did not participate in BPCI Model 1.

Four statistically similar non-Awardee hospitals were *matched* to each Awardee to minimize anomalous performance of any singular non-Awardee hospital over time. Similarity was assessed over observable average baseline characteristics such that the resulting comparison hospital group and Awardee hospitals were statistically similar over these characteristics and had similar baseline trends in key outcomes of average patient LOS, all-cause mortality, all-cause readmissions, and Medicare acute care hospital payments. By construction, the comparison hospitals allowed for inferences of a counterfactual scenario: For BPCI Model 1 Awardees, what would their outcomes be had they not participated in BPCI Model 1?

There are various methods for assessing statistical similarity and identifying appropriate comparisons ("matching"). A common component of these methods is that they include a tool for assessing statistical similarity (e.g., *t*-tests, KS-tests) and a set of observable characteristics over which to compare similarity. A 1-to-4 *nearest neighbor* matching methodology that assessed similarity of a Mahalanobis[33] distance metric over observable characteristics between Awardees and potential comparison hospitals was used to select the comparison group. Baseline market, hospital, and patient characteristics considered are listed in Table 5.[34]

[33] Rubin, D. B. (1980). Bias reduction using Mahalanobis-metric matching. *Biometrics, 36*(2), 293–298.

[34] Several other matching specifications were considered (e.g., using 1:1, 2:1, and 3:1 nearest neighbor matching). Other characteristics considered included the change in readmission and mortality rates, case mix index, average MS-DRG weight, disproportionate share percentage, and proportion of patients who were dually eligible for Medicare and Medicaid.

Table 5. Matching Variable Names, Specifications, and Sources

Variable Name	Technical Specification	Source
Pre-Match Characteristics		
Urban	Equal to 1 if the hospital is located in an urban area; 0 otherwise.	Fiscal Year (FY) 2014 Final Rule
Provider type	Nine types of ACHs: • IPPS • Rural Referral Center (RRC) • Indian Health Service • Medicare Dependent Hospital (MDH) • MDH/RRC • Sole Community Hospital (SCH) • SCH/RRC • Essential Access Community Hospital (EACH) • EACH/RRC	FY 2014 Final Rule
Hospital Characteristics		
Indicator for general hospital	Equal to 1 for general hospital; 0 otherwise.	AHA Annual Survey Database FY 2011
Indicator for teaching hospital	Equal to 1 for teaching hospital; 0 otherwise.	AHA Annual Survey Database FY 2011
Indicator for presence of ED	Equal to 1 if the hospital has an ED; 0 otherwise.	AHA Annual Survey Database FY 2011
Number of beds	Number of hospital beds.	FY 2014 Final Rule
Urban classification	Equal to 1 if hospital is located in a large urban area; equal to 2 if hospital is located in another type of urban area.	FY 2014 Final Rule
Patient Episode Characteristics		
Indicator for high surgical MS-DRG percentage	Equal to 1 if hospital has more than 90% surgical MS-DRGs.	2008 Inpatient 5% Base Claims Database
Percentage of hospital days paid by Medicare	Medicare days as a proportion of total.	FY 2014 Final Rule
Average Hierarchical Condition Category (HCC) score	Calculated from inpatient claims and HCC files.	Inpatient claims HCC files
LOS	Calculated from inpatient claims file.	Inpatient claims
Change in LOS between: • Q1 2011 and Q2 2011 • Q3 2011 and Q4 2011 • Q1 2012 and Q2 2012 • Q3 2012 and Q4 2012	Calculated from inpatient claims file.	Inpatient claims
All-cause mortality	Calculated from inpatient claims and Beneficiary Summary File.	Inpatient claims Beneficiary Summary File
All-cause readmissions	Calculated from inpatient claims file.	Inpatient claims

First, two hospital characteristics were used to winnow down the pool of more than 3,000 potential comparison hospital matches to 1,851 hospitals by using two characteristics that all BPCI Model 1 Awardees shared: being located in an urban area and receiving IPPS payments.

Second, after using these "Pre-Match Characteristics" to reduce the universe of potential comparison hospitals, the aforementioned Mahalanobis distance metric with a 1-to-4 *nearest neighbor* matching algorithm was employed. Using the nearest neighbor algorithm, the four closest potential comparison hospitals were matched to each Awardee hospital to form the comparison hospital sample.

The main categories for matching—hospital characteristics and patient and episode characteristics—were averaged at the hospital level. Hospital characteristics included indicators for whether a hospital was a general hospital or teaching hospital and whether it had an ED. Other matching characteristics included bed size and whether a hospital was located in a large urban or other urban area.[35] These characteristics capture aspects that may fundamentally affect how hospitals function, as there may be patient differentials in hospitals with differing capacities and qualities.

Additionally, a number of patient and episode characteristics were included in the matching algorithm, such as an indicator for hospitals with a high (greater than 90 percent) proportion of episodes falling within certain surgical MS-DRGs. The percentage of hospital days paid by Medicare captures information that could affect hospital participation decisions, since BPCI Model 1 is based on inpatient stays paid by Medicare. Select baseline performance measures in the matching process were included, such as episode LOS and hospital-level mortality and readmission rates. While CMS-HCC scores are meant to capture Medicare beneficiaries' expected chronic disease burden, one could infer to some extent that these are average resources provided to Medicare beneficiaries across episodes based on episode length (patient lengths of stay). Readmission and mortality were also included in the matching algorithm due to their importance as indicators of baseline quality-of-care and coordination-of-care performance, as these variables are strongly linked to patient demographic and community factors not necessarily observable in available data.

[35] Following the advice of matching methodologists (Rubin, 2001, 1980, and 1973; and Stuart, 2010), selection of these criteria was based on scientific understanding of different confounding factors that could drive changes in performance measures and program participation.

Statistical similarity ("quality") of this matching process was assessed by examining the standardized *bias* of and across each characteristic.[36] A high-quality match (i.e., low bias that implies similarity over characteristics) would result in small standardized differences between BPCI Model 1 Awardee hospitals and selected comparison hospitals across observable characteristics. Table 6 shows overall bias *before* matching—the bias between Awardee hospitals (in aggregate) and the *potential* comparison hospital group (1,851 hospitals)—and the overall bias after matching, which compares the Awardee hospital group to *actual* matched comparison hospitals. The overall bias is the average percentage of biases across individual characteristics matched on and reduced to 9.3 percent after matching, down from 30.1 percent before matching (Table 6). Thus, starting from 24 Awardee hospitals and more than 3,000 potential comparison hospitals, we find 1,851 potential comparison hospitals, which were eventually matched to 96 hospitals, of which 82 are unique.

Table 6. Overall Matching Quality

Mean Bias Before Matching	Mean Bias After Matching
30.1%	9.3%

Additional Similarity Requirements. An additional point of concern in this comparison hospital selection process was meeting an expected assumption for DiD regression models to produce unbiased impact estimates. This assumption, known as parallel paths, requires that trajectories of the dependent/outcome variables in a DiD model not differ for two cohorts (Awardee and comparison cohorts) before the introduction of a study intervention. Note that differences in the level of a measure assessed does not pose a problem for DiD regression models.[37] The validity of this assumption was inspected visually in Figure 1.

Figure 1 shows pre-model trends of four performance measures for BPCI Model 1 Awardees and comparison hospitals: average patient LOS, 30-day all-cause mortality, 30-day all-cause readmissions, and Medicare episode payments. The horizontal axis indicates the quarters prior to the start of the BPCI program and runs from the first quarter of 2011 through the first quarter of 2013. Figure 1 shows a parallel pre-model trend for each of the four measures using unadjusted data. DiD models detailed in Sections 4 through 7 will capture residual differences between Awardee and Comparison cohorts by accounting for hospital and patient characteristics.

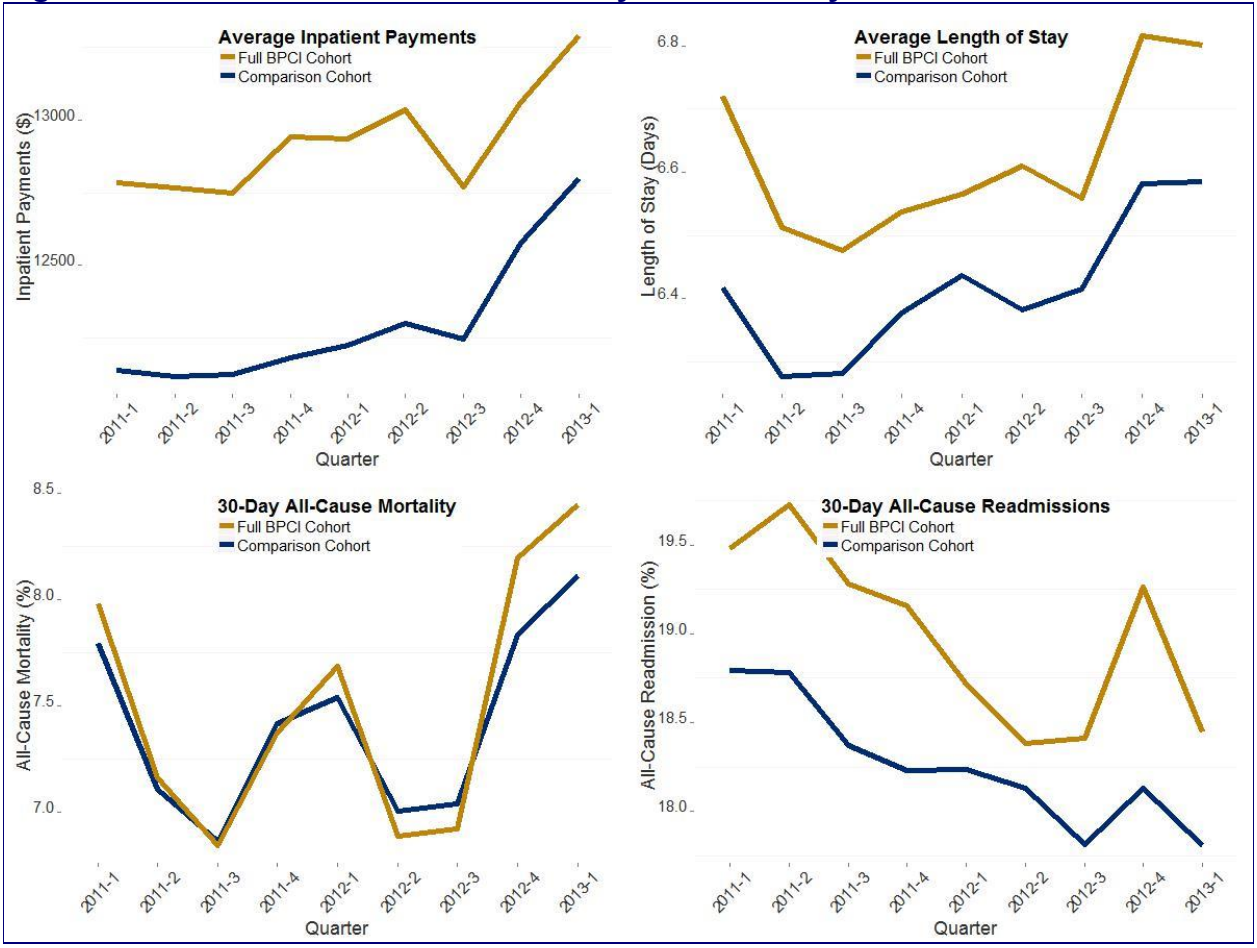
[36] Statistically, bias is defined using the formula in Rosenbaum and Rubin (1985):

$$\text{Bias} = \frac{\bar{X}_T - \bar{X}_C}{\left(\frac{(\sigma_T^2 + \sigma_C^2)}{2}\right)^{1/2}},$$

where $\bar{X}_T$ and $\bar{X}_C$ represent the sample means of Awardee and selected comparison hospitals, respectively, for Table 7 characteristics; σ_T^2 and σ_C^2 represent the variances of these characteristics for Awardee and comparison hospitals. The ratios of these variances are also assessed when determining the quality of the match.

[37] This assumption is discussed on page 770 in Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: Methods and applications*. New York: Cambridge University Press.

Figure 1. Pre-BPCI Model 1 Trends of Key Outcomes by Quarter



2.3.3. Hospital Cohorts

Awardee hospitals pursue care redesign that differ in number, type, objective, and focus on patient populations. Additionally, from April 1, 2013, through November 1, 2015, 13 hospitals exited the model, including 6 Awardees with similar gainsharing experience under the PHC. To assess differences between Awardees that terminated their agreements and those that remained, model impacts were estimated for:

- All Awardee hospitals, regardless of Awardee Agreement termination (Full BPCI Cohort).
- Awardee hospitals still active in BPCI Model 1 through March 31, 2015 (Active BPCI Cohort).[38]
- Awardee hospitals that terminated their Awardee Agreement before March 31, 2015 (Exiting BPCI Cohort).
- Awardee hospitals with recent gainsharing experience from the PHC (PHC BPCI Cohort).

[38] No Awardees terminated their Awardee Agreement between March 31, 2015, and November 1, 2015.

Despite withdrawing from the model, Exiting (and its PHC subset) Awardees were analyzed and included in the Full BPCI cohort to discern any residual effects from BPCI participation.[39] All exiting Awardees were *active* in BPCI Model 1 for an average of 63 percent of the 2-year program period analyzed in this report. Because Awardees are followed even after withdrawal from the model, the Full, Exiting, and PHC cohorts are analyzed under *intent*-to-treat frameworks.

Table 7 shows the number of Awardee hospitals classified as above and their respective Comparison hospitals.

Table 7. Hospital Cohort Membership

Cohort Classification	Number of Awardee Hospitals	Number of Matched Comparison Hospitals
Full	24	96
Active	12	48
Exiting	12	48
PHC	6	24

2.3.4. Analyses

The report includes results from the individual Awardee level and the Awardee cohort level. Awardee-level and Awardee cohort-level analyses consisted of comparative analyses for each Awardee relative to their matched comparison hospitals and each Awardee cohort to its matched comparison cohort. Generally, unadjusted, (risk) adjusted, and DiD measure estimates were assessed to determine impacts attributable to BPCI Model 1. Regression models for adjusted and DiD statistics leveraged the aforementioned counterfactual scenario directly by comparing Awardee measure differences before and after BPCI Model 1 inception (i.e., Baseline vs. Since BPCI Inception) to like differences for comparison hospitals. Standard errors were computed using the delta method.

Unadjusted measure statistics were adjusted by controlling for hospital and time effects and episode and patient characteristics to account for residual differences between Awardee and comparison hospitals that were not otherwise captured by the comparison hospital selection process. Analyses were conducted in Stata 14 and SAS 7.1.

[39] As such, Full cohort results could be interpreted as an Intent-to-Treat model that does not drop treated participants due to compliance issues (e.g., exits).

3. Awardee Implementation and Organizational Responses to BPCI Model 1

Awardee success in BPCI Model 1 depends on physician participation and engagement in implementing care redesign. This section summarizes findings from telephone interviews and focus groups. It includes findings on Awardee and physician participation, characteristics of care redesign, and the rationale for why Awardees terminated their agreement with CMS.

3.1. BPCI Model 1 Participation

This subsection provides an overview of Awardee participation and physician enrollment and engagement. Multiple factors that impacted Awardee participation in PY1 were detailed in the 2014 BPCI Model 1 Annual Report and summarized in Section 1.2.2 and in this section for context.

3.1.1. Awardee Participation

Currently, 11 Awardees continue to participate in BPCI Model 1, and all except 1 of these Awardees are located in New Jersey. Overall, administrators at these Awardee hospitals believed that they had more to achieve from their care redesign and want to continue furthering clinician and hospital alignment for efficiency gains despite challenges faced in implementing BPCI Model 1.[40]

Awardees' PY1 goals continued in PY2 and included maintaining or improving patient quality of care while reducing *hospital* costs for care provision. To meet these goals, Awardees used gainsharing (i.e., enrolled practitioner incentive payments) as a tool to increase physician engagement in care redesign. These care redesign, discussed in detail in Section 3.2.1 generally included goals of improving clinical effectiveness, leveraging health IT,[41] and connecting this program with other initiatives to change practice behavior.

Awardee participation suffered during the first five PQs, with nine Awardees terminating their Awardee Agreement with CMS. Within PQs 6 through 8, an additional three Awardees withdrew.

3.1.2. Physician Enrollment and Engagement

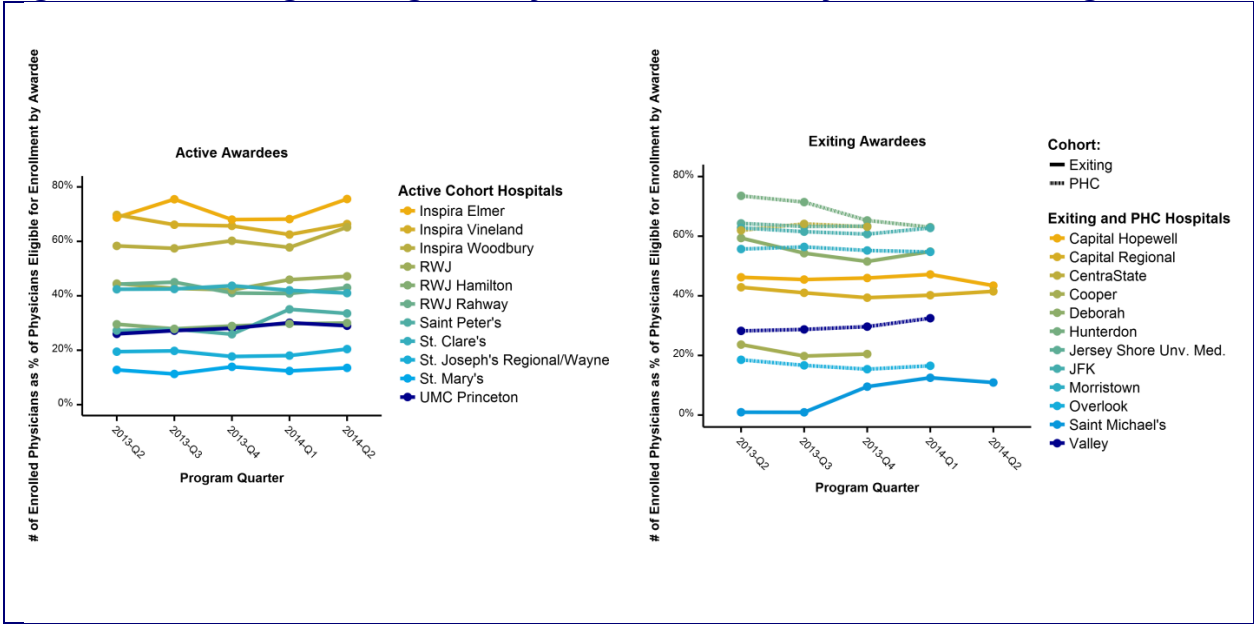
During PY1, Awardees cited several strategies to enroll and engage physicians to assist in their BPCI Model 1 activities (e.g., care redesign). These strategies included a **targeted approach,** focusing on enrolling high-volume physicians; a **scaled approach,** focusing on specific service lines; and **a mixed-methods approach,** utilizing a range of techniques such as presentations, emails, and newsletters to reach out to physicians. Awardees that had previously participated in the PHC initiative reported "rolling over" physicians from the PHC into BPCI Model 1. Physicians who did not want to participate in BPCI Model 1 were required to opt out.

[40] Further detailed in Section 3.4.

[41] Specific example: leveraging software(s) to create physician scorecards that assessed patient LOS relative to statewide or hospital goals.

Early in PY1, physicians were unsure of BPCI Model 1 requirements and goals. This made recruitment a challenge, especially among Awardees that were new to gainsharing models. Figure 2 shows the proportion of eligible physicians that Awardees enrolled over the first five PQs.[42] The majority of Awardees in all cohorts experienced relatively minor variation in their enrollment levels over time. However, it should be noted that Exiting Awardees experienced a slight drop-off in enrollment in the PQ immediately preceding their withdrawal from BPCI Model 1.

Figure 2. Percentage of Eligible Physicians Enrolled by Awardee Through PQ5*



* Source: CMS Enrolled Practitioner lists from April 1, 2013, through June 30, 2014.

In PY2, four Awardees reported increased physician enrollment levels, and three other Awardees enrolled the most eligible physicians into the model. This general upward trend in the number of enrolled physicians across Awardees indicates that physician skepticism was no longer a barrier to enrollment. One Awardee, Inspira Woodbury, reported that the distribution of incentive payments resulted in a dissipation of skepticism that physicians initially had at the start of the program.

Methods to enroll physicians in BPCI Model 1 remained the same for all but two Awardees, Saint Clare's Hospital and RWJ Rahway. These Awardees continued recruitment efforts and adjusted their initial enrollment strategy to include memos and direct encounters with physicians. Saint Clare's Hospital reported that physicians participating in BPCI Model 1 at their hospital covered more than 85 percent of all Medicare cases.

[42] Data are currently unavailable for PQs 6–8 or for KSRC.

Physician engagement also reportedly improved across Awardees continuing in BPCI Model 1 through PY2. This was largely attributed to a better understanding of the program, the impact of gainsharing payment distributions, and interest in physician-specific performance data. Physicians at Inspira Woodbury indicated that BPCI Model 1 did not affect day-to-day practice and acknowledged that the experience changes more *for a patient* in relation to how and when care is delivered (e.g., timeliness, case manager visit).

Some Awardees also reported that physicians provided feedback and suggestions for improving communication and compliance with care redesign. KSRC administrators reported that discussions with physicians resulted in a greater understanding of the model and the purpose of participating in this program. Physicians at Inspira Medical Center within the Elmer and Vineland campuses expressed interest in participating in other initiatives such as those with "shared-savings" based on achievements in cost-savings through BPCI Model 1. Administrators at Inspira Medical Center Elmer and Vineland explained that BPCI Model 1 was a vehicle for the "doctors on the front line," allowing physicians to hear from leaders and vocal doctors during department meetings improving communication across the hospital.

Other Awardees (RWJ Rahway, Saint Clare's Hospital, and St. Mary's Medical Center), however, noted continued struggles in achieving desirable physician engagement. The PC at RWJ Rahway indicated that about 40 percent of participating physicians were *well* engaged and about 30 percent were *somewhat* engaged.

3.2. BPCI Model 1 Design Characteristics

This section examines the types of care redesign Awardees pursued, care redesign focus/targets, cost-savings, and operational efficiency, as well as the impact of gainsharing payments on practice behavior.

3.2.1. Care Redesign

BPCI Model 1 Awardees attempt to achieve efficiency gains in health care delivery through reduced health service redundancies, improved care processes, and increased clinical effectiveness from use of evidence-based guidelines. Collectively, care redesign may also lead to internal hospital cost-savings and, potentially, savings to Medicare. The number and objective of care redesign pursued through BPCI Model 1 varied across Awardees, with Awardees pursuing anywhere from two to nine care redesign foci. To better understand Awardee motivations for these self-selected pursuits, care redesign were classified in two ways:

1. According to BPCI Model 1 goals.
2. By the service area targeted.

Table 8 and Table 9 do not specify the number of hospitals associated with each BPCI Model 1 goal or service area target because many Awardees' list of selected care redesign could be stratified into more than one of the classifications. For example, an Awardee with five types of care redesign may have two redesigns that impact cost reduction and three redesigns that impact quality improvement.

Table 8 categorizes each Awardee's care redesign by the BPCI Model 1 goal it primarily impacts. Most hospitals implemented interventions that directly affect quality improvement, and exiting Awardees focused more on improving resource utilization, relative to active Awardees. This finding supports information gathered from previous rounds of primary data collection with hospital administration. Hospital steering committees reported that by targeting quality improvement, cost reduction and better resource utilization would follow.

Table 8. BPCI Model 1 Care Redesign by Associated Goal*

Goal	Definition	Full BPCI Cohort # of Care Redesign	Active BPCI Cohort # of Care Redesign	Exiting BPCI Cohort # of Care Redesign
Cost Reduction	Strategies, policies, or processes implemented or planned to directly reduce the cost of medical care (e.g., On Time First Case, Increase Use of Reprocessed Equipment).	11	4	7
Quality Improvement	Strategies or initiatives associated with service delivery and underlying systems of care, designed to enhance medical services, health status of patients, and improve patient experience of care (e.g., Hospital Consumer Assessment of Healthcare Providers and Systems, Readmissions, Medication Reconciliation).	74	38	36
Resource Utilization	Strategies that aim to manage the level of organizational materials and instruments used to improve efficiency (e.g., Opportunity Assessment Policy, Multidisciplinary Touch Base Rounds).	16	3	13

* Table 8 does not specify the number of hospitals associated with each BPCI Model 1 goal or service area target because many Awardees' list of selected care redesign could be stratified into more than one of the classifications.

Table 9 classifies BPCI Model 1 care redesign by the service area targeted. Some care redesign target hospital departments, require physician practice change, or aim at improving a specific protocol based on best practices.

Table 9. BPCI Model 1 Care Redesign by Service Target*

Target	Definition	Full BPCI Cohort # of Care Redesign	Active BPCI Cohort # of Care Redesign	Exiting BPCI Cohort # of Care Redesign
Physician/ Eligible Provider Directed	Policies that require physician change in practice or physician education, or are physician-driven (e.g., computerized provider order entry, Standard Order Sets, Reduce HF Readmissions).	25	12	13
Organization Directed	Activities that involve enhancement of communication between departments, modification of resources to improve efficiency, and quality assurance (e.g., LOS, COACH Program).	23	7	16
Care Management Directed	Protocols that involve care management team members such as care coordinators/nurses, or activities surrounding direct patient education and information sharing (e.g., Discharge Planning, Improve Patient Flow).	13	5	8
Clinical Practice Guideline Directed	Strategies or activities that involve the education and adoption of new clinical protocols based on current evidence-based research (e.g., CAUTI, Surgical Site Infection Protocol, VTE Prophylaxis).	40	21	19

* Table 9 does not specify the number of hospitals associated with each BPCI Model 1 goal or service area target because many Awardees' list of selected care redesign could be stratified into more than one of the classifications.

Two Awardees, St. Mary's and St. Clare's, chose to update their care redesign in June 2015. St. Mary's Hospital Passaic replaced the original Surgical Care Improvement Project (SCIP) measure compliance and Heart Failure (HF) measure compliance interventions with two new areas of focus:

1. Compliance with stroke care guidelines.
2. Compliance with venous thromboembolism (VTE) prophylaxis for ICU patients.

Preliminary data from the most recent telephone interview indicate that St. Mary's decided to shift its focus after achieving 100-percent compliance with respect to SCIP and HF. St. Mary's is a designated stroke center, and the BPCI Model 1 steering committee believed that adding this redesign would help physicians increase compliance with the guidelines and meet best practice.

St. Clare's implemented the greatest number of changes. The Awardee terminated two areas of focus (treatment and care guidelines for HF patients, and SCIP protocol) and added four new areas of focus, including:

1. Patient flow and throughput improvement.
2. Managing ED patient flow for admitted patients.

3. Improving care delivered to patients with severe sepsis or in septic shock.
4. Protocols for VTE prevention.

The addition of a number of care redesign seems to indicate that this Awardee views BPCI Model 1 as an effective way to achieve practice change across its physicians. The PC at St. Clare's explained that the administration decided to replace the HF and SCIP protocols and focus on new areas through BPCI Model 1 because almost all participating physicians were compliant with the goal set for both care redesign. However, the hospital still monitors the original protocols and continues to spot-check associated metrics.

