

Orthopaedic Nurse Navigators and Total Joint Arthroplasty Preoperative Optimization Substance Use

Martha Kebeh ▼ Chloe C. Dlott ▼ Donna Kurek ▼ Jensa C. Morris ▼ Daniel H. Wiznia

Substance use is one of the most common risk factors contributing to complications following total joint arthroplasty. Preoperative optimization programs can help patients modify or stop substance use. The purpose of this study was to provide recommendations and resources that will help nurse navigators standardize and improve preoperative optimization protocols regarding substance use. In a semi-structured format, we asked nurse navigators how smoking, alcohol use, and opioid use were addressed. We conducted a literature review and combined findings with nurse navigator reports to create practice recommendations. We recommend consistently referring patients who smoke to smoking cessation programs; using validated screening tools to evaluate alcohol use and involving internists in caring for patients at risk for withdrawal; and involving pain specialists and local resources to assist patients who use opioids. There is a breadth of resources for managing substance use that nurse navigators can utilize to support stronger and more consistent preoperative optimization protocols.

Introduction

This article is part two of an *Orthopaedic Nursing Journal (ONJ)* series on orthopaedic nurse navigators and patient optimization prior to total joint arthroplasty (TJA; see Table 1). In this article, we focus on risk factors related to substance use, including smoking, alcohol use, and opioid use, and how nurse navigators can manage these risk factors in preoperative optimization.

Substance use is commonly managed as part of preoperative optimization protocols, as it is associated with worse patient outcomes after TJA (Best et al., 2015; Duchman et al., 2015; Gold et al., 2020; Keswani et al., 2016; Pivec et al., 2014; Smith et al., 2017; Wall & de Steiger, 2020). Smoking is associated with depressed immune function, impaired wound healing, increased rates of complications such as deep wound infections, and increased rates of discharge to inpatient rehabilitation facilities after TJA (Duchman et al., 2015; Keswani et al., 2016). Alcohol use disorder (AUD) has been identified as

a risk factor for increased postoperative complications, greater length of stay, acute postoperative infections, and prosthetic joint infections (Best et al., 2015; Gold et al., 2020). Preoperative opioid use has been linked to poor pain relief or increased experiences of pain after TJA (Pivec et al., 2014; Smith et al., 2017; Wall & de Steiger, 2020).

The reduction of substance use as part of TJA preoperative optimization is of increased importance among racial minorities and socioeconomically disadvantaged patient populations, as studies have demonstrated racial and economic disparities in substance use. Cigarette smoking is more prevalent among those who are socially or economically disadvantaged (Baum & Fisher, 2014). Although Black and White patients report smoking at similar rates, the highest rates of smoking are reported among Native American patients, another racial minority (Jones et al., 2018; Wang, Asman, et al., 2018). In addition, lower quit rates have been reported among Black patients who smoke (Centers for Disease Control and Prevention, 2002; Jones et al., 2018). Among former

Martha Kebeh, BA, Department of Orthopaedics and Rehabilitation, Yale School of Medicine, New Haven, CT.

Chloe C. Dlott, BS, Department of Orthopaedics and Rehabilitation, Yale School of Medicine, New Haven, CT.

Donna Kurek, MSN, RN, MHA, ONC, CMSRN, National Association of Orthopaedic Nurses and Movement is Life, Chicago, IL; OrthoVirginia, Chesterfield, VA.

Jensa C. Morris, MD, Hospital Medicine Service, Yale New Haven Hospital, New Haven, CT; Smilow Cancer Hospital, Yale New Haven Hospital, New Haven, CT; Yale School of Medicine, New Haven, CT.

Daniel H. Wiznia, MD, Department of Orthopaedics and Rehabilitation, Yale School of Medicine, New Haven, CT.

Support for the conduct of this research was provided by the National Heart, Lung and Blood Institute of the National Institutes of Health. This content does not represent the views of the National Institutes of Health.

The authors have no conflicts of interest to declare.

Correspondence: Martha Kebeh, BA, Department of Orthopaedics and Rehabilitation, Yale School of Medicine, 800 Howard Avenue, New Haven, CT 06519 (martha.kebeh@yale.edu).

DOI: 10.1097/NOR.0000000000000983

TABLE 1. CONTEXT STATEMENT FOR ORTHOPAEDIC NURSE NAVIGATORS AND PREOPERATIVE OPTIMIZATION SERIES**Orthopaedic Nurse Navigators and Preoperative Optimization: The Movement Is Life Special ONJ Series—Context Statement**

Patient comorbidities such as obesity, uncontrolled diabetes, and smoking are common and associated with increased postoperative complications among patients seeking TJA. In addition, social determinants of health, such as socioeconomic status or mental health conditions, may contribute to postoperative health complications and can act as barriers to care. Although many medical comorbidities and psychosocial factors affecting patients are modifiable conditions that can be addressed preoperatively and increasingly popular practices of patient optimization relying on orthopaedic nurse navigators for implementation may prove beneficial to both providers and patients, marginalized patient populations carry an increased comorbidity burden and are at increased risk of exclusion from TJA when eligibility criteria are used in these programs. Nurse navigators can assist in the development and implementation of these programs and thus improving both outcomes and equity of TJA while increasing the ability of patients with comorbidities and risk factors to safely receive treatment.

Note. TJA = total joint arthroplasty.

smokers, Black patients report smoking for longer and into later ages, regardless of how much they smoked before quitting, and 86% of former smokers are White whereas only 7.5% are Black (Jones et al., 2018). Studies have found that patients from minority and disadvantaged backgrounds are less likely to be considered eligible for TJA due to smoking (Hinman & Bozic, 2008; Wang, Wong, et al., 2018). Regarding alcohol, patients who are socioeconomically disadvantaged disproportionately suffer from mortality due to alcohol-attributable causes (Probst et al., 2014). Black patients are more likely to be prescribed opioids in advance of TJA (Jin et al., 2019), and Black and Hispanic patients are less likely than White patients to successfully complete substance use disorder (SUD) treatment at substance use treatment facilities (Grooms & Ortega, 2022). These findings demonstrate a potential for substance use-related interventions within TJA preoperative optimization protocols to exert positive effects on the health and TJA utilization of racial minorities and socioeconomically disadvantaged patient populations (Dlott et al., 2020).

This article uses information gathered from orthopaedic nurse navigators and a review of the current literature to share resources and practical recommendations for optimizing patients using tobacco, alcohol, or opioids before TJA.

Methods

NURSE NAVIGATOR PERSPECTIVES

The methodology for this article series is fully described in the introduction to the series (*introduction article citation*). Members of the National Association of Orthopaedic Nurses (NAON) were contacted via an online forum and asked to specifically describe their protocols and practices for optimizing patients by helping them reduce or cease smoking, alcohol use, or opioid use.

