Published in final edited form as:

J Arthroplasty. 2017 June ; 32(6): 1763–1768. doi:10.1016/j.arth.2017.01.028.

Receipt of pain management information pre-operatively is associated with improved functional gain after elective total joint replacement

Celeste A. Lemay, RN, MPH,

Research Instructor and Senior Project Director, Department of Orthopedics and Physical Rehabilitation, University of Massachusetts Medical School, 55 Lake Ave North, Worcester, MA 01655

Courtland G. Lewis, MD,

Hartford Hospital, 80 Seymour St, Hartford, CT 06102

Jasvinder Singh, MD, MPH, and

Professor of Medicine, Division of Clinical Immunology and Rheumatology, University of Alabama at Birmingham, 1720 2nd Ave South, Birmingham, AL 35294

Patricia D. Franklin, MD, MBA, MPH

Professor and Director, Clinical and Outcomes Research, Department of Orthopedics and Physical Rehabilitation, University of Massachusetts Medical School, 55 Lake Ave North, Worcester, MA 01655

Abstract

Background—Poorly controlled post-operative pain may adversely affect total joint replacement (TJR) patients' outcomes and associated healthcare cost. Understanding effective pain management after surgery is important to patients, surgeons, and hospitals. We evaluated patient-reported receipt of pre-operative pain management information in a national prospective cohort evaluating post-operative pain and function following elective TJR.

Methods—Preoperative, 2-week and 6-month postoperative survey data of 1609 TJR patients collected between 6/2013 and 12/2014 were analyzed. Data included demographics, medical and musculoskeletal comorbidity, operative joint pain, physical function and mental health. At 2-weeks post-operative, patients were asked if they had received pain management information prior to surgery, the content of that education, and pain management strategies. Descriptive statistics were performed.

Results—At 2 weeks post TJR, one third of patients reported not receiving information about pain management; an additional 11% did not find the information helpful. There were no differences pre-operatively in demographics or clinical profiles between those who received pain

Corresponding author: celeste.lemay@umassmed.edu, Phone: 508-856-4251 Fax: 508-856-2581.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

information and those who did not. Patients who received pain information reported less pain 2-weeks post-operatively; greater use of non-narcotic pain care strategies; and, better physical function scores at 6-months post-operatively. No differences in operative joint pain were identified at 6-months between education and non-education groups.

Conclusion—Forty-four percent of patients reported that they did not receive/received unhelpful information regarding post-operative pain management, highlighting a need for improved patient education. In this sample, the lack of pain management information was associated with poorer 6-month post-operative function.

Keywords

pain management education; patient reported outcomes; elective surgery; Non-medicine pain management

Introduction

Patients undergoing total joint replacement (TJR) experience significant arthritic pain prior to electing surgery [1,2] and are often managing pain with the use of prescription and non-prescription pain medication. Additionally, the majority experience new surgical pain in the early post-operative period. [3] Effective pain management continues to be a challenge for orthopedic surgeons and their patients. [4,5] Poorly controlled post-operative pain may have adverse effects on patients' post-operative course, including an increased length of hospital stay, greater risk for adverse events such as readmission and deep vein thrombosis, as well as delayed physical recovery and return to activities of daily living. Associated increased overall healthcare costs will impact bundled payments, which the Centers for Medicare and Medicaid is now linking to 30 day all-cause readmission and complications. [6] Finally, as TJR patients are increasingly discharged directly to home, it is important that patients understand how to self-manage post-surgical pain. Thus, understanding effective pain management after TJR is important to patients, surgeons, and hospitals.

