SYSTEMATIC REVIEW ARTICLE

Preemptive and Preventive Pain Psychoeducation and Its Potential Application as a Multimodal Perioperative Pain Control Option: A Systematic Review

Audrey Horn, BS,* Kelly Kaneshiro, BS,† and Ban C. H. Tsui, MD, FRCPC‡

See Articles, p 555, p 556, p 574

The common treatment for postoperative pain is prescription opioids. Yet, these drugs have limited effect in preventing chronic pain from surgical intervention and have in part contributed to the opioid epidemic. Recently, preemptive analgesia and multimodal analgesia have been proposed with widely gained acceptance in addressing the pain issues. However, both analgesic approaches have been focused on pharmacological means while completely neglecting the psychological aspect. To address this epidemic, we have conducted a systematic review of preoperative educational methods to explore its application as both a preemptive and a preventive psychological approach to decrease postsurgical pain and improve outcome. Preemptive psychoeducation occurs before surgery and would include information about regional or neuraxial analgesia, while preventive psychoeducation occurs throughout the perioperative period. The content and presentation of preemptive psychoeducation can help patients form accurate expectations and address their concerns of surgical outcome, leading to a significant decrease in patients' anxiety levels. By addressing the psychological needs of patients through preoperative education, one can decrease postoperative recovery time and postsurgical acute pain. Reduced postsurgical acute pain results in fewer opioid prescriptions, which theoretically lowers the patient's risk of developing chronic postsurgical pain (CPSP), and potentially offers a novel concept using preemptive pain psychoeducation as a part of multimodal pain management solution to the opioid epidemic. (Anesth Analg 2020;130:559–73)

GLOSSARY

ACT = Acceptance and Commitment Therapy; **ADVANCE** = Anxiety-reduction, Distraction, Video modeling and education, Adding parents, No excessive reassurance, Coaching, and Exposure/shaping; **APSP** = acute postsurgical pain; **COPE** = Coping Orientation to Problems Experienced; **CPSP** = chronic postsurgical pain; **DNIC** = diffuse noxious inhibitory controls; **ER** = emergency room; **fMRI** = functional magnetic resonance imaging; **FORCE-TJR** = Function and Outcomes Research for Comparative Effectiveness in Total Joint Replacement; **KOOS/HOOS** = hip disability and osteoarthritis outcome score/knee injury and osteoarthritis outcome score; **Max** = maximum; **N/A** = not applicable; **NMDA** = *N*-methyl-D-aspartate; **NSAID** = nonsteroidal anti-inflammatory drugs; **ODI** = Oswestry Disability Index; **PACU** = postanesthesia care unit; **PCA** = patient-controlled analgesia; **PCS** = Pain Catastrophizing Scale; **postop** = postoperative; **preop** = preoperative; **PRISMA** = Preferred Reporting Items for Systematic Reviews and Meta-analyses; **RALP** = robotic-assisted laparoscopic prostatectomy; **RCT** = randomized controlled trial; **STEPS** = Steps to Surgical Success; **TSA** = thermostimulator; **VAS** = visual analogue scale

Opioids including morphine, fentanyl, and others have been the mainstay of primary analgesia for most surgical patients.[1] Adverse effects of opioid use include postoperative nausea and vomiting, constipation, delirium, and respiratory depression.[1] Thus, overreliance on opioids for postoperative pain management may be associated with adverse drug events that can increase length of stay and hospital costs.[2] When patients utilized opioid-sparing treatments for postoperative pain, fewer resources were expended, including a shorter hospital length of stay, lower nursing workload, and improved recovery profile.[1,2] Proper postoperative pain management is crucial because excessive postoperative pain can not only hinder the healing and recovery process but can also lead to chronic pain.[1] Two important analgesic concepts have been introduced and are gaining popularity in perioperative pain practice: preemptive analgesia[3,4] and multimodal regimen approach.[5] However, within the extensive literature on preemptive and multimodal concepts, most research has only focused

From the *Department of Psychological and Brain Sciences, University of California Santa Barbara, Santa Barbara, California; †Department of Osteopathic Medicine, Western University of Health and Sciences, Lebanon, Oregon; and ‡Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, Palo Alto, California.

Accepted for publication May 28, 2019.

Funding: Departmental/institutional.

The authors declare no conflicts of interest.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's website (www.anesthesia-analgesia.org).

Reprints will not be available from the authors.

Address correspondence to Ban C. H. Tsui, MD, FRCPC, Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, 300 Pasteur Dr, 3rd Floor, Room H3584, MC 5640, Stanford, CA 94305. Address e-mail to bantsui@stanford.edu.

DOI: 10.1213/ANE.0000000000004319

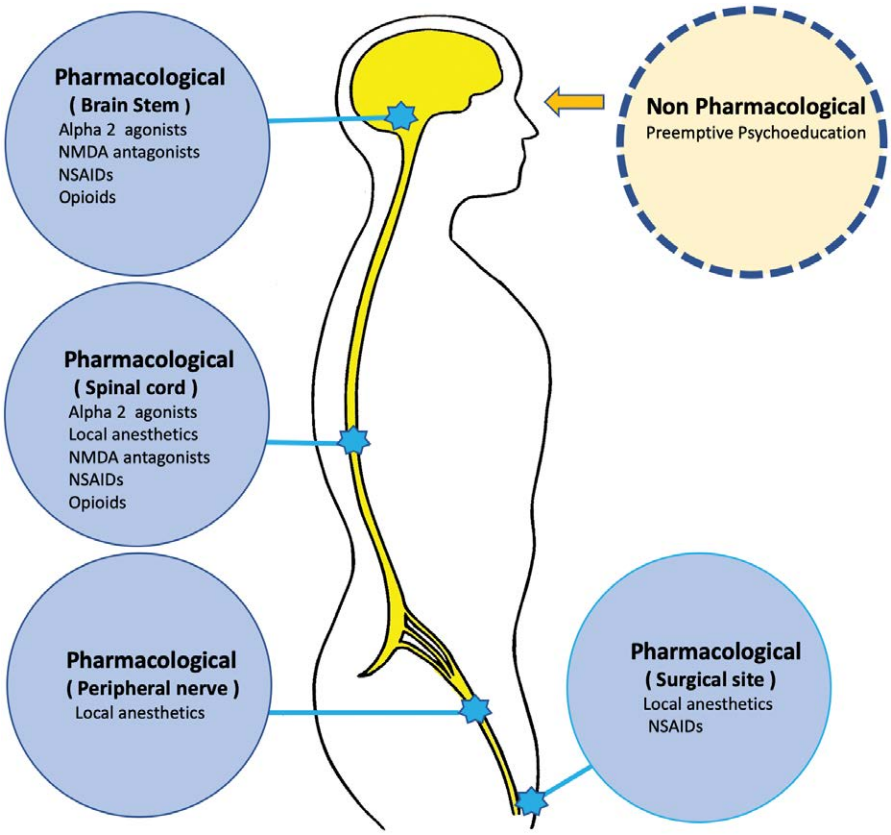

Figure. Schematic diagram of nonpharmacological preemptive pain psychoeducation as a part of multimodal perioperative pain control option. NMDA indicates *N*-methyl-D-aspartate; NSAID, nonsteroidal anti-inflammatory drugs.

on pharmacological means with little attention dedicated on the relationship between psychological intervention and perioperative pain management (Figure).

Specifically, psychological intervention is as follows: What preoperative information should patients be informed of regarding the pain they will experience after surgery? Does the education about the modalities to manage their postoperative pain influence patient's recovery? What evidence is there concerning the merit of psychological intervention in patient pain outcomes? All these questions have been rarely addressed in today's anesthesia and pain literature. To address this shortcoming, we have conducted a systematic review of preoperative educational methods to explore its application as both a preemptive and a preventive psychological approach to decrease postsurgical pain and improve outcome.

