CMS Bundled Payments for Care Improvement Advanced Model: Year 1 Evaluation Annual Report – Appendices

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The Lewin Group, Inc. with our partners
Abt Associates, GDIT, and Telligen

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List of Appendices

Appendix A: Glossary of Terms and Acronyms List

Exhibit A.1: Glossary of Terms

Name	Definition
Advanced Alternative Payment Model (APM)	A component of the Quality Payment Program (QPP) in which eligible clinicians are excluded from Merit-based Incentive Payment System (MIPS) reporting requirements and payment adjustments, and receive a 5% bonus incentive for achieving threshold levels of patient volumes or payment amounts.
Anchor Procedure	The hospital outpatient procedure that triggers the start of an outpatient episode.
Anchor Stay	The hospital inpatient stay that triggers the start of an inpatient episode.
Applicant	An organization that completed and submitted a BPCI Advanced application to the Centers for Medicare & Medicaid Services (CMS).
Awardee	A risk-bearing, financially responsible organization that was in BPCI. This entity may or may not have been an episode initiator (EI).
Baseline Period	The period of time used for calculation of historical payments. For Model Years 1 and 2, the baseline period spans 4 years from January 1, 2013 through December 31, 2016.
BPCI Advanced Entity	A non-Medicare provider that has signed a BPCI Advanced entity agreement to provide administrative services to the participant in the administration of financial arrangements under the model.
Care Redesign Plan (CRP)	A document submitted to CMS prior to the start of each Model Year where participants document their plan for operationalizing BPCI Advanced and care redesign interventions.
Clinical Episode	For Model Years 1 and 2, one of the 32 episodes of BPCI Advanced related to a specific set of Healthcare Common Procedure Coding System (HCPCS) codes or Medicare Severity Diagnosis Related Group (MS-DRGs) that begins with an anchor stay or anchor procedure and extends for 90 days post-discharge or procedure.
CMS Discount	A three percent discount CMS applies to the benchmark price to calculate a target price.
Composite Quality Score (CQS)	An aggregate quality score determined by calculating a score for each quality measure at the clinical episode level. Scores are scaled across the clinical episodes attributed to a specific EI and weighted based on clinical episode volume. The CQS is used to adjust positive or negative total reconciliation amounts.
Convener Participant	A type of participant that brings together at least one downstream EI to participate in BPCI Advanced, facilitate coordination among them, and bear and apportion financial risk. A convener participant may or may not be a Medicare provider or initiate episodes.
Downstream Episode Initiator (EI)	Hospitals or physician group practice (PGPs) that are associated with a convener participant and initiate episodes. Downstream EIs do not bear financial risk directly with CMS.
Episode Initiator (EI)	The hospital or PGP participating in the model as a participant or a downstream EI that can trigger clinical episodes.
Financial Arrangements	An arrangement entered into between the participant and Net Payment Reconciliation Amount (NPRA) sharing partner or NPRA sharing group practice practitioner for purposes of sharing NPRA with organizations or individuals or for the contribution of shared repayment amounts or internal cost savings.
Financial Arrangement List	A document submitted to CMS prior to the start of every calendar quarter where participants list each NPRA sharing partner, NPRA sharing group practice practitioner, and BPCI Advanced entity that a participant has had a financial arrangement with during the model, even if that financial arrangement has ended.

Name	Definition
Merit-based Incentive Payment System (MIPS)	A component of the QPP in which eligible clinicians have performance-based payment adjustments for the services provided to Medicare beneficiaries.
Net Payment Reconciliation Amount (NPRA)	The amount paid to a participant when aggregate Medicare allowed amounts for clinical episodes which the participant has selected, including an adjustment from the CQS, are lower than the target price for such clinical episodes.
Non-convener Participant	An individual hospital or PGP that assumes financial risk for clinical episodes. Non-convener participants are also EIs.
NPRA Sharing Arrangement	An arrangement between a participant and an NPRA sharing partner that outlines, in writing, the terms of sharing NPRA, the contribution of internal cost savings to the BPCI Advanced savings pool, and the apportionment to the NPRA sharing partner of any repayment amount owed by the participant.
NPRA Sharing Group Practice Practitioner	A Medicare-enrolled physician or non-physician practitioner who has entered into a partner distribution arrangement with a PGP that is an NPRA sharing partner to receive partner distribution payment.
NPRA Sharing Partner	Individuals or organizations such as hospitals, PGPs, Accountable Care Organizations (ACOs), or post-acute care (PAC) providers who have entered into a written NPRA sharing arrangement with a participant. NPRA sharing partners for a convener participant may be EIs.
Performance Period	A defined period of time during which episodes may initiate and all Medicare FFS payments are aggregated for a specific clinical episode are attributed to a participant. The performance periods are used to determine reconciliation for clinical episodes. Apart from the first performance period, performance periods will run from January 1 – June 30th and July 1st – December 31st. The BPCI Advanced Model includes 10 performance periods, running through December 31, 2023.
Quality Payment Program (QPP) List	A document submitted to CMS prior to the start of every calendar quarter where participants provide individual-level information needed for Qualifying APM participant (QP) determinations.
Reconciliation	The semi-annual process where CMS compares the aggregate Medicare FFS allowed amounts for all items and services included in clinical episodes attributed to a participant against the target price for those clinical episodes in order to determine whether the participant is eligible to receive a NPRA payment from CMS or is required to pay a repayment amount to CMS.
Retroactive Withdrawal	A one-time opportunity for participants to withdraw some or all of their EIs and/or clinical episodes without being held financially accountable for clinical episodes initiated between October 1, 2018 and March 1, 2019.
Target Price	The benchmark price for each EI-clinical episode combination with the CMS discount applied.
Three-day Hospital Stay Waiver	One of the payment policy waivers offered under the model that waives the three-day inpatient hospital stay requirement for coverage of SNF services furnished to a BPCI Advanced beneficiary.

Exhibit A.2: Acronym List

Acronym	Definition
ACO	Accountable Care Organization
AHRF	Area Health Resource File
AHRQ	Agency for Healthcare Research and Quality
APM	Alternative Payment Model
BPCI	Bundled Payments for Care Improvement
CBSA	Core-Based Statistical Area
CJR	Comprehensive Care for Joint Replacement
CMMI	Center for Medicare & Medicaid Innovation
CMS	Centers for Medicare & Medicaid Services
COPD	chronic obstructive pulmonary disease
CQS	Composite Quality Score
DJRLE	double joint replacement of the lower extremity
EI	episode initiator
FFS	Fee-for-service
GI	gastrointestinal
HCPCS	Healthcare Common Procedure Coding System
IP	inpatient
IPPS	Inpatient Prospective Payment System
IRF	inpatient rehabilitation facility
IQR	Inpatient Quality Reporting
MDM	Master Data Management
MD-PPAS	Medicare Data on Provider Practice and Specialty
MIPS	Merit-based Incentive Payment System
MS-DRG	Medicare Severity Diagnosis Related Group
MSSP	Medicare Shared Savings Program
MJRLE	major joint replacement of the lower extremity
MJRUE	major joint replacement of the upper extremity
NPI	National Provider Identifier
NPRA	Net Payment Reconciliation Amount
OP	outpatient
PAC	post-acute care
PCI	percutaneous coronary intervention
PGP	physician group practice
POS	Provider of Service
QP	Qualifying APM Participant
QPP	Quality Payment Program
SNF	skilled nursing facility
SPRI	simple pneumonia and respiratory infections
TIN	Taxpayer Identification Number

Appendix B: BPCI Advanced Clinical Episode Definitions

Exhibit B.1: BPCI Advanced Inpatient Clinical Episodes and Medicare Severity Diagnosis Related Groups (MS-DRGs), Model Years 1 and 2

Clinical Episode	MS-DRGs Trigger Codes							
	1	2	3	4	5	6	7	8
Acute Myocardial Infarction	280	281	282					
Back and Neck Except Spinal Fusion	518	519	520					
Coronary Artery Bypass Graft Surgery	231	232	233	234	235	236		
Cardiac Arrhythmia	308	309	310					
Cardiac Defibrillator	222	223	224	225	226	227		
Cardiac Valve	216	217	218	219	220	221	266	267
Cellulitis	602	603						
Cervical Spinal Fusion	471	472	473					
Combined Anterior Posterior Spinal Fusion	453	454	455					
Congestive Heart Failure	291	292	293					
Chronic Obstructive Pulmonary Disease, Bronchitis, Asthma	190	191	192	202	203			
Disorders of Liver Except Malignancy, Cirrhosis, or Alcoholic Hepatitis	441	442	443					
Double Joint Replacement of the Lower Extremity	461	462						
Fractures of the Femur and Hip or Pelvis	533	534	535	536				
Gastrointestinal Hemorrhage	377	378	379					
Gastrointestinal Obstruction	388	389	390					
Hip and Femur Procedures Except Major Joint	480	481	482					
Lower Extremity and Humerus Procedure Except Hip, Foot, Femur	492	493	494					
Major Bowel Procedure	329	330	331					
Major Joint Replacement of the Lower Extremity	469	470						
Major Joint Replacement of the Upper Extremity	483							
Pacemaker	242	243	244					
Percutaneous Coronary Intervention	246	247	248	249	250	251	273	274
Renal Failure	682	683	684					
Sepsis	870	871	872					
Simple Pneumonia and Respiratory Infections	177	178	179	193	194	195		
Spinal Fusion (Non-Cervical)	459	460						
Stroke	61	62	63	64	65	66		
Urinary Tract Infection	689	690						

Source: Centers for Medicare & Medicaid Services (2019, June 28). BPCI Advanced. Retrieved from https://innovation.cms.gov/initiatives/bpci-advanced.

Exhibit B.2: Outpatient Clinical Episodes and Healthcare Common Procedure Coding System (HCPCS) Codes, Model Years 1 and 2

Clinical Episode	HCPCS Trigger Codes												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Back and Neck Except Spinal Fusion	62287	63005	63011	63012	63017	63030	63040	63042	63045	63046	63047	63056	63075
Cardiac Defibrillator	33262	33263	33264	33249	33270								
Percutaneous Coronary Intervention	92920	C9600	C9604	92924	92937	92928	92943	C9606	92933	C9602	C9607		

Source: Centers for Medicare and Medicaid Services (2019, June 28). BPCI Advanced. Retrieved from https://innovation.cms.gov/initiatives/bpci-advanced.