Several studies have focused on TJR pain management during hospitalization [7–12] with less attention paid to addressing the management of pain after discharge. Currently, prescription pain medications such as opioids are the most common approach to managing pain postoperatively. Although current standard of care for elective surgical patients includes a pre-operative education class, in their review of the literature, Louw et al. (2013) concluded that patient education classes that use the “biomedical model” have little impact on post-operative pain after TJR. [13] A 2014 Cochrane review also found no difference in patient reported outcomes of pain and function between participants receiving a pre-operative patient education intervention and those receiving usual care.[14]

Although these studies have examined the impact of pre-operative patient education on patient outcomes after surgery, little is known about the patients' perception of the information received pre-operatively regarding managing their pain at home post-operatively. In this study, we evaluated patient reported receipt of pre-operative pain treatment options information for managing pain post-operatively in a national prospective multi-center cohort of TJR patients. The dataset includes post-operative pain and function.

[15] Additionally, we explored the use of non-medical methods of pain management by patients to help decrease or alleviate their postoperative pain.

Methods

Participants and setting

Data were obtained from the Function and Outcomes Research for Comparative Effectiveness in Total Joint Replacement (FORCE-TJR) study, a national cohort of more than 132 orthopedic surgeons in academic and private centers from 22 states across the country.[15] A randomized sample of surgeons were invited to participate, and were stratified by region of the US and surgical volume. Overall, 75% of participating surgeons are community-based orthopedists.

Design

Patients were prospectively enrolled into the cohort beginning in 2011, at a preoperative visit within three months of undergoing their primary, elective, unilateral total joint replacement surgery. Follow-up data were collected at 6 months post-operatively and annually thereafter. The response rate for the FORCE study was 80 to 85%.[16] For the current study, a subset of patients, between June 2013 and December 2014, were invited to complete an additional survey at 2 weeks post-operatively, which collected data regarding pain intensity and pain treatment information. Data were accessed in July 2015.

Instruments

FORCE-TJR collects demographic data, clinical comorbidity, and patient reported outcomes (PRO) through a self-administered questionnaire. Demographic data included age, gender, race, ethnicity, income, insurance status, educational level. Patient-reported outcome measures include the Mental Component Summary (MCS) score and Physical Component Summary (PCS) score of the Short Form-36 (SF-36) [17,18] and the Knee or Hip Disability and Osteoarthritis Outcome Score (KOOS/HOOS) [19, 20]. Medical comorbidities were measured using the modified Charlson Comorbidity Index (CCI) [21]. Musculoskeletal disease burden was assessed using the KOOS/HOOS pain subscale in non-operative joints and one item from the Oswestry Disability Index was used to measure back pain [22,23]. Body mass index (BMI) information was also collected. Patients completed the same PRO measures six-months postoperatively.

At 2 weeks post-operatively, a subset of patients from the FORCE-TJR registry completed a pain survey that included questions regarding whether or not they had received information prior to surgery about pain management options and if so, how helpful the information was (on a Likert scale of 0 to 10, with higher scores indicating greater helpfulness). Additionally, patients were asked about the use of and number of non-medication methods employed to relieve operative joint pain, about their current pain level, maximum pain level in the past 24 hours (higher scores indicating greater pain), and pain relief from all pain treatments combined (higher scores indicating greater relief). Patients were also asked about how much pain interfered with activities of daily living, including physical therapy (higher scores indicating greater interference).

Analyses

Descriptive statistics were calculated for continuous variables. Frequencies were determined for categorical variables including race, ethnicity, income, insurance status, educational level. Some variables with more than two categories were dichotomized; for example, race was considered as either white or nonwhite. Additionally, some continuous variables were collapsed into categorical variables. For example, HOOS and KOOS pain scores were collapsed into None/Mild (HOOS/KOOS score of 70 to 100) and Moderate/Severe (HOOS/KOOS score of 0 to less than 70). Independent sample t-tests and two-sample Wilcoxon rank-sum tests were used to compare means of continuous variables as indicated. Chi-square tests were used to compare frequencies of categorical values. Statistical significance level was set at $p < 0.05$.

IRB Approval

Study protocols and consent procedures were approved by the institution Committee for the Protection of Human Subjects in Research.

Results

Complete preoperative, 2 week and 6 month postoperative data were obtained from 1609 primary unilateral TJR patients. One third of patients (33% or 526/1609) reported not receiving information about pain management options prior to their surgery, and an additional 10.6% ($n=171$), who did receive information, reported that they did not find the information helpful (rated helpfulness of information as a 4 or less on a 0 to 10 scale).

