2015

The New Era of Health Care: Catholic Health Initiatives Journey with Bundled Payment for Care Improvement in Total Joint Replacements

Tamara Cull
Medical University of South Carolina

THE NEW ERA OF HEALTH CARE: CATHOLIC HEALTH INITIATIVES JOURNEY WITH BUNDLED PAYMENT FOR CARE IMPROVEMENT IN TOTAL JOINT REPLACEMENTS

BY

Tamara Cull

A doctoral project submitted to the faculty of the Medical University of South Carolina in partial fulfillment of the requirements for the degree of Doctor of Health Administration in the College of Health Professions

THE NEW ERA OF HEALTH CARE: CATHOLIC HEALTH INITIATIVES JOURNEY WITH BUNDLED PAYMENT FOR CARE IMPROVEMENT IN TOTAL JOINT REPLACEMENTS

BY

Tamara Cull

Approved by:

Chair, Project Committee	Abby Kazley/PhD	Date
Member, Project Committee	Karen A. Wager/DBA	Date
Member, Project Committee	Christopher Stanley/MD	Date
Dean, College of Health Professions	Lisa K. Saladin/PT, PhD	Date

ACKNOWLEDGEMENTS

I would like to express my sincere appreciation to Dr. Abby Kazley, Chair of the Doctoral Project Committee. Throughout this process Dr. Kazley has been my mentor and has provided support, encouragement, and guidance every step of the way. I will always owe her a debt of gratitude for all of her support on this journey.

I would also like to thank the members of my committee, Dr. Karen Wager and Dr. Chris Stanley. Dr. Wager played an important part in how this project came to completion and I am sincerely grateful. Dr. Stanley provided support, encouragement and guidance that led this project to a successful completion. As my current leader at Catholic Health Iniatives, Dr. Stanley also has played an instrumental part in my development as a healthcare scholar and administrator and I owe immense gratitude to him for helping me bring this dream to reality. I will be forever grateful. My personal thanks to Navigant (Karumah/Paridha) and TAVHealth (Melinda/Lori) for their support in this project.

To all the Catholic Health Iniatives (CHI) team that I am blessed to work with each day and all of the CHI leaders that guide our path, I thank you for supporting this project and allowing the CHI BPCI journey to be one others can learn from. I am honored to be a part of an organization that always puts serving others at the center of our work.

A journey this difficult is not accomplished alone and I was blessed to have the support and encouragement of many along my path. To the friend who encouraged and supported my journey from day one and cheered me on every step of the way-- "Thank You" alone is not enough Mel. To my extended family who excused my absences from family events when school had to be the priority I thank all of you for your support and

encouragement along the way. I will now have to take the best brother I know up on all the cookouts I missed out on.

To my Mom, Virginia, who has taught me so many valuable life lessons. She demonstrated to me early on that women can do anything men can do and showed me first hand that hard work pays off. Her undying belief that I can do anything and her support all the days of my life are debts that I will never be able to repay. All my love and thanks to the most wonderful mother a girl could ever wish for is just not enough. To my late father, Grandon, who battled ALS with a courage I have never seen, I know that some of that strength was how I completed this journey and I know you are cheering for me from Heaven on this day along with the angel down here (Larry) you sent to take care of Mom and all of us.

To my son, Alex, who has been the very best thing I have ever accomplished in my life, I hope that my journey has shown you that you can achieve anything in this world that you want to accomplish. My hope is that your life takes you on a journey that leads you to all the happiness that you deserve. For all the hours I had to spend on school instead of with you, I hope that you know that every step I took on this journey would not have been possible without your love and support. Great things are in store for you and I look forward to seeing all your dreams come true.

To my husband, Steve, who willing took over any duty that I was unable to complete to support my time for my studies-- I am forever grateful. There is no doubt in my mind that without all of your love, support and encouragement I would not have been able to complete this task. I hope to spend the rest of my life and all my love making it up to you.

TABLE OF CONTENTS

	Page
Acknowledgements…….	i
Table of Contents……	iii
List of Figures…….	iv
List of Tables……..	vi
Abstract……	ix
1. INTRODUCTION……	1
Background and Need	
Problem Statement	
Research Hypotheses	
Sample	
Definition of Terms	
II. REVIEW OF THE LITERATURE…….	10
III. METHODOLOGY……	25
Study Design	
Sample	
Data Collection	
Data Analysis	
Limitations	
ARTICLE MANUSCRIPT…….	38
REFERENCES……	60
APPENDICES……	73

LIST OF FIGURES

1) BPCI-Model 2: Roles

2) Total Costs Per Episode: DRG 469/470

3) Framework for Post-Acute Interventions by Care Management Navigators

4) Total Readmission Rates Per Episode: DRG 469/470

5) Navigator Call Script Examples

6) Volume of Patient Engagement Calls: Incoming/Outgoing

7) Continuing Care Network: Expectations of SNF Partners

LIST OF TABLES

1) BPCI: Summary of Program Models

2) BPCI: Clinical Episodes

3) Summary of BPCI Model 2: Key Components

4) BPCI: Phase Summary (Models 2-4)

5) Comparison of Payment Reform Models

6) BPCI Phase 2: Regression Analysis: Total Costs Per Episode

7) BPCI Phase 2: Regression Analysis: Total Readmissions Per Episode

Abstract of Doctoral Project Report Presented to the Executive Doctoral Program in
Health Administration & Leadership
Medical University of South Carolina
In Partial Fulfillment of the Requirements for the
Degree of Doctor of Health Administration

THE NEW ERA OF HEALTH CARE: CATHOLIC HEALTH INITIATIVES JOURNEY WITH BUNDLED PAYMENT FOR CARE IMPROVEMENT IN TOTAL JOINT REPLACEMENTS

By
Tamara Cull

Chairperson: Abby Kazley, PhD
Committee: Karen A. Wager, DBA
Christopher Stanley, MD

Abstract

This study examined the relationships between total costs of care and total readmission rates for Medicare patients undergoing major joint replacement of the lower extremity (knee/hip arthroplasty) at one of four Catholic Health Initiatives (CHI) facilities participating in both Phase 1 and Phase 2 of the BPCI program by using complete Medicare claims data for beneficiaries. Both univariate and multivariate models were utilized to examine the impact of the BPCI initiative on costs and readmissions. Findings from this study suggest a relationship between Phase 2 BPCI participation and decreased costs. Hospitals participating in the Phase 2 BPCI program had total episode costs that were $3,333 per episode lower than hospitals participating in the Phase 1 BPCI program. There was no statistically significant evidence of decreased readmissions for Phase 2 BPCI participants.

CHAPTER 1

INTRODUCTION

As health care shifts into a new era of reform, providers and payers are testing innovative payment models in an effort to keep healthcare costs down while improving quality. The Affordable Care Act issued the Center for Medicare and Medicaid Services (CMS) a directive to form an innovation center to explore new payment models that would begin shifting from a pay-for-service model to a pay-for-value model (Center for Medicare and Medicaid Services [CMS], 2010). Developing the capacity to provide value-based health care has become the goal of healthcare providers.

The Patient Protection and Affordable Care Act "marks the U.S. government's commitment to the widespread adoption of patient-centered approaches, coordinated models of care, and rational reimbursement" (Dinan, Simmons, & Snyderman, 2010, p. 1665). The Institute for Healthcare Improvement established the triple aim framework for all value programs in order to: (a) improve an individual's experience of care, (b) improve the health of the population, and (c) reduce the costs of care (Vetter, Boudreaux, Jones, Hunter, & Pittet, 2014). Value in this new-era healthcare market will achieve higher quality outcomes with improved efficiency and providers will be expected to provide care across the entire care continuum (King, 2013).

Background & Need

Traditional healthcare delivery systems are not capable of meeting the needs of the patient population or providing the necessary resources to address the rapid growth of chronic diseases in the United States (Ferrario, Moore, & Copeland, 2009). Because the resources currently being utilized are unable to be sustained, the CMS began exploring value-based payment models as an alternative to how health care is delivered in the United States. An Institute of Medicine report highlighted the need for change, estimating that "30 to 40 cents of every health care dollar is spent on inappropriate, duplicative, or ineffective care, costing the nation between $600 and $700 billion annually" (as cited in Shomaker, 2010, p. 756). Surgical care alone "currently accounts for an estimated 52% of hospital admission expenses in the United States" (Vetter, Boudreaux, Jones, Hunter & Pittet, 2014, p. 1131). The Affordable Care Act includes provisions to improve the quality of care; develop new models of care delivery (i.e., care redesign); ensure appropriately priced services; modernize the U.S. health system; and fight against waste, fraud, and abuse (Center for Medicare and Medicaid Services [CMS], 2010).

Borah et al. (2012) described the shift to value-based care as a bold transformation by Medicare to become actively involved in quality of outcomes for Medicare beneficiaries. The current Medicare fee-for-service model supports volume rather than quality, which can lead to misaligned incentives for providers and payers to collaborate and coordinate better care for beneficiaries (Delisle, 2013). In order to make the shift to a value-based care model that rewards physicians and health systems for quality outcomes (Froimson, Deadwiler, Schill, & Cousineau, 2013), care redesign is required. The current

healthcare system leaves the care of Medicare beneficiaries uncoordinated and increases healthcare costs to an unsustainable level (Hackbarth, Reischauer, & Mutti, 2008).

Center for Medicare and Medicaid Services: BPCI Program

One of the value-based care models developed through the Centers for Medicare and Medicaid Innovation Center (CMMI) is the Bundled Payments for Care Improvement (BPCI) initiative. The BPCI model is a new innovative episode-based payment approach that focuses on improving patient experience and quality while decreasing costs (See Table 1). The primary goal of the BPCI program is to redesign the care delivery model by increasing care coordination among providers. The bundled payment model is designed to incentivize providers to "deliver the right mix of services at the right time" while shifting risk from the payer to the provider (Averill, Goldfield, Hughes, Eisenhandler, & Vertrees, 2009, p. 241).

Upon official CMS launch of the program January 2013, there were more than 500 hospitals, health systems and other providers enrolled with 191 of those enrolled in Model 2 (Herman, 2013). The first participants started the Phase 2 (at financial risk) program October 1, 2013. Participant entry into Phase 2 of the program is optional allowing participants to stay in Phase 1 of the program indefinitely. Participants entering Phase 2 of the program agree to a three year commitment to the program, but CMS does offer provisions to opt out of the Phase 2 program if requested. CMS offered participants 48 clinical episodes to choose from for program participation (See Table 2). Providers have the option to provide care for a 30, 60, or 90 day episode of care. The episodes of care are linked to Diagnosis Related Groups (DRG's) and the BPCI episode of care is triggered when a Medicare beneficiary with one of those DRG's enters an acute hospital. The most

common clinical episodes selected were: major joint replacement (78%), congestive heart failure (58%), coronary artery bypass graft (51%), chronic obstructive pulmonary disease—bronchitis/asthma (49%) and percutaneous coronary intervention (48%) (Herman, 2013).

Traditionally, Medicare makes separate payments to each provider for each service provided to a beneficiary during a single illness (episode) of care. This approach can result in fragmented care in which providers are rewarded for the quantity of care provided, not the quality of care provided. Episode-based payment bundles all Medicare payments for services related to a clinical condition for a determined amount of time. The goal of the model is to decrease the fragmented care delivery system by aligning all payment incentives among the providers of care for a Medicare beneficiary.

CMS has publically voiced the expectation that the BPCI model will lead to required bundled payment models in the future, but no mandatory BPCI program announcements have been released at this time. This program is based on the belief that providers look beyond a single setting of care to an entire episode of care to improve clinical outcomes (Tian, DeJong, Munin, & Smout, 2010). The program moves the focus from accountability only for a procedure or hospitalization to a model that holds providers accountable for improving the total episode of care (Pappas, 2013). In addition to the economic challenges of the current fee-for-service model, there is a perception, supported with data, that healthcare services are over utilized and that patient safety is compromised in the current fee for service model (McIntyre, 2013).

The BPCI program is comprised of four models of care which all link payments for multiple services beneficiaries receive during an episode of care. Model 1 focuses on acute

care hospitalization. Models 2 and 3 involve a retrospective bundled payment arrangement in which actual expenses are reconciled against a target price for an episode of care. In model 2, the episode of care includes the inpatient hospital stay and all other related services during the episode of care (See Table 3). This episode ends at 30, 60, or 90 days after hospital discharge. Model 4 is a prospective bundled payment, where a lump sum payment is made to provide for an entire episode of care. During BPCI models 1, 2, and 3 all healthcare providers continue to be paid on a fee-for-service model (See Table 4). The BPCI reconciliation is done on a retrospective basis after all the care has been delivered and paid for. CMS and the participant facility enter into the bundled payment agreement and only the facility is at downside financial risk in this payment model. No other healthcare providers are at any financial risk.

The BPCI program is divided into two phases. Phase 1 of the program is an information gathering (no financial risk) phase in which facilities are given CMS claims data on DRG episodes to determine if the facility would like to enter into the Phase 2 (at financial risk) BPCI program. In Phase 2, the facility and CMS enter into a three-year bundled payment agreement which includes downside risk to the facility. If the facility can financially manage the episode of care under the target cost set by CMS the facility will receive a savings check from CMS. If the facility goes over the target price per episode then the facility has to reimburse CMS for the dollars that were over the target.

There are different ways to participate in BPCI. Individual participants may enter into an agreement with CMS directly or a convening organization that coordinates multiple health care providers' participation in BPCI can enter into the agreement with CMS.

Awardee conveners bear all the financial risk for the model for all the participants that they convene for.

Catholic Health Initiatives (CHI): The New Era of Health Care

The focus of this research study is on the CHI journey in the CMS BPCI program. The current CHI area of expertise in this program is in the area of major joint replacement of the lower extremity. To understand the motivation for CHI's participation in value-based programs you must first understand the organization's history. Catholic Health Initiatives was founded in 1996 by 12 women religious congregations coming together to create one non-profit faith based organization dedicated to caring for those in need with one mission statement. The current CHI mission statement continues to honor the original founders: "The mission of Catholic Health Initiatives is to nurture the healing ministry of the Church, supported by education and research. Fidelity to the Gospel urges us to emphasize human dignity and social justice as we create healthier communities" (CHI, 2014, p. 2). As one of the nation's largest faith-based health systems, CHI serves more than four million people each year with 105 hospitals in 19 states. About 46 million people—or nearly 15 percent of the U.S. population—live within a 60-mile radius of a CHI hospital.

CHI has made a commitment to providing value based care reflecting this commitment in their strategic plan (CHI, 2014, p.1) making this statement:

> *"A revolution in health care is upon us. For the first time ever, market forces are coming together to shape an environment that rewards health care providers and organizations for going beyond delivering services-to improving health. This is the very vision on which Catholic Health Initiatives was founded. The changing face of*

> *health care marks an unprecedented opportunity for us to bring our mission to life with new relevance and renewed determination. It calls us to strengthen ourselves as a system, reinvent the way we do things, introduce innovative programs and relentlessly focus on those we are blessed to serve. By boldly transforming for the future—what we call The Next Era of Healthy Communities—CHI honor the pioneering spirit of those who founded us. Today, the people of CHI hold dear the legacy entrusted to us. And, like our founders, we are called to transform the times"*

Catholic Health Initiatives entered into the Phase 2 BPCI project as an awardee Convener on October 1, 2013. CHI was the convener for St. Vincent Medical Center in Little Rock, AR which was one of thirteen hospitals across the nation to go at risk during this first phase out of 450 hospitals/post-acute providers across 44 states that applied to CMS to participate in the program (CMS, 2013). St. Vincent Medical Center entered into the BPCI program to manage MS-DRGs 469/470, major joint replacement of the lower extremity (hip/knee arthroplasty). On January 1, 2014 CHI acted as the convener for three additional facilities to enter the program to manage MS-DRGs 469/470: Alegent Mercy Medical Center in Council Bluffs, IA, Good Samaritan Medical Center in Kearney, NE, and St. Elizabeth Medical Center in Lincoln, NE.