The goal of this study is to examine the roles and evidence in utilizing preoperative psychoeducational intervention as a new concept of preemptive multimodal strategy on postoperative pain, outcomes to enhance recovery, prevent chronic postsurgical pain (CPSP), and minimize the opioid epidemic. Anticipated pain,[6] procedural pain knowledge,[7] anxiety and pain catastrophizing effect,[8] delivery strategy,[9] and cost[10] have been identified as major influences on postoperative pain, and this review will specifically look at the effects of education/information in respect to these 5 categories on assessing the quality of preoperative psychoeducation and its effects on the outcome of surgery.

METHODS

We conducted a literature review using Medline, Google Scholar, and PubMed. The term "psychological intervention"[11] and following keywords were used when finding articles—"anxiety," "postoperative pain," "preoperative expectations," "recovery," "education," "pain management," "coping," "postoperative outcome," and "pain catastrophizing." Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines were followed for the identification, screening, and inclusion of articles for analysis. Inclusion criteria for the study were set to include individual case-controlled studies, original research studies, and systematic reviews. Expert opinion was excluded from the study. We selected studies that focused on pain management education and postoperative recovery. Studies involving cognitive–behavioral techniques were included. To broaden the search on the topic and studies, bibliographies within identified publications were also manually reviewed and included. We narrowed our search to human clinical trials and clinical studies in English. The evidence in the literature was also categorized and analyzed based on 5 interrelated psychological domains,

Table 1. Summarized Interpretations for 5 Domains of Preemptive and Preventive Pain Psychoeducation

Domains	Summary of Interpretation
Preoperative anticipated pain education	A mismatch between pain expectation (either too much or too little) and physical sensation can lead to increased postoperative pain levels, increased risk of developing CPSP, and increased postoperative analgesic use.[7,12–14]
Procedural pain knowledge	Psychological intervention and educational approaches during surgery preparation or recovery from surgery result in a 1.25- to 2.7-day shorter hospitalization, a decrease in ER visits 12 days postoperatively, and positive effects on patient anxiety and satisfaction.[11,15–21]
Anxiety and pain catastrophizing effect	Pain catastrophizing and preoperative anxiety are associated with increased postoperative pain and analgesic use and negatively impact patient recovery.[22–30] Education about the postoperative care, the surgical procedure, and the operative environment has been shown to reduce preoperative anxiety and postoperative pain.[31,32] Identifying patients at risk of catastrophizing and with preoperative anxiety can serve as a basis for initiating a more comprehensive preemptive pain psychoeducation.[33]
Information delivery strategy	A sympathetic patient-centered approach to care can reduce preoperative anxiety, improve surgical recovery and wound healing, and increase patient satisfaction with the quality of preoperative information.[34] Open conversations utilizing lay terms to explain the surgical process and outcomes can make patients more comfortable, help them regain a sense of control, and diminish fears about their surgery.[14,35] Written or electronic psychoeducation should be provided along with verbal information during preoperative consulting for optimal satisfaction and maximum recovery.[9,36,37]
Psychoeducational cost	Although there is limited existing research within this topic, some studies show that psychoeducational intervention can decrease recovery time and pain which can be cost-effective for hospitals.[10] Preoperative education can reduce a patient's anxiety which lowers their risk to complications and ultimately lowers hospitalization time and analgesic use.[11,15]

Abbreviations: CPSP, chronic postsurgical pain; ER, emergency room.

respectively: (1) preoperative pain anticipated education, (2) procedural pain knowledge, (3) anxiety and pain catastrophizing effect, (4) information delivery strategy, and (5) psychoeducational cost. The quality of evidence obtained from the literature searches was then assessed and graded using the Oxford levels of evidence (Supplemental Digital Content 1, Table 1, http://links.lww.com/AA/C862).[12]

RESULTS

Studies range from 1955 to 2018, including a large percentage from the 80s, were identified. The search resulted a total of 338 publications (Supplemental Digital Content 2, Figure 1, http://links.lww.com/AA/C863). All titles were manually screened by 2 authors. At the first stage, articles unrelated to human subjects or not in English were excluded, leaving a total of 55 publications for further evaluation. We further excluded 31 publications due to their focuses having no direct relationship to pain education such as prerehabilitation, performance of surgeons, virtual reality, observational studies, unpublished studies, therapeutic play, lack of postoperative outcome measures, supportive care intervention, and image guiding studies. We also evaluated an additional 6 articles that were referred by an expert colleague to our review. During the peer review process, 13 additional articles were evaluated as recommended by reviewers. The result of literature assessment based on Oxford levels of evidence is summarized in Tables 1–4.

Preoperative Anticipated Pain Education

Koyama et al[13] conducted a study where patients were examined in functional magnetic resonance imaging (fMRI) machines, and different temperature stimulus was given to their legs at different time intervals (Table 2). They found that an inflated expectation of pain (illustrated by longer waiting time between temperature stimuli) more strongly activate neural processes that sense pain and influence the physical sensation ($R^2 = 0.88$, $P < .0001$). An inflated expectation can lead to a stronger physical sensation of pain. For example, a study of 567 patients undergoing breast surgery found that patients with inflated expectations of postoperative pain experienced more pain up to 7 days after surgery compared to patients who had lower expectations of pain.[14] Furthermore, Wang et al[7] conducted a study of 259 surgical patients and examined the effects of preoperative beliefs on postsurgical pain score. Patients with long-term surgical fears were significantly correlated with developing CPSP.[7] In addition, the patient–practitioner relationship is negatively affected when a patient is told that a procedure will be painless because the patient will perceive their pain to be abnormal and/or something to be worried about.[38] Ridgeway and Mathews[15] found that patients who believe they understand the surgical process and deny information about their surgery form a mismatch between expectation and reality. These patients have consumed more analgesics and report higher levels of incisional pain compared to informed patients.[15] In addition, medical settings can lead to strong patient emotions such as anxiety and anger, impeding their abilities to communicate with medical staff.[38] Patients may feel overwhelmed, which can prevent physicians from having open conversations about medical procedures and their aftermath. Therefore, physicians should be truthful about postoperative pain to prevent a mismatch between patients' pain expectations and physical sensation.

Table 2. Preoperative Anticipated Pain Education: A Summary of Literature and Its Evidence

Preoperative Anticipated Pain Education					
Author(s) (Year Published)	**Study Design**	**Comments**	**N**	**Outcomes**	**Oxford Levels of Evidence**
Papaioannou et al[22] (2009)	Prospective observational cohort study	The day before surgery, Greek patients completed PCS and Hospital Anxiety and Depression Scale. Postoperative days 1 and 2, pain intensity, and intravenous PCA fentanyl use were assessed.	61	Catastrophizing served as predictor of postoperative pain intensity during surgery and analgesic use. May be possible to identify patients before surgery who are at risk for experiencing more postoperative pain.	1b
Ridgeway and Matthews[15] (1982)	Randomized controlled study	A study randomly placing 70 hysterectomy patients under 3 different groups of psychological preparation.	70	Patients receiving cognitive coping methods as a mode of psychological preparation had the best recovery and lowest pain score.	1b
Koyama et al[13] (2005)	Longitudinal design	TSA II thermal stimulator, fMRI scanning, and VAS were used to examine the interactions between expectations and incoming sensory information.	10	A mental representation of an impending sensory event can significantly shape neural processes that underlie the formulation of the actual sensory experience and provide insight as to how positive expectations diminish the severity of chronic disease states.	2b
Sipilä et al[14] (2017)	Prospective study	Beck Depression Inventory, State-Trait Anxiety Inventory, and Numerical Rating Scale for pain used to assess association between pain expectation, psychological distress, and acute postoperative pain.	563	Psychological distress, pain expectations, and patients' reports of preoperative pain in the area to be operated on should be recognized and assessed before surgery. Preoperative pain in the area to be operated on is a risk factor for acute and persistent pain.	2b
Wang et al[7] (2018)	Prospective study	Self-report battery of pain experiences and psychological factors 24 hours before surgery, and follow-up pain intensity ratings 48–72 hours after surgery and at 4-month follow-up	259	Patients who reported more presurgery pain self-efficacy experienced less intense acute postsurgical pain. Patients who expressed more presurgery concerns about long-term effects of surgery were at risk for more intense CPSP at 4-month follow-up.	1b
Horne et al[38] (1994)	Literary review of cognitive and behavioral interventions	The review examined patients' preoperative belief of what is happening, their beliefs about why they must have the operation, their knowledge about the operation, and their ability to understand and relate to themselves any information they have been provided.	191 studies	Cognitive–behavioral approaches are effective in reducing the anxiety and pain experienced by both adults and children during a variety of invasive medical procedures and are cost-effective techniques because they do not require much time, expensive materials, or resources that are not readily available.	3a

Abbreviations: fMRI, functional magnetic resonance imaging; PCA, patient-controlled analgesia; PCS, Pain Catastrophizing Scale; TSA, thermostimulator; VAS, visual analogue scale.