Patients who had received information that was not helpful were similar to those who had received helpful information in demographic and clinical factors, thus we compared patients who reported not receiving information about pain management options post-operatively ($n=526$) with those who did ($n=1083$).

Preoperative Data

There were no statistically significant differences in demographics, including age, gender, race, ethnicity, education level or household income pre-operatively between those participants who received pain management information and those who did not (Table 1).

Additionally, there were no statistically significant differences in the type of joint surgery, the number of patient reported comorbid conditions, operative joint pain severity measured by the HOOS/KOOS pain scale, musculoskeletal disease burden which included pain in other joints and lower back pain, or pre-operative SF36 PCS and MCS between those who reported receiving pain management information and those who did not.

When the patient volume of the surgical practice where patients were recruited was examined, there were no statistical differences between low volume sites (less than 100 patients with data), moderate volume sites (100 to less than 200 patients) and high volume sites (more than 200 patients) for patients reporting no pain education.

2 weeks post-operative data

Patients who received information about pain management options reported lower current pain in the last 24 hours (2.96 versus 3.31; $p < 0.01$) and lower maximum pain in the last 24 hours (mean 4.80 versus 5.17) $p < 0.01$) (Figure 1) in their operative joint as well as higher levels of pain relief in the last 24 hours (mean 7.46 versus 7.04; $p < 0.01$). Figure 1 demonstrates the differences in distribution between patients who received information about pain management options and those who did not as it relates to maximum pain in the last 24 hours.

Patients who received information about pain management options were more likely to report the use of at least one non-medication method to relieve operative joint pain after TJR (90% versus 79%, $p < 0.01$). Among the strategies reported, patients who received information about pain management were more likely to report: using a cold pack (85% versus 73%, $p < 0.01$); using distraction such as watching TV and reading (50% versus 42%, $p = 0.01$); using relaxation (21% versus 16%, $p = 0.04$); listening to music (14% versus 8%, $p < 0.01$); walking (30% versus 24%, $p = 0.01$) and; imagery (3% versus 1%, $p = 0.04$) than patients who did not receive information about pain management. There were no significant differences between those who received information and those who did not in the use of prayer, massage, deep breathing, heat, and meditation.

When asked about pain interfering with activities of daily living, patients who received information about pain management options reported statistically significantly less interference doing activities in bed (e.g., turning, sitting up and repositioning) (mean 3.47 versus 3.86; $p = 0.01$), doing activities out of bed, (e.g., walking, sitting and standing) (mean 3.05 versus 3.37; $p = 0.01$), participating in physical therapy (mean 2.76 versus 3.34; $p < 0.01$), and falling asleep (mean 3.31 versus 3.75; $p = 0.01$). There were no differences between the two groups regarding staying asleep.

6 months post-operative data

At 6 months post-operatively, patients who reported receiving information about pain management pre-operatively had statistically higher mean physical function scores than those not receiving information (44.20 versus 45.74; $p = 0.012$). Additionally, when PCS was examined dichotomously (PCS less than one standard deviation below normal, or less than 40 versus 40 or greater and PCS less than two standard deviations below normal, or less than 30 versus 30 or greater) patients who reported receiving information about pain management pre-operatively were less likely to be in the lower PCS groups ($p = 0.03$ and $p = 0.001$, respective) (Table 2 and Figure 2). Figure 2 demonstrates the differences in distribution of the 6 month post-operative function scores between patients who received information about pain management options and those who did not. There were no differences in self-report of pain in the surgical joint or the MCS score at 6 months post-operatively. Finally, PCS scores were also examined by joint replaced (hip versus knee). Due to the smaller sample size by joint, most of the analyses were not statistically significant, however there was a consistent pattern of higher mean physical function scores for patients who reported receiving information about pain management pre-operatively than those not receiving information. For patients with hip replacements, this difference was significant

when examined dichotomously (PCS less than 40 versus 40 or greater and PCS less than 30 versus 30 or greater) ($p = 0.008$ and 0.002 respectively).