Problem Statement

Despite the large volume of pay-for value programs, such as BPCI, now active in the United States, research reveals that there is "limited evidence to support the effectiveness of this approach" (Ryan and Doran, 2012, p. 195).

Research Question

What is the impact of bundled payments on cost and quality?

Research Hypothesis 1:

Participation in the Phase 2 BPCI program improves care coordination which leads to decreased costs per episode of care.

Research Hypothesis 2:

Participation in the Phase 2 BPCI program improves quality which leads to decreased readmission rates per episode of care.

Sample

This study was based on complete Medicare claims data for Medicare beneficiaries in the clinical episode of care DRGs 469/470: major joint replacement of the lower extremity (i.e., hip/knee arthroplasty) who (a) received surgery at one of the four CHI facilities (i.e., St. Vincent, Alegent Mercy, Good Samaritan, or St. Elizabeth) and (b) the facility participated in both the Phase 1 and Phase 2 BPCI programs. The CHI BPCI facility geographic representation includes the states of Arkansas, Iowa, and Nebraska. The assumption was that the hospitals selected were similar in economic, political, and other market competitive forces.

Definitions

Key definitions in this research study are:

1) BPCI: Bundled Payment Care Improvement
2) CMS: Centers for Medicare and Medicaid Services

3) CMMI: Center for Medicare and Medicaid Innovation
4) MS-DRG: Medicare Severity Diagnostic Related Group is a system to classify hospital cases into one groups for reimbursement.
5) Total Hip/Knee Arthroplasty: Joint replacement of the hip or knee

CHAPTER 2

REVIEW OF THE LITERATURE

History and Overview of Bundled Payments

Bundled payments date back to 1984 when the Texas heart Institute developed a bundled payment pricing model for cardiovascular services which was proven effective in decreasing costs for coronary artery bypass surgery (Froimson et. al, 2013). Other organizations followed, and Geisinger Health introduced their Proven Care model in 2006 which also focused on coronary artery bypass surgery. The Geisinger Proven Care model results were excellent: "100% compliance with care protocols, a 44% decrease in readmissions, and a 16% reduction in length of stay" (Shomaker, 2010, p. 757).

In 2006 the PROMETHEUS (Provider payment Reform for Outcomes, Margins, Evidence, Transparency, Hassle-reduction, Excellence, Understandability, and Sustainability) bundled payment project was developed by PROMETHEUS Payment Inc. tying evidenced based payment rates to various conditions (Froimson et. al, 2013). As of 2010, there were more than 150 pay-for performance programs, but unfortunately "many have shown inconsistent results in controlling health care costs" (Fromison et. al, 2013).

After seeing the success of the Geisinger project, the commercial payers wanted to engage in bundled payment models. United Health entered into an Oncology bundled payment model in 2011 hoping they could demonstrate the success in Oncology that others had achieved in the Cardiac area (Butcher, 2011).

One concern voiced in moving commercial bundled models forward to the CMS was that the private payers used larger financial incentives for providers than the CMS would likely be able to maintain in the current financial state of affairs for Medicare (Rosenthal, Landon, Normand, Frank, & Epstein, 2006). It was learned early on that hospitals which are consistently expensive may face extensive financial risk in a bundled payment program, but hospitals that are low cost could do very well in this type of model; therefore finding the best performing hospitals to enter into a bundled payment model was identified as a key success factor for all payers (Miller et. al, 2011).

Center for Medicare and Medicaid Services: History and Overview of Participation in Bundled Payments

The CMS first attempted work in the bundled payment model in 1991 when they experimented with episode-based payments for coronary bypass surgery bundling Medicare Part A and Part B services for admissions, plus any readmissions within 72 hours. During the first 27 months of this demonstration project, the CMS saved more than $17 million on coronary bypass surgery in four of the participating hospitals (Cromwell, Dayhoff, & Thoumaian, 1997). Despite the CMS demonstrating a reduction in spending and improved quality for the seven hospitals that participated, the demonstration faced intense hospital–industry opposition and was subsequently discontinued (Mechanic, 2011).

In an open letter to Congress in 2003, Don Berwick and other leaders challenged Congress to make payment for performance a national priority, beginning with Medicare payments (Berwick, 2003). The letter appealed to bipartisan leaders to (a) follow in the footsteps of leaders two decades prior who had adopted prospective payments and (b) do something to improve the health care of Americans. It was evident that commercial payers

and private healthcare organizations' work in bundled payment models did not bring enough value to make significant change. The CMS needed to develop bundled payments in order for any significant progress to be made (Ginsburg, 2013), as they were the only payer with sufficient market presence to drive meaningful reform (Mechanic and Altman, 2009).

In 2008, the Medicare Payment Advisory Commission (MedPAC) recommended that Congress move into a broader implementation of bundled payments around hospital episodes with a focus on surgical admissions (as cited in Birkmeyer et al., 2010). In 2009, the CMS again attempted to employ the bundled payment model with the introduction of the Medicare Acute Care Episode (ACE) demonstration project. This project included bundling payments for hospital and physician services provided for certain orthopedic procedures such as total hip and knee arthroplasty and cardiovascular procedures (Hussey, Sorbero, Mehrotra, Liu, & Damberg, 2009). The ACE project was voluntary and participation was poor, with only five hospital systems participating (Mechanic, 2011).

Effectiveness of Value-Based Payment Models

By 2006, 140 public and private payers operated 258 pay-for-performance programs; however, few programs have undergone a formal evaluation of effectiveness (Mechanic and Altman, 2009). Knowledge gained from early pay-for-performance work indicated it would be best to develop episode-payment models that included substantial physician input. Bertko (2010) showed that pay-for-performance models in California, which have been running the longest, have had little effect on decreasing costs and improving quality. Bertko (2010) reported that the small performance bonuses offered by the program do not motivate the physicians to make the significant changes needed to

improve quality and decrease costs. Shih, Nicholas, Thumma, Birkmeyer, and Dimick (2014) stated that other value-based programs, such as the Premier Hospital Quality Incentive Demonstration (HQID), provided no improvement in surgical outcomes. Currently it remains untested as to whether episode-based payment models will foster the system changes that will lead to a coordinated, integrated care delivery system (Hussey, Sorbero, Mehrotra, Liu, & Damberg, 2009).

There are many payment reform models in place for providers to engage in to decrease costs, and improve quality and patient experience. Those models include: accountable care organizations (shared savings), patient centered medical homes (PCMH), bundled payments, partial capitation, and full capitation (Lowell and Bertko, 2010) (See Table 5). Episode-based payment models are considered easier to succeed in as a single physician is often involved in the entire episode of care vs. a global payment model such as Medicare Shared Savings where there are many physicians caring for a patient during the accountable payment phase (Cutler and Ghosh, 2012). The involvement of many providers in the care of a single Medicare beneficiary impedes the ability for any one provider to influence the overall quality and care for a given patient (Pham et. al, 2007). Davis (2007) reports that an average Medicare beneficiary sees two primary care physicians and five specialists in the course of one year further highlighting the need for a care model that has one team accountable for the care of a patient for a defined episode of care.

Despite Medicare beneficiaries seeking care from multiple providers, it has been found that they do receive most of their care from a local delivery system of a set group of physicians and hospitals leading to the belief that the formation of integrated health care

delivery systems will improve the care for Medicare beneficiaries (Fisher, Staiger, Bynum, & Gottlieb, 2006). Physicians are often on staff at more than one hospitals, but provide the majority of their care at one single hospital (Weenberg, Fisher, Skinner, and Bronner, 2007).

Value-Based Program Success Factors

In the review of the literature, the following components were consistently included in the description of effective value-based programs: value-based leadership skills, care redesign/coordinating care across the continuum, decreasing internal costs, readmission reduction, post-acute relationship development, patient engagement, and care management.

Value-Based Program Leadership

Vetter et. al (2014) report the need for strategic, operational, and financial alignment of payers, hospitals, and physicians and other providers across the care continuum to succeed in value-based programs. Successful leaders in this work report key elements of success are a strong vision of patient-centered change as genuinely transformational, being comfortable with the uncertainty that innovation brings, and a carefully designed organization structure that sends a consistent message (Millenson, DiGioia, Greenhouse, & Swieskowski, 2013).

There is increasing belief in the healthcare community that collaboration between surgeons and non-surgeons can reduce the cost and improve the quality of care (Britt, Hoyt, Jasak, Jones, & Drapkin, 2013). Britt et. al (2013) found the quality of care was improved by eliminating duplicate tests, procedures, and imaging when the interdisciplinary team

worked in collaboration. That kind of collaboration will require transformative leadership skills by healthcare organizations. To meet the needs of the Affordable Care Act "value-based leaders must be transformative in purpose and must have character, values, and qualities of ethical accountability, social responsibility, and working through people to align the organization for improvement in quality, cost and the patient-and family-centered experience" (Piper, 2013, p.231).

Achieving the triple aim goals of decreased costs, increased quality and increased patient satisfaction in the BPCI program require hospitals to implement multiple care redesign changes. In this model of care the physicians and health care leadership must work together to develop capacity for integration and coordination of care in order to reform the health care system (Robinson, 2013).

Care Redesign: Coordinating Care Across the Continuum

Teams that work in the bundled payment model must develop capacity to care for patients along the entire care continuum. As Fong et. al (2011) describes, a model that focuses on behavioral change interventions is necessary to achieve long-term success. Bundled payment model implementation requires significant time and effort (Mead, Grantham, and Siegel, 2014) and a high functioning inter-professional team. Martin (2014) defines well-coordinated care as ensuring that the patient is always at the center of the team. This focus of patient centered care is a critical component to the success of this program and coordination of care and coordination of the entire team is a strategy that is important in coordinating care across the entire health care delivery system (Martin, 2014). For Medicare beneficiaries, 57% of the episodes related to total hip replacement require

four or more distinct care settings highlighting the need for care coordination along the entire care continuum (Mechanic, 2011).

One focus area to keep the patient at the center of the care is in the area of pre-operative optimization. Ensuring that patients are clinically optimized prior to surgery is shown to improve a patient's clinical outcomes. One area that has received attention is around pre-operative anemia screening. Preoperative anemia has also been found to be an "independent predictor of postoperative morbidity and mortality" (Vetter, 2013, p. 51). Research indicates that in "patients undergoing elective orthopedic surgery have an average of 24% prevalence of preoperative anemia" (Vetter, 2013, p. 51).

In addition, research finds that high quality care transitions help to change the normal behaviors of patients automatically returning to the ED when they felt anxiety about their recovery process. Duckett (2011) summarizes that the work of Coleman, Boult, and Naylor on the importance of care transitions increased national awareness on what a difference a good transition plan can make in the health outcomes of patients. The work of care transitions and the need for effective community engagement strategies with our community post-acute partners will be required to meet the needs of patients (Kaprielian et. al, 2013).

Before entering into a bundled payment models providers should ask themselves if they are (a) capable of taking responsibility for the quality and efficiency with which that set of services is provided and, (b) are the incentives enough to cover the increased services that must be provided in the model (Guterman and Schoenbaum, 2010). Bundled payment models will require increased resources to monitor and follow patients after hospital

discharge so the incentives to provide that care must be countered by improvement in quality/costs outcomes for those patients.

Decreasing Internal Costs

Birkmeyer, Gust, Dimick, Birkmeyer, and Skinner (2012) determined the connection between quality and cost of inpatient surgery, with results revealing that Medicare payments for inpatient surgery cases were substantially higher at hospitals with high complications. Pine, Fry, Jones, Meimban, and Pine (2010) established additional links between costs and quality, finding that effective, efficient hospitals can produce sizable cost savings and not jeopardize quality outcomes. Pine et al. (2010) found that "96% of the total savings resulted from improvements in efficiency" (p. 867), which indicates that inefficiency is more costly than ineffectiveness. Cutler and Ghosh (2012) found that it is possible to achieve substantial healthcare savings after moving from a fee-for-service model to a bundled payment model. Weeks, Rauh, Wadsworth, and Weinstein (2013) estimated that bundled payment models are the most promising mechanism to reducing healthcare costs, with a potential of a 5.4% reduction in national healthcare spending over 10 years. In a bundled payment care delivery model, supply expense and reduction efforts are needed to ensure there are no potential losses from inefficient operations and processes (Delisle, 2013).

One of the largest focus areas for decreasing internal costs is in the area of surgical implants. Expenditures for medical devices were "$ 80 billion in 2007 and constitute one of the fast growing components of hospital costs" (Burns, Housman, Booth, & Koenig, 2009, p. 2). Orthopedic implants represent a large proportion of device expenditures and are expected to rise almost 10% annually (Burns et. al, 2009). To combat these high costs,

surgeons and hospital facilities have to engage in cost-containment strategies which include standardization of implants using a smaller number of vendors. This physician agreement is difficult for hospitals to secure as surgeons are reluctant to switch vendors citing both efficiency and safety reasons (Burns et. al, 2009).

Readmission Prevention Program

There is a clear case for the focus on reducing readmissions. "From 2003 to 2004, 19.5% of all Medicare beneficiaries who were discharged from a hospital were readmitted within 30 days, leading to an estimated cost of $17.4 billion" (Sweeney, 2013, p. 19). Other studies confirm that nearly 20% of Medicare fee-for-service patients are re-hospitalized within 30 days of discharge with more that 50% of patients not seeing a physician between discharge and readmission highlighting the poor provider coordination at the time of discharge (Sood, Huckfeldt, Escarce, Grabowski, & Newhouse, 2011). In addition, research has shown that 24% of patients who enter a skilled nursing facility are readmitted to a hospital within 30 days of discharge, costing Medicare $4.3 billion in one year alone (Sood et. al, 2011).

The evidence has shown that the utilization of care management in the care transition role leads to decreased re-hospitalizations even up to 180 days after hospital discharge (Berkowitz, Schreiber, and Paasche-Orlow, 2012). Involvement of the acute hospital nursing staff in taking a more proactive monitoring and evaluation of patients who have readmitted will also provide valuable insights (Steffens et. al, 2009).

One key strategy found for decreasing readmissions is to collaborate with your ED physician teams. If ED teams are engaged in the BPCI program they can serve as a first

line of defense to prevent a BPCI patient readmission by treating and releasing that patient from the ED instead of admitting for inpatient services (Gaines, 2012).

Several studies have been completed to try to identify common characteristics of patients undergoing total joint arthroplasty (hip and knee) that require readmission following surgery. Tayne et. al (2014) found the most common characteristics predicting increased readmissions were: female gender, high ASA class (ASA class takes into account the existence of systemic disease and the severity of the disease), and increased operative time. Saucedo et. al (2013) identified common characteristics were: coronary artery disease, diabetes, increased LOS, underweight status, obese status, age (over 80 or under 50), and Medicare. Schairer, Sing, Vail and Bozie (2014) identified common characteristics for total hip replacement patients were: type of procedure, hospital stay of greater than 5 days, cardiac valvular disease, diabetes with end-organ complications, and substance abuse. Clement (2013) identified common characteristics for total hip replacement patients were: increased age, length of stay, and body mass index. Estimates are that "8.5% of primary and 14.1% of revision THA patients are readmitted within 30 days of discharge" (Clement et. al, 2013, p. 7). Researchers have found that patient age and comorbid conditions have been found to increase the length of the hospital stay, readmissions, and mortality after surgery for both total hip and total knee arthroplasty patients (Jorgensen and Kehlet, 2013).

In studies for all orthopedic surgical admissions (not just total hip and knee replacements), the findings were similar indicating that the characteristics of patients with the highest risk of readmission were: longer length of stay in the hospital, spending time in

the intensive care unit, marital status of widowed, and Medicaid insurance status result in increased risk for readmission (Dailey, Kasten, Chapman, & Lee, 2013).

