

The Perioperative Surgical Home: Improving the Value and Quality of Care in Total Joint Replacement

George F. Chimento^{1,2} · Leslie C. Thomas^{2,3}

Published online: 22 June 2017
© Springer Science+Business Media, LLC 2017

Abstract

Purpose of Review The perioperative surgical home (PSH) is a patient-centered, physician-led, multidisciplinary care pathway developed to deliver value-based care based on shared decision-making. Physician and hospital reimbursement will be tied to providing quality care at lower cost, and the PSH model has been used in providing care to patients undergoing lower extremity arthroplasty. The purpose of this review is to discuss the rationale, definition, development, current state, and future direction of the PSH.

Recent Findings The PSH model guides the patient throughout the pre and perioperative process and into the postoperative phase. It has been shown in multiple studies to decrease length of stay, improve functional outcomes, allow more home discharges, and lower costs. There is no increase in complications or readmission rates.

Summary The PSH pathway is a safe and effective method of providing value-based care to patients undergoing hip and knee arthroplasty.

Keywords Perioperative surgical home · Arthroplasty · Outcomes · Bundled payments, readmission · Value-based care

Introduction

Payment models in healthcare are shifting rapidly. No longer are surgeons getting reimbursed solely on the volume of procedures performed in the traditional fee-for-service model. In 2015, then secretary of US Health and Human Services Sylvia Burwell stated that 85% of Medicare fee-for-service payments should be tied to quality or value by 2016, and 30% of Medicare payments should be tied to quality or value through alternative payment models by 2016 and 50% by the end of 2018 [1]. The Comprehensive Care for Joint Replacement model (CJR) was introduced by CMS in several geographic areas on April 1, 2016. The CJR model holds participant hospitals financially accountable for the quality and cost of a CJR episode of care and incentivizes increased coordination of care among hospitals, physicians, and post-acute care providers [2]. Bundled payments have existed since 1984 and were first adopted by CMS in 2009. They have become much more widespread in the ensuing years [3].

Recently, congress repealed the sustainable growth rate (SGR) formula for physician reimbursement and replaced it with the Medicare Access and CHIP Reauthorization Act of 2015 (MACRA). Physicians will be reimbursed through the Merit-based Incentive Payment Systems (MIPS) or through an alternate payment model (APM). Participation in the CJR qualifies as an APM. Payments in this system will be based on value, not volume [4]. Value is defined as outcomes relative to cost. Cost reduction that does not produce excellent patient outcomes does not qualify as value-based care. The results of the procedure should be measured by the outcome achieved.

This article is part of the Topical Collection on *Quality and Cost Control in TJA*

✉ George F. Chimento
gchimento@ochsner.org

¹ Department of Orthopaedic Surgery, Ochsner Medical Center, 1514 Jefferson Highway, New Orleans, LA 70121, USA

² Ochsner Clinical School, University of Queensland School of Medicine, New Orleans, LA, USA

³ Department of Anesthesiology, Ochsner Medical Center, Jefferson, LA 70121, USA

Outcomes are multifaceted and can include not only survival but also the degree of improvement produced by the intervention, the time needed for recovery, and the sustainability of recovery, including complications and readmissions. Ideally, the outcomes should be risk adjusted and transparent. Cost refers to the full cost for the entire episode of care, not just a specific intervention [5, 6].

Kurz et al. have projected that the demand for primary total hip arthroplasty (THA) is estimated to grow by 174% to 572,000, and the demand for primary total knee arthroplasty (TKA) is projected to grow by 673% to 3.48 million procedures by 2030 [7]. Given the projected volume increase and the change in payment methodology to both physicians and hospitals, care pathways that reduce costs and improve outcomes in the arthroplasty patient population have been developed. The use of rapid recovery programs following hip and knee replacements have been implemented with some success. Although not PSH programs, these integrated care pathways can reduce length of stay without an increase in complications or readmissions [8, 9].