After adjusting for age, gender, BMI as well as pre-operative PCS, MCS and musculoskeletal disease burden, receiving information about pain management pre-operatively remained statistically significant for higher 6 month post-operative physical function ($p = 0.017$).

Discussion

Although patients in this study had elective TJR surgery, which should allow time for planning/educating patients, 33% reported that they did not receive pain management information prior to their planned surgery. This finding is similar to a study by Apfelbaum et al. (2003) that found 37% of post-operative patients reported that they did not receive information from a health care professional regarding pain management prior to surgery.[3] The current study could not determine when patients received pain management information and who provided this information, but qualitative data from semi-structured interviews with a selected sample of participating patients from all surgeon offices indicated that information about pain management after discharge was not included in the pre-operative education class [24]. As two recent literature reviews found that pre-operative education classes have little impact on postoperative pain [13, 14] and function [14] after TJR, it may be that the content of the information provided or lack thereof in pre-operative education classes is not sufficient to meet the postoperative pain management needs of the patient.

This study highlights the overall lack of knowledge in both groups regarding the use of non-medication strategies for managing pain post-operatively, with the sole exception of using cold therapy on operative joints. With trends toward shorter hospital stays, optimal home-based pain management is a priority. Additionally, with growing recognition and attention to what the Centers for Disease Control and Prevention (CDC) has classified as a prescription drug abuse epidemic [25], and with proposed solutions focusing on prescribing habits [25,26], use of narcotic medications as the primary method to control outpatient post-operative pain will most likely change. Narcotics may be required in the early post-operative period, but it will be important to minimize and shorten the time for which they are prescribed. Increasing the diversity of tools that patients can utilize to decrease narcotic use, increase self-efficacy and self-management may not only improve participation in physical therapy, home exercise, and rehabilitation, but could also provide skills for managing future osteoarthritis pain in other joints.

Enhanced educational goals for pain management post-operatively should focus on the appropriate timing of education. [27] It may be appropriate to provide additional pain management education at multiple time points after surgery using a multi-pronged approach. Possible methods could include: using media such as web-based education or CDs that patients could access as needed; using visiting nurses or in-home physical therapist in the first weeks after surgery and/or; case management from the surgeon's office. Increasing patient knowledge of non-medication methods of pain management would be an important place to start. Materials should also be tailored to specific patient sub-groups, such as

tailored material by literacy, language, and culture. The American Pain Society, in their recently published “Guidelines on the Management of Postoperative Pain” (2016), recommended many of these approaches, including patient centered education pre-operatively and in the transition to outpatient care as well as the use of multimodal therapies. [28] Despite these recommendations, Gordon et al. (2016) recognized evidence gaps in the current literature, specifically, the need for research to better understand the educational needs of all post-surgical patients in managing their post-operative pain [28]. Next steps will include interviewing participating patients to better understand the challenges they faced managing their pain postoperatively and identify their educational needs.

Two weeks after surgery, patients who reported receiving pain management information pre-operatively had lower levels of current and maximum pain in their operative joint compared to those who did not. It is important to recognize this difference. Having a better understanding of how to manage pain may help to increase activity post-operatively, thus making full participation in rehabilitation more successful for patients. It is also important to note that patients that did not receive pain management education reported greater interference with the activities of daily living, including physical therapy. Adequate pain management appears to be essential for encouraging appropriate engagement with post TJR exercise and activities.

Perhaps of greatest importance is that patients who reported receiving pain management information had a small, but statistically significant, increase in functional outcome at 6 months post-operatively than those who did not receive information. As mentioned previously, the ultimate goals of elective joint replacement surgery are to maximize function and reduce pain. As insurers, including CMS, increase focus on patient reported pain and functional outcomes after elective TJR [6], developing more effective ways of educating patients about managing their post-operative pain after discharge from the hospital should be a priority.