Post-Acute Relationships: Development of Continuing Care Networks

Post-acute providers are eager to partner with BPCI teams understanding that in the current healthcare environment of value-based care programs the performance of post-acute providers will be evaluated more closely and will impact incoming referrals (Graham et. al, 2013). In the BPCI total joint program, the two areas of post-acute utilization that are highly costly and therefore closely monitored are inpatient rehab and skilled nursing facility settings. Herbold, Bonistall, and Walsh (2011) determined that patients who received inpatient rehab following total hip or knee replacement surgeries had a shorter stay with superior functional outcomes than patients that received skilled nursing facility care, but cost of stay in rehab was significantly greater. These types of outcomes and costs analyses are important when designing an optimal care plan for the BPCI patient.

The expenses in the post-acute part of the BPCI episode of care have been found to heavily contribute to success in this new care delivery model. Post-acute costs are growing rapidly with an average annual rate of increase at 25% between 1988 and 1997 making it the fastest growing area of Medicare spending (Buntin, Colla, and Escarce, 2009). In studying this issue, research has found that bundled payment care models will be most effective in reducing total episode costs if post-acute services are included in the accountability as is currently being tested in the CMS BPCI project (Chandra, Dalton, and Holmes, 2013). The causes for variation in post-acute utilization are complex, but it is important to recognize that population market factors may influence those decisions impacting the cost variations (Miller et. al, 2011). For example, surgeons working in a

market with a large volume of skilled nursing facilities may utilize these facilities more often due to availability allowing for an earlier discharge from the acute care setting.

Patient Engagement/Post-Acute Telephonic Follow-Up

There is evidence on the success of coordinated care in reducing episode costs for surgical patients (Hockenberry, Burgess, Glasgow, Vaughn-Sarrazin, & Kaboli, 2013). The increase in perioperative medical homes and BPCI programs for surgical diagnosis groups is steadily rising as part of these coordination of care models. Traditionally patients have delegated decision making to their physicians, but in the new value-based care models the patient should be actively engaged in the process with implementation of a shared decision making model (Wennberg et. al, 2007).

Research has also demonstrated the value of telephonic follow-up by care managers. Riegel et. al (2002) found that there was a reduction in hospitalizations, costs, and other resource use when a standardized telephonic case management model was followed in a heart failure patient population. The Riegel et. al (2002) study conclusions were that telephonic case management can decrease physician office visits, hospital days, emergency department visits, and re-hospitalization rates. Studies that compare the effects between home visits and telephonic care management follow-up with telephone calls only found bundling interventions of home visits and calls were most effective in reducing readmissions (Wong, Chow, Chan, & Tam, 2014).

Care Managers/Navigators

The role of care managers in these type programs has been shown to improve results and is supported by the work of Dr. John Kotter. Dr. Kotter recognized the need for

collaboration across disciplines to improve health care organizations and has supported embedding care managers in value-based programs to achieve results (Treadwell and Giardino, 2014). Nurse navigators are relatively new to the nursing profession as nurses that typically work with patients to ensure that well-coordinate care is provided (Hader, 2012). Population care coordination nurses are "acting as architects and co-leaders in transforming the healthcare system" (Christopher, 2014, p.505). The inclusion of nursing in all of the value-based work has increased their visibility as a required part of the inter-professional team.

Physician Led Inter-Professional Teams

It is important to understand the difference between multidisciplinary care which is when several disciplines work with patients in parallel vs. inter-professional care which is a collaborative and integrated care where team members collaboratively work to solve patients problems (Pecukonis, Doyle and Bliss, 2008). Successful teams in this work report that "transforming medical care ultimately means transforming what doctors do and how they do it, and that requires clinical credibility" (Millenson et. al, 2013, p. 331-332).

Inter-professional teams focus on opportunities to reduce care fragmentation and improve patient outcomes (Treadwell and Giardino, 2014). This collaboration seeks to improve the understanding of all members of the health care team working with a patient. Teamwork is described as an essential ingredient, recognizing that no one person has the expertise to independently achieve all of the necessary changes to adapt to a value-based care model (Treadwell and Giardino, 2014).For effective results, inter-professional teams must demonstrate core competencies of: "role clarification, team functioning, patient/client/family/community-centered care, collaborative leadership, inter-professional

communication, and inter-professional conflict resolution" (Aston et. al, 2012, p. 950). Due to the need for this collaborative practice model in value-based care, there has been an increase in inter-professional education competency requirements in higher education institutions focused on healthcare (Thistlethwaite et. al, 2014). Results from evaluation of this model are showing promise with physicians and medical students working on inter-professional teams perceiving that these type teams did provide improved patient care (Corbridge, Tiffen, Carlucci, & Zar, 2013). It should be noted that inter-professional teams must have an acknowledgement of the issue of power differentials that exist between physicians and other health care professionals (Whitehead, 2007) when developing models for shared responsibility for patient outcomes. Physicians are trained to lead the team so full collaboration for some physicians may take time to achieve as physicians in this model must give up some power to the team (Baker, Egan-Lee, Martimianakis, & Reeves, 2010).

The BPCI program requires care redesign from both the hospital teams and the physician teams. If the physicians do not redesign their care protocols the care redesign efforts will not succeed. In the bundled payment models, the physician teams must agree to both inpatient and outpatient care model redesign which is different from the current models of care. In the BPCI care model, the physicians must develop a multidisciplinary framework that extends post-discharge that will also ensure high quality outcomes in the outpatient setting (Fong, 2011).

Leveraging Access to Information: Data Availability

Euclid Hospital is currently participating in the CMS Phase 2 BPCI project and reports that "tracking outcomes requires a robust infrastructure" (Froimson et. al, 2013, p. 2). The BPCI teams require monthly reports built from the CMS data that can track

outcomes in the programs. Waiting on quarterly CMS outcome reporting does not allow the teams the ability to make care redesign changes quickly enough to impact success in the program.

Summary

There has been little research on the overall effectiveness of the new value-based payment models in decreasing costs and improving quality. The CMS BPCI program launched in October 2013 continues to undergo model changes by CMS based on feedback from program participants. No current research on the effectiveness of the CMS BPCI program was found for this literature review. The CMS BPCI program is a three year program and final results of the effectiveness of this model in achieving the triple aim of improved patient experience, improved quality, and decreased costs is not expected to be released by the CMS until after the first BPCI participants complete the program on September 30, 2016.

CHAPTER 3

METHODOLOGY

CHI BPCI Program Methods

In managing the 90 day BPCI episode of care, the areas identified as most heavily impacting costs and quality (increased readmissions) in the CHI Phase 2 BPCI programs were: pre-operative education/optimization, acute care model redesign, patient engagement/care management, and post-acute provider engagement. In addition, there was a need identified to establish common roles at CHI for the BPCI program to ensure consistent program delivery (See Figure 1).

Pre-Operative Education/Optimization

The first step was to design a pre-operative optimization program developed and led by the physicians to determine if patients were clinically ready for surgery. The clinical optimization screening process included testing for anemia, sleep apnea, and general surgical readiness. Patients were required to complete this optimization process prior to being assigned a surgery date. If clinical needs were identified during the optimization

process, patients were required to resolve any outstanding issues prior to surgery. Once patients successfully completed the pre-operative optimization screening process a date was set for the patient to attend a mandatory education course ("Joint Academy") focused on increasing understanding of the surgery and the post-surgical recovery process.

The Joint Academy course included further functional/discharge planning assessments for surgery readiness and included intensive education on the surgery process and post-operative process. During the Joint Academy course, patients and their "coach" (family/friend who would help patient during the post-operative recovery phase) were introduced to the inter-professional team (Joint Academy Education Coordinator, RN Care Manager/Navigator, Social Work Care Manager/Navigator, Physician Therapist (PT), Hospital RN) that would be responsible for their care during the entire 90 day episode of care. Joint Academy assessments included a functional assessment and discharge planning assessment. Patients' pre-operative functioning was assessed by a PT who also instructed patients on proper completion of required pre-op exercises. The RN/Social Work care managers met with patients to complete a discharge planning assessment and begin planning for post-operative discharge needs. After completion of the pre-operative optimization process and Joint Academy class, patients were medically cleared for surgery, started on their pre-operative exercise program, and voiced a clear understanding of the surgery and the required recovery process. In addition, patients and families were clearly prepared with expected hospital length of stay and plans for discharge following surgery. With the addition of the pre-operative optimization program and the Joint Academy course the teams noted clear declines in surgery cancellations, hospital length of stay, need for post-acute services, and post-operative readmissions.

Acute Care Redesign

The hospital length of stay and hospital plan of care also required care redesign. The interdisciplinary team had to make modifications to the typical post-operative plan of care to add physical therapy on day of surgery, discharge planning reassessment on day of surgery, and a discharge education course on the morning of discharge to reinforce the teachings provided pre and post operatively. Hospital care management teams and the care management/navigators for the BPCI program had to work collaboratively on discharge planning and plans for follow-up after the hospital discharge. The surgeons were asked to evaluate their current practices and evaluate options for increasing patient's mobility on day of surgery and allow for decreased length of stay in the hospital. Physician and pharmacy teams collaborated on pain control options to improve pain control for patients on day of surgery which allowed them the ability to participate in therapy on the afternoon of surgery. Other physician practice changes was a collaboration with physical therapy for a more aggressive physical therapy plan post-op which resulted in decreased length of stay.

Patient Engagement/Care Management

The pre-operative optimization and education programs were designed to assist with readmission prevention by preparing patients for what to expect after surgery. In addition, the care managers/navigators developed a telephonic follow-up call schedule to monitor the patients. If a patient entered a post-acute facility post-op, the care managers would contact the post-acute provider to continue to follow that patient. In addition, the post-acute facility was required to provide physical therapy progress updates to ensure that the patients were improving mobility and moving toward discharge home.

The care managers completed follow-up call with patients calling patients at least 10 times: prior to the Joint Academy course, in-person at the Joint Academy course, in-person day one after surgery during hospital stay, 48 hours after discharge, 7-10 days after discharge, following the first post-op physician appointment, 30 days after discharge, 60 days after discharge, 90 days after discharge, and 120 days after discharge (See Figure 3). The team followed a call script (See Figure 5) to guide the calls for program consistency. Topics covered during the call included: incision care, mobility status, securement of medications, expectations for recovery. The volume of calls to manage this program was extensive—ingoing and outgoing calls were tracked and reasons for incoming calls were also tracked to trend questions/concerns patients were having post-discharge (See Figure 6). For example, one common question was around constipation so the care managers developed increased pre-operative education on this topic to reduce this concern after surgery.

After discharge, patients would often have questions about their recovery phase that they needed to reach out about (ex. Pain, constipation, incision care). Prior to this program there was no ability for a patient to have 24/7 access to a Care Manager that could assist with these type questions. Often patients would try to reach out to their physician office, but if calls were not returned quickly the patient would get anxious and return to the emergency room. The 24/7 Care Coordination access line provided patients with a consistent contact number that they could call during their recovery phase to obtain information or be linked to the physician if required.

The skill set of the care manager in the program proved to be critical to coordinate the care across the entire 90 day episode continuum. The patients quickly learned that the

care manager was their "go to" person and should be the first point of contact for any questions or concerns. Utilizing the expertise of the care managers from the time of pre-op until 120 days after surgery clearly demonstrated that the care manager was the point person for the patient and the person who could mobilize other inter-professional team members to intervene if needed. This central contact person was felt to be one of the key factors in decreasing readmissions.

CHI partnered with TAVHealth for the BPCI project. TAVHealth worked with the BPCI teams to develop a standardized workflow process which is then tracked in TAVConnect. The TAVConnect software solution identifies barriers of care so that the care management navigators can address those issues that might prevent a full recovery. Patient engagements with any of the care team members is tracked and measured in TAVConnect so that all of the team can easily monitor how the patient is progressing. The real-time reporting provided by TAVHealth to the BPCI team means changes to improve processes and prevent readmissions can be implement quickly. BPCI populations are then consistently monitored to allow continuous improvements in the program.

Post-Acute Provider Engagement

Prior to the launch of the BPCI program, the post-acute providers expected to receive BPCI patients upon hospital discharge were provided education about the program. In addition, the providers were informed of the expected plan of care/required therapy protocols/goal length of stay that the BPCI team/physicians expected for these patients. The facilities were informed that the care managers would be contacting them at least weekly for updates for the patients in the BPCI program. The providers received education on data CMS would be sending monthly on costs and length of stay for their facility vs.

other local facilities providing services to BPCI patients and were informed that data would be reviewed and tracked by the BPCI leadership team. A continuing care network (CCN) was established in each market with a BPCI program and consistent expectations for the skilled nursing facility partners were established and communicated to the network facilities (See Figure 7). The goal of developing a highly functioning network of post-acute providers was to provide standardized, evidence-based care seamlessly across continuum for optimal patient experience.

Utilizing the described CHI BPCI program methods, the teams were able redesign the care delivery system for these patients, develop capacity to manage care across the entire care continuum, and achieve success in an episode based payment model.

Research Study Methods

Study Design

We used an ANOVA analysis to assess the relationship between total costs (i.e., allowed costs) per episode and total readmissions per episode between Phase 1 and Phase 2 BPCI program participation. Episode payments and readmissions were examined at the episode level. We used a regression analysis to assess the relationship of age, gender, BPCI phase, CMI, and site of service (i.e., surgery) location on total costs of the episode and total readmissions per episode.

Sample and Data Collection

The CMS BPCI data reports contain information for all claims processed for each beneficiary for the entire episode of care. The actual claims files are contained in 13 files split by the type of service: Durable Medical Equipment, Outpatient, Home Health, Skilled Nursing Facility, Professional/Part B, and Inpatient/Long Term Care/Inpatient Rehab. For

the first time, teams were able to see all CMS claims information for beneficiaries and not just claims information that occurred at the surgical BPCI facility.

The CMS BPCI data reports include the following information:

Metrics by BPCI Facility	Definitions
Total # of Episodes	Number of cases billed with selected DRG at BPCI facility
Baseline Price Before Discount	Average price of episode of care during the baseline period (2009-2012)
Target Price per Episode	Baseline price minus a required 2% discount; Programs must come under target price to achieve savings in this program
Total Allowed Amount	Total amount paid by CMS
Winsorized Allowed per Episode	Total amount paid by CMS after outlier calculations are applied
Anchor ALOS	Average Length of Stay in hospital for episode
# Readmits	Number of inpatient readmissions following anchor episode during the 90 day episode of care
Average Readmits per Episode	Average number of readmits per number of cases
Anchor Allowed per Episode	Total amount paid by CMS for the anchor (acute care) part of the episode
--Anchor Facility Allowed per Episode	Total amount paid by CMS for the acute care part of the episode of care
--Anchor Prof Allowed per Episode	Total amount paid by CMS for the professional physician fees during the acute care part of the episode of care
Readmit Allowed Per Episode	Total amount paid by CMS for readmissions per case
Total Post Allowed per Episode	Total amount paid by CMS by case for care that was delivered in the post-acute phase of the episode
--OP Allowed per Episode	Total amount paid by CMS for outpatient services per case
--ED Allowed per Episode	Total amount paid by CMS for emergency department care per case
--SNF Allowed per Episode	Total amount paid by CMS for skilled nursing facility care per case
--Home Health Allowed per Episode	Total amount paid by CMS for home health care per case

--IRF Allowed per Episode	Total amount paid by CMS for inpatient rehab facility care per case
--Prof Allowed Per Episode	Total amount paid by CMS for professional fees per case
--LTC Allowed per Episode	Total amount paid by CMS for long-term acute care per case
Post 30-day Total Spend	Total amount paid by CMS for total care in the 30 days following the end of the 90 day BPCI episode of care
Post 30-day Total Spend per Episode	Total amount paid by CMS for total care in the 30 days following in the end of the 90 day BPCI episode of care per case

The above CMS claims information is provided to CHI and it is loaded into user reports for the BPCI teams to utilize. The reports provided to the teams range from very high level summary reports that show the breakout of average type of service costs as a section of the overall episode cost, to specific detail reports that show individual providers and their average claim costs compared to other providers of the same type of service.