Definition

The perioperative surgical home (PSH) is defined as a patient-centered, physician-led continuity of care delivery model that includes multi-specialty care teams and cost-efficient use of resources at all levels, utilizing shared decision-making. Anesthesiologists played a key role in the development of the PSH, in an effort to expand their role in perioperative management [10]. The well-established patient-centered medical home (PCMH) is based on the concept of a single physician who leads a team of health care providers in an individualized treatment and management plan. Both the PCMH and the PSH share a vision of delivering patient-centered value-based care [11]. The PSH has some similarities to the enhanced recovery after surgery (ERAS) program, but there are key differences. ERAS is designed to modify the physiological and psychological responses to major surgery and has been shown to lead to a reduction in complications and hospital stay. This is accomplished through a multimodal approach including pre-operative counseling and early mobilization with an emphasis on nutrition, and standardization of anesthetic and analgesic regimens [12].

The PSH model is a comprehensive pathway and encompasses all aspects of care throughout the process from the pre-operative optimization process through the post-discharge period. The care is coordinated by a team led by the surgeon and anesthesiologist, and all aspects of care are evidence based and protocol driven [13]. Traditional medical co-management models have not shown success in the management of hip and knee arthroplasty patients. Duplantier et al. have shown that total joint patients co-managed by hospitalists had more medical tests ordered while hospitalized,

had a higher cost of hospitalization, and were more likely to be discharged to a skilled nursing facility compared to a group that was managed by the surgeons alone [14].

Garson et al. reported on the use of the PSH model in total hip and knee patients at their institution. The model was initiated in 2012. The team was led by members of the departments of anesthesia and orthopedic surgery and consisted of nurses, pharmacists, physical therapists, case managers, social workers, and information technology experts. Evidence-based clinical practice guidelines were developed. The pathway was initiated pre-operatively and included intraoperative and postoperative phases of care, as well as coordinating postoperative anticoagulation and a postoperative follow-up phone call. They had a very low complication and readmission rate, but only 50% of the patients were discharged to home [15].

Current state

Example of a PSH Pathway

Our institution developed a PSH pathway for THA patients in March 2014. There is a weekly multidisciplinary meeting where advanced discharge planning and specific case-related medical and orthopedic issues are discussed. Also, successes and potential areas of improvement of the prior week are reviewed in an effort to continuously advance. Representatives of orthopedic surgery, anesthesia, nursing, physical therapy, the pre-operative center, social work, home health, the skilled nursing facility, case management, and hospital administration attended the meeting.

All patients receive pre-operative medical optimization at our institution's anesthesia led pre-op center, and they all attend a two-hour total joint class where the procedure and aftercare are explained to them in detail. Discharge expectations are reinforced at this class.

The patients receive standardized perioperative antibiotics and the surgeries are performed through a posterolateral approach with capsular repair. Patients received aspirin 325 mg bid for DVT prophylaxis, unless they have a strong personal or family history of thromboembolic disease. These patients were placed on dose-adjusted warfarin with a target INR of 1.8–2.2. Our institution's anticoagulation clinic manages the dosing. Standard anticoagulation is continued for 4 weeks postoperatively. All patients receive 3 g of tranexamic acid in 100 mL normal saline injected deep to the fascia following its closure.

The anesthetic choice for all patients is a spinal-epidural anesthetic, unless contraindicated or technically unable to be performed. If this occurs, a general anesthetic is administered. Patients receive a short acting mepivacaine spinal. Intraoperative fluid management is standardized with a goal of 3 L normal saline being administered during the case.

Patients also receive dexamethasone and ketamine. Postoperatively, all patients with an epidural receive patient-controlled epidural analgesia (PCEA) with a mixture of dilute ropivacaine and fentanyl to minimize motor blockade. If no epidural is placed, the patients are switched immediately to oral opioid pain medication, and a PCA device is not used. Other forms of multimodal analgesia utilized in both groups include celecoxib and acetaminophen; in addition, the PSH patients also received pregabalin. The goal of the multimodal approach in the PSH group is to limit opioid consumption. Quick onset, short-acting opioids are available for breakthrough pain, but their use is discouraged.