Appendix C: Methods

This appendix includes details on the methods used for analyses in the Year 1 annual report.

A. Data Sources

1. Secondary Data Sources

Exhibit C.1 lists the secondary data sources and their uses for this annual report. Overall, we used provider-level and aggregated data sources to identify and describe BPCI Advanced participants, hospital episode initiators (EIs), and physician group practice (PGP) EIs. Medicare claims data were used to identify clinicians and specialty types, as well as calculate the number of discharges and procedures associated with the Bundled Payments for Care Improvement Advanced (BPCI Advanced) Model, Bundled Payments for Care Improvement (BPCI) Initiative, and non-participating hospitals and PGPs. We used primary data sources to capture entry decisions, clinical episode selections, approaches to care redesign, and financial arrangement decisions.

Exhibit C.1: Secondary Data Sources used in the BPCI Advanced Year 1 Evaluation

Dataset Name	Date Range	Data Set Contents	Use
Academic Medical Center Indicator Dataset	2013-2016	Dataset from the BPCI Advanced payment reconciliation contract that indicated if the Inpatient Prospective Payment System (IPPS) hospital is an academic medical center.	Used to identify which hospitals are academic medical centers.
Agency for Healthcare Research and Quality (AHRQ) Hospital Linkage File	2016	Data linking hospitals to Compendium Health Systems.	Used to identify whether a hospital is part of a health system.
Area Health Resource File (AHRF)	2013-2016	County-level data on population, environment, geography, health care facilities, and health care professionals.	Used within descriptive analysis of market characteristics for BPCI Advanced hospitals, BPCI hospitals, and non-participating hospitals.
BPCI Advanced Hospital Target Pricing File	2013-2016, 2018	The clinical episode-specific Model Years 1 and 2 preliminary target prices, historical payments, and historical volume for all BPCI Advanced-eligible hospitals.	Used to compare historical payments and calculate the difference between historical payment and preliminary target price among BPCI Advanced participants and non-participants by clinical episodes.
Centers for Medicare and Medicaid Services (CMS) BPCI Advanced Database	2018-2019	Information compiled by CMS on BPCI Advanced participants and their clinical episodes, including participant name, CMS Certification Number (CCN), Taxpayer Identification Number (TIN), location, type (hospital, PGP, other), BPCI Advanced "role," clinical episode(s), BPCI Advanced participation start and end dates, and contact information.	Used to identify participants, hospital EIs, and PGP EIs participating in BPCI Advanced and the clinical episodes in which they are participating. Also used to identify participants that retroactively withdrew or applied but did not become a participant or EI.

Dataset Name	Date Range	Data Set Contents	Use
CMS BPCI Database	2013-2018	Information compiled by CMS on BPCI awardees and their clinical episodes, including awardee name, CMS Certification Number, TIN, location, type, clinical episode (s), BPCI participation start and end dates, and contact information.	Used to identify BPCI participating hospitals and PGPs.
CMS Inpatient Prospective Payment System (IPPS) Files	2013-2016	Hospital-level file containing provider characteristics such as bed count, resident-bed ratio, and discharge counts.	Used within descriptive analysis of BPCI Advanced participating hospitals and non-participating hospitals.
CMS Provider of Services (POS) File	2013-2016, 2018	Information on Medicare-approved institutional providers, including provider number, size, and staffing.	Used within descriptive analysis of BPCI Advanced participating hospitals and non-participating hospitals.
Dartmouth Atlas Project Crosswalk Files	2015	Crosswalk files from the ZIP code level to the Hospital Service Area (HSA) and the Hospital Referral Region (HRR).	Used to assign a CBSA code to hospitals that are not located within a CBSA code by using the largest CBSA that overlaps the HRR.
Inpatient Quality Reporting (IQR) Measures	2017	Quality data compiled by CMS from hospitals paid under the IPPS.	Used within descriptive analysis of BPCI Advanced participating hospitals and non-participating hospitals.
Master Data Management (MDM)	2013-2019	Provider-level information on participation in Center for Medicare and Medicaid Innovation (CMMI) payment demonstration programs.	Used to identify providers who were involved in a Medicare Shared Savings Program (MSSP), Next Generation (Next Gen), or Pioneer Accountable Care Organization (ACO) Model.
Medicare Data on Provider Practice and Specialty (MD-PPAS) User Documentation version 2.3	N/A	Mapping of Provider Enrollment and Chain/Ownership System (PECOS) codes to six broad physician specialties, other physician, and non-physician categories.	Used to map clinician specialty codes on Medicare claims to broad specialty categories and provide guidance on how to assign a category to physicians that can be assigned to more than one category.
Medicare Fee-For-Services (FFS) Claims	Jan 2013-June 2019	Medicare Part A and B claims.	Used to calculate the number of discharges and procedures by BPCI Advanced, BPCI and non-participating hospitals, BPCI Advanced and BPCI PGPs, and by CBSAs. Also used to identify clinicians, clinician specialties, and hospitals where PGPs had discharges or procedures associated with BPCI Advanced and BPCI PGP EIs.
Proposed Financial Arrangements List (PFAL)	Quarter 1 2019	Information submitted by participants to CMS that includes organizations, individuals, and entities with whom the participant may have a financial arrangement. Organizations, individuals, and entities within the PFAL were not yet vetted by CMS and may or may not be eligible for NPRA sharing.	Used to identify the number and types of potential NPRA sharing partners and NPRA sharing group practice practitioners under BPCI Advanced.

2. Primary Data Sources

In this section we describe the sample included in each of the primary qualitative data collection activities and the data collected. We describe the methods used for analyzing the data in Section D: Qualitative Analysis.

a. Site Visits

In the first year of the evaluation, we conducted three site visits with EIs. Site visits consisted of interviews with key informants at each site such as executive leaders, financial leaders, data and quality management managers, care redesign leaders, care coordination leaders, nurses, physicians and representatives from convener participants (conveners). Two site visits were conducted in-person and one site visit was conducted virtually. The focus of these site visits was to explore the reasons why organizations chose to participate in the BPCI Advanced Model, how they selected clinical episodes and their partners, and their early approach to care redesign. We also asked about NPRA sharing arrangements and the level of clinician and beneficiary awareness of the model. Each of the site visits focused on specific clinical episodes of interest – inpatient and outpatient back and neck except spinal fusion, inpatient and outpatient percutaneous coronary intervention and major joint replacement of the lower extremity.

Sampling Approach

The site visit sample was purposive and not representative of the broader BPCI Advanced EI population. Site visit participants were selected to ensure a diverse sample. Characteristics considered in the selection process include: EI type (hospital and PGP), total number of clinical episodes, participation in linked inpatient and outpatient episodes, EI's convener type (if applicable), participation in other CMS models and metropolitan area. Exhibit C.2 summarizes the key characteristics of the three site visit participants.

Exhibit C.2: Site Visit EI Characteristics, Year 1

Hospital / PGP EI	EI's Convener Participant Type (if applicable)	BPCI Experience	Participation in Outpatient Episodes
Hospital EI	Health system convener	No	Yes
PGP EI	For-profit convener	No	Yes
PGP EI	N/A, non-convener participant	No	No

Note: EI = episode initiator; PGP = physician group practice.

***Source*:** The BPCI Advanced evaluation team's analysis of the CMS BPCI Database and the CMS BPCI Advanced Database as of March 1, 2019.

Interview Protocols

The site visit protocols were designed to capture information about: entry decisions; clinical episode selection; partner selection; convener choice; NPRA sharing arrangements; care redesign; care coordination; data and quality monitoring; and clinician and beneficiary awareness of the model. Interview protocols were tailored to each type of respondent. For example, care redesign leaders were asked targeted questions about care redesign while financial and executive leaders were asked more questions about entry decisions and partner selection (Exhibit C.3).

Exhibit C.3: Site Visit Interview Topics by Respondent Type

Topics	Convener[1]	Executive	Finance	Data & Quality	Care Redesign	Care Coordination	Physician	Nurses & Direct Care Staff
Entry Decision	X	X	X					
EI Selection	X							
Convener Selection		X	X					
Clinical Episode Selection	X	X	X					
NPRA Sharing	X	X	X				X	
Partner Selection	X	X	X					
Monitoring Cost and Quality		X	X	X	X		X	
Care Redesign		X			X	X	X	X
Care Coordination					X	X	X	X
Clinician Awareness of Model					X	X	X	X
Beneficiary Awareness of Model					X	X	X	X

b. *Exit Interviews*

We conducted semi-structured exit phone interviews with a small, purposive sample of BPCI Advanced EIs that were no longer participating in the model. The purpose was to uncover any unanticipated reasons that organizations decided to exit that would be important in informing the model. The exit interview protocol elicited information on topics including key factors in the decision to both participate and exit from BPCI Advanced and the EIs' experiences while participating in the model.

To adequately answer all protocol questions and learn from various perspectives, we intended to sample EIs:

- With and without prior experience in BPCI;
- Participating as non-convener participants and downstream EIs under a convener ; and
- That participated in a diverse selection of clinical episodes (both amount and type), including some that participated in at least one of the outpatient clinical episodes.

[1] Convener protocol questions were asked when applicable.

We sampled 10 EIs and sent emails to their point of contact, requesting a phone call with key staff involved in the decision to exit from the model. Three of the 10 EIs that were contacted participated in exit interviews. Response rates are detailed in Exhibit C.4. Key characteristics of the sample included: two PGP EIs and one hospital EI; two had previous experience in BPCI; two were downstream EIs; and the EIs selected a range of two to 32 clinical episodes, including two EIs selecting at least one of the outpatient clinical episodes. Each exit interview was conducted with one to three individuals and lasted less than 30 minutes.