We distinguish alcohol use and opioid use from AUD and opioid use disorder (OUD), as the use of alcohol or

opioids can impact surgical outcomes even without meeting the criteria for AUD or OUD. The term “opioid use” includes the use of opioids for chronic pain managed by a primary care provider (PCP) or pain specialist as well as the use of opioids outside of a provider-supervised regimen. To allow for diversity of responses, we used semistructured individual discussions, held over the phone or via video conference. Each conversation was recorded to document and review discussion content. Four standard questions were asked to gather perspectives and examples of optimization strategies (see Table 2), followed by open-ended questions based on their responses to prompt discussion around the administration of screening questionnaires, laboratory tests, patient education, and connection to outside resources of a medical or social nature. Because conversations were qualitatively focused and semistructured, there was variation in the discussion of practices to optimize these risk factors.

LITERATURE REVIEW

For our literature review, we conducted searches in the Scopus and Web of Science databases, which were selected to reflect the perspectives and methodologies of multiple disciplines. We found eight articles pertinent to smoking, six pertinent to alcohol use, and 10 pertinent to opioid use.

Results

SMOKING

Nurse Navigator Perspectives

Nurse navigators reported that smoking was discussed with patients preoperatively and described interventions that they recommended to patients to assist with smoking cessation. Eighty-eight percent of nurse navigators stated that the surgeon, anesthesia team, advanced practice providers, or the navigator themselves conducted an initial health assessment that included

TABLE 2. STANDARD QUESTIONS ASKED OF ORTHOPAEDIC NURSE NAVIGATORS

Question 1	Questions 2 and 3	Question 4
<ul style="list-style-type: none"> Describe your role as a nurse navigator and how you interface with patients throughout the preoperative optimization process. 	<ul style="list-style-type: none"> Is [smoking status, alcohol use, opioid use, diabetes, cardiovascular disease, obesity, malnutrition, mental health, housing, payer status and affordability, or medication management] an area that is addressed as part of preoperative optimization at your institution? If so, how is this risk factor managed or optimized? What is your role in its optimization? 	<ul style="list-style-type: none"> Please share any additional resources you use to remain apprised of current guidelines and preoperative optimization strategies for TJA.

Note. TJA = total joint arthroplasty.

questions pertaining to smoking in their first individual encounter with the patient. Twenty-eight percent of nurse navigators reported that TJA patients were uniformly required to abstain from using any nicotine products for up to 6 weeks prior to TJA. The remainder stated that their institution did not have a uniform policy regarding smoking among TJA patients and individual surgeons' preferences guided how smoking status was addressed. Interventions included patient education (delivered in an asynchronous online format or in person) regarding the negative effects of smoking on wound healing and recovery from surgery; verbal encouragement and follow-up; smoking cessation commitment letters or nonlegally binding contracts; preoperative provision of nicotine replacement therapies in the form of lozenges or lollipops, patches, and gums; referral to smoking cessation helplines; and referral to structured smoking cessation programs (see Table 3). Structured smoking cessation programs included features such as pharmacists who provided medical management of nicotine weaning, a nurse navigator employed by the institution for the specific role of implementing a smoking cessation program, community classes and support groups, guided meditations, and options for telehealth meetings.

Literature Review

Smoking has been identified as the most common risk factor for poor outcomes following TJA (Hansen et al., 2012), and cessation prior to TJA is a goal that is frequently included in the literature regarding optimization due to its deleterious effects on wound healing and complication rates (Adie et al., 2019; Bernstein et al., 2018; Hejblum et al., 2009). One study showed that, although prior smokers were reported to have a greater risk of complications than never smokers, smoking cessation could reduce their risk relative to that of current smokers (Singh et al., 2011).

Interventions to support smoking cessation, which we collectively refer to as "cessation interventions," can include pharmacotherapy, counseling, support groups, education, nicotine replacement therapy, or any referral to resources to support patients' efforts to quit smoking, many of which are low-cost, low-risk, and routinely included in research exploring preoperative optimization protocols. Cessation interventions described in the results of our literature search are described here.

One systematic review found that the lengths of preoperative smoking cessation periods were rarely defined

(Theadom & Cropley, 2006). However, when defined, longer preoperative smoking cessation periods demonstrated nonstatistically significant but appreciable decreases in postoperative complication risk. Preoperative interventions leading to a decrease or elimination of smoking have been shown to decrease cost and length of hospital stay as well as lower complication rates (Bernstein et al., 2018; Hansen et al., 2012; Hejblum et al., 2009; Lindström et al., 2008; Møller et al., 2002). Varying recommendations in the literature state that TJA patients should stop smoking 4–8 weeks in advance of surgery (Adie et al., 2019; Lindström et al., 2008; Møller et al., 2002). In the literature, cessation interventions consistently included education regarding the increased risks of perioperative complications and weekly counseling sessions, often with nurses (Adie et al., 2019; Lindström et al., 2008; Møller et al., 2002). The provision of nicotine replacement therapy, sometimes including patient-specific schedules for using this therapy, was also reported in the literature (Hansen et al., 2012; Lindström et al., 2008; Møller et al., 2002). Some institutions provided patients with written educational materials (Bernstein et al., 2018) or connection to smoking cessation hotlines (Lindström et al., 2008). A study of patients undergoing TJA implemented a smoking cessation intervention that consisted of weekly meetings with a nurse who provided free nicotine replacement products and instructions on how to properly utilize them, as well as counseling related to avoiding weight gain and managing withdrawal symptoms (Møller et al., 2002). This study found that 64% of patients assigned to the intervention group stopped smoking during the study period, which was 6–8 weeks preceding surgery and 10 days following surgery, whereas 7.7% of patients not participating in the intervention stopped smoking during the same period. The intervention group experienced a lower rate of overall postoperative complications as well as wound-related complications. Similar results have been found among patients undergoing general surgery (Lindström et al., 2008).

ALCOHOL USE

Nurse Navigator Perspectives

Ninety-two percent of nurse navigators reported that alcohol use was discussed with patients by themselves, the surgeon, or in preadmission testing. Forty-four percent of nurse navigators personally collected an alcohol use history from patients. They did so by utilizing custom interview questions, questions from standardized screening tools such as the Alcohol Use Disorders

TABLE 3. INTERVENTIONS FOR SMOKING REPORTED BY NURSE NAVIGATORS

- **Education through joint classes** and asynchronous online or app-based patient education platforms in regard to increased risks of TJA complications associated with smoking and resources for smoking cessation
- **Verbal encouragement and follow-up** through reinforcement of risk and resource education, continued monitoring of patient progress with cessation efforts leading up to TJA
- **Cessation commitment letters/contracts**
- Assistance with accessing nicotine substitution therapy (provided by PCP or PAT)
- Referral to publicly-funded smoking cessation helplines, from which patients could connect with further resources
- Referral to smoking cessation programs featuring support groups and other providers (provided by institution, PCP, or outside organizations)

Note. Interventions in *italics* can be implemented in-house (without referrals or outside resources). PCP = primary care provider; PAT = preadmission testing; TJA = total joint arthroplasty.

