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The "Hip Fracture" Bundle—Experiences, Challenges, and Opportunities

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Abstract

Introduction: With growing popularity and success of alternative-payment models (APMs) in elective total joint arthroplasties, there has been recent discussion on the probability of implementing APMs for geriatric hip fractures as well. **Significance:** Despite the growing interest, little is known about the drawbacks and challenges that will be faced in a stipulated "hip fracture" bundle. **Results:** Given the varying intricacies and complexities of hip fractures, a "one-size-fits-all" bundled payment may not be an amenable way of ensuring equitable reimbursement for participating physicians and hospitals. **Conclusions:** Health-policy makers need to advocate for better risk-adjustment methods to prevent the creation of financial disincentives for hospitals taking care of complex, sicker patients. Hospitals participating in bundled care also need to voice concerns regarding the grouping of hip fractures undergoing total hip arthroplasty to ensure that trauma centers are not unfairly penalized due to higher readmission rates associated with hip fractures skewing quality metrics. Physicians also need to consider the launch of better risk-stratification protocols and promote geriatric comanagement of these patients to prevent occurrences of costly adverse events.

Keywords

fragility, fractures, trauma surgery, geriatric trauma, economics of medicine, adult reconstructive surgery

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Introduction

Hip fractures in the elderly individuals are a major public health concern in the United States. An estimated 150 000 to 330 000 hospitalizations for hip fractures occur each year,[1-4] with an annual direct and indirect cost burden of US$17 to US$25 billion.[3,5] Given the increase in the elderly population across the nation, it is estimated that, by 2040, the incidence of hip fractures will rise to 500 000 cases/year with a projected cost burden of US$240 billion.[6,7] Given the unsustainable trajectory of health-care costs in the United States, health-policy makers are increasingly looking at cost-minimization strategies to help curtail the impending economic burden associated with the management of this fracture.

The launch of the Patient Protection and Affordable Care Act in 2010 ushered a new era of health-care reform in the nation.[8] In an attempt to prioritize value over volume, health-policy makers introduced the concept of launching alternative-payment models (APMs),[9-13] such as bundled payments for costly medical/surgical conditions. In contrast to the current fee-for-service reimbursement model, where each service provider associated with an episode-of-care is paid separately based on the type/level of care they provide, bundled payments introduce the principle of risk sharing of money out of one "lump-sum" amount. In a true "bundled payment," insurance companies calculate a predetermined target price for an episode-of-care. This is usually done through historical pricing methods, using billing records/instances from the institution participating in the bundled payment. The "lump-sum" payment is then provided to a single convener (usually, the hospital) who is then responsible for distributing payments among multiple service providers. Since money is being shared out of 1 "single-pocket," bundled payments incentivize co-ordination among providers and enhance resource stewardship to increase gain sharing.

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Currently, bundled payments in orthopedics have largely been focused on elective costly surgical procedures, such as total hip/knee arthroplasties, through the mandatory Comprehensive Joint Replacement (CJR) model or the voluntary Bundled Payment for Care Improvement (BPCI) model.[14,15] Preliminary results showing success of bundled payments in elective total hip/knee arthroplasties[16] paved way to the Center for Medicare and Medicaid Services (CMS) extending mandatory bundled-payment models for patients undergoing surgical treatment of hip/femur fractures (called the Surgical Hip & Femur Fracture Treatment/SHFFT bundle). Although the model was due to begin in January 2018, it was eventually scaled back and cancelled in response to concerns voiced by physicians regarding the ineffectiveness of prospective payment models for nonelective trauma/fracture cases. Although the mandatory fracture bundle has been placed on hold, CMS is still experimenting bundled payments in hip fractures through the voluntary BPCI model.

As value-based care begins to come to forefront in the battle against rising health-care costs, there is a need for a better understanding how bundled payments may work for fracture patients. In this review, we describe the current model of hip fracture bundles, national experience, challenges, pitfalls, and future opportunities for bundled payments in hip fractures.

