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Economic Evaluation

A Model for Evaluating Total Costs of Care and Cost Savings of Specialty Condition-Based Care for Hip and Knee Osteoarthritis in an Integrated Practice Unit

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ABSTRACT

Objectives: The viability of specialty condition-based care via integrated practice units (IPUs) requires a comprehensive understanding of total costs of care. Our primary objective was to introduce a model to evaluate costs and potential costs savings using time-driven activity-based costing comparing IPU-based nonoperative management with traditional nonoperative management and IPU-based operative management with traditional operative management for hip and knee osteoarthritis (OA). Secondarily, we assess drivers of incremental cost differences between IPU-based care and traditional care. Finally, we model potential cost savings through diverting patients from traditional operative management to IPU-based nonoperative management.

Methods: We developed a model to evaluate costs using time-driven activity-based costing for hip and knee OA care pathways within a musculoskeletal IPU compared with traditional care. We identified differences in costs and drivers of cost differences and developed a model to demonstrate potential cost savings through diverting patients from operative intervention.

Results: Weighted average costs of IPU-based nonoperative management were lower than traditional nonoperative management and lower in IPU-based operative management than traditional operative management. Key drivers of incremental cost savings included care led by surgeons in partnership with associate providers, modified physical therapy programs with self-management, and judicious use of intra-articular injections. Substantial savings were modeled by diverting patients toward IPU-based nonoperative management.

Conclusions: Costing models involving musculoskeletal IPUs demonstrate favorable costs and cost savings compared with traditional management of hip or knee OA. More effective team-based care and utilization of evidence-based nonoperative strategies can drive the financial viability of these innovative care models.

Keywords: comprehensive care, hip and knee osteoarthritis, integrated care, time driven activity based costing, value based health care.

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Introduction

Healthcare spending in the United States has rapidly exceeded that of the 10 highest-income countries worldwide but failed to achieve a commensurate improvement in many population health outcomes.[1] This healthcare challenge has stimulated the development of value-based payment and practice reforms, based on the principle of improving patient outcomes and quality of care relative to costs.[2-4] In this regard, there has been a growing interest in comprehensive innovative whole person models of care called integrated practice units (IPUs) that aim to deliver appropriate evidence-based treatments in a timely, coordinated, and personalized fashion via multidisciplinary teams working within colocated facilities.[5,6] IPUs are well aligned with alternative payment arrangements (including specialty condition-based practice and payment models such as those involving bundled episode payments or shared savings programs) that reward measurement and achievement of improved health outcomes by managing conditions over an episode of care.[7] Such specialty condition-based care models contrast with payment based on volume, driven by specific providers or procedures, which are common in fee-for-service health systems.[2,7-9]

Few IPUs have currently been developed to manage joint pain secondary to osteoarthritis (OA)—a common and costly condition that contributes substantially to the global burden of disease.[10-13] Early studies demonstrate the positive outcomes that can be achieved after IPU-based musculoskeletal care of OA.[10,11,14] Nevertheless, a comprehensive understanding of the total costs of such care models is lacking. When it comes to cost accounting, most health systems adopt traditional methods, such as ratio of costs to charges, relative value units, and activity-based costing, that use average costs at the organizational level based on charges and revenues. These charge-based approaches to cost calculations are nonsystematic and risk over- or underestimation compared with actual total costs configured at the individual patient level.[15,16]

Time-driven activity-based costing (TDABC) enables a more targeted estimate of total costs based on resources (service lines and personnel) actually used during patient care and the time consumption per resource.[15-18] Recent systematic reviews have recognized TDABC as an effective strategy for closing the cost-information gap through improving cost accuracy and a means of signaling opportunities for cost savings.[17,18]

In orthopedics, most studies to date involving TDABC define the actual costs of care for high-volume, high-cost surgical procedures, such as total joint replacement (TJR) for hip and knee OA.[16,17,19] To the best of our knowledge, this is the first study involving TDABC that establishes total costs of care related to the comprehensive management of hip and knee OA within a musculoskeletal IPU delivering team-based specialty care and a range of evidence-based nonoperative strategies.

Our primary objective was to introduce a model to evaluate costs and potential costs savings using TDABC comparing IPU-based nonoperative management with traditional non-operative management and IPU-based operative management with traditional operative management (ie, TJR surgery) for hip and knee OA. Secondarily, we assess key drivers of incremental cost differences between IPU-based care and traditional care. Finally, we assess potential cost savings through diverting patients from traditional operative management to IPU-based nonoperative management.