TABLE 4. INTERVENTIONS FOR ALCOHOL USE REPORTED BY NURSE NAVIGATORS

- **Education in joint classes** in regard to increased risks of TJA complications associated with alcohol use and resources for managing alcohol use
- **Verbal encouragement and follow-up** through reinforcement of risk and resource education, continued monitoring of patient progress
- Communication with PCP to identify and address counseling and pharmacotherapy needs
- Referral to support groups (facilitated by outside organizations such as AA)
- Referral to case management or social work for further identification of resources

Note. Interventions in *italics* can be implemented in-house (without referrals or outside resources). AA = Alcoholics Anonymous; PCP = primary care provider; TJA = total joint arthroplasty.

Identification Test-Consumption (AUDIT-C; Babor et al., 2001; Saunders et al., 1993; van Gils et al., 2021), or by referring to notes in the patients' chart to gain an understanding of their alcohol use history. The nurse navigators we spoke with generally did not focus on a distinction between alcohol use and AUD, nor did they specifically attempt to diagnose and treat AUD. Rather, there was a collective focus on implementing interventions that would reduce the likelihood of postoperative alcohol withdrawal syndromes and associated complications of poor wound healing among TJA patients.

Nurse navigators reported offering to patients multiple interventions to help patients reduce or eliminate their alcohol consumption, including providing education on the effects of alcohol and alcohol withdrawal, coordinating with PCPs regarding medication or counseling, referring patients to local chapters of Alcoholics Anonymous (AA), and ensuring case manager or social work involvement in the patient's care (see Table 4). Joint classes served as an opportunity to provide education and resources that patients could access even if they were not required to abstain from alcohol use by their surgeon. When temporary discontinuation of alcohol use was specifically recommended, recommendations for how long patients should abstain were most commonly 48 or 72 hours.

Literature Review

Although our discussions with nurse navigators included alcohol use that did not meet the criteria for AUD, the relevant results from our literature review focused on the effects of AUD on TJA outcomes. Studies have demonstrated an increased rate of postoperative complications such as prosthetic joint infections in TJA patients with AUD (Best et al., 2015; Gold et al., 2020) and the negative physiological effects of alcohol on wound healing and surgical recovery (Trevejo-Nunez et al., 2015). These studies reported poorer outcomes for patients with AUD and also identified the need for research on how best to support patients in reducing

alcohol intake prior to surgery (Best et al., 2015; Gold et al., 2020). A study of the effect of preoperative optimization on TJA outcomes reported improved outcomes for optimized patients. However, despite including AUD among their screening criteria, they did not specify which interventions were implemented with regard to alcohol use (Bernstein et al., 2018). We found one reference that detailed interventions for decreasing or eliminating alcohol use before arthroplasty. This was an ongoing, unpublished randomized controlled trial for total hip arthroplasty patients (Egholm et al., 2018; Tønnesen, 2002), and the trial plan featured pharmacological interventions, vitamin supplementation, treatment of withdrawal symptoms, weekly motivational counseling sessions, and phone support for 3 months after surgery.

OPIOID USE

Nurse Navigator Perspectives

Ninety-six percent of nurse navigators stated that there was discussion regarding opioid use with patients preoperatively, including with care providers other than the nurse navigator themselves. Fifty-six percent of nurse navigators personally engaged in screening for or discussion of opioid use in the preoperative period. Nurse navigators detailed the interventions that they employed to help manage both opioid use and OUD (see Table 5), such as providing education in joint classes regarding the potential effects of preoperative pain medication on pain after surgery, how to dispose of medication, and potential drug interactions. Nurse navigators also collaborated with pharmacists, anesthesiologists, and physical therapists to teach patients about multimodal pain management and referred patients to outside resources such as intervention programs with behavioral health specialists.

For patients with OUD, nurse navigators discussed resources such as local chapters of Narcotics Anonymous (NA) or nonlegally binding letters of commitment to decreasing or discontinuing the use of opioids. For patients with chronic pain, nurse navigators reported that

TABLE 5. INTERVENTIONS FOR OPIOID USE REPORTED BY NURSE NAVIGATORS

- **Education in joint classes** and online or app-based patient education platforms in regard to risks associated with atypical or inappropriate opioid use and resources for managing opioid use
- Collaborative joint class or online education with pharmacists, anesthesiologists, and physical therapists regarding multimodal pain management with nonopioid analgesics, nonpharmacologic methods, physical therapy exercises
- Coordination with PCP or pain specialist for referral to pain management program featuring behavioral therapy
- Referral to support groups (facilitated by outside organizations such as NA)
- **Cessation commitment letters/contracts**

Note. Interventions in *italics* can be implemented in-house (without referrals or outside resources). NA = Narcotics Anonymous; PCP = primary care provider.

they connected patients to in-house surgical preoperative programs. These included pain management sessions, appointments, or hospitalist-run clinics serving patients with Medicaid. Nurse navigators also connected patients with new pain management specialists, coordinated communication with established pain management providers, or recommended patients receive bedside pain management consultations postoperatively.

Literature Review

Previous studies have found that persistent opioid use after surgery was more common in patients who used opioids preoperatively and that patients using opioids preoperatively had lower functional scores postoperatively (Catchpool et al., 2019; Pivec et al., 2014). One study showed that a majority of Medicare beneficiaries received opioids within the year leading up to TJA (Jin et al., 2019). Another study reported that diagnoses of depression in conjunction with SUD were also associated with increased wound complication rates (Gold et al., 2020). Although patients with osteoarthritis (OA) may experience severe pain and there is still a lack of consensus on optimal analgesic measures for OA (Xu et al., 2019), successful implementation of opioid-free analgesia after TJA has been reported as part of optimization protocols demonstrating increased home discharge rates and decreased costs, length of stay, and complication rates (Gray et al., 2018). Our review of the literature revealed preoperative optimization protocols that identified prescription opioid use or unspecified SUD as areas for optimization (Bernstein et al., 2018; Garson et al., 2014; Gray et al., 2018; Hansen et al., 2017; Wall & de Steiger, 2020) but did not include specific descriptions of interventions for reducing opioid use prior to TJA in either context.