Table 3. Procedural Pain Knowledge: A Summary of Literature and Its Evidence

Procedural Pain Knowledge					
Author(s) (Year Published)	**Study Design**	**Comments**	**N**	**Outcomes**	**Oxford Levels of Evidence**
Mumford et al[11] (1982)	Literary review of psychological interventions on outcomes	A quantitative review of 34 controlled studies.	47 studies	Groups with psychological interventions saw a better recovery rate (2 days) compared to the controlled group.	1a
Egbert et al[16] (1964)	Randomized controlled trial	Split patients undergoing intra-abdominal operations into control and special care group. Control were given general information about the hospital, and special care were given specific instructions about pain management after surgery.	97	Special care group used significantly fewer narcotics and left 2 and 7 of 10 days earlier than the control group.	1b
Devine and Cook[39] (1983)	Meta-analysis	Analyzed studies that looked at the relationships between brief psychoeducational interventions and the length of postsurgical hospitalization.	49 studies	Brief psychoeducational interventions may be cost-effective with many types of surgical patients because the length of hospital stay is reduced by about 1 of 4 days.	1a
Majid et al[17] (2015)	Systematic review	Identify effectiveness of patient education for orthopedic surgery based on various factors.	N/A	Majority of studies found significant result between patient education and control on length of stay.	1a
Eastwood et al[18] (2019)	Retrospective cohort study	Two-hour education session 3–6 weeks before their surgery with interactive discussions with nursing, physiotherapy, and occupational therapy staff concentrating on what patients should expect, how to best prepare for surgery, and proper care postsurgery.	206	A single 2-hour educational session before surgery reduced emergency room utilization, improved patient satisfaction, achievement of expected improvements, and alleviation of back pain that were documented with greater success.	2b
Lemay et al[19] (2017)	Prospective study (survey)	FORCE-TJR study, PCS score, KOOS/HOOS, and modified Charlson Comorbidity Index for evaluation of the effectiveness of preoperative pain treatment option information for managing pain postoperatively.	1609	Patients, who received information about pain management options, reported lower current pain in the last 24 hours and had higher mean physical function scores 6 months postoperatively.	1c
Petersen et al[20] (2014)	Prospective cohort study	Patients received open and hidden administration of pain-relieving (lidocaine) or pain-inducing (capsaicin) treatment controlled for the natural history of pain.	18	Expected pain levels predicted a substantial amount of variance in pain intensity and unpleasantness in relation to the open administration of lidocaine.	1b
Stomberg et al[21] (2003)	Descriptive and comparative design based on survey data	VAS levels to assess long-term effects on pain management routines, patient experiences, and staff member attitudes in surgical wards after introduction of a quality assurance program.	110	Inverse relationship between age and satisfaction with pain management. Significant relationship between preoperative information deficits/inadequate discussion of pain management and increased postoperative pain, nausea, and vomiting.	2b
Sjöling et al[40] (2003)	Prospective experimental design	VAS assessment to test whether specific information given before surgery can help patients obtain better pain relief.	60	Intervention group reported a higher degree of satisfaction with pain management than the control group. They were told to be on top of their pain management to keep up with physical therapy, so they felt comfortable asking for more pain medication when they needed it.	1b

Abbreviations: FORCE-TJR, Function and Outcomes Research for Comparative Effectiveness in Total Joint Replacement; KOOS/HOOS, knee injury and osteoarthritis outcome score/hip disability and osteoarthritis outcome score; N/A, not applicable; PCS, Pain Catastrophizing Scale; VAS, visual analogue scale.

Table 4. Anxiety and Pain Catastrophizing Effect: A Summary of Literature and Its Evidence

Anxiety and Pain Catastrophizing Effect					
Author(s) (Year Published)	**Study Design**	**Comments**	**N**	**Outcomes**	**Oxford Levels of Evidence**
Sobol-Kwapinska et al[8] (2016)	Systematic review of RCT	Systematic review of psychological factors that are associated with APSP.	53 studies	Pain catastrophizing, optimism, expectation of pain, neuroticism, anxiety, negative affect, and depression are all associated with APSP.	1a
Özkan et al[23] (2017)	Prospective cohort study	Tested whether cognitive fusion or catastrophic thinking interacts with pain and upper extremity physical function in hand surgery.	110	Participants who scored high on both cognitive fusion and catastrophic thinking about pain reported the greatest levels of pain and lowest levels of upper extremity function.	1b
Theunissen et al[24] (2012)	Meta-analysis	Observational cohort studies, case–control studies, and RCTs were used to investigate whether high levels of preop anxiety or pain catastrophizing are associated with an increased risk of CPSP.	29 studies	Larger studies were more likely to report a statistically significant relationship between high levels of preoperative anxiety or pain catastrophizing and CPSP. No studies showed a reversed relationship.	1a
Khan et al[25] (2012)	Prospective epidemiological study	Preoperative and postoperative pain catastrophizing scale, hospital anxiety and depression scale, verbal rating scale, and analgesia consumption were recorded to investigate the short-term association between preoperative psychological variables (pain catastrophizing, anxiety, and depression) and postoperative pain.	64	Increased preoperative pain catastrophizing is associated with increased postoperative pain.	2b
Kain et al[26] (2000)	Repeated-measures design	State-Trait Anxiety Inventory, Monitor-blunting style scale, perceived stress scale, and Short-Form McGill Pain Questionnaire to establish the relationship between preoperative state anxiety and postoperative pain.	53	Preoperative state anxiety was significantly correlated with increased levels of postoperative pain directly after surgery and 1 week later.	2b
Dunn et al[27] (2018)	Prospective cohort study	Analyze influence of catastrophizing, anxiety, depression on hospital opioid consumption, pain scores, and quality of recovery in adults who underwent spine surgery.	101	Patients with higher catastrophizing scores on PCS were more likely to have higher postoperative pain scores. Patients with higher depression scores were associated with lower quality of recovery.	1b
Horne et al[38] (1994)	Literary review of cognitive and behavioral interventions	The review examined patients' preoperative belief of what is happening, their beliefs about why they must have the operation, their knowledge about the operation, and their ability to understand and relate to themselves any information they have been provided.	191 studies	Cognitive–behavioral approaches are effective in reducing the anxiety and pain experienced by both adults and children during a variety of invasive medical procedures and are cost-effective techniques because they do not require much time, expensive materials, or resources that are not readily available.	3a
Jacobsen and Butler[28] (1996)	Prospective study	Self-report measure of cognitive coping and catastrophizing to investigate the relation of cognitive coping and catastrophizing to acute postoperative pain and analgesic use.	59	Catastrophizing is associated with individual differences in pain intensity and analgesic use. Younger patients are more likely to catastrophize and to report increased postoperative pain.	2b
Wasan (2005)[41]	Randomized crossover designed trial	Numerical Rating Scale of Pain, Functional Measures of Relief, Pain Anxiety Symptoms Scale, State-Trait Anger Index, Expectations for Relief Scale to address the association between psychopathology and diminished opioid analgesia in patients with chronic, noncancer pain.	60	High levels of psychopathology are associated with diminished opioid analgesia in patients with discogenic low back pain.	1b
Wallace[6] (1985)	Correlational studies	Examined predictive relationship between expectation of pain and the actual experience of pain of gynecological surgeries.	2	Greater pain expectations correlated with higher pain rating	2b