3.2.2. Methods to Monitor BPCI Model 1 Progress

Awardees used various data sources to monitor quality and hospital costs, including AMS, Crimson, Nuance, CMS, and QualityNet. In general, Awardees were satisfied with the data they received through these systems and use these data during meetings (e.g., dashboards, scorecards, presentations) to educate and help participating physicians improve their performance. However, delays with data remain a concern for NJHA Awardees in PY2.[43]

3.2.2.1. Impact of Care Redesign Initiatives

Nine active Awardees reported significant improvements in the level of quality of care. Many Awardees are making practice changes based on evidence-based research. For example, KSRC decreased the number of falls by 50 percent by switching from the femoral block to a saphenous block for knee patients. One Awardee, RWJ Rahway, reported continuous improvement in reducing readmissions. This Awardee was involved in the Surviving Sepsis Campaign and initiated an evidence-based computerized provider order entry (CPOE) for sepsis care. This order set resulted in significant improvements in the sepsis-related mortality rate, which in turn decreased LOS and associated costs. Order set development also proved effective at Inspira Woodbury, where order sets for congestive HF and pneumonia generated the greatest increase in quality of care. During care redesign meetings, this hospital found that MRIs were not performed over the weekends. Inspira Woodbury staff worked with the Radiology unit to remedy the issue and expedite patient transitions in and out of the hospital, thereby reducing LOS. Saint Clare's Hospital achieved significant improvements in quality metrics for HF and surgical care improvement. These care redesign elements were removed in July 2015 to accommodate other initiatives since physician compliance with HF and SCIP protocols had reached 100 percent.

All Awardees still active in BPCI Model 1 during Wave 3 reported achieving internal hospital cost-savings. While some Awardees attributed the cost-savings to BPCI Model 1, others were unable to determine whether the savings resulted from the implementation of care redesign under BPCI Model 1 due to confounding initiatives. Inspira Woodbury, for example, is implementing various changes to its processes, including the MRI testing process and the care coordination model. This Awardee is also implementing a new system of communication between care coordinators and physicians called "Practice Unite," which supports timely and easier communication between staff. Inspira Elmer and Vineland's internal finance department initiated an in-depth cost-per-patient-day analysis and found that there were real savings from implants,

[43] PY2 data delays were attributable to Awardee and CMS physician vetting issues that have since been resolved. These vetting data are used to compute gainsharing payments and are updated quarterly. Data from the last calendar quarter of 2014 have been delayed until the fourth calendar quarter of 2015.

renegotiated contracts, standardization of products, and working with the Council for Environmentally Responsible Surgery. The implementation of an electronic medical record system at Saint Mary's Medical Center will reduce test duplication. RWJ Rahway reported that interventions related to LOS are driving efficiency gains. The Awardee created Hospital Operations Teams to look into processes, such as ordering and scheduling tests, to identify and correct inefficiencies. Although these are not wholly attributable to BPCI Model 1 care redesign, Awardees reported hospital cost-savings that ranged from $300,000 to $1,700,000.

3.2.2.2. Incentive Mechanisms

Multiple rounds of gainsharing payments have been distributed since BPCI Model 1's inception. All Awardees distributed gainsharing payments, and only three Awardees reported an increase in the size of these payments as the program progressed. Awardee administrators qualified gainsharing payments as "motivators" for positive impact on physician engagement (e.g., care redesign adoption) and overall communication.

Physicians who received checks reported to be more satisfied and more willing to engage and collaborate with administration and other physicians. For example, Inspira Woodbury's participating physicians are more inclined to work in collaboration with administration to standardize the use of devices and protocols. At KSRC, internal medicine physicians are now willing to follow a new protocol to order labs as established by the administration. Despite these achievements, administrators generally found it difficult to clearly establish the extent to which incentive payments influenced physicians' behavior due to confounding initiatives.

Some Awardees, however, still struggled to align physicians with model goals despite the model's incentive mechanism. RWJ Rahway, for example, reported that some participating physicians enrolled in BPCI Model 1 at multiple institutions were not willing to comply with Rahway-specific requirements (e.g., face-to-face meetings). Three Awardees, Inspira Medical Center Elmer and Vineland campuses and Saint Joseph's Regional Medical Center, reported that delayed check distribution challenged continued physician engagement with BPCI Model 1 care redesign.

3.3. Motivations for Termination of BPCI Model 1 Awardee Agreement

3.3.1. Overall Assessment of Termination

Four exit interviews were conducted with administrators at Awardee hospitals that terminated their Awardee Agreement in PY2. Hunterdon Medical Center and Deborah Heart and Lung Center withdrew in May 2014, St. Michael's Medical Center in August 2014, and RWJ Hamilton in April 2015.

Hunterdon Medical Center's motivation for withdrawal centered on the Awardee's actual or perceived ability to achieve cost-savings from care redesign under BPCI Model 1. The Awardee had previously participated in the PHC demonstration and believed it had achieved all the gains in care delivery possible through that demonstration.

Deborah Heart and Lung Center's primary motivation for withdrawal was attributable to its staffing structure. All practicing physicians at Deborah were employed by the hospital, which

lowered the marginal value of gainsharing payments, as physician and hospital interests were already reported to be aligned.

St. Michael's Medical Center and RWJ Hamilton cited low physician engagement as their primary challenge and reason for withdrawal. Additionally, Awardee administration at RWJ Hamilton calculated that more was being spent than saved through participation in BPCI Model 1 since the outcomes from BPCI Model 1 activities did not outweigh administrative and model requirement (e.g., reporting) costs due to their low volume of engaged physicians.

3.3.2. Specific Rationale for Termination

3.3.2.1. Organizational Structure and Physician Engagement

Administrators at Saint Michael's reported that only 13 of the 129 physicians eligible to participate with their Awardee in BPCI Model 1 decided to participate. Administrators did not recruit any new physicians during the third and fourth quarters because the Awardee was in the process of being acquired by Prime Healthcare. The impending change in ownership, and what that might mean for clinicians, reportedly discouraged physician engagement and stalled recruitment efforts.

Deborah Heart and Lung Center has a unique staffing and organization structure. The PC at Deborah mentioned that physicians at the hospital were employed as individuals but act like a group practice, which made gainsharing payment distribution a challenge as administrators attempted to calculate the gainsharing payment amounts for each participating physician.

Though RWJ Hamilton enrolled a satisfactory number of physicians into the model, it was not able to achieve the high level of engagement administration believed necessary for the program to succeed. Despite holding one-on-one meetings with physicians and maintaining frequent communication with clinical staff, the Awardee was unable to improve engagement. The primary reason was structural, as the voluntary employment status of its physicians made engagement challenging. Further, physicians at this hospital had engrained practice patterns that administration found difficult to modify. Administrators claimed that there was a general lack of interest in the model from physicians.

3.3.2.2. Care Resign Outcomes and Finances

Hunterdon and Deborah realized their inability to offset the IPPS discount by the end of the first year of the program. The cost-savings generated through care redesign did not match the costs for BPCI Model 1 implementation. Hunterdon estimated the IPPS discount to be between $250,000 and $280,000, which they considered non-trivial in a financially difficult year. Hunterdon also reported having to pay a data fee of $125,000, a prime factor in the decision to terminate participation in BPCI Model 1.

Deborah achieved minimal savings but could not attribute these savings to BPCI Model 1. Deborah learned about the IPPS discount freeze at 1 percent and reported almost breaking even at that percent. However, the IPPS discount freeze did not change their decision to withdraw.

RWJ Hamilton indicated that they were spending more than what they saved through the program. Though the hospital made strides in reducing incidence of catheter-associated urinary tract infection (CAUTI), central line-associated blood stream infection, and LOS, the impacted

savings were insufficient. The volume of staff involved in the program was not enough to make a significant difference.

In contrast, the financial situation of St. Michael's did not influence the Awardee's decision to withdraw. The PC claimed that the institution would have continued—despite the cost of the program—if enough physicians were participating.

3.3.2.3. Gainsharing Payment Distribution

A major complaint with the incentive mechanism from these hospitals echoed sentiments made by hospitals that withdrew earlier in the program. Awardees reported a lag in data used for calculating incentive payment amounts. This delay likely affected the value of the gainsharing process negatively since the hospitals did not possess current data.

There were benefits to the gainsharing process: some physicians at RWJ Hamilton were increasingly cognizant of the number of consultants used, a major cost to the hospital. However, the payments' risk outweighed this benefit. The Chief Financial Officer noted that the hospital was paying out more than the hospital was realizing in savings. The site added full-time equivalents to fill the role of data manager to complete requirements under the BPCI Model 1 program and other responsibilities for NJHA communication, which increased hospital spending.

3.3.2.4. Requirements of the BPCI Model 1 Program

Overall, hospitals viewed model requirements such as data reporting (that added additional financial burden for third-party data organizations, such as AMS, to manage and report data) and the IPPS discount as a financial burden and a strong reason to withdraw from the model.

3.4. Discussion of Implementation and Organizational Responses Domain Findings

Currently, there are 11 active hospitals in the model. This is down from 24 hospitals since the model started in 2013. Most hospitals within the exiting cohort cited structural- and cost-based issues as reasons for terminating their BPCI Model 1 Awardee Agreement.

Structural-Based Issues. Some Awardees believed that their clinical staff was already sufficiently motivated (e.g., through employment/contractual obligations with the hospital). Others experienced too much difficulty in obtaining desired physician enrollment and engagement.

Cost-Based Issues. Awardees expressed inability to associate perceived or even realized internal hospital cost-savings from care redesign, and in some cases expressed concern that hospital cost-savings engendered over the model period had not offset BPCI Model 1's IPPS discount.

In PY2, Awardee withdrawal reasons also centered on structural and cost issues. However, at this point in the program, these are realized issues rather than perceived.

For active Awardees, remaining challenges primarily surrounded delays in performance data. The most recent round of site visit data indicated that physicians shared the desire for data to arrive more frequently, to better associate changes in behavior with hospital gains. Participants at

Inspira Woodbury reported being rarely aware of which accomplishments or adoption of new practice encouraged improvements in care efficiency and incentives. This "black hole of information" served as a barrier to sustained change in care delivery.

In the first two calendar quarters of 2015, active Awardees had an opportunity to adjust, remove, or add to care redesign they had originally proposed. All but 2 of the 11 Awardees continued with their original care redesign, as they had yet to fully achieve their goals for those care redesign. Given that it takes about 3 to 9 months to implement care redesign, it follows that there is room to meet existing care redesign goals after PY2.

4. Episode Case Mix and Patient Characteristic Analysis

Although, BPCI Model 1 was designed to improve quality of care and contain health care costs, it is plausible that the model could produce unintended consequences on the quality of care received by Medicare beneficiaries. These unintended consequences may stem from or manifest as propitious patient selection (e.g., hospital cherry picking, servicing less sick Medicare beneficiaries) or stinting of care.[44]

This section shows patient and episode characteristics for Awardee and comparison hospitals over study periods. Because comparison hospitals were selected on potentially correlated characteristics, large baseline differences are not expected between Awardee and Comparison hospital cohorts. However, as residual differences between Awardee and comparison groups may exist in baseline and potentially grow in program periods, characteristics listed in the next section are included in most multivariate analyses in subsequent sections.

4.1. Data Sources and Measures

Medicare inpatient claims and beneficiary characteristic summary files were extracted from CCW for the January 1, 2011, through March 31, 2013, baseline period and the April 1, 2013, through March 31, 2015, model implementation period. Episodes in these data have been previously described in Section 2.3.1.

Over the study period, Medicare beneficiaries maintained FFS A and B enrollment without any health maintenance organization (HMO) enrollment, did not have episode LOSs exceeding 1 year, and did not have an end-stage renal disease (ESRD) as the Medicare reason for entitlement. Transfers that occurred during the middle of an episode were excluded.

Patient age was stratified—by 0 to 64 years, 65 to 69 years, 70 to 74 years, 75 to 79 years, and 80 years or more—to allow for nonlinear relationship between age and various outcomes. Beneficiary sociodemographics included gender, race, and dual Medicare and Medicaid status.

A frail beneficiary with multiple CCs is more likely to experience poor outcomes or require more intensive treatment than a beneficiary without such conditions. As a result, multivariate analyses sought to control for prior calendar year beneficiary utilization—in terms of, for example, number of hospitalizations—and whether Medicare beneficiaries had CCs that might affect episode and post-episode treatment decisions and outcomes.

CCs year files were extracted from the CCW servers for Medicare beneficiaries within the study episodes. Of the 27 CC indicators, 5 cancer CC indicators (breast, colorectal, endometrial, lung, and prostate cancer) were combined into a single "cancer" indicator. "Alzheimer's Disease" and "Alzheimer's Disease and related disorders or senile dementia" indicators were also combined into a single "Alzheimer's and dementia" indicator, leaving 22 CC indicators for multivariate inclusion. Because of missing data issues, prior year utilization variables were excluded.

[44] Care stinting through decreased care utilization (e.g., to reduce costs associated with care) is examined in other domains.

MS-DRG weight, a measure of a hospitalization's resource-intensity, reflects the expected relative costliness of inpatient treatment. CMS-HCC risk scores, conversely, are (prospective) payment-weighted measures of beneficiary health status and come from CMS-HCC yearly data.[45] Similarly, additional variables capturing whether the beneficiary received certain specific treatments while hospitalized were controlled for in multivariate analyses. These treatments were identified using ICD-9-CM diagnosis and procedure codes and include:

- Hemodialysis.
- Any ventilator use or ventilator use for 96 hour or more.
- Total parenteral nutrition (TPN) at transfer.
- Central line management.
- Severe pressure ulcer.

4.2. Descriptive Results

This section describes sociodemographic and episode intensity/cost characteristics (Table 10) controlled for in multivariate analyses. The descriptive statistics focus on Full and Active BPCI Model 1 Awardee and their comparison cohorts. Appendix A, which is separate from this document, presents the results for Exiting and PHC cohorts (Appendix A – Table A.2).

Sociodemographic Variables. As expected, the majority of BPCI Medicare beneficiaries were over 65 years of age, with the largest subgroup comprising those aged 75 to 84 years old. Full and Active comparison cohorts had a younger patient population than their respective BPCI Model 1 Awardee cohorts. These distributional similarities and differences remained relatively constant across study periods (Baseline, Since BPCI inception).

The proportion of Medicare beneficiaries who were *dually eligible for Medicare and Medicaid* was larger for comparison cohorts than for the BPCI Model 1 Awardee cohorts. The difference in this proportion between the Full BPCI Model 1 Awardee cohort and its comparison hospitals was larger than that between the Active BPCI Model 1 Awardee and comparison cohorts.

More than 80 percent of all Medicare beneficiaries at BPCI Model 1 Awardee and comparison hospitals were white. The second largest racial demographic was blacks, more prevalent (by more than 2 percent) in the Full cohort comparison relative to its BPCI Model 1 Awardee counterpart. Conversely, the Active BPCI Model 1 Awardee cohort exhibited a marginally higher population of blacks (about 1.0 percentage point (pp)) relative to their comparison cohort. This racial and ethnic composition remained relatively stable over study periods across cohorts.

Episode Intensity/Cost Control Variables. This group of characteristics accounted for FFS Medicare beneficiaries who had hemodialysis, ventilator use for 96 hours or more, central line management, severe pressure ulcers, or TPN during an episode.

In general, the distribution of these variables was similar between Full and Active BPCI Model 1 Awardee cohorts and their respective comparison cohorts, with two exceptions. First, the average

[45] CMS-HCC scores for 2015 were unavailable when claims data for this report were pulled from the CCW. Thus, for episodes in PQ8 (January 1, 2015, through March 31, 2015), the last known CMS-HCC score for that patient is taken.

proportion of *Medicare beneficiaries who had central line management during an episode* was larger for the Full BPCI Model 1 Awardee cohort than for its comparison cohort. Conversely, this proportion was smaller for the Active BPCI Model 1 Awardee cohort than for its comparison cohort. The use of central line management decreased for both BPCI Model 1 Awardee and comparison cohorts from baseline by more than 1.0 pp. Second, the average proportion of *Medicare beneficiaries who had TPN* was similar for both Full and Active BPCI Model 1 Awardee cohorts, and was larger than their comparison cohorts across study periods. Other BPCI Model 1 Awardee cohorts exhibited similar proportions relative to their comparison cohorts.

Table 10. Means of Explanatory Variables*

Measure	Full Cohort: Baseline		Full Cohort: Since BPCI (PY1 & PY2)		Active Cohort: Baseline		Active Cohort: Since BPCI (PY1 & PY2)	
	BPCI	Comparison	BPCI	Comparison	BPCI	Comparison	BPCI	Comparison
Sociodemographics								
Age 0 to 64	12.24	15.23	12.62	15.57	12.81	15.05	13.43	15.41
Age 65 to 74	25.83	27.73	27.40	29.04	24.98	27.64	26.31	28.80
Age 75 to 84	33.11	31.80	31.57	30.50	32.64	31.71	30.85	30.45
Age 85+	28.82	25.24	28.41	24.89	29.58	25.60	29.41	25.34
Dual-eligibility status	18.92	24.01	18.16	23.74	21.65	24.87	20.83	24.46
Black	11.47	13.74	11.44	13.82	11.22	10.42	11.35	10.51
Hispanic	2.42	2.22	2.39	2.10	3.47	3.06	3.35	2.87
White	83.33	81.06	82.80	80.74	82.12	82.98	81.62	82.71
Other racial/ethnic classification	2.79	2.98	3.37	3.33	3.19	3.55	3.68	3.92
Episode Intensity/Cost Controls								
Any hemodialysis during episode	0.47	0.51	0.53	0.55	0.48	0.52	0.48	0.52
Any ventilator use for 96 hours or more during episode	4.27	4.17	4.53	4.26	4.17	4.04	4.67	4.11
Central line management during episode	7.10	6.47	5.89	5.00	5.79	6.33	4.12	4.88
Severe pressure ulcer during episode	3.94	3.84	3.60	3.57	4.04	4.02	3.53	3.76
TPN	1.29	0.88	1.15	0.85	1.33	0.91	1.11	0.85
MS-DRG weight (SD)	1.58 (1.50)	1.62 (1.49)	1.64 (1.53)	1.65 (1.48)	1.49 (1.36)	1.61 (1.46)	1.51 (1.38)	1.64 (1.45)
CMS-HCC score (SD)	1.72 (1.35)	1.68 (1.32)	1.72 (1.40)	1.70 (1.38)	1.75 (1.36)	1.68 (1.32)	1.75 (1.41)	1.70 (1.37)
Number of episodes	282,894	892,481	240,960	745,377	125,467	481,726	102,771	405,165

* Twenty-two CC indicators taken from MBSF data are also included within most multivariate regression models. Baseline = January 1, 2011, through March 31, 2013; PY1 = April 1, 2013, through March 31, 2014; PY2 = April 1, 2014, through March 31, 2015.

5. Medicare Expenditures and Health Care Utilization

While the PHC demonstration—a precursor to BPCI Model 1—focused on budget neutrality, BPCI Model 1 aims to reduce Medicare expenditures without sacrificing quality of care through hospital–physician gainsharing and care redesign. The IPPS discount provides Medicare with an automatic, risk-free percent decrease to IPPS payments Awardees receive for Medicare beneficiaries served while enrolled in BPCI Model 1. Care redesign that Awardees pursue under this model may engender cost-efficiencies while maintaining or even improving patient quality of care. These efficiencies may translate to decreases in Medicare expenditures beyond the IPPS discount and changes in care resource utilization. Achieving such efficiencies requires engaging medical staff in implementing pursued care redesign. The Awardee's ability to gainshare with enrolled physicians under this model aims to promote such engagement.

This section presents analyses of Medicare expenditures and utilization metrics for baseline and model implementation periods between Awardees and their comparisons. For all measures, tabular data are presented for the Full BPCI Model 1 Awardee and comparison cohorts. These cohorts respectively include Awardee and comparison hospitals from Active, Exiting, and PHC sub-cohorts (identified in Section 2.3.3). Tabular data also are included in text for Active cohorts, which include BPCI Model 1 Awardees that remained active in BPCI Model 1 through PY2. Tables for the Exiting and PHC sub-cohorts are relegated to Appendix A, from which specific tables are identified as needed. Further, trends and DiD estimates for these cohorts are graphically presented in text for comparisons against Active cohorts.

5.1. Data Sources and Measures

Medicare inpatient, carrier, outpatient, SNF, HHA, and DME claims were extracted from CCW for the January 1, 2011, through March 31, 2013, baseline period and for the April 1, 2013, through March 31, 2015, model implementation period. Specific measures analyzed from these data and their requirements for patient and episode inclusion in this study are summarized below.

Medicare Episode and Post-Episode Expenditure included all Medicare Parts A and B expenditures within the index hospital stay (episode) and 30 days after the episode (post-episode), respectively. Episode and post-episode expenditures were analyzed separately and by health care service types. Specifically, the episode expenditures were analyzed as the total Medicare Parts A and B payments divided into hospital-specific payment portion (Medicare IPPS payment to a BPCI Model 1 Awardee or comparison hospital) and the non-hospital payment portion, which includes all other Medicare Parts A and B payments during the episode. The 30-day post-episode expenditures were also analyzed as total Medicare Parts A and B payments during this period, with an emphasis placed on Medicare payments to SNFs and LTCHs. Table 11 lists and defines Medicare expenditure measures assessed in this report. Each regression model type listed in Table 11 is detailed in Section 5.2.

All Medicare payments were adjusted to 2013 dollars using the Medical Consumer Price Index. Medicare payment analyses did not directly adjust for regional factors that may influence Medicare payments (e.g., differing wage indexes). Instead, they relied on regression methods to account for such factors, with one exception—the hospital-specific Medicare episode payment. Specifically, the hospital-specific episode payment was also standardized.[46] Medicare payments to acute care hospitals are adjusted by several hospital- and locale-specific adjustments, while standardized payments are calculated without such adjustments. The most notable adjustment left out of the standardized allowed amount (SAM) calculation is the wage index, but others include disproportionate share payments, adjustments for inpatient medical education, and incentives or penalties due to value-based purchasing and hospital readmissions reduction initiatives. Thus, examination of SAM hospital payments during the episode, where BPCI Model 1 is focused, effectively allow for insight into a hypothetical scenario where ACHs are paid the same by Medicare for a given patient and these payments are not subjected to potentially competing initiatives.[47]

While nonstandardized hospital-specific Medicare payments include the BPCI Model 1 IPPS discount, the SAM hospital episode payments do not include this discount by construction. In the multivariate analyses, this discount is added into the SAM Medicare payments to hospitals.

All Medicare expenditure measures captured Medicare beneficiaries over the study period that:

1. Maintained FFS A and B enrollment without HMO enrollment during the episode.
2. Did not have episode LOSs exceeding 1 year.
3. Did not have ESRD Medicare entitlement.
4. Did not die during the episode.

Of these, only beneficiary episodes that listed Medicare as a primary payer for Awardee or comparison hospital stays and were not at the beginning or middle of a transfer sequence to/from other facilities were included. For 30-day post-episode expenditure measures, FFS coverage condition (1) above was extended for the 30-day post-period.

[46] Instructions on generating SAMs for acute care inpatient facilities can be found at https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Geographic-Variation/GV_PUF.html and https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Geographic-Variation/GV_PUF.html.

[47] Examples include the Hospital Readmissions Reduction Program, which may affect Medicare payments to hospitals based on their readmission performance.

Table 11. Medicare Episode and 30-Day Post-Episode Expenditure Measures and Model Types

Medicare Expenditure Measure	Description/Notes	Model Type
Total Medicare Episode Expenditure	The sum of Medicare expenditures for a given episode, which includes inpatient, outpatient, carrier, and DME Medicare payments.	Ordinary Least Squares (OLS)
Hospital Medicare Episode Expenditure	The hospital Medicare expenditure for a given episode. These are Medicare payments paid to Awardee and comparison hospitals and, for Awardees, include the IPPS discount as applicable.	OLS
Non-Hospital Medicare Episode Expenditure	The sum of all non-inpatient Medicare expenditures occurring during the episode period for a given episode. This includes carrier, outpatient, and DME Medicare payments.	OLS
Standardized Allowed Amount Hospital Expenditure Measure With IPPS Discount	The standardized allowed Medicare payment amount for the Hospital Medicare Episode Expenditure measure, with the BPCI Model 1 IPPS discount applied.	OLS
Hospital Medicare Outlier Episode Payment	The non-capital outlier payment portion of the IPPS Hospital Medicare Episode Expenditure.	Two-part model (TPM): logistic and OLS
Total Medicare 30-Day Post-Episode Expenditure	The sum of Medicare expenditure within 30 days after episode discharge, which includes all Part A and B Medicare payments to institutional and non-institutional providers.	OLS
SNF Medicare Post-Episode Expenditures	The sum of Medicare payments made to SNFs within 30 days after episode discharge. Identified from SNF-specific Medicare claims.	TPM: logistic and OLS
ACH/CAH Medicare Post-Episode Expenditures	The sum of Medicare payments made to ACHs or critical access hospitals (CAHs) within 30 days after episode discharge. Identified from inpatient Medicare claims where Medicare provider numbers are 0001–0879 or 1300–1399.	TPM: logistic and OLS
LTCH Medicare Post-Episode Expenditures	The sum of Medicare payments made to LTCHs within 30 days after episode discharge. Identified from inpatient Medicare claims where Medicare provider numbers are 2000–2299.	TPM: logistic and OLS
All Other Medicare Post-Episode Expenditures*	The sum of Medicare payments made to institutional and non-institutional Part A and B providers within 30 days after episode discharge, not including Medicare payments to SNF, ACH/CAH, or LTCH facilities.	OLS

* This grouping was formulated to avoid regression model convergence issues that occurred for components of this All Other category with low incidence.

Health Care Resource Utilization Measures included all Medicare Parts A and B FFS services within the episode and 30 days after the episode. The 30-day post-episode utilization measures imposed the same study inclusion criteria as the 30-day post-episode payment measures noted above. ICU utilization and episode LOS measures imposed fewer restrictions than the episode payment measures. Namely, they did not exclude Medicare beneficiaries who died during their episode hospitalization to keep the study sample for these utilization measures as inclusive as possible. Table 12 lists and describes health care utilization measures analyzed in this report. Each regression model type is detailed in Section 5.2.

Table 12. Episode and 30-Day Post-Episode Utilization Measures and Model Types

Medicare Expenditure Measure	Description/Notes	Model
Episode Utilization		
Length of (Hospitalization) Stay	An episode LOS is measured as the difference between hospitalization admission and discharge dates + 1.	Poisson
ICU Utilization*	Episode ICU utilization is identified by 020x (except 20106) revenue center codes within the inpatient Medicare claim files. This measure identifies any ICU utilization and is also used to examine the length of ICU stays within an episode.	Logistic for utilization
30-Day Post-Episode Utilization		
SNF Utilization	The sum of Medicare claims for SNF services within 30 days after episode discharge. Identified from SNF-specific Medicare claims.	Logistic; Poisson for number of SNF claims
ACH/CAH Utilization	The sum of Medicare claims for ACH or CAH services within 30 days after episode discharge. Identified from inpatient Medicare claims where Medicare provider numbers are 0001–0879 or 1300–1399.	Logistic
LTCH Utilization	The sum of Medicare claims made to LTCHs for services within 30 days after episode discharge. Identified from inpatient Medicare claims where Medicare provider numbers are 2000–2299.	Logistic
Other Part A and B Medicare Utilization	The sum of Medicare claims for institutional and non-institutional Part A and B providers within 30 days after episode discharge, not including Medicare payments to SNF, ACH/CAH, or LTCH facilities.	Logistic

* KSRC and its comparison hospitals are excluded from ICU analyses due to no or low incidence of these events.