Methods

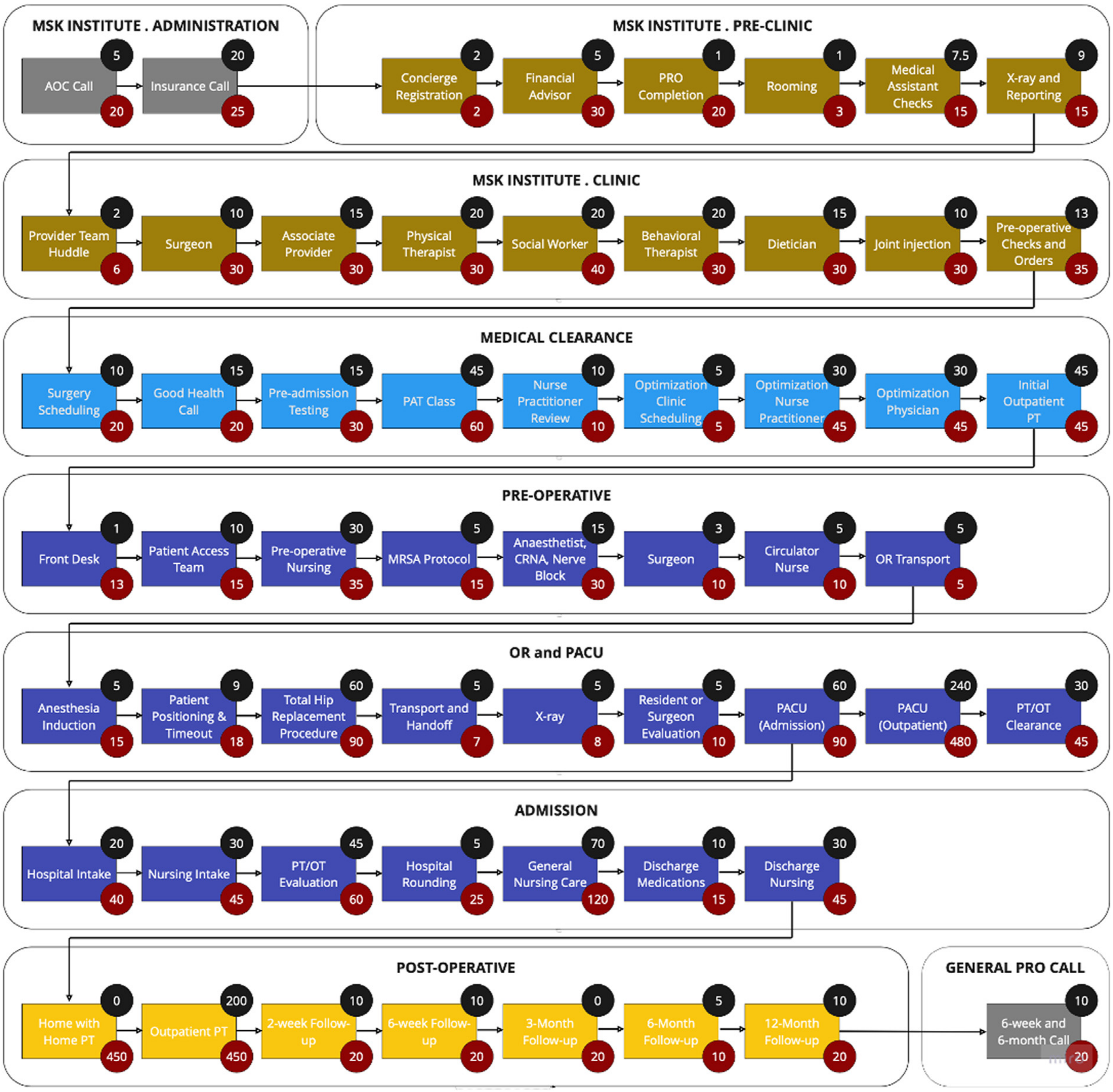
We performed a case study to develop a model to evaluate costs using TDABC (based on an established 7-step framework described by Kaplan and Anderson) involving the full cycle of care for new patients with hip or knee pain secondary to OA presenting to a musculoskeletal IPU (Lower Extremity IPU at The Musculoskeletal Institute, University of Texas at Austin, Dell Medical School, Austin, TX) (Appendix 1 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2023.05.009).[15,20] We aimed for the model to provide a comprehensive evaluation of the IPU team, including orthopedic surgeons, associate providers (physician's assistant, chiropractor, or nurse practitioner), physical therapists, a dietician, a behavioral health trained social worker, medical assistants, a financial advisor, concierge team, and administrative staff working within a colocated facility. The episode of care delivered by this team encompasses all resources required to treat the patient's musculoskeletal condition from initial appointment through a year of care. The range of services includes physical therapy and a structured exercise program, imaging, physician administered medications including corticosteroid joint injections, patient education and lifestyle modification (dietary advice, weight loss counseling), social support services (smoking and alcohol cessation, behavioral health, and psychotherapy, including cognitive behavioral therapy and pain coping strategies), and pain management. Immediate access to these services enables comprehensive nonoperative management using evidence-based strategies that may delay or avert TJR altogether. Consultations incorporate shared decision making and longitudinal assessment of patient-reported outcome (PRO) measures. A subset of patients who proceed to TJR surgery attend a medical optimization clinic and receive perioperative, operative, and postoperative care at a partnering hospital (Ascension Dell Seton Medical Center, Austin, TX).