While this study reports pain management education data from a large national study, it has a few limitations. It is possible that patient recall bias regarding receipt of pain management information before surgery influenced the results as the question was asked 2 weeks after surgery. However, recall limitations will not influence the importance of the findings of this study. If pre-TJR pain management education was provided, but the patient does not remember the pain management options when they are needed after TJR, this is an important educational gap. We also did not measure literacy levels to determine the differences among groups, however there were no differences regarding education and income pre-operatively. We did not collect information about pre-operative methods that patients used to manage pain, including narcotics and non-medication management. However, there were no differences pre-operatively in operative joint pain, pain in other joints and lower back pain all of which are possible indicators for pre-operative narcotic use (see Table 1). Additionally, there were no differences in SF MCS Score, a measure of anxiety and depression, which can be associated with chronic pain requiring narcotic use. Although we did not collect information regarding the content of the pre-operative education class, patient report of absent of pain education did not vary by surgeon volume. Finally, it is possible that prior narcotic use may influence medication and non-medication methods of pain management

after TJR. The relationships among pre-surgical use of medical and non-medical pain management strategies require additional research.

Although the findings from this study regarding the differences in pain at 2 weeks and function at 6 months post-operatively between patients reporting receipt of pain management education and those who did not are statistically significant, they may not be clinically significant, as the differences were not large. However, the consistent trends of more pain, more pain interference, and poorer physical function at 6 months consistently support a relationship between early post-TJR pain and functional gain. Additionally, when PCS was examined dichotomously (PCS less than one standard deviation below normal, or less than 40 and PCS less than two standard deviations below normal, or less than 30) patients who reported not receiving information about pain management pre-operatively were more likely to be in the lower PCS groups (31% versus 26% for less than 40 and 11% versus 6% for less than 30). This difference is illustrated in Figure 2 in the distribution of function scores between the two groups for those who did not receive post-operative pain self-management options. Although not statistically significant, the trend of poorer physical function remained consistent when examined by joint type. Next steps will include examining the subset of patients with little or no improvement in function 6 months post-TJR to help identify who may be at greater risk for poorer outcomes post-operatively.

Conclusion

Forty-four percent of TJR patients in this study reported that they did not receive or received unhelpful information regarding post-operative pain self-management options for surgical knee or hip pain. This gap highlights a need for improved patient education with innovative strategies to reinforce pain management education after TJR. Furthermore, in this cohort, the lack of pain management information was associated with poorer 6 month post-operative function. Thus, peri-operative education about the optimal use of prescription and non-medical methods to manage joint pain are urgently required to assure maximum functional gain following successful primary total joint replacement surgery. A better understanding of the factors that influence consistent and effective pre-operative pain self-management options after TJR surgery could inform interventions and potentially reduce pain, reduce post-surgical narcotic use and improve functional outcomes. It is also important to note that although this study only included patients electing to have TJR surgery, the findings indicating the need for improved pain management education prior to elective surgery could have implications for other surgical interventions.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding: This project was supported by grants from the Agency for Healthcare Research and Quality (AHRQ) P50HS018910 and 1U19HS021110-03

The authors would like to thank Dr. Sylvie Puig for her editorial assistance with this manuscript.