Day of surgery physical therapy is instituted with all patients ambulating at the bedside. There is a rapid de-escalation of care with the epidural and Foley catheter being removed at 0600 on POD 1.

The orthopedic and the anesthesia service coordinate postoperative care. Rounding is performed as a team and medical management, pain management, and discharge plans are discussed and mutually agreed upon. In our model, the surgeon acts as the team leader. We developed standardized clinical assessment and management pathways (SCAMPS) for common clinical problems such as postoperative hypertension, chest pain, volume management, and sleep apnea. The pathways were developed using best practices based on a current literature search in conjunction with an expert in that particular field, and are frequently evaluated and updated. Consultation with a specialist is obtained when clinically indicated based on the SCAMP. The goal of the PSH team at our institution is to have a defined group (the orthopedic surgeon and anesthesiologist) who handle most all events in the perioperative period, limiting the necessity for outside teams who may not be as familiar with the intricacies of a post-arthroplasty patient.

Home discharge is encouraged over a transfer to a skilled nursing facility (SNF). Home health orders are standardized. An orthopedic nurse practitioner rounds weekly on the SNF patients. Initially, we had an orthopedic certified nurse call patients at home deemed high risk following discharge. This evolved into a scripted phone call on all patients within 3 days following discharge. There is early orthopedic evaluation and intervention to help prevent unnecessary emergency department visits and readmissions. The patients are given a single number to call post-discharge and the patients are instructed to return to the orthopedic clinic rather than the emergency room whenever possible.

Presently, all primary total hip and total knee arthroplasties are managed with our PSH pathway.

Pre-operative Phase

In the patient-centered PSH model, the pathway begins when the patients are scheduled for surgery. Yoon et al. demonstrated that patients who attended a pre-operative education class had a

significantly shorter LOS than patients who did not [16]. Studies by Ng et al. and Duplantier et al. have demonstrated improved outcomes and decreased LOS when patients are medically optimized in a standardized fashion prior to surgery [17, 18]. Boraiah et al. and Iorio have discussed risk stratification and stressed optimization prior to joint replacement surgery, with special attention placed on modifiable risk factors. The opinion is that mitigating as much risk as possible preoperatively will decrease the risk of a complication or readmission [19, 20]. Expectations regarding LOS and discharge location are set during this pre-operative process and are upheld with every service (orthopedics, anesthesia, physical therapy, nursing, etc.) that interacts with the patient.

Anesthesia and Analgesia

We do not refer to this strictly as the intraoperative phase because medications given before arrival to the OR play an important role in anesthetic choice and postoperative function. Husted, in extensive review, has shown that opioid-sparing multimodal pain control is a key element in a successful rapid recovery program. The multimodal opioid-sparing pain treatment used in most of the studies he reviewed consisted of acetaminophen, a COX-2 inhibitor gabapentin, and fast-acting short-duration opioid upon request. The use of long-acting opioids was not recommended [21]. Ayalon et al. also recommend the use of dexamethasone to combat postoperative nausea [22]. Garson et al. have also demonstrated that standardized intraoperative anesthetic regimen is a key component to their protocol [15••]. This is confirmed by Ayalon et al. [22]. However, in the model proposed by Vetter, there is not a standardized intraoperative regimen [23]. The use of regional anesthesia in the total knee population is also a significant portion of the multimodal approach. The PSH pathway process also leads to better operating room efficiency, less waste, and more on-time case starts [15••, 20, 23].

Postoperative Phase

The multimodal approach has been associated with earlier mobilization and participation in physical therapy. Day of surgery physical therapy has also been demonstrated to help reduce LOS without compromising outcomes in both a hip and knee arthroplasty population [8, 24].

In the PSH model, anesthesiologists assume a larger role in the perioperative care of the patient. The orthopedic surgeon does not abdicate care to the anesthesiologist, but they work closely together coordinating the care of the patient. As previously mentioned, hospitalist management of arthroplasty patients may increase cost, without any improvement in outcomes [14]. SCAMPS are an attractive alternative to clinical practice guidelines. They accomplish the goal of narrowing practice variability, while still allowing providers to provide

individualized care. They are flexible in that they are frequently updated and are modifiable [25].