Exhibit C.4: Exit Interview Participation Rates, Year 1

Characteristic	Sample (N = 10)
Interviewed	3 (30%)
Did Not Respond	7 (70%)
Unable to Participate	0 (0%)

Source: The BPCI Advanced evaluation team's analysis of the qualitative sample for Year 1 data collection.

c. Key Informant Interviews

We held semi-structured telephone interviews with a sample composed of BPCI Advanced PGP EIs, hospital EIs, and participants to learn about their respective decisions to: participate in the model; select clinical episodes; determine NPRA sharing arrangements; and their motivations for making those decisions. The design was chosen to allow for an efficient way to collect information about early model decisions. The intention of focusing on these topics was to supplement similar data collected on site visits and facilitate recollection of decisions made at the beginning of participation in the model.

To achieve a diverse sample and address all relevant research questions, we intended to sample EIs and conveners:

- With varied entity types (e.g., hospital EIs, PGP EIs, nonprofit conveners, and for-profit conveners);
- With and without prior experience in BPCI;
- That participated in a diverse selection of clinical episodes (both amount and type), including participating in the outpatient clinical episodes;
- With and without NPRA sharing arrangements (EIs), or with varied percentages of EIs with NPRA sharing arrangements (conveners);
- With conveners and those that participated as non-convener participants (EIs only); and
- With varied amounts of downstream EIs (participated under conveners only).

We sampled 27 EIs and conveners and sent emails to their point of contact, requesting an hour-long phone call with individuals knowledgeable about the interview topics. 17 of the 27 EIs and conveners that were contacted participated in key informant interviews. Response rates (Exhibit C.5) and interviewee characteristics (Exhibits C.6 and C.7) are included below.

Exhibit C.5: Key Informant Interview Participation Rate, Year 1

Response	Sample (N = 27)
Interviewed	17 (63%)
Did Not Respond	8 (30%)
Unable to Participate	2 (7%)

Source: The BPCI Advanced evaluation team's analysis of the qualitative sample for Base Year 1 data collection.

Exhibit C.6: Characteristics of Key Informant Interview Participants, Year 1

Domain	Characteristic	Key Informant Interviews (N = 17)	Key Informant Interviews (%)
Participant Role	Convener Participant	6	35%
	Non-convener Participant	4	24%
	Downstream EI	7	41%
Organization Type	Hospital EI	6	35%
	PGP EI	5	30%
	Convener	6	35%
Census Region	Midwest	7	41%
	Northeast	4	24%
	South	4	24%
	West	2	11%
Experience in BPCI	Yes	13	76%
Participation in Outpatient Episodes	Yes	4	24%
Elected to Participate in NPRA Sharing Arrangements	Yes	12	70%

Note: EI = episode initiator; PGP = physician group practice; NPRA = Net Payment Reconciliation Amount.

***Source*:** The BPCI Advanced evaluation team's analysis of the Area Health Resource File (AHRF) from 2013 to 2016, CMS BPCI Database, and the CMS BPCI Advanced Database as of March 1, 2019 for the qualitative key informant interview sample for Base Year 1 data collection.

Exhibit C.7: Characteristics of Key Informant Interview Participants, Continued

Characteristic	# of Distinct Counts (mean)	Range
Clinical Episodes	9	1 - 25
Downstream EIs (for Convener Interviewees Only)	34	2 - 104

Note: EIs = episode initiators.

Source: The BPCI Advanced evaluation team's analysis of the CMS BPCI Advanced Database as of March 1, 2019 for the qualitative key informant interview sample for Base Year 1 data collection.

B. Variable Definitions

We relied on both secondary quantitative and primary qualitative data to describe the BPCI Advanced participants and EIs. To summarize characteristics of the model and participants at the baseline and during the course of the model, Lewin ran a series of descriptive analyses on the variables included in Exhibits C.8 through C.10.

Exhibit C.8: Participant Characteristics Variable Definitions

Variable Name	Definition	Technical Definition	Eligible Sample
Convener Organization Type	Defines the type of organization for a convener, including an acute care hospital (ACH), PGP, ACO, health care system, health plan, integrated delivery health system, management services organization (MSO), clinically integrated network (CIN), or a non-provider convener.		Participants who: 1) were actively participating as of March 1, 2019; 2) were identified as a convener.
# Conveners (%)	The unique number of conveners that were identified within each convener organization type.		Participants who: 1) were actively participating as of March 1, 2019; 2) were identified as a convener.
Participant Type	Defines the type of BPCI Advanced participant, including the convener participant or non-convener participant.		Participants who: 1) were actively participating as of March 1, 2019; 2) were identified as a convener participant or non-convener participant.
Number of Participants (%)	The unique number of convener or non-convener participants.	Outcome refers to the number of unique entities who are participating as a convener participant and/or as a non-convener participant.	Participants who: 1) were actively participating as of March 1, 2019; 2) were identified as a convener participant or non-convener participant.
% that Participated in BPCI	The percentage of convener participants or non-convener participants that were identified as having prior experience in BPCI.	If the participant has experience in BPCI, then BPCI Experience = 1. This is confirmed by matching the CCN, TIN, or the participant's legal name in the CMS BPCI and BPCI Advanced Databases.	Participants who: 1) were actively participating as of March 1, 2019; 2) were identified as a convener participant or non-convener participant; 3) were in Phase II of BPCI at any point in time since October 2013.
% For Profit	The percentage of all convener participants or non-convener participants that were identified as a for-profit organization.	Participant must be identified as a for-profit or as a privately held for-profit organization.	Participants who: 1) were actively participating as of March 1, 2019; 2) were identified as a convener participants or non-convener participants.

Variable Name	Definition	Technical Definition	Eligible Sample
Number of Episode Initiators (%)	The unique number of non-convener participants, downstream EIs under a convener participant, or episode-initiating convener participants.		EIs who were actively participating in at least one clinical episode as of March 1, 2019.
Average # of EIs per Convener	The mean number of unique downstream EIs by each convener organization type.	The total number of downstream EIs divided by the total number of conveners for each convener organization type.	Downstream EIs who were actively participating in at least one clinical episode as of March 1, 2019.
Average # of Distinct Clinical Episodes Selected	Of the 32 inpatient and outpatient clinical episodes, the mean value of the distinct clinical episodes selected by each convener participant for each of its downstream EIs and itself (if it is an episode-initiating convener participant), identified within each convener participant organization type.	The mean number of distinct clinical episodes is calculated as the sum of the unique number of clinical episodes selected for each of the convener participant's downstream EIs and itself (if it is an episode-initiating convener participant), divided by the total number of the convener participant's downstream EIs and itself (if it is an episode-initiating convener participant).	Clinical episodes are uniquely counted for convener participants if the episode-initiating convener participants and the downstream EIs were actively participating in at least one clinical episode as of March 1, 2019.
Number of Hospital EIs (%)	The total unique number of hospital EIs associated with each convener participant type.		EIs who: 1) were actively participating as of March 1, 2019; 2) were identified as hospitals.
Number of PGP EIs (%)	The total unique number of PGP EIs associated with each convener participant type.		EIs who: 1) were actively participating as of March 1, 2019; 2) were identified as PGPs.

***Source*:** The BPCI Advanced evaluation team's analysis of the CMS BPCI Database and the CMS BPCI Advanced Database as of March 1, 2019.

Exhibit C.9: Hospital Characteristics Variable Definitions

Variable	Definition	Technical Definition	Source
Academic Medical Center	A binary variable indicating if a hospital is an academic medical center.		Academic Medical Center Indicator Dataset
Medicare Advantage Penetration	The Medicare Advantage (MA) penetration in the CBSA in which the hospital is located.	The percentage of total eligible Medicare enrollees in the CBSA that are enrolled in MA.	AHRF
Per Capita Personal Income	Per capita income of the CBSA code in which the hospital is located.	The total income in the CBSA divided by total population in the CBSA.	AHRF
Inpatient Rehabilitation Facility (IRF) in Market	A binary variable indicating if there is a short or long term rehab hospital in the CBSA in which the hospital is located.		AHRF

Variable	Definition	Technical Definition	Source
Market Population	The total population of the CBSA code in which the hospital is located.	The population is summed for each Federal Information Processing Standards (FIPS) State/County Code in the CBSA.	AHRF
Skilled Nursing Facility (SNF) Beds per 10,000	The SNF beds per 10,000 inhabitants of the CBSA in which the hospital is located.	The SNF beds and population are summed for each FIPS State/ County Code in the CBSA. SNF beds are divided by the population and then multiplied by 10,000.	AHRF
Part of a Health System	A binary variable indicating if a hospital is a part of a health system.	A health system includes at least one hospital and at least one group of physicians that provides comprehensive care (including primary and specialty care) that are connected with each other and with the hospital through common ownership or joint management.	AHRQ Compendium of US Health Systems
Disproportionate Share Percent	The sum of the percentage of Medicare inpatient days attributable to patients eligible for both Medicare Part A and Supplemental Security Income (SSI), and the percentage of total inpatient days attributable to patients eligible for Medicaid but not Medicare Part A.		CMS IPPS Files
Medicare Days Percent	The Medicare days as a percent of total inpatient days.		CMS IPPS Files
Resident to Bed Ratio	The average number of residents assigned per bed.		CMS IPPS Files
Safety Net Status	A binary variable indicating if the hospital is a safety net hospital based on disproportionate share percentage.	A hospital receives safety net status when the disproportionate share percentage is over 60%.	CMS IPPS Files
Bed Count	The total number of beds in a hospital.		CMS Provider of Service (POS) Files
Census Region	The census region in which the hospital is located (Midwest, Northeast, South, West).		CMS POS Files
Ownership	The ownership type of the hospital (government, non-profit, for-profit).		CMS POS Files
Provides Outpatient Surgery	A binary variable indicating if a hospital provides outpatient surgery.		CMS POS Files
Urban/Rural	A variable indicating if the hospital is in an urban or rural market.		CMS POS Files