This research study was based on complete Medicare claims data for Medicare beneficiaries in the clinical episode of care DRGs 469/470: major joint replacement of the lower extremity (i.e., hip/knee arthroplasty) who (a) received surgery at one of the four CHI facilities (i.e., St. Vincent, Alegent Mercy, Good Samaritan, or St. Elizabeth) and (b) participated in both the Phase 1 and Phase 2 BPCI program. The CHI BPCI facility geographic representation includes the states of Arkansas, Iowa, and Nebraska. The assumption was that the hospitals selected were similar in economic, political, and other market competitive forces.

The unit of analysis for this study was individual patients who were eligible for participation in the BPCI program by having total hip or knee arthroplasty at one of the BPCI participating facilities. In this program, the CMS defines: one patient = one episode.

The data contain all tracked program metrics by patient (i.e., episode) for the duration of the 90-day BPCI program for each facility participating in the program. Our data came from one primary source: CMS claims reports for all episodes for each participating BPCI facility. The CMS protects the data by removing all patient identifying data fields; there is no way to track the data back to an individual beneficiary. The CMS data included historical/baseline data from July 1, 2009 to June 30, 2012. Additionally, the CMS provides monthly data reports that outline the current episodes of care that have been completed.

We focused on major joint replacement of the lower extremity joint episodes. Data was limited to facilities that had both Phase 1 and Phase 2 data. Beneficiaries with more than one episode were excluded. Gender and case mix index (CMI) were converted to categorical variables. Readmission count and total costs per episode were used as continuous variables. A total of 2,603 observations were utilized.

Data Analysis

For each patient, we obtained the total episode bundle cost by summing the index hospitalization payments with the postoperative post-acute costs to compute the total 90-day episode of care cost. Readmissions in this program are defined as any inpatient acute hospital (Rehab/LTAC are not included) admission following the BPCI trigger inpatient admission that occurs during the 90-day episode period. The CMS provides a readmission exclusion list for the BPCI program; thus, any inpatient admission DRG listed on the CMS exclusion list was removed from the total readmission count. The data relating to the following performance indicators (i.e., total costs per episode and readmissions) were collected and analyzed. The year that the Phase 2 BPCI facilities entered the program (2013 or 2014) served as the base year for data analysis. The assumption was that the care

coordination process and performance improvements required to achieve savings in the first year of the Phase 2 BPCI program would be demonstrable. The study was limited to one year (i.e., the first year of Phase 2 BPCI program participation) due to data availability and the limited sample of CHI hospitals that are currently participating in the program. The data for the study were collected from CMS claims data files for all relevant MS-DRG episodes in the participating facilities.

Descriptive Statistics of the Sample

The total sample size was 2,603 episodes, with 92% of the BPCI program participants between 61 and 90 years of age. The largest number of participants included in this study was from the geographic region of Nebraska, at 57% of the total sample. Arkansas was the next highest represented (29%), and the smallest population came from Iowa (14%). Females made up 63% of the sample and males represented 37% of the group. Ninety-five percent of the sample had a CMI of 2.1 or less. Table 9 presents the descriptive statistics on variables used to test Hypothesis 1 and 2.

Findings

Findings from this study suggest a relationship between Phase 2 BPCI participation and decreased costs with inpatient lower extremity total joint replacement. Hospitals participating in the Phase 2 BPCI program had total episode costs of $3,333 per episode lower than facilities participating in the Phase 1 BPCI program. There was no statistically significant evidence of decreased readmissions for Phase 2 BPCI participants.

ANOVA Testing Summary: Total Costs per Episode

A proven statistically significant difference existed between the mean of Phase 1 and Phase 2 populations based on total allowed costs per episode. Phase 1 participants had a higher average total allowed per episode compared to Phase 2 participants. Costs for the Phase 1 facilities were $25,171 per episode compared to the costs of $21,838 for Phase 2 facilities. Phase 2 participants achieved a total cost per episode reduction of $3,333 (see Figure 2). Figure 2 provides support for Hypothesis 1: Participation in Phase 2 BPCI program improves care coordination which leads to decreased costs per episode of care.

ANOVA Testing Findings: Total Readmissions per Episode

No statistically significant difference existed between the mean of Phase 1 and Phase 2 populations based on total readmissions per episode. Phase 1 participants had a slightly higher average readmit count compared to Phase 2 participants (see Figure 4). Figure 4 reflects that no support was established for Hypothesis 2: Participation in the Phase 2 BPCI program improves quality which leads to decreased readmission rates per episode of care.

Regression Analysis Testing: Total Costs Allowed per Episode

The independent variables of age, gender, BPCI Phase 2 participation, CMI, and site of service/surgery all impact total costs per episode. An increased age and higher CMI (3.4 or higher) demonstrated statistically significant increases to total costs per episode. The lowest costs per episode were achieved by participants with the following characteristics: (a) male, (b) a CMI of 2.1 or lower, (c) in a Phase 2 BPCI program, and (d) surgery in Arkansas/St. Vincent Medical Center (see Table 6).

Regression Analysis Testing: Total Readmissions Allowed per Episode

No statistically significant difference existed between the mean of Phase 1 and Phase 2 populations based on total readmissions per episode. Phase 1 participants had a higher average total readmission count per episode compared to Phase 2 participants. An increased age and higher CMI appeared to have an impact on total readmissions, but a statistically significant impact could be proven with this research study. Of note, the total volume of readmissions for this study was 332 of 2,602 cases; thus, the sample size may have limited the regression analysis findings (see Table 7).

Although not a statistically significant finding, Phase 2 BPCI participation did reflect a relationship between readmissions reduction in increased age and higher CMI groups; this is positive, as it shows the program can have an impact on improving quality for total joint replacement patients.

Limitations

Some limitations for this research study include: (a) reliance on CMS claims data; (b) inclusion of only CHI facilities in the sample; (c) only one clinical episode represented; (d) limited sample size; and (e) comparing facilities not matched by size, geographic area, number of cases, or number of surgeons participating in the program.

Practice Implications

Findings from this study have direct implications for ongoing episode-based payment initiatives aimed at improving quality and patient experience while decreasing costs. Our findings suggest that episode-based payment models have the potential to

decrease total costs per episode. The study focus of total knee arthroplasty as a BPCI episode is important, as the available data reveal that total knee arthroplasty is now among the most common major surgical procedures, with approximately 600,000 total knee procedures, at a total expense of $9 billion per year, performed annually in the United States (Cram et al., 2012). In this estimation of 600,000 total knee procedures per year in the United States, our research predicts that the implementation of the BPCI model could result in an overall savings of approximately $2 billion per year. For CHI alone, our research indicates that the Phase 2 BPCI program reduced total costs for the 1,279 episodes by a total of $4.2 million. In the CMS BPCI program, the savings achieved by the facilities are shared with the CMS so CHI did not maintain 100% of those savings, but positive savings ratios were still achieved in this program by CHI.

The results of this study do not directly suggest that episode-based payment models improve quality outcomes, but the positive relationships on the BPCI model with readmission reduction in relationship to age and CMI warrant more study. Future research could include a more intense focus on patients in the program that are older and have a CMI of 3.4 or greater in order to produce statistically significant reductions in total readmissions.

ARTICLE MANUSCRIPT

The New Era of Health Care: Catholic Health Initiatives Journey with Bundled Payment for Care Improvement in Total Joint Replacements

Tamara Cull DHA©

Medical University of South Carolina and National Director of Value-Based Programs and Operations, Catholic Health Initiatives

Abby Kazley, PhD

Associate Professor, College of Health Professions, Medical University of South Carolina

Christopher Stanley, MD

VP of Care Management, Catholic Health Initiatives

Karen Wager, DBA

Professor and Associate Dean for Student Affairs, College of Health Professions, Medical University of South Carolina

Correspondence concerning this article should be addressed to Tamara Cull, 122 Margeaux Dr., Maumelle, AR 72113. Fax: 501-734-8461; Phone: 501-773-0566; E-mail: TamaraCull@catholichealth.net.

Abstract

Background: The Bundled Payment for Care Improvement (BPCI) initiative is a value-based episode-based care model developed through the Centers for Medicare and Medicaid Innovation (CMMI) focused on improving patient experience and quality while decreasing costs.

Purpose: To examine relationships between total costs of care and total readmission rates for Medicare patients undergoing major joint replacement of the lower extremity (knee/hip arthroplasty) at Catholic Health Initiatives (CHI) facilities participating in the BPCI program.

Methodology/Approach: This study used complete Medicare claims data for beneficiaries in the clinical episode of care DRGs 469/470 receiving major joint replacement of the lower extremity surgery at one of the four (CHI) facilities participating in both the Phase 1 and Phase 2 BPCI program. Both univariate and multivariate models were utilized to examine the impact of the BPCI initiative on costs and readmissions.

Findings: Findings from this study suggest a relationship between Phase 2 BPCI participation and decreased costs. Hospitals participating in the Phase 2 BPCI program had total episode costs that were $3,333 per episode lower than hospitals participating in the Phase 1 BPCI program. There was no statistically significant evidence of decreased readmissions for Phase 2 BPCI participants.

Practice Implications: Findings from this study have direct implications for ongoing episode-based payment initiatives aimed at improving quality and decreasing costs, as they

suggest that episode-based payment models have the potential to decrease total costs per episode.

Keywords: BPCI, bundling, episode-based payment models, care management, care navigation, Medicare, arthroplasty, total joint replacement

The New Era of Health Care: Catholic Health Initiatives Journey with Bundled Payment for Care Improvement in Total Joint Replacements

Introduction

As health care shifts into a new era of reform, providers and payers are testing innovative payment models in an effort to keep healthcare costs down while improving quality. The Affordable Care Act issued the Center for Medicare and Medicaid Services (CMS) a directive to form an innovation center to explore new payment models that would begin shifting from a pay-for-service model to a pay-for-value model (Center for Medicare and Medicaid Services [CMS], 2010). Developing the capacity to provide value-based health care has become the goal of healthcare providers.

The Patient Protection and Affordable Care Act "marks the U.S. government's commitment to the widespread adoption of patient-centered approaches, coordinated models of care, and rational reimbursement" (Dinan, Simmons, & Snyderman, 2010, p. 1665). The Institute for Healthcare Improvement established the triple aim framework for all value programs in order to: (a) improve an individual's experience of care, (b) improve the health of the population, and (c) reduce the costs of care (Vetter, Boudreaux, Jones, Hunter, & Pittet, 2014). Value in this new-era healthcare market will achieve higher quality outcomes with improved efficiency and providers will be expected to provide care across the continuum (King, 2013).

Background

Traditional healthcare delivery systems are not capable of meeting the needs of the patient population or providing the necessary resources to address the rapid growth of chronic diseases in the United States (Ferrario, Moore, & Copeland, 2009). Because the

resources currently being utilized are unable to be sustained, the CMS began exploring value-based payment models as an alternative to how health care is delivered in the United States. An Institute of Medicine report highlighted the need for change, estimating that "30 to 40 cents of every health care dollar is spent on inappropriate, duplicative, or ineffective care, costing the nation between $600 and $700 billion annually" (as cited in Shomaker, 2010, p. 756). Surgical care alone "currently accounts for an estimated 52% of hospital admission expenses in the United States" (Vetter et al., 2014, p. 1131). The Affordable Care Act includes provisions to improve the quality of care; develop new models of care delivery (i.e., care redesign); ensure appropriately priced services; modernize the U.S. health system; and fight against waste, fraud, and abuse (Center for Medicare and Medicaid Services [CMS], 2010).

Borah et al. (2012) described the shift to value-based care as a bold transformation by Medicare to become actively involved in quality of outcomes for Medicare beneficiaries. The current Medicare fee-for-service model supports volume rather than quality, which can lead to misaligned incentives for providers and payers to collaborate and coordinate better care for beneficiaries (Delisle, 2013). In order to make the shift to a value-based care model that rewards physicians and health systems for quality outcomes (Froimson, Deadwiler, Schill, & Cousineau, 2013), care redesign is required. The current healthcare system leaves the care of Medicare beneficiaries uncoordinated and increases healthcare costs to an unsustainable level (Hackbarth, Reischauer, & Mutti, 2008).

Center for Medicare and Medicaid Services: BPCI Program

The BPCI model is a new, innovative, episode-based payment approach that focuses on improving patient experience and quality while decreasing costs. The primary

goal of the BPCI program is to redesign the care delivery model by increasing care coordination among providers. The bundled payment model is designed to incentivize providers to provide the right care at the right time, while shifting risk from the payer to the provider (Averill, Goldfield, Hughes, Eisenhandler, & Vertrees, 2009). The BPCI program is based on the belief that providers should look beyond a single setting of care to an entire episode of care to improve clinical outcomes (Tian, DeJong, Munin, & Smout, 2010). The program moves the focus from accountability for a procedure or hospitalization to accountability for improving the total episode of care (Pappas, 2013). While the BPCI program does not attempt to control the volume of care, estimates are that by increasing the coordination of care, it could "result in a 5.4% reduction in national health care spending" (Shomaker, 2010, p. 757).

Episode-based payments bundle all Medicare payments for services related to a clinical condition for a determined amount of time. The goal of the model is to decrease the fragmented care delivery system by aligning all payment incentives among the providers of care for a Medicare beneficiary. The CMS created 48 different clinical episodes in BPCI program and offered providers the ability to provide care for a 30-, 60-, or 90-day episode of care. The episodes of care are linked to diagnosis-related groups (DRGs), and the BPCI episode of care is triggered when a Medicare beneficiary with the selected BPCI DRG enters an acute care hospital.

The program has two phases. In Phase 1, the CMS provides health care facilities with monthly claims data for episodes of care for learning purposes, but there is no financial risk to the provider Once facilities enter Phase 2 of the program (which is optional), they are held accountable for downside financial risk if they do not achieve the episode target

prices set by the CMS. Upon official CMS launch of the BPCI program on January 1, 2013, more than 500 hospitals, health systems, and other providers enrolled; 191 of those facilities enrolled in Model 2 (Herman, 2013). The first participants started the Phase 2 program on October 1, 2013.While the participants entering Phase 2 of the program agree to a 3-year commitment to the program, the CMS does offer provisions to opt out of Phase 2 if requested. The most common clinical episodes participants selected were: (a) major joint replacement (78%), (b) congestive heart failure (58%), (c) coronary artery bypass graft (51%), (d) chronic obstructive pulmonary disease–bronchitis/asthma (49%), and (e) percutaneous coronary intervention (48%) (Herman, 2013).

Catholic Health Initiatives: The New Era of Health Care

This study examines the Catholic Health Initiatives (CHI) experience with the CMS BPCI program. The current CHI area of expertise in this program is in the area of major joint replacement of the lower extremity. As one of the nation's largest faith-based health systems, CHI serves more than four million people each year with 105 hospitals in 19 states. About 46 million people—or nearly 15% of the U.S. population—live within a 60-mile radius of a CHI hospital (Catholic Health Initiatives, 2014).

Catholic Health Initiatives (CHI) entered into the Phase 2 BPCI project as an awardee convener on October 1, 2013 for St. Vincent Medical Center in Little Rock, AR. St. Vincent Medical Center was one of only thirteen hospitals across the nation to go "at risk" during this first phase, out of a total of 450 hospitals/post-acute providers across 44 states that originally applied to the CMS (CMS, 2013). St. Vincent Medical Center entered into the BPCI program to manage MS-DRGs 469/470, major joint replacement of the lower extremity (i.e., hip/knee arthroplasty). On January 1, 2014, CHI acted as the convener for

three additional facilities to enter the program to manage MS-DRGs 469/470: (a) Alegent Mercy Medical Center in Council Bluffs, IA; (b) Good Samaritan Medical Center in Kearney, NE; and (c) St. Elizabeth Medical Center in Lincoln, NE.

Conceptual Framework

Study Purpose/Hypotheses

This study focuses on the relationship between total costs of care/total readmission rates per episode for Medicare patients undergoing major joint replacement of the lower extremity (knee/hip arthroplasty) at Catholic Health Initiatives (CHI) facilities participating in the BPCI program. The research hypotheses of the study were: 1) Participation in Phase 2 BPCI program improves care coordination which leads to decreased costs per episode of care; 2) Participation in the Phase 2 BPCI program improves quality which leads to decreased readmission rates per episode of care.

The two dependent variables were total costs per episode and total readmissions per episode. The independent variables tested were (a) age; (b) gender; (c) phase of BPCI participation; (d) case mix index (CMI); and (e) site of service (surgery): IA-Alegent, NE-St. Elizabeth, NE-Good Samaritan, or AR-St. Vincent. The intercept independent variable composition utilized for the regression analysis was: female, age 20-30, Phase 1 BPCI participation, and CMI 2.1 or less (See Appendix: Figure 1).

Methods

Sample and Databases

This study was based on complete Medicare claims data for Medicare beneficiaries in the clinical episode of care DRGs 469/470: major joint replacement of the lower

extremity (i.e., hip/knee arthroplasty) who (a) received surgery at one of the four CHI facilities (St. Vincent, Alegent Mercy, Good Samaritan, or St. Elizabeth) and (b) participated in both the Phase 1 and Phase 2 BPCI programs. The CHI BPCI facility geographic representation includes the states of Arkansas, Iowa, and Nebraska. The assumption was that the hospitals selected were similar in economic, political, and other market competitive forces.

The unit of analysis for this study was individual patients who were eligible for participation in the BPCI program by having total hip or knee arthroplasty at one of the BPCI participating facilities. In this program, the CMS defines: one patient = one episode. The data contain all tracked program metrics by patient (i.e., episode) for the duration of the 90-day BPCI program for each facility participating in the program. Data came from one primary source: CMS claims reports for all episodes for each participating BPCI facility. The CMS protects the privacy of health data by removing all patient identifying data fields; there is no way to track the data back to an individual beneficiary. The CMS data included historical/baseline data from July 1, 2009 to June 30, 2012. Additionally, the CMS provides monthly data reports that outline the current episodes of care that have been completed.

We focused on major joint replacement of the lower extremity joint episodes. Data was limited to facilities that had both Phase 1 and Phase 2 data. Beneficiaries with more than one episode were excluded to ensure each participant was a first-time BPCI participant. Gender and case mix index (CMI) were converted to categorical variables. Readmission count and total costs per episode were used as continuous variables. A total of 2,603 observations were utilized.

Study Design

We used an ANOVA analysis to assess the relationship between total allowed costs per episode and total readmissions per episode between Phase 1 and Phase 2 BPCI program participation. Episode payments and readmissions were examined at the episode level.

We used a regression analysis to assess the relationship between total costs of the episode and total readmissions per episode on age, gender, BPCI phase, CMI, and site of service location.

Analysis

For each patient, we obtained the total episode bundle cost by summing the index hospitalization payments with the postoperative post-acute costs to compute the total 90-day episode of care cost. Readmissions in this program are defined as any inpatient acute hospital admission following the BPCI trigger inpatient admission that occurs during the 90-day episode period. The CMS provides a readmission exclusion list for the BPCI program; thus, any inpatient admission DRG listed on the CMS exclusion list was removed from the total readmission count. The data relating to total costs per episode and readmissions were collected and analyzed. The year that the Phase 2 BPCI facilities entered the program (2013 or 2014) served as the base year for data analysis. The assumption was that the care coordination process and performance improvements required to achieve savings in the first year of the Phase 2 BPCI program would be demonstrable. The study was limited to one year (i.e., the first year of Phase 2 BPCI program participation) due to data availability and the limited sample of CHI hospitals that are currently participating in

the program. The data for the study were collected from CMS claims data files for all relevant MS-DRG episodes in the participating facilities.

Descriptive Statistics of the Sample

The total sample size was 2,603 episodes, with 92% of the BPCI program participants between 61 and 90 years of age. The largest number of participants included in this study was from the geographic region of Nebraska, at 57% of the total sample. Arkansas was the next highest represented (29%), and the smallest population came from Iowa (14%). Females made up 63% of the sample and males represented 37% of the group. Ninety-five percent of the sample had a CMI of 2.1 or less. Table 1 (See Appendix) presents the descriptive statistics on variables used to test Hypothesis 1 and 2.

Findings

Findings from this study suggest a relationship between Phase 2 BPCI participation and decreased costs with inpatient lower extremity total joint replacement. Hospitals participating in the Phase 2 BPCI program had total episode costs of $3,333 per episode lower than facilities participating in the Phase 1 BPCI program. There was no statistically significant evidence of decreased readmissions for Phase 2 BPCI participants.

ANOVA Testing Summary: Total Costs per Episode

A statistically significant difference existed between the mean of Phase 1 and Phase 2 populations based on total allowed costs per episode (p value: <0.0001). Phase 1 participants had a higher average total allowed per episode compared to Phase 2 participants. Costs for the Phase 1 facilities were $25,171 per episode compared to the costs of $21,838 for Phase 2 facilities. Phase 2 participants achieved a total cost per episode reduction of $3,333 (See Appendix: Table 2). Table 2 provides support for Hypothesis 1:

Participation in Phase 2 BPCI program improves care coordination which leads to decreased costs per episode of care.

ANOVA Testing Findings: Total Readmissions per Episode

No statistically significant difference existed between the mean of Phase 1 and Phase 2 populations based on total readmissions per episode. Phase 1 participants had a slightly higher average readmit count compared to Phase 2 participants (See Appendix: Table 3). Table 3 reflects that no support was established for Hypothesis 2: Participation in the Phase 2 BPCI program improves quality which leads to decreased readmission rates per episode of care.

Regression Analysis Testing: Total Costs Allowed per Episode

The independent variables of age, gender, BPCI Phase 2 participation, CMI, and site of service/surgery all impact total costs per episode. A higher age and higher CMI (3.4 or higher) demonstrated statistically significant increases to total costs per episode. The lowest costs per episode were achieved by participants with the following characteristics: (a) male, (b) a CMI of 2.1 or lower, (c) in a Phase 2 BPCI program, and (d) surgery in Arkansas/St. Vincent Medical Center (See Appendix: Table 4).

Regression Analysis Testing: Total Readmissions Allowed per Episode

No statistically significant difference existed between the mean of Phase 1 and Phase 2 populations based on total readmissions per episode. Phase 1 participants had a higher average total readmission count per episode compared to Phase 2 participants. An increased age and higher CMI appeared to have an impact on total readmissions, but not a statistically significant impact could be proven with this research study. Of note, the total

volume of readmissions for this study was 332 of 2,602 cases; thus, the sample size may have limited the regression analysis findings (See Appendix: Table 5).

Although not statistically significant, Phase 2 BPCI participation did reflect a relationship between readmissions reduction in increased age and higher CMI groups; this is positive, as it shows the program can have an impact on improving quality for total joint replacement patients.

Some limitations for this research study include: (a) reliance on CMS claims data; (b) inclusion of only CHI facilities in the sample; (c) only one clinical episode represented; (d) limited sample size; and (e) comparing facilities not matched by size, geographic area, number of cases, or number of surgeons participating in the program.

Practice Implications

Findings from this study have direct implications for ongoing episode-based payment initiatives aimed at improving quality and patient experience while decreasing costs. Our findings suggest that episode-based payment models have the potential to decrease total costs per episode. The study focus of total knee arthroplasty as a BPCI episode is important, as the available data reveal that total knee arthroplasty is now among the most common major surgical procedures, with approximately 600,000 total knee procedures, at an expense of $9 billion per year, performed annually in the United States (Cram et al., 2012). In this estimation of 600,000 total knee procedures per year in the United States, our research predicts that the implementation of the BPCI model could result in an overall savings of approximately $2 billion per year. For CHI alone, our research indicates that the Phase 2 BPCI program reduced total costs for the 1,279 episodes by a

total of $4.2 million. CHI did not maintain 100% of those savings, but positive savings ratios were still achieved in this program by CHI.

The results of this study do not directly suggest that episode-based payment models improve quality outcomes, but the positive relationships on the BPCI model with readmission reduction in relationship to age and CMI warrant more study. Future research could include a more intense focus on patients in the program that are older and have a CMI of 3.4 or greater in order to focus on the ability of this model to produce significant reductions in total readmissions.

Acknowledgements

The authors thank the team (Karumah Cosey, MPH, Managing Consultant and Paridha Gupta, MPH, Senior Consultant) at Navigant Consulting for their efforts in data analysis for this research study. The authors thank the Catholic Health Initiatives (CHI) leadership team for allowing the researchers to report the CHI results in the Bundled Payment for Care Improvement Program to assist others in increasing knowledge of value-based programs. No funding for this work was provided by the National Institutes of Health (NIH), Wellcome Trust, Howard Hughes Medical Institute (HMMI) or any other funding sources. Institutional Review Board (IRB) approval was obtained from Medical University of South Carolina IRB. No conflicts of interest are declared.

References

Averill, R., Goldfield, N., Hughes, J., Eisenhandler, J., & Vertrees, J. (2009). Developing a prospective payment system based on episodes of care. *Journal of Ambulatory Care Management*, *32*, 241–251.

Borah, B., Rock, M., Wood, D., Roellinger, D., Johnson, M., & Naessens, J. (2012). Association between value-based purchasing score and hospital characteristics. *BMC Health Services Research*, *12*(464), 1–12.

Catholic Health Initiatives. (2014). *CHI 2014-2018 strategic plan*. Retrieved from http://www.catholichealthinit.org/strategic-vision.

Center for Medicare and Medicaid Services. (2010). *Affordable Care Act update: Implementing Medicare cost savings*. Retrieved from http://www.cms.gov/apps/docs/ACA-Update-Implementing-Medicare-Costs-Savings.pdf.

Center for Medicare and Medicaid Services. (2013). *Bundled Payment for Care Improvement Initiative (BPCI) background on model 2 for prospective participants*. Retrieved from http://innovation.cms.gov/Files/x/BPCI_Model2Background.pdf.

Cram, P., Lu, X., Kates, S., Singh, J., Li, Y., & Wolf, B. (2012). Total knee arthroplasty volume, utilization and outcomes among Medicare beneficiaries, 1991-2010. *Journal of the American Medical Association*, *308*(12), 1227–1236.

Delisle, D. (2013). Big things come in bundled packages: Implications of bundled payment systems in health care reimbursement reform. *American Journal of Medical Quality*, *28*(4), 339–344.

Dinan, M., Simmons, L., & Snyderman, R. (2010). Personalized health planning and the Patient Protection and Affordable Care Act: An opportunity for academic medicine to lead. *Health Care Reform*. *85*(11), 1665–1668.

Ferrario, C., Moore, M., & Copeland, L. (2009). The economic challenges in healthcare: The effect on quality. *The American Journal of the Medical Sciences*, *337*(6), 391–393.

Froimson, M., Deadwiler, M., Schill, M., & Cousineau, K. (2013). Early results of a total joint bundled payment program: The BPCI initiative. Retrieved from http://www.ors.org/Transactions/60/2026.pdf.

Hackbarth, G., Reischauer, R., & Mutti, A. (2008). Collective accountability for medical care- toward bundled Medicare payments. *The New England Journal of Medicine*, *3559*(1), 3–5.

Herman, B. (2013). *The bundled payments for care improvement program: A hospital analysis*. Retrieved from Becker's Hospital Review website: http://www.beckershospitalreview.com.

King, M. (2013). Affordability, accountability, and accessibility in health care reform: Implications for cardiovascular and pulmonary rehabilitation. *Journal of Cardiopulmonary Rehabilitation and Prevention*, *33*, 144–152.

Pappas, S. (2013). Value, a nursing outcome. *Nursing Administration Quarterly*, *37*(2), 122–128.

Shomaker, T. (2010). Health care payment reform and academic medicine: Threat or opportunity? *Academic Medicine*, *85*(5), 756–758.

Tian, W., DeJong, G., Munin, M., & Smout, R. (2010). Patterns of rehabilitation after hip arthroplasty and the association with outcomes. *American Journal of Physical Medicine Rehabilitation, 89*, 905–922.

Vetter, T., Boudreaux, A., Jones, K., Hunter, J., & Pittet, J. (2014). The perioperative surgical home: How anesthesiology can collaboratively achieve and leverage the triple aim in health care. *Anesthesia and Analgesia*, *118*(5), 1131–1136.

Tables

Table 1

Description of Sample

Sample	Total Count	% of Sample
Total Sample Count	2,603	100%
Gender		
Female	1,646	63%
Male	957	37%
BPCI Phase		
Phase 1 Episodes	1,324	51%
Phase 2 Episodes	1,279	49%
CMI		
CMI 2.1 or less	2,486	95%
CMI 3.4 or more	117	5%
Age		
Age 21-30	2	<1%
Age 31-40	7	<1%
Age 41-50	41	2%
Age 51-60	97	4%
Age 61-70	808	31%
Age 71-80	1,099	42%
Age 81-90	484	19%
Age 90-100	65	2%
Facility		
IA: Alegent Mercy	365	14%
NE: Good Samaritan	669	26%
NE: St. Elizabeth	815	31%
AR: St. Vincent	754	29%

Table 2

ANOVA: Total Costs per Episode

Participation Phase	Total Sample Size	Total Costs
Phase 1	1,324	$25,171
Phase 2	1,279	$21,838
Cost Reduction per Episode	1,279 Episodes	$(3,333)
CHI Total Cost Reduction[a]	1,279 Episodes	$4,262,907

Notes[a]CMS cost savings reduction reflects total difference from Phase 1 CMS allowed payments and Phase 2 CMS allowed payments.
F Value= 32.15; Pr > F= <.0001; Confidence interval is 95%; and p value is <0.0001

Table 3

ANOVA: Total Readmissions per Episode

Participation Phase	Total Sample Size	Total Readmissions
Phase 1	1,324	0.09970
Phase 2	1,279	0.08913
Readmission Reduction	1,279 Episodes	0.01
CHI Total	1,279 Episodes	0.01

Note: F Value= 0.57; Pr > F= <.4512

Table 4

Regression Analysis Summary: Total Costs per Episode

Independent Variables	Description/Observations	Total Impact of Independent Variables on Total Costs Per Episode
Intercept	Female; Age 21–30; Phase 1; CMI 2.1	$11,125
Age	For every 1 unit increase in age category, the total costs increase	$3,697
Gender	Allowed per episode is lower for males	($1,671)
Phase	Allowed per episode is lower for Phase 2	($1,870)
CMI	Allowed per episode is higher for participants with a higher CMI of 3.4	$16,509
IA: Alegent Mercy	Participants from Mercy have lower costs per episode by parameter estimate	($6,350)
NE: St. Elizabeth	Participants from St. Elizabeth have lower costs per episode by parameter estimate	($3,293)
AR: St. Vincent	Participants from St. Vincent have lower costs per episode by parameter estimate	($8,930)
NE: Good Samaritan	Participants from Good Samaritan have lower costs per episode by parameter estimate	($7,448)

Note: *F value= 87.27; p value= <0.001; R-square= 0.19*

Table 5

Regression Analysis Summary: Total Readmissions per Episode

Independent Variables	Description/Observations	Total Impact of Independent Variables on Total Readmissions per Episode
Intercept	Female; Age 21–30; Phase 1; CMI 2.1	-0.01121
Age	For every 1 unit increase in age category, the total readmissions increase	0.02099
Gender	No effect of gender on readmit count	0.01933
Phase	No effect of phase on readmit count	-0.00675
CMI	Readmits per episode are higher for participants with a higher CMI of 3.4	0.13179
IA: Alegent Mercy	No effect of facility on readmit count	-0.02269
NE: St. Elizabeth	No effect of facility on readmit count	-0.00063600
AR: St. Vincent	No effect of facility on readmit count	-0.00861
NE: Good Samaritan	No effect of facility on readmit count	-0.02

