Total hip replacement (THR) was developed in the 1960s and entered routine use for disabling advanced hip arthritis in the mid 1970s. Total knee replacement (TKR) development and implementation followed about a decade later. The early years of hip and knee replacement use were characterized by innovation in implant design and in pre-, intra- and postoperative management, with attendant improvements in perioperative mortality, complication rates and functional outcomes. Total joint replacements (TJRs) were performed largely in referral centers during these early years, by pioneers in the field. Operative and perioperative care philosophies and practices differed among surgeons and centers, reflecting the culture of innovation and specialization that typifies new technologies. Borrowing terminology from retail sales, THR and TKR represented specialty items offered in boutique settings.

Let’s fast forward about 25 years and note how times have changed: THR and TKR are now performed in hospitals large and small by high- and low-volume providers. In fact, in many metropolitan areas (including ours), patients seeking THR or TKR can choose from 10 or more centers located within 15 miles of their homes. Patients often spend as few as 2 days in the hospital. An industry has developed to provide inpatient and outpatient rehabilitative TJR care. Reimbursement for TKR is now capitated in many settings around the world, with fixed global payments allotted for each patient to pay for all pre-, peri- and postoperative components of TJR care. Increasingly, outcomes of care are monitored to document and improve rates of complications. In short, TJR has evolved from a boutique product to a widely available product offered by a broad range of providers at highly competitive prices.

Boutique specialty goods are distinguished by the unique differences among a small set of providers. Prices tend to be high in relation to actual inputs because demand exceeds supply and it is difficult for new providers to enter the marketplace. Commodities, on the other hand, are offered by many producers and are priced much more competitively. As TJR assumes more of a commodity than a boutique phenotype, the organizations that succeed will be those that master the efficient provision of high-quality TJR services to large numbers of patients at low cost.

Healthcare organizations have struggled to develop models of care delivery that meet the dual objectives of efficiency and quality. In this setting, the work of Marshall et al. is especially noteworthy. These investigators report a large randomized comparative effectiveness trial evaluating a new, evidence-informed, clinical pathway (NCP) vs standard of care (SOC) for total hip and knee arthroplasty in three health regions in Alberta, Canada. The goal of their work was to test a program designed to control escalating healthcare costs while maintaining quality of care. The intervention provided dedicated resources for patient intake, operating room and inpatient care; algorithmic guidelines for the pre-, intra- and postoperative processes of care; and measurable benchmarks that allowed for the evaluation and improvement of the process.

Previous work suggested a 4% cost savings utilizing the new clinical pathway, largely based on reduced OR time and length of inpatient stay. The trial went a step further to include patient-reported outcomes at 3 and 12 months. The study design was rigorous, using cluster randomization (at the surgeon level) to minimize contamination within surgeon practices. The primary outcomes used to evaluate effectiveness were total Western Ontario and McMaster Osteoarthritis Index (WOMAC) score improvements at 3 and 12 months after surgery; secondary measures included improvement in SF-36 scores for physical function (PF) and bodily pain.

Randomization appears to have succeeded in achieving balance between the NCP and SOC groups. Twelve-month mean WOMAC scores improved from baseline by 37.5 and 34.5 points in the NCP and SOC groups, respectively. These are large differences, amounting to approximately two standard deviations. Similarly impressive improvements were noted in the SF-36 PF and body pain scores. The treatment effect of the NCP (defined as improvement between baseline and 12 months in the NCP group minus improvement in the SOC group) was 2.56 (95% CI 1.1, 4.0) for the WOMAC, 1.88 for the SF-36 PF, and 3.01 for bodily pain.

Adverse events for all groups were low. However, for the NCP patients, the most frequently reported adverse event was hip dislocation, and at 1.1%, this was higher than historical rates (0.7%) and higher than in the SOC group (0%).

The authors conclude that hip and knee replacements are effective surgical procedures that were further improved by use of the accelerated NCP approach. The effect of the NCP was small in comparison to the dramatic effect of the surgery itself. The treatment effect was about three points whereas the minimal clinically important change is closer to 10 points. But even this small gain in patient-reported outcomes over the SOC is noteworthy when viewed in the context of an overall reduction in inpatient costs.

As with all good studies, this one raises questions that will need to be addressed in further work. Did the results arise as a chance finding? Were the functional differences observed here sustainable? The study will need to be confirmed and the differences in short-term patient-reported outcomes will need to be evaluated over longer follow-up. Are the small differences in dislocation rate a robust finding? The initial cost savings of the NCP group could be offset by subsequent revisions if the higher hip dislocation rates reported in the NCP group here eventuate in higher rates of implant failure. Did the effects of the intervention arise from specific changes...
in process of care, or to a more general awareness of quality and efficiency prompted by the care improvement intervention? Interventions have the opportunity to both introduce specific process changes that themselves result in improved outcomes, and to inspire changes in the overall care environment that then translate into better outcomes. Are the system improvements studied in this paper translatable to other health care settings? To other procedures in the same settings? This evaluation model certainly merits further evaluation across a range of settings, particularly when policymakers across the world are so eagerly searching for ways to reduce medical costs without compromising the quality of patient care.

The Alberta team’s work in this area points to the potential benefits of the transformation toward commodification of TJR. The heterogeneity in care processes that characterized the boutique era of TJR development is potentially costly from the standpoint of both dollars and outcomes. Standardization of evidence-based practices has the potential to yield economic and patient-centered benefits. Patients, providers, payers and health systems all stand to gain if the findings of this RCT from Alberta are confirmed and integrated into clinical practice and policy.

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Drs. Katz and Martin both contributed to the conceptualization, writing and editing of the piece.

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Conflict of interest
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References


J.N. Katz†‡*, T.L. Martin†§
†Department of Orthopedic Surgery, Harvard Medical School, Boston, MA, USA
‡Division of Rheumatology, Immunology and Allergy, Harvard Medical School, Boston, MA, USA
§Brigham and Women’s Hospital, Boston VA Medical Center, Harvard Medical School, Boston, MA, USA

* Address correspondence and reprint requests to: J.N. Katz, Orthopedic and Arthritis Center for Outcomes Research, Brigham and Women’s Hospital, 75 Francis Street, Boston, MA 02115, USA. Tel.: 1-617-732-5338; Fax: 1-617-525-7900. E-mail address: jnkatz@partners.org (J.N. Katz)