Variable	Definition	Technical Definition	Source
Role	The role in BPCI Advanced (downstream EI or participant).	Convener participants and non-convener participants are classified as participants.	CMS BPCI Advanced Database
Experience in BPCI	A binary variable indicating if the hospital was an EI in Model 2 or 4 for at least one Phase II (i.e., at risk) calendar quarter during BPCI.		CMS BPCI Database
Unplanned Readmission Rate	The proportion of Medicare FFS beneficiaries aged 65 years and older discharged alive from a Medicare participating acute care hospital who have an unplanned readmission for any cause within 30 days of the discharge date.		Inpatient Quality Reporting (IQR) Measures
Participation in MSSP, Next Gen, or Pioneer ACO Initiatives	A binary variable indicating providers who were involved in an MSSP, Next Generation, or Pioneer ACO initiative at any point up to May 1, 2019.		MDM Program Participation Data
Total Discharges for BPCI Advanced Medicare Severity-Diagnosis Related Groups (MS-DRGs)	The total annual volume of Medicare FFS discharges at the hospital that occur in one of the 29 inpatient clinical episodes.		Part A Medicare Claims
Total Procedures for BPCI Advanced HCPCS	The total annual volume of Medicare FFS procedures at the hospital that occur in one of the 3 outpatient clinical episodes.		Part A Medicare Claims
Herfindahl Index	The sum of the squared market share (in BPCI Advanced MS-DRGs) for the CBSA of all eligible hospitals located in or assigned to the CBSA. Hospitals that are not in a CBSA were assigned to the largest CBSA that overlaps the HRR.		Part A Medicare Claims
Hospital Market Share for BPCI Advanced MSDRGs and HCPCS	The percent of discharges in BPCI Advanced MS-DRGs in or assigned to the CBSA that occur at the hospital. Hospitals that are not in a CBSA were assigned to the largest CBSA that overlaps the HRR.		Part A Medicare Claims

Note: Market characteristics are assigned to hospitals at the CBSA code level. Using the Area Health Resource File (AHRF), characteristics are aggregated from the FIPS State/County code level to the CBSA code level. Hospitals that are in a CBSA code are given the characteristics of that CBSA. Hospitals that are not in a CBSA code are assigned to a CBSA based on the Hospital Referral Region (HRR) in which the hospital is located. They are assigned to the largest CBSA (based on population) that overlaps the HRR.

***Source*:** The BPCI Advanced evaluation team's analysis of the 2016 Agency for Healthcare Research and Quality (AHRQ) Hospital Linkage File, Area Health Resource File (AHRF) from 2013 to 2016, CMS Provider of Service (POS) files from 2013 to 2016, 2018 CMS Inpatient Prospective Payment System (IPPS) file, 2018 Master Data Management (MDM) provider file, CMS BPCI Database, and the CMS BPCI Advanced Database as of March 1, 2019.

Exhibit C.10: PGP Characteristic Variable Definitions

Variable	Definition	Technical Definition	Source
Number of unique clinicians associated with the PGP EI	Total number of National Provider Identifiers (NPIs) that had at least one Part B claim where the billing provider TIN was a BPCI Advanced PGP TIN.		2016 Medicare Part B claims
Annual discharges for MS-DRGs that map to one of the 29 BPCI Advanced inpatient clinical episodes	Total number of discharges related to the 29 BPCI Advanced clinical episode MS-DRGs for the PGP.	We identified discharges when the attending or operating NPI on the inpatient stay during the anchor stay also submitted a Part B carrier claim where the billing provider was a BPCI Advanced PGP TIN.	2016 Medicare Part A & B claims
Annual procedures for HCPCS that map to one of the 3 BPCI Advanced outpatient clinical episodes	Mean total number of outpatient procedures related to the 3 BPCI Advanced clinical episode HCPCS for the PGP EI.	We identified procedures done at a hospital outpatient department (HOPD) where the operating NPI had a corresponding Part B claim with the BPCI Advanced PGP TIN.	2016 Medicare Part B claims
Number of hospitals where PGP EIs had discharges/procedures	Mean number of unique hospitals where the PGP had discharges related to the 29 BPCI Advanced clinical episode MS-DRGs or procedures related to the 3 BPCI Advanced clinical episode HCPCS codes.	Unique hospitals where discharges and procedures met the criteria used to obtain the annual number of discharges and procedures.	2016 Medicare Part A & B claims

Source: The BPCI Advanced evaluation team's analysis of 2016 Medicare FFS Claims and the CMS BPCI and BPCI Advanced databases, as of March 1, 2019.

We defined the composition of clinicians within a PGP by calculating the proportion of a PGP EI's clinicians that fell under one of eight broad specialty categories. In the case where a clinician had more than one specialty category assigned, the MD-PPAS precedence logic was used (see Exhibit C.11 for more information). Only PGP EIs that had clinicians that billed at least one Medicare Part B claim to the PGP's TIN were analyzed.

Exhibit C.11: Definition of Physician and Non-physician Specialty Categories Used to Define Average Composition of Clinicians within a PGP

Clinician Type	Specialty Category	Included Specialties
Physician	Psychiatry	Psychiatry, Geriatric Psychiatry, Neuropsychiatry
	Hospital-based	Hospitalist, Emergency Medicine, Physical Medicine And Rehabilitation, Critical Care (Intensivists), Diagnostic Radiology, Anesthesiology, Pathology, Pain Management, Interventional Pain Management, Radiation Oncology, Interventional Radiology, Nuclear Medicine
	Ob-Gyn	Obstetrics & Gynecology, Gynecological Oncology
	Surgical	Orthopedic Surgery, General Surgery, Hand Surgery, Sports Medicine, Neurosurgery, Otolaryngology, Urology, Vascular Surgery, Ophthalmology, Plastic And Reconstructive Surgery, Thoracic Surgery, Cardiac Surgery, Colorectal Surgery, Surgical Oncology, Peripheral Vascular Disease.
	Medical	Cardiovascular Disease, Pulmonary Disease, Nephrology, Gastroenterology, Infectious Disease, Neurology, Hematology-Oncology, Rheumatology, Endocrinology, Dermatology, Allergy/Immunology, Medical Oncology, Sleep Medicine, Addiction Medicine, Hematology, Interventional Cardiology
	Primary care	Internal Medicine, Family Practice, Pediatric Medicine, Geriatric Medicine, General Practice, Hospice And Palliative Care, Osteopathic Manipulative Medicine, Preventive Medicine
	Other physician	Clinic Or Group Practice, Undefined Physician Type
Non-physician	Non-physician	Oral Surgery (Dentists Only), Chiropractic, Optometry, Podiatry, Maxillofacial Surgery, Speech Language Pathologist, Anesthesiology Assistant, Certified Nurse Midwife, Certified Registered Nurse Anesthetist, Nurse Practitioner, Psychologist Billing Independently, Audiologist, Physical Therapist, Occupational Therapist, Clinical Psychologist, Registered Dietitian or Nutrition Prof, Mass Immunization Roster Biller, Clinical Social Worker, Undefined Non-Physician Type, Clinical Nurse Specialist, Physician Assistant

Note: The specialty categories in this exhibit are the broad categories that related to physician and non-physician specialty codes. In the case that a physician could be in more than one listed broad specialty category, the precedence logic in the MD-PPAS was employed. The categories are listed in approximate descending precedence order; for example, psychiatry takes precedence over emergency medicine and internal medicine.

Source: Medicare Data on Provider Practice and Specialty (MD-PPAS) User Documentation Version 2.3

C. Quantitative Analysis

1. Study Samples

There were 3,284 hospitals eligible to initiate episodes in BPCI Advanced. Eligible hospitals were IPPS hospitals in 2018 that also existed for a portion of the baseline period, 2013 to 2016. The sample excludes hospitals that met any of the following criteria: PPS-exempt cancer hospital, inpatient psychiatric hospital, critical access hospital, located in Maryland, participating in the Pennsylvania Rural Health Model or participating in the Rural Community Health Demonstration.

We further restrict the eligible hospital sample when comparing historical payments by clinical episode between BPCI Advanced hospitals and eligible hospitals not participating in the clinical episode. We exclude hospitals that did not meet the minimum baseline volume threshold (>40 discharges in 2013 through 2016), and we exclude hospitals participating in the Comprehensive

Care for Joint Replacement (CJR) Model from the major joint replacement of lower extremity clinical episode eligible hospital sample.

We used the CMS BPCI and BPCI Advanced databases to identify BPCI Advanced hospital EIs and BPCI hospital EIs. When comparing the difference between historical payments and preliminary target prices, we further restricted the sample to hospital applicants.

We also used the CMS BPCI and BPCI Advanced databases to identify PGP EIs, which are defined by a unique TIN. We relied on the TINs in the two databases to identify PGPs that participated in both BPCI and BPCI Advanced. Because PGPs could elect to create a new TIN when applying to participate in BPCI Advanced, it is difficult to say for certain if a PGP EI and the clinicians within it had experience in BPCI.

We defined eligible clinicians as attending and operating NPIs who treated Medicare beneficiaries who met the BPCI Advanced beneficiary inclusion criteria at a BPCI Advanced eligible hospital. Minimum hospital volume in the baseline period was not applied. We defined clinicians who participated in BPCI Advanced as 1) any attending or operating NPI at a BPCI Advanced hospital EI for a clinical episode in which the hospital was participating; or 2) any attending or operating NPI on the hospital claim when the beneficiary had a corresponding Part B claim during the anchor stay or anchor procedure (including one day prior) where the BPCI Advanced PGP TIN was the billing provider and the PGP was participating in the given clinical episode.

Discharges and procedures attributed to BPCI Advanced hospital EIs were at a BPCI Advanced hospital participating in the clinical episode. Discharges or procedures attributed to BPCI Advanced PGP EIs required that the beneficiary had a corresponding Part B claim during the anchor stay or anchor procedure (including one day prior) where the BPCI Advanced PGP TIN was the billing provider and the PGP was participating in the given clinical episode. The PGP discharges and procedures include those at BPCI Advanced hospitals.

2. Methods

We used descriptive analyses to compare and contrast groups of participants and providers of interest. We analyzed the CMS BPCI Advanced database to explore the types of participants and number of EIs participating under a convener or as a non-convener participant. To understand the BPCI Advanced participants, as well as hospitals and PGPs participating in the model, the markets in which they are located, and overlap with other initiatives and models, Lewin conducted descriptive analyses using data from the CMS BPCI Advanced and BPCI databases, POS files, CMS IPPS annual files, Medicare claims, PECOS, and the AHRF. We also compared the BPCI Advanced hospitals to analogous BPCI hospitals.