References

1. Franklin PD, Li W, Ayers DC. The Chitranjan Ranawat Award: functional outcome after total knee replacement varies with patient attributes. *Clin Orthop Relat Res*. 2008 Nov; 466(11):2597–604. DOI: 10.1007/s11999-008-0428-8 [PubMed: 18810570]
2. Franklin PD, Karbassi JA, Li W, Yang W, Ayers DC. Reduction in narcotic use after primary total knee arthroplasty and association with patient pain relief and satisfaction. *J Arthroplasty*. 2010 Sep; 25(6 Suppl):12–6. Epub 2010 Jun 26. DOI: 10.1016/j.arth.2010.05.003 [PubMed: 20580191]
3. Apfelbaum JL, Chen C, Mehta SS, Gan TJ. Postoperative pain experience: results from a national survey suggest postoperative pain continues to be undermanaged. *Anesth Analg*. 2003 Aug; 97(2): 534–40. [PubMed: 12873949]
4. Horlocker TT. Pain management in total joint arthroplasty: a historical review. *Orthopedics*. 2010 Sep; 33(9 Suppl):14–9.
5. Gan TJ, Habib AS, Miller TE, White W, Apfelbaum JL. Incidence, patient satisfaction, and perceptions of post-surgical pain: results from a US national survey. *Curr Med Res Opin*. 2014 Jan; 30(1):149–60. [PubMed: 24237004]
6. HHS Press Office. [Accessed March 16, 2016] Beyond the impact on outcomes, the Centers for Medicare and Medicaid proposed to link bundled payments to these outcomes, specifically length of stay and 30 day all-cause readmission. Nov 16. 2015 Available at: <http://www.hhs.gov/about/news/2015/11/16/cms-finalizes-bundled-payment-initiative-hip-and-knee-replacements.html>
7. Fang R, Liu Z, Alijiang A, Jia H, Deng Y, Song Y, Meng Q. Efficacy of Intra-articular Local Anesthetics in Total Knee Arthroplasty. *Orthopedics*. 2015 Jul 1; 38(7):e573–81. [PubMed: 26186318]
8. Jove M, Griffin DW, Minkowitz HS, Ben-David B, Evashenk MA, Palmer PP. Sufentanil Sublingual Tablet System for the Management of Postoperative Pain after Knee or Hip Arthroplasty: A Randomized, Placebo-controlled Study. *Anesthesiology*. 2015 Aug; 123(2):434–43. [PubMed: 26079801]
9. Kovalak E, Do an AT, Üzümcügil O, Obut A, Yildiz AS, Kanay E, Tüzüner T, Özyuvaci E. A comparison of continuous femoral nerve block and periarticular local infiltration analgesia in the management of early period pain developing after total knee arthroplasty. *Acta Orthop Traumatol Turc*. 2015; 49(3):260–6. [PubMed: 26200404]
10. Haghighi M, Sedighnejad A, Mirbolook A, Naderi Nabi B, Farahmand M, Kazemnezhad Leili E, Shirvani M, Khajeh Jahromi S. Effect of Intravenous Intraoperative Esmolol on Pain Management Following Lower Limb Orthopedic Surgery. *Korean J Pain*. 2015 Jul; 28(3):198–202. [PubMed: 26175880]
11. Pulos N, Sheth N. Perioperative pain management following total joint arthroplasty. *Ann Orthop Rheumatol*. 2014; 2(3):1029.
12. Andersson V, Otterstrom-Rydberg E, Karlsson AK. The Importance of Written and Verbal Information on Pain Treatment for Patients Undergoing Surgical Interventions. *Pain Manag Nurs*. 2015 Oct; 16(5):634–41. [PubMed: 25979458]
13. Louw A, Diener I, Butler DS, Puenteadura EJ. Preoperative education addressing postoperative pain in total joint arthroplasty: review of content and educational delivery methods. *Physiother Theory Pract*. 2013 Apr; 29(3):175–94. [PubMed: 23035767]
14. McDonald S, Page MJ, Beringer K, Wasiak J, Sprowson A. Preoperative education for hip or knee replacement. *Cochrane Database Syst Rev*. 2014 May. 13(5):CD003526.
15. Franklin PD, Allison JJ, Ayers DC. Beyond joint implant registries: a patient-centered research consortium for comparative effectiveness in total joint replacement. *JAMA*. 2012 Sep 26; 308(12): 1217–8. [PubMed: 23011710]
16. Rolfson O, Eresian Chenok K, Bohm E, Lübbecke A, Denissen G, Dunn J, Lyman S, Franklin P, Dunbar M, Overgaard S, Garellick G, Dawson J. Patient-Reported Outcome Measures Working Group of the International Society of Arthroplasty Registries. Patient-reported outcome measures in arthroplasty registries. *Acta Orthop*. 2016 Jul; 87(Suppl 1):3–8. Epub 2016 May 11. DOI: 10.1080/17453674.2016.1181815 [PubMed: 27168175]