5.2. Methods

Multivariate analysis used a DiD model framework, where the model functional form changed as appropriate. DiD is a quasi-experimental policy analysis tool that enables longitudinal comparisons of outcomes for BPCI Model 1 Awardee hospitals with those of comparison hospitals. In comparing outcomes during the BPCI Model 1 implementation period between Awardee and comparison hospitals, differences in measure performance could be attributed to BPCI Model 1 participation. The base DiD model takes the generic form of:

$$Equation\ (1): Y_{iht} = \mathrm{f}(PY_t * D_h, D_h, PY_t, X_{iht}, \lambda_h) + \epsilon_{iht}$$

The specific form and distributional assumptions for this model vary by outcome. The dependent variable Y_{iht} is the measure of interest for episode i[48] receiving services at hospital h at time t. Furthermore:

D_h: Cohort indicator equal to 1 if an episode occurred at a BPCI Model 1 Awardee hospital and 0 otherwise.

PY_t: Time indicator equal to 2 if an episode occurred within PY2, equal to 1 if it occurred in PY1, and equal to 0 for the baseline period.[49] This indicator is separated into binary identifiers for every period, which are equal to 0 or 1 depending on whether an observation occurs in a given period.

PY_t*D_h: Policy indicator equal to 1 if an episode occurred at a BPCI Model 1 Awardee hospital after execution of a BPCI Model 1 Awardee Agreement with CMS (PY1 or 2) and 0 otherwise. This is the source of the estimated impact of BPCI Model 1.

λ: Hospital fixed effects.[50]

ϵ_{iht}: An error term.

X_{iht}: Additional beneficiary and episode characteristics listed in Table 10.

Linear models such as OLS translates Equation 1 to take the form of:

$$Y_{iht} = \alpha + D_h + \sum_t \theta_t PY_t * D_h + PY_t + \gamma X_{iht} + \lambda_h + \epsilon_{iht}$$

Within this model type, BPCI Model 1 impacts for PY1 and PY2 come from DiD estimators $\widehat{\theta_1}$ and $\widehat{\theta_2}$, respectively, with their combinations equating to the Since BPCI impact estimate that includes *both* PY1 and PY2.

Nonlinear models, including logistic and Poisson models, vary in functional form for Equation 1. For these models, DiD impact estimates and adjusted period rates were calculated by taking a subsample from each PY and predicting counterfactual scenarios with respect to BPCI Model 1 participation, given the estimated nonlinear model. In practice, the adjusted period statistics for baseline, PY1, and PY2 require the following estimations of the predicated measure outcome $\hat{Y}$:

[48] These are reference patient-level outcomes (e.g., whether a patient had a mortality event 30 days after inpatient admission).
[49] This variable is dichotomized for each value that it takes.
[50] All Awardee and comparison hospitals were included in every quarter of the study.

$$\hat{\Gamma}_{BPCI=1\ PY=0} = E(\hat{Y}|All\ hospitals\ are\ treated\ as\ BPCI)\ when\ PY = 0$$

$$\hat{\Gamma}_{BPCI=0\ PY=0} = E(\hat{Y}|No\ hospitals\ are\ treated\ as\ BPCI)\ when\ PY = 0$$

$$\hat{\Gamma}_{BPCI=1\ PY=1} = E(\hat{Y}|All\ hospitals\ are\ treated\ as\ BPCI)\ when\ PY = 1$$

$$\hat{\Gamma}_{BPCI=0\ PY=1} = E(\hat{Y}|No\ hospitals\ are\ treated\ as\ BPCI)\ when\ PY = 1$$

$$\hat{\Gamma}_{BPCI=1\ PY=2} = E(\hat{Y}|All\ hospitals\ are\ treated\ as\ BPCI)\ when\ PY = 2$$

$$\hat{\Gamma}_{BPCI=0\ PY=2} = E(\hat{Y}|No\ hospitals\ are\ treated\ as\ BPCI)\ when\ PY = 2$$

The regression/risk-adjusted difference due to BPCI PY2 relative to baseline is calculated as:

$$\Delta_{BPCI} = \hat{\Gamma}_{BPCI=1\ PY=2} - \hat{\Gamma}_{BPCI=1\ PY=0}$$

The analogous difference attributable to the comparison group is:

$$\Delta_{Control} = \hat{\Gamma}_{BPCI=0\ PY=2} - \hat{\Gamma}_{BPCI=0\ PY=0}$$

The BPCI Year 2 DiD estimate is then calculated as the difference between these two differences:

$$\text{BPCI Year 2 DiD} = \Delta_{BPCI} - \Delta_{Control}$$

Similar predications and calculations are employed to obtain BPCI Year 1 DiD estimates and Since BPCI DiD estimates—estimates for PY1 and PY2 combined.

When analyzing whether *any* utilization occurred for each utilization measure noted in Table 12, the outcome variable, Y_{iht}, was equal to 1 if any utilization of that measure occurred and 0 otherwise. As an example, when examining SNF utilization, if a beneficiary had at least 1 post-episode SNF claim, then Y_{iht} = 1 regardless of the number of SNF claims or days spent in an SNF and Y_{iht} = 0 otherwise. For select utilization measures, such as post-episode SNF stays, the actual duration or number of claims/visits is examined. Such examinations were done with two-part models (detailed later in this section).

Count model. Count models are employed for utilization outcomes that count instances or durations of events. Such outcomes typically follow Poisson or negative binomial distributional processes; in this study, Poisson models are employed over negative binomial models to leverage their feature as a (quasi) maximum likelihood estimator that is robust to underlying data density misspecifications. Given this distributional assumption, Equation 1 becomes:

$$\Pr[Y = y\ days] = \frac{e^{-\mu}\mu^{y}}{y!}$$

Where:

$$\mu_{iht} = e^{\alpha + D_h + \sum_t \theta_t PY_t * D_h + PY_t + \gamma X_{iht} + \lambda_h}$$

These models are used when analyzing episode LOS, days spent in ICU, and the number of SNF claims over the 30-day post-episode period. For these last two measures, count models employed are censored such that they do not include zero stays to provide adjusted estimates of average ICU stay or the number of SNF claims conditional on having any episode ICU or post-episode SNF utilization.

TPMs employ two regression models, where the first accounts for selection effects by examining whether any utilization occurred and the latter accounts for expenditure, conditional on having *any* utilization. Continuing the SNF example above, not all Medicare beneficiaries will have an SNF stay during the 30-day post-episode period. Further, those that do may differ from those that do not. TPM frameworks allow the first model to capture the data/decision-generating process for having any SNF utilization. This decision to not have SNF utilization may stem from a patient (or their care provider) believing that such services are "nonoptimal"[51] or, more simply, not necessary. For measure analyses that utilize a TPM, the necessity of such utilization is assumed, as is independence between the decision to engage/consume services and the associated Medicare expenditure for that decision.[52] For all TPMs employed to analyze select Medicare expenditure measures in this evaluation report, the first model is logistic and the latter is OLS.

Multivariate explanatory/control variables. The Awardee comparison hospital selection process yielded a non-BPCI Model 1 comparison hospital group. As noted in Section 2.3.2, residual differences may exist between Awardees and their matched comparison hospitals. To mitigate these differences in patient case mix, multivariate models adjust by characteristics noted in Table 10, which provides means for these *explanatory* variables included in analyses for the Full and Active BPCI Model 1 Awardees and their comparisons. Appendix A provides these means for Exiting and PHC cohorts (Appendix A – Table A.2). Note that episode sample size may differ from measures presented in subsequent sections due to additional requirements (e.g., FFS coverage during the post-episode period) but still provide an accurate representation of explanatory variables used in multivariate analyses throughout this report.

5.3. Descriptive Results

Results in this subsection do not adjust for beneficiary or hospital characteristics; as such, they should be interpreted as a simple examination of unadjusted differences between Awardees and their comparisons. As shown in Section 4, Awardee and comparison cohorts **do** differ, and multivariate results presented in the following section adjust for these differences.

Episode Payments. Total Medicare payments per episode were larger for the Full BPCI Model 1 Awardee cohort than for its comparison cohort at baseline by approximately 5 percent (Table 13). This differential increased through PY2 to an 8.1-percent difference. Conversely, the Active

[51] If the former (i.e., having post-discharge services is a non-optimal action), then the decision to have a post-discharge visit is a corner solution. In this scenario, a zero-left truncated Tobit model is the preferred estimation method. However, we believe that post-discharge utilization is driven more by medical necessity than this corner-solution scenario.

[52] Technically, this second assumption is a point for model identification, specifically that the actual utilization/expenditure is not correlated with the decision to utilize a given service. A simple example: the decision to initiate a doctor's visit does not determine the number of times one sees a doctor within a specific timeframe.

BPCI Model 1 Awardee cohort exhibited marginally lower (about 1 to 2 percent) Medicare payments per episode relative to its comparison across study periods (Table 14). The hospital-specific portion of these payments accounted for approximately 85 percent of total Medicare payment per episode for each cohort across study periods.

All BPCI Model 1 Awardee Medicare payments per episode stayed relatively constant for the Full Cohort and decreased slightly for the Active cohort since baseline. Conversely, Medicare payments decreased slightly for all comparison cohorts over the period of performance. The Active comparison cohort exhibited a slightly larger decrease (2 percent) than the Active Awardee cohort (1.6 percent) in their total Medicare payments per episode from baseline.

The Full Awardee cohort exhibited a marginal increase in its SAM hospital-specific Medicare payments of 0.9 percent.[53] In contrast, the Active Awardee cohort exhibited a decrease in SAM hospital-specific payments of -1.8 percent. Both Full and Active comparison cohorts exhibited marginal decreases in this type of payments, -0.1 percent and -0.8 percent, respectively. Conversely, SAM hospital specific-payments increased for both Awardee and comparison Exiting cohorts, by 2.4 percent and 0.3 percent, respectively. For the Active BPCI Model 1 Awardee cohort, total, hospital-specific, and SAM hospital-specific Medicare episode payments exhibited either a lower rate of growth or decreased from PY1 to PY2 when compared to Medicare payments exhibited by the Exiting BPCI Model 1 Awardee cohort and its subset, the PHC BPCI Model 1 Awardee cohort, which increased over this period (Figure 3).

Outlier payments are the only type of payment for which large differences are observed across cohorts, between Awardee and comparison cohorts, and over the period of performance. In particular, a 26-percent increase in outlier payments is observed for the Active Awardees, whereas their comparisons exhibited a 7.8-percent decrease during the same performance period. Conversely, the Exiting and its comparison cohorts exhibited an increase in outlier payments of 3.4 percent and 1.7 percent, respectively. As it corresponds to the combination of the Active and Exiting cohorts, the Full cohort exhibited an increase in outlier payments of 11.9 percent, whereas its comparison cohort exhibited a decrease of 1.9 percent since baseline. The increases observed for the Active and Full Awardee cohorts occurred mostly in PY1, with a slight decrease observed between PY1 and PY2. An explanation for these findings requires further research.

Post-Episode Medicare Payments. All BPCI Model 1 Awardee cohorts exhibited larger total Medicare post-episode payments in baseline than their respective comparison cohorts (Table 13 and Table 14). Post-episode Medicare payments were relatively constant for the Full and Active cohorts across BPCI performance periods. They decreased slightly (-2.3 percent) for the Full and Active comparison cohorts since baseline; these decreases were mainly exhibited between baseline and PY1.

Of the service and facility components that comprise total Medicare post-episode payments, LTCH Medicare payments exhibited the largest percent increases among BPCI Model 1 Awardee cohorts over the study period (8.4 percent for the Full Cohort and 15.4 percent for the Active cohort). Conversely, the Full and Active comparison cohorts exhibited decreases in

[53] Recall that unless otherwise specified, the SAM Medicare payment does not include the IPPS discount applied to BPCI Model 1 Awardees while active in the model.

LTCH payments of -3.5 percent and -0.9 percent, respectively. All post-episode Medicare payment components decreased for the comparison cohorts, with the exception of post-episode SNF payments for the Active comparison group, which remained constant. Across study periods, relative increases (or smaller decreases) among BPCI Model 1 Awardee cohorts surpassed those of their comparison counterparts by as little as 0.4 pps and as much as 16.2 pps (Active cohort LTCH payment percent changes between Since BPCI and baseline, relative to its comparison). Panels 2 and 3 of Figure 4 show that increases in SNF Medicare payments across BPCI Model 1 Awardee cohorts were relatively similar, while LTCH payment increased by a larger amount for the Active BPCI Model 1 Awardee cohort than for the Exiting and PHC BPCI Model 1 cohorts over study periods.

Table 13. Unadjusted Mean Episode and Post-Episode Medicare Expenditures by Measure for Full Cohort*

Medicare Expenditure Measures	Baseline		Since BPCI PY1 & 2		BPCI PY2	
	BPCI	Comparison	BPCI	Comparison	BPCI	Comparison
Total Episode Payment	13,426.20	12,804.08	13,426.88	12,633.89	13,544.92	12,526.47
Hospital Episode Payment	11,244.70	10,897.38	11,330.15	10,777.16	11,459.05	10,671.38
Hospital Outlier Payment	238.25	287.84	266.64	282.36	260.38	257.25
SAM Hospital Payment w/ IPPS discount	9,035.86	9,315.96	9,119.28	9,307.56	9,131.94	9,225.67
Non-Hospital Episode Payment	2,181.51	1,906.70	2,096.73	1,856.72	2,085.87	1,855.08
Number of Episodes	270,984	858,464	230,729	717,551	116,847	359,127
Total Post-Episode Payment	10,127.54	8,862.20	10,034.16	8,655.81	10,107.21	8,639.21
ACH/CAH Payment	2,593.24	2,403.75	2,479.03	2,271.30	2,497.47	2,237.87
LTCH Payment	316.15	400.38	342.71	386.50	358.72	389.22
SNF Payment	3,756.06	2,844.01	3,746.91	2,827.08	3,783.67	2,853.93
Other Part A/B Payment	3,462.10	3,214.06	3,465.51	3,170.94	3,467.36	3,158.19
Number of Episodes	269,431	852,055	229,350	710,239	116,253	354,882

* SAM = Standardized Allowed Amount; Other Part A/B Payment contains other post-episode other Part A and B Medicare payments; adjusted to 2013 dollars. Baseline = January 1, 2011, through March 31, 2013; PY1 = April 1, 2013, through March 31, 2014; PY2 = April 1, 2014, through March 31, 2015.

Table 14. Unadjusted Mean Episode and Post-Episode Medicare Expenditures by Measure for Active Cohort*

Medicare Expenditure Measures	Baseline		Since BPCI PY1 & 2		BPCI PY2	
	BPCI	Comparison	BPCI	Comparison	BPCI	Comparison
Total Episode Payment	12,719.04	12,958.91	12,515.91	12,704.67	12,516.03	12,562.27
Hospital Episode Payment	10,668.74	11,050.62	10,550.95	10,833.87	10,559.68	10,688.35
Hospital Outlier Payment	197.15	303.04	248.42	279.52	241.17	254.74
SAM Hospital Payment w/ IPPS discount	8,483.56	9,298.80	8,332.31	9,228.31	8,298.34	9,110.98
Non-Hospital Episode Payment	2,050.30	1,908.29	1,964.96	1,870.79	1,956.35	1,873.92
Number of Episodes	120,264	463,838	98,193	390,435	49,448	197,023
Total Post-Episode Payment	9,943.94	8,963.40	9,972.55	8,760.64	10,024.22	8,735.07
ACH/CAH Payment	2,613.60	2,447.34	2,530.97	2,302.83	2,536.85	2,268.11
LTCH Payment	339.03	346.24	391.12	343.18	410.94	338.78
SNF Payment	3,763.61	2,885.99	3,818.41	2,887.26	3,867.98	2,910.90
Other Part A/B Payment	3,227.71	3,283.82	3,232.06	3,227.37	3,208.45	3,217.28
Number of Episodes	119,489	460,214	97,578	386,676	49,202	194,938

* SAM = Standardized Allowed Amount. All Other Post-Episode contains all other Part A and B Medicare payments. Baseline = January 1, 2011, through March 31, 2013; PY1 = April 1, 2013, through March 31, 2014; PY2 = April 1, 2014, through March 31, 2015.

Figure 3. Unadjusted Mean Medicare Episode Payments by Cohort

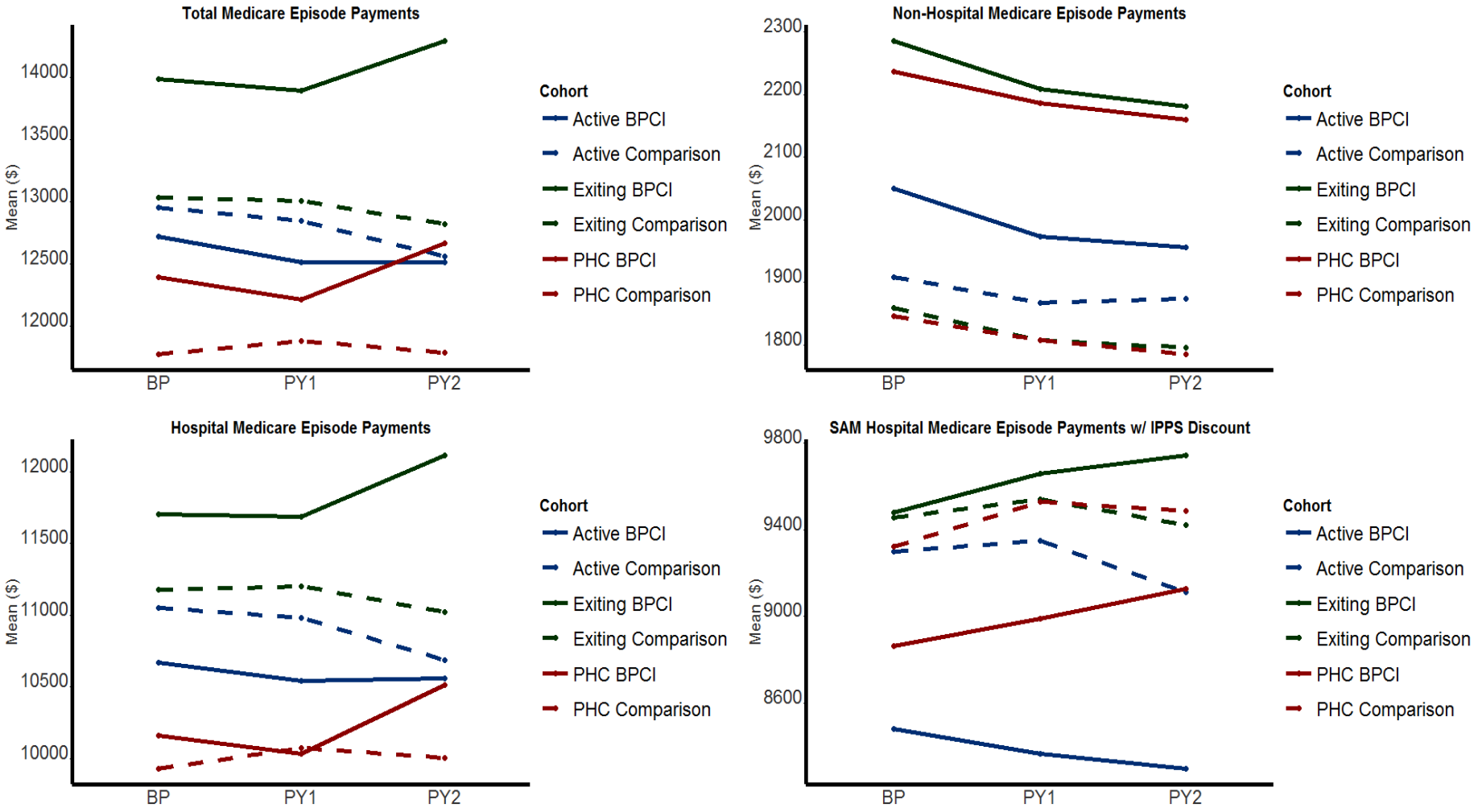
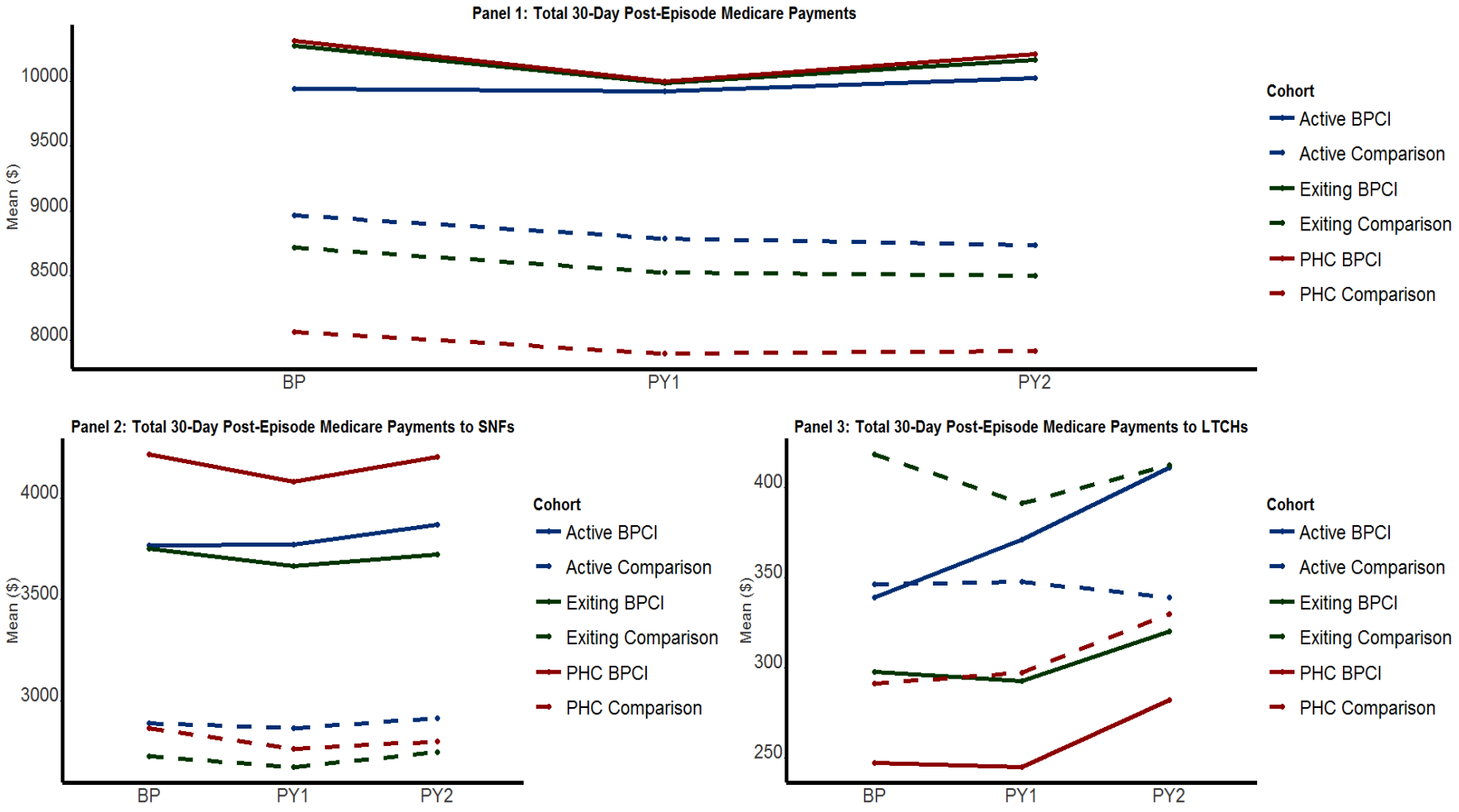


Figure 4. Unadjusted Mean Medicare Post-Episode Payments



Episode Utilization. Table 15 and Table 16 show average LOS (in days) and rate of ICU utilization per episode. All cohorts exhibited slight increases in episode LOS. With the rate of increase in LOS larger for the comparison cohorts than for the BPCI Model 1 Awardee cohorts. Other BPCI Model 1 Awardee cohorts also exhibited increases, with the PHC BPCI Model 1 Awardee cohort exhibiting the largest increase from baseline, amounting to an increase of less than half a day (Figure 5, Panel 1).

ICU utilization rate—a measure of whether a beneficiary had any ICU utilization—was higher for comparison cohorts than for the Full, Active, and Exiting BPCI Model 1 Awardee cohorts over study periods. Despite these level differences, Full and Active BPCI Model 1 Awardee cohorts exhibited increases over the study period while their comparison cohorts stayed either relatively constant or decreased. Indeed, Panel 2 of Figure 5 shows that the Active, Exiting, and PHC comparison cohorts generally exhibited downward trends in ICU utilization from PY1 to PY2 while their respective BPCI Model 1 Awardee cohorts generally exhibited an increased rate of ICU utilization over these two PYs. Figure 6 shows that most Medicare beneficiaries from Active BPCI Model 1 Awardee and its comparison cohort had either 1 or more than 5 days of ICU utilization at baseline, PY1, and PY2.

Post-Episode Utilization. These measures focused on whether Medicare beneficiaries from BPCI Model 1 Awardee or comparison hospitals had *any* post-episode acute care or critical access care admission, or LTCH or SNF visit. All cohorts exhibited slight decreases in ACH or Critical Access Hospital (CAH) 30-day post-episode utilization rates. Conversely, Medicare beneficiaries from these cohorts exhibited slight increases in the SNF utilization rates over study periods. In addition, across all study periods, both Full and Active BPCI Model 1 Awardee cohorts exhibited higher utilization of SNFs than their comparison cohorts. The Exiting BPCI Model 1 Awardee cohort exhibited similar increases to that of the Active BPCI Model 1 Awardee cohort (Figure 8, Panel 1)

Figure 7 shows that the largest proportion of Medicare beneficiaries from the Active BPCI Model 1 Awardee and its comparison cohort had 2 SNF claims during their 30-days post-discharge period at baseline, PY1, and PY2. This proportion, for both the Active BPCI Model 1 Awardee cohort and its comparison, increased over the study periods and was larger for comparison hospitals. The second largest proportion was comprised of Medicare beneficiaries with only one SNF claim, which was larger for the BPCI Model 1 Awardee cohort than for its comparison cohort at all study periods, but decreased over time.

Full, Exiting, and PHC BPCI Model 1 Awardee and comparison cohorts exhibited increases in the rate of patient post-episode LTCH utilization over study periods. The Active BPCI Model 1 Awardee and its comparison cohort exhibited differing trends, with the Active BPCI Model 1 Awardee cohort Medicare beneficiaries exhibiting increasing LTCH utilization from PY1 to PY2 (Figure 8, Panel 2).

Table 15. Unadjusted Mean Utilization Measures for Full Cohort*

Measure	Baseline		Since BPCI PY1 & PY2		BPCI PY2	
	BPCI	Comparison	BPCI	Comparison	BPCI	Comparison
Episode						
LOS (days)	6.62	6.42	6.66	6.50	6.69	6.52
Number of Episodes	282,893	892,482	240,960	745,379	122,090	372,906
ICU utilization (%)	12.24	13.53	13.14	13.56	13.22	13.27
Number of Episodes	281,245	887,677	240,021	743,324	121,314	371,274
Post-Episode Utilization						
Any ACH/CAH Visit (%)	19.53	19.19	18.81	18.37	18.79	18.29
Any LTCH Visit (%)	0.62	1.01	0.72	1.01	0.76	0.99
Any SNF Visit (%)	32.18	25.69	32.66	26.45	32.66	26.62
Number of Episodes	269,431	852,055	229,350	710,239	116,253	354,882

* KSRC and its comparison hospitals are excluded from ICU analyses due to no or low incidence of these events. Baseline = January 1, 2011, through March 31, 2013; PY1 = April 1, 2013, through March 31, 2014; PY2 = April 1, 2014, through March 31, 2015.