We conducted descriptive analyses on the BPCI Advanced hospital target pricing file to understand the range and differences of historical payments and target prices between hospitals that participated and hospitals that applied but did not participate in the clinical episode. Historical payments were based on standardized Medicare payments, updated to Model Year dollars, for the anchor stay or anchor procedure plus the 90-day post discharge period that occurred between 2013 and 2016. We used claims data to compare the composition of clinician specialties, number of clinicians, number of procedures, and number of discharges between BPCI Advanced and BPCI PGP EIs.

To determine whether observed differences between the groups were statistically significant, we used standard statistical tests, including t-tests for differences in means and chi-square tests for differences in proportions. These findings were triangulated with results of the qualitative analysis, as well as prior BPCI results, to develop our knowledge of the factors that most affect willingness to participate in BPCI Advanced.

Exhibit 20 in the report plots a moving average of the proportion of hospital EI/clinical episodes. This moving average was calculated using a kernel-weighted local polynomial regression, regressing a binary indicator for participation in BPCI Advanced in a given clinical episode on the percent difference between preliminary target prices and historical payments relative to historical payments. The local polynomial regression was of degree zero, used an Epanechnikov kernel function, and used the rule-of-thumb bandwidth selection method suggested in Fan and Gijbels (1996).[2]

D. Qualitative Analysis

Interview notes from site visits, key informant interviews and exit interviews were organized and analyzed using ATLAS.ti (version 8.4.15.0; Scientific Software Development GmbH, Berlin, Germany), a qualitative data analysis software. Analysis was conducted across data types to understand the range of participant experiences in the BPCI Advanced Model.

We modified the codebook used for the BPCI evaluation to reflect the BPCI Advanced evaluation's new topics and research questions. For each code, the codebook provided a definition, an example of a response that belonged to that code, inclusion criteria, exclusion criteria, and code search expressions. All staff involved in qualitative analysis were familiar with BPCI Advanced and participated in data gathering as interviewers or note-takers. Staff involved in analysis all received training on the final codebook to promote a consistent approach and ensure a clear understanding of codes, and coding was reviewed to ensure inter-rater reliability.

Analytic staff used queries to review coded documents for themes related to entry decisions, partnership decisions and episode selection. Data were reviewed for commonalities and differences in responses by different conveners and EIs, and summarized to capture congruence or dissimilarity. We used characteristics such as past BPCI experience, participant or EI type, and use of a convener (or not) as document groups and ran queries on some groups of respondents to review differences in response by interviewee characteristics. Team members used regular meetings to share initial findings and synthesize results.

[2] Fan, Jianqing, and I Gijbels. *Local polynomial modelling and its applications: monographs on statistics and applied probability 66*. Routledge, 1996.

Appendix D: Additional Results

A. Participant Characteristics Results

Exhibit D.1: BPCI Advanced Convener Participant (Convener) Characteristics, by Type, March 1, 2019

Convener Type	N (%)	Average Downstream EIs Per Convener	Range of Downstream EIs	Average # of Distinct Clinical Episodes Selected
Acute Care Hospital	7 (9%)	4	1-6	4
Physician Group Practice	3 (4%)	17	2-38	6
Accountable Care Organization	8 (10%)	5	1-10	8
Healthcare System	21 (26%)	7	1-33	7
Health Plan	3 (4%)	23	1-64	12
Integrated Delivery Health System	9 (11%)	8	1-20	6
Management Services Organization	12 (15%)	3	1-9	3
Clinically Integrated Network	4 (5%)	3	1-8	2
Non-provider	15 (18%)	40	1-228	12
Total	**82 (100%)**	**12**	1-228	7

Note: BPCI Advanced conveners were categorized into one of the nine convener types based on information in their participant application. Integrated delivery health system: a network of health care facilities under a parent holding company. Management services organization: an organization that provides specific services, such as claims administration, project management, provider relations, or data analysis, to a health system. Non-provider: an entity that does not furnish Medicare services. EIs = episode initiators.

Source: The BPCI Advanced evaluation team's analysis of the CMS BPCI Advanced Database, March 1, 2019.

B. Hospital Characteristics Results

Exhibit D.2: Characteristics of BPCI Advanced Hospital EIs and Non-participating Hospitals, 2013 - 2016

Domain	Characteristic	BPCI Advanced Hospital EIs (N = 715)	BPCI Advanced Hospital EIs (%)	Non-participating Hospitals (N = 2,569)	Non-participating Hospitals (%)	Chi-Square	P-value
Census Region	Midwest	174	24%	576	22%	33.7	<0.01
	Northeast	140	20%	354	14%		
	South	259	36%	1,104	43%		
	West	142	20%	485	19%		
	Puerto Rico	0	0%	50	2%		
Urban/Rural	Urban	645	90%	1,849	72%	101.8	<0.01
	Rural	70	10%	720	28%		
Ownership	For Profit	183	26%	598	23%	92.6	<0.01
	Government	33	5%	502	20%		
	Non-profit	499	70%	1,469	57%		

Domain	Characteristic	BPCI Advanced Hospital EIs (N = 715)	BPCI Advanced Hospital EIs (%)	Non-participating Hospitals (N = 2,569)	Non-participating Hospitals (%)	Chi-Square	P-value
Academic Medical Center	Yes	45	6%	88	3%	11.8	<0.01
Part of Health System	Yes	685	96%	1,784	69%	208.3	<0.01
Safety Net Status	Yes	44	6%	160	6%	0.01	0.94
Participation in MSSP, Next Gen, or Pioneer ACO Initiatives	Yes	72	10%	151	6%	15.5	<0.01
Experience in BPCI	Yes	213	30%	225	9%	214.1	<0.01
IRF in Market	Yes	524	73%	1,403	55%	80.4	<0.01
Provides Outpatient Surgery	Yes	681	95%	2,345	91%	12.1	<0.01

Note: Appendix C contains the BPCI Advanced hospital eligibility criteria and definitions of each hospital characteristic. Values for categorical variables are for the most recent year between 2013 and 2016 that data was available. Market characteristics are calculated for the Core Based Statistical Area (CBSA) in which the hospital is located. ACO = Accountable Care Organization; EIs = episode initiators; IRF = Inpatient Rehabilitation Facility; MSSP = Medicare Shared Savings Program.

***Source*:** The BPCI Advanced evaluation team's analysis of the 2016 Agency for Healthcare Research and Quality (AHRQ) Hospital Linkage File, Area Health Resource File (AHRF) from 2013 to 2016, CMS Provider of Service (POS) files from 2013 to 2016, 2018 CMS Inpatient Prospective Payment System (IPPS) file, 2018 Master Data Management (MDM) provider file, CMS BPCI Database, and the CMS BPCI Advanced Database as of March 1, 2019.

Exhibit D.3: Characteristics of BPCI Advanced Hospital EIs and Non-participating Hospitals, 2013 - 2016

Characteristic	BPCI Advanced Hospital EIs (mean)	Non-participating Hospitals (mean)	T-statistic	P-value
Bed Count	338	213	-13.0	<0.01
Resident-to-bed Ratio	0.09	0.06	-5.3	<0.01
Medicare Days Percent	40%	49%	4.4	<0.01
Disproportionate Share Percent	29%	28%	-0.6	0.59
Total Discharges for BPCI Advanced Clinical Episode MS-DRGs	2,281	1,281	-16.7	<0.01
Total Procedures for BPCI Advanced Clinical Episode HCPCS	121	65	-10.4	<0.01
Unplanned Readmission Rate, 2017	15.4%	15.3%	-4.1	<0.01
Market Population	4,178,862	2,542,567	-8.6	<0.01
Per Capita Personal Income	$47,035	$44,803	-5.5	<0.01
SNF beds per 10,000	52	56	2.8	<0.01

Characteristic	BPCI Advanced Hospital EIs (mean)	Non-participating Hospitals (mean)	T-statistic	P-value
Medicare Advantage Penetration	31.8%	30.8%	-1.7	0.09
Hospital Market Share for BPCI Advanced MS-DRGs and HCPCS	21%	26%	3.9	<0.01
Herfindahl Index	0.22	0.35	9.4	<0.01

Note: Data from 715 BPCI Advanced hospital EIs and 2,569 non-participating hospitals. **Appendix C** contains the BPCI Advanced hospital eligibility criteria and variable definitions. **Appendix B** contains the MS-DRGs and HCPCS that trigger each BPCI Advanced clinical episode. Unless otherwise specified, values for numeric variables are averaged for all years between 2013 and 2016 that data was available. Market characteristics are calculated for the Core-Based Statistical Area (CBSA) in which the hospital is located. EIs = episode initiators; HCPCS = Healthcare Common Procedure Coding System; MS-DRGs = Medicare Severity-Diagnosis Related Groups; SNF = skilled nursing facility.

***Source*:** The BPCI Advanced evaluation team's analysis of the Area Health Resource File (AHRF) from 2013 to 2016, CMS Provider of Service (POS) files from 2013 to 2016, CMS Inpatient Prospective Payment System (IPPS) files from 2013 to 2018, 2017 Inpatient Quality Reporting (IQR) Measures, Part A Medicare claims from 2013 to 2016, and the CMS BPCI Advanced Database as of March 1, 2019.