Discharge

One of the keys to delivering value-based care is to safely reduce the length of stay (LOS) and discharge patients to home rather than a SNF. Bini et al. demonstrated that discharge to a SNF was associated with a higher readmission rate after controlling for ASA score, age, sex, and hospital complications [26]. Ashby et al. have shown that as many as 46% of patients who remain in the hospital on POD 3 have no significant medical reason to remain hospitalized and timely discharge can be financially beneficial to the healthcare facility. The top five reasons for delayed discharge were remaining in the hospital for further physical therapy, awaiting social services, awaiting a bed in a rehabilitation facility, awaiting home equipment, and the patient “not feeling well” although all testing was negative [27].

Chaurasia et al. evaluated 190 total joint patients managed in a surgical home model. They demonstrated that regional anesthesia decreased the LOS in arthroplasty patients. They also found that patients operated on earlier in the day and earlier in the week had a shorter LOS. They also found that the ASA score and BMI were not related to the LOS [28].

Crawford et al. reported their results after initiating a total joint pathway and found that increased age and ASA score were related to an increased LOS. Interestingly, higher BMI was associated with a shorter LOS. They also found increased age and ASA scores were more likely to be associated with a disposition to a SNF. This was not a PSH pathway [29]. Phan et al. examined the impact of patient characteristics on the PSH model. Their group found an increased ASA score was the only factor that contributed to an increased LOS and there was a higher readmission rate for these patients. There was no correlation with age, gender, procedure, or Charlson comorbidity index (CCI) [30].

Cyriac et al. reported on the 2-year follow-up of Garson’s initial report on the PSH and found that through continued evolution of the model, significantly more patients were discharged home, rather than to a SNF [31]. Iorio stressed that home discharge is tantamount to a successful PSH model [20].

Post-Discharge

One of the concerns of having a decreased length of stay is an increase in readmissions. This was specifically studied by Alem et al. who did not find an increase in readmissions following the decreased LOS seen with implementation of a PSH pathway [32]. Several other studies have confirmed that the PSH pathway was not associated with increased readmission or complications. Pre- and postoperative education and post-discharge follow-up, usually in the form of a phone call, is utilized as part of the PSH [11•, 15•, 23].

Financial Impact

Raphael et al. looked specifically at the effect of the PSH on hospital costs. They found that their institution was significantly below benchmark costs for both THA and TKA with the utilization of a PSH model. They attributed most of this to decreased length of stay [33]. Vetter et al. note that they reduced the direct costs (with the exclusion of the implants) at their institution [23]. Kash et al. reported on the positive financial impact of the PSH and noted the effect this could have on future policy [11•].

Future State

According to Kash, continued success and evolution of the PSH model will require stakeholders to disseminate the models. Also, there must be willingness for both physicians and hospitals to follow evidence-based guidelines. This necessitates orthopedic surgeons and anesthesiologists be willing to work closely together in their perioperative roles [11•]. There is much room for improvement in the pre-operative optimization process [19, 20]. Furthermore, the PSH model can be expanded to include a greater control of the entire episode of care. This will involve the pathway to extend deeper into the post-acute phase than it presently does. To our knowledge, most pathways stop at the prevention of readmissions, but there is significant cost associated with home health and outpatient therapy. Post-discharge navigators may play a role in ensuring that patients are not over or under utilizing these resources.

Conclusion

In conclusion, the PSH pathway achieves its goal of providing sound value-based care. It should be strongly stressed that although the orthopedic surgeons and anesthesiologists co-manage the patients, the ultimate responsibility rests with the surgeon. From the pre-operative process to the post-acute phase, the orthopedic surgeon is intimately involved, and care is not abdicated to a consulting service. The length of stay is safely decreased through pre-operative education and optimization, and sound evidence-based intraoperative and postoperative management. Close post-discharge follow-up prevents an increase in readmissions. These factors lower costs and provide better outcomes.