Table 16. Unadjusted Mean Utilization Measures for Active Cohort*

Measure	Baseline		Since BPCI PY1 & PY2		BPCI PY2	
	BPCI	Comparison	BPCI	Comparison	BPCI	Comparison
Episode						
LOS (days)	6.61	6.41	6.65	6.53	6.69	6.57
Number of Episodes	125,466	481,725	102,771	405,167	51,792	204,324
ICU Utilization (%)	11.13	13.55	11.71	13.14	11.71	12.68
Number of Episodes	123,818	476,920	101,832	403,112	51,016	202,692
Post-Episode Utilization						
Any ACH/CAH Visit (%)	19.63	19.23	19.19	18.43	19.11	18.28
Any LTCH Visit (%)	0.69	0.87	0.87	0.87	0.93	0.83
Any SNF Visit (%)	32.76	24.89	33.26	25.84	33.29	25.99
Number of Episodes	119,489	460,214	97,578	386,676	49,202	194,938

* KSRC and its comparison hospitals are excluded from ICU analyses due to no or low incidence of these events. Baseline = January 1, 2011, through March 31, 2013; PY1 = April 1, 2013, through March 31, 2014; PY2 = April 1, 2014, through March 31, 2015.

Figure 5. Unadjusted Episode Utilization: LOS and ICU Utilization by Cohort

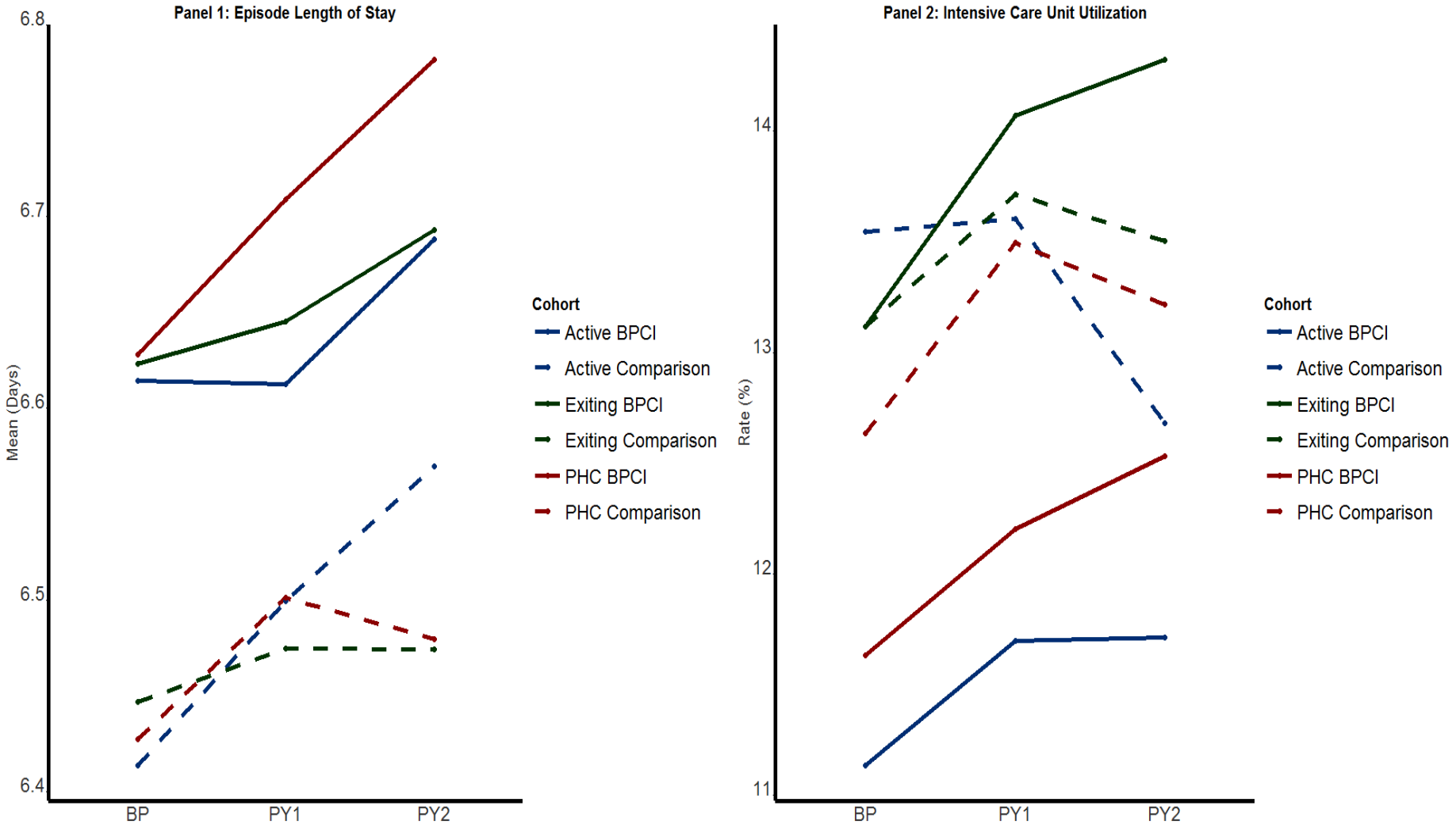


Figure 6. Percentage of ICU Days During Episode Period for Medicare Beneficiaries With Any ICU Utilization, Discharged From Active Cohort Hospitals by Analysis Period

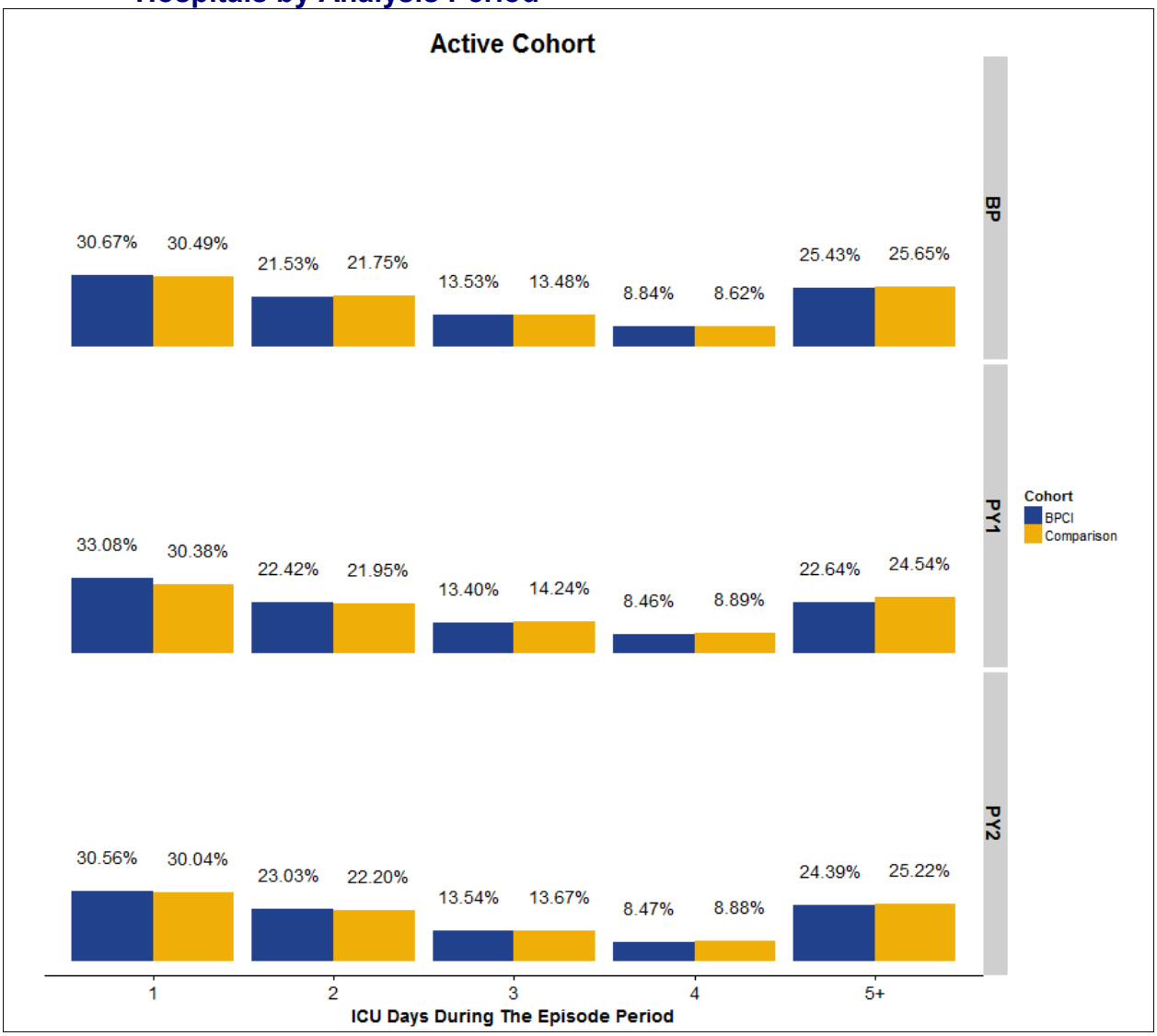


Figure 7. Percentage of SNF Claims During 30-Day Post-Episode Period for Medicare Beneficiaries With Any SNF Claims, Discharged From Active Cohort Hospitals by Analysis Period

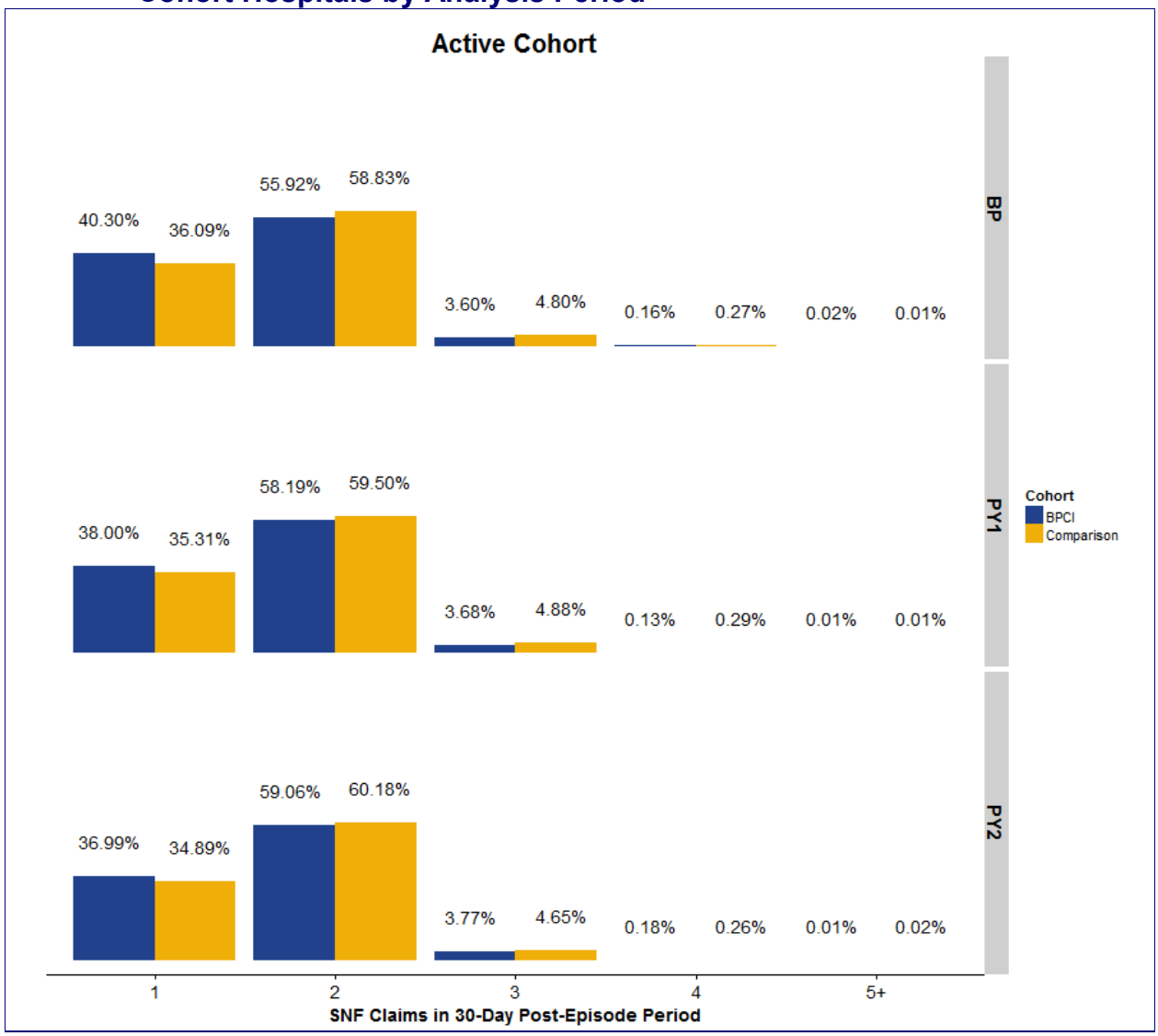
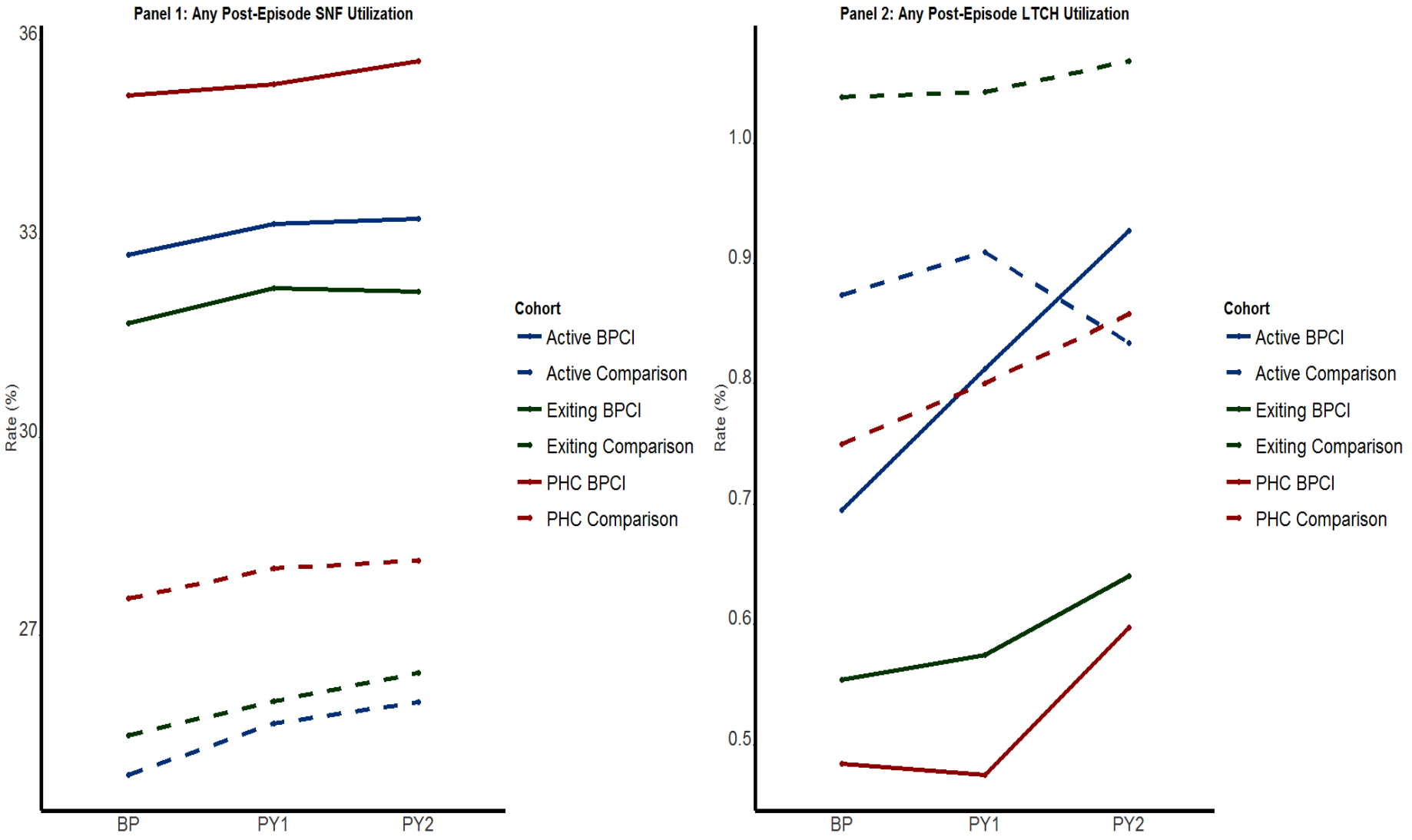


Figure 8. Unadjusted Post-Episode Utilization: SNF and LTCH Utilization by Cohort



5.4. Multivariate Results

Medicare Payments per Episode. Medicare payments per episode decreased since BPCI inception relative to baseline for the Full, Active, and Exiting BPCI cohorts, in 2013 dollars. The Full BPCI Model 1 Awardee cohort's adjusted *Medicare payments per episode* decreased by \$169 ($p < 0.01$) since BPCI implementation (PY1 and PY2 combined) from a baseline mean of \$14,581 (Table 17). Its comparison cohort exhibited a decrease of a lesser magnitude (\$123, $p < 0.01$). The DiD impact estimate—the difference between these two changes—was not statistically significant at -\$46. Examination by PY provides more insight into this estimate. The PY1 and PY2 DiD estimates for the Full BPCI cohort were not statistically significant but differed in direction (-\$123 and +\$31, respectively). Active cohort DiD estimates of Medicare payments per episode were relatively stable and positive, but they were not statistically significant across PYs (Table 18). Exiting cohort DiD estimates exhibited a progression from PY1 to PY2 similar to that of the Full cohort (Appendix A – Table A.8).

The *hospital-specific portion of Medicare payments per episode* accounted for approximately 85 percent of Medicare payments per episode and greatly influenced aforementioned DiD estimates. The risk-adjusted hospital payment (per episode) DiD estimates were not statistically significant in PY1 or PY2 for the Full or Active cohorts (Appendix A – Tables A.4, Table A.6). However, the combined PY1 and PY2 DiD impact estimate for the Active cohort was statistically significant at +\$119 ($p < 0.1$). The Exiting cohort did exhibit a statistically significant decrease in hospital-specific Medicare paid amounts in PY1 (-\$211, $p < 0.05$; Appendix A – Table A.8), relative to comparisons.[54] *IPPS outlier payments* were included in analysis of the hospital-specific portion of Medicare payments per episode and were analyzed separately. The Full cohort exhibited IPPS outlier payment DiD estimates that were statistically significant in PY1 (-\$26, $p < 0.1$) and PY2 (+\$33, $p < 0.05$) but differed in direction. Awardees in both the Active and Exiting cohorts contributed to the elevated PY2 Full cohort DiD estimate. The Active cohort exhibited a PY2 estimate of +\$88 ($p < 0.01$), while the Exiting cohort transitioned from a -\$86 ($p < 0.01$) DiD estimate in PY1 to a PY2 estimate that was not statistically different from 0 at conventional levels.

The *non-hospital portion of payments* for services during the episode generally exhibited decreases from baseline over study periods for all cohorts, with these decreases being larger for BPCI Model 1 cohorts than for comparison cohorts. These changes, relative to comparison, averaged a DiD estimate of -\$53 (Full cohort, $p < 0.01$) since baseline.

As noted in Section 5.1, the risk-adjusted SAM hospital-specific portion of Medicare payments per episode is analyzed as the *non*standardized allowed amounts discussed above may not fully account for impacts resulting from other initiatives, models, or demonstrations. There were no statistically significant DiD impacts on *SAM hospital payments per episode*, with the IPPS discount applied, in the Full cohort or sub-cohorts.

[54] The 2014 BPCI Model 1 Annual Report also detailed similar decreases for the Exiting cohort for a similar period. It is important to note, however, that those previously reported payment estimates are not directly comparable as they came from a different composition of Awardees—those that had withdrawn from BPCI Model 1 before the writing and analyses of that report—and were estimated in terms of nominal dollars.

Figures 11 through 14 show varied adjusted trends across total Medicare payments per episode and its components for each Active Awardee. There are no clear indications of decreasing Medicare payments in terms of total Medicare payments per episode (Figure 11), hospital-specific portions (Figure 12), or non-hospital payment portions (Figure 13). However, three Awardees—St Mary's Hospital, RWJ Rahway, and Inspira Elmer—exhibited signs of decreasing Medicare payments, primarily in the non-hospital portion and in the standardized allowed IPPS payment amount (Figure 14).

Overall, the Active and Exiting Awardees exhibited tendencies toward increases in risk-adjusted nonstandardized allowed IPPS episode payments from PY1 to PY2, relative to comparisons and baseline. Furthermore, analyses indicate that increases in outlier IPPS payments contributed to this potential increase from PY1 to PY2. However, though not statistically significant, the IPPS standardized allowed episode amounts exhibited tendencies toward Medicare savings from PY1 to PY2 across cohorts. The non-hospital episode payments—capturing Medicare Part B payments during the episode—exhibited the opposite across cohorts. As with IPPS episode payments, these nonstandardized Part B payments should be interpreted with caution. Table 19 isolates the BPCI Model 1 IPPS discount for study episodes and indicates that Medicare directly recouped approximately $7.3 million (in 2013 dollars)[55] over PY1 and PY2, and BPCI Model 1 affected approximately 60 percent of all study episodes.

Post-Episode Medicare Payments. The Full BPCI Model 1 Awardee and comparison cohorts exhibited decreases since BPCI inception from baseline (Table 20). Aggregate post-episode Medicare payments, which captured all post-episode Medicare Part A and B FFS expenditures within 30 days of episode discharge, exhibited decreases of $85 (BPCI Model 1 Awardee cohort, *not statistically significant*) and $212 (comparison cohort, $p < 0.01$) since BPCI implementation. The corresponding DiD estimate was not statistically significant at $127, a result of the Full comparison cohort's decrease outweighing that of the Full BPCI Model 1 cohort. Awardees in the Active BPCI Model 1 Awardee cohort contributed most to this estimate, exhibiting a DiD estimate of $345 ($p < 0.05$; Table 21). The largest component increases correspond to post-episode payments to SNFs ($169, $p < 0.1$) and LTCHs ($53, $p < 0.05$). Payments to both of these facility types increased relative to baseline and comparisons more in PY2 than in PY1. The Exiting cohort did not exhibit any consistent statistically significant changes across post-episode Medicare payment components (Appendix A – Table A.13).

As noted in the discussion of episode payment, regression estimates on nonstandardized allowed amounts may not have fully accounted for impacts other initiatives, models, or demonstrations.

Episode LOS and ICU Utilization. BPCI Model 1 Awardee cohorts did not exhibit statistically significant changes in patient *length of stay* from baseline (Table 22, Table 23; Appendix A – Table A.20, Table A.22). Their respective comparison cohorts did exhibit statistically significant increases in LOS from baseline; however, these increases were marginal and at most well under half of one day. DiD estimates were not statistically significant for any cohort at conventional levels. Panels 1 and 2 of Figure 17 show Active and Exiting BPCI Model 1 Awardee cohorts with similar trends in their adjusted LOS and DiD estimates over study periods. Awardee-level

[55] This is a conservative estimate; some episodes affected by the IPPS discount are excluded by evaluation design (e.g., no FFS coverage in month of admission).

analysis shows variation among the Active BPCI Model 1 Awardees with an almost even split in those that exhibited decreasing trends in LOS and those that did not (Figure 18).

For the Full BPCI Model 1 Awardee cohort, *ICU utilization* Since BPCI inception increased by 0.74 pps ($p < 0.01$; Table 22). The Full comparison cohort, however, exhibited a 0.05 pp increase Since BPCI inception (not statistically significant). The corresponding DiD estimate were 0.69 pps ($p < 0.01$).

Active cohort estimates differed from their Full cohort counterparts. Active BPCI Model 1 Awardee cohort ICU utilization increased since BPCI inception by 0.24 pps (not statistically significant; Table 23). Conversely, the Active comparison cohort's ICU utilization decreased by 0.62 pps ($p < 0.01$), yielding a DiD estimate of 0.87 pps ($p < 0.01$). The Active BPCI Model 1 Awardee cohort's changes between each PY and baseline were relatively minor and remained statistically insignificant; however, its comparison cohort exhibits larger decreases over the study period. Indeed, Panel 3 of Figure 17 shows the Active BPCI Model 1 Awardee cohort's ICU utilization as stable across study periods when compared to Exiting (and PHC) BPCI Model 1 Awardee cohorts and shows the Active comparison cohort's steady decreasing trend over study periods. Panel 4 of Figure 17 further demonstrates this movement, or lack thereof, in terms of DiD estimates for each BPCI Model 1 Awardee cohort relative to its comparison.

Post-Episode Utilization. Full and Active BPCI Model 1 Awardee cohorts exhibited statistically significant increases in Medicare beneficiaries having *LTCH utilization* from baseline (Table 22, Table 23; Appendix A – Table A.20, Table A.22); the Exiting BPCI Model 1 Awardee cohort's increase was not statistically significant. Full, Active, and Exiting comparison cohorts did not exhibit statistically significant changes over this period. Resulting DiD estimates for the Full, Active, and Exiting cohorts were 0.09 pps ($p < 0.01$), 0.13 pps ($p < 0.01$), and 0.06 pps (not statistically significant), respectively.

Panel 3 of Figure 19 shows juxtaposed trends for the Active BPCI Model 1 Awardee cohort and its comparison cohort, and Panel 4 shows corresponding DiD estimates for PY1 and PY2. These panels also show increasing tendencies in LTCH utilization for the Exiting and PHC BPCI Model 1 Awardee cohorts over the study periods, relative to their comparison cohorts.

All cohorts exhibited increases from baseline in beneficiary *SNF utilization* over the 30-day post-episode period. While most of these increases were statistically significant (Since BPCI vs baseline), they were relatively minor, with *percentage* increases less than 3 percent. Further, increases exhibited by BPCI Model 1 Awardee cohorts were nearly matched by their respective comparison cohorts such that no DiD estimates were statistically significant at conventional levels.

Coupled with increases in Medicare payments to SNFs over this same post-episode period, these results indicate that SNF Medicare payment increases (e.g., Active Cohort DiD of $345, $p < 0.01$, Table 21) are not attributable to increased likelihood of BPCI Model 1 Medicare beneficiaries utilizing post-episode SNF services. Instead, increases in the *number* of SNF visits, their intensity, or duration may be responsible for the previously noted increase in Medicare payments to SNFs. An examination of the number of SNF visits indicates that the number of SNF claims is not likely responsible. For those with any post-episode SNF utilization, Medicare beneficiaries from the Active BPCI Model 1 Awardee cohort did experience an increase in the average number of SNF claims (0.03 claims, $p < 0.01$, Appendix A – Table A.32) relative to the Active comparison cohort (0.01 stays, $p < 0.01$). However, the statistically significant DiD estimate of 0.02 claims ($p < 0.01$) is of little marginal significance. More research is needed to determine differences in SNF stay intensity and duration.