Exhibit D.4: Characteristics of BPCI Advanced EIs and Hospitals that Retroactively Withdrew, 2013 - 2016

Domain	Characteristic	BPCI Advanced Hospital EIs (N = 715)	BPCI Advanced Hospital EIs (%)	Retroactive Withdrawals (N = 117)	Retroactive Withdrawals (%)	Chi-Square	P-value
Role	Downstream EI	593	83%	107	91%	7.1	0.03
	Participant	122	17%	10	8%		
Census Region	Midwest	173	24%	14	12%	73.0	<0.01
	Northeast	140	20%	15	13%		
	South	258	36%	54	46%		
	West	142	20%	24	21%		
	Puerto Rico	0	0%	10	9%		
Urban/Rural	Urban	645	90%	98	84%	4.4	0.04
	Rural	70	10%	19	16%		
Ownership	For Profit	183	26%	55	47%	23.4	<0.01
	Government	33	5%	6	5%		
	Non-profit	499	70%	56	48%		
Academic Medical Center	Yes	45	6%	2	2%	4.0	0.05
Part of Health System	Yes	685	96%	104	89%	9.8	<0.01
Safety Net Status	Yes	44	6%	3	3%	2.4	0.12

Domain	Characteristic	BPCI Advanced Hospital EIs (N = 715)	BPCI Advanced Hospital EIs (%)	Retroactive Withdrawals (N = 117)	Retroactive Withdrawals (%)	Chi-Square	P-value
Participation in MSSP, Next Gen, or Pioneer ACO Initiatives	Yes	72	10%	5	4%	4.0	0.04
Experience in BPCI	Yes	213	30%	21	18%	7.0	<0.01
IRF in Market	Yes	524	73%	66	56%	13.9	<0.01
Provides Outpatient Surgery	Yes	681	95%	111	95%	0.03	0.86

Note: Appendix C contains the BPCI Advanced hospital eligibility criteria and variable definitions. Values for categorical variables are for the most recent year between 2013 and 2016 that data was available. Market characteristics are calculated for the Core-Based Statistical Area (CBSA) in which the hospital is located. ACO = Accountable Care Organization. EIs = episode initiators; IRF = inpatient rehabilitation facility; MSSP = Medicare Shared Savings Program.

Source: The BPCI Advanced evaluation team's analysis of the 2016 Agency for Healthcare Research and Quality (AHRQ) Hospital Linkage File, Area Health Resource File (AHRF) from 2013 to 2016, CMS Provider of Service (POS) files from 2013 to 2016, 2018 CMS Inpatient Prospective Payment System (IPPS) file, 2018 Master Data Management (MDM) provider file, CMS BPCI Database, and the CMS BPCI Advanced Database as of March 1, 2019.

Exhibit D.5: Characteristics of BPCI Advanced EIs and Hospitals that Retroactively Withdrew, 2013 - 2016

Characteristic	BPCI Advanced Hospital EIs (mean)	Retroactive withdrawals (mean)	T-statistic	P-value
Bed Count	338	235	-4.2	<0.01
Resident-to-bed Ratio	0.09	0.03	-3.5	<0.01
Medicare Days Percent	40%	49%	4.5	<0.01
Disproportionate Share Percent	29%	26%	-1.6	0.11
Total Discharges for BPCI Advanced Clinical Episode MS-DRGs	2,281	1,576	-4.4	<0.01
Total Procedures for BPCI Advanced Clinical Episode HCPCS	121	90	-2.2	0.03
Unplanned Readmission Rate, 2017	15.4%	15.4%	-0.6	0.57
Market Population	4,178,862	2,164,035	-3.9	<0.01
Per Capita Personal Income	$47,035	$44,962	-4.2	<0.01
SNF beds per 10,000	52	54	0.6	0.57
Medicare Advantage Penetration	31.8%	34.0%	1.7	0.10
Hospital Market Share for BPCI Advanced MS-DRGs and HCPCS	21%	25%	1.6	0.11
Herfindahl Index	0.22	0.33	3.9	<0.01

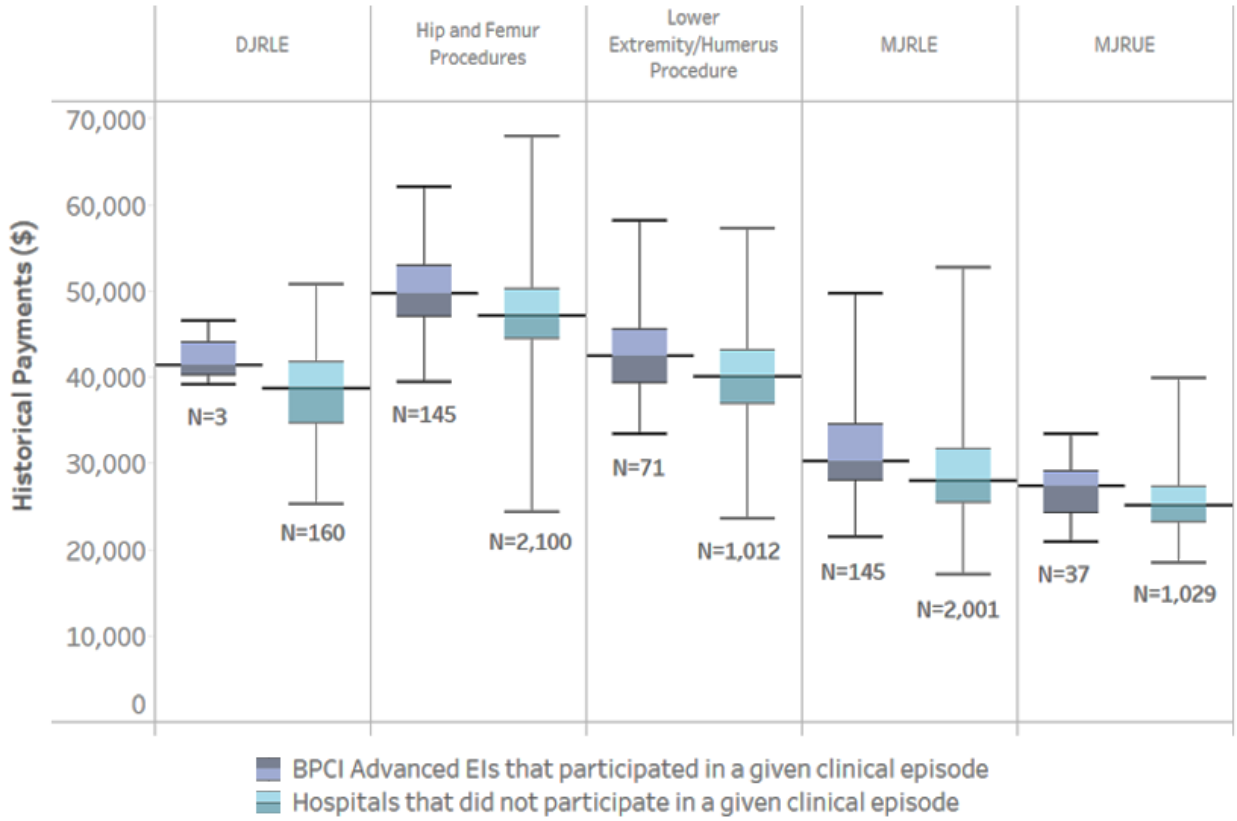
Note: Data from 715 BPCI Advanced hospital EIs and 117 hospitals that retroactively withdrew from BPCI Advanced. **Appendix C** contains the BPCI Advanced hospital eligibility criteria and variable definitions. **Appendix B** contains the MS-DRGs and HCPCS that trigger each BPCI Advanced clinical episode. Unless otherwise specified, values for numeric variables are averaged for all years

between 2013 and 2016 that data was available. Market characteristics are calculated for the Core-Based Statistical Area (CBSA) in which the hospital is located. EIs = episode initiators; HCPCS = Healthcare Common Procedure Coding System; MS-DRGs = Medicare Severity-Diagnosis Related Groups; SNF = skilled nursing facility.

***Source*:** The BPCI Advanced evaluation team's analysis of the Area Health Resource File (AHRF) from 2013 to 2016, CMS Provider of Service (POS) files from 2013 to 2016, CMS Inpatient Prospective Payment System (IPPS) files from 2013 to 2018, 2017 Inpatient Quality Reporting (IQR) Measures, Part A Medicare claims from 2013 to 2016, and the CMS BPCI Advanced Database as of March 1, 2019.

C. Baseline Payment Results

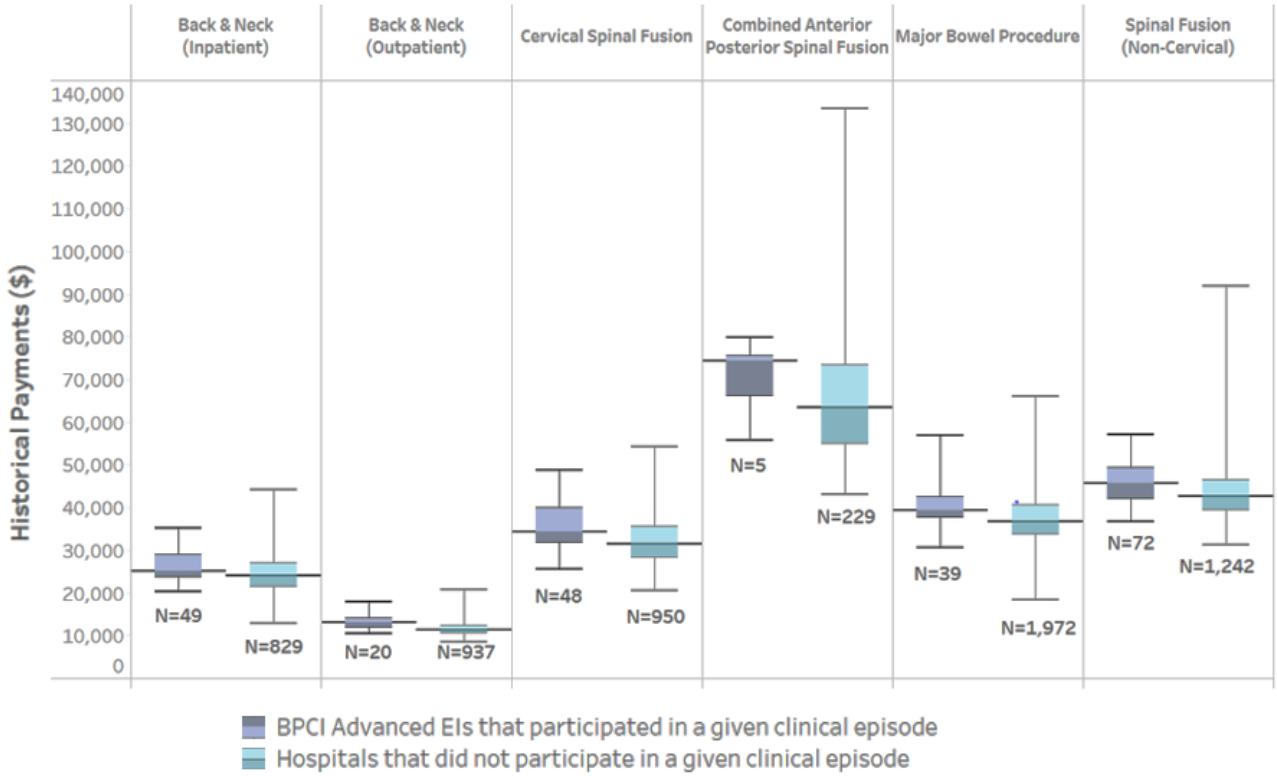
Exhibit D.6: Historical Payments (Median, Interquartile Range, Range), BPCI Advanced and Non-participating Hospitals, Orthopedic Surgery (Excluding Spine) Clinical Episodes, 2013 - 2016



