Episode of Care Payments in Total Joint Arthroplasty and Cost Minimization Strategies

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Received: 25 April 2015/Accepted: 21 July 2015/Published online: 2 September 2015
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Abstract Total joint arthroplasty (TJA) is receiving significant attention in the US health care system for cost containment strategies. Specifically, payer organizations have embraced and are implementing bundled payment schemes in TJA. Consequently, hospitals and providers involved in the TJA care cycle have sought to adapt to the new financial pressures imposed by episode of care payment models by analyzing what components of the total “event” of a TJA are most essential to achieve a good outcome after TJA. As part of this review, we analyze and discuss a health economic study by Snow et al. As part of their study, the authors aimed to understand the association between preoperative physical therapy (PT) and post-acute care resource utilization, and its effect on the total cost of care during total joint arthroplasty. The purpose of this current review therefore is to (1) describe and analyze the findings presented by Snow et al. and (2) provide a framework for analyzing and critiquing economic analyses in orthopedic surgery. The study under review, while having important strengths, has several notable limitations that are important to keep in mind when making policy and coverage decisions. We support cautious interpretation and application of study results, and we encourage maintained attention to economic analysis in orthopedics as well as continued care path redesign to maximize value for patients and health care providers.

Keywords total joint arthroplasty · orthopedics · health care system

Introduction

Health care expenditures represent 18% of the gross domestic product of the USA [6], of which \$128 billion [2] is allocated to the treatment of arthritis. Based on a 2014 report, over one million total knee arthroplasties (TKAs) and total hip arthroplasties (THAs) were performed in the USA each year [3], and the number of patients needing TKA and THA is projected to grow significantly over the next two decades [4]. Given that the majority of TKA and THA procedures are “pathway” driven, total joint arthroplasty (TJA) has received significant attention by the US government as a source for cost containment strategies [5].

As part of the effort to decrease the costs associated with health care delivery, various financial incentive schemes have been proposed. For example, an episode of care payment (“bundled payment”) model has gained traction and is defined by a single payment to all providers for any care related to a treatment or condition. Preliminary data from early bundled payment initiatives in TJA suggests that this form of reimbursement may successfully reduce costs while maintaining and even improving the quality of care provided [5]. As such, payer organizations have embraced and are implementing bundled payment schemes in TJA. Consequently, hospitals and providers involved in the TJA care cycle have sought to adapt to the new financial pressures imposed by episode of care payment models by analyzing what components of the total “event” of a TJA are most essential to achieve a good outcome after TJA.

Health care economics and health services research (HSR) is a relatively new and growing area of academic and research focus within orthopedic surgery. HSR seeks to understand how patients come to receive care, how to assign value to the quality of care that they receive and how much it

The work was performed at Hospital for Special Surgery.

Electronic supplementary material The online version of this article (doi:10.1007/s11420-015-9460-x) contains supplementary material, which is available to authorized users.

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costs patients to receive such care. The article discussed in this review by Snow et al. [9] is an example of HSR, where the authors aimed to understand the association between preoperative physical therapy (PT) and post-acute care resource utilization, and its effect on the total cost of care during TJA. The study by Snow et al. [9] may be of significance in dictating health care policy and could potentially lead to substantial aggregate cost reduction in the TJA cycle of care. The purpose of our review is to (1) describe and analyze the findings presented by Snow et al. [9] and (2) provide a framework for analyzing and critiquing economic analyses in orthopedic surgery.

The Article

Snow et al.'s study, *Association between preoperative physical therapy and post-acute care utilization patterns and cost in total joint replacement* [9], sought to answer the following research question: How can providers reduce the costs incurred across the care cycle in TJA; specifically, does PT prior to TJA, decrease post-acute care costs? To answer this question, the authors conducted a retrospective cohort analysis of historical claims data from the Centers for Medicare and Medicaid Services (CMS) for Diagnosis Related Group (DRG) 470—total joint arthroplasty (without comorbidity or complication). The patients who were included in the study primarily consisted of Medicare fee-for-service beneficiaries in Ohio. The primary outcome was the total episode-of-care costs for patients undergoing lower extremity arthroplasty. The authors conducted analyses to compare the cost of care for patients who underwent at least one PT session prior to their surgery versus those who did not. The analysis was conducted over a 90-day care cycle post-hospitalization after TJA. The study groups were controlled for comorbidities and patient demographics. In the end, the authors found that there was an \$871 reduction in episode of care payment after TJA, with a 29% reduction in post-acute care use in patients who underwent at least one preoperative PT session. The \$871 in cost savings for patients undergoing pre-operative PT came mostly from reduced utilization of nursing facilities, home health agencies, and inpatient rehabilitation post-operatively.

Commentary

Snow et al. [9] found that pre-operative PT may be a cost-minimizing strategy in the TJA care cycle, and as such, the authors suggest that preoperative PT may represent a cost-efficient patient care intervention within the pathway for joint arthroplasty. The purpose of our review is to (1) describe the findings presented by Snow et al. and (2) provide a framework for analyzing and critiquing economic analyses in orthopedic surgery.