Note: *F value= 5.27; p value= <0.0001; R-square= 0.014*

Figures

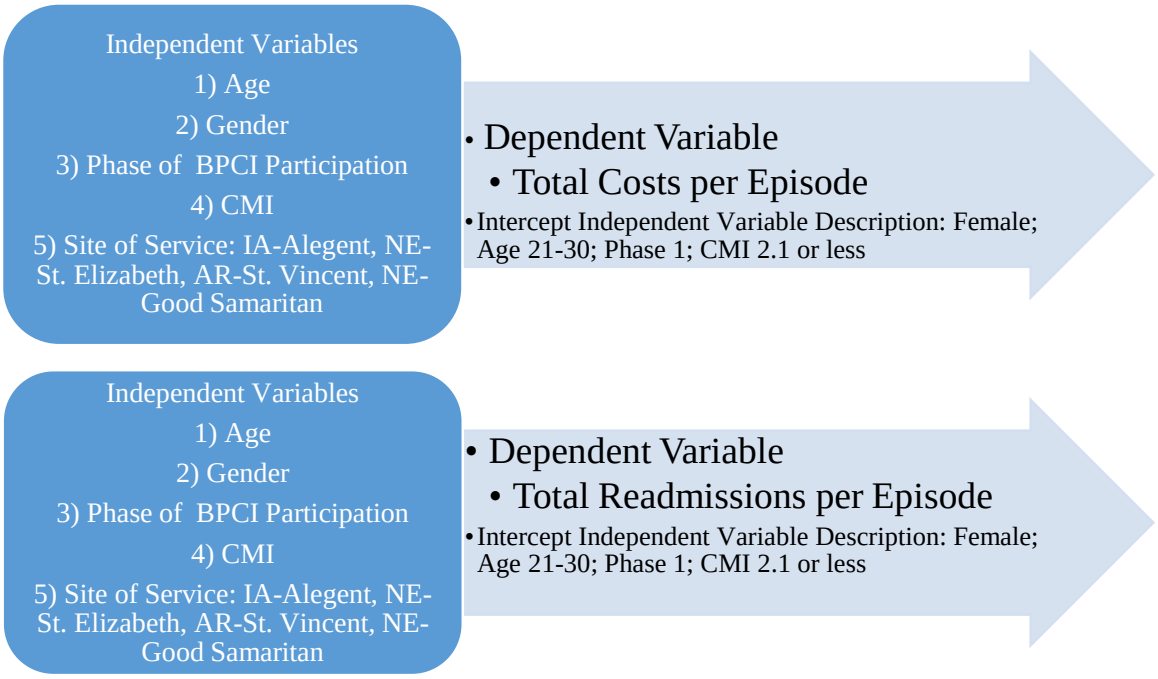


Figure 1: Conceptualized relationships among variables

REFERENCES

Altman, S. (2012). The lessons of Medicare's prospective payment system show that the bundled payment program faces challenges. *Health Affairs*, 31(9), 923-1930.

Aston, S., Rheault, W., Arenson, C., Tappert, S., Stoecker, J., Orzoff, J., Galitski, H., and Mackintosh, S. (2012). Interprofessional education: A review and analysis of programs from three academic health centers. *Academic Medicine*, 87, 949-955.

Averill, R., Goldfield, N., Hughes, J., Eisenhandler, J., & Vertrees, J. (2009). Developing a prospective payment system based on episodes of care. *Journal of Ambulatory Care Management*, 32, 241–251.

Baker, L., Egan-Lee, E., Martimianakis, T., and Reeves, S. (2011). Relationships of power: implications for interprofessional education. *Journal of Interprofessional Care*, 25 (2), 98-104.

Berkowitz, R., Schreiber, R., and Paasche-Orlow, M. (2012). Team improvement and patient safety conferences. *Journal of Nursing Care Quality*, 27(3), 259-265.

Berwick, D., DeParle, N., Eddy, D., Ellwood, P., Enthoven, A., Halvorson, G., Kizer, K., McGlynn, E., Reinhardt, U., Reischauer, R., Roper, W., Rowe, J., Schaeffer, L.,

Wennberg, J., and Wilensky, G. (2003). Paying for performance: Medicare should lead. *Health Affairs*, 22(6), 8-10.

Bertko, J. (2010). Response to achieving cost control, care coordination, and quality improvement through incremental payment system reform. *Journal of Ambulatory Care Management*, 33(1), 24-25.

Birkmeyer, J., Gust, C., Dimick, J., Birkmeyer, N., and Skinner, J. (2012). Hospital quality and the cost of inpatient surgery in the United States. *Annals of Surgery*, 255(1), 1-5.

Birkmeyer, J., Gust, C., Baser, O., Dimick, J., Sutherland, J. and Skinner, J. (2010). Medicare payments for common inpatient procedures: Implications for episode-based payment bundling. *Health Services Research*, 45(6), 1783-1795.

Borah, B., Rock, M., Wood, D., Roellinger, D., Johnson, M., & Naessens, J. (2012). Association between value-based purchasing score and hospital characteristics. *BMC Health Services Research*, 12(464), 1–12.

Bozie, K., Ward, L., Vail, T., and Maze, M. (2014). Bundled payments in total joint arthroplasy: Targeting opportunities for quality improvement and cost reduction. *Clinical Orthopedic and Related Research*, 472, 188-193.

Buntin, M., Colla, C., and Escarce, J. (2009). Effects of payment changes on trends in post-acute care. *Health Research and Educational Trust*, 44 (4), 1188-1210.

Burns, L., Housman, M., Booth, R., and Koenig, A. (2009). Implant vendors and

hospitals: Competing influences over product choice by orthopedic surgeons. *Health Care Management Review*, 34(1), 2-18.

Britt, L., Hoyt, D., Jasak, R., Jones, S., and Drapkin, J. (2013). Health care reform: Impact on American surgery and related implications. *Annals of Surgery*, 258(4), 517-526.

Butcher, L. (2011). Bundled payments come to oncology. *Oncology Times*. November 25, 15-16.

Catholic Health Initiatives. (2014). *CHI 2014-2018 strategic plan*. Retrieved from http://www.catholichealthinit.org/strategic-vision.

Center for Medicare and Medicaid Services. (2010). *Affordable Care Act update: Implementing Medicare cost savings*. Retrieved from http://www.cms.gov/apps/docs/ACA-Update-Implementing-Medicare-Costs-Savings.pdf.

Center for Medicare and Medicaid Services. (2013). *Bundled Payment for Care Improvement Initiative (BPCI) background on model 2 for prospective participants*. Retrieved from http://innovation.cms.gov/Files/x/BPCI_Model2Background.pdf.

Chandra, A., Dalton, M. and Holmes, J. (2013). Large increases in spending on post acute care in Medicare point to the potential for cost savings in these settings. *Health Affairs*, 32(5), 864-872.

Christopher, M. (2014). The role of nursing and population health in achieving the

triple aim. *Home Healthcare Nurse*, 32(8), 505-506.

Clement, R., Derman, P., Graham, D., Speck, R., Flynn, D., Levin, L. and Fleisher, L. (2013). Risk factors, causes and the economic implications of unplanned readmissions following total hip arthroplasty. *The Journal of Arthroplasty*, 28(1), 7-10.

Corbridge, S., Tiffen, J., Carlucci, M. and Zar, F. (2013). Implementation of an interprofessional educational model. *Nurse Educator*, 38(6), 261-264.

Cram, P., Lu, X., Kates, S., Singh, J., Li, Y., & Wolf, B. (2012). Total knee arthroplasty volume, utilization and outcomes among Medicare beneficiaries, 1991-2010. *Journal of the American Medical Association*, *308*(12), 1227–1236.

Cromwell, J., Dayhoff, D., and Thoumaian, A. (1997). Cost savings and physician responses to global bundled payments for Medicare heart bypass surgery. *Health Care Financing Review*, 19 (1), 41-57.

Cutler, D. and Ghosh, K. (2012). The potential for cost savings through bundled episode payments. *The New England Journal of Medicine*, 366(12). 1075-1077.

Dailey, E., Kasten, J., Chapman, J., and Lee, M. (2013). Risk factors for readmission of orthopaedic surgical patients. *Journal of Bone and Joint Surgery*, 95, 1012-1019.

Davis, K. (2007). Paying for care episodes and care coordination. *The New England Journal of Medicine*, 356 (11), 1166-1168.

Delisle, D. (2013). Big things come in bundled packages: Implications of bundled payment systems in health care reimbursement reform. *American Journal of Medical Quality, 28*(4), 339–344.

Dinan, M., Simmons, L., & Snyderman, R. (2010). Personalized health planning and the Patient Protection and Affordable Care Act: An opportunity for academic medicine to lead. *Health Care Reform*. *85*(11), 1665–1668.

Duckett, K. (2011). Care transitions: More important than ever and on the national agenda. *Home Healthcare Nurse*, 29 (10), 590-591.

Ferrario, C., Moore, M., & Copeland, L. (2009). The economic challenges in healthcare: The effect on quality. *The American Journal of the Medical Sciences, 337*(6), 391–393.

Fisher, E., Staiger, D., Bynum, J., and Gottlieb, D. (2007). Creating accountable care organization: The extended hospital medical staff. *Health Affairs*, 26(1): w44-w57.

Fong, P., Jackson, E., Churchwell, K., Steaban, R., Starmer, J., Johnson, D., McNeil, J., Klint, Z., Scalf, S., Parsons, C., Cortez, S., Christensen, D., French, T., and McPherson, J. (2011). Acute coronary syndrome pathways: Alignment with a bundled care reimbursement model. *Critical Pathways in Cardiology*, 10(1), 1-8.

Frankel, H., Butler, K., Cuschieri, J., Friese, R., Huynh, T., Mohr, A., Schinco, M. Napolitano, L., Britt, L.D., Coimbra, R., Croce, M., Davis, J., Jurkovich, G., Moore, E., Morris, J., Peitzman, A., Pruitt, B., Rozycki, G., Scalea, T., and

Meredith, J. (2012). The role and value of surgical critical care, and essential component of acute care surgery, in the affordable care act: A report from the critical care committee and board of managers of the american association for the surgery of trauma, 73(1), 20-26.

Froimson, M., Deadwiler, M., Schill, M., & Cousineau, K. (2013). Early results of a total joint bundled payment program: The BPCI initiative. Retrieved from http://www.ors.org/Transactions/60/2026.pdf.

Froimson, M., Rana, A., White, R., Marshall, A., Schutzer, S., Healy, W., Naas, P., Daubert, G., Iorio, R., and Parsley, B. (2013). Bundled payments for care improvement initiative: The next evolution of payment formulations: AAHKS bundled payment task force. *The Journal of Arthroplasty*, 28(1), 157-165.

Gaines, E. (2012). Payment reforms and gain sharing models: Does the risk outweigh the reward? *Emergency Medicine News*, November 15, 1-3.

Ginsburg, P. (2013). Achieving health care cost containment through provider payment reform that engages patients and providers. *Health Affairs*, 32(5). 929-934.

Graham, J., Deutsch, A., O'Connell, A., Karmarkar, A., Granger, C., and Ottenbacher, K. (2013). Inpatient rehabilitation volume and functional outcomes in stroke, lower extremity fracture, and lower extremity joint replacement. *Medical Care*, 51(5), 404-412.

Guterman, S. and Schoenbaum, S. (2010). Getting from here to there in payment

reform: Necessary practices and policies. *Journal of Ambulatory Care Management,* 33(1), 52-57.

Hackbarth, G., Reischauer, R., & Mutti, A. (2008). Collective accountability for medical care- toward bundled Medicare payments. *The New England Journal of Medicine*, *3559*(1), 3–5.

Hader, R. (2012). Healthcare delivery: Which way do we go? *Nursing Management*, September, 33-36.

Herbold, J., Bonistall, K., and Walsh, M. (2011). Rehabilitation following total knee replacement, total hip replacement, and hip fracture: A case-controlled comparison. *Journal of Geriatric Physical Therapy*, 24,155-160.

Herman, B. (2013). *The bundled payments for care improvement program: A hospital analysis*. Retrieved from Becker's Hospital Review website: http://www.beckershospitalreview.com.

Hockenberry, J., Burgess, J., Glasgow, J., Vaughan-Sarrazin, M., and Kaboli, P. (2013). Cost of readmission: Can the Veterans Health Administration (VHA) experience inform nation payment policy, *Medical Care*, 51(1), 13-19.

Hussey, P., Sorbero, M., Mehrotra, A., Liu, H., and Damberg, C. (2009). Episode-based performance measurement and payment: Making it a reality. *Health Affairs*, 28(5), 1406-1417.

Jorgensen, C., and Kehlet, H. (2013). Role of patient characteristics for fast-track hip and knee arthroplasty. *British Journal of Anaesthesia*, 110(6), 972-980.

Kaprielian, V., Silberberg, M., McDonald, M., Koo, D., Hull, S., Murphy, G., Tran, A., Sheline, B., Halstater, B., Martinez-Bianchi, V., Weigle, N., Strand de Oliveira, J., Sangvai, D., Copeland, J., Tilson, H., Scutchfield, F., and Michener, L. (2013). Teaching population health: A competency map approach to education. *Academic Medicine*, 88, 626-637.

King, M. (2013). Affordability, accountability, and accessibility in health care reform: Implications for cardiovascular and pulmonary rehabilitation. *Journal of Cardiopulmonary Rehabilitation and Prevention*, *33*, 144–152.

Levine, M. (September, 2014). *Providing value: Delivery System Innovation*. Presented at Catholic Health Learning Lab, Denver, CO.

Lowell, K. and Bertko, J. (2010). The accountable care organization (ACO) model: Building blocks for success. *Journal of Ambulatory Care Management*, 33(1), 81-88.

Martin, D. (2014). Interprofessional teams in the patient-centered medical home. *Nursing Administration Quarterly*, 38 (3). 214-220.

McIntyre, L. (2013). Exploring new practice models delivering orthopedic care: Can we significantly decrease delivery costs and improve quality? *Sports Medicine Arthroscopy Review*, 21(3), 152-154.

Mead, H., Grantham, S., and Siegel, B. (2014). Improving cardiovascular care through

outpatient cardiac rehabilitation: An analysis of payment models that would improve quality and promote use. *Journal of Cardiovascular Nursing*, 29(2), 158-164.

Mechanic, R. and Altman, S. (2009). Payment reform options: Episode payment is a good place to start. *Health Affairs*, 2 (2), w262-w271.

Mechanic, R. (2011). Opportunities and challenges for episode-based payment. *The New England Journal of Medicine*, 365(9), 777-779.

Miller, D., Gust, C., Dimick, J., Birkmeyer, N., Skinner, J., and Birkmeyer, J. (2011). Large variations in Medicare payments for surgery highlight savings potential from bundled payment programs, *Health Affairs*, 30(11), 2107-2115.

Miller, H. (2009). From volume to value: Better ways to pay for health care. *Health Affairs*, 28(5), 14-18.

Millenson, M., DiGioia, A., Greenhouse, P., and Swieskowski, D. (2013). Turning patient-centeredness from ideal to real: Lessons from 2 success stories. *Journal of Ambulatory Care Management*, 36(4), 319-334.

Pappas, S. (2013). Value, a nursing outcome. *Nursing Administration Quarterly*, *37*(2), 122–128.

Pecukonis, E., Doyle, O., and Bliss, D. (2008). Reducing barriers to interprofessional training: Promoting interprofessional cultural competence. *Journal of Interprofessional Care*, 22(4), 417-428.

Pham, H., Schrag, D., O'Malley, A., Wu, B., and Bach, P. (2007). Care Patterns in Medicare and their implications for pay for performance. *The New England Journal of Medicine*, 356(11), 1130-1139.

Pine, M., Fry, D., Jones, B., Meimban, R., and Pine, G. (2010). Controlling costs without compromising quality: Paying hospitals for total knee replacement. *Medical Care,* 48(10), 862-868.

Piper, L., (2013). The affordable care act: The ethical call for value-based leadership to transform quality. *The Health Care Manager*, 32(2), 227-232.