"Hip Fracture" Bundle in the BPCI and BPCI-Advanced

The BPCI model relies on the use of Diagnosis-Related Groups (DRG) to identify/trigger episodes of care and risk-adjust payments, based on patient complexity. The DRGs were first introduced in the 1980s as part of the Inpatient Prospective Payment System and are essentially a cluster/collection of procedures that are thought to have similar resource utilization patterns and costs.[17] The hip fracture bundle encompasses 3 distinct DRGs: 480, 481, and 482; with patient complexity and subsequent payments increasing successively with each different DRG. All 3 DRG codes essentially capture patients with a hip fracture undergoing open reduction internal fixation (ORIF), hip hemiarthroplasty, or closed reduction percutaneous pinning (CRPP). Patients undergoing a total hip arthroplasty (THA) for a hip fracture fall under DRG codes 469-470, which are either part of the CJR or the BPCI-lower extremity joint replacement (LEJR) model. A brief flowchart showing assignment of different procedure types in hip fracture bundles is shown in Figure 1. Institutions have the choice of participating in 4 distinct payment "models," which differ, largely, in terms of type of payment (prospective vs retrospective vs mixed) and the length of entire episode (inpatient only vs 30/60/90 day). In January 2018, CMS introduced an offshoot additional model termed "BPCI-A or BPCI-Advanced," which consolidates the original BPCI models 1 to 4 and places a higher emphasis on value by tying payments to quality metrics. A complete description of the differences between various BPCI models can be seen in Table 1.

The BPCI-A is a voluntary episode payment model that represents a proper "prospective bundled payment" that includes all service providers (hospitals, postacute care, and readmissions) associated in a 90-day episode of care. Target prices for each clinical episode will be individualized to each participating facility, and calculations will be made based on historical claims data of each included DRG, historical case-mix through a patient-case mix adjustment index, hospital peer group characteristics, and peer group trends. The calculated price will then be discounted by 3% to retrieve the final target price. Contrary to other BPCI models, the BPCI-A qualifies an advanced APM where participants are required to bear risk for monetary losses under a predefined amount in the model. In the BPCI-A model, participants will be financially at risk for up to 20% of the final target price of each episodes. In the BPCI-A model, CMS also requires participants to at least report 2 mandatory quality measures, all-cause hospital readmissions and advance care plans that will be factored into target pricing. Reporting and reconciliation payments under the BPCI-A model will be done on a semiannual basis. At the end of each performance period, CMS will compare the total Medicare expenditure for an episode against the target price to calculate the Net Payment Reconciliation Amount (if money is saved by the participant) or a repayment amount owed by the participant to CMS (if spending goes over the target price).

Current Experiences With the Hip Fracture BPCI Bundle (DRG 480-482 and DRG 469-470)

Literature debating the effectiveness of hip fracture bundles is limited by the number of institutions participating in the voluntary BPCI hip fracture bundles. In perhaps the only major hip fracture bundle study, researchers from the New York University Langone Orthopaedic Trauma Research Group analyzed a subset who participated in the BPCI hip fracture bundle and compared it to historical controls prior to BPCI participation. A total of 116 patients who underwent operative fixation/treatment of a hip or femur fracture under DRG codes 480 to 482 were included in the study, with a total of 126 patients falling in the historical control group. The authors found that though fractures that were part of the bundled initiative had a trend toward a decreasing mean length of stay and lower readmission rates, the findings were largely nonsignificant. However, the number of patients going home doubled by nearly 2-fold over time. By simply controlling postacute discharge patterns, the hospital saved over US$728 000 over the participating period, amounting to around US$6450 per patient.[18] Much of the bundled payment literature on hip fracture has raised concerns on the BPCI's current rule of including THAs being performed for hip fractures into the elective lower extremity arthroplasty bundle. As evidenced by findings from numerous studies (Table 2), THAs being performed for hip fractures, as compared to those being performed for hip osteoarthritis, are associated with significantly higher odds of longer length of stay,