17. Ware JE Jr, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). Conceptual framework and item selection. *Med Care*. 1992; 30(6):473. [PubMed: 1593914]
18. Marx RG, Jones EC, Atwan NC, Closkey RF, Salvati EA, Sculco TP. Measuring improvement following total hip and knee arthroplasty using patient-based measures of outcome. *J Bone Joint Surg Am*. 2005; 87(9):1999. [PubMed: 16140815]
19. Nilsson AK, Lohmander LS, Klassbo M, Roos EM. Hip disability and osteoarthritis outcome score (HOOS)--validity and responsiveness in total hip replacement. *BMC musculoskeletal disorders*. 2003; 4:10. [PubMed: 12777182]
20. Roos EM, Toksvig-Larsen S. Knee injury and Osteoarthritis Outcome Score (KOOS) – validation and comparison to the WOMAC in total knee replacement. *Health and Quality of Life Outcomes*. 2003; 1:17. [PubMed: 12801417]
21. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis*. 1987; 40(5):373. [PubMed: 3558716]
22. Daltroy LH, Cats-Baril WL, Katz JN, Fossel AH, Liang MH. The North American spine society lumbar spine outcome assessment Instrument: reliability and validity tests. *Spine (Phila Pa)*. 1976; 21(6):741, 199.
23. Williamson A, Hoggart B. Pain: a review of three commonly used pain rating scales. *J Clin Nurs*. 2005; 14(7):798. [PubMed: 16000093]
24. Lemay, CA., Franklin, PD. Using Interviews to Understand Patients' Post-operative Pain Management Educational Needs before and after Elective Total Joint Replacement Surgery. American Public Health Association Meeting abstract; November 2016; Available at: <https://apha.confex.com/apha/144am/meetingapp.cgi/Paper/343793>
25. Centers for Disease Control and Prevention. [Accessed August 20, 2015] Prescription Painkiller Overdoses in the US. CDC Vital Signs. Nov. 2011 Available at: <http://www.cdc.gov/vitalsigns/pdf/2011-11-vitalsigns.pdf>
26. American Medical Association. [Accessed August 20, 2015] 6 things you can do to prevent opioid abuse. *AMA Wire*. May 5. 2015 Available at: <http://www.ama-assn.org/ama/ama-wire/post/6-things-can-prevent-opioid-abuse>
27. Chou R, Gordon DB, de Leon-Casasola OA, Rosenberg JM, Bickler S, Brennan T, et al. Management of Postoperative Pain: A Clinical Practice Guideline From the American Pain Society, the American Society of Regional Anesthesia and Pain Medicine, and the American Society of Anesthesiologists' Committee on Regional Anesthesia, Executive Committee, and Administrative Council. *J Pain*. 2016 Feb; 17(2):131–57. DOI: 10.1016/j.jpain.2015.12.008 [PubMed: 26827847]
28. Gordon DB, de Leon-Casasola OA, Wu CL, Sluka KA, Brennan TJ, Chou R. Research Gaps in Practice Guidelines for Acute Postoperative Pain Management in Adults: Findings From a Review of the Evidence for an American Pain Society Clinical Practice Guideline. *J Pain*. 2016 Feb; 17(2): 158–66. [PubMed: 26719073]

Figure 1. Distribution of Maximum Pain level in the last 24 hours at 2 weeks post-operatively by receipt of pre-operative pain management demonstrating a higher proportion of those receiving pain education reporting less pain (lower scores).

Figure 2. Distribution of Physical Function Score (PCS score) at 6 months post-operatively by receipt of pre-operative pain management information demonstrating a higher proportion of those receiving pain education reporting better function (higher scores).