(*Continued*)

Table 4. Continued

Anxiety and Pain Catastrophizing Effect					
Author(s) (Year Published)	**Study Design**	**Comments**	**N**	**Outcomes**	**Oxford Levels of Evidence**
Thomas et al[42] (1998)	Prospective observational study	Present Pain Intensity, VAS, and McGill Pain Questionnaire used to identify factors which might correlate with and potentially predict severe postoperative pain and dissatisfaction with analgesic management.	91	Significant correlates of both worse than expected pain experience and low satisfaction were female sex, high preoperative pain severity, high anxiety about risks and problems, low expected pain severity, age (younger), and high willingness to report pain.	2b
de Groot et al[43] (1999)	Longitudinal design	VAS and disappointment questionnaires used investigate postoperative disappointment in groups of patients with different expectations regarding postoperative pain, rate of recovery, and returning to work.	120	Patients who expected to feel leg and back pain reported more postoperative leg pain after 3 days and after 3 months than those who did not expect any pain. Patients who are optimistic about not experiencing any postoperative pain will be less disappointed after surgery than will be patients with more pessimistic expectations about pain.	2b
Logan and Rose[29] (2005)	Preoperative and postoperative questionnaires	State-Trait Anxiety Inventory, anticipated pain, pain catastrophizing scale, brief COPE, pain scores, PCA use, and surgery severity were all taken into account to examine relationships among anxiety, anticipated pain, coping styles, postoperative pain, and patient-controlled analgesia use.	65	Postoperative pain estimation: underestimated (42.9%), overestimated (46.4%), and accurate (10.7%). Patients who overestimated had larger discrepancies between preoperative and postoperative pain ratings.	2b
Goodin et al[30] (2009)	In vivo assessment volunteer	Standard Pain Catastrophizing Scale, In Vivo Pain Catastrophizing Scale, short-form McGill Pain Questionnaire, and Positive and Negative Affect Schedule examined whether DNIC mediated the relationship between catastrophizing and pain.	35	Diminished DNIC was a significant partial mediator of the relation between greater pain-related catastrophizing and more severe pain ratings. Pain catastrophizing plays a primary role in modulation of pain outcomes.	3b
Kim et al[33] (2018)	Prospective cohort study	PCS questionnaire used for pain catastrophizing assessment before and 3 years after surgery. The VAS for back and leg pain and ODI were assessed 3 and 6 months and 1 and 3 years after surgery.	96	Significant correlations between preoperative pain intensity/VAS and preoperative PCS as well as between 3-year postoperative pain/disability and 3-year postoperative PCS. Catastrophizing is always associated with pain intensity and disability,	1b
Pavlin et al[31] (2005)	Prospective cohort study	Patients completed the PCS before surgery. Measures of pain obtained in the postanesthetic care unit, as well as 1, 2, and 7 days after surgery. Opioid and nonopioid analgesic consumption was tabulated, while patients were in the hospital and after discharge.	48	PCS was a significant predictor of acute postsurgical pain in the postanesthetic care unit. Max pain score in patients with high PCS was 33% greater in PACU and 38% greater at 24 hours compared with pain scores in patients with low PCS scores (below the median).	1b
Collin et al[32] (2015)	Prospective cohort study	Patients undergoing RALP were encouraged to attend 45–60 min educational class.	192	Patients who participated in preoperative educational classes made fewer calls to the office seeking reassurance after surgery.	1b
Lee et al[44] (2018)	Randomized control trial	Patients split into intervention group (received preoperative education) or control group. Anxiety and pain were assessed at 3 different time intervals.	86	Significant difference in the reduction of anxiety and pain in the intervention group compared to the control group.	1b

Abbreviations: APSP, acute postsurgical pain; CPSP, chronic postsurgical pain; COPE, Coping Orientation to Problems Experienced; DNIC, diffuse noxious inhibitory controls; Max, maximum; ODI, Oswestry Disability Index; PACU, postanesthesia care unit; PCA, patient-controlled analgesia; PCS, Pain Catastrophizing Scale; preop, preoperative; RALP, robotic-assisted laparoscopic prostatectomy; RCT, randomized controlled trial; VAS, visual analogue scale.

Inaccurate pain expectations will lead to increased severity of acute postoperative pain.

Authors' Interpretation. Based on 3 studies with Oxford levels of evidence of 1b, there is strong evidence suggesting that pain expectation will have an impact on postoperative recovery. Patients who are not fully informed about postoperative pain may develop a mismatch between pain expectation and physical sensation.[6] When physical pain sensory information matches the expected sensation, patients feel some degree of reassurance.[15] Hence, preoperative anticipated pain education should be considered by physicians in preemptive pain psychoeducation.

Procedural Pain Knowledge

Preoperative procedural and pain management information improves patient pain control and shortens their recovery time (Table 3). A review of 34 studies showed that psychological intervention and educational approaches during surgery preparation or recovery from surgery resulted in a 2.37-day shorter hospitalization.[11] Egbert et al[16] conducted a study where 97 patients were split into 2 groups: the control group was given general information about the hospital ward and the "special care" group was given preoperative pain education. The special care group received about half the narcotics and went home on average 2.7 days earlier than the control group.[16] Devine and Cook[39] did a meta-analysis of 49 studies and found that preoperative education about procedural information, pain management methods, and psychological support can reduce the length of hospitalization by 1.25 days. A systematic review of patient education for orthopedic surgery patients found that patient education significantly reduced the length of hospital stays compared to those who received no patient education or information.[17] Another study found that participation in a single preoperative multidisciplinary educational session resulted in about a 50% reduction in emergency room visits in the first 12 weeks after spine surgery compared to the controlled cohort (16 emergency room visits in the education cohort and 33 visits in the no education cohort).[18] With proper pain education and management, physicians may be able to prescribe fewer narcotics and decrease patient hospitalization.

Studies focusing on pain have shown a significant relationship between inadequate preoperative information and higher postoperative anxiety and pain score. In a study of 1609 elective total joint arthroplasty patients, Lemay et al[19] showed that patients who receive information about postoperative pain management options report lower current pain 24 hours after surgery and higher levels of pain relief than patients who did not receive pain management information. Six months after surgery, the informed patients also demonstrated higher mean physical function scores and were more likely to use pain management practices.[19] These factors may have played a role in decreasing their postoperative pain. Moreover, when physicians provided preoperative information about the effects of analgesics, there was a significant placebo effect causing a decrease in neuropathic pain intensity and unpleasantness.[20] Stomberg et al[21] demonstrated a significant correlation between poor preoperative information and increased postoperative nausea and vomiting among 110 surgical patients. A study by Sjöling et al,[40] involving 60 patients undergoing total knee arthroplasty, looked at the efficacy of educating patients about the importance of postoperative pain management and taking an active role in their own pain treatment. The treatment and control groups were given basic preoperative information, but the treatment group was also educated about their own role in pain management and instructed to inform medical staff about their pain.[40] The treatment group reported lower preoperative state anxiety and increased satisfaction of care than the control group.[40] These studies demonstrate the importance of preoperative patient education for patient anxiety, satisfaction, and pain.

Authors' Interpretation. In light of 3 studies with Oxford levels of evidence 1a, 3 studies with 1b, and 1 study with 1c, procedural pain knowledge has a significant impact on pain control and recovery time, and patients who opted out of procedural pain education had longer hospitalization and poor pain management. Therefore, procedural pain knowledge is a good potential tool for physicians to improve patient pain control and decrease length of hospital stays.

Anxiety and Pain Catastrophizing Effect

The lack of preoperative information not only leads to a mismatch between pain expectation and sensation but also increases anxiety and catastrophizing (Table 4). Catastrophizing is defined as an exaggerated negative mental state during actual or anticipated pain experiences and is one of the most important psychological predictors of pain.[8,22] Studies show a significant interaction between catastrophic thinking and postoperative pain intensity.[23] A systematic review and meta-analysis of 29 studies by Theunissen et al[24] showed that, in a majority (55%) of studies, preoperative anxiety and pain catastrophizing are significantly associated with greater pain 3 months postoperatively and with CPSP. A study of 64 cardiac surgery patients illustrated that a pain catastrophizing score above the median was associated on average with a 1.8 higher postoperative pain score (based on a 10-point verbal rating scale).[25] In addition, Kain et al[26] conducted a

Table 5. Information Delivery Strategy: A Summary of Literature and Its Evidence

Information Delivery Strategy					
Author(s) (Year Published)	**Study Design**	**Comments**	**N**	**Outcomes**	**Oxford Levels of Evidence**
Blythe and Erdahl[35] (1986)	Single case study	Using stress inoculation in a single patient case study to counter their anxiety and depression.	1	Intervention was successful at reducing emotional distress.	3b
Horne et al[38] (1994)	Literary review of cognitive and behavioral interventions	The review examined patients' preoperative belief of what is happening, their beliefs about why they must have the operation, their knowledge about the operation, and their ability to understand and relate to themselves any information they have been provided.	191 studies	Cognitive–behavioral approaches are effective in reducing the anxiety and pain experienced by both adults and children during a variety of invasive medical procedures and are cost-effective techniques because they do not require much time, expensive materials, or resources that are not readily available.	3a
Winefield and Murrell[34] (1991)	Literature review of 2 studies	Analyzed the verbal interactions between patient and physicians during consultations in 2 studies. Evaluated the success of the interaction based on the individual parties' perspective.	2	Patient and physicians evaluate the success of the consultation differently where doctors regarded consultation with clear medical solutions more highly and patients preferred opened conversations discussing their own opinions/experiences.	2c
Sjöling et al[40] (2003)	Prospective experimental design	VAS assessment to test whether specific information given before surgery can help patients obtain better pain relief.	60	Intervention group reported a higher degree of satisfaction with pain management than the control group. They were told to be on top of their pain management to keep up with physical therapy, so they felt comfortable asking for more pain medication when they needed it.	1b
Pereira et al[45] (2016)	Randomized control trial	State-Trait Anxiety Inventory Form Y, surgery recovery score, and Pressure Ulcer Scale for Healing to evaluate the influence of an empathic patient-centered approach on preop anxiety and surgical outcomes.	104	One month postop, the intervention group showed lower levels of local pain and better wound tissue type.	1b
Gouin and Kiecolt-Glaser[36] (2011)	Review	Examined data and methods from observational, experimental, and interventional studies corroborating the impact of stress on wound healing.	N/A	The relationship between stress and wound repair is not only statistically significant but also clinically relevant.	3a
Yek et al[37] (2017)	Cross-sectional study	Questionnaires were administered to assess patients' perceptions, by trained interviewers in regard to material risk in the anesthesia consent-taking process.	364	Most patients prefer a clinic consult instead of audio–visual multimedia for preoperative anesthetic counseling. Patients appeared to place greater importance on rare but serious complications compared to common complications.	2b
Collin et al[32] (2015)	Prospective cohort study	Patients undergoing RALP were encouraged to attend 45- to 60-min educational class.	192	Patients who participated in preoperative educational classes made fewer calls to the office seeking reassurance after surgery.	1b
Laws et al[46] (2018)	Observational study	Evaluated characteristics of patients and outpatient encounters associated with patient recall of information after 1 week.	189	Forty-nine percent of decisions and recommendations were recalled accurately without prompting; 36% recalled with a prompt; and 15% recalled erroneously or not at all.	2b
Parrinello[47] (1984)	Descriptive survey	Booklet used for preoperative teaching. Patients reported their perceived value of the booklet.	21	Ninety percent of responding patients described the booklet as helpful in meeting their preoperative learning needs, and 95% said they would recommend the booklet to a friend.	3b
Miller and Shank[9] (1986)	Quasi-Scientific study	Comparing verbal preoperative education to written preoperative education (pamphlet) for compliance with return appointment.	129	Verbal education from a physician had the highest compliance with return appointment	2b

Abbreviations: N/A, not applicable; postop, postoperative; preop, preoperative; RALP, robotic-assisted laparoscopic prostatectomy; VAS, visual analogue scale.

study with 53 women undergoing elective abdominal hysterectomy and found that preoperative state anxiety was significantly correlated with increased levels of postoperative pain directly after surgery and 1 week later ($r = 0.35$, $P < .01$; $r = 0.29$, $P < .05$). Another study found that catastrophizing, anxiety, and depression scores (on Pain Catastrophizing Scale, Hospital Anxiety and Depression Scale) were associated with higher pain scores and lower quality of recovery.[27] Some patients have a fear of the unknown, which can develop into medical phobias and increase their anxiety.[38] Similarly, higher levels of pain catastrophizing are linked to a weaker opioid analgesia response.[28,41] Pediatric research showed that high expected pain is a predictor of postoperative pain.[6,42,43] Adolescent surgery patients who expected higher levels of postoperative pain experienced greater intensity postoperative pain and utilized more patient-controlled analgesia (PCA) medication than those who expected lower levels of pain. In this study, adolescent anticipated pain score was the strongest predictor of postoperative pain.[29] Pain catastrophizing is thought to interrupt descending pain inhibition signals to the spinal cord preventing neuroplastic changes that normally respond to painful stimuli.[30] This stimulates pain sensitization and can hinder pain management. A study of patients undergoing lumbar spinal surgery demonstrated a significant correlation between higher preoperative Pain Catastrophizing Scale (PCS) scores and increased 3-year postoperative pain/disability.[33] Therefore, identification of patients at risk for catastrophizing before surgery could serve as a basis for initiating a more comprehensive preemptive pain psychoeducation.[31] Education about the postoperative care, surgical procedure, and operative environment has been shown to reduce preoperative anxiety, postoperative pain, and, in some cases, decreased number of postsurgical calls related to reassurance of their recovery.[32,44]

Authors' Interpretation. Two studies with the Oxford levels of evidence of 1a and seven 1b studies suggest that there is a strong negative relationship between preoperative anxiety/pain catastrophizing and postoperative recovery. Therefore, preemptive pain psychoeducation focusing on preoperative education and pain management should be considered as part of a multimodal approach in addressing the preoperative psychological state of patients to improve recovery.

Information Delivery Strategy

Presenting information on postoperative pain before surgery may affect patient outcome and satisfaction (Table 5). Patients' primary complaints are the lack of information and the complex nature of doctors' language.[35] Scientific language can make patients feel helpless and confused, and in turn, patients may attempt to regain control by withholding information from the physician, which could lead to a misdiagnosis. Using lay terms to explain the surgical process and outcomes can help patients feel more comfortable and avoid conflict of information control between both parties.[38] Patients can then more easily participate in conversations with a physician rather than blindly accepting the doctor's information. In fact, patients are most satisfied when they participate in the consultation by discussing their opinions and experiences with the physician.[34] Open conversation can help regain a patient's sense of control and diminish some fears about the surgical process.[38] By educating patients about pain management and encouraging open discussions, patients can verbalize their postoperative pain at an early stage to the medical staff, and physicians can use effective pain management methods to prevent high peaks of pain.[40]

According to Pereira et al,[45] a sympathetic patient-centered approach can reduce preoperative anxiety, improve surgical recovery and wound healing, and increase patient satisfaction. One hundred four ambulatory surgery patients were assigned to a control or intervention group. The intervention group received a 15-minute individual interview conducted by a trained nurse who sympathetically addressed questions regarding the surgery to validate each patient's concerns. On postoperative day 1, the intervention group had lower pain levels, better surgery recovery, more physical activity, and more satisfaction with the quality of preoperative information. One month later, the intervention group had lower levels of local pain and better wound tissue type.[45] Because anxiety is associated with slower wound healing and more postoperative pain, it is beneficial to provide sympathetic patient-centered care to reduce patient anxiety.[36]

Kastanias et al[48] conducted a survey of 150 surgical patients' wants and needs. The top 3 items of importance were all related to pain expectations, experience, and severity.[48] Patients wanted information about drugs prescribed, their effectiveness and side effects, and who to call if the pain is not well controlled.[48] When information is given by physicians, patients typically only accurately recall about half of the recommendations and information.[46] A solution would be to provide written information in a general format for all different types of populations undergoing surgery.[48] Hospitals can create a streamlined structure for preoperative patient education for health care. Individualized information could still be added to patient education, but the overall structure would be implemented to maximize patient outcome and minimize postoperative pain. In fact, 90% of patients undergoing arterial bypass surgery felt

that a preoperative educational booklet was helpful.[47] However, only providing written information for patient education is not adequate. In a study comparing verbal information from a nurse or physician and written handouts, more knowledge was gained through verbal information.[9] Yek et al[37] conducted a survey in Singapore of 364 surgical patients' preferences regarding information during the anesthesia consent-taking process. They found that most patients prefer a clinic consult instead of audio–visual multimedia for preoperative anesthetic counseling. This reinforces the fact that physicians should provide better preoperative procedural and pain information in conjunction to distributing written materials to patients. Preoperative education classes are another effective method to provide procedural pain education to patients, but it may not be feasible due to the increase in time required by medical personnel to provide such classes.[32]

Authors' Interpretation. The way health care providers address patients and present psychoeducational pain information should be considered. An open and sympathetic discussion between providers and patients is crucial for optimal satisfaction and maximum recovery. Based on the strong Oxford level of evidence of three 1b articles, some form of written or electronic psychoeducation should be provided along with verbal information during preoperative consulting.

Psychoeducational Cost

Last but not least, an important question to address is the operation cost of patient education on today's limited resource economic environment (Table 6). It is a difficult topic to directly address because there is limited research on the cost of increasing preoperative education. Also, there has been a trend in hospitals to lessen interventions that treat preoperative patient anxiety due to increasing operational costs.[49] However, postoperative complications may cost patients up to $10,000 or more in hospital expenses.[50] Through increased preoperative education, physicians can reduce a patient's anxiety which lowers their risk to complications and ultimately lowers hospitalization time and analgesic use.[11,16] Similarly, Devine and Cook[10] did a meta-analysis of 102 studies and found that psychoeducational intervention can decrease recovery time and pain which can be cost-effective for hospitals. If hospitalization, complications, and analgesics are all decreased with the help of preoperative pain education, then hospitals can potentially save thousands of dollars per patient by implementing psychoeducational programs.

Authors' Interpretation. Although there is limited existing research within this topic, the Oxford levels of evidence of 2 1a papers and 1 1b paper strongly support that implementing preemptive pain psychoeducation could decrease health care costs.

DISCUSSION

To our knowledge, this is the first systematic review to examine the possibility of using psychological intervention in the form of preoperative psychoeducation to achieve both preemptive benefit and multimodal advantage. Although it is important to note that each surgery includes a specific psychosocial context that differs by institution, cultural history/context or other considerations may influence the need for a specific cognitive strategy. Thus, a carefully designed preoperative intervention on patient literacy and education is critical in improving postoperative outcome.

Health care professionals (anesthesiologist, surgeons, nurses, etc) should give accurate preoperative pain education and pain management options. Improper pain education can lead patients to form inaccurate expectations of postoperative pain, either inflated or deflated expectation, which increases patients' physical sensations after surgery. Proper pain education can ameliorate this problem by more accurately preparing patients. High levels of preoperative anxiety are associated with higher levels of pain directly, 1 week and 3 months postoperatively.[24,26] Patients who received specific information about pain management options experienced decreased postoperative pain 24 hours after surgery and better physical function scores 6 months out.[19] Because high anxiety and pain catastrophizing are significantly correlated with a patient's risk for developing chronic pain, preoperative information can help lower anxiety and acute postoperative pain, ultimately lowering a patient's risk for developing CPSP. Using lay terms is important to enable patients to participate in open discussions with their physicians. Better education can help lower the risk for developing chronic pain, which ultimately decreases health care costs.[24,51]

The quantity of preoperative pain information given to patients still needs to be researched. In a review article by Wells and Kaptchuk,[52] they discuss the idea that disclosing every possible side effect of a medication may induce a nocebo effect in patients; causing more harm in a patient than good. Because of this psychological phenomenon, it is pertinent to research the quantity of psychoeducation necessary to minimize acute pain and the possibility of a nocebo effect.

This review focused on preoperative education as a form of psychoeducational pain management. However, there are other proposed methods described in the literature for lessening acute pain. Sears et al[53] evaluated a holistic perioperative medicine program called "Steps to Surgical Success" (STEPS) and its effect on patient preoperative anxiety and pain and

Table 6. Psychoeducational Cost: A Summary of Literature and Its Evidence

Psychoeducational Cost					
Author(s) (Year Published)	**Study Design**	**Comments**	**N**	**Outcomes**	**Oxford Levels of Evidence**
Kain et al[49] (1997)	Randomized control trial	Modified Yale Preoperative Anxiety Scale, State-Trait Anxiety Inventory, Miller Behavioral Style Scale, and Bieri Faces Scale score to examine the effectiveness of the ADVANCE intervention on reducing anxiety.	408	A family-centered preoperative behavioral intervention not only reduced children's anxiety before surgery but also reduced the incidence of postoperative delirium, shortened discharge time after surgery, and reduced analgesic consumption after surgery. Cost efficiency of any newly developed intervention is important in today's medical–economic climate.	2b
Dimick et al[50] (2006)	Retrospective analysis	Merged clinical information from the National Surgical Quality Improvement Program database to the internal accounting data at the University of Michigan hospital to determine whether hospitals or payers incur a larger burden of increased hospital costs associated with complications.	1008 patients	Hospitals and payers both suffer financial consequences from poor-quality health care, but the greater burden falls on health care payers.	2b
Mumford et al[11] (1982)	Literary review of psychological interventions on outcomes	A quantitative review of 34 controlled studies.	47 studies	Groups with psychological interventions saw a better recovery rate (2 days) compared to the controlled group.	1a
Egbert et al[16] (1964)	Randomized controlled trial	Split patients undergoing intra-abdominal operations into control and special care group. Control were given general information about the hospital, and special care were given specific instructions about pain management after surgery.	97	Special care group used significantly fewer narcotics and left 2 and 7 of 10 days earlier than the control group.	1b
Devine and Cook[10] (1986)	Meta-analysis	Examined how psychoeducational interventions influence recovery, pain, psychological well-being, and satisfaction with care among hospitalized adult surgery patients.	102 studies	Psychoeducational interventions have positive, cost-relevant effects on recovery, pain, psychological well-being, and satisfaction with care.	1a

Abbreviation: ADVANCE, Anxiety-reduction, Distraction, Video modeling and education, Adding parents, No excessive reassurance, Coaching, and Exposure/shaping.

postoperative outcome. With STEPS, 111 patients were given a 1-hour healing therapy session on preadmission and education day. Patients experienced reduced pain levels directly after therapy and reported that the STEPS program eased their overall surgical experience.[53] Ridgeway and Mathews[15] conducted a psychological preparation study with 60 hysterectomy patients split into 3 groups: cognitive coping techniques, information about surgical procedure and effects, and general information about the hospital ward (control). The cognitive coping group used the least amount of analgesics compared to the information group and control group.[15] Dindo et al[54] conducted a randomized control trial to analyze the efficacy of Acceptance and Commitment Therapy (ACT—a type of cognitive–behavioral therapy) on chronic pain and opioid use of "at-risk" veterans. This study illustrated that patients who participated in the ACT workshop ceased opioid use and had reduced pain sensation compared to the control group.[54] This emphasizes the importance of conducting further research on psychological intervention, not only on psychoeducation, but also on optimal cognitive coping techniques.

Different characteristics can also increase a patient's risk for developing CPSP. Althaus et al[55] found that capacity overload, preoperative pain at the proposed surgical site, other chronic preoperative pain, presence of ≥1 stress symptoms, and postsurgical acute pain are risk factors for developing CPSP. Hence, physicians need to recognize those at increased risk (signs of psychological distress) and tailor psychoeducational methods based on patient needs.[38,55] Physicians may also want to consider the PCS to recognize at-risk patients or incorporate ACT to address psychological risk factors for developing CPSP.[27,35]

Longer duration of acute pain can increase patients' risks of developing chronic pain.[51] Secondary hyperalgesia is thought to be a basis for CPSP and results from central nervous system changes that increase patients' pain perceptions in the previously injured area.[56] A major issue is the current use of medications to treat CPSP. Many prescribed opioids have limited success with preventing chronic pain.[56] To make the situation worse, opioids can also directly activate award associations in the brain causing patients to form learned associations eventually resulting in drug cravings, opioid misuse, and addiction.[57,58] Opioid exposure induces tolerance to the medication and may trigger paradoxical opioid-induced hyperalgesia.[59] In the United States, such overuse and abuse of opioids has led to the current opioid epidemic. Opioids are now reported as the second most common cause of poisoning in North America after alcohol intoxication.[60] About 488,000 emergency department visits were attributed to nonmedical use of prescription opioids in 2011 as well as 16,235 deaths in 2013.[60] A study done in 2012 found that the number of opioid prescriptions written by physicians in the United States has increased from 76 million in 1991 to 219 million prescriptions in 2011.[61]

We attempted to address the importance of education for optimal postsurgical recovery. However, we are limited by the lack of recent literature available and scope of the studies reviewed. Many of the studies published were from the 80s and 90s while only a few were from 2010 and onward. Because information from older studies may no longer be accurate, there is an obvious need for future research to validate these findings.

One major limitation of this study was that our initial search process was not complete and missed a few known important studies identified by expert reviewers that were then incorporated during the peer review process. A partial explanation may lie in the fact that it can be challenging to capture all literature in this diverging and emerging field. Readers should be reminded to exercise caution in the interpretation on the findings from this study. Nevertheless, this review provided reasonable evidence that psychological intervention in the form of the preoperative education may offer an attractive modality of nonpharmacological means in pain management. Appropriate psychological intervention may provide patients with not only preemptive benefit but also a multimodal advantage in their recovery. As aforementioned, there is a lack of research and literature exploring the option of psychological intervention in enhancing patient recovery from surgery. Future research will be needed to explore and address the specifics of psychoeducation such as timing, medical personnel in charge of education and patients' psychosocial, and cultural backgrounds in improving and enhancing postoperative recovery.

DISCLOSURES

Name: Audrey Horn, BS.
Contribution: This author helped perform the systematic review and prepare the manuscript.
Name: Kelly Kaneshiro, BS.
Contribution: This author helped perform the systematic review and prepare the manuscript.
Name: Ban C. H. Tsui, MD, FRCPC.
Contribution: This author helped overlook the project, analyze the data, and revise the manuscript.
This manuscript was handled by: Honorio T. Benzon, MD.

REFERENCES

1. Philip BK, Reese PR, Burch SP. The economic impact of opioids on postoperative pain management. *J Clin Anesth.* 2002;14:354–364.
2. Oderda GM, Said Q, Evans RS, et al. Opioid-related adverse drug events in surgical hospitalizations: impact on costs and length of stay. *Ann Pharmacother.* 2007;41:400–406.

3. Kelly DJ, Ahmad M, Brull SJ. Preemptive analgesia I: physiological pathways and pharmacological modalities. *Can J Anesth.* 2001;48:1000–1010.
4. Penprase B, Brunetto E, Dahmani E, Forthofer JJ, Kapoor S. The efficacy of preemptive analgesia for postoperative pain control: a systematic review of the literature. *AORN J.* 2015;101:94.e8–105.e8.
5. Helander EM, Menard BL, Harmon CM, et al. Multimodal analgesia, current concepts, and acute pain considerations. *Curr Pain Headache Rep.* 2017;21:3.
6. Wallace LM. Surgical patients' expectations of pain and discomfort: does accuracy of expectations minimise post-surgical pain and distress? *Pain.* 1985;22:363–373.
7. Wang Y, Liu Z, Chen S, et al. Pre-surgery beliefs about pain and surgery as predictors of acute and chronic post-surgical pain: a prospective cohort study. *Int J Surg.* 2018;52:50–55.
8. Sobol-Kwapinska M, Bąbel P, Plotek W, Stelcer B. Psychological correlates of acute postsurgical pain: a systematic review and meta-analysis. *Eur J Pain.* 2016;20:1573–1586.
9. Miller G, Shank JC. Patient education: comparative effectiveness by means of presentation. *J Fam Pract.* 1986;22:178–181.
10. Devine EC, Cook TD. Clinical and cost-saving effects of psychoeducational interventions with surgical patients: a meta-analysis. *Res Nurs Health.* 1986;9:89–105.
11. Mumford E, Schlesinger HJ, Glass GV. The effect of psychological intervention on recovery from surgery and heart attacks: an analysis of the literature. *Am J Public Health.* 1982;72:141–151.
12. OCEBM Levels of Evidence Working Group. The Oxford 2011 Levels of Evidence. Oxford Centre for Evidence-Based Medicine. Available at: http://www.cebm.net/index.aspx?o=5653. Accessed March 30, 2019.
13. Koyama T, McHaffie JG, Laurienti PJ, Coghill RC. The subjective experience of pain: where expectations become reality. *Proc Natl Acad Sci USA.* 2005;102:12950–12955.
14. Sipilä RM, Haasio L, Meretoja TJ, Ripatti S, Estlander AM, Kalso EA. Does expecting more pain make it more intense? Factors associated with the first week pain trajectories after breast cancer surgery. *Pain.* 2017;158:922–930.
15. Ridgeway V, Mathews A. Psychological preparation for surgery: a comparison of methods. *Br J Clin Psychol.* 1982;21(pt 4):271–280.
16. Egbert LD, Battit GE, Welch CE, Bartlett MK. Reduction of postoperative pain by encouragement and instruction of patients. A study of doctor-patient rapport. *N Engl J Med.* 1964;270:825–827.
17. Majid N, Lee S, Plummer V. The effectiveness of orthopedic patient education in improving patient outcomes: a systematic review protocol. *JBI Database System Rev Implement Rep.* 2015;13:122–133.
18. Eastwood D, Manson N, Bigney E, et al. Improving postoperative patient reported benefits and satisfaction following spinal fusion with a single preoperative education session. *Spine J.* 2019;19:840–845.
19. Lemay CA, Lewis CG, Singh JA, Franklin PD. Receipt of pain management information preoperatively is associated with improved functional gain after elective total joint arthroplasty. *J Arthroplasty.* 2017;32:1763–1768.
20. Petersen GL, Finnerup NB, Grosen K, et al. Expectations and positive emotional feelings accompany reductions in ongoing and evoked neuropathic pain following placebo interventions. *Pain.* 2014;155:2687–2698.
21. Stomberg MW, Wickström K, Joelsson H, Sjöström B, Haljamäe H. Postoperative pain management on surgical wards–do quality assurance strategies result in long-term effects on staff member attitudes and clinical outcomes? *Pain Manag Nurs.* 2003;4:11–22.
22. Papaioannou M, Skapinakis P, Damigos D, Mavreas V, Broumas G, Palgimesi A. The role of catastrophizing in the prediction of postoperative pain. *Pain Med.* 2009;10:1452–1459.
23. Özkan S, Zale EL, Ring D, Vranceanu AM. Associations between pain catastrophizing and cognitive fusion in relation to pain and upper extremity function among hand and upper extremity surgery patients. *Ann Behav Med.* 2017;51:547–554.
24. Theunissen M, Peters ML, Bruce J, Gramke HF, Marcus MA. Preoperative anxiety and catastrophizing: a systematic review and meta-analysis of the association with chronic postsurgical pain. *Clin J Pain.* 2012;28:819–841.
25. Khan RS, Skapinakis P, Ahmed K, et al. The association between preoperative pain catastrophizing and postoperative pain intensity in cardiac surgery patients. *Pain Med.* 2012;13:820–827.
26. Kain ZN, Sevarino F, Alexander GM, Pincus S, Mayes LC. Preoperative anxiety and postoperative pain in women undergoing hysterectomy. A repeated-measures design. *J Psychosom Res.* 2000;49:417–422.
27. Dunn LK, Durieux ME, Fernández LG, et al. Influence of catastrophizing, anxiety, and depression on in-hospital opioid consumption, pain, and quality of recovery after adult spine surgery. *J Neurosurg Spine.* 2018;28:119–126.
28. Jacobsen PB, Butler RW. Relation of cognitive coping and catastrophizing to acute pain and analgesic use following breast cancer surgery. *J Behav Med.* 1996;19:17–29.
29. Logan DE, Rose JB. Is postoperative pain a self-fulfilling prophecy? Expectancy effects on postoperative pain and patient-controlled analgesia use among adolescent surgical patients. *J Pediatr Psychol.* 2005;30:187–196.
30. Goodin BR, McGuire L, Allshouse M, et al. Associations between catastrophizing and endogenous pain-inhibitory processes: sex differences. *J Pain.* 2009;10:180–190.
31. Pavlin DJ, Sullivan MJ, Freund PR, Roesen K. Catastrophizing: a risk factor for postsurgical pain. *Clin J Pain.* 2005;21:83–90.
32. Collin C, Bellas N, Haddock P, Wagner J. Pre-operative education classes prior to robotic prostatectomy benefit both patients and clinicians. *Urol Nurs.* 2015;35:281–285.
33. Kim HJ, Kwon OH, Chang BS, Lee CK, Chun HJ, Yeom JS. Change in pain catastrophizing in patients with lumbar spinal surgery. *Spine J.* 2018;18:115–121.
34. Winefield HR, Murrell TG. Speech patterns and satisfaction in diagnostic and prescriptive stages of general practice consultations. *Br J Med Psychol.* 1991;64(pt 2):103–115.
35. Blythe BJ, Erdahl JC. Using stress inoculation to prepare a patient for open-heart surgery. *Health Soc Work.* 1986;11:265–274.
36. Gouin JP, Kiecolt-Glaser JK. The impact of psychological stress on wound healing: methods and mechanisms. *Immunol Allergy Clin North Am.* 2011;31:81–93.
37. Yek JLJ, Lee AKY, Tan JAD, Lin GY, Thamotharampillai T, Abdullah HR. Defining reasonable patient standard and preference for shared decision making among patients undergoing anaesthesia in Singapore. *BMC Med Ethics* 2017;18:6.
38. Horne DJ, Vatmanidis P, Careri A. Preparing patients for invasive medical and surgical procedures. 1: adding behavioral and cognitive interventions. *Behav Med.* 1994;20:5–13.
39. Devine EC, Cook TD. A meta-analytic analysis of effects of psychoeducational interventions on length of postsurgical hospital stay. *Nurs Res.* 1983;32:267–274.

40. Sjöling M, Nordahl G, Olofsson N, Asplund K. The impact of preoperative information on state anxiety, postoperative pain and satisfaction with pain management. *Patient Educ Couns.* 2003; 51:169–176.
41. Wasan AD, Davar G, Jamison R. The association between negative affect and opioid analgesia in patients with discogenic low back pain. *Pain.* 2005;117:450–461.
42. Thomas T, Robinson C, Champion D, McKell M, Pell M. Prediction and assessment of the severity of post-operative pain and of satisfaction with management. *Pain.* 1998;75:177–185.
43. de Groot K, Boeke S, Passchier J. Preoperative expectations of pain and recovery in relation to postoperative disappointment in patients undergoing lumbar surgery. *Med Care.* 1999;37:149–156.
44. Lee CH, Liu JT, Lin SC, Hsu TY, Lin CY, Lin LY. Effects of educational intervention on state anxiety and pain in people undergoing spinal surgery: a randomized controlled trial. *Pain Manag Nurs.* 2018;19:163–171.
45. Pereira L, Figueiredo-Braga M, Carvalho IP. Preoperative anxiety in ambulatory surgery: the impact of an empathic patient-centered approach on psychological and clinical outcomes. *Patient Educ Couns.* 2016;99:733–738.
46. Laws MB, Lee Y, Taubin T, Rogers WH, Wilson IB. Factors associated with patient recall of key information in ambulatory specialty care visits: results of an innovative methodology. *PLoS One.* 2018;13:e0191940.
47. Parrinello K. Patients' evaluation of a teaching booklet for arterial bypass surgery. *Patient Educ Couns.* 1984;5: 183–188.
48. Kastanias P, Denny K, Robinson S, Sabo K, Snaith K. What do adult surgical patients really want to know about pain and pain management? *Pain Manag Nurs.* 2009;10:22–31.
49. Kain ZN, Mayes LC, Cicchetti DV, Bagnall AL, Finley JD, Hofstadter MB. The yale preoperative anxiety scale: how does it compare with a "gold standard"? *Anesth Analg.* 1997;85: 783–788.
50. Dimick JB, Weeks WB, Karia RJ, Das S, Campbell DA Jr. Who pays for poor surgical quality? Building a business case for quality improvement. *J Am Coll Surg.* 2006;202:933–937.
51. Savarese JJ, Tabler NG Jr. Multimodal analgesia as an alternative to the risks of opioid monotherapy in surgical pain management. *J Healthc Risk Manag.* 2017;37:24–30.
52. Wells RE, Kaptchuk TJ. To tell the truth, the whole truth, may do patients harm: the problem of the nocebo effect for informed consent. *Am J Bioeth.* 2012;12:22–29.
53. Sears SR, Bolton S, Bell KL. Evaluation of "Steps to Surgical Success" (STEPS): a holistic perioperative medicine program to manage pain and anxiety related to surgery. *Holist Nurs Pract.* 2013;27:349–357.
54. Dindo L, Zimmerman MB, Hadlandsmyth K, et al. Acceptance and commitment therapy for prevention of chronic postsurgical pain and opioid use in at-risk veterans: a pilot randomized controlled study. *J Pain.* 2018;19:1211–1221.
55. Althaus A, Rocker-Hinrichs A, Chapman R, et al. Development of a risk index for the prediction of chronic post-surgical pain. *Eur J Pain.* 2010;16:901–910.
56. De Kock M. Transition of acute postoperative pain to persistent pain and establishment of chronic postsurgical pain services. *Anesthesiology*. 2009;111:461–463.
57. Ewan E, Martin T. Analgesics as reinforcers with chronic pain. 2012;1:233–245.
58. Volkow ND, McLellan AT. Opioid abuse in chronic pain–misconceptions and mitigation strategies. *N Engl J Med.* 2016;374:1253–1263.
59. Roeckel LA, Le Coz GM, Gavériaux-Ruff C, Simonin F. Opioid-induced hyperalgesia: cellular and molecular mechanisms. *Neuroscience.* 2016;338:160–182.
60. Nelson LS, Juurlink DN, Perrone J. Addressing the opioid epidemic. *JAMA.* 2015;314:1453–1454.
61. Cicero TJ, Ellis MS. The prescription opioid epidemic: a review of qualitative studies on the progression from initial use to abuse. *Dialogues Clin Neurosci.* 2017;19:259–269.