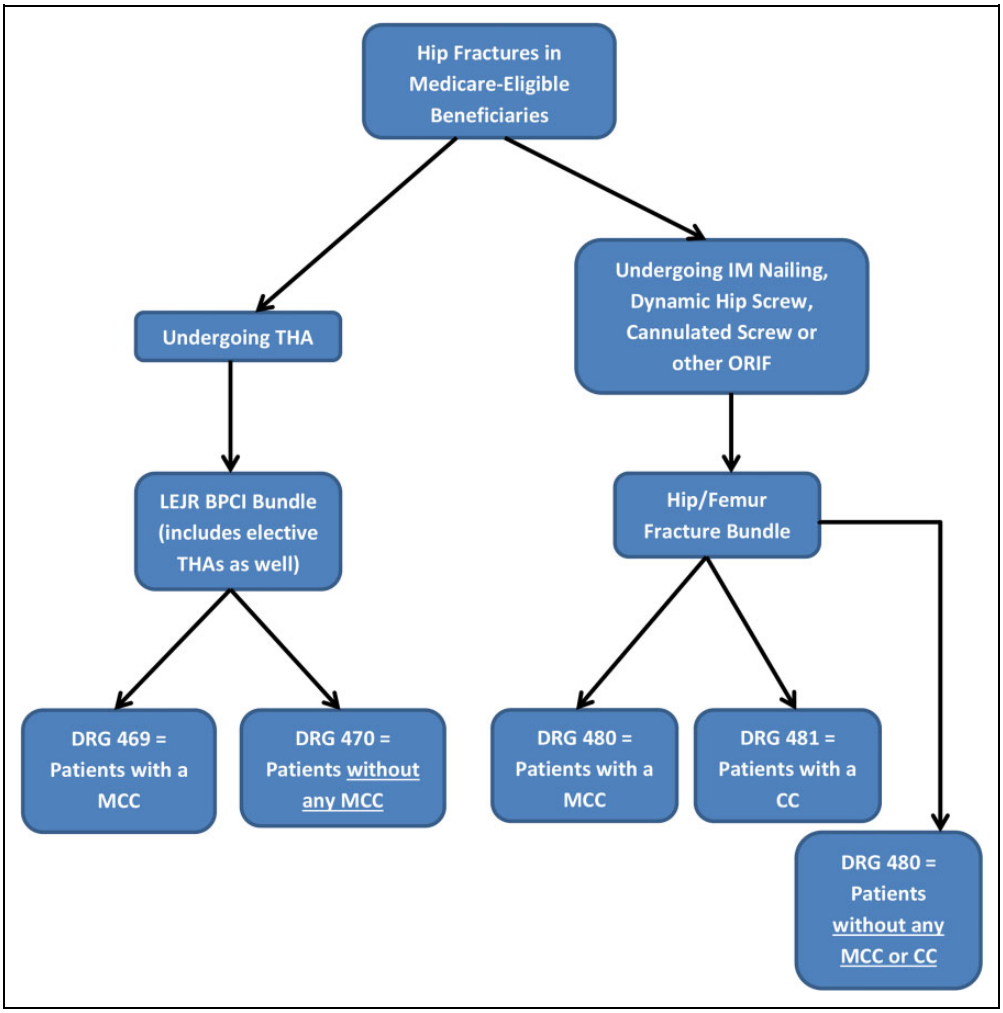

Figure 1. Current hip fracture bundle pathways.

Table 1. Types of BPCI Models.