Table 1

Patient demographics and pre-operative medical characteristics

	Received Information regarding pain treatment options		Total 1609	P
	Yes 1083 (%)	No 526 (%)		
Demographics				
Age				
Mean [SD]	66.56 [9.06]	66.99 [9.40]	66.70 [9.17]	0.510
Range	30–97	30–99	30–99	
Gender				
Female	652 (60.2)	333 (63.3)	985	0.231
Male	431 (39.8)	193 (36.7)	624	
Race				
White	1004 (94.6)	484 (94.7)	1488	0.942
Non-White	57 (5.4)	27 (5.3)	84	
Ethnicity				
Hispanic	12 (1.3)	8 (1.8)	20	0.444
Non-Hispanic	937 (98.7)	440 (98.2)	1377	
Education Level				
High School Graduate or less	272 (27.2)	150 (30.6)	422	0.301
Post High School	730 (72.8)	341 (69.4)	1071	
Household Income				
Less than or equal to \$45,000	275 (32.2)	137 (33.6)	412	0.821
Greater than \$45,000	579 (67.8)	271 (66.4)	850	
Pre-operative Medical Characteristics				
BMI				
Mean [SD]	30.30 (5.89)	30.41 (5.84)	30.34 (5.87)	0.764
Range	15.04–54.92	18.04–54.92	15.04–54.92	
Surgery Type				
Total Knee Replacement	672 (62%)	315 (60%)	987 (61.3%)	0.435
Total Hip Replacement	411 (38%)	211 (40%)	622 (38.7%)	
KOOS/HOOS pain in operative joint				
None/mild	108 (10.4)	48 (9.6)	156	0.708
Moderate/severe	933 (89.6)	451 (90.4)	1384	
PCS				
Mean [SD]	33.07 [8.17]	32.46 [8.62]	32.87 [8.32]	0.208
Range	10.44–59.60	12.19–54.66	10.44–59.60	
< 40	820 (79.8)	381 (80.0)	1201	0.48
40 or greater	208 (20.2)	95 (20.0)	303	
MCS				

	Received Information regarding pain treatment options		Total 1609	P
	Yes 1083 (%)	No 526 (%)		
Mean [SD]	53.07 [11.60]	52.22 [12.26]	52.80 [11.82]	0.213
Range	18.67–76.06	10.54–75.34	10.54–76.06	
Medical Comorbidity				
0	696 (66.2)	335 (65.2)	1031	0.141
1	198 (18.9)	82 (15.9)	280	
2–5	87 (8.3)	58 (11.3)	145	
6	70 (6.6)	39 (7.6)	109	
Pain in other knee/hip joints				
0	776 (73.8)	355 (71.0)	1131	0.121
1–3	276 (26.2)	145 (29.0)	421	
Lower back pain				
None/mild	793 (80.6)	382 (80.6)	1175	1.0
Moderate/severe	191 (19.4)	92 (19.4)	283	
Surgical Practice				
Low volume (< 100 patients)	417 (38.8)	191 (36.9)	608	0.098
Moderate Volume (100 to < 200 patients)	366 (34.1)	160 (30.9)	526	
High volume (≥ 200 patients)	291 (27.1)	167 (32.2)	458	

Table 2

Six month Post-operative patient reported outcomes

	Received Information regarding pain treatment options		Total 1609	P
	Yes 1083 (%)	No 526 (%)		
KOOS/HOOS pain in operative joint				
None/mild	862 (86.8)	413 (84.6)	1275	0.290
Moderate/severe	131 (13.2)	75 (15.4)	206	
PCS				
Mean [SD]	45.74 [9.21]	44.20 [10.07]	45.24 [9.52]	0.012
Range	14.09–64.51	14.56–61.25	14.09–64.51	
< 40	256 (25.5)	149 (31.0)	405	0.028
40 or greater	746 (74.5)	332 (69.0)	1078	
< 30	63 (6.3)	54 (11.2)	117	0.001
30 or greater	939 (93.7)	427 (88.8)	1366	
MCS				
Mean [SD]	55.48 [8.93]	55.70 [9.11]	55.55 [8.99]	0.418
Range	4.72–70.47	16.32–70.79	4.72–70.79	