Table 17. Adjusted Episode Medicare Expenditures by Measure for Full Cohort

Medicare Episode Expenditure Measure	Cohort	Baseline (a)	Since BPCI (PY1 & PY2) (b)	Difference Between (a) & (b)	Since BPCI DiD	BPCI PY2 (c)	Difference Between (a) &(c)	BPCI PY2 DiD
Total Episode Payment	**BPCI**	14,581.84 (95.86)	14,412.72 (101.72)	-169.12*** (57.34)		14,419.58 (116.21)	-162.26** (75.90)	
	Comparison	12,748.64 (34.60)	12,625.11 (35.89)	-123.54*** (28.79)	-45.58 (64.13)	12,554.96 (44.13)	-193.69*** (38.63)	31.43 (85.23)
Hospital Episode Payment	**BPCI**	12,302.76 (88.19)	12,245.13 (93.06)	-57.64 (51.42)		12,272.18 (105.67)	-30.59 (68.65)	
	Comparison	10,863.02 (31.97)	10,797.79 (33.44)	-65.23** (26.82)	7.59 (57.94)	10,730.87 (41.45)	-132.14*** (36.33)	101.56 (77.68)
Hospital Outlier Payment	**BPCI**	123.90 (9.56)	129.72 (9.99)	5.82 (5.45)		123.78 (10.57)	-0.12 (7.04)	
	Comparison	431.97 (25.80)	434.23 (27.71)	2.27 (10.62)	3.56 (11.97)	399.25 (27.67)	-32.72** (13.26)	32.60** (14.98)
SAM Hospital Payment w/ IPPS discount	**BPCI**	8,999.35 (44.61)	9,009.18 (44.70)	9.83 (22.89)		8,943.45 (47.19)	-55.90** (26.87)	
	Comparison	9,577.98 (16.56)	9,606.22 (17.89)	28.24* (15.90)	-18.41 (27.89)	9,556.62 (24.01)	-21.36 (23.01)	-34.53 (35.44)
Non-Hospital Episode Payment	**BPCI**	2,279.07 (17.97)	2,167.59 (19.00)	-111.48*** (11.01)		2,147.40 (22.43)	-131.67*** (15.92)	
	Comparison	1,885.63 (6.26)	1,827.31 (6.68)	-58.31*** (5.17)	-53.17*** (12.20)	1,824.08 (8.76)	-61.54*** (7.74)	-70.13*** (17.74)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance levels when program periods (Since BPCI, PY1, and PY2) are each compared to Baseline. SAM = Standardized Allowed Amount. Baseline = January 1, 2011, through March 31, 2013; PY1 = April 1, 2013, through March 31, 2014; PY2 = April 1, 2014, through March 31, 2015. Standard errors are provided in parentheses.

Table 18. Adjusted Episode Medicare Expenditures by Measure for Active Cohort

Medicare Episode Expenditure Measure	Cohort	Baseline (a)	Since BPCI (PY1 & PY2) (b)	Difference Between (a) & (b)	Since BPCI DiD	BPCI PY2 (c)	Difference Between (a) &(c)	BPCI PY2 DiD
Total Episode Payment	**BPCI**	14,201.65 (116.62)	14,016.64 (120.74)	-185.01*** (67.05)		13,910.87 (134.51)	-290.78*** (85.33)	
	Comparison	12,868.68 (38.75)	12,598.89 (38.59)	-269.78*** (40.74)	84.77 (78.32)	12,481.71 (51.55)	-386.96*** (53.52)	96.18 (100.65)
Hospital Episode Payment	**BPCI**	11,943.41 (113.99)	11,845.30 (117.67)	-98.11 (60.53)		11,752.98 (129.21)	-190.44** (76.12)	
	Comparison	11,002.80 (37.29)	10,786.16 (37.48)	-216.64*** (38.31)	118.54* (71.52)	10,667.93 (50.00)	-334.88*** (50.87)	144.44 (91.48)
Hospital Outlier Payment	**BPCI**	93.57 (9.04)	106.76 (10.48)	13.19** (6.38)		101.45 (11.48)	7.88 (8.23)	
	Comparison	478.10 (31.65)	436.45 (30.25)	-41.65*** (13.23)	54.84*** (14.63)	398.18 (30.05)	-79.92*** (16.62)	87.80*** (18.45)
SAM Hospital Payment w/ IPPS discount	**BPCI**	8,913.89 (61.22)	8,838.34 (61.98)	-75.55** (32.16)		8,724.98 (64.12)	-188.91*** (33.38)	
	Comparison	9,423.66 (19.20)	9,332.39 (18.79)	-91.27*** (17.80)	15.72 (36.72)	9,235.90 (23.06)	-187.77*** (22.59)	-1.14 (40.31)
Non-Hospital Episode Payment	**BPCI**	2,258.23 (21.91)	2,171.33 (24.71)	-86.90*** (12.14)		2,157.89 (29.86)	-100.34*** (18.74)	
	Comparison	1,865.87 (6.78)	1,812.73 (7.20)	-53.14*** (6.67)	-33.76** (13.84)	1,813.79 (10.09)	-52.09*** (9.82)	-48.25** (21.16)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance levels when program periods (Since BPCI , PY1, and PY2) are each compared to Baseline. SAM = Standardized Allowed Amount. Baseline = January 1, 2011, through March 31, 2013; PY1 = April 1, 2013, through March 31, 2014; PY2 = April 1, 2014, through March 31, 2015. Standard errors are provided in parentheses.

Table 19. Savings to Medicare from BPCI Model 1 IPPS Discount

	2013 Q4	2014 Q1	2014 Q2	2014 Q3	2014 Q4	2015 Q1	Since BPCI Inception (PY1 & PY2)	
							Total	Average
IPPS Discount	0.5%	0.5%	1.00%	1.00%	1.00%	1.00%	–	–
Nominal Dollars	$1,345,069	$1,152,138	$1,545,982	$1,217,811	$1,138,031	$1,096,832	$7,495,863	$72
2013 Dollars	$1,345,069	$1,125,135	$1,509,748	$1,189,269	$1,111,358	$1,043,608	$7,324,187	$71
Hospital-Specific Episode Payments for Episodes Affected	$322,972,435	$266,875,538	$183,375,226	$146,544,807	$135,963,420	$126,226,220	$1,181,957,646	$ –
Episodes Affected*	27,041	23,235	16,733	13,337	12,102	11,151	103,599	–
Total Episodes From BPCI Awardees**	**27,857**	**28,775**	**29,412**	**28,496**	**28,763**	**30,176**	**173,479**	**–**

* Episodes are affected by a discount to the operating portion of the IPPS discount while BPCI Awardees are active within BPCI Model 1.
** Includes all BPCI Awardees, including those that have withdrawn from April 1, 2013, through March 31, 2015.

Figure 9. Adjusted Medicare Episode Payments by Cohort

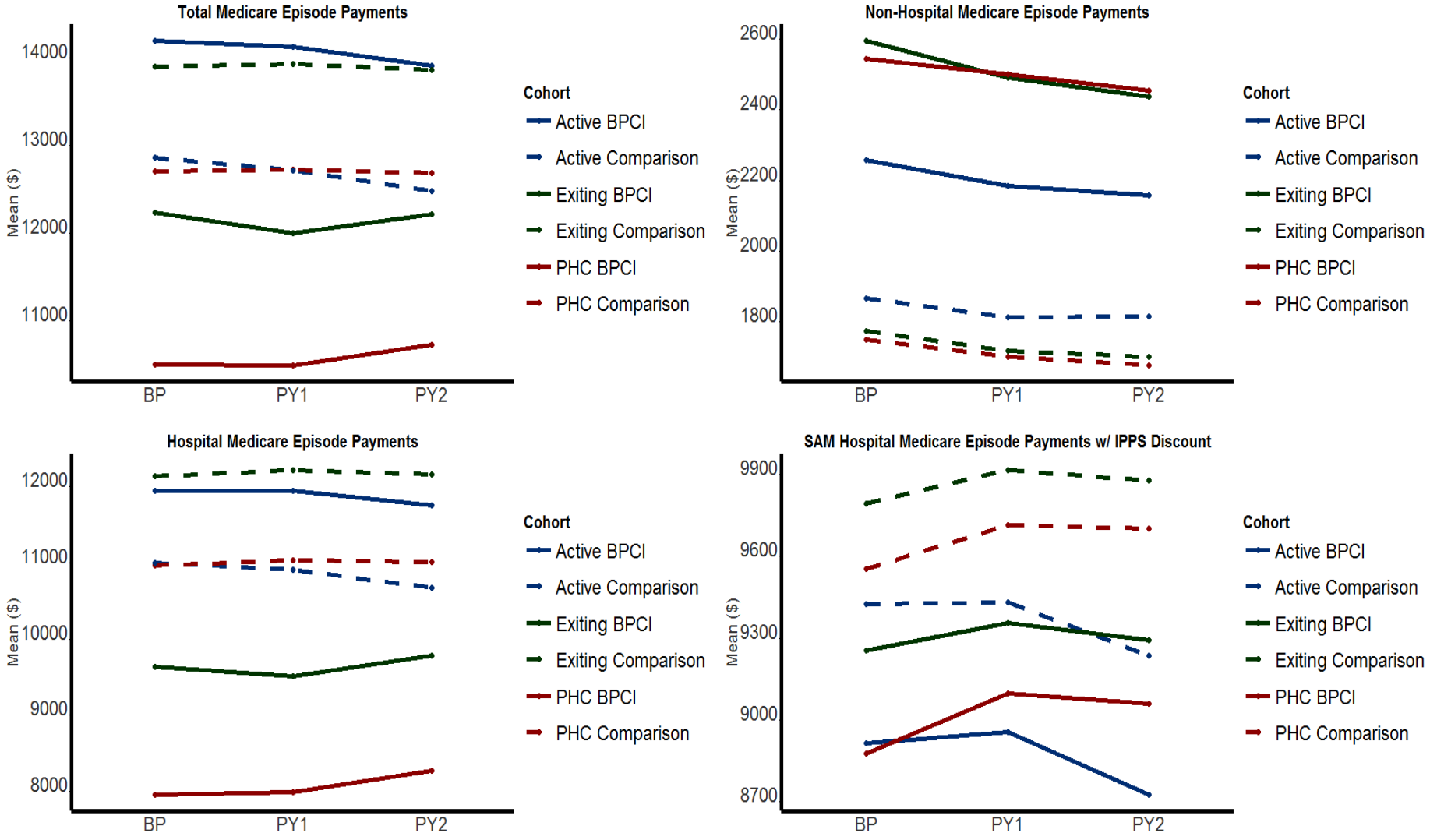


Figure 10. Adjusted DiD Estimates of Medicare Episode Payments by Cohort

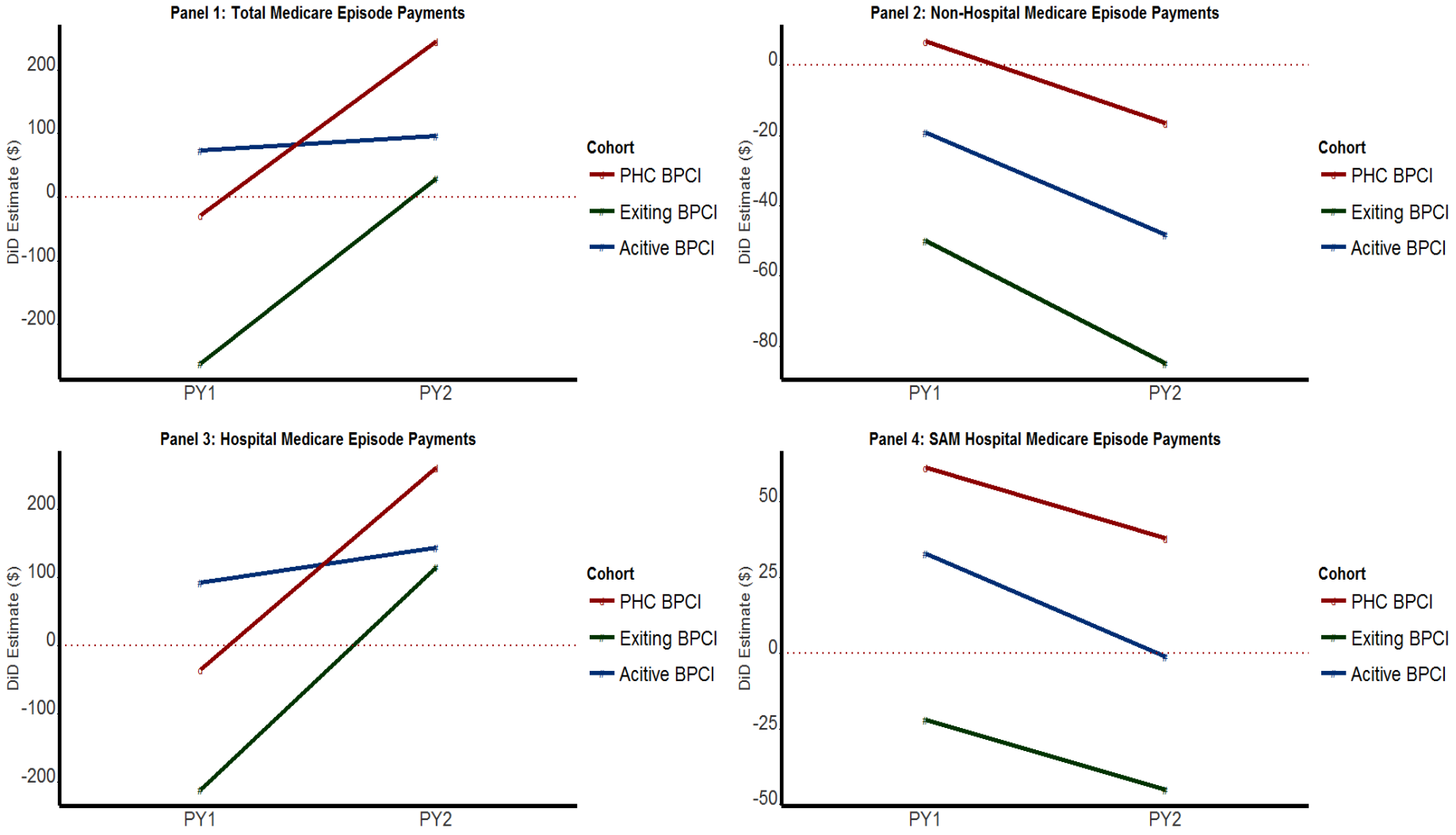


Figure 11. Adjusted Total Episode Medicare Payments by Active BPCI Awardee

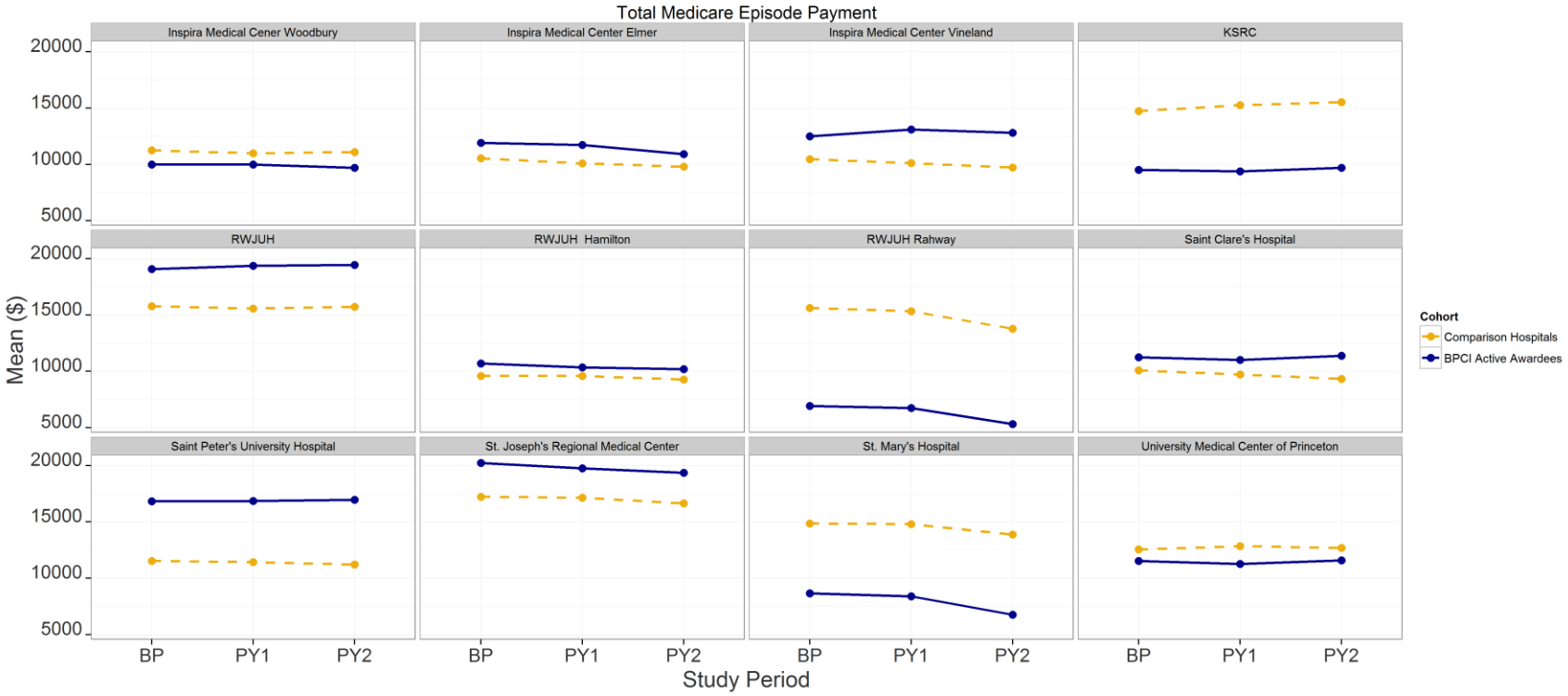


Figure 12. Adjusted Hospital-Specific Medicare Episode Payments by Active BPCI Awardee

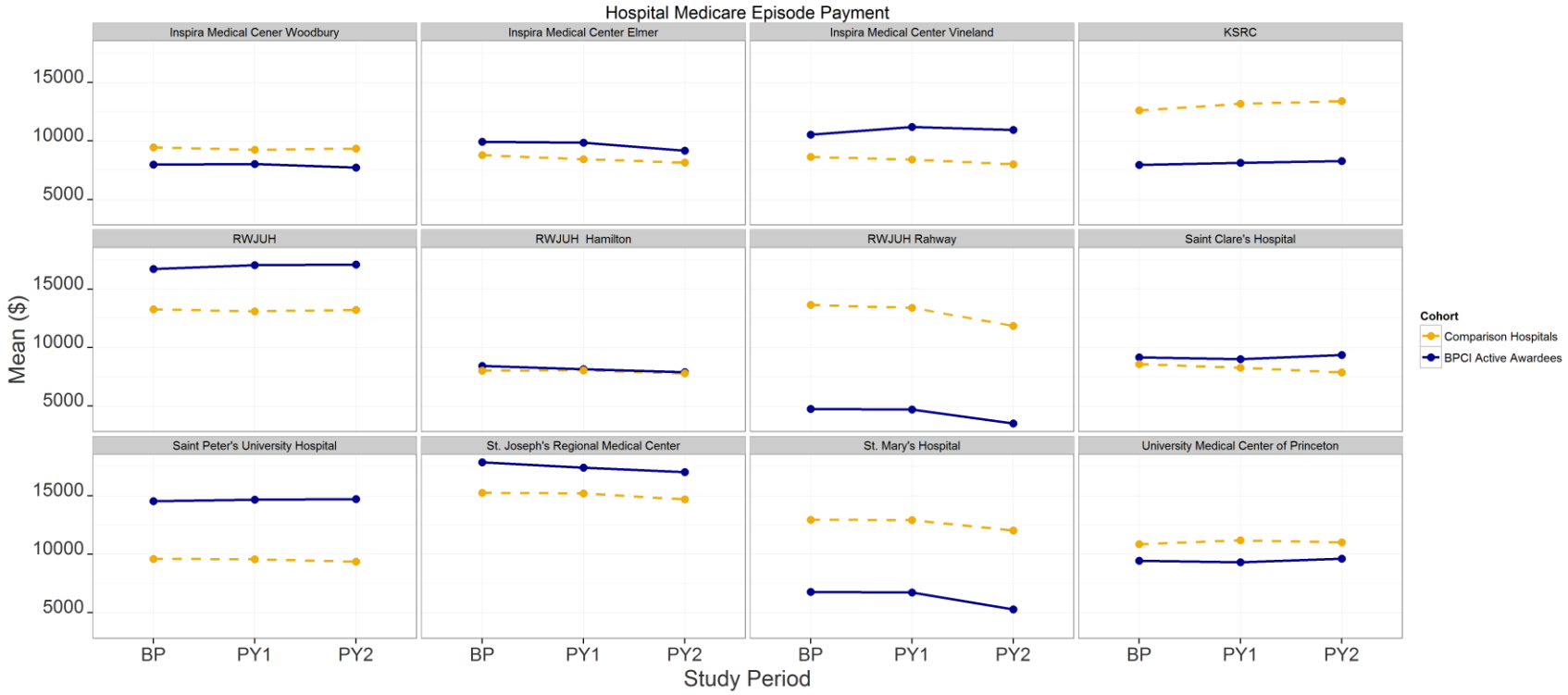


Figure 13. Adjusted Non-Hospital Medicare Episode Payments by Active BPCI Awardee

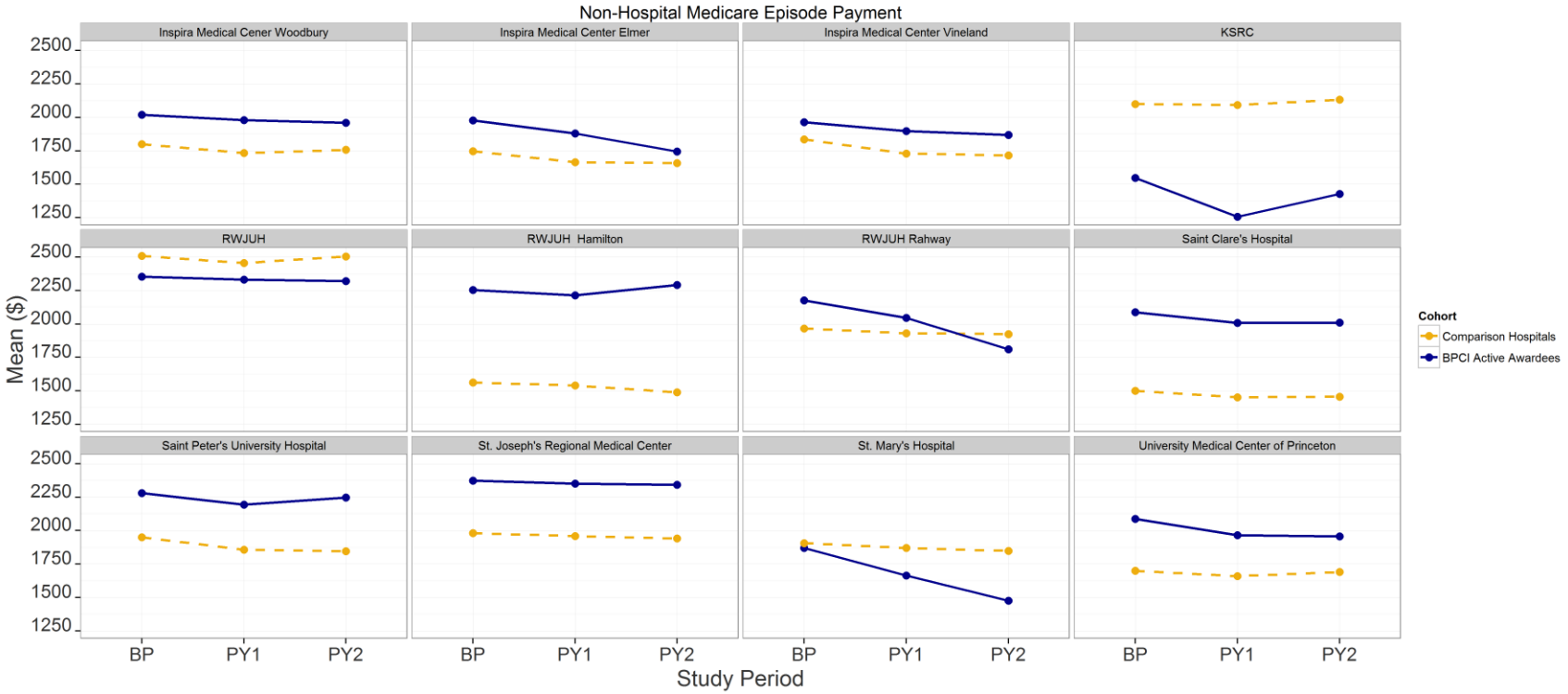


Figure 14. Adjusted SAM Hospital-Specific Medicare Episode Payments by Active BPCI Awardee

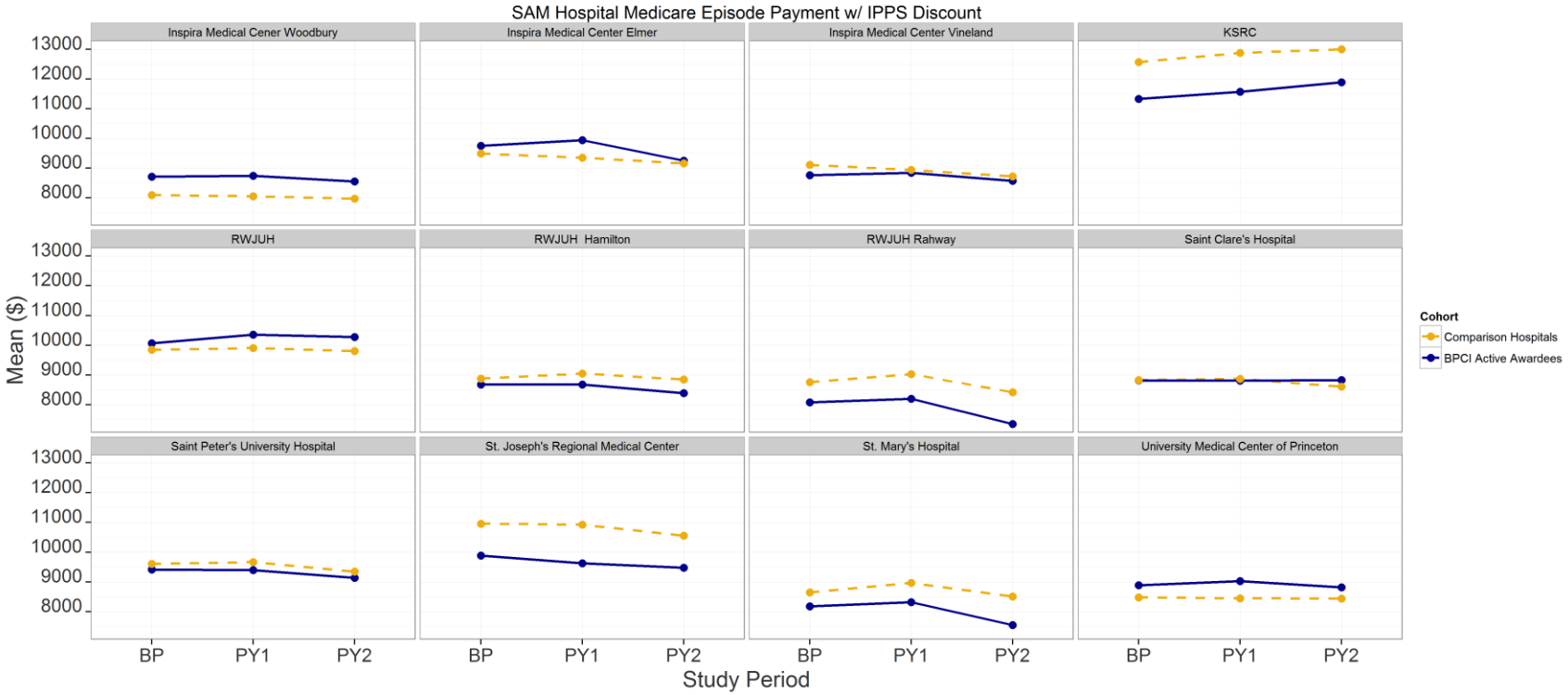


Table 20. Adjusted Post-Episode Medicare Expenditure Measures Full Cohort

Medicare Episode Expenditure Measure	Cohort	Baseline (a)	Since BPCI (PY1 & PY2) (b)	Difference Between (a) & (b)	Since BPCI DiD	BPCI PY2 (c)	Difference Between (a) &(c)	BPCI PY2 DiD
Total Post-Episode Payment	**BPCI**	10,603.20 (224.76)	10,518.13 (246.79)	-85.07 (111.15)		10,602.13 (302.84)	-1.06 (206.10)	
	Comparison	8,847.71 (72.29)	8,635.32 (87.10)	-212.39*** (57.00)	127.33 (125.00)	8,620.43 (124.27)	-227.28** (106.35)	226.22 (232.06)
ACH/CAH Payment	**BPCI**	2,811.47 (103.79)	2,707.58 (107.64)	-103.89** (45.98)		2,731.06 (127.45)	-80.41 (81.62)	
	Comparison	2,348.09 (26.33)	2,220.54 (29.87)	-127.55*** (21.90)	23.67 (51.37)	2,203.05 (42.17)	-145.05*** (37.56)	64.64 (90.65)
LTCH Payment	**BPCI**	255.48 (30.02)	281.22 (33.73)	25.74** (12.16)		295.55 (36.43)	40.07** (16.50)	
	Comparison	429.41 (19.47)	413.82 (19.91)	-15.58 (10.14)	41.33*** (15.80)	418.15 (22.75)	-11.25 (14.41)	51.32** (22.00)
SNF Payment	**BPCI**	5,632.93 (161.21)	5,630.52 (169.12)	-2.42 (63.34)		5,721.11 (192.67)	88.18 (105.53)	
	Comparison	2,546.61 (22.79)	2,526.06 (27.71)	-20.55 (21.89)	18.13 (66.96)	2,543.90 (41.39)	-2.72 (37.74)	90.90 (111.87)
Other Part A/B Payment	**BPCI**	2,726.06 (63.47)	2,723.79 (67.30)	-2.28 (30.82)		2,725.03 (79.76)	-1.04 (53.37)	
	Comparison	3,475.20 (20.65)	3,434.29 (23.86)	-40.91*** (15.78)	38.63 (34.64)	3,424.85 (32.39)	-50.35* (27.17)	49.31 (59.91)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance levels when program periods (Since BPCI , PY1, and PY2) are each compared to Baseline. Baseline = January 1, 2011, through March 31, 2013; PY1 = April 1, 2013, through March 31, 2014; PY2 = April 1, 2014, through March 31, 2015. Standard errors are provided in parentheses.