Compliance with Ethical Standards

Conflict of Interest Both authors declare that they have no conflict of interest.

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

References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

1. Burwell SM. Setting value-based payment goals—HHS efforts to improve U.S. health care. *N Engl J Med* [Internet]. 2015;372(10):897–899. **Available from:** <http://www.ncbi.nlm.nih.gov/pubmed/25738663%5C> <http://www.ncbi.nlm.nih.gov/pubmed/25622024>
2. Comprehensive care for joint replacement model. [CMS.gov](http://www.cms.gov)
3. Froimson MI, Rana A, White RE, Marshall A, Schutzer SF, Healy WL, et al. Bundled payments for care improvement initiative: the next evolution of payment formulations: AAHKS bundled payment task force. *J Arthroplasty* [Internet]. Elsevier Inc.; 2013;28(8 SUPPL):157–165. **Available from:** <http://dx.doi.org/10.1016/j.arth.2013.07.012>
4. What is MACRA—network for regional healthcare improvement. [NRHli.org](http://www.nrhli.org)
5. Porter ME. What is value in health care? *N Engl J Med* [Internet]. 2010;363(1):1–3.
6. Porter ME. A strategy for health care reform—toward a value-based system. *N Engl J Med*. 2009;361(2):109–12.
7. Kurtz S, Ong K, Lau E, Mowat F, Halpern M. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. *J Bone Jt Surgery-American*. 2007;89A(4):780–5.
8. Doman DM, Gerlinger TL. Total joint arthroplasty cost savings with a rapid recovery protocol in a military medical center. *Mil Med*. 2012;177(1):64–9.
9. Mertes SC, Raut S, Khanduja V. Integrated care pathways in lower-limb arthroplasty: are they effective in reducing length of hospital stay? *Int Orthop*. 2013;37(6):1157–63.
10. Vetter TR, Goeddel LA, Boudreaux AM, Hunt TR, Jones KA, Pittet J-F. The perioperative surgical home: how can it make the case so everyone wins?. [Internet]. Vol. 13, *BMC anesthesiology*. 2013. p. 6 **This is a description of an early PSH model that provides a widely accepted definition of what the PSH is.**
11. Kash BA, Zhang Y, Cline KM, Menser T, Miller TR. The perioperative surgical home (PSH): a comprehensive review of us and non-us studies shows predominantly positive quality and cost outcomes. *Milbank Q*. 2014;92(4):796–821. This is an excellent review that compared the PSH to other models.
12. Melnyk M, Casey RG, Black P, Koupparis AJ. Enhanced recovery after surgery (ERAS) protocols: Time to change practice? [Internet]. Vol., *Can Urol Assoc J* 2011 5. p. 342–348.
13. Cannesson M, Kain Z. The perioperative surgical home: an innovative clinical care delivery model. *J Clin Anesth*. 2015;27(3):185–7.
14. Duplantier N, Briski D, Luce L, Meyer M, Ochsner J, Chimento G. The effects of a hospitalist co-management model for joint replacement patients in a teaching facility. *J Arthroplasty* [Internet]. Elsevier Ltd; 2015;31(3):1–6.
15. Garson L, Schwarzkopf R, Vakharia S, Alexander B, Stead S, Cannesson M, et al. Implementation of a total joint replacement-focused. *Anesth Analg*. 2014;118(5):1081–9. **To our knowledge this is the description of the first total joint PSH Model.**
16. Yoon RS, Nellans KW, Geller JA, Kim AD, Jacobs MR, Macaulay W. Patient education before hip or knee arthroplasty lowers length of stay. *J Arthroplasty* [Internet]. Elsevier Inc.; 2010;25(4):547–551.
17. Ng VY, Lustenberger D, Hoang K, Urchek R, Beal M, Calhoun JH, et al. Preoperative risk stratification and risk reduction for Total joint reconstruction. *J Bone Jt Surgery-American*. 2013;19:1–15.