	Model 1 (Akin to IPPS)	Model 2	Model 3	Model 4	BPCI-Advanced
Time period	Inpatient only	30, 60, or 90 day	Post-acute only	Inpatient-only	90-day
Episodes included	All DRGs	Choice out of 48 DRGs	Choice out of 48 DRGs	Choice out of 48 DRGs	Choice of 29 inpatient DRGs and 3 outpatient procedures (identified by CPT codes)
Episode initiators	ACHs	ACHs and PGPs	SNFs, IRFs, LTACs, HHAs or PGPs	ACHs	ACHs and PGPs
Services counted as part of episode	All Inpatient Part A services	All Non-Hospice Part A and B services (inpatient + postacute care + readmission)		All Non-Hospice Part A and B services for inpatient stays only (inpatient + 30 day readmissions)	All Non-Hospice Part A and B services (inpatient + postacute care + readmission)
Payment	Retrospective	Retrospective	Retrospective	Prospective	Prospective
Risk adjustment of target price	None	None	None	None	Yes

Abbreviations: BPCI, Bundled Payment for Care Improvement; CPT, current procedural terminology; DRG, diagnosis-related groups; ACH, acute care hospitals; SNF, skilled nursing facility; IRF, inpatient rehabilitation facility; LTAC, long-term acute care hospital; HHA, home health agencies; IPPS, Inpatient Prospective Payment System; PGP, physician group practice.

Table 2. Characteristics and Description of Studies Looking the Clinical and Economic Impact of Including Hip Fractures in the LEJR Bundle.

Author	Data Source	Findings
Charette et al	ACS-NSQIP	THA for FNF (vs OA) was associated with higher odds of 30-day complications, readmissions, reoperations, and mortality. FNF cohort also had longer length of stay and greater number of nonhome discharges
Cairns et al	Medicare	Undergoing THA for a FNF increased 90-day risk adjusted costs by US$5000.
Schroer et al	Multi-institution	Undergoing THA for FNF was linked with longer length of stay, more frequent ICU admissions, higher rate of ED visits, and greater number of readmissions. Overall 90-day charges were higher for the FNF cohort, as compared to those undergoing THA for OA.
Grace et al	Single institution BPCI data	Under the BPCI Model 2 for LEJR Bundle (DRG 469-470), the FNF cohort incurred a US$415 950 loss under target episode prices, whereas the OA cohort was associated with cost savings of over US$170 000.
Yoon et al	New York State Database	Patients undergoing THA for fracture (vs OA) experienced greater inhospital complications, longer length of stay, higher hospital costs, and increased readmissions.
Schairer et al	ACS-NSQIP	THA for FNF is associated with longer length of stay, higher rate of 30-day complications, readmissions, and nonhome discharges.

Abbreviations: ACS-NSQIP, American College of Surgeons National Surgical Quality Improvement Program; BPCI, Bundled Payment for Care Improvement; FNF, femoral neck fracture; ICU, intensive care unit; LEJR, lower extremity joint replacement; OA, osteoarthritis; THA, total hip arthroplasty.

postoperative complications, readmissions, reoperations, nonhome discharges, and mortality.[19-24] Although the CJR model risk-adjusts prospective payments based on fracture status (https://innovation.cms.gov/initiatives/CJR), the BPCI-LEJR model for the same DRG codes has not implemented any robust risk-adjustment methodology that accounts for the indication/cause of surgery.