Table 21. Adjusted Post-Episode Medicare Expenditure Measures Active Cohort

Medicare Episode Expenditure Measure	Cohort	Baseline (a)	Since BPCI (PY1 & PY2) (b)	Difference Between (a) & (b)	Since BPCI DiD	BPCI PY2 (c)	Difference Between (a) &(c)	BPCI PY2 DiD
Total Post-Episode Payment	**BPCI**	10,234.54 (178.78)	10,348.25 (213.74)	113.70 (154.48)		10,443.54 (308.35)	208.99 (283.72)	
	Comparison	9,015.34 (51.16)	8,784.24 (80.10)	-231.09*** (75.69)	344.79** (172.03)	8,755.60 (140.66)	-259.73* (140.25)	468.73 (316.71)
ACH/CAH Payment	**BPCI**	2,698.47 (96.40)	2,627.17 (109.71)	-71.29 (64.95)		2,648.60 (144.14)	-49.87 (114.38)	
	Comparison	2,441.62 (25.11)	2,300.62 (32.01)	-141.00*** (30.35)	69.70 (72.12)	2,279.96 (51.63)	-161.66*** (51.62)	111.79 (126.45)
LTCH Payment	**BPCI**	187.61 (22.97)	226.79 (29.42)	39.18*** (13.62)		240.63 (32.88)	53.02*** (18.28)	
	Comparison	402.42 (28.70)	389.05 (27.64)	-13.37 (13.99)	52.55*** (18.99)	387.18 (30.98)	-15.24 (20.45)	68.26** (26.95)
SNF Payment	**BPCI**	5,497.33 (165.08)	5,666.56 (179.79)	169.23* (91.36)		5,787.24 (219.38)	289.91* (154.36)	
	Comparison	2,668.47 (22.85)	2,668.59 (31.01)	0.12 (30.32)	169.11* (96.10)	2,687.76 (52.19)	19.29 (52.01)	270.62* (162.51)
Other Part A/B Payment	**BPCI**	2,798.44 (54.78)	2,805.61 (60.98)	7.17 (41.71)		2,787.50 (82.66)	-10.94 (73.49)	
	Comparison	3,425.15 (16.42)	3,356.34 (22.34)	-68.80*** (21.36)	75.97 (46.89)	3,344.19 (36.62)	-80.96** (36.50)	70.02 (82.10)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance levels when program periods (Since BPCI , PY1, and PY2) are each compared to Baseline. Baseline = January 1, 2011, through March 31, 2013; PY1 = April 1, 2013, through March 31, 2014; PY2 = April 1, 2014, through March 31, 2015. Standard errors are provided in parentheses.

Figure 15. Adjusted Means and DiD Estimates for Post-Episode Medicare Payments by Cohort

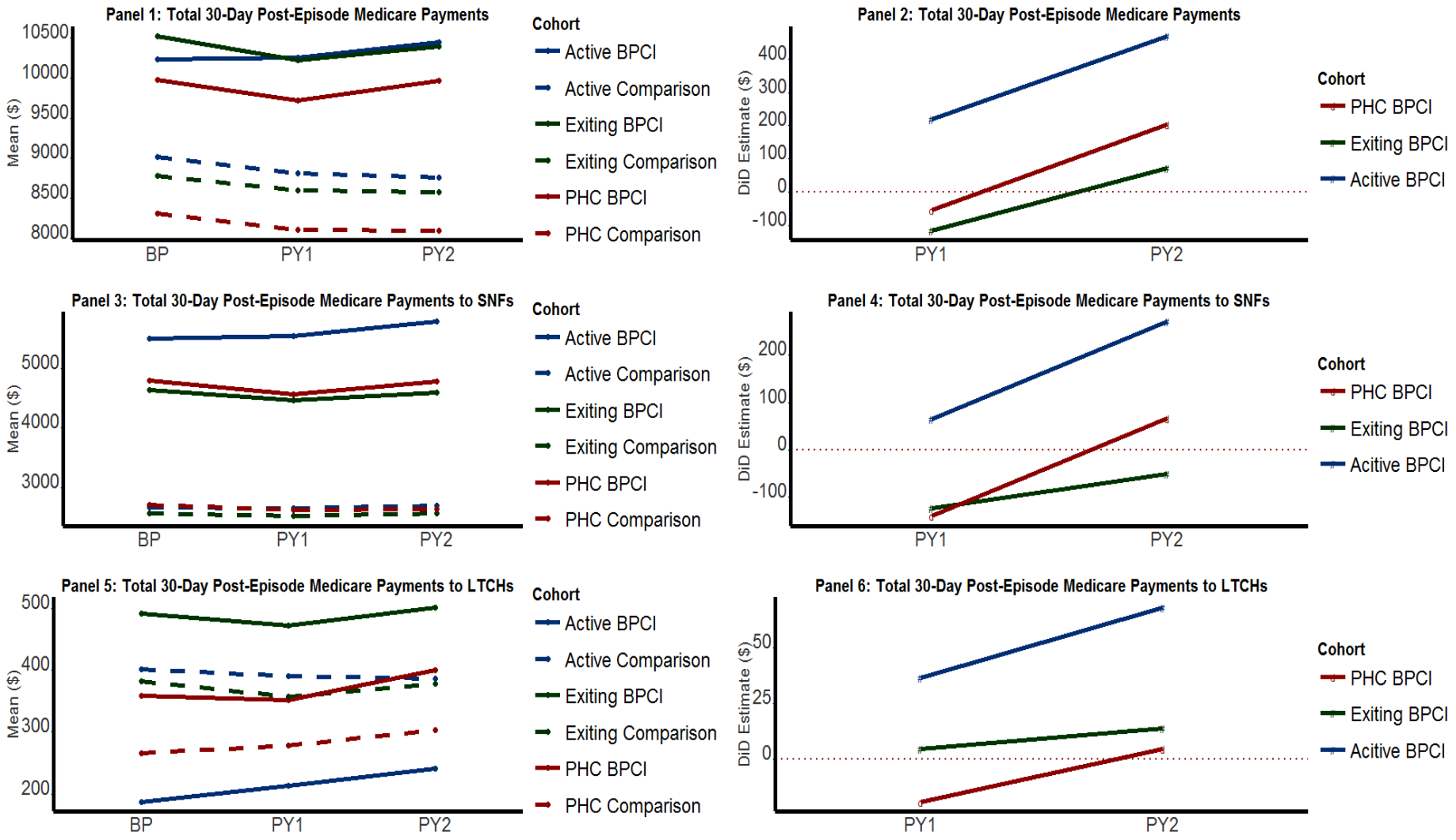


Figure 16. Adjusted 30-Day Post-Episode Medicare Payments to SNFs by Active BPCI Awardee

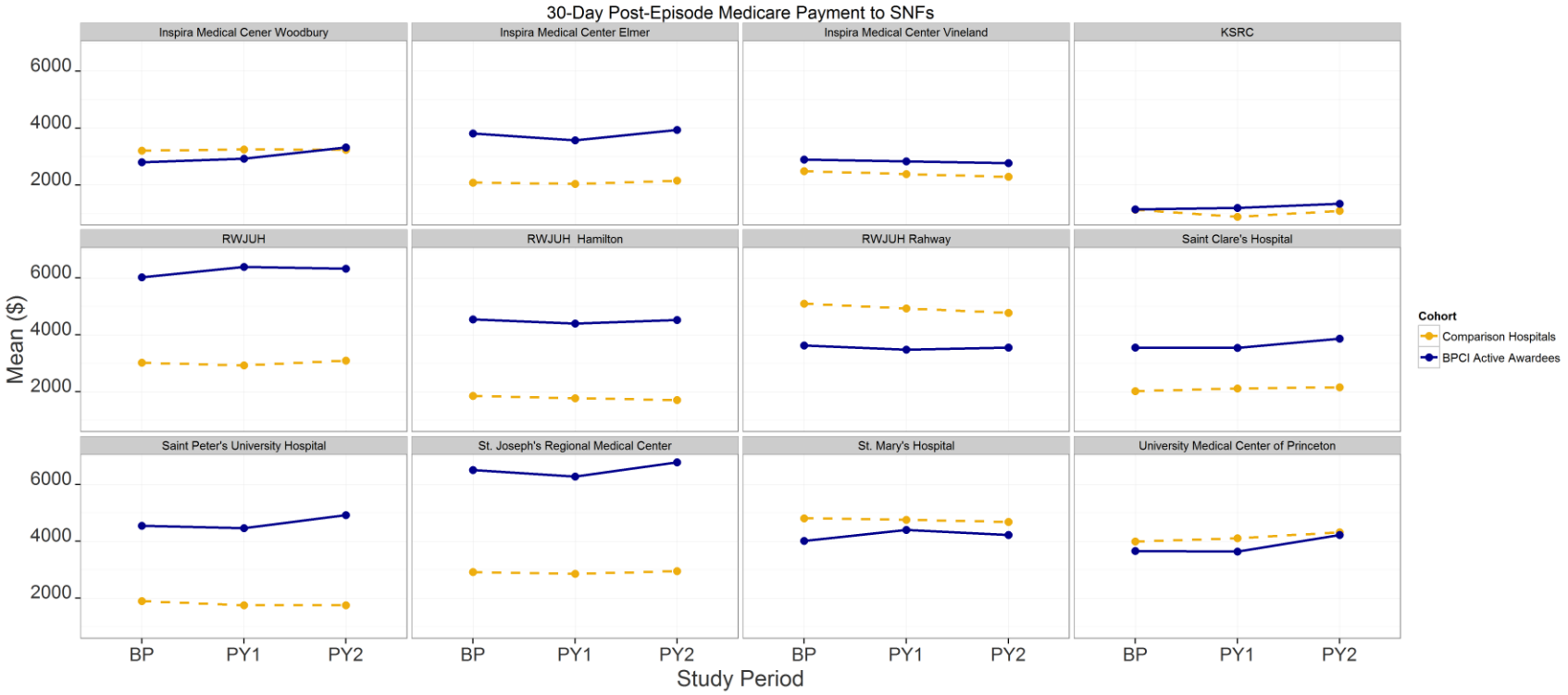


Table 22. Adjusted Utilization Measures for Full Cohort

Measure	Cohort	Baseline (a)	Since BPCI (PY1 & PY2) (b)	Difference Between (a) & (b)	Since BPCI DiD	BPCI PY2 (c)	Difference Between (a) &(c)	BPCI PY2 DiD
Episode LOS (days)	**BPCI**	7.37 (0.12)	7.40 (0.11)	0.03 (0.04)		7.42 (0.12)	0.05 (0.06)	
	Comparison	6.29 (0.03)	6.39 (0.03)	0.10*** (0.02)	-0.07 (0.04)	6.42 (0.04)	0.14*** (0.03)	-0.08 (0.07)
Episode ICU Utilization (%)†	**BPCI**	9.93 (0.21)	10.67 (0.24)	0.74*** (0.14)		10.66 (0.27)	0.73*** (0.18)	
	Comparison	14.96 (0.14)	15.01 (0.16)	0.05 (0.14)	0.69*** (0.20)	14.76 (0.22)	-0.20 (0.21)	0.93*** (0.28)
Post-Episode Utilization								
Any ACH/CAH	**BPCI**	18.42 (0.61)	17.80 (0.65)	-0.63** (0.27)		17.74 (0.77)	-0.68 (0.50)	
	Comparison	19.44 (0.22)	18.51 (0.25)	-0.93*** (0.16)	0.30 (0.32)	18.43 (0.34)	-1.01*** (0.30)	0.33 (0.59)
Any LTCH	**BPCI**	0.45 (0.05)	0.54 (0.06)	0.08*** (0.02)		0.57 (0.06)	0.11*** (0.03)	
	Comparison	1.17 (0.06)	1.16 (0.06)	-0.01 (0.03)	0.09*** (0.03)	1.16 (0.07)	-0.01 (0.04)	0.13*** (0.05)
Any SNF	**BPCI**	46.02 (1.14)	46.82 (1.23)	0.80* (0.44)		47.07 (1.44)	1.05 (0.83)	
	Comparison	23.17 (0.20)	23.84 (0.26)	0.68*** (0.19)	0.12 (0.48)	23.98 (0.39)	0.81** (0.35)	0.24 (0.90)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance levels when program periods (Since BPCI , PY1, and PY2) are each compared to Baseline. Baseline = January 1, 2011, through March 31, 2013; PY1 = April 1, 2013, through March 31, 2014; PY2 = April 1, 2014, through March 31, 2015. Standard errors are provided in parentheses.

† KSRC and its comparison hospitals are excluded from ICU analyses due to no or low incidence of these events.

Table 23. Adjusted Utilization Measures for Active Cohort

Medicare Episode Expenditure Measure	Cohort	Baseline (a)	Since BPCI (PY1 & PY2) (b)	Difference Between (a) & (b)	Since BPCI DiD	BPCI PY2 (c)	Difference Between (a) &(c)	BPCI PY2 DiD
Episode LOS (days)	**BPCI**	7.04 (0.10)	7.10 (0.12)	0.06 (0.05)		7.14 (0.14)	0.09 (0.07)	
	Comparison	6.39 (0.03)	6.52 (0.03)	0.13*** (0.03)	-0.07 (0.06)	6.56 (0.04)	0.17*** (0.04)	-0.08 (0.09)
Episode ICU Utilization (%)†	**BPCI**	5.85 (0.49)	6.09 (0.57)	0.24 (0.16)		6.06 (0.63)	0.20 (0.23)	
	Comparison	17.48 (0.69)	16.86 (0.68)	-0.62*** (0.21)	0.87*** (0.25)	16.35 (0.71)	-1.13*** (0.32)	1.34*** (0.38)
Post-Episode Utilization								
Any ACH/CAH	**BPCI**	18.45 (0.60)	18.07 (0.70)	-0.37 (0.39)		18.06 (0.92)	-0.38 (0.73)	
	Comparison	19.45 (0.18)	18.57 (0.24)	-0.88*** (0.22)	0.51 (0.45)	18.41 (0.40)	-1.04*** (0.40)	0.66 (0.83)
Any LTCH	**BPCI**	0.32 (0.03)	0.41 (0.05)	0.09*** (0.02)		0.44 (0.05)	0.12*** (0.03)	
	Comparison	1.27 (0.09)	1.23 (0.08)	-0.04 (0.04)	0.13*** (0.04)	1.18 (0.09)	-0.09 (0.06)	0.21*** (0.06)
Any SNF	**BPCI**	41.77 (1.03)	43.14 (1.17)	1.37** (0.61)		43.59 (1.50)	1.82 (1.12)	
	Comparison	23.61 (0.18)	24.50 (0.28)	0.88*** (0.25)	0.49 (0.66)	24.64 (0.48)	1.03** (0.47)	0.79 (1.21)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance levels when program periods (Since BPCI , PY1, and PY2) are each compared to Baseline. Baseline = January 1, 2011, through March 31, 2013; PY1 = April 1, 2013, through March 31, 2014; PY2 = April 1, 2014, through March 31, 2015. Standard errors are provided in parentheses.

† KSRC and its comparison hospitals are excluded from ICU analyses due to no or low incidence of these events.

Figure 17. Adjusted Rates and DiD Estimates of Episode Utilization: LOS and ICU Utilization

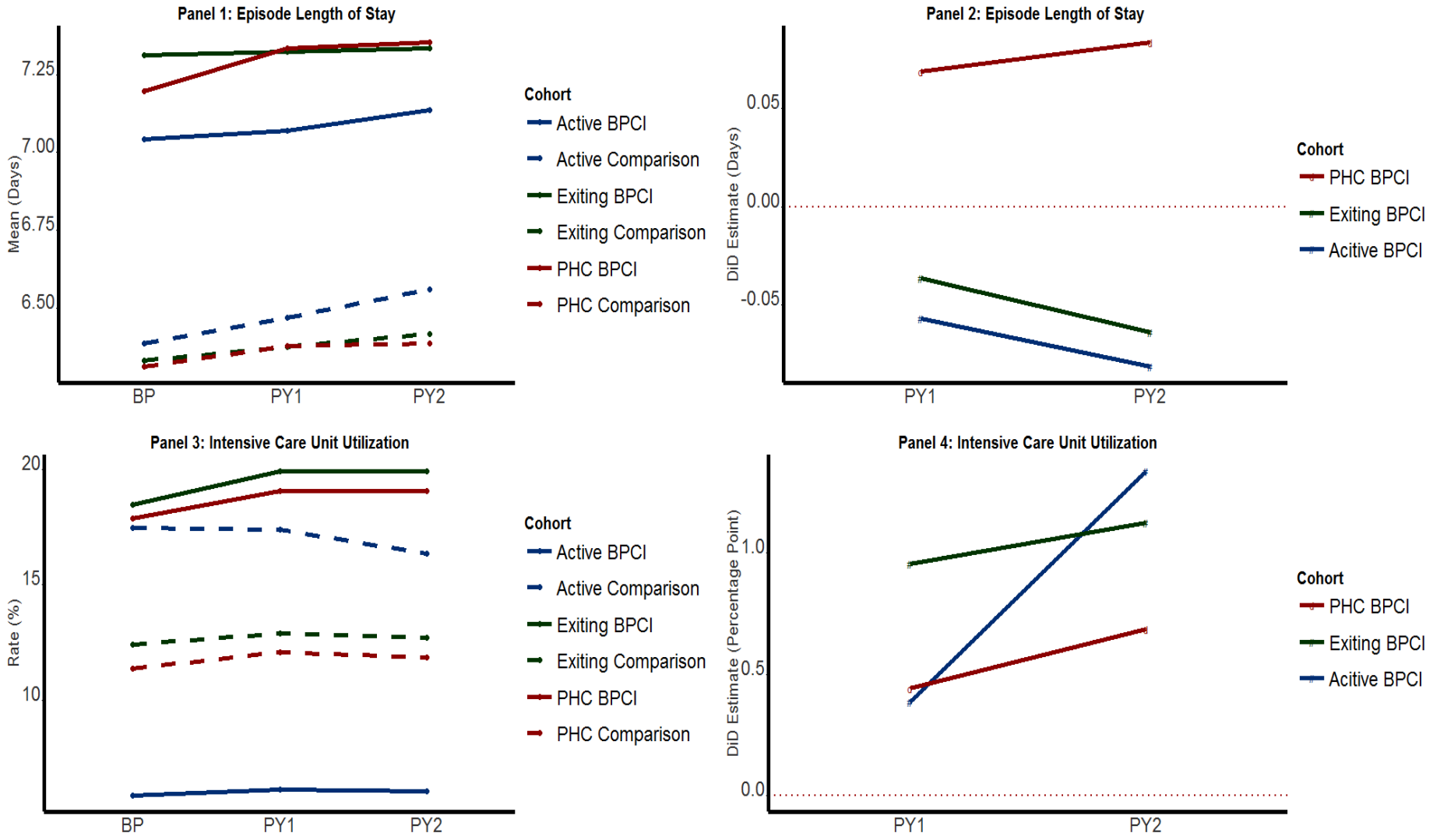


Figure 18. Adjusted Trends for Episode LOS for Active Cohorts

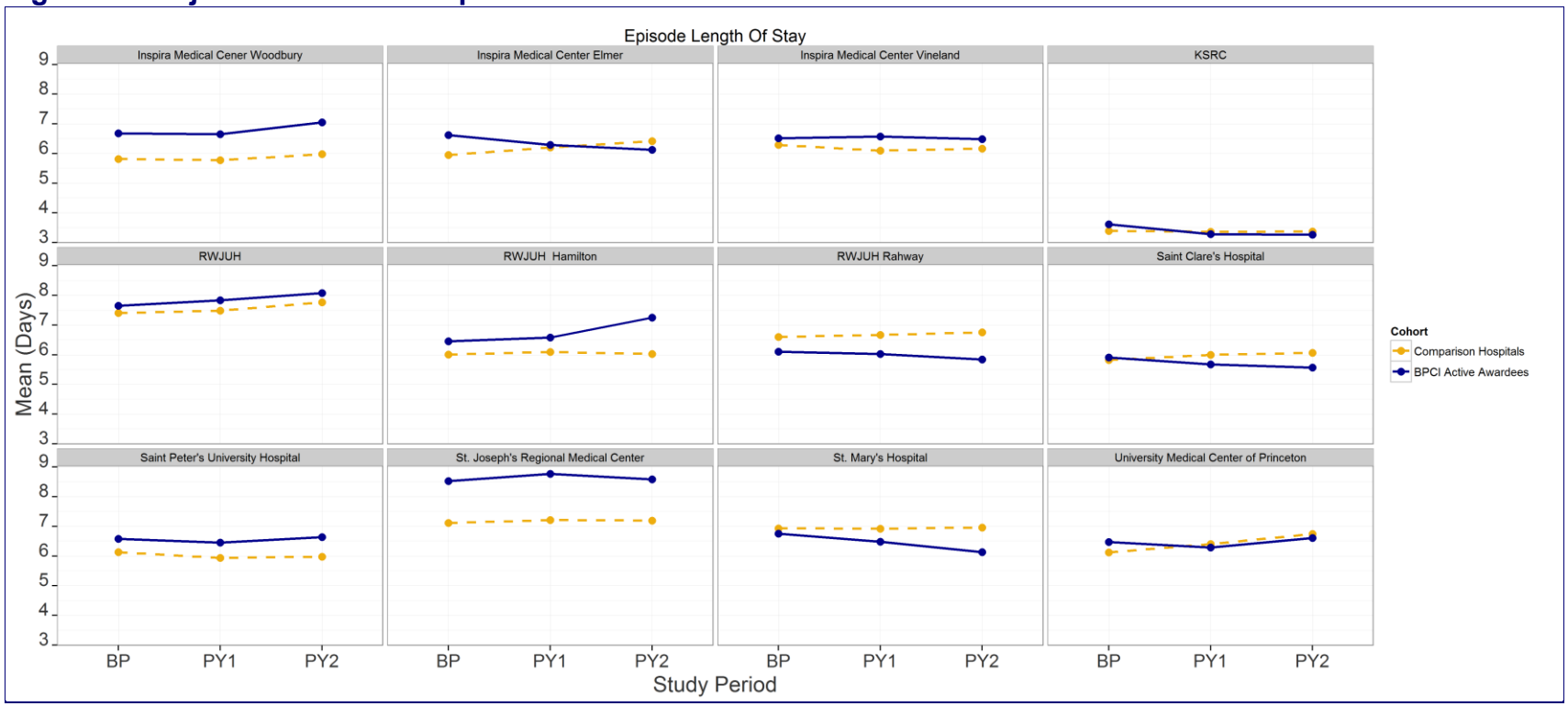
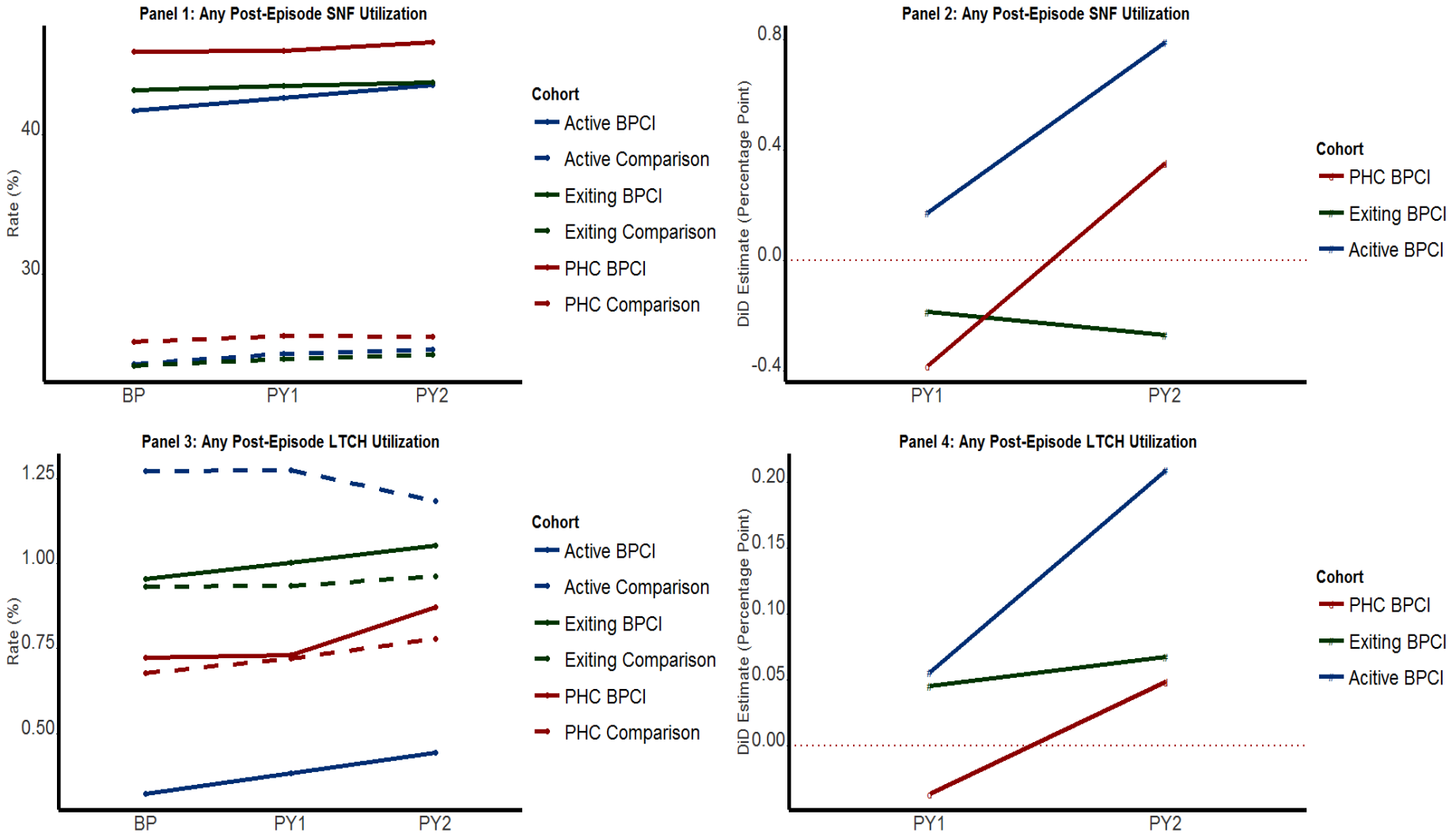


Figure 19. Adjusted Rates and DiD Estimates of Post-Episode Utilization: SNF and LTCH



5.5. Discussion

The goal of BPCI Model 1 is to reduce Medicare expenditures while maintaining or improving patient quality of care. By design, BPCI Model 1 affords a mechanism for Awardees to reduce internal costs that may translate to reductions in Medicare expenditures—care redesign and gainsharing. A second mechanism, the IPPS discount, provides Medicare with a direct savings.