As a real-world example, a new patient may be referred to the IPU with severe knee OA and a history of knee pain, poor physical function, and symptoms of depression, while being overweight and experiencing poor sleep. The patient's clinical history and PRO scores (completed in advance of their clinic appointment) are reviewed during the preclinic multidisciplinary team huddle where a management plan is provisionally formulated before the patient's arrival. The patient arrives in clinic and initially meets the orthopedic surgeon or associate provider. Care is then coordinated on the same day with the physical therapist, dietician, and behavioral health trained social worker who engage the patient with a structured exercise program and strategies for self-management of joint pain, a weight loss program and nutritional guidance, behavioral therapies to address symptoms of depression, and relaxation techniques to promote sleep hygiene. Several months down the line, if the patient and surgeon feel the time is right, they experience a consultation involving shared decision making regarding TJR surgery.

We performed TDABC by initially identifying all the clinical and nonclinical team members within the IPU and services delivered before mapping the processes over the entire care pathway (also known as the care delivery value chain). Process maps spanned first patient contact with the health system administrative services, to outpatient management, through to surgery and postoperative follow-up. Mapping was conducted via observations in situ recorded on an online software platform (Miro.com, San Francisco, CA) (Figs. 1 and 2).[18,21] We identified clinical team members in outpatient and inpatient settings a priori to validate these process maps. This initial step established a framework for developing cost equations, allocating resources (structural and human), and evaluating the total costs of all key patient-focused activities and care pathways throughout a 1-year episode of care. This episode of care encompassed nonoperative and operative pathways. We further stratified these pathways through consensus reached with our clinical team members and approaches to stratification in costing studies from other specialties.[18] Pathways were stratified into *low* and *high* complexity to account for variations in terms of clinical factors (eg, comorbidities, severity of OA, pain management) and personal factors (eg, mental health concerns such as pain related psychological distress, social health concerns, language barriers) that could influence the duration, volume, and type of services provided. We classified *low complexity* pathways as those where a patient's engagement with services was relatively straightforward (eg, less severe comorbidities, OA, symptoms, and minimal or no mental or social health concerns), resulting in standard durations for a given event and basic consumption of services. *High complexity* pathways were classified as those where patient engagement was more complex (eg, advanced OA with greater comorbidities, mobility issues, greater pain related psychological distress, social unmet needs, issues concerning health literacy, language barriers, and requiring translation services). These pathways likely require longer than usual visit times and an increased consumption of services (eg, a greater number and range of clinician encounters including access to physical therapists, nutritionist, and social worker).

We separately estimated resources used for patients experiencing low complexity and high complexity pathways for nonoperative and operative care within an IPU and traditional care. The estimation of resources for traditional care was informed by the American Academy of Orthopedic Surgeon's Evidence-based Clinical Practice guidelines[22] and through consensus reached among our clinical team to define typical clinical event

Figure 1. Process map of full care pathway for hip osteoarthritis including nonoperative and operative management. Large, curved boxes represent care segments encompassing key activities and personnel with arrows representing transitions of care. Numbers in circles represent activity duration (in minutes) for "low complexity" cases (dark blue) and "high complexity" cases (red)—see article for definitions. Color coding: administrative activity (gray); Musculoskeletal (MSK) Institute Clinic-based activity (gold); medical clearance activity (light blue); preoperative, operative, hospital-based activity (purple); postoperative activity (yellow).