Note: This exhibit includes all hospitals that were eligible to participate in the BPCI Advanced clinical episode (i.e., met hospital inclusion criteria and had more than 40 clinical episodes between 2013 through 2016). Non-participating hospitals includes hospitals that did not participate in BPCI Advanced in any clinical episode and BPCI Advanced hospital EIs that did not choose to participate in the given clinical episode. Hospitals participating in the Comprehensive Care for Joint Replacement (CJR) Model were excluded from statistics on major joint replacement of the lower extremity due to their inability to participate in that clinical episode. This box plot displays the historical payments, 2013-2016, by hospital separately for each clinical episode that is included in the surgical: orthopedic excluding spine clinical community. The box represents the interquartile range. The line in the middle of the box is the median historical payments. The top and bottom whiskers of each box plot are the maximum and minimum historical payments among the sample. Historical payments were based on standardized Medicare payments, updated to Model Year dollars, for the anchor stay or anchor procedure plus the 90-day post discharge period that occurred between 2013 and 2016. DJRLE = double joint replacement of the lower extremity; EIs = episode initiators; Hip & Femur Procedures = hip & femur procedures except major joint; Lower Extremity/Humerus Procedure = lower extremity/humerus procedure except hip, foot, femur; MJRLE = major joint replacement of the lower extremity; MJRUE = major joint replacement of the upper extremity.

***Source*:** The BPCI Advanced evaluation team's analysis of BPCI Advanced Hospital Target Pricing File, 2013-2016, and CMS BPCI Advanced Database, 2018-2019.

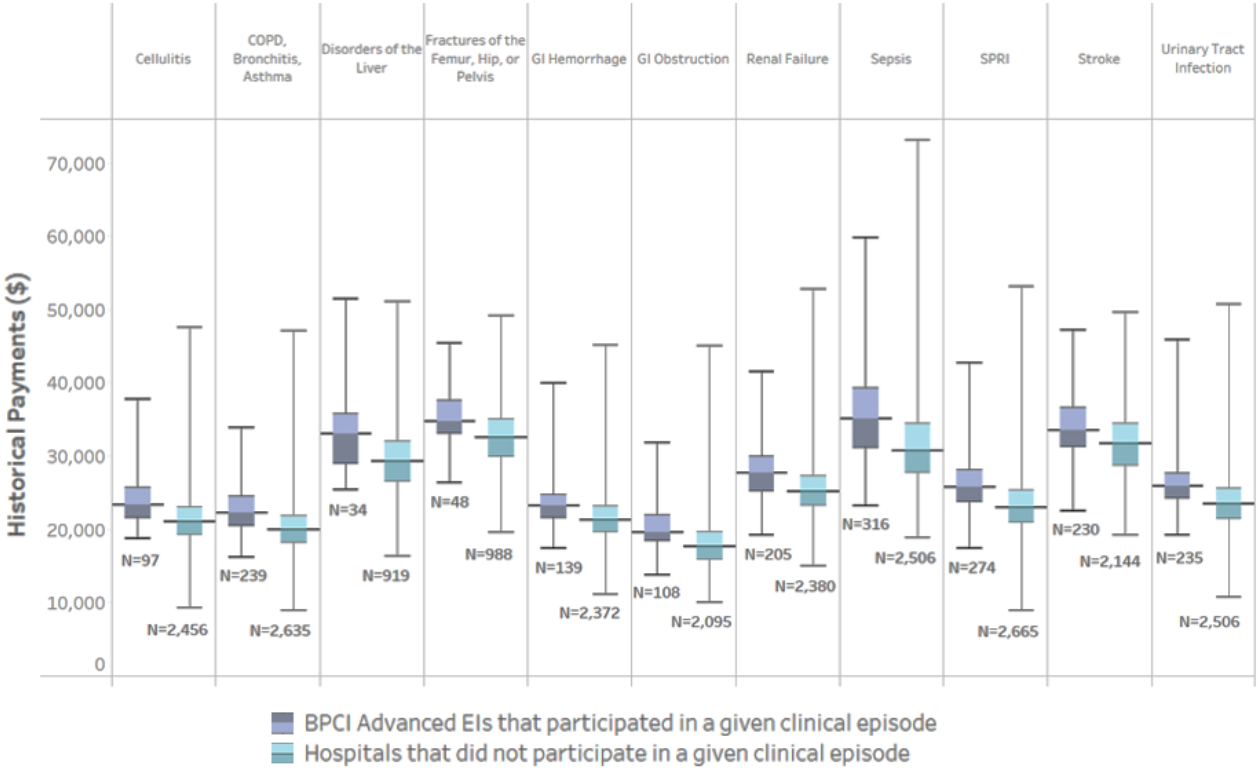
Exhibit D.7: Historical Payments (Median, Interquartile Range, Range), BPCI Advanced and Non-participating Hospitals, Other Surgical Clinical Episodes, 2013 - 2016



Note: This exhibit includes all hospitals that were eligible to participate in the BPCI Advanced clinical episode (i.e., met hospital inclusion criteria and had more than 40 clinical episodes between 2013 through 2016). Non-participating hospitals includes hospitals that did not participate in BPCI Advanced in any clinical episode and BPCI Advanced hospital EIs that did not choose to participate in the given clinical episode. This box plot displays the historical payments, 2013-2016, by hospital separately for each clinical episode that is included in the other surgical clinical community. The box represents the interquartile range. The line in the middle of the box is the median historical payments. The top and bottom whiskers of each box plot are the maximum and minimum historical payments among the sample. Historical payments were based on standardized Medicare payments, updated to Model Year dollars, for the anchor stay or anchor procedure plus the 90-day post discharge period that occurred between 2013 and 2016. Back & Neck = back & neck except spinal fusion; EIs = episode initiators.

***Source**:* The BPCI Advanced evaluation team's analysis of BPCI Advanced Hospital Target Pricing File, 2013-2016, and CMS BPCI Advanced Database, 2018-2019.

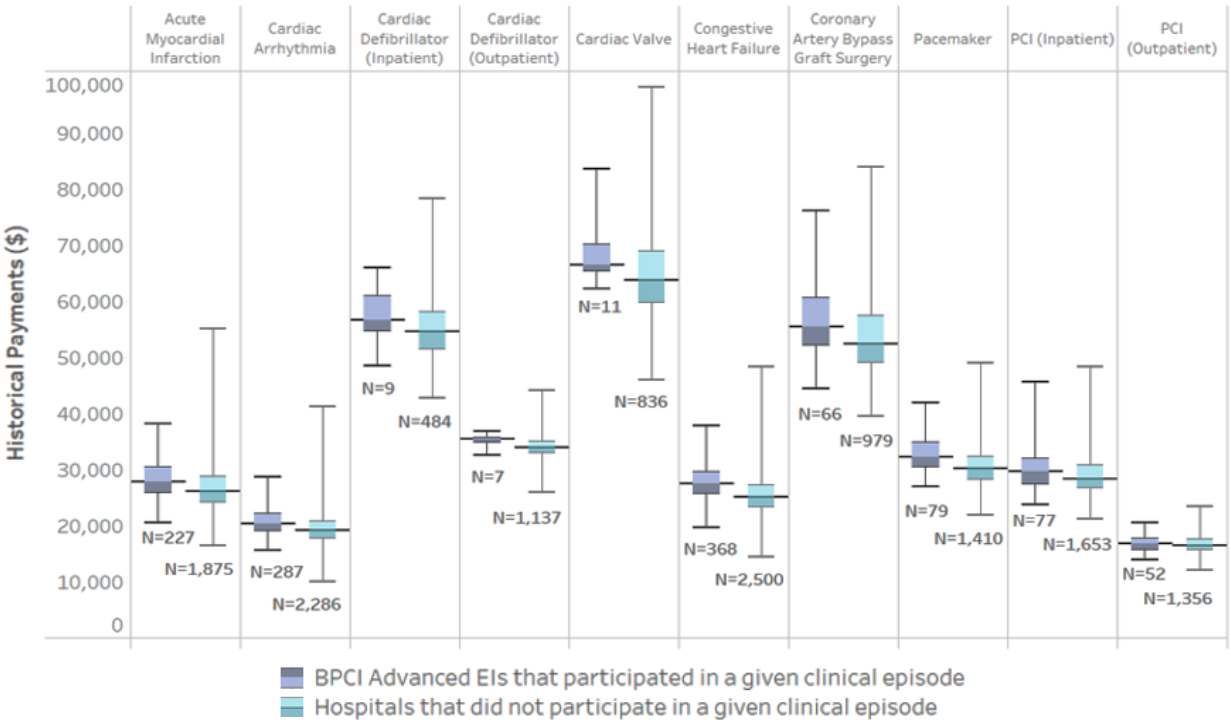
Exhibit D.8: Historical Payments (Median, Interquartile Range, Range), BPCI Advanced and Non-participating Hospitals, Non-surgical Other Clinical Episodes, 2013 - 2016



Note: This exhibit includes all hospitals that were eligible to participate in the BPCI Advanced clinical episode (i.e., met hospital inclusion criteria and had more than 40 clinical episodes between 2013 through 2016). Non-participating hospitals includes hospitals that did not participate in BPCI Advanced in any clinical episode and BPCI Advanced hospital EIs that did not choose to participate in the given clinical episode. This box plot displays the historical payments, 2013-2016, by hospital separately for each clinical episode that is included in the non-surgical other clinical community. The box represents the interquartile range. The line in the middle of the box is the median historical payments. The top and bottom whiskers of each box plot are the maximum and minimum historical payments among the sample. Historical payments were based on standardized Medicare payments, updated to Model Year dollars, for the anchor stay or anchor procedure plus the 90-day post discharge period that occurred between 2013 and 2016. COPD = chronic obstructive pulmonary disease; Disorders of the Liver = disorders of liver except malignancy, cirrhosis, or alcoholic hepatitis; EIs = episode initiators; GI = gastrointestinal; SPRI = simple pneumonia and respiratory infections.

***Source**:* The BPCI Advanced evaluation team's analysis of BPCI Advanced Hospital Target Pricing File, 2013-2016, and CMS BPCI Advanced Database, 2018-2019.

Exhibit D.9: Historical Payments (Median, Interquartile Range, Range), BPCI Advanced and Non-participating Hospitals, Cardiovascular Clinical Episodes, 2013 - 2016



Note: This exhibit includes all hospitals that were eligible to participate in the BPCI Advanced clinical episode (i.e., met hospital inclusion criteria and had more than 40 clinical episodes between 2013 through 2016). Non-participating hospitals includes hospitals that did not participate in BPCI Advanced in any clinical episode and BPCI Advanced hospital EIs that did not choose to participate in the given clinical episode. This box plot displays the historical payments, 2013-2016, by hospital separately for each clinical episode that is included in cardiovascular clinical community. The box represents the interquartile range. The line in the middle of the box is the median historical payments. The top and bottom whiskers of each box plot are the maximum and minimum historical payments among the sample. Historical payments were based on standardized Medicare payments, updated to Model Year dollars, for the anchor stay or anchor procedure plus the 90-day post discharge period that occurred between 2013 and 2016. EIs = episode initiators; PCI = percutaneous coronary intervention.

***Source**:* The BPCI Advanced evaluation team's analysis of BPCI Advanced Hospital Target Pricing File, 2013-2016, and CMS BPCI Advanced Database, 2018-2019.

D. BPCI Advanced Reach Results

Exhibit D.10: Proportion of Eligible Clinicians Participating in BPCI Advanced, by Clinical Episode, October 2018 - March 2019

Clinical Episode	Number of Clinicians Participating in BPCI Advanced	Number of Clinicians Eligible for BPCI Advanced	Percent of Eligible Clinicians Participating in BPCI Advanced
Acute Myocardial Infarction	6,314	38,507	16%
Back & Neck Except Spinal Fusion (Inpatient)	365	4,726	8%
Back & Neck Except Spinal Fusion (Outpatient)	310	4,748	7%
Cardiac Arrhythmia	8,167	45,263	18%
Cardiac Defibrillator (Inpatient)	149	7,117	2%
Cardiac Defibrillator (Outpatient)	47	4,415	1%
Cardiac Valve	212	8,808	2%
Cellulitis	2,884	32,489	9%
Cervical Spinal Fusion	534	5,811	9%
Chronic Obstructive Pulmonary Disease, Bronchitis, Asthma	7,651	48,446	16%
Combined Anterior Posterior Spinal Fusion	136	4,676	3%
Congestive Heart Failure	14,841	70,004	21%
Coronary Artery Bypass Graft Surgery	824	9,486	9%
Disorders of Liver Except Malignancy, Cirrhosis, or Alcoholic Hepatitis	663	14,594	5%
Double Joint Replacement of the Lower Extremity	80	1,319	6%
Fractures of the Femur and Hip or Pelvis	732	12,044	6%
Gastrointestinal Hemorrhage	5,136	50,010	10%
Gastrointestinal Obstruction	2,719	28,707	9%
Hip & Femur Procedures Except Major Joint	4,906	33,919	14%
Lower Extremity/Humerus Procedure Except Hip, Foot, Femur	1,353	14,513	9%
Major Bowel Procedure	777	21,352	4%
Major Joint Replacement of the Lower Extremity	5,434	30,326	18%
Major Joint Replacement of the Upper Extremity	902	6,796	13%
Pacemaker	1,645	19,501	8%
Percutaneous Coronary Intervention (Inpatient)	2,719	34,100	8%
Percutaneous Coronary Intervention (Outpatient)	884	13,261	7%
Renal Failure	6,616	48,257	14%
Sepsis	18,782	94,263	20%
Simple Pneumonia and Respiratory Infections	10,237	61,955	17%
Spinal Fusion (Non-Cervical)	875	6,461	14%
Stroke	8,010	47,560	17%
Urinary Tract Infection	6,594	42,057	16%

Note: Eligible clinicians include attending and operating NPIs who treated Medicare beneficiaries who met the BPCI Advanced beneficiary inclusion criteria at a BPCI Advanced eligible hospital. Minimum hospital volume in baseline period was not applied.

We defined clinicians who participated in BPCI Advanced as 1) any attending or operating NPI at a BPCI Advanced hospital EI for a clinical episode in which the hospital was participating; or 2) any attending or operating NPI on the hospital claim when the beneficiary had a corresponding Part B claim during the anchor stay or anchor procedure where the BPCI Advanced PGP TIN was the billing provider and the PGP was participating in the given clinical episode. EI = episode initiator; NPI = National Provider Identifier; PGP = physician group practice; TIN = Taxpayer Identification Number.

Source: The BPCI Advanced evaluation team's analysis of Medicare Part A and B claims, October 2018 through March 2019 and CMS BPCI Advanced Database, March 2019.

Exhibit D.11: Proportion of Discharges at BPCI Advanced Eligible Hospitals Attributed to BPCI Advanced Hospital and PGP EIs, by Clinical Episode, October 2018 - March 2019

Episode	Number of Discharges and Procedures at BPCI Advanced eligible hospital	Hospital EIs		PGP EIs	
		Number of BPCI Advanced Hospital EI Attributed Discharges and Procedures	Percent of Eligible Discharges and Procedures Attributed to BPCI Advanced Hospital EIs	Number of BPCI Advanced PGP EI Attributed Discharges and Procedures	Percent of Eligible Discharges and Procedures Attributed to BPCI Advanced PGP EIs
Acute Myocardial Infarction	53,625	6,117	11%	3,015	6%
Back & Neck Except Spinal Fusion (Inpatient)	6,702	320	5%	231	3%
Back And & Neck Except Spinal Fusion (Outpatient)	22,961	305	1%	1,222	5%
Cardiac Arrhythmia	78,503	9,643	12%	4,576	6%
Cardiac Defibrillator (Inpatient)	5,885	90	2%	47	1%
Cardiac Defibrillator (Outpatient)	19,676	136	1%	9	0%
Cardiac Valve	30,281	592	2%	116	0%
Cellulitis	44,024	2,041	5%	1,973	4%
Cervical Spinal Fusion	12,215	465	4%	830	7%
Chronic Obstructive Pulmonary Disease, Bronchitis/Asthma	114,432	12,316	11%	5244	5%
Combined Anterior Posterior Spinal Fusion	18,154	117	1%	636	4%
Congestive Heart Failure	179,064	28,102	16%	10,877	6%
Coronary Artery Bypass Graft Surgery	20,849	1,272	6%	405	2%
Disorders Of Liver Except Malignancy, Cirrhosis or Alcoholic Hepatitis	13,129	213	2%	454	3%
Double Joint Replacement of the Lower Extremity	2,523	13	1%	220	9%
Fractures Femur and Hip or Pelvis	13,382	526	4%	306	2%
Gastrointestinal Hemorrhage	74,715	4,596	6%	3,712	5%
Gastrointestinal Obstruction	36,413	1,829	5%	1,712	5%
Hip And Femur Procedures Except Major Joint	51,718	3,596	7%	7,317	14%

Episode	Number of Discharges and Procedures at BPCI Advanced eligible hospital	Hospital EIs		PGP EIs	
		Number of BPCI Advanced Hospital EI Attributed Discharges and Procedures	Percent of Eligible Discharges and Procedures Attributed to BPCI Advanced Hospital EIs	Number of BPCI Advanced PGP EI Attributed Discharges and Procedures	Percent of Eligible Discharges and Procedures Attributed to BPCI Advanced PGP EIs
Lower Extremity/Humerus Procedure Except Hip, Foot, Femur	14,953	762	5%	1,167	8%
Major Bowel Procedure	41,655	863	2%	464	1%
Major Joint Replacement of the Lower Extremity	176,435	7,362	4%	46,050	26%
Major Joint Replacement of the Upper Extremity	28,259	618	2%	4,879	17%
Pacemaker	22,243	1,031	5%	871	4%
Percutaneous Coronary Intervention (Inpatient)	66,592	3,192	5%	2,320	3%
Percutaneous Coronary Intervention (Outpatient)	56,759	2,802	5%	1,221	2%
Renal Failure	87,503	8,214	9%	4,919	6%
Sepsis	268,586	38,678	14%	16,947	6%
Simple Pneumonia and Respiratory Infections	158,814	17,288	11%	8,409	5%
Spinal Fusion (Non-Cervical)	21,197	1,027	5%	2,447	12%
Stroke	82,899	9,864	12%	4,474	5%
Urinary Tract Infection	82,161	8,365	10%	4,405	5%

Note: Eligible discharges and procedures include Medicare beneficiaries who met the BPCI Advanced beneficiary inclusion criteria at a BPCI Advanced eligible hospital. Minimum hospital volume in baseline period was not applied. Discharges and procedures attributed to BPCI Advanced hospital EIs were at a BPCI Advanced hospital participating in the clinical episode. Discharges or procedures attributed to BPCI Advanced PGP EIs required the beneficiary had a corresponding Part B claim during the anchor stay or anchor procedure where the BPCI Advanced PGP TIN was the billing provider and the PGP was participating in the given clinical episode. The PGP discharges and procedures include those at BPCI Advanced hospitals. When accounting for the overlap of PGP discharges at BPCI Advanced hospitals, BPCI Advanced represents 16% of eligible discharges. EI = episode initiator; NPI = National Provider Identifier; PGP = physician group practice; TIN = Taxpayer Identification Number.

Source: The BPCI Advanced evaluation team's analysis of Medicare Part A and B claims, October 2018 through March 2019 and CMS BPCI Advanced Database, March 2019.