Awardees propose and pursue care redesign to achieve BPCI Model 1 goals and employ gainsharing to incent engagement of enrolled practitioners in Awardee care redesign. Whether gainsharing actually does occur is dependent on two factors: whether an Awardee exhibits internal hospital cost-savings and whether Awardee physicians achieve Awardee-specified quality metrics. Awardees, including some of those that have withdrawn, have yielded sufficient internal hospital cost-savings to support gainsharing. Most Awardees still active through PY2 did indeed note increases in physician enrollment and engagement to target levels (Section 3.1). Moreover, some have opted to pursue different care redesign after having met goals on care redesign proposed in 2013.

Internal hospital cost-savings and improved care utilization may or may not extend to Medicare resources. Analyses of Medicare payments during the focus of this model—episode hospitalization—show increasing Medicare payments for all study hospitals, Awardees, and their comparisons. However, when comparing Awardees to their comparison hospitals, there are no statistically significant increases or decreases in total Medicare payments per episode for Awardees still active through PY2, as evidenced by DiD estimates. Despite the lack of statistically significant findings, results show that the IPPS discount produced a direct savings of $7.3 million on episodes affected by this discount. This savings accounted for approximately 0.60 percent of all Medicare payments (in 2013 dollars) in this study that included episodes for both currently active Awardees and exiting Awardees while they were active in BPCI Model 1.

As the *episode* of focus for BPCI Model 1 is a beneficiary's inpatient hospitalization, there is a need to monitor cost-shifting to post-episode periods. In attempting to engender hospital cost-savings to offset the BPCI Model 1 IPPS discount, Awardees may decrease the amount of care that Medicare beneficiaries actually need and shift that burden to PAC facilities. Evaluation results indicate that 30-day post-episode Medicare payments did increase, driven by statistically significant increases in Medicare payments to SNFs and LTCHs. Such increases may be a result of impacts on utilization patterns. Other data indicate that this is not likely. Despite an emphasis for some of these Awardees on increasing patient throughput and decreasing beneficiary LOS, analysis of the LOS measure exhibited no such decreases. Further, analysis of the percentage of Medicare beneficiaries who receive intensive care exhibited increases in the Active cohort relative to its comparison—DiD results of 0.87 pps ($p < 0.01$, PY1 and PY2 combined) and 1.13 pps ($p < 0.01$, PY2 alone)—after controlling for beneficiary and hospital characteristics. Moreover, the average percentage of Medicare beneficiaries having any SNF utilization during this post-episode period was not statistically significantly different from baseline and changes from the comparison cohort (DiD 0.49 pps, PY1 and PY2 combined; 0.79 pps, PY2 alone). The increases in LTCHs claims were marginal and accounted for in LTCH payment analyses (Full cohort DiD 0.09 pps and Active cohort DiD 0.13 pps, $p < 0.01$).

As previously noted, risk-adjusted estimates on nonstandardized allowed amounts may not fully account for impacts from other initiatives, models, or demonstrations. Such payments will need to be reassessed when these data become available. Thus, more research is needed to determine whether this finding is an artifact of the nonstandardized payments analyzed of the intensity or duration of stays at SNFs and LTCHs visited by Medicare beneficiaries.

6. Health Care Outcomes Analysis

Awardee incentives to reduce internal costs could result in care stinting that may lead to adverse outcomes such as mortality or more intensive care during the post-episode period. Under the assumption that Awardees are able to align physicians with their care redesign and that virtually all Awardees view their care redesign as quality focused, one might expect to note decreases in negative health outcomes for Medicare beneficiaries. Indeed, interview and focus group data presented in Section 3.2 note that Awardees have purported successes in such care redesign metrics. Metrics within this section examine claims-based outcomes during the episode and post-episode period that may not directly align with specific care redesign goals but do align with the overall outcomes of Medicare beneficiaries.

This section presents analyses of health care outcomes for baseline and model implementation periods between Awardees and their comparisons. As with Sections 4 and 5, tabular data are presented for the Full and Active BPCI Model 1 Awardee and comparison cohorts in text along with graphical trends and DiD estimates for all sub-cohorts. Exiting and PHC cohort tabular data are relegated to Appendix A, from which specific tables are referenced as needed.

6.1. Data Sources and Measures

Medicare inpatient claims and MBSF files were obtained from CCW for the January 1, 2011, through March 31, 2013, baseline period and the April 1, 2013, through March 31, 2015, model implementation period. Episodes in these data were identified as detailed in Section 2.3.1. Specific measures analyzed from these data and their requirements for patient and episode inclusion in this study are summarized below.

Health Care Outcome Measures spanned beneficiary episode and 30-day post-episode periods. Four measures were assessed in this domain. The all-cause mortality outcome measured whether a beneficiary from any study hospital experienced a mortality event within 30 days from episode admission. All-cause readmissions measured whether a beneficiary experienced a post-episode rehospitalization event, to ACHs or CAHs, within 30 days of episode discharge. Similarly, the ED visit measure examined whether a beneficiary had an ED visit that did not result in an inpatient hospitalization (e.g., readmission) over the post-episode period. The final measure examined was beneficiary discharge destinations (e.g., whether a beneficiary was discharged home or to post-episode care). Table 24 provides identification detail for these measures and notes the multivariate regression model type used to analyze them.

All measures in this section capture Medicare beneficiaries who:

1. Maintained FFS A and B enrollment without HMO enrollment during the episode.
2. Did not have episode LOSs exceeding 1 year.
3. Did not have ESRD Medicare entitlement.

Of these Medicare beneficiaries, only beneficiary episodes that listed Medicare as a primary payer for Awardee or comparison hospital stays were included. The patient discharge measure further excluded episodes that were in the beginning or middle of a transfer sequence. As post-episode measures, the all-cause readmissions and ED measures further extend criterion (1) above

to FFS coverage during the post-episode period and exclude Medicare beneficiaries who died during hospitalization. The all-cause readmission measure also excludes Medicare beneficiaries discharged from their episode hospitalization against medical advice.

Table 24. Health Outcome Measures

Medicare Expenditure Measure	Description/Notes	Model Type
All-Cause 30-Day Mortality*	Captures whether Medicare beneficiaries expired within 30 days of episode admission. This includes potential in-hospital mortality events.	Logistic
All-Cause 30-Day Readmissions	Captures whether Medicare beneficiaries were rehospitalized within 30 days after episode discharge to an ACH or CAH.	Logistic
ED Visit	ED utilization is identified by revenue center codes 0450, 0451, 0452, 0456, 0459, or 0981 within the Outpatient Medicare claims files and captures whether an ED visit that did not lead to a rehospitalization occurred within 30 days after episode discharge.	Logistic
Patient Discharge Destination	Captures beneficiary discharge destination as identified in episode claim by discharge to SNF (03), hospice (50 or 51), home health (06), IRH (62), LTCH (63), and all other discharge codes. SNF and LTCH discharges are excluded from examination in this section, as they are examined within Section 5.	Multinomial Logistic

* KSRC and its comparison hospitals are excluded from mortality analyses due to no or low incidence of these events.

6.2. Methods

Multivariate analysis used the DiD model framework identified in Equation 1 (Section 5.2), with different model functional forms as appropriate. The model, specification, and estimation method for measures presented in this section are the same as those described in the Section 5.2 discussion of nonlinear models, with the exception of the unordered logistic model employed for the patient discharge destination measure.

Unordered Logistic Model. The unordered logistic model allows for choice among many options that have no cardinal relation to each other (e.g., option 1 is better than option 2), unlike the binary structure of a simple logistic model. In the case of the patient discharge destination measure, each option signifies a destination type, such as being discharged to an SNF or LTCH. The unordered logit for k choices translates Equation 1 to the following form:

$$(P_{iht} = j) = \Lambda(X'\beta) = \frac{e^{\alpha_j + D_{jht} + \sum_t \theta_{jt} PY_t * D_{ht} + PY_{jt} + \gamma_j X_{iht} + \lambda_h}}{\sum_j^K e^{\alpha_j + D_{jht} + \sum_t \theta_{jt} PY_t * D_{ht} + PY_{jt} + \gamma_j X_{iht} + \lambda_h}}$$

The DiD estimate is θ_{jt}, which is indexed by j. In the unordered logistic model, each outcome, j, has its own associated coefficient that represents the likelihood that BPCI Model 1 PY t result in event j being more or less likely to occur. As with other nonlinear models, the unordered logistic model is predicted across BPCI Model 1 Awardee and comparison cohort samples and study periods to predict DiD percentage-point changes, in place of its default θ_{jt} estimates, which are typically presented as odds ratios or relative risks.

6.3. Descriptive Results

Results in this subsection do not adjust for Medicare beneficiary or hospital characteristics; they should be interpreted as a simple examination of unadjusted differences between Awardees and their comparisons. As shown in Section 4, Awardee and comparison cohorts **do** differ, and multivariate results presented in the following section adjust for these differences.

The all-cause mortality rate for all cohorts increased from baseline (Table 25, Table 26; Appendix A – Table A.27, Table A.29). Increases in mortality differed across BPCI Model 1 Awardee cohorts. Panel 1 of Figure 20 shows that the all-cause mortality rate increased at a decreasing rate over study periods for the Active BPCI Model 1 Awardee cohort. Conversely, Exiting and PHC BPCI Model 1 Awardee cohorts exhibited increases at an increasing rate over study periods. With the exception of the Exiting BPCI Model 1 Awardee cohort, since BPCI inception, all other BPCI Model 1 Awardee cohorts exhibited larger percentage increases in their mortality rates relative to comparisons.

The all-cause 30-day readmission rate decreased from baseline for all cohorts. The Full BPCI Model 1 Awardee cohort and the Active BPCI Model 1 Awardee cohort were slightly higher than the 30-day readmission rate for their respective comparison cohorts across study periods. The Active BPCI Model 1 Awardee cohort did not exhibit decreases as large as its comparison or other BPCI Model 1 Awardee cohorts but did exhibit stable declines across study periods (Figure 20, Panel 2).

The 30-day post-episode ED rate for the Full BPCI Model 1 Awardee and the Active BPCI Model 1 Awardee cohorts were similar and slightly below that of their comparison cohorts across study periods. This rate increased from baseline for all cohorts, but the increases for BPCI Model 1 Awardee cohorts were larger than those of their comparisons (Figure 20, Panel 3).

Patient discharge destination—a record of the *expected*[56] placement of a patient after being released from the hospital—stayed relatively stable from baseline for the Full BPCI Model 1 Awardee and comparison cohorts. The Active BPCI Model 1 Awardee cohorts exhibited a slight increase in the rate of SNF discharge destinations and a near halving of the IRH discharge destination rate. HHA, IRH, Hospice, and LTCH were the second, third, fourth, and last common facility discharge destination, not counting the "All Other" category that contained discharges to home.

Table 25. Unadjusted Mean (%) Health Outcomes by Measure for Full Cohort

Measures	Baseline		Since BPCI PY1 & PY2		BPCI PY2	
	BPCI	Comparison	BPCI	Comparison	BPCI	Comparison
All-Cause Mortality†	7.54	7.44	7.77	7.58	7.87	7.66
Number of Episodes	284,381	890,037	241,855	742,774	122,211	370,621
All-Cause 30-Day Post-Episode Readmissions	18.97	18.24	18.17	17.59	18.10	17.57
Number of Episodes	267,920	846,195	228,105	705,092	115,452	352,183

[56] While highly likely, this destination record may not link to actual utilization/placement.

Measures	Baseline		Since BPCI PY1 & PY2		BPCI PY2	
	BPCI	Comparison	BPCI	Comparison	BPCI	Comparison
Any 30-Day Post-Episode ED Visit	10.71	11.94	11.31	12.46	11.68	12.63
Number of Episodes	269,428	851,949	229,347	710,060	116,252	354,742
Discharge Destination						
SNF	29.41	24.92	30.21	25.49	29.95	25.56
LTCH	0.95	0.97	0.94	0.93	0.93	0.93
Hospice	2.41	2.96	2.53	3.17	2.67	3.23
HHA	14.12	19.20	13.91	20.33	13.85	20.18
IRH	6.75	4.05	6.04	4.20	6.08	4.27
All Other	46.36	47.90	45.99	45.87	46.52	45.83
Number of Episodes	270,984	858,464	230,729	717,551	116,847	359,127

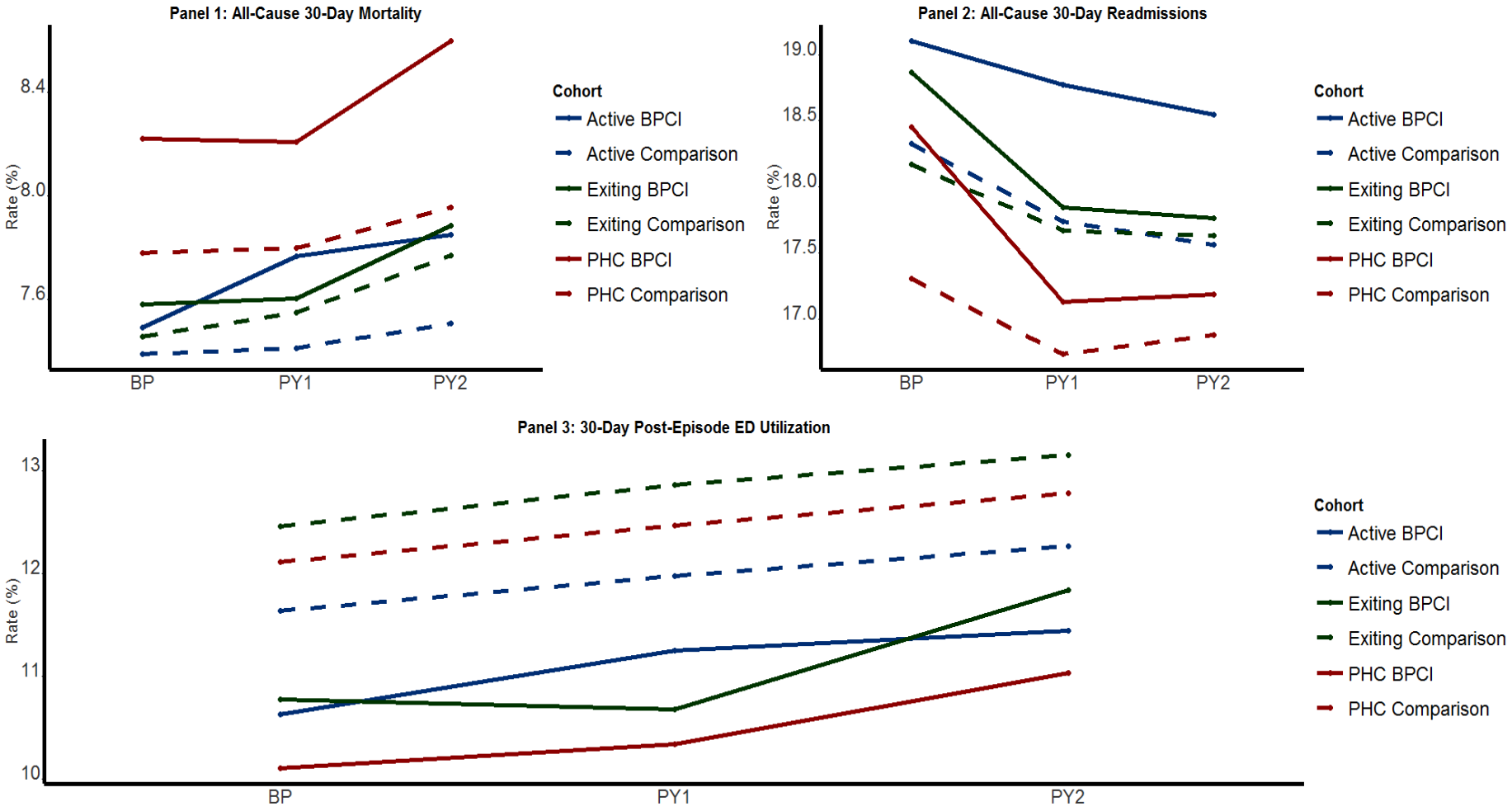
† KSRC and its comparison hospitals are excluded from mortality analyses due to no or low incidence of these events.

Table 26. Unadjusted Mean (%) Health Outcomes by Measure for Active Cohort

Measure	Baseline		Since BPCI PY1 & PY2		BPCI PY2	
	BPCI	Comparison	BPCI	Comparison	BPCI	Comparison
All-Cause Mortality†	7.49	7.39	7.81	7.46	7.85	7.51
Number of Episodes	124,925	478,657	102,835	402,389	51,562	202,137
All-Cause 30-Day Post-Episode Readmissions	19.11	18.33	18.66	17.65	18.55	17.56
Number of Episodes	118,705	456,995	96,910	383,853	48,777	193,457
Any 30-Day Post-Episode ED Visit	10.63	11.64	11.35	12.12	11.45	12.26
Number of Episodes	119,487	460,113	97,577	386,507	49,202	194,805
Discharge Destination						
SNF	28.63	23.91	31.28	24.56	31.53	24.58
LTCH	1.33	0.84	1.26	0.83	1.17	0.79
Hospice	2.35	3.00	2.31	3.18	2.28	3.27
HHA	13.06	19.19	12.92	19.67	12.92	19.39
IRH	7.55	4.41	4.97	4.52	4.55	4.55
All Other	47.08	48.65	47.26	47.25	47.56	47.42
Number of Episodes	120,264	463,838	98,193	390,435	49,448	197,023

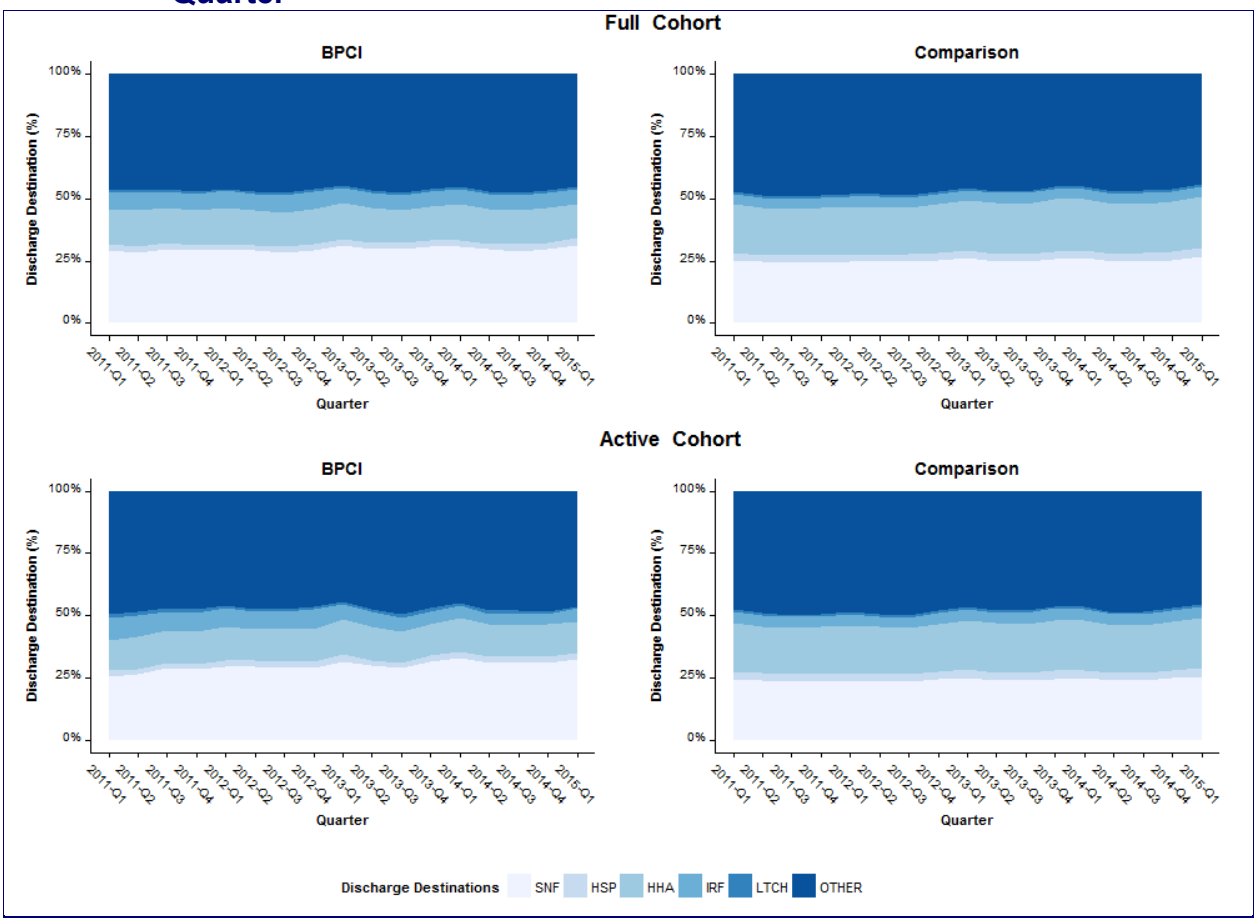
† KSRC and its comparison hospitals are excluded from mortality analyses due to no or low incidence of these events.

Figure 20. Health Outcomes: Mortality, Readmissions, and ED Utilization by Cohort*



* KSRC and its comparison hospitals are excluded from mortality analyses due to no or low incidence of these events.

Figure 21. Beneficiary Discharge Destinations From Full and Active Cohorts by Quarter



6.4. Multivariate Results

Table 27 and Table 28 show regression-adjusted rates for the Full and Active cohorts for the baseline, Since BPCI inception period (consisting of PY1 and PY2), and PY2 alone. They also show Since BPCI and PY2 differences from baseline and DiD estimates for claims-based health outcome measures. These estimates implement the DiD models discussed in Section 5.2 that adjust for covariates listed in Table 10.

Mortality. The Full BPCI Model 1 Awardee cohort adjusted *all-cause mortality rate* increased by 0.21 pp (not statistically significant) from the baseline period, while its comparison cohort's mortality rate increased by 0.14 pp ($p < 0.05$, Table 27). The resulting DiD estimate—the difference between these two increases—was not statistically significant at 0.07 pp. Since BPCI, the Active BPCI Model 1 Awardee cohort's adjusted mortality rate increased by 0.32 pp ($p < 0.1$), while its comparison cohort's rate increased by 0.06 pp (not statistically significant, Table 28). This yielded a non-statistically significant Since BPCI DiD estimate of 0.27 pp.

DiD impact estimates for this measure are not statistically significant for the Full or subset Awardee cohorts in PY1, PY2, or PY1 and PY2 combined. However, there is room for concern due to the statistically significant increase in the Active BPCI Model 1 Awardee cohort's mortality rate from baseline to the PY1 and PY2 aggregate (0.32 pp, $p < 0.01$, Table 28). Awardee-level analyses (not shown) identify a *singular* active Awardee with a statistically significant DiD mortality estimate, driven by in-hospital mortality events.[57]

Readmissions. All cohorts exhibited decreases in all-cause readmissions over study periods. Most of these decreases were statistically significant (Since BPCI vs. baseline) and evenly matched between BPCI Model 1 Awardee and comparison cohorts. As a result, no cohorts exhibited statistically significant DiD impact estimates. Panel 3 of Figure 22 shows Active and Exiting cohorts experienced their largest decreases in this readmission measure from baseline to PY1. This panel further shows the Active BPCI Model 1 Awardee cohort's readmission rate remaining stable from PY1 to PY2 while its comparison cohort's rate decreased over these periods, as well as the converse movement occurring between the Exiting BPCI Model 1 Awardee and Exiting comparison cohorts. These changes can be seen in terms of DiD estimates (not statistically significant) in Panel 4 of Figure 22.

ED Utilization. All BPCI Model 1 Awardee and comparison cohorts exhibited statistically significant increases in patient *ED Utilization* between baseline and the Since BPCI inception period, an average of 0.5 pp ($p < 0.01$). Only the Full cohort's DiD estimate of 0.29 pp ($p < 0.1$) was marginally significant. Further, the Active cohort's DiD PY1 estimate was statistically significant (0.49 pp; $p < 0.05$), though not in PY2 (Appendix A – Table A.26). Panel 5 of Figure 22 shows that adjusted ED rates were indeed higher in PY1 relative to PY2 for the Active BPCI Model 1 Awardee cohort, and lower in PY1 relative to PY2 for the Exiting BPCI Model 1 Awardee cohort—all while their respective comparison cohorts' ED rates increased over the study period in a stable fashion. Panel 6 of Figure 22 shows this juxtaposition in terms of PY DiD estimates for both Active and Exiting BPCI Model 1 Awardee cohorts. Taken together, this

[57] For example, this Awardee's in-hospital unadjusted mortality rate among its study episodes was 2.3 percent in the base period and 3.1 percent in PY2. This Awardee's comparison hospital cohort exhibited percentage decreases in in-hospital mortality events over study periods.

indicates that BPCI Model 1 Awardees no longer active in the model drive the statistically significant Since BPCI DiD estimate for the Full cohort (0.29, $p < 0.1$).

Discharge Destination. Since BPCI inception, the Full BPCI Model 1 Awardee cohort adjusted hospice-destination rate increased by 0.21 pp ($p < 0.05$, Table 27) and nearly matched its comparison cohort's rate increase of 0.17 pp ($p < 0.01$). These changes yielded a statistically insignificant DiD estimate of 0.04 pps.

Patient discharges to HHA or IRH decreased between the PY1 and PY2 aggregate and PY2 alone for the Full BPCI Model 1 Awardee cohort (all statistically significant at $p < 0.1$ or higher), while the Full comparison cohort exhibited statistically significant increases (all $p < 0.01$) among these discharge destinations and time periods (relative to baseline). Since BPCI, the percentage-point decreases in HHA and IRH destinations were outweighed by comparison cohort increases and yielded DiD estimates of -1.47 ($p < 0.01$) and -0.66 ($p < 0.01$), respectively. Actual utilization of SNFs and LTCHs (which may differ from an expected discharge destination) was analyzed in Section 5.