18. Duplantier N, Briski D, Ochsner JL, Meyer M, Stanga D, Chimento GF. The financial impact of a multidisciplinary preoperative risk stratification program for joint arthroplasty. *J Arthroplasty* [Internet]. Elsevier Inc.; 2015;30(9):1485–1491.
19. Boraiah S, Joo L, Inneh IA, Rathod P, Meftah M, Band P, et al. Management of modifiable risk factors prior to primary hip and knee arthroplasty: a readmission risk assessment tool. *J Bone Jt Surg* [Internet]. 2015;97(23):1921–8.
20. Iorio R. Strategies and tactics for successful implementation of bundled payments: bundled payment for care improvement at a large, urban, academic medical center. *J Arthroplasty* [Internet]. Elsevier Inc.; 2015;30(3):349–350.
21. Husted H. Fast-track hip and knee arthroplasty: clinical and organizational aspects. *Acta Orthop Suppl* [Internet]. 2012;83(346):1–39.
22. Ayalon O, Liu S, Flics S, Cahill J, Juliano K, Cornell CN. A multimodal clinical pathway can reduce length of stay after Total knee arthroplasty. *HSS J*. 2011;7(1):9–15.
23. Vetter TR, Barman J, Hunter JM, Jones KA, Pittet JF. The effect of implementation of preoperative and postoperative care elements of a perioperative surgical home model on outcomes in patients undergoing hip arthroplasty or knee arthroplasty. *Anesth Analg*.
24. Juliano K, Edwards D, Spinello D, Capizzano Y, Epelman E, Kalowitz J, et al. Initiating physical therapy on the day of surgery decreases length of stay without compromising functional outcomes following Total hip arthroplasty. *HSS J*. 2011;7(1):16–20.
25. Farias M, Jenkins K, Lock J, Rathod R, Newburger J, Bates DW, et al. Standardized clinical assessment and management plans (SCAMPs) provide a better alternative to clinical practice guidelines. [Internet]. Vol. 32, *Health affairs (Project Hope)*. 2013. p. 911–920.
26. Bini SA, Fithian DC, Paxton LW, Khatod MX, Inacio MC, Namba RS. Does discharge disposition after primary total joint arthroplasty affect readmission rates? *J Arthroplasty* [Internet]. Elsevier Inc.; 2010;25(1):114–117.
27. Ashby E, Matejowsky C, Mythen MG, Haddad FS, Grocott MP. How efficient is patient discharge following lower limb arthroplasty? *Perioper Med* [Internet]. 2015;4(1):5.
28. Chaurasia A, Garson L, Kain ZL, Schwarzkopf R. Outcomes of a joint replacement surgical home model clinical pathway. *Biomed Res Int*. 2014;2014
29. Crawford DA, Scully W, McFadden L, Manoso M. Preoperative predictors of length of hospital stay and discharge disposition following primary total knee arthroplasty at a military medical center. *Mil Med* [Internet]. 2011;176(3):304–7.
30. Phan DL, Ahn K, Rinehart JB, Calderon M-D, Wu W-D, Schwarzkopf R. Joint arthroplasty perioperative surgical home: impact of patient characteristics on postoperative outcomes [Internet].
31. Cyriac J, Garson L, Schwarzkopf R, Ahn K, Rinehart J, Vakharia S, et al. Total Joint Replacement Perioperative Surgical Home Program: 2-Year Follow-Up. *Anesth Analg*. 2016;123:51–62.
32. Alem N, Rinehart J, Lee B, Merrill D, Sobhanie S, Ahn K, et al. A case management report: a collaborative perioperative surgical home paradigm and the reduction of total joint arthroplasty readmissions [Internet]. Vol. 5, *Perioper Med*. 2016. p. 1–10.
33. Raphael DR, Cannesson M, Schwarzkopf R, Garson LM, Vakharia SB, Gupta R, et al. Total joint perioperative surgical home: an observational financial review. *Perioper Med (London, England)* [Internet]. 2014;3(1):6.