Challenges and Opportunities of Including Hip Fractures in Bundled Payments

The need for better risk-adjustment strategies in APMs. The success of a bundled payment model for hip fracture is contingent on certain key factors. First, the use of DRG codes to identify/trigger episodes may be an inefficient way of introducing an APM for fracture patients. The DRG codes for the hip/femur fracture bundle (480-482) combine different hip surgeries (ORIF, CRPP, hemiarthroplasty) into 1 single group, even though the procedure type has known to impact costs and outcomes.[25] The inclusion of THAs being done for hip fractures in an the lower extremity arthroplasty bundle, corresponding to DRG codes 469-470, is also concerning given the evident differences between an elective and nonelective arthroplasty patient population. Although the CJR model now risk-adjusts payments based on whether the THA was being performed for a fracture or not, the BPCI still has to follow suit in implementing the same risk-adjustment methodology for participating institutions. The lack of risk-adjustment, based on fracture status, will ultimately create financial disincentives for BPCI-participating tertiary care hospitals and Level 1 Trauma centers who regularly take care of complex hip fractures. Furthermore, given that payments for BPCI-Advanced are tied to quality metrics, hospitals that have a higher proportion of THAs being done for fractures in the BPCI-LEJR cohort are bound to get penalized unfairly due to relatively higher rates of readmission rates seen in the nonelective trauma patient population. The DRG codes are also an ineffective way of risk-adjusting payments, based on the comorbidity status. As mentioned previously, the BPCI model also does not employ a robust risk-adjustment methodology to account for the patient comorbidity burden and uses "complications and comorbidity/major complications and comorbidity (CC/MCC)" modifiers to assign sicker patients into a higher complexity DRG code. While the use of CC/MCC modifiers may be justifiable from an administrative point of view, it can introduce a lot of financial disincentives in a bundled payment model. For instance, both obese and malnourished patients undergoing surgical treatment of a hip fracture would be classified under the "CC" modifier and would have the same national DRG base payment amount regardless of the fact that actual resource utilization varies drastically between obese and malnourished individuals. In 2 studies looking at bundled payments in spinal fusions.[26,27] Malik et al found that the presence of malnutrition increased 90-day risk-adjusted costs by US$12 000 to US$15 000, whereas obesity only increased it by US$1000 to US$3000. Due to such discrepancies being introduced through the use of CC/MCC modifiers, Cairn et al proposed that risk adjustment carried out using a short list of comorbidities would have better predictability rather than the use of DRG alone.[25] Due to the nonelective nature of a fracture population, as well as an urgency to shorten the time from admission to operation in order to improve outcomes,[28] providers do not have a large window to appropriately preoperatively optimize patients. To ensure equitable reimbursements and prevent providers/hospitals from "cherry-picking" patients, risk adjustment of both modifiable and nonmodifiable comorbidities in this nonelective fracture population will be extremely important in ensuring success of such APMs. Since the MCC/CC modifier also accounts for complications, the current risk-adjustment methodology may also introduce financial disincentive toward preventing complications. If an individual gets classified under DRG 482 (no MCC or CC) upon admission and develops a

sepsis (an MCC) during hospital stay, they would automatically get reassigned to DRG 480, resulting in higher payments for the hospital.

Optimizing inhospital costs. Up to 44% to 57% of the share of the total costs associated with hip fracture care are attributable to hospital alone,[6] with the length of stay, occurrences of inpatient complications, and implant costs being the strongest drivers of inhospital expenditures. Efforts to mitigate the occurrences of adverse events and subsequently drive down the need for unnecessary days in the hospital will be an effective way in saving costs in a bundle. While the option of an enhanced preoperative optimization is not available to a fracture population, orthopedic surgeons should strongly consider implementation of geriatric fracture comanagement programs to improve postoperative outcomes in elderly hip fractures. Results from single-institution study found that implementation of a geriatric fracture comanagement program resulted in over US$18 000 in cost savings per patient, with a reduction in the average length of stay from 6.2 days to 4.6 days.[13] In another study based off the National Surgical Quality Improvement Program database, Arshi et al found that institutions that implemented a standardized hip fracture program had lower rates of nonhome discharges, lower 30-day readmission rates, higher rates of immediate postoperative weight-bearing, greater adherence to deep venous thromboprophylaxis up 28 days postoperatively, and higher likelihood of initiation of antiosteoporotic medication following the fracture.[29] Most geriatric fracture programs are built to enhance efficiency and quality of care by introducing risk-stratification tools, appropriate pain protocols, avoidance/management of postoperative delirium, expedited medical clearance for surgery, standardized order sets, daily team communications, and appropriate discharge planning. A brief overview detailing several features of geriatric fracture programs, as outlined by Kates et al, can be seen in Table 3. Nearly 30% to 80% of the reimbursement a hospital receives for a procedure is consumed by implant costs alone.[30] Furthermore, due to differences in contracting between different hospitals, implant costs are known to vary widely across the nation.[31-33] If bundled payments for hip fractures are implemented on a national scale, controlling the cost variation of these implants will be one of the few ways to bring about value in care. Implementing value-based purchasing programs that ensure alignment of physician incentives with that of the hospital involves careful review of potential conflicts of interest between the implant companies and physicians, uses price transparency to compare implant costs across other institutions, and involves a technology review of the efficacy of new implants will be an effective way of implementing an aggressive contracting policy with industry companies to reduce costs.[34]