Riegel, B., Carlson, B., Kopp, Z., LePetri, B., Glaser, D., and Unger, A. (2002). Effect of a standardized nurse case-management telephone intervention on resource use in patients with chronic heart failure. *Archives of Internal Medicine*, 162 (March 25), 705-712.

Robinson, J. (2013). Case studies in orthopedic surgery in California: The virtues of care coordination versus specialization. *Health Affairs*, 32(5). 921-928.

Rosenthal, M., Landon, B., Normand, S., Frank, R., and Epstein, A. (2006). Pay for performance in commercial HMOs. *The New England Journal of Medicine*, 355 (18), 1895-1902.

Rosenthan, M., Frank, R., Li, Z., and Epstein, A. (2005). Early experience with pay-for-

performance: From concept to practice. *Journal of American Medical Association*, 294(14), 1788-1793.

Ryan, A. and Doran, T. (2012). The effect of improving processes of care on patient outcomes: Evidence from the United Kingdom's quality and outcomes framework. *Medical Care*, 50(3), 191-199.

Saucedo, J., Marecek, G., Wanke, T., Lee, J., Stulberg, S., and Puri, L. (2014). Understanding readmissions after primary total hip and knee arthroplasty: Who's at risk? *The Journal of Arthroplasty*, 29, 256-260.

Schairer, W., Sing, D., Vail, T., and Bozie, K. (2014). Causes and frequency of unplanned readmission after total hip arthroplasty. *Clinical Orthopedic and Related Research*, 472, 464-470.

Shih, T., Nicholas, L., Thumma, J., Birkmeyer, J., and Dimick, J. (2014). Does pay-for-performance improve surgical outcomes? An evaluation of phase 2 of the Premier Hospital Quality Incentive Demonstration, *Annals of Surgery*, 259(4), 677-681.

Shomaker, T. (2010). Health care payment reform and academic medicine: Threat or opportunity? *Academic Medicine*, *85*(5), 756–758.

Sood, N., Huckfeldt, P., Escarce, J., Grabowski, D., and Newhouse, J. (2011). Medicare's bundled payment pilot for acute and post-acute care: Analysis and recommendations on where to begin. *Health Affairs*, 30(9), 1708-1717.

Sweeney, J. (2013). Postoperative complications and hospital readmissions in surgical

patients. *Annals of Surgery*, 258(1), 19-20.

Steffens, L., Thomas, K., Jaeger, S., Barker, K., Hermann, S., and Eggleston, A. (2009). Hospital readmission: The move toward pay for performance. *Journal of Nursing Administration*, 39(11), 462-464.

Tayne, S., Merrill, C., Smith, E., and Mackey, W. (2014). Predictive risk factors for 30-day readmissions following primary total joint arthroplasty and modification of patient management. *The Journal of Arthroplasty*, 05(23), 1-5.

Tian, W., DeJong, G., Munin, M., & Smout, R. (2010). Patterns of rehabilitation after hip arthroplasty and the association with outcomes. *American Journal of Physical Medicine Rehabilitation, 89*, 905–922.

Thistlethwaite, J., Forman, D., Matthews, L., Rogers, G., Steketee, C., and Yassine, T. (2014). Competencies and frameworks in interprofessional education: A comparative analysis. *Academic Medicine*, 89(6), 869-875.

Treadwell, J. and Giardino, A. (2014). Collaborating for care: Initial experience of embedded case managers across five medical homes. *Professional Case Management*, 19(2), 86-92.

Ugiliweneza, B., Kong, M., Nosova, K., Huang, K., Babu, R., Lad, S., and Boakye, M. (2014). Spinal surgery: Variations in health care costs and implications for episode-based bundled payments. *SPINE*, 39(15), 1235-1242.

Vetter, T., Boudreaux, A., Jones, K., Hunter, J., & Pittet, J. (2014). The perioperative surgical home: How anesthesiology can collaboratively achieve and leverage the triple aim in health care. *Anesthesia and Analgesia*, *118*(5), 1131–1136.

Vetter, T. (2013). Tighten your belts! Reduce your transfusion costs with preoperative management of anemic patients. *International Anesthesia Research Society*. 2013 Review Course Lectures, 51-57.

Weeks, W., Rauh, S., Wadsworth, W., and Weinstein, J. (2013). The unintended consequences of bundled payments. *Annals of Internal Medicine,* 158, 62-64.

Wennberg, J., Fisher, E. and Skinner, J. (2002). Geography and the debate over Medicare reform. *Health Affairs,* 2002, w96-w114.

Wennberg, J., Fisher, E., Skinner, J., and Bronner, K. (2007). Extending the P4P agenda: Part 1: How Medicare can improve patient decision making and reduce unnecessary care. *Health Affairs*, 26(6), 1564-1574.

Wennberg, J., Fisher, E., Skinner, J., and Bronner, K. (2007). Extending the P4P Agenda: Part 2: How Medicare can reduce waste and improve the care of the chronically ill. *Health Affairs*, 26(6), 1575-1585.

Whitehead, C. 2007. The doctor dilemma in interprofessional education and care: how and why will physicians collaborate? Medical Education. 41:1010-1016.

Wong, F., Chow, S., Chan, T., and Tam, S. (2014). Comparison of effects between home

visits with telephone calls and telephone calls only for transitional discharge support: a randomized controlled trial. *Age and Ageing*, 43, 91-97.

APPENDICES

Figure 1: BPCI Model 2: Key Roles

Key Roles	BPCPI Program Responsibilities
CHI: BPCI Oversight Steering Committee	Manage the operations of BPCI Model 2 and oversee all MBO participants in the program, including: • Operational oversight of care redesign • Governance and oversight of BPCI shared savings pools • Governance and oversight of BPCI Episode Initiator (EI) performance • Governance and oversight of BPCI participating physician performance Conduct oversight and approvals to ensure that Awardees, EpisodeInitiators,EIPs, Gain sharers are in compliance with the terms and conditions of the Agreement, including development and reporting of required policies, procedures, program operations and quality metrics.
CHI: Program Director	Operational oversight of the care redesign; Serves an internal consultant to the local market BPCI teams to assist in launching and maintaining BPCI programs; Shares best practice learnings and lessons learned for all teams participating in the BPCI program
CHI: Financial Analyst	Provides analysis of BPCI results; Completed quarterly gain sharing reports for the local markets and the local physicians participating in the program
CHI: Data Analyst/Reporting	Provides monthly reports to the BPCI teams on key indicators of the program for tracking success and opportunities for improvement

Local Market: Project Manager/Lead	Provides daily oversight to the BPCI project; Ensures that all required steering committee meetings are held; Reports required CHI BPCI program tracking to CHI Program Director
Local Market: Physician Champion and Leader of the Steering Committee	Provides leadership for the care redesign activities; Provides leadership for the steering committee
Local Market: Continuing Care Network Leader	Develops the CCN for the market, establishes quality metrics for CCN participants and tracks metrics for performance
Local Market: Acute Hospital Care Management Team	Provides discharge planning services
Local Market: Care Management Navigators	Provided pre-op and post-op navigation for the BPCI participants for 120 days following surgery
Local Market: Pre-Op Education Coordinator	Leads the required pre-op education course for participants/family members
Local Market: Interdisciplinary Team: Nursing, Therapy, Pre-Op team, Hospitalists/PCP's; Pharmacy	Serves on the steering committee and works as a team to ensure the BPCI participants have a highest quality and highest satisfaction possible

Figure 2: ANOVA: Total Cost Per Episode: DRG 469/470

The ANOVA Procedure

Class Level Information		
Class	**Levels**	**Values**
Phase	2	0 1

Number of Observations Read	2603
Number of Observations Used	2603

The ANOVA Procedure

Dependent Variable: Total_Allowed_Per_Episode Total Allowed Per Episode

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	7224322679.8	7224322679.8	32.15	<.0001
Error	2601	584406007853	224685124.13		
Corrected Total	2602	591630330532			

R-Square	Coeff Var	Root MSE	Total_Allowed_Per_Episode Mean
0.012211	63.69377	14989.50	23533.70

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Phase	1	7224322680	7224322680	32.15	<.0001

Scheffe's Test for Total_Allowed_Per_Episode

Note: This test controls the Type I experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	2601
Error Mean Square	2.2469E8
Critical Value of F	3.84504
Minimum Significant Difference	1152.4
Harmonic Mean of Cell Sizes	1301.111

Note: Cell sizes are not equal.

Means with the same letter are not significantly different.			
Scheffe Grouping	**Mean**	**N**	**Phase**
A	25171.1	1324	1
B	21838.7	1279	2

Observations:

1. Statistically significant difference exists between the mean of phase I and Phase II populations based on Total allowed per episode.
2. Phase I participants have a higher average total allowed per episode ($25,171) as compared to Phase II participants ($21,838).
3. Confidence interval would be 95% and p value for this test is <0.0001

ANOVA: Total Costs per Episode (Summary)

Participation Phase	Total Sample Size	Total Costs
Phase 1	1,324	$25,171
Phase 2	1,279	$21,838
Cost Reduction per Episode	1,279 Episodes	$(3,333)
CHI Total Cost Reduction[a]	1,279 Episodes	$4,262,907

Notes:[a]CMS cost savings reduction reflects total difference from Phase 1 CMS allowed payments and Phase 2 CMS allowed payments.
F Value= 32.15; Pr > F= <.0001; Confidence interval is 95%; and p value is <0.0001

Figure 3: Framework for Post-Acute Interventions by Care Management Navigators

Timing of Intervention	Focus of Intervention	Common Findings
5-7 days prior to Surgery	Prep for Operation	Anxiety about Surgery
Joint Academy Course	Discharge Planning	Unresolved support issues
Inpatient Interview—While in Hospital (1st day after surgery)	Prep for transition to home	Pain; Anxiety about transition to home
48 hours after hospital discharge	Home plan of care; Any unexpected issues	Pain—increasing as surgical meds have worn off; Constipation; Reminders to use ice packs; Follow-up needed on medication reconciliation; Unsure of post-op appointment information—need reminder
7-10 days after hospital discharge	Surgical recovery	Pain; Reminders to use ice packs; Constipation; Leaking bandage; Follow-up needed on medication reconciliation
Post-First OR Physician Visit (Usually 14-21 days after discharge)	Any changes to treatment plan	Clarification of appt. overview
30-days after discharge	Surgical recovery process; Return of mobility	Mobility restriction questions
60-days after discharge	Return of mobility and independence	Return of independence; Patient satisfaction with the process
90-days after discharge	Plans for return to normal activities	Return of independence; Patient satisfaction with the process
120-days after discharge	Completion of care plan	Patient satisfaction; Closure of the episode with the care manager
*Additional Calls at Discretion of the Care Managers	Follow-Up on issues that are voiced as concerns by patient/family/treatment team	Varies
*Incoming Calls: From Patients/Families	Unexpected developments	Unable to find post-op appt. information or post-op recovery instructions

Figure 4: ANOVA Total Readmissions Rates Per Episode: DRG 469/470

Dependent Variable: Readmit_count Readmit_count

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.0726248	0.0726248	0.57	0.4512
Error	2601	332.6788158	0.1279042		
Corrected Total	2602	332.7514406			

R-Square	Coeff Var	Root MSE	Readmit_count Mean
0.000218	378.4264	0.357637	0.094506

Source	DF	Anova SS	Mean Square	F Value	Pr > F
Phase	1	0.07262482	0.07262482	0.57	0.4512

The ANOVA Procedure

Scheffe's Test for Readmit_count

Note: This test controls the Type I experimentwise error rate.

Alpha	0.05
Error Degrees of Freedom	2601
Error Mean Square	0.127904
Critical Value of F	3.84504
Minimum Significant Difference	0.0275
Harmonic Mean of Cell Sizes	1301.111

Means with the same letter are not significantly different.

Scheffe Grouping	Mean	N	Phase
A	0.09970	1324	1
A			
A	0.08913	1279	2

Observations:

1. No Statistically significant difference exists between the mean of phase I and Phase II populations based on readmissions.
2. Phase I participants have a slightly higher average readmit count (0.099)as compared to Phase II participants (0.089).

ANOVA: Total Readmissions per Episode (Summary)

Participation Phase	Total Sample Size	Total Readmissions
Phase 1	1,324	0.09970
Phase 2	1,279	0.08913
Readmission Reduction	1,279 Episodes	0.01
CHI Total	1,279 Episodes	0.01

Note: F Value= 0.57; Pr > F= <.4512

Figure 5: Navigator Call Script Example: 48 hour post-discharge call

TAV Health

CHI St. Vincent
Imagine better health.℠

St. Vincent Joint Bundle
Patient Name:
Patient Contact Number:

Date: Time: Whom you spoke to :

Questions: **Is this a good time?**

1. Overall assessment of health status since discharge: "How are you feeling since your discharge? What's going well and what's not going well?"
2. I understand that your follow-up appointment with Dr. _____ is scheduled for _____ (confirm) Yes No
3. How will you get to your appointment? *(Discuss barriers).
4. **(Knee replacement only)** How are your daily outpatient physical therapy appointments going? *(Discuss barriers).
5. **(Hip replacement only)** How are things going with the exercises you were instructed to do? What's it been like following your hip precautions? *(Discuss barriers).
6. How is your dressing/bandage covering your incision? – Dr. Edwards & Barnes still in intact? Newbern – intact or changing?
7. How is your mobility since you've been home?
8. How were you able to fill your prescriptions? *(Discuss barriers).
9. Sometimes people have side effects from the pain medication. One of the most common side effects is constipation. What has your experience been? *(Advise patient about stool softeners, etc.)

10. Blood Clot Prevention: If you are using the AC machine, how has it been? What have you been told about taking a baby aspirin? How is that going? How long are you supposed to take it? *(Discuss barriers).

OR-I see that you've been discharged with a blood thinner medication? How is that going? Are you taking your blood thinner as prescribed? (Discuss barriers).

11. What questions might you have: **(if clinical)

12. What, if anything, are you having trouble doing or not doing?

13. What else can I assist you with? *

14. What are your plans if you should develop a fever or your pain medication is not working? What if you fell?

15. Can I go over important signs to look out for? (asking permission) High-risk signs include chest pain or pressure, sudden difficulty breathing, stroke like symptoms i.e. drooping of mouth, weakness on one side, slurring of words. Should any of theses symptoms occur you should call 911.