Discussion

Nurse navigators were often directly involved in providing patients with education, encouragement, resources, referrals, and other forms of support for preoperative optimization that addressed smoking, alcohol use, and/or opioid use. Not all of the nurse navigators consulted took part in addressing substance use, indicating the lack of uniformity of optimization protocols for substance use and potential for these nurse navigators to have a greater role in the optimization process.

Based on our discussions with nurse navigators and our literature searches, we have developed preoperative optimization recommendations that nurse navigators can consider discussing with the surgical care team. Further research regarding the effectiveness of these interventions is warranted to help determine which patients and institutions would most benefit from the implementation of specific interventions. We provide links to resources that can aid nurse navigators in implementing these recommendations (see Table 6). Although the sample of nurse navigators we contacted was modest in number, it included geographically diverse programs at different stages of developing preoperative optimization protocols. We believe the responses

collected are representative of current practices for optimizing patient health by addressing substance use before TJA.

Recommendations

SMOKING

Studies of preoperative optimization and risk management programs for TJA have noted a gap between identifying smoking as a risk factor and implementing smoking cessation efforts for patients (Bernstein et al., 2018; Dlott & Wiznia, 2022; Ryan et al., 2019). Given this trend, our first recommendation (see Table 7) is that nurse navigators encourage surgeons, PCPs, or preadmission testing units to refer all patients who smoke to robust cessation programs involving personalized counseling, options for pharmacotherapy, nicotine replacement therapies such as lozenges, lollipops, patches, and gums, and regular follow-up. Smoking cessation pharmacotherapy options that nurse navigators can be aware of and encourage PCPs to consider include varenicline and bupropion (Sabesan et al., 2022).

Though smoking cessation programs are cost-effective (Hejblum et al., 2009), these resources are not universally available. It may not be feasible to create a resource solely for use by patients receiving TJA. However, the benefits of smoking cessation for patients in other surgical areas are well-established (Theadom & Cropley, 2006), and combining patient pools across surgical specialties may help offset costs. National cessation helplines and organizations such as the American Red Cross may also serve as resources for establishing cessation programs or accessing existing programs outside of the hospital setting. Helplines provide patients with cessation support ranging from counseling to nicotine replacement therapy (Centers for Disease Control and Prevention, 2021) and we recommend nurse navigators refer patients to this free resource. These programs should be begun at least 4 weeks prior to TJA and progress should be assessed continuously with the use of motivational interviewing and positive reinforcement as nurse navigators follow patients preoperatively. Nurse navigators should advocate for supportive measures discussed in this article to aid patients in smoking cessation and against the use of nicotine or cotinine-level testing to disqualify patients from receiving TJA, which results in reduced access to care (O'Connor et al., 2022).

Studies have cited the importance of patient education and information in improving outcomes (Anderson et al., 2021; Bottle et al., 2019; Parsons et al., 2013). We found that nurse navigators often discussed smoking cessation in joint classes attended by patients before surgery and recommend using this strategy. Nurse navigators should address this topic in classes so that all patients who smoke are aware of the risks associated with smoking and the resources available to help them quit. This should be done in a focused and efficient manner, as this information is critical for patients who smoke but not applicable to those who do not. Nurse navigators can provide evidence-based education derived from the resources we reference (see Table 6) and inform

TABLE 6. RESOURCES FOR IMPLEMENTING RECOMMENDATIONS: SUBSTANCE USEResources^a

- Smoking
- Tobacco treatment resources for providers¹
- Smoking cessation handout for patients with resources²
- Structured smoking cessation programs^{3,4}
- Printable handouts and resources on smoking cessation and medication management for patients^{5,6}

Alcohol use

- AA meeting search tool⁷
- AUDIT-C screening questions⁸

Opioid use

- Pain resources for patients and providers⁹
- Special interest article collections, including pain management¹⁰
- NA meeting search tool¹¹

General

- SAMHSA helpline, provider resources, and patient resources¹²
- Podcasts on orthopaedic surgery, nursing, care coordination, and risk factors¹³
- Webinars on orthopaedic surgery, nursing, care coordination, and risk factors¹⁴

Note. AA = Alcoholics Anonymous; AUDIT-C = Alcohol Use Disorders Identification Test-Consumption; NA = Narcotics Anonymous; SAMHSA = Substance Abuse and Mental Health Services Administration.

^aCited resources listed below:

1. The Joint Commission. (2022, May). **Tobacco measure resource links.** https://www.jointcommission.org/-/media/tjc/documents/measurement/measures/tobacco-treatment/dashboard-resource-links-tob-5_22.pdf
2. American College of Surgeons. (2022). Quit smoking before your operation. <https://www.facs.org/for-patients/preparing-for-your-surgery/quit-smoking/>
3. Become an EX Smoker. (2022). **Truth initiative.** <https://www.becomeanex.org>
4. National Institutes of Health. (n.d.). **Home—smokefree.** <https://smokefree.gov>
5. American College of Surgeons. (2022). **Operation brochures for patients.** <https://www.facs.org/for-patients/preparing-for-your-surgery/operation-brochures-for-patients/>
6. American College of Surgeons. (2022). **Strong for surgery.** <https://www.facs.org/for-patients/strong-for-surgery/>
7. General Service Office (G.S.O.) of Alcoholics Anonymous. (n.d.). **Find A.A. near you.** <https://www.aa.org/find-aa>
8. American College of Surgeons. (2022). **Safe pain control: Opioid abuse and surgery.** <https://www.facs.org/for-patients/safe-pain-control/>
9. Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., Monteiro, M. G., & Organization, W. H. (2001). **AUDIT: The Alcohol Use Disorders Identification Test: Guidelines for use in primary health care.** World Health Organization.
10. JBJS Article Collections. (2022). **Journal of Bone and Joint Surgery.** <https://www.jbjs.org/collections.php>
11. Narcotics Anonymous World Services. (2012). **Find a meeting.** <https://www.na.org/meetingsearch/>
12. Substance Abuse and Mental Health Services Administration. (n.d.). **SAMHSA –Substance Abuse and Mental Health Services Administration.** <https://www.samhsa.gov>
13. Becker's Healthcare. (2022). **Becker's healthcare podcasts.** <https://www.beckerspocasts.com>
14. Becker's Healthcare. (2022). **Webinars.** <https://www.beckershospitalreview.com/upcoming-webinars.html>

patients of the risks that are increased by smoking, such as that of infection and delayed wound healing (Duchman et al., 2015). Another way to incorporate education and motivational counseling is using personalized content delivery through online patient education platforms such as Wellbe, Care Companion, or CareSense. Some of these platforms are customizable, which allows nurse navigators to deliver specific information and motivation to patients who smoke. As some of these platforms also provide messaging services, they may strengthen communication between patients and nurse navigators. However, adoption of these platforms

can be expensive, and certain populations such as elderly and low-income patients may have limited access to these resources (Mamedova & Pawlowski, 2018). Nurse navigators should discuss the financial feasibility of these options and ways to make them more cost-effective, such as utilizing them across the institution, with surgeons and medical directors.

ALCOHOL USE

The majority of nurse navigators discussed alcohol use with patients in some form, although few imposed

TABLE 7. RECOMMENDATIONS FOR PREOPERATIVE OPTIMIZATION: SMOKING STATUS

Smoking

- Regularly refer patients to **smoking cessation program** involving counseling, options for pharmacotherapy such as varenicline or bupropion, and regular follow-up
- Offer or refer for **nicotine substitution therapy** with lozenges, lollipops, patches, and gums and **pharmacotherapy** with varenicline and bupropion
- Refer to **national smoking cessation helpline (1-800-QUIT-NOW)** for redirection to local resources
- Incorporate patient education on effects of smoking **into joint classes, online education platforms, and individual counseling** conversations
- Provide patient with **direct motivational counseling**

TABLE 8. RECOMMENDATIONS FOR PREOPERATIVE OPTIMIZATION: ALCOHOL USE

Alcohol use

- Utilize standard screening tools such as the AUDIT-C to identify concerning alcohol use as defined by institution/preoperative optimization program
- Incorporate patient education on effects of alcohol and alcohol withdrawal into **joint classes, individual counseling** conversations
- Discuss potential **outpatient treatment with acamprosate, naltrexone, and disulfiram** with PCP and surgeon
- Coordinate with PCP and surgeon regarding **withdrawal-related inpatient care and nutritional supplementation with thiamine and multivitamins**
- Refer to **local support groups such as AA** or hospital programs
- Refer to **national SAMHSA hotline (1-800-662-HELP)** for redirection to local resources
- Provide patient with **direct motivational counseling**

Note. AA = Alcoholics Anonymous; AUDIT-C = Alcohol Use Disorders Identification Test-Consumption; PCP = primary care provider; SAMHSA = Substance Abuse and Mental Health Services Administration.

strict cutoffs regarding alcohol use prior to TJA. We recommend instituting a standardized and validating screening tool such as the AUDIT-C to identify patients at risk for hazardous drinking during the first contact between the nurse navigator and the patient (Babor et al., 2001; van Gils et al., 2021). Healthcare institutions may choose to implement different interventions for patients with a positive screen or institute a lower threshold for intervention than what is classically used, but utilizing a standard tool will advance the ability of preoperative optimization programs to define a threshold for intervention and later establish a standard of care as more institutions collect and compare data.

Most commonly, alcohol use was discussed during joint classes, and we recommend using this setting to provide education regarding the effects of alcohol on surgical recovery (see Table 8). In the outpatient setting, nurse navigators should communicate concerns related to patients' alcohol use with their PCPs and be aware of potential pharmacologic interventions to treat AUD, such as acamprosate, naltrexone, and disulfiram (Egholm et al., 2018; Jørgensen et al., 2011; Rösner, Hackl-Herrwerth, Leucht, Lehert, et al., 2010; Rösner, Hackl-Herrwerth, Leucht, Vecchi, et al., 2010). In addition, surgical care teams, PCPs, and internists may recommend thiamine and multivitamin supplementation to avoid nutrient deficiencies and postoperative benzodiazepines for treatment of withdrawal symptoms (Campbell et al., n.d.; Egholm et al., 2018), and nurse navigators should be familiar with these treatment options. In the inpatient setting, we recommend that nurse navigators consult with surgeons and surgical care teams to consider involving inpatient medical providers for management of any alcohol use-related risks in the inpatient setting.

One of the resources nurse navigators most frequently referred to was AA, and we recommend consideration of this resource to connect patients to resources and support beyond the hospital (AA, n.d.). Nurse navigators should also access and connect patients to resources through the Substance Abuse and Mental Health Services Administration (SAMHSA) national hotline (SAMHSA, n.d.). We recommend sharing these resources with patients and becoming familiar with available options to help make patients aware of the types of resources available. Motivational counseling on a regular basis and management of withdrawal symptoms were interventions discussed in our literature review and commonly discussed by nurse navigators that may also serve as low-risk, cost-effective ways to facilitate changes related to alcohol use.

OPIOID USE

Qualitative studies have found that patients undergoing TJA benefit from nurse navigator availability and knowledge (Causey-Upton et al., 2020; Teng et al., 2021). However, a perceived lack of information on pain management can contribute to decreased postoperative patient satisfaction (Goldsmith et al., 2017). Our first recommendation (see Table 9) is to assess patient understanding regarding pain management and opioid use, which can be done as part of the perioperative calls already made by many nurse navigators or administered via online patient education platforms when available. Sharing results with the surgical care team or providing further education to bridge gaps in patient understanding may improve patients' surgical experiences. Nurse navigators can use the resources available in this article (see Table 6) to provide evidence-based education (Pivec et al., 2014; Smith et al., 2017).

TABLE 9. RECOMMENDATIONS FOR PREOPERATIVE OPTIMIZATION: OPIOID USE

Opioid use

- **Assess and improve patient understanding** of pain management through one-on-one conversations, joint classes, and online patient education platforms
- Incorporate **patient education on effects of opioid use and multimodal pain management into joint classes, individual counseling** conversations
- Refer to **local support groups such as NA** or internal programs
- Refer to **national SAMHSA hotline (1-800-662-HELP)** for redirection to local resources
- Coordinate with PCP and established pain specialists regarding postoperative pain management by **inpatient care providers**

Note. NA = Narcotics Anonymous; PCP = primary care provider; SAMHSA = Substance Abuse and Mental Health Services Administration.

For patients with chronic pain treated with opioids, we recommend that nurse navigators confirm patients' management regimen with pain specialists and consider incorporating presentations by specialists on multimodal pain management into joint classes. Chronic pain would be best managed by a pain specialist, so connecting patients to these providers would be an important intervention. However, many nurse navigators will not have access to the necessary resources to do so. We also recommend the inclusion of inpatient providers such as hospitalists, who are likely to be more accessible, in planning perioperative care and pain management.

The most frequently used outside resource among nurse navigators was NA, which lists resources in all 50 states on their website (Narcotics Anonymous World Services, 2012), or similar peer support groups for patients with OUD. The SAMHSA also provides a national hotline, 1-800-662-4357, that shares resources for patients seeking support for SUDs and their providers (SAMHSA, n.d.). We recommend nurse navigators share this resource with patients with OUD and familiarize themselves with the resources that the hotline provides for patients. In addition, patients may seek different qualities and methods in support groups, such as a focus on a shared faith or identity among group members. Coordination between nurse navigators and PCPs may help identify the most suitable resources for patients to access on a local level.

Conclusion

The development of preoperative optimization programs is an area of orthopaedics with the potential to greatly improve patient outcomes. Nurse navigators are critical to the implementation of these programs and are uniquely positioned to identify patients' needs, implement interventions to address them, and monitor patients' progress in reaching optimization goals. We have provided recommendations for reducing or eliminating substance use among patients seeking TJA. By utilizing strategies that will help patients meet optimization goals, nurse navigators can help improve TJA outcomes, especially among underserved patient populations.

ACKNOWLEDGMENTS

This article is part of a series describing contributions of nurse navigators to patient optimization for total hip and knee arthroplasty. This series was developed in coordination with Movement is Life, a group comprised of healthcare professionals whose mission is to eliminate musculoskeletal healthcare disparities. The authors would like to thank the nurse navigators who participated in discussions and provided their perspectives on each of the topics discussed in the series: Paulina Andujo, BSN, RN, ONC, Christopher Bautista, BSN, RN-BC, Emily Belcher, RN, Kerry Boyer, MSN, APRN, FNP-C, Pam Cupec, BSN, MS, RN, ONC, CRRN, ACM, Madonna Doyle, RN, Dawn Ellington, MBA, BSN, ONC, Sara Holman, RN, MSN, MBA, Diane Marie Jeselskis, BSN, RN, ONC, Jillian Knudsen, RN, MSN, CMSRN, ONC, CNL, CPHQ, Melissa A. Lafosse, RN, ONC, Lyndee

Leavitt, RN, BSN, ONC, MaryHellen Lezan, MS, MSN, APRN, FNP-C, JoAnn Miller-Watts, RN, BSN, ONC, Christen Nelson, RN, BSN, ONC, Kara Orr, MSN, RN, CNL, Misty Robbins, RN, Nicole Sarauer, APRN, CNS, ONC, Heather Schulte, BSN, Kathy Steffensmeier, RN, BSN, Ashley Streett, MSN, RN, ONC, CCRN, Naomi Tashman, RN, BSN, ONC, Maureen Wedopohl, BSN, RN, ONC, and Rhyana Whiteley, MN, RN, ONC.

REFERENCES

- Adie, S., Harris, I., Chuan, A., Lewis, P., & Naylor, J. M. (2019). Selecting and optimising patients for total knee arthroplasty. *Medical Journal of Australia*, *210*(3), 135–141. <https://doi.org/10.5694/mja.2.12109>
- Alcoholics Anonymous. (n.d.). *Find A.A. near you*. <https://www.aa.org/find-aa>
- Anderson, A. M., Comer, C., Smith, T. O., Drew, B. T., Pandit, H., Antcliff, D., Redmond, A. C., & McHugh, G. A. (2021). Consensus on pre-operative total knee replacement education and prehabilitation recommendations: A UK-based modified Delphi study. *BMC Musculoskeletal Disorders*, *22*(1), 352. <https://doi.org/10.1186/s12891-021-04160-5>
- Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., Monteiro, M. G., & Organization, W. H. (2001). *AUDIT: The Alcohol Use Disorders Identification Test: Guidelines for use in primary health care*. World Health Organization.
- Baum, F., & Fisher, M. (2014). Why behavioural health promotion endures despite its failure to reduce health inequities. *Sociology of Health & Illness*, *36*(2), 213–225. <https://doi.org/10.1111/1467-9566.12112>
- Bernstein, D. N., Liu, T. C., Winegar, A. L., Jackson, L. W., Darnutzer, J. L., Wulf, K. M., Schlitt, J. T., Sardan, M. A., & Bozic, K. J. (2018). Evaluation of a preoperative optimization protocol for primary hip and knee arthroplasty patients. *The Journal of Arthroplasty*, *33*(12), 3642–3648. <https://doi.org/10.1016/j.arth.2018.08.018>
- Best, M. J., Buller, L. T., Goshe, R. G., Klika, A. K., & Barsoum, W. K. (2015). Alcohol misuse is an independent risk factor for poorer postoperative outcomes following primary total hip and total knee arthroplasty. *The Journal of Arthroplasty*, *30*(8), 1293–1298. <https://doi.org/10.1016/j.arth.2015.02.028>
- Bottle, A., Parikh, S., Aylin, P., & Loeffler, M. (2019). Risk factors for early revision after total hip and knee arthroplasty: National observational study from a surgeon and population perspective. *PLoS One*, *14*(4), e0214855. <https://doi.org/10.1371/journal.pone.0214855>
- Campbell, A. R., Tatum, R., Brenner, B. M., & Petrusa, E. R. (n.d.). *ACS/ASE medical student core curriculum: Perioperative care*. American College of Surgeons Division of Education. https://www.facs.org/media/ucgfkicy/perioperative_care.pdf
- Catchpool, M., Knight, J., Young, J. T., Clarke, P., Barrington, M. J., Choong, P. F. M., & Dowsey, M. M. (2019). Opioid use prior to elective surgery is strongly associated with persistent use following surgery: An analysis of 14 354 Medicare patients. *ANZ Journal of Surgery*, *89*(11), 1410–1416. <https://doi.org/10.1111/ans.15492>
- Causey-Upton, R., Howell, D. M., Kitzman, P. H., Custer, M. G., & Dressler, E. V. (2020). orthopaedic nurses' perceptions of preoperative education for total knee replacement. *Orthopaedic Nursing*, *39*(4), 227–237. <https://doi.org/10.1097/nor.0000000000000675>
- Centers for Disease Control and Prevention. (2002). Cigarette smoking among adults—United States, 2000.

Morbidity and Mortality Weekly Report, 51(29), 642–645.

- Centers for Disease Control and Prevention (2021, December 22). *1-800-QUIT-NOW: 15 years of helping people quit*. Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion. <https://www.cdc.gov/tobacco/features/quitlines/index.html>
- Dlott, C. C., Moore, A., Nelson, C., Stone, D., Xu, Y., Morris, J. C., Gibson, D. H., Rubin, L. E., & O'Connor, M. I. (2020). Preoperative risk factor optimization lowers hospital length of stay and postoperative emergency department visits in primary total hip and knee arthroplasty patients. *Journal of Arthroplasty*, 35(6), 1508–1515.e2. <https://doi.org/10.1016/j.arth.2020.01.083>
- Dlott, C. C., & Wiznia, D. H. (2022). CORR synthesis: How might the preoperative management of risk factors influence healthcare disparities in total joint arthroplasty? *Clinical Orthopaedics and Related Research*, 480(5), 872–890. <https://doi.org/10.1097/CORR.0000000000002177>
- Duchman, K. R., Gao, Y., Pugely, A. J., Martin, C. T., Noiseux, N. O., & Callaghan, J. J. (2015). The effect of smoking on short-term complications following total hip and knee arthroplasty. *Journal of Bone and Joint Surgery*, 97(13), 1049–1058. <https://doi.org/10.2106/jbjs.N.01016>
- Egholm, J. W. M., Pedersen, B., Møller, A. M., Adami, J., Juhl, C. B., & Tønnesen, H. (2018). Perioperative alcohol cessation intervention for postoperative complications. *Cochrane Database of Systematic Reviews*, 2018(11), CD008343. <https://doi.org/10.1002/14651858.CD008343.pub3>
- Garson, L., Schwarzkopf, R., Vakharia, S., Alexander, B., Stead, S., Cannesson, M., & Kain, Z. (2014). Implementation of a total joint replacement-focused perioperative surgical home: A management case report. *Anesthesia & Analgesia*, 118(5), 1081–1089. https://journals.lww.com/anesthesia-analgesia/Fulltext/2014/05000/Implementation_of_a_Total_Joint.29.aspx
- Gold, P. A., Garbarino, L. J., Anis, H. K., Neufeld, E. V., Sodhi, N., Danoff, J. R., Boraiah, S., Rasquinha, V. J., & Mont, M. A. (2020). The cumulative effect of substance abuse disorders and depression on postoperative complications after primary total knee arthroplasty. *Journal of Arthroplasty*, 35(6S), S151–S157. <https://doi.org/10.1016/j.arth.2020.01.027>
- Goldsmith, L. J., Suryaprakash, N., Randall, E., Shum, J., MacDonald, V., Sawatzky, R., Hejazi, S., Davis, J. C., McAllister, P., & Bryan, S. (2017). The importance of informational, clinical and personal support in patient experience with total knee replacement: A qualitative investigation. *BMC Musculoskeletal Disorders*, 18(1), 127. <https://doi.org/10.1186/s12891-017-1474-8>
- Gray, C. F., Prieto, H. A., Duncan, A. T., & Parvataneni, H. K. (2018). Arthroplasty care redesign related to the Comprehensive Care for Joint Replacement model: Results at a tertiary academic medical center. *Arthroplasty Today*, 4(2), 221–226. <https://doi.org/10.1016/j.artd.2018.02.002>
- Grooms, J., & Ortega, A. (2022). Substance use disorders among older populations: What role do race and ethnicity play in treatment and completion? *Journal of Substance Abuse Treatment*, 132, 108443. <https://doi.org/10.1016/j.jsat.2021.108443>
- Hansen, C. A., Inacio, M. C. S., Pratt, N. L., Roughead, E. E., & Graves, S. E. (2017). Chronic use of opioids before and after total knee arthroplasty: A retrospective cohort study. *The Journal of Arthroplasty*, 32(3), 811–817. <https://doi.org/10.1016/j.arth.2016.09.040>
- Hansen, T. B., Bredtoft, H. K., & Larsen, K. (2012). Preoperative physical optimization in fast-track hip and knee arthroplasty. *Danish Medical Journal*, 59(2), A4381.
- Hejblum, G., Atsou, K., Dautzenberg, B., & Chouaid, C. (2009). Cost-benefit analysis of a simulated institution-based preoperative smoking cessation intervention in patients undergoing total hip and knee arthroplasties in France. *Chest*, 135(2), 477–483. <https://doi.org/10.1378/chest.08-0897>
- Hinman, A., & Bozic, K. J. (2008). Impact of payer type on resource utilization, outcomes and access to care in total hip arthroplasty. *The Journal of Arthroplasty*, 23(6, Suppl. 1), 9–14. <https://doi.org/10.1016/j.arth.2008.05.010>
- Jin, Y., Solomon, D. H., Franklin, P. D., Lee, Y. C., Lii, J., Katz, J. N., & Kim, S. C. (2019). Patterns of prescription opioid use before total hip and knee replacement among US Medicare enrollees. *Osteoarthritis and Cartilage*, 27(10), 1445–1453. <https://doi.org/10.1016/j.joca.2019.05.023>
- Jones, M. R., Joshu, C. E., Navas-Acien, A., & Platz, E. A. (2018). Racial/ethnic differences in duration of smoking among former smokers in the National Health and Nutrition Examination Surveys. *Nicotine & Tobacco Research*, 20(3), 303–311. <https://doi.org/10.1093/ntr/ntw326>
- Jørgensen, C. H., Pedersen, B., & Tønnesen, H. (2011). The efficacy of disulfiram for the treatment of alcohol use disorder. *Alcoholism Clinical and Experimental Research*, 35(10), 1749–1758. <https://doi.org/10.1111/j.1530-0277.2011.01523.x>
- Keswani, A., Tasi, M. C., Fields, A., Lovy, A. J., Moucha, C. S., & Bozic, K. J. (2016). Discharge destination after total joint arthroplasty: An analysis of postdischarge outcomes, placement risk factors, and recent trends. *The Journal of Arthroplasty*, 31(6), 1155–1162. <https://doi.org/10.1016/j.arth.2015.11.044>
- Lindström, D., Azodi, O. S., Wladis, A., Tønnesen, H., Linder, S., Näsell, H., Ponzer, S., & Adami, J. (2008). Effects of a perioperative smoking cessation intervention on postoperative complications: A randomized trial. *Annals of Surgery*, 248(5), 739–745. https://journals.lww.com/annalsofsurgery/Fulltext/2008/11000/Effects_of_a_Periooperative_Smoking_Cessation.8.aspx
- Mamedova, S., & Pawlowski, E. (2018). A Description of U.S. adults who are not digitally literate [electronic article]. *Statistics in Brief, NCES-2018-161*. <https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2018161>
- Møller, A. M., Villebro, N., Pedersen, T., & Tønnesen, H. (2002). Effect of preoperative smoking intervention on postoperative complications: A randomised clinical trial. *The Lancet*, 359(9301), 114–117. [https://doi.org/10.1016/S0140-6736\(02\)07369-5](https://doi.org/10.1016/S0140-6736(02)07369-5)
- Narcotics Anonymous World Services. (2012). *Find a meeting*. <https://www.na.org/meetingsearch/>
- O'Connor, M. I., Burney, D., III., & Jones, L. C. (2022). Movement is life-optimizing patient access to total joint arthroplasty: Smoking cessation disparities. *Journal of the American Academy of Orthopaedic Surgeons*, 30(22), 1055–1058. <https://doi.org/10.5435/jaaos-d-21-00875>
- Parsons, G., Jester, R., & Godfrey, H. (2013). A randomised controlled trial to evaluate the efficacy of a health

maintenance clinic intervention for patients undergoing elective primary total hip and knee replacement surgery. *International Journal of Orthopaedic and Trauma Nursing*, 17(4), 171–179. <https://doi.org/10.1016/j.ijotn.2013.07.004>

- Pivec, R., Issa, K., Naziri, Q., Kapadia, B. H., Bonutti, P. M., & Mont, M. A. (2014). Opioid use prior to total hip arthroplasty leads to worse clinical outcomes. *International Orthopaedics*, 38(6), 1159–1165. <https://doi.org/10.1007/s00264-014-2298-x>
- Probst, C., Roerecke, M., Behrendt, S., & Rehm, J. (2014). Socioeconomic differences in alcohol-attributable mortality compared with all-cause mortality: A systematic review and meta-analysis. *International Journal of Epidemiology*, 43(4), 1314–1327. <https://doi.org/10.1093/ije/dyu043>
- Rösner, S., Hackl-Herrwerth, A., Leucht, S., Lehert, P., Vecchi, S., & Soyka, M. (2010). Acamprosate for alcohol dependence. *Cochrane Database of Systematic Reviews*, 2010(9), CD004332. <https://doi.org/10.1002/14651858.CD004332.pub2>
- Rösner, S., Hackl-Herrwerth, A., Leucht, S., Vecchi, S., Srisurapanont, M., & Soyka, M. (2010). Opioid antagonists for alcohol dependence. *Cochrane Database of Systematic Reviews*, 2000(12), CD001867. <https://doi.org/10.1002/14651858.CD001867.pub3>
- Ryan, S. P., Howell, C. B., Wellman, S. S., Attarian, D. E., Bolognesi, M. P., Jiranek, W. A., Aronson, S., & Seyler, T. M. (2019). Preoperative optimization checklists within the comprehensive care for joint replacement bundle have not decreased hospital returns for total knee arthroplasty. *Journal of Arthroplasty*, 34(7S), S108–S113. <https://doi.org/10.1016/j.arth.2018.12.010>
- Sabesan, V. J., Rankin, K. A., & Nelson, C. (2022). Movement is life—optimizing patient access to total joint arthroplasty: Obesity disparities. *Journal of the American Academy of Orthopaedic Surgeons*, 30(21), 1028–1035. https://journals.lww.com/jaaos/Fulltext/2022/11010/Movement_Is_Life_Optimizing_Patient_Access_to.6.aspx
- Substance Abuse and Mental Health Services Administration. (n.d.). *SAMHSA—Substance Abuse and Mental Health Services Administration*. <https://www.samhsa.gov>
- Saunders, J. B., Aasland, O. G., Babor, T. F., de La Fuente, J. R., & Grant, M. (1993). Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption-II. *Addiction*, 88(6), 791–804. <https://doi.org/10.1111/j.1360-0443.1993.tb02093.x>
- Singh, J. A., Houston, T. K., Ponce, B. A., Maddox, G., Bishop, M. J., Richman, J., Campagna, E. J., Henderson, W. G., & Hawn, M. T. (2011). Smoking as a risk factor for short-term outcomes following primary total hip and total knee replacement in veterans. *Arthritis Care & Research*, 63(10), 1365–1374. <https://doi.org/10.1002/acr.20555>
- Smith, S. R., Bido, J., Collins, J. E., Yang, H., Katz, J. N., & Losina, E. (2017). Impact of preoperative opioid use on total knee arthroplasty outcomes. *Journal of Bone and Joint Surgery*, 99(10), 803–808. <https://doi.org/10.2106/JBJS.16.01200>
- Teng, L. J., Goldsmith, L. J., Sawhney, M., & Jussaume, L. (2021). Hip and knee replacement patients' experiences with an orthopaedic patient navigator: A qualitative study. *Orthopaedic Nursing*, 40(5), 292–298. <https://doi.org/10.1097/nor.0000000000000789>
- Theadom, A., & Cropley, M. (2006). Effects of preoperative smoking cessation on the incidence and risk of intra-operative and postoperative complications in adult smokers: A systematic review. *Tobacco Control*, 15(5), 352–358. <https://doi.org/10.1136/tc.2005.015263>
- Tønnesen, H. (2002, July 31). *Intensive intervention among alcohol patients prior to elective hip replacement—complications, life-quality, surgical outcome*. Unpublished data.
- Trevejo-Nunez, G., Kolls, J. K., & de Wit, M. (2015). Alcohol use as a risk factor in infections and healing: A clinician's perspective. *Alcohol Research*, 37(2), 177–184.
- van Gils, Y., Franck, E., Dierckx, E., van Alphen, S. P. J., Saunders, J. B., & Dom, G. (2021). Validation of the AUDIT and AUDIT-C for hazardous drinking in community-dwelling older adults. *International Journal of Environmental Research and Public Health*, 18(17), 9266. <https://doi.org/10.3390/ijerph18179266>
- Wall, C., & de Steiger, R. (2020). Pre-operative optimisation for hip and knee arthroplasty: Minimise risk and maximise recovery. *Australian Journal for General Practitioners*, 49, 710–714. <https://www1.racgp.org.au/ajgp/2020/november/pre-operative-optimisation-for-hip-and-knee-arthro>
- Wang, A. Y., Wong, M. S., & Humbyrd, C. J. (2018). Eligibility criteria for lower extremity joint replacement may worsen racial and socioeconomic disparities. *Clinical Orthopaedics and Related Research*, 476(12), 2301–2308. <https://doi.org/10.1097/corr.0000000000000511>
- Wang, T. W., Asman, K., Gentzke, A. S., Cullen, K. A., Holder-Hayes, E., Reyes-Guzman, C., Jamal, A., Neff, L., & King, B. A. (2018). Tobacco product use among adults—United States, 2017. *Morbidity and Mortality Weekly Report*, 67(44), 1225–1232. <https://doi.org/10.15585/mmwr.mm6744a2>
- Xu, J., Li, H., Zheng, C., Wang, B., Shen, P., Xie, Z., & Qu, Y. (2019). The efficacy of pre-emptive analgesia on pain management in total knee arthroplasty: A mini-review. *Arthroplasty*, 1(1), 10. <https://doi.org/10.1186/s42836-019-0011-7>

For additional nursing continuing professional development activities related to orthopaedic nursing topics, go to www.NursingCenter.com/ce.