In the first part of this commentary, we provide a brief primer on cost analyses in orthopedic surgery in order to provide readers with a framework for analyzing and understanding Snow et al.'s analysis and other economic studies in orthopedic surgery. Economic analyses in health care are

typically in the following forms: (1) cost-effectiveness analysis, (2) cost utility analysis, (3) cost benefit analysis, and (4) cost minimization/cost identification analysis. The first two forms of economic analysis are similar and report the costs (numerator) required to achieve a health outcome (denominator). Cost utility analysis requires however that the health outcome is a subjective patient utility outcome (e.g., quality-adjusted life year (QALY)) whereas cost-effectiveness analysis incorporates a general health outcome (e.g., pulmonary emboli and death). Thus, a cost utility analysis would report the cost to obtain a QALY where a cost-effectiveness analysis would report, for example, the cost to avoid a death (or other similar cost to obtain a nonsubjective outcome). On the other hand, cost benefit analysis converts health states into a financial benefit and the cost required to achieve this health is reported. Cost minimization analysis is a type of economic analysis wherein cost data alone are presented for different treatment options, and the least costly treatment option is selected as the treatment that best *minimizes* costs. Health states are not presented in this form of analysis as health states are assumed to be equal. Health economists note however that cost minimization analysis is problematic because for valid comparison to be made there must be a parity in outcome among comparator programs [7]. As such, cost minimization is rarely correctly applied and is not a preferred mode for health care policy reporting [1]. Cost identification analysis is increasingly utilized to denote such studies that tabulate and identify costs but do not demonstrate equivalence in health outcomes among treatment options. While most forms of economic analyses are useful, cost utility analyses are the preferred form of economic reporting in healthcare due to the incorporation of subjective patient outcome [10]. Value in health care is defined as patient outcomes per dollar spent [8], and cost utility analysis comes the closest to capturing this value equation. With that framework, the study that was reviewed above would most appropriately be classified as a cost identification analysis. The authors do not show that pre-operative physical therapy has the same clinical efficacy as no pre-operative physical therapy and to the contrary their data demonstrates that readmission costs are different between groups (worse in patients with pre-operative PT), which may imply differential outcomes for one group compared to the other.

The article by Snow et al. does have several important strengths however. The authors explored the timely and relevant topic of cost-reducing options in the perioperative period for a TJA. The authors used a large patient database with demographic and comorbidity reporting, thereby allowing for controlling of patient factors. Furthermore, the authors were able to accurately tabulate costs in this large number of patients across the entire care cycle typically associated with TJA episode of care payments. The authors' findings may have significance for healthy policy, hospital reimbursement, and implementation of care pathways. However, we support cautious interpretation and application of their results, given our concerns about the specificity of the study cohorts, clinical usefulness of comorbidity data presented, generalizability, and the limited cost perspective.

In the study, the authors identified patients using DRG 470 alone. DRG 470 codes for a major joint replacement or reattachment of lower extremity *without* major comorbidity or complication. Use of this DRG complicates accurate description of cohort characteristics and analyses of comorbidities—comorbidities are inherently screened out. Further, although the authors attempt to exclude confounding operations included in the DRG (e.g., ankle replacement and lower-extremity fractures), they do not describe the composition of the cohort with respect to ratio of THA versus TKA. These two surgeries are fundamentally different operations that require different rehabilitation strategies. Availability of this data is critical to the interpretation of the study's results. Similarly, use of this administrative dataset limits the authors' understanding of the role and impact of pre-operative PT. Utilization of pre-operative PT was identified using billing codes for any PT; however, it is unclear from this methodology whether PT was indicated for arthritis or other pre-existing conditions; additionally, the authors cannot determine from the data the frequency or type of PT received.

Furthermore, Snow et al. [4] categorize cohort comorbidities using Clinical Classification Software (CCS). While utilization of CCS is commonplace in administrative databases, CCS clusters disease codes into comorbidity groups that can be vague and confusing (e.g., “other injuries and conditions due to external causes”). Increased granularity of these comorbidities may be helpful in attempting to identify comorbidity characteristics in patients that would benefit from pre-operative physical therapy.

With regard to generalizability, the data only represent Medicare fee-for-service patients, as the authors acknowledge. Also, the data reflect a geographically distinct area, taken from 39 county hospitals in central and southeast Ohio. Geographic idiosyncrasies, especially with regard to the use and availability of rehabilitation centers, may be very different between Ohio and other regions of the USA.

Finally, it is important to note that the study under review presents cost data based on CMS reimbursements; this represents a governmental cost perspective and does not incorporate costs from the universe of health care providers (i.e., health care systems perspective). As such, the authors' conclusion that pre-operative physical therapy is a cost-effective intervention must be qualified by noting that it is cost-effective for CMS and not necessarily for the hospital. Interestingly, the authors report in Table IV that there were increased readmission costs associated with pre-operative physical therapy. Given the penalties and under-reimbursement associated with hospital readmission, this finding raises the question of whether health care systems might actually be absorbing some of the costs for patients receiving pre-operative physical therapy.

In summary, while we applaud the authors for exploring the timely and relevant topic of cost-saving strategies in TJA, we support cautious interpretation and application of study results and we encourage maintained attention to economic analysis in orthopedics as well as continued care path redesign to maximize value for patients and health care providers.

Disclosures

Conflict of Interest: Benedict U. Nwachukwu, MD, MBA; Evan O'Donnell, MD; Alexander S. McLawhorn, MD, MBA; and Michael B. Cross, MD have declared that they have no conflict of interest.

Human/Animal Rights: This article does not contain any studies with human or animal subjects performed by the any of the authors.

Informed Consent: N/A

Required Author Forms Disclosure forms provided by the authors are available with the online version of this article.

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