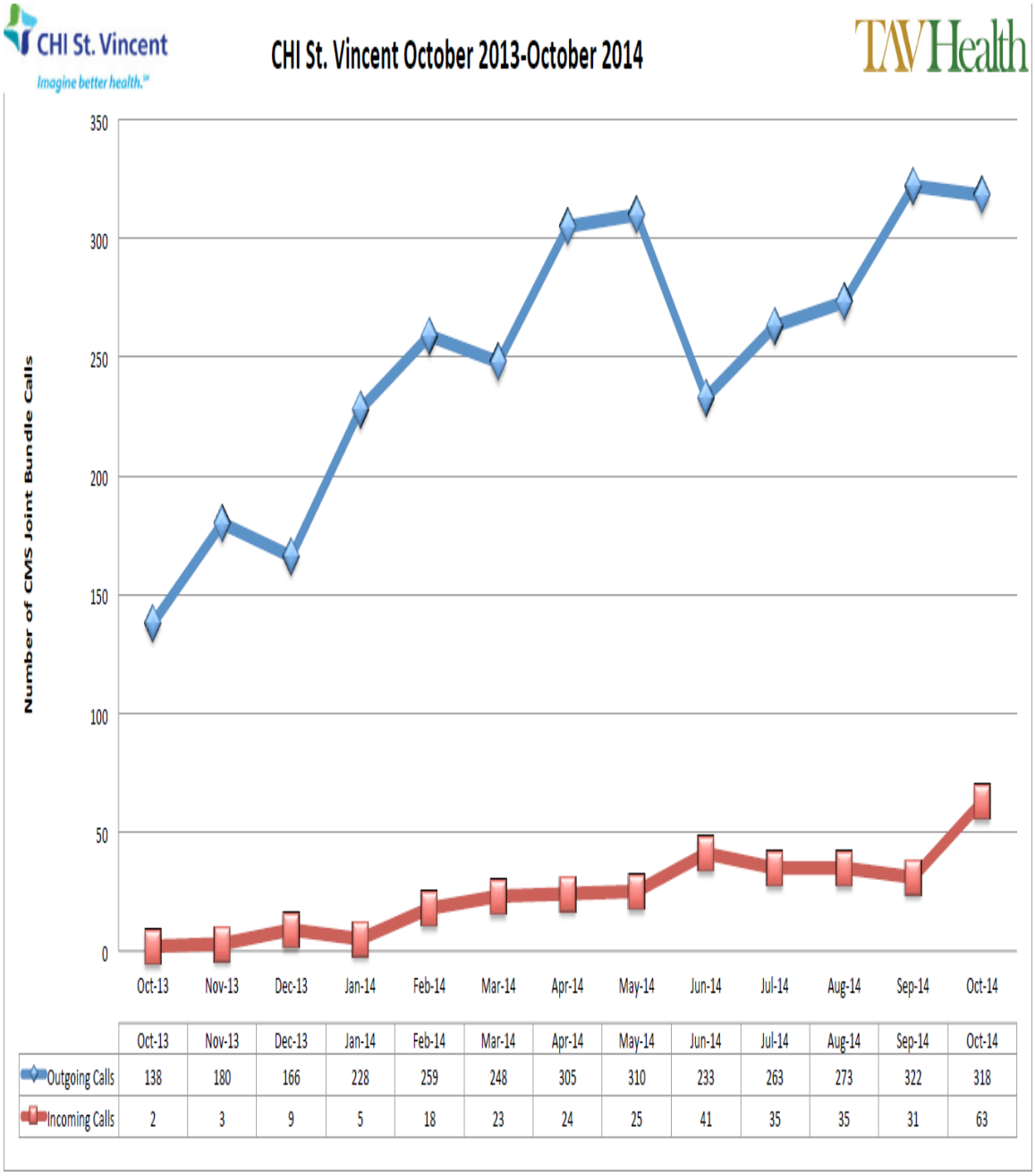
16. If anything should occur after hours, you can call Joint Academy Hotline: (516) 986-7846 or 501-663-6300 to reach the medical exchange.

17. Just a reminder, should you have to go to the ED or get readmitted, please let us know. You can leave Just a reminder, should you have to go to the ED or get readmitted, please let us know. You can leave a message at 501-552-3861 or 552-3858 and we will follow up with you.

All * require corrective action
All ** require referral to NP

Note: Provided by TAVHealth

Figure 6: Volume of Patient Engagement Calls: Incoming/Outgoing: St. Vincent Medical Center, Little Rock AR



	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14	Oct-14
Outgoing Calls	138	180	166	228	259	248	305	310	233	263	273	322	318
Incoming Calls	2	3	9	5	18	23	24	25	41	35	35	31	63

Note: Provided by TAVHealth

Figure 7: Continuing Care Network: Expectations of SNF Partners

CHI Nebraska (Example)
Skilled Nursing Facility (SNF) Credentialing Criteria for Participation in Continuing Care Network (CCN) of the CHI Clinically Integrated Network (CCN) Nebraska
1. Easy access for hospital's patient discharges
This means geographic proximity to the hospitals' primary service areas from which that hospitals draw the majority of their patients; the ability to have a firm commitment to the hospital(s) for admission to the skilled nursing facility within two hours of notification of patient day and time of discharge; facility readiness to admit a patient 24/7, including emergent admissions on weekends, evenings and nights, and, immediate access to the patient's room, upon ambulance arrival at the facility.
2. Compliance with federal and state regulations
This means survey deficiencies that are less than average for Nebraska (6.5 as of August 2013), and no deficiencies in previous three years that would place the facility in immediate jeopardy or cause actual harm to residents (i.e., no G level or higher level of deficiencies); no civil money penalties in past three years.
3. Meets or exceeds median for federal quality standards
This means achieving at least a three star rating overall and in each of three categories as shown on the Centers for Medicare and Medicaid's (CMS's)Nursing Home Compare website (Ratings are based on results of inspections, nursing staffing levels and quality indicators).
4. **Thirty-day hospital readmissions rate** at or below national, state or CIN Nebraska norms whichever is lowest. Currently, CIN Nebraska expects the rate of 30 day readmissions from SNFs to be no greater than 10%.
5. Medical Staff
Attending physicians at the skilled nursing facility shall include one or more primary care physicians and extenders that are part of hospital's physician network. This criterion will become relevant when the SNFist program in Lincoln is launched.
6. **Medicare or Short Stay or Sub acute Unit**
Facility must have a unit dedicated to short stay post-acute patients who require short term skilled nursing or rehabilitative services prior to returning home.
7. **RN Care Providers** To assure that the skilled nursing facilities in the CCN can effectively manage the care of hospitals' patient discharges, skilled nursing facilities must have an RN providing care in the Medicare/Short Stay/Sub acute Unit 24/7.
8. **Nursing Ratios** While nursing staffing levels are encompassed with CMS's Five Star rating

system, skilled nursing facilities in the CCN must have a ratio of at least one RN to 15 Medicare A or A/B patients to best assure quality outcomes.
9. **Seven Day Therapies** Skilled nursing facilities in the CCN must provide necessary therapies to Medicare A or A/B patients in the short stay/sub acute/Medicare unit seven days a week to assure that patients are actively engaged in their skilled nursing and therapies throughout their stay. This includes twice a day therapies seven days per week.
10. **Medicare A or A/B Patient Average Length of Stay** For post-acute patients, skilled nursing facilities in the CCN must have an average length of stay (ALOS)for Medicare patients that is at or less than 21 days. For patients with joint replacements who were discharged as MS-DRG 469 or 470, SNF ALOS is expected to be ≤ 9 days.
11. **Discharge to Community** For post-acute patients, skilled nursing facilities in the CCN must discharge at least 60% of short-stay Medicare patients (not formerly long-term care residents) to the community.
12. **Use of Interact and 3.0 Tools** Skilled nursing facilities in the CCN must actively use the Interact 3.0 tools (fully implemented and used effectively by all nursing staff), including the advance care planning tools. **INTERACT** (**Inter**ventions to **R**educe **A**cute **C**are **T**ransfers) is a quality improvement program that focuses on the management of acute change in a skilled nursing facility patient's condition. It includes clinical and educational tools and strategies for use in every day practice in skilled nursing facilities. The goal of INTERACT is to improve care and reduce the frequency of potentially avoidable transfers to the acute hospital.

Note: Provided by CHI

Table 1: BPCI: Summary of Program Models

	Model 1: Retrospective Acute-Care Hospital Stay Only	Model 2: Retrospective Acute Hospital Stay plus Post-Acute Care	Model 3: Retrospective Post-Acute Care Only	Model 4: Prospective Acute Care Hospital Stay Only
Episode	All MS-DRGs	Selected DRG's + Post-Acute Care	Post-acute only for selected DRGs	Selected DRGs
Services Included in the bundle	Part A services during the inpatient stay	Part A and B services during the inpatient stay, post-acute period and readmissions	Part A and B services during the post-acute period and readmissions	All Part A and B services (hospital, physician) and readmissions
Payment	Retrospective	Retrospective	Retrospective	Prospective

Note: Levine, M. (September, 2014). *Providing value: Delivery System Innovation*. Presented at Catholic Health Learning Lab, Denver, CO.

Table 2: BPCI: Clinical Episodes

Acute myocardial infarction	Major bowel procedure
Lower extremity and humerus procedure except hip, foot, femur	Major cardiovascular procedure
AICD	Major joint replacement of the lower extremity
Amputation	Major joint replacement of the upper extremity
Artherosclerosis	Medical non-infectious orthopedic
Back and neck except spinal fusion	Medical peripheral vascular disorders
Coronary artery bypass graft	Nutritional and metabolic disorders
Cardiac defibrillator	Other knee procedures
Cardiac valve	Other respiratory
Cellulitis	Other vascular surgery
Cervical spinal fusion	Pacemaker
Chest pain	Pacemaker device replacement or revision
Combined anterior posterior spinal fusion	Percutaneous coronary intervention
Complex non-cervical spinal fusion	Red blood cell disorders
Chronic obstructive pulmonary disease, bronchitis, asthma	Removal of orthopedic devices
Diabetes	Renal failure
Double joint replacement of the lower extremity	Revision of the hip or knee
Esophagitis, gastroenteritis and other digestive disorders	Sepsis
Fractures of the femur and hip or pelvis	Simple pneumonia and respiratory infections
Gastrointestinal hemorrhage	Spinal fusion (non-cervical)
Gastrointestinal obstruction	Stroke
Hip and femur procedures expect major joint	Syncope & collapse
Transient ischemia	Urinary tract infection

Note: Center for Medicare and Medicaid Services. (2013). *Bundled Payment for Care Improvement Initiative (BPCI) background on model 2 for prospective participants*. Retrieved from http://innovation.cms.gov/Files/x/BPCI_Model2Background.pdf.

Table 3: Summary of BPCI Model 2: Retrospective Acute Care Hospital Stay Plus Post-Acute Care

Examples of organizations that may participate in Model 2	• Acute care hospitals • Health systems • Physician hospital organizations • Physician group practices • Conveners of health care providers
Entities that can initiate episodes in Model 2	• Acute care hospitals • Physician group practices
Criteria for beneficiary inclusion in episode	• The beneficiary is eligible for Part A and enrolled in Part B • Receives inpatient hospital care at an Episode Initiator • The beneficiary must not have End Stage Renal Disease • The beneficiary must not be enrolled in any managed care plan (for example, Medicare Advantage) • The beneficiary must not be covered under United Mine Workers; and • Medicare must be the primary payer
Start of episode	• Acute care hospital admission by Episode Initiator for included clinical conditions (identified via MS-DRG)
End of episode	• 30, 60, or 90 days after hospital discharge
Types of services included in bundle, which include broad episode categories	• Physicians' services • Inpatient hospital services • Inpatient hospital readmission services • Long term acute hospital services (LTHC) • Inpatient rehabilitation facility services (IRF) • Skilled nursing facility services (SNF)

	• Home health agency services (HHA) • Hospital outpatient services • Independent outpatient therapy services • Clinical laboratory services • Durable medical equipment • Part B drugs
Payment to CMS to Providers and Suppliers	• Traditional FFS payments
Discount provided to Medicare are defined by episode length	• 3% discount for episodes of 30 or 60 days in length • 2% discount for episodes 90 days in length
Reconciliation	• Medicare pays the Awardee the difference between the target price and the actual cost of care for an episode if the actual cost is less than the target price. If the actual cost of care exceeds the target price, the Awardee pays Medicare the difference between the target price and actual spending

Note: Center for Medicare and Medicaid Services. (2013). *Bundled Payment for Care Improvement Initiative (BPCI) background on model 2 for prospective participants*. Retrieved from http://innovation.cms.gov/Files/x/BPCI_Model2Background.pdf.

Table 4: BPCI: Phase Summary (Models 2-4)

Phase 1	Phase 2
Phase 1 represents the initial period of participant preparation for implementation and assumption of financial risk	Phase 2 is the risk-bearing period
Selection is based on CMS' review and acceptance of proposed care redesign plans and program integrity screening	To move into Phase 2 as an Awardee, participants must be offered an agreement by CMS following a comprehensive review and enter into an agreement with CMS
Participants receive: ➢ Monthly beneficiary-level claims data ➢ Engagement in variety of learning activities with other BPCI Phase 1 participants ➢ Baseline pricing information to inform assessments of opportunities under BPCI	Agreements allow awardees to: ➢ Bear financial risk for the model ➢ Continue receiving monthly beneficiary-level claims data ➢ May utilize applicable fraud and abuse waivers and payment policy waivers (i.e. gain sharing)

Note: Levine, M. (September, 2014). *Providing value: Delivery System Innovation*. Presented at Catholic Health Learning Lab, Denver, CO.

Table 5: Comparison of Payment Reform Models

	Accountable Care Organization (Shared Savings/MSSP)	Primary Care Medical Home (PCMH)	Bundled Payments	Partial Capitation	Full Capitation
General Strengths and Weaknesses	Makes providers accountable for total costs; Does not require patient "lock-in"; Reinforced by other reforms to promote coordinated care	Supports primary care coordination of care, but does not provide accountability for total costs of care	Promotes efficiency and care coordination within an episode, but not total costs of care	Provides upfront payments, but only hold accountable for services that fall under partial capitation	Provided upfront payment and makes providers accountable for costs, but requires patients to "lock-in"
Strengthens primary care directly or indirectly	Yes	Yes	Yes/No—Only for bundled payments that result in support for primary care	Yes	Yes
Fosters Coordination Among All Participating Providers	Yes	No—Only primary care providers are incentivized	Yes	Yes	Yes
Removes payment incentives to increase volume	Yes	No	No	Yes/No—Strong efficiency incentive for services that are part of model	Yes
Fosters accountability for total per-capita costs	Yes	No	Yes, within episode	Yes	Yes

Requires providers to bear risk for excess costs	No	No	Yes, within episode	Yes	Yes
Requires "lock-in" of patients to specific providers	No	Yes	No	Yes—for some depending on model	Yes

Note: Lowell, K. and Bertko, J. (2010). The accountable care organization (ACO) model: Building blocks for success. *Journal of Ambulatory Care Management*, 33(1), 81-88.

Table 7: BPCI Phase 2: Regression Analysis: Total Costs Per Episode

Regression Analysis Testing

Regression results with Total Allowed per Episode as Dependent Variable	
F value	87.27
p value	<0.0001
R-square	0.19

Variable	Description/Observations
Intercept	Total allowed per episode for a female in age category 21-30, in Phase 1, with CMI of 2.1
Age	With every 1 unit increase in age category (so from 21-30 category to 31-40 category and so
Gender	Allowed per Episode is lower for Males
Phase	Allowed per episode is lower for Phase II
CMI	Allowed per episode is higher for participants with higher CMI of 3.4
Mercy	Participants from Mercy facility have lower allowed per episode by the parameter estimate
Elizabeth	Participants from Elizabeth facility have lower allowed per episode by the parameter estimat
Vincent	Participants from Vincent facility have lower allowed per episode by the parameter estimate
Good Sam	Participants from Good Sam facility have lower allowed per episode by the parameter estima

Table 8: BPCI Phase 2: Regression Analysis: Total Readmissions per Episode

Regression results with Readmit Count as Dependent Variable	
F value	5.27
p value	<0.0001
R-square	0.014

Variable	Description/Observations
Intercept	Readmit count for a female in age category 21-30, in Phase 1, with CMI of 2.1 (Not signific
Age	With every 1 unit increase in age category (so from 21-30 category to 31-40 category and so
Gender	No effect of Gender on Readmit count
Phase	No Effect of Phase on Readmit count
CMI	Readmit count is higher for participants with higher CMI of 3.4
Mercy	No effect of Facility on Readmit count
Elizabeth	No effect of Facility on Readmit count
Vincent	No effect of Facility on Readmit count
Good Sam	No effect of Facility on Readmit count

Table 9: Descriptive Statistics of Sample

Description of Sample

Sample	Total Count	% of Sample
Total Sample Count	2,603	100%
Female	1,646	63%
Male	957	37%
Phase 1 Episodes	1,324	51%
Phase 2 Episodes	1,279	49%
CMI 2.1 or less	2,486	95%
CMI 3.4 or more	117	5%
Age 21-30	2	<1%
Age 31-40	7	<1%
Age 41-50	41	2%
Age 51-60	97	4%
Age 61-70	808	31%
Age 71-80	1,099	42%
Age 81-90	484	19%
Age 90-100	65	2%
IA: Alegent Mercy	365	14%
NE: Good Samaritan	669	26%
NE: St. Elizabeth	815	31%
AR: St. Vincent	754	29%