Optimizing postacute care costs. Up to 28% of the overall 30-day costs for hip fractures is accounted for by postacute care, with skilled-nursing facilities and inpatient rehabilitation alone contributing up to 85% of postacute reimbursements.[35] Controlling postacute care utilization following hip fractures has been one method employed by current BPCI-participating institutions to reducing costs in a bundled payment environment. Undergoing continued inpatient care in a facility has also been shown to be independently linked with higher odds of experiencing 30-day complications, readmissions, and reoperations in total joint arthroplasties[36,37] and spinal fusions,[38-40] further supporting the need for driving down postacute care utilization. Physicians have the option of offering patients rehabilitation in a home-health setting, through home-health agencies, in order to maintain quality of care and ensure adequate functional outcome. Contrary to undergoing rehabilitation in an inpatient setting, where the average payments can reach US$15 000/patient, home health only costs around US$1500/patient.[35] However, the key to successfully reducing postacute care utilization is also dependent on certain uncontrollable factors, such as availability of caregiver at home, socioeconomic status, and patient's residence prior to the fracture. For long-term nursing home residents, arranging transport for follow-up visits may incur additional indirect costs and can be a source of noncontinuity of care. Such barriers to access of care for these elderly patients can be abolished by launching mobile outreach programs that are capable of delivering cost-efficient follow-up care in nursing home facilities. According to a recent report out of a single health-care system,[41] implementation of a mobile outreach service was associated with direct cost savings of over

Table 3. Major Components of Geriatric Comanagement Fracture Programs.

Component	Aim
Standardized orders in the emergency department	Expedite time from ED admission to incision time.
Transfer envelope	Expedite and improve communication across teams
Standardized admit orders	Reduction in errors, improve quality of care
Standard geriatric consultation	Improve perioperative and postoperative management
Standard postoperative orders	Reduction in errors, improve quality of care, and reduce variation in orders between different teams
Osteoporosis treatment recommendations	Minimize risk of experiencing secondary fragility fractures
Continued data collection	For launching quality improvement initiatives and identifying pitfalls along continuum of care
Standard nursing care plan	Coordination of care
Standardized implant selection	Reduction in hospital costs
Comanagement by multidisciplinary team	Improve quality of care and postoperative management
Mobile outreach	Reduction in postacute care costs, minimize indirect costs associated with travel for patient, and reduce unnecessary ED visit

Abbreviation: ED, emergency department.

US$130 000 across the whole year (largely due to avoidance of hospital and emergency room admissions). Furthermore, mobile outreach also saved over US$55 000 in indirect costs attributable to patient transportation.

Given the varying intricacies and complexities of hip fractures, a "one-size-fits-all" bundled payment may not be an amenable way of ensuring equitable reimbursement for participating physicians and hospitals. Health-policy makers need to advocate for better risk-adjustment methods, using more patient-level and procedure-level granular data, to prevent the creation of financial disincentives for hospitals taking care of complex, sicker patients. Hospitals participating in BPCI also need to voice concerns regarding the grouping of hip fractures undergoing THA in the LEJR bundle to ensure that trauma centers that are part of the LEJR bundle are not unfairly penalized due to higher readmission rates associated with hip fractures skewing quality metrics. Physicians also need to consider the launch of better risk-stratification protocols and promote geriatric comanagement of these patients to prevent occurrences of costly adverse events. Although the creation of a "perfect" hip fracture bundle may seem challenging, its capability in reducing costs, controlling variation in resource utilization, and enhancing delivery of quality care is promising.

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