IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 3, November 2024

Systematic Approaches to Optimize Opioid Prescribing in Surgical Patients

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Abstract: *The opioid crisis has highlighted the urgent need to optimize pain management strategies in surgical settings, prompting a shift towards opioid-sparing therapies. While opioids are crucial for alleviating moderate to severe postoperative pain, their over prescription poses significant risks, including addiction and overdose. This paper examines the feasibility of achieving opioid-free surgical recovery, particularly for minor and minimally invasive procedures, with the goal of extending this practice to more invasive surgeries through enhanced recovery after surgery (ERAS) programs. It also considers the cultural factors that influence patient expectations regarding pain management in countries with lower opioid prescribing rates, such as Japan and Germany, emphasizing the need for tailored approaches in the United States. The study advocates for the exclusion of opioids at every stage of the perioperative experience, promoting opioid-free anesthesia and analgesia. A framework for optimizing opioid prescribing practices in surgical contexts is proposed, highlighting the vital roles of acute pain specialists and pharmacists in developing comprehensive pain management strategies. By incorporating multimodal analgesia techniques, including non-opioid medications and alternative therapies, healthcare providers can effectively mitigate the risks associated with opioids while ensuring adequate pain relief*

Keywords: Opioid crisis, Pain management, Opioid-free recovery, Enhanced recovery after surgery (ERAS), Non-opioid analgesia, Pharmacist involvement

I. INTRODUCTION

Opioid analgesics are vital for managing moderate to severe acute pain, particularly in patients recovering from surgical procedures. They effectively alleviate pain, facilitating patient recovery and enhancing overall surgical outcomes.*(1)* However, the widespread overuse of prescription opioids has transformed into a significant public health crisis, leading to an alarming increase in rates of morbidity and mortality associated with opioid misuse. In 2017 alone, more than 49,000 Americans died from opioid overdoses, a stark indicator of the crisis that continues to evolve. Growing evidence also indicates that the misuse of prescription opioids often serves as a gateway to illicit opioid use, including heroin, exacerbating the problem. While the focus has primarily been on the role of opioids in chronic noncancer pain management, there is an increasing recognition that opioids prescribed for acute postoperative pain contribute substantially to the ongoing opioid epidemic. With over 50 million outpatient surgeries performed annually in the United States, the perioperative period presents a crucial opportunity for healthcare providers to manage pain effectively while mitigating risks associated with opioid prescriptions. The aging population, which is undergoing a higher volume of surgical procedures, emphasizes the importance of optimizing opioid prescribing practices.*(2)*

Healthcare providers aim to enhance patient recovery by minimizing pain to the greatest extent possible while also considering the potential risks and adverse effects associated with opioid use. National guidelines acknowledge a continuum of risk associated with opioid prescriptions, indicating that even short-term use can pose significant dangers to patients. Research suggests that patients may experience adverse outcomes from opioid prescriptions following surgery, highlighting the need for a more understanding of opioid prescribing practices in this context. Despite the recognized benefits of opioids in managing postoperative pain, knowledge gaps persist regarding optimal prescribing

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practices.*(3)*Key questions arise, such as the appropriate quantity of opioids to prescribe and how to effectively manage pain after patients are discharged from surgical care. Addressing these questions is crucial for improving patient safety and reducing the potential for opioid misuse. In light of the current opioid crisis, there is a pressing need to generate better evidence regarding opioid prescribing in surgical settings. Researchers have sought to examine concepts and methods relevant to optimal opioid prescribing and pain management during the perioperative period. A particular focus has been placed on opioid prescriptions made at the time of discharge, as these prescriptions may contribute to problematic opioid use among patients transitioning out of hospital care. Developing a conceptual framework for understanding opioid prescribing in the surgical context is essential for several reasons. First, it provides a structured approach to analyzing the risks and benefits of opioid use in postoperative care. Second, it fosters collaboration among providers, policymakers, and payers to develop standardized guidelines for opioid prescribing.*(4)* Finally, it in identifying alternative pain management strategies that can be employed in conjunction with or as substitutes for opioids.