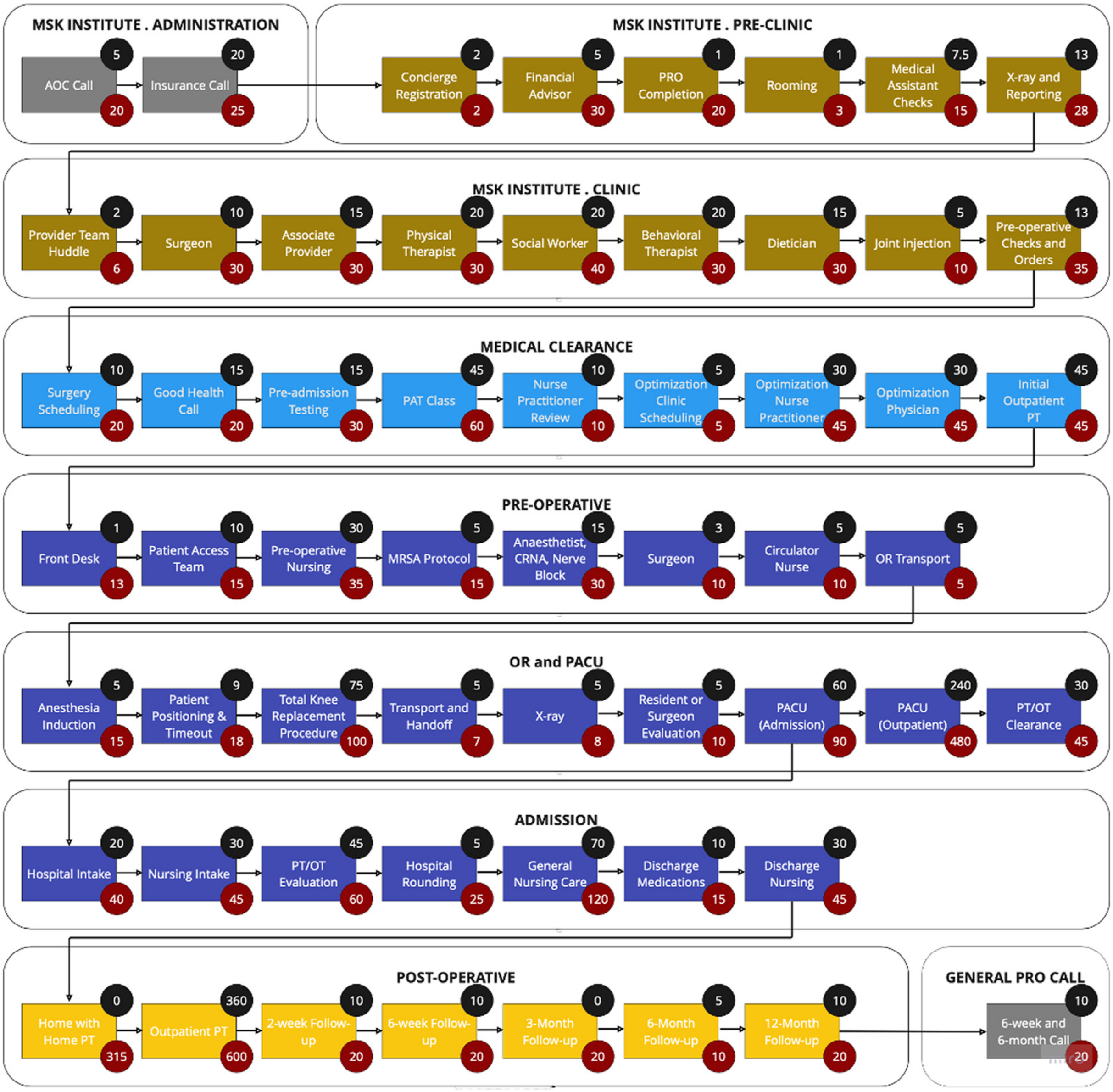
AOC indicates Access and Outcomes Center; CRNA, certified registered nurse anesthetist; MSK, musculoskeletal; MRSA, methicillin-resistant *Staphylococcus aureus*; OR, operating room; OT, occupational therapy; PACU, postanesthetic care unit; PAT, preadmission testing; PRO, patient-reported outcome; PT, physical therapy; THR, total hip replacement.

frequencies for both settings (Appendix 2 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2023.05.009).

We calculated direct labor costs for the range of providers without discriminating against those that are and are not reimbursable in a fee-for-service structure.[18] We estimated the capacity of each human resource (team member) and calculated the capacity cost rate (or cost per labor minute) using practical capacity (actual productive time the resource spent on delivering patient care) for labor set at 87% of theoretical capacity, that is, excluding holidays, sick leave, breaks, training, education, professional development, teaching, travel, administrative duties, research, and quality improvement. We acquired these data through annual salary information for each human resource (ie, total salary plus benefits including health insurance and social security), departmental reports, employee allocation scales, and interviews with clinical and nonclinical stakeholders including departmental managers.

We analyzed time estimates for each personnel resource used across patient-focused activities within the lower extremity IPU clinics and hospital setting using at least 2 of the following modes

Figure 2. Process map of full care pathway for knee osteoarthritis including nonoperative and operative management. Large, curved boxes represent care segments encompassing key activities and/or personnel with arrows representing transitions of care. Numbers in circles represent activity duration (in minutes) for "low complexity" cases (dark blue) and "high complexity" cases (red)—see article for definitions. Color coding: administrative activity (gray); Musculoskeletal (MSK) Institute Clinic-based activity (gold); medical clearance activity (light blue); preoperative, operative, hospital-based activity (purple); postoperative activity (yellow).



AOC indicates Access and Outcomes Center; CRNA, certified registered nurse anesthetist; MSK, musculoskeletal; MRSA, methicillin-resistant *Staphylococcus aureus*; OR, operating room; OT, occupational therapy; PACU, postanesthetic care unit; PAT, preaadmission testing; PRO, patient-reported outcome; PT, physical therapy; THR, total hip replacement.

of assessment: (1) audited time stamps from electronic medical records within outpatient and hospital systems or electronic activity logs, (2) interviews with clinical and nonclinical professionals, and (3) observations of time and activity using stopwatch assessment (Appendix 3 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2023.05.009).[18] We calculated average (median) time estimates for clinical events in relation to low complexity or high complexity pathways. These data established the actual time spent during the application of different patient-facing resources.

We proceeded to determine direct labor costs for each of the care pathways (ie, traditional, nonoperative, and operative) and organize these pathways by level of complexity (ie, low and high complexity). We calculated labor costs as the product of the capacity cost rate and the total average time spent for each team member.

We further calculated direct nonlabor costs (ie, structural costs related to services, procedures, and goods within the patient care episode, including variably priced and billed inputs such as implant costs) and indirect costs (ie, costs related to overhead,

Table 1. Total costs of care for traditional and IPU-based care pathways.

Condition	IPU nonoperative management			Traditional nonoperative management, $	IPU operative management			Traditional operative management, $
	Low complexity, $	High complexity, $	Weighted average, $		Low complexity, $	High complexity, $	Weighted average, $	
Hip osteoarthritis	316	1376	475	795	15576	17744	15902	16162
Knee osteoarthritis	314	1316	464	854	15398	17670	15738	15918

IPU indicates integrated practice unit.

administration, and internal logistics such as facility costs) necessary to provide patient care. We used financial data from a minimum of 12 months before estimate average costs of each of these resources (Appendices 4-6 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2023.05.009 provide a detailed account of cost components). We then summed direct professional costs with the direct nonlabor cost and indirect cost calculations. The weighted average cost of each care pathway was then calculated based on the assumption that 15% of the treated populations experienced high complexity pathways (eg, if the average total cost of using IPU nonoperative management to treat hip OA is $316 and $1336 for patients with low and high complexity, respectively, then the weighted average cost of this care pathway is $475 (ie, 0.85 × $316 + 0.15 × $1336).

After weighted average costs were calculated for each care pathway, we used a straightforward algorithm to model overall estimated cost savings to the clinic from using an IPU-based model (compared with traditional care) as a function of (1) the percentage of patients following operative versus nonoperative pathways and (2) the percentage of patients diverted from an operative pathway (ie, percentage of patients following an operative pathway in the traditional model who could potentially be managed entirely nonoperatively in the IPU model) (Appendix 7 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2023.05.009).

Results

We performed costings (combining direct labor, direct nonlabor, and indirect costs) for both nonoperative and operative pathways guided by detailed process maps (Figs. 1 and 2, Appendices 4-6 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2023.05.009). Weighted average costs of IPU-based nonoperative management for hip OA ($475) were lower than traditional nonoperative management ($795) and lower in IPU-based operative management including a total hip replacement (THR) pathway ($15 902) than traditional operative management ($16 162) (Table 1). The weighted average costs of IPU-based nonoperative management for knee OA ($464) were lower than traditional nonoperative management ($854) and lower in IPU-based operative management including a total knee replacement (TKR) pathway ($15 738) than traditional operative management ($15 918). Thus, IPU-based operative management saves 1.6% ([$16 162-$15 902)/$16 162]) per patient with hip OA undergoing THR and 1.1% ([$15 918-$15 738]/$15 918]) per patient with knee OA undergoing TKR, and for patients following a nonoperative pathway, IPU-based outpatient care saves 40.3% ([$795-$475)/$795]) per patient with hip OA and 45.7% ([$854-$464)/$854]) per patient with knee OA.

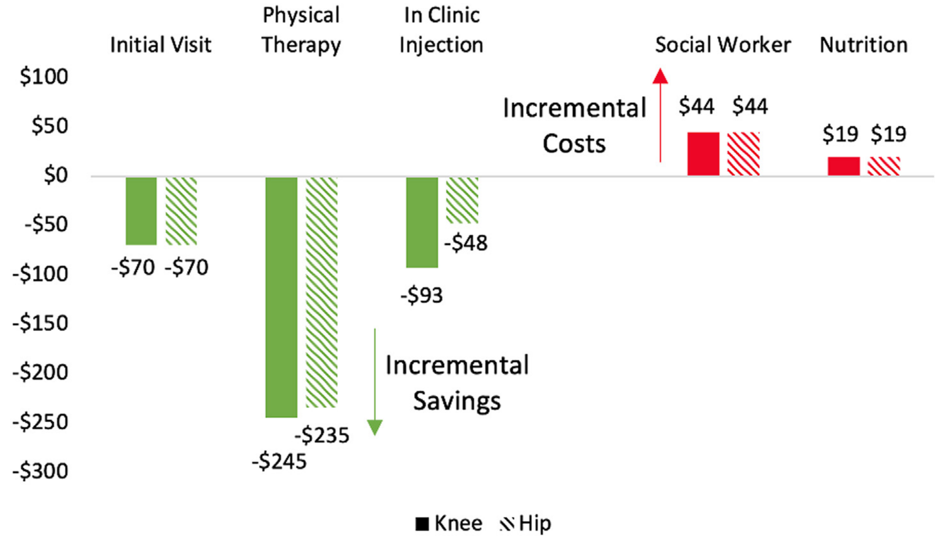
Key drivers of reductions in incremental costs of IPU-based care compared with traditional care overall included the implementation of musculoskeletal associate providers to work alongside surgeons at the point of care rather than a surgeon alone; provision of physical therapy tailored to the patients' needs and personal circumstances, focused on a combination of structured exercise programs and coaching self-management strategies, home exercises, and combinations of remote and in-person sessions compared with several in-person sessions alone; and judicious use of intra-articular injections performed predominantly by associate providers (Fig. 3). The resultant savings offset the incremental costs associated with services provided by a behavioral health trained social worker and nutritionist. The incremental costs and cost savings for low complexity knee and hip patients matched this trend. Incremental savings were also matched for high complexity knee and hip patients in terms of physical therapy and in clinic injections; nevertheless, these patients incurred greater incremental costs related to surgeon-led consultations during the initial visit and greater engagement with the social workers and nutritionist (Appendices 8 and 9 in Supplemental Materials found at https://doi.org/10.1016/j.jval.2023.05.009).

The estimated total cost savings model demonstrated the level of potential savings based on diverting different percentages of patients from traditional operative management to comprehensive IPU-based nonoperative care, accounting for those already receiving traditional nonoperative management. For instance, assuming a traditional model of care managed 70% of its patients with hip OA nonoperatively and no patients planned for THR could be diverted to IPU-based nonoperative care, overall cost savings would be 5.6%. Nevertheless, if 10% of patients planned for THR in the traditional model could be diverted to IPU-based nonoperative management, then estimated cost savings would increase to 14.2% (Fig. 4). Similarly, assuming a traditional model of care managed 70% of its patients with knee OA nonoperatively and no patients planned for TKR could be diverted to IPU-based nonoperative management, overall cost savings would be 6.1%. Nevertheless, if 10% of patients planned for TKR in the traditional model could be diverted to IPU-based nonoperative management, then estimated cost savings would increase to 14.6%.

Discussion

Implementing sustainable team-based approaches to comprehensive specialty condition-based care, such as IPUs, requires an accurate understanding of the total costs of care. Our model using TDABC showed average costs of IPU-based management of hip OA and knee OA were lower than traditional management involving both nonoperative and operative pathways. Opportunities driving these cost savings include a team-based approach and modified use of nonoperative strategies that can offset the costs of valuable services to support behavioral, social, and nutritional health and wellbeing. Our findings also demonstrate the savings achievable by delivering comprehensive OA management, especially through

Figure 3. Incremental savings and costs of integrated practice unit-based care versus traditional care for hip and knee osteoarthritis.



diverting patients from surgery toward a range of nonoperative strategies.

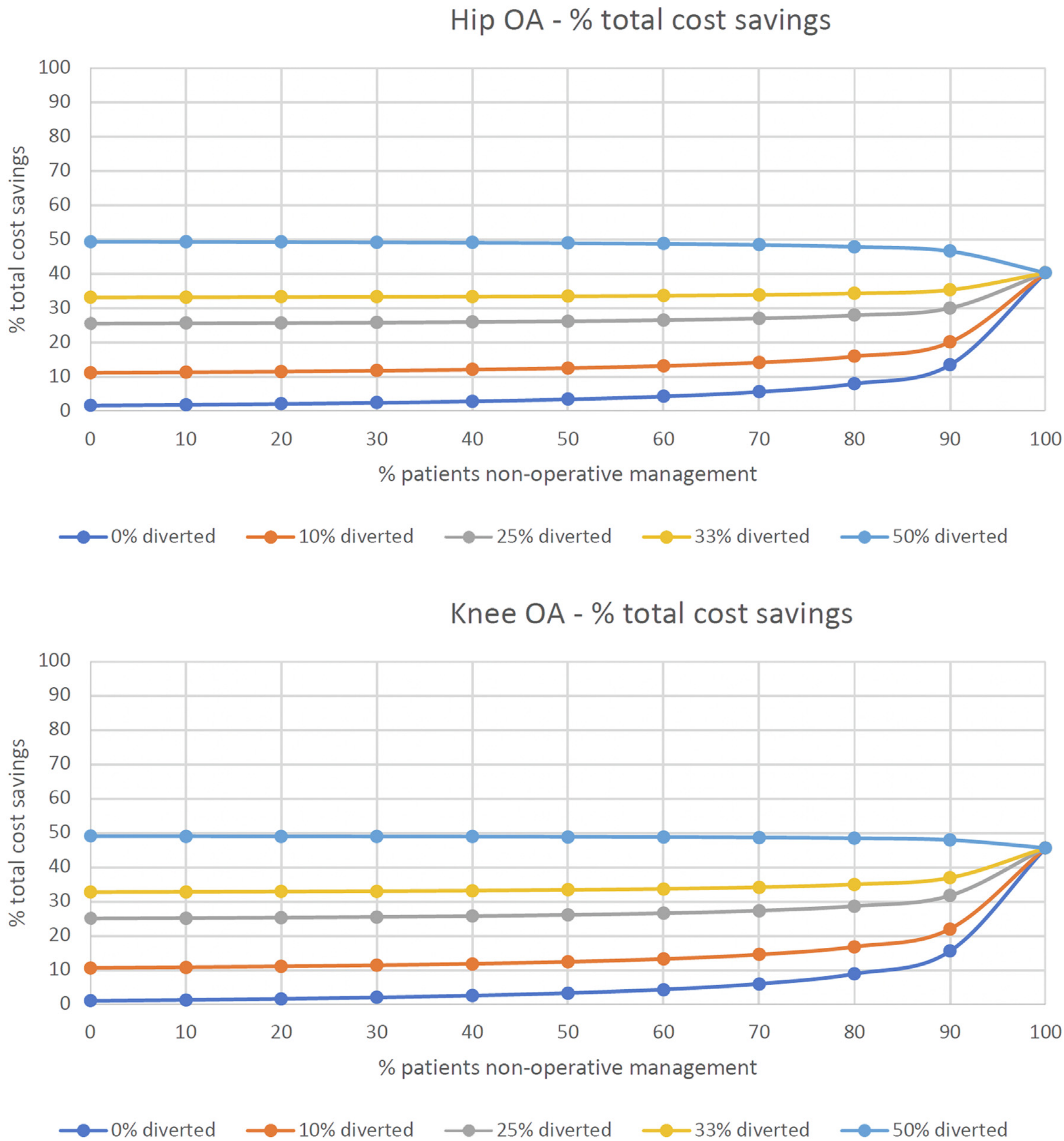
Accounting for the case mix of our patient population, the weighted average costs of IPU-based nonoperative and operative management were consistently lower than traditional nonoperative and operative management respectively. The savings per new patient attending an IPU were $320 for hip OA and $390 for knee OA, and IPU-based operative management was $260 involving THR and $180 involving TKR per patient. These cost savings seem modest for IPU-based operative management (1.6% for THR; 1.1% for TKR) but achieving any degree of saving in an end-to-end clinical pathway, fully loaded with a wide range of nonoperative strategies and joint replacement surgery, is advantageous. Greater savings occur with IPU-based nonoperative management (40.3% for hip OA; 45.7% for knee OA). Such findings suggest substantial cost savings can still be generated while providing comprehensive OA management with a set of treatments that are often lacking in traditional care. Furthermore, the cost savings of IPU-based care are likely to be greater given that our calculations included all available nonoperative strategies, where most patients do not require the full range of services. Notably, the costs for surgical care in our study stood at the lower end of the range of surgical costs based on previous TDABC studies that have calculated costs from index admission up to 90 days after discharge ($14 924-$29 557 for THR; $13 322-$21 208 for TKR episode).[23] IPU-based operative management and traditional operative management were configured based on local best practices including enhanced recovery after surgery principles, minimizing inpatient length of stay, and promoting discharge home rather than to post acute care facilities. We also standardized the duration of the surgical episode and implant-related costs—both major drivers of the variability in cost estimates of surgical care for OA.[16,17] We believed this enabled a fair comparison across operative and nonoperative care pathways and avoided overestimating the costs of traditional operative management, including inpatient admission and discharge to post acute care.

Redesigning musculoskeletal care to include associate providers who work at the top of their license alongside orthopedic surgeons and other healthcare professionals in the same colocated facility is one reason for the incremental difference in costs between IPU and traditional care. Associate providers can manage clinically straightforward cases under the guidance of the orthopedic surgeon who can be freed up to provide more time and attention to complex patients rather than reviewing every case attending clinic. A further driver of the differences in costs was the delivery of physical therapy that actively coaches patients on self-management in home and community settings while supporting them with structured and tailored exercise plans delivered via a combination of in-person and remote sessions tailored to the patient and their personal circumstances as an alternative to a fixed set of multiple outpatient physical therapy sessions. Finally, the judicious use of intra-articular injections for pain management also drove down total costs. These collective savings more than offset the costs of adding valuable team members such as social workers providing case management and behavioral therapy and nutritionists providing dietary advice and weight loss counseling.

TDABC allowed us to identify key drivers of the differences in incremental costs, a function that is otherwise challenging to ascertain using traditional methods, such as ratio of costs to charges, relative value units, and activity-based costing. Such methods often use average costs at the organizational level based on charges and revenues. Charge-based costing approaches are nonsystematic and may risk over- or underestimation compared with actual total costs configured at the level of the individual patient.[15] The key drivers of overall cost savings to the clinic are the percentage of nonoperative patients and percentage of patients diverted from the operative pathway. Modeling estimated cost savings based on percentage of patients diverted from traditional operative management to IPU-based nonoperative management provides further granularity around potential cost savings, without having to assume the same number of patients receive operative management in both traditional and IPU-based models of care.

Costing techniques such as TDABC provide a level of granularity that supports economic evaluations to guide health policy and enhance organizational improvement in resource

Figure 4. Modeling of % total cost savings achieved based on the % of patients being diverted to nonoperative management, accounting for the proportion of patients already being managed nonoperatively.



management, service and payment design, and hospital decision making.[15,16,18,21] The costs defined in our study can inform payer and provider organizations involved in the development of capitation-based compensation and reference pricing for condition-based bundled episode payment models designed to provide comprehensive OA management.[17,18,24,25] A recent survey showed that clinicians want to know the total costs of care but $<$ 10% affirm that their organizations can accurately determine the direct costs.[26] Respondents from this survey and other studies have stated that the availability of such cost data would be critical for opportunities to reduce waste, optimize resource allocation, improve the processes of care delivery, set return-on-investment priorities, and shift toward risk-sharing arrangements and value-based reimbursement strategies.[18,20,25-27] An accurate definition of total costs rather than revenue or charge-based costs, as undertaken in this study, might fuel this strategy across health systems and support more stringent price setting for services at levels lower than charges set by private payers. Resetting prices in this way may further serve as a stimulus for the expansion of state and federal Medicare and Medicaid programs, enabling increased coverage for vulnerable populations.[24,28]

There are several limitations to this study. First, we intended to characterize the heterogeneity within our population's case mix and variations in care pathways by dichotomizing patients into low and high complexity and used weighted estimates of these levels of complexity to define average total costs of care. These underlying assumptions were intended to span the diverse patient population treated in the IPU while also making the interpretation of costs more manageable; nevertheless, we recognize the need (and opportunity) for a more precise estimation. As recommended by Helmers and Kaplan,[15,20] future studies should prospectively evaluate total costs based on real-time utilization of services at the encounter level by each patient in a population over a given time frame to define total cost information more accurately. This study provides costs of comprehensive care inclusive of a full range of services to simplify interpretation, whereas in reality there are multiple care pathway permutations with patients experiencing a range of different services. Accurate costings of each encounter in multifaceted, team-based care can be facilitated by Real Time Location Systems—a technology we are incorporating for future iterations of this work that enables automatic capture and reporting of total costs of care by tracking providers and assets in real time during care delivery.[29] Second, the model in our final aim was developed to simulate potential cost savings through diverting candidates away from TJR, based on the assumption that immediate access to a comprehensive range of nonoperative strategies during OA care may delay or avert surgery altogether. Further prospective evaluation is required to confirm this assumption and ascertain the actual proportion of patients truly diverted from TJR in tandem with the level of cost savings achieved. Third, a challenge in this and other TDABC studies is the accurate capture of indirect costs, such as structural (facility) and administrative resources.[18] TDABC studies involving orthopedic surgery to date show that patient-level costs are invariably lower than those generated by traditional accounting methods—with the difference largely attributed to unused capacity and indirect costs.[28,30] An approach to overcoming this issue might be to calculate total costs using a combination of TDABC (for defining direct costs) and traditional accounting methods and claims-based analysis for more accurate quantification of indirect costs.[18] The use of recent consensus-based frameworks for TDABC studies may help standardize the methodology and reduce some of the variation around calculating direct and indirect costs.[20] Fourth, our costs do not incorporate aspects related to utilization and costs of PRO measurement within this model of care. Although we account for the costs of administering PRO measures longitudinally, we do not account for the PRO platform costs or break out additional time for clinicians to access, visualize, discuss, and apply PRO scores with patients during the clinical decision-making process. For instance, patients who screen for symptoms of depression using mental health PRO measures can spark discussion among team members and with patients, resulting in a modified cadence of PRO measurement and variations in the provision of behavioral therapies and coaching strategies, including virtual care through telehealth. In addition, individuals who demonstrate substantial functional limitations using PRO measures with clinically and radiologically severe OA may trigger the use of patient decision aids and shared decision-making discussions around joint replacement surgery. Future costing studies should account for patient and provider engagement that incorporate these tools and patient-centered approaches to care delivery. Fifth, we do not incorporate costs for injections of biologics, such as hyaluronic acid, which is a commonly performed procedure in current musculoskeletal care in the United States for knee OA. Nevertheless, the American Academy of Orthopaedic Surgeons clinical practice guidelines do not support the use of hyaluronic acid after exhaustive review of the literature.[22] As such, these medications are not used in IPU-based care and generally cost 50 to 100 times more than corticosteroids, so the cost savings are likely to be greater accounting for this intervention.

Finally, and related to patient outcomes, we do not perform an objective comparison of patient or clinical outcomes of IPU-based care and traditional care in this study. Previous studies involving the IPU in this study have demonstrated significant improvements in PROs with high proportions of patients receiving substantial clinical benefit from IPU-based operative and nonoperative management.[10,14] A prospective evaluation of outcomes of IPU-based care versus traditional care is required to confirm model validity and provide a complete picture of value, that is, the outcomes benefiting patients relative to total costs of care.

Establishing total costs and potential cost savings of comprehensive specialty condition-based care for hip and knee OA in an IPU setting, relative to traditional care pathways, provides valuable information for stakeholders involved in value-based practice and payment reform. Scalable costing models applied to IPUs using TDABC can influence decision making and measurement capabilities related to healthcare resource allocation and delivering high-value, patient-centered, evidence-based treatment strategies.

Conclusions

Stakeholders in US healthcare increasingly endeavor to achieve greater value for patients and populations experiencing common chronic conditions such as OA. The procedure-based bundled episode payment experience has shown limited reductions in overall spending with no demonstrable positive impact on clinical outcomes. Furthermore, such models fail to account for appropriateness of the surgical procedure itself or leverage often-underused evidence-based nonoperative strategies that could delay or avert joint replacement altogether. Thus, payers, providers, and policy makers seek an accurate estimate of total costs of alternative condition-based models, including IPUs, which up to this point remain largely unknown.

Using a model enabled by TDABC, we demonstrate that value-based musculoskeletal specialty care, provided by highly coordinated multidisciplinary teams via IPUs that comprehensively manage patients based on their clinical condition, serves as an economically viable alternative with substantial cost saving opportunities compared with procedure-based alternative payment arrangements and traditional management delivered within fee-for-service infrastructures. This innovative value-based approach ultimately offers patients a greater number of services, tailored to their needs while at a lower relative cost. Organizations that fail to execute whole person care for patients with OA and lack a robust understanding of total costs of comprehensive care may find themselves at a competitive disadvantage, flying blind into the new era of value-based, condition-focused payment and practice reform.

Supplemental Materials

Supplementary data associated with this article can be found in the online version at https://dx.doi.org/10.1016/j.jval.2023.05.009.

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