Since BPCI inception, the Active BPCI Model 1 Awardee cohort adjusted hospice and HHA destination rates did not notably change (less than 0.03 pps, not statistically significant; Table 28) while its comparison cohort's rates increased by 0.15 pps (hospice, $p < 0.01$) and 0.48 pps (HHA, $p < 0.01$). These changes yielded a statistically insignificant DiD estimates of -0.12 and -0.50 pps for the hospice and HHA discharge destination rate. Changes between PY2 and baseline were similar to changes from the since BPCI Model 1 inception (PY1 and PY2 combined) period for hospice discharge destination rates. Change in HHA discharge destination rates were lower relative to the Since BPCI aggregate and not statistically significant for the Active comparison cohort, while PY2 versus baseline change did not differ from the Since BPCI versus baseline change. PY2 DiD estimates for hospice and HHA discharge destinations were not statistically significant at -0.19 and -0.24 pps. Since BPCI inception, the Active BPCI Model 1 Awardee cohort exhibited relatively large decreases in the IRH discharge destination rate of -3.09 ($p < 0.01$) while its comparison group did not notably change (0.11, not statistically significant). This yielded a DiD estimate of -3.21 pps ($p < 0.01$). More research is needed to clarify the impetus and result of the decreases among Active BPCI Model 1 cohort Awardees.

Table 27. Adjusted Health Outcome Measures for Full Cohort

Measure (%)	Cohort	Baseline (a)	Since BPCI (PY1 & PY2) (b)	Difference Between (a) & (b)	Since BPCI DiD	BPCI PY2 (c)	Difference Between (a) &(c)	BPCI PY2 DiD
All-Cause Mortality†	**BPCI**	8.58 (0.35)	8.79 (0.38)	0.21 (0.14)		8.89 (0.00)	0.32 (0.24)	
	Comparison	7.31 (0.09)	7.45 (0.11)	0.14** (0.07)	0.07 (0.16)	7.53 (0.00)	0.22* (0.12)	0.10 (0.27)
All-Cause 30-Day Readmission	**BPCI**	18.79 (0.64)	18.19 (0.67)	-0.59** (0.29)		18.15 (0.01)	-0.64 (0.54)	
	Comparison	18.34 (0.20)	17.60 (0.24)	-0.74*** (0.16)	0.15 (0.33)	17.58 (0.00)	-0.76*** (0.29)	0.12 (0.61)
ED 30-Day Visits	**BPCI**	13.72 (0.40)	14.40 (0.41)	0.68*** (0.14)		14.61 (0.00)	0.89*** (0.21)	
	Comparison	10.96 (0.08)	11.35 (0.10)	0.39*** (0.07)	0.29* (0.16)	11.48 (0.00)	0.52*** (0.10)	0.38 (0.24)
Patient Discharge Destination††								
Hospice	**BPCI**	3.08 (0.24)	3.28 (0.27)	0.21** (0.10)		3.52 (0.32)	0.44*** (0.18)	
	Comparison	2.70 (0.04)	2.87 (0.05)	0.17*** (0.04)	0.04 (0.11)	2.91 (0.07)	0.21*** (0.07)	0.23* (0.19)
HHA	**BPCI**	14.70 (0.45)	14.34 (0.45)	-0.36* (0.21)		14.21 (0.47)	-0.50* (0.27)	
	Comparison	18.06 (0.17)	19.16 (0.19)	1.10*** (0.13)	-1.47*** (0.24)	19.00 (0.22)	0.94*** (0.18)	-1.44*** (0.33)
IRH	**BPCI**	2.87 (0.13)	2.55 (0.14)	-0.32*** (0.13)		2.56 (0.17)	-0.31* (0.17)	
	Comparison	6.16 (0.23)	6.49 (0.26)	0.33*** (0.09)	-0.66*** (0.16)	6.64 (0.29)	0.48*** (0.15)	-0.79*** (0.23)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance levels when program periods (Since BPCI , PY1, and PY2) are each compared to baseline. Standard errors are provided in parentheses.

† KSRC and its comparison hospitals are excluded from mortality analyses due to no or low incidence of these events.

†† These are expected discharge destinations and may differ from actual post-discharge services utilized (presented in Section 5).

Table 28. Adjusted Health Outcome Measures for Active Cohort

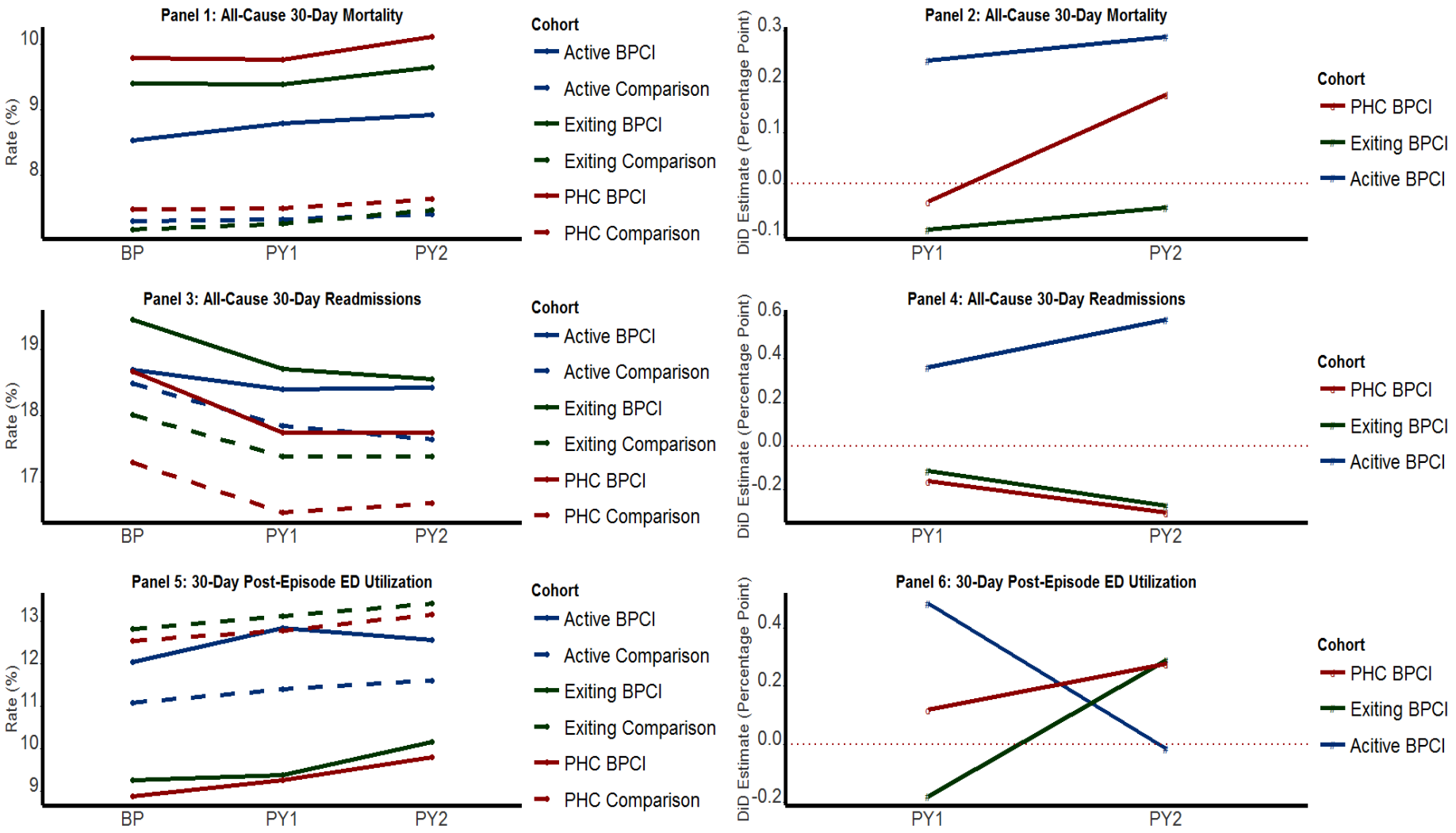
Measure (%)	Cohort	Baseline (a)	Since BPCI (PY1 & PY2) (b)	Difference Between (a) & (b)	Since BPCI DiD	BPCI PY2 (c)	Difference Between (a) &(c)	BPCI PY2 DiD
All-Cause Mortality†	**BPCI**	8.53 (0.41)	8.86 (0.48)	0.32* (0.19)		8.92 (0.01)	0.39 (0.32)	
	Comparison	7.30 (0.09)	7.36 (0.11)	0.06 (0.09)	0.27 (0.21)	7.40 (0.00)	0.10 (0.15)	0.29 (0.35)
All-Cause 30-Day Readmission	**BPCI**	18.69 (0.63)	18.41 (0.74)	-0.28 (0.42)		18.42 (0.01)	-0.27 (0.79)	
	Comparison	18.49 (0.18)	17.74 (0.24)	-0.75*** (0.21)	0.47 (0.47)	17.64 (0.00)	-0.85** (0.39)	0.58 (0.88)
ED 30-Day Visits	**BPCI**	12.04 (0.40)	12.70 (0.42)	0.65*** (0.19)		12.55 (0.00)	0.51* (0.28)	
	Comparison	11.08 (0.10)	11.50 (0.11)	0.42*** (0.09)	0.23 (0.21)	11.61 (0.00)	0.53*** (0.14)	-0.02 (0.31)
Patient Discharge Destination††								
Hospice	**BPCI**	3.19 (0.26)	3.22 (0.28)	0.03 (0.13)		3.22 (0.32)	0.03 (0.20)	
	Comparison	2.83 (0.05)	2.98 (0.06)	0.15*** (0.06)	-0.12 (0.14)	3.05 (0.10)	0.22** (0.09)	-0.19 (0.22)
HHA	**BPCI**	11.40 (0.67)	11.39 (0.72)	-0.01 (0.31)		11.38 (0.80)	-0.01 (0.42)	
	Comparison	19.92 (0.33)	20.40 (0.34)	0.48*** (0.18)	-0.50 (0.36)	20.14 (0.38)	0.23 (0.26)	-0.24 (0.49)
IRH	**BPCI**	9.62 (1.04)	6.53 (0.90)	-3.09*** (0.62)		5.97 (0.97)	-3.65*** (0.76)	
	Comparison	4.20 (0.10)	4.31 (0.11)	0.11 (0.09)	-3.21*** (0.63)	4.35 (0.16)	0.15 (0.14)	-3.80*** (0.77)

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ denote statistical significance levels when program periods (Since BPCI , PY1, and PY2) are each compared to baseline. Standard errors are provided in parentheses.

† KSRC and its comparison hospitals are excluded from ICU analyses due to no or low incidence of these events.

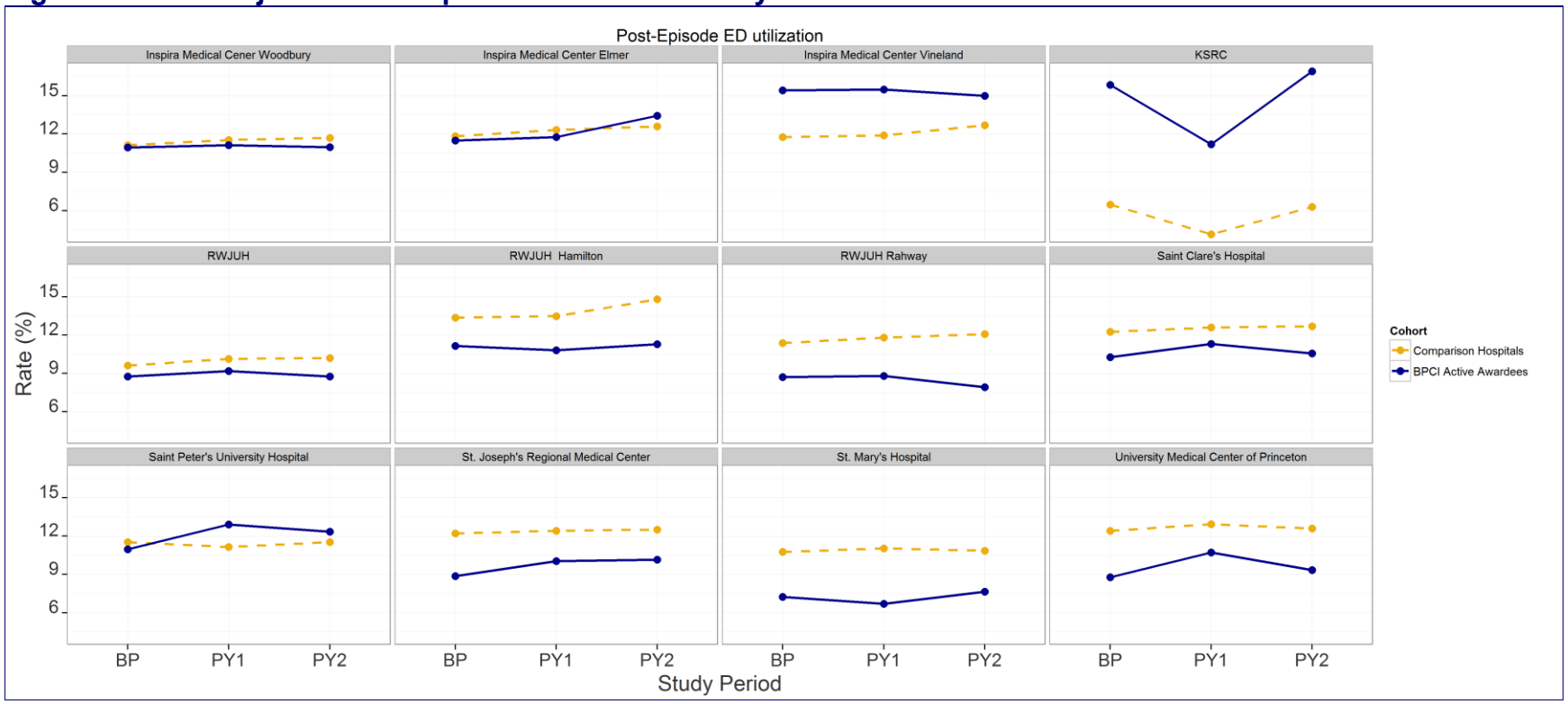
†† These are expected discharge destinations and may differ from actual post-discharge services utilized (presented in Section 5).

Figure 22. Risk-Adjusted and DiD Estimates for Health Outcomes by Cohort*



* KSRC and its comparison hospitals are excluded from mortality analyses due to no or low incidence of these events.

Figure 23. Risk-Adjusted Post-Episode ED Utilization by Active Awardee



6.5. Discussion

As measured by readmission, ED utilization, and patient discharge destination, results indicate that Awardees active through PY2 have not exhibited any statistically significant unintended negative effects on Medicare beneficiaries. However, there is room for concern with the all-cause mortality measure for Active Awardees. Since BPCI inception, there was a statistically significant increase of 0.32 pps ($p < 0.1$) from baseline that remained even after adjusting for hospital and patient characteristics (Table 28). Further, Figure 22, Panel 1 shows a slight increase over study periods, and Panel 2 shows this increase over PY1 and PY2 relative to the Active BPCI Model 1 Awardee cohort's comparison group. Noting this, Table 28 also shows that Active BPCI Model 1 Awardee mortality rate increases were not larger than those of the Active comparison cohort at conventional statistical significance levels.

Active cohort Awardee-level analyses (not shown) identify a *singular* active Awardee with a statistically significant DiD mortality estimate, driven by in-hospital mortality events.[58] This Awardee noted a decrease in the incidence of sepsis and mortality rates specific to sepsis when interviewed in PY1,[59] which they credited to the use of a sepsis bundle for all patients admitted with a sepsis diagnosis. Decreases in sepsis diagnoses and associated mortality were not seen across PY1 and PY2 combined. However, unadjusted analyses by study year indicated an uptick of mortality events associated with episodes with sepsis MS-DRGs in PY2.[60] Furthermore, the percent of episodes with any sepsis diagnoses present on admission and the rate of in-hospital mortality events associated with such episodes followed a U-shaped pattern across study years from April 2011 through March 2015.[61] The first and last study years had the highest sepsis-related unadjusted mortality rates of 21 and 23 percent, respectively. Mortality associated with sepsis diagnoses—present or not present on admission—accounted for about one-third of this Awardee hospital's mortality events over the study period. In telephone interviews, this Awardee also noted that it had established a palliative care program in 2011, with the goal of expanding this program to encompass all impacted patients and families in both the inpatient and outpatient settings. While there is no specific evidence to link the palliative care initiative with higher mortality, it is another factor for consideration. Taken together, there is no clear indication that the increase in this Awardee's mortality rate was directly associated with BPCI Model 1.

Throughout the evaluation of BPCI Model 1, Awardees have characterized their care redesign as being quality focused and typically concern in-hospital events such as beneficiary falls (Section 3.2). Measures assessed in this section primarily concentrated on outcomes external to a beneficiary's episode hospitalization. Post-episode outcomes may yet show improvement, given that Awardees noted high or ideal physician enrollment and engagement only recently—near the end of PY2.

[58] For example, this Awardee's in-hospital unadjusted mortality rate among its study episodes was 2.3 percent in the base period and 3.1 percent in PY2. This Awardee's comparison hospital cohort exhibited percentage decreases in in-hospital mortality events over study periods.
[59] This particular interview was conducted in September 28, 2013, indicating that this particular care redesign may have been initiated prior to the start of BPCI Model 1.
[60] For example, MS-DRG v25 872 - Septeciemia and ICD-9 diagnoses codes 038.x and 995.x.
[61] Measured from April 1 of one year to March 31 of the subsequent year.

7. Summary of Findings

The PHC demonstration, a precursor to BPCI Model 1, did not aim for reductions in Medicare expenditures; instead, it focused on (Medicare) budget neutrality and promotion of physician-hospital alignment for the betterment of care by affording hospitals the ability to gainshare with physicians. This alignment was expected to induce reductions in internal hospital costs without negatively affecting care quality. Summative evaluation findings for the PHC demonstration indicate that PHC participants were indeed able to engender hospital cost-savings and pass a portion of these savings to enrolled physicians via gainsharing.[62] Further, that evaluation showed no statistically significant reductions to Medicare payments but did exhibit non-statistically significant increases in these payments—primarily driven by Medicare payments to PAC facilities—over PHC program periods.

BPCI Model 1 shifted its episode-of-care focus to the inpatient hospitalization but maintained post-episode care and spending monitoring. BPCI Model 1 also retained similar waivers to afford gainsharing between Awardees and enrolled practitioners. Given the PHC demonstration's findings that hospitals could reduce internal hospital costs without sacrificing their quality of care, BPCI Model 1 added a predetermined, progressive Medicare (IPPS) operating payment discount to Awardee hospitalizations, affecting their Medicare revenue. Under BPCI Model 1, if Awardees are able to align physicians with care redesign pursuits and achieve internal hospital efficiencies, these efficiencies may translate to reduction in Medicare payments and, potentially, increases in the value of health care utilization during the episode. Ideally, these efficiencies would occur without shifting care required by Medicare beneficiaries—or corresponding costs—to post-episode periods.

The purpose of this 2015 BPCI Model 1 evaluation report was to analyze and report the impact of BPCI Model 1 against these goals, through PY1 and PY2.

Awardees initially struggled with physician enrollment and engagement. Interview and focus group data from PY1 indicated that a primary concern across most Awardees was low physician enrollment in the model and/or lackluster engagement in care redesign. Reasons were mixed but generally centered on physician skepticism or misinformation of BPCI Model 1 components (e.g., gainsharing payment methodologies), structural issues such as non-employed physicians with privileges at an Awardee hospital adhering to their own practice standards, or even physicians exhibiting unwillingness to change from long-established care standards.

Of Awardees that remained active through PY2, the majority—in June 2015—had reportedly become satisfied with the level of physician enrollment and engagement, noting that the main drivers of increased enrollment and engagement included repeat presentations of educational materials, clarity on gainsharing payments to physicians, and performance statistics.

Awardee participation was a balancing act between actual/perceived profitability under BPCI Model 1 and the need to align physicians with care redesign. By the third PQ, when the

[62] Greenwald, L., Adamache, W., Cole-Beebe, M., Amico, P., Hunter, E., & Baker, B. (2014). *Evaluation of the Physician Hospital Collaboration Demonstration: Final Report.* RTI International. Retrieved from: https://downloads.cms.gov/files/cmmi/PHC_FINAL-RPT_September2014.pdf.

BPCI Model 1 IPPS discount was 0.5 percent, three Awardees withdrew from BPCI Model 1. Two of these three Awardees were previously enrolled in the PHC demonstration. The predominant sentiment was that different care redesign would need to be initiated and the time required to identify and implement such care redesign would not allow sufficient time to engender hospital cost-savings and offset the IPPS discount to their Medicare revenue.

By PQ5, when the IPPS discount increased to 1 percent of IPPS operating payments, six more Awardees withdrew from the model, four of which were also in the PHC demonstration. Around this time, most if not all Awardees had an idea of their cost-savings, with some actually distributing gainsharing payments to physicians. The perception that the IPPS discount to their revenue was unsustainable remained. Some of the exiting Awardees also noted the belief that they had a strong enough infrastructure to continue pursuit of their care redesign without an automatic discount to their Medicare revenue. Additional reasons, such as previously noted lackluster physician enrollment and engagement, were also an issue. Despite four more withdrawals since PQ5, Awardees that remained after the IPPS discount increased to its adjusted cap of 1 percent noted that they believe the BPCI Model 1 gainsharing component could still benefit hospital–physician alignment for care redesign at their hospital, even at the expense of a discount to their revenue.

Medicare savings came from the BPCI Model 1 IPPS discount. Analysis of PY1 and PY2 risk-adjusted Medicare payments per episode found no consistent negative or positive statistically significant impacts. Exiting Awardees exhibited per-episode savings to Medicare in PY1 ($p < 0.05$) while still active in BPCI Model 1.[63] These savings did not extend into PY2, as estimated Medicare payments per episode impact estimates were no longer statistically different from zero. Conversely, Awardees that remained active through PY2 had a marginal increase in Medicare payments per episode in PY2 from an elevated PY1 impact estimate. However, neither PY1 nor PY2 DiD estimates were statistically significant at conventional levels. Further analyses indicated that the non-statistically significant but elevated impact estimates in PY2 across cohorts were influenced by changes in IPPS outlier payments per episode—a component of the Medicare (hospital-specific) episode payments. Specifically, the active Awardee cohort exhibited a statistically significant positive IPPS outlier payment per episode impact estimate (PY1 and PY2 combined: +$55; $p < 0.01$) while exiting Awardees exhibited a decrease in outlier payment impact estimates from PY1 (-$86, $p < 0.01$) to PY2 (-$13, not statistically significant).

In attempting to engender hospital cost-savings to offset the BPCI Model 1 IPPS discount, Awardees may have decreased the amount of care that Medicare beneficiaries actually received and shifted that burden to PAC facilities. Evaluation results indicated that 30-day post-episode Medicare payments did increase, driven by statistically significant increases in Medicare payments to SNFs. Specifically, Medicare payments to SNFs from Medicare beneficiaries discharged from Awardee hospitals active through PY2 exhibited a DiD estimate of $169 ($p < 0.1$), an increase in Medicare payments to SNF when comparing the adjusted aggregate PY1 and PY2 periods to baseline and to comparison Medicare beneficiaries. While this finding may be indicative of cost shifting or even care stinting, other data indicate that this is not likely. Despite an emphasis of some Awardees on increasing patient throughput and decreasing beneficiary

[63] Twelve Awardees terminated their CMS Awardee Agreement, six of which were previously enrolled in the similar PHC demonstration.

LOS, analysis of the beneficiary LOS exhibited no such persistent decreases. Furthermore, analysis of the percentage of Medicare beneficiaries who received intensive care, as measured by ICU utilization during their episode, actually increased among these active Awardees, relative to baseline and comparison hospitals. Moreover, the average percentage of Medicare beneficiaries having any SNF utilization during this post-episode period did not statistically differ from baseline or comparison hospitals. Further research is needed to determine whether this finding is an artifact of the intensity or duration of SNF stays and whether such aspects are out of Awardee control.

BPCI Model 1 does have a safety net for excess post-episode spending. A different CMS contractor monitors standardized post-episode Medicare payments for active BPCI Awardees, comparing individual Awardee spending in a program year to a baseline benchmark and risk threshold for that Awardee. If an Awardee's post-episode expenditure were to surpass the combined benchmark and risk threshold, then that Awardee would be liable to pay Medicare the excess. Information from CMS indicates that Awardees did not surpass expenditure thresholds.

Medicare payment analyses did not directly adjust for regional factors that may influence Medicare payments (e.g., differing wage indexes) and instead relied on regression methods to account for such factors, with one exception—the hospital-specific Medicare episode payment. Specifically, the hospital-specific episode payment was also standardized. Medicare payments to acute care hospitals are adjusted by several hospital- and locale-specific adjustments, while standardized payments are calculated without such adjustments. The most notable adjustment left out of the SAM calculation is the wage index, but others include disproportionate share payments, adjustments for inpatient medical education, and incentives or penalties due to value-based purchasing and hospital readmissions reduction initiatives. As with nonstandardized allowed amounts, there were no statistically significant impact estimates in PY1 or PY2 on IPPS SAMs per episode (with the IPPS discount applied) across Awardee cohorts.

Despite the lack of statistical significance in nonstandardized Medicare payments per episode or available SAM counterparts, Medicare did recoup an estimated $7.3 million (in 2013 dollars)[64] through the BPCI Model 1 IPPS discount across PY1 and PY2.

No consistent negative or positive impacts on claims-based health outcomes were observed. As measured by all-cause readmissions, post-episode ED utilization, beneficiary discharge destinations, and all-cause mortality rates, results indicate that BPCI Model 1 Awardees active through PY2 did not exhibit any consistent statistically significant unintended negative—or positive—effects on Medicare beneficiaries. DiD impact estimates for the all-cause mortality or readmission measures were not statistically significant for the Full or subset Awardee cohorts in PY1, PY2, or PY1 and PY 2 combined. However, one Awardee active through PY2 exhibited a statistically significant DiD impact estimate in their mortality rate, driven by in-hospital mortality events. This Awardee noted a decrease in the incidence of sepsis and mortality rates specific to sepsis when interviewed in PY1,[65] which they credited to the use of a sepsis bundle for all patients admitted with a sepsis diagnosis. The percent of episodes with any sepsis

[64] This is a conservative estimate; some episodes affected by the IPPS discount are excluded by evaluation design.
[65] This particular interview was conducted in September 28, 2013, indicating that this particular care redesign may have been initiated prior to the start of BPCI Model 1.

diagnoses present on admission and the rate of in-hospital mortality events associated with such episodes followed a U-shaped pattern across study years from April 2011 through March 2015,[66] with the first year in the baseline period and PY2 having the highest sepsis-related unadjusted mortality rates. Mortality associated with sepsis diagnoses—present or not present on admission—accounted for about one-third of this Awardee's in-hospital mortality events over the study period. In telephone interviews, this Awardee also noted that it had established a palliative care program in 2011, with the goal of expanding this program to encompass all impacted patients and families in both the inpatient and outpatient settings. While there is no specific evidence to link the palliative care initiative with higher mortality, it is another factor for consideration. Taken together, there is no clear indication that the increase in this Awardee's mortality rate was directly associated with BPCI Model 1.

Throughout the evaluation of BPCI Model 1, Awardees have characterized their care redesign as being quality focused with the expectation that improved quality will lead to increased cost-efficiencies and overall value of care. Given that Awardees still active in the model reported achiving (near) ideal physician enrollment and engagement in PY2, the translation of these efforts to quantifiable impacts under BPCI Model 1 may need more time for fruition.

[66] Measured from April 1 of one year to March 31 of the subsequent year.