II. METHODS

In this study, we undertook a comprehensive literature search to explore the opioid prescribing in the context of surgical procedures. Our search was conducted using Medline, encompassing English-language journal articles published from the inception of the database up to June 2018. The electronic search strategy was meticulously designed, incorporating a range of medical subject headings and free-text terms relevant to our focus area. Specifically, we utilized terms such as *(1)* "surgery," "surgical," or "perioperative," alongside *(2)* "opioid prescribing," "opioid prescription," or "prescription opioids." By emphasizing studies published within the last ten years, we aimed to capture the most recent advancements in understanding opioid prescribing practices, reflecting the growing awareness among clinicians dealing with surgical and acute pain management.*(5)*

Following our literature review, we synthesized the findings to develop a framework of key elements pertinent to optimizing opioid prescribing practices after surgical interventions. This framework serves as a visual and conceptual tool that illustrates how various concepts and methods interconnect within the broader topic of opioid management in postoperative care. By organizing the relationships among different factors, this framework not only clarifies existing knowledge but also provides a foundation for generating hypotheses for future research *(6)*It is essential to note that while the process of creating a framework may share some similarities with conducting a systematic review, there are significant distinctions between the two approaches. Systematic reviews typically aim to answer a specific, narrow question by compiling and grading levels of evidence from various studies..

The development of this framework is timely, given the heightened awareness surrounding opioid prescribing practices in surgical settings.*(7)* As the opioid crisis continues to pose significant challenges to public health, understanding the opioid management after surgery becomes paramount. Our framework serves as a guiding tool for clinicians, policymakers, and researchers, about optimizing opioid use in postoperative care while mitigating associated risks. Moreover, this framework opens avenues for future studies aimed at refining opioid prescribing practices and improving pain management protocols in surgical settings. It underscores the need for further investigation into the impact of various factors, including patient demographics, pain assessment methods, and alternative pain management strategies, on opioid prescribing patterns. By identifying and exploring these critical areas, we can enhance the quality of postoperative care and contribute to efforts aimed at curbing the opioid epidemic.*(8)*

Opioids And The Brain:

For thousands of years, plant-derived opiates have been employed in the treatment of pain. However, it wasn't until the 1970s that the existence of an endogenous opioid system in the human body was definitively confirmed. This pivotal discovery marked a significant turning point in our understanding of how opioids function within the brain and fundamentally reshaped our approach to pain management. Prior to this, it was commonly believed that the processes of opioid-induced pain relief and addiction occurred separately in distinct areas of the brain*(9)* However, ongoing research has revealed a more complex relationship between pain and reward, demonstrating that .(they are intricately linked in maintaining homeostasis and influencing behavior.

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Pain and reward systems interact in various ways, allowing individuals to assess the significance of pain and respond appropriately to it. This interaction is crucial for the development of learned protective behaviors that enhance survival, both from an evolutionary perspective and on an individual level. As a result, the use of opioid drugs extends beyond mere analgesia, influencing numerous cognitive and emotional processes in the brain. Continuous use of opioid medications can lead to effects that surpass the initial goal of pain relief. *(10)*While not every individual who uses opioids will develop an addiction, long-term exposure to these substances can lead to significant alterations in one's hedonic tone—the capacity to experience pleasure. This alteration can affect several aspects of life, including the ability to enjoy social interactions, engage with others, and prioritize various activities based on their perceived value. These changes can compromise an individual's overall quality of life and well-being. The interplay between pain and reward suggests that the brain's response to opioids is multifaceted. Opioids not only block pain signals but also activate the brain's reward pathways, reinforcing behaviors associated with drug use. This dual action can lead to the development of maladaptive behaviors where the search for pain relief becomes intertwined with the pursuit of pleasure.*(11)* As patients seek to manage their pain, they may inadvertently find themselves at risk of developing a substance use disorder.

Recognizing that addiction is not an inevitable outcome of opioid use is essential. However, healthcare providers and patients alike must be aware of the potential consequences of prolonged opioid use. The risks associated with opioid therapy necessitate a comprehensive approach to pain management that incorporates a variety of strategies beyond pharmacological interventions.In light of these complexities, it is critical to explore alternative pain management options that minimize the reliance on opioids. These may include non-opioid medications, physical therapy, cognitive-behavioral therapy, and other holistic approaches that address both the physical and emotional aspects of pain. By broadening the scope of pain management strategies, we can enhance patient care while reducing the likelihood of opioid-related complications. *(12)*

Chronic Pain and Reward Deficiency:

Chronic pain has increasingly been recognized as more than just a sensory issue; it is also deeply rooted in the brain's reward pathways.*(13)* Researchers Elman and Borsook have posited that the neural alterations associated with chronic pain closely resemble those seen in individuals with long-term substance abuse. This connection suggests that the propensity for addictive behaviors may be embedded within the pathology of chronic pain itself. Patients suffering from chronic pain often experience a state of reward deficiency or anhedonia, which is characterized by a diminished ability to experience pleasure.*(14)*This condition mirrors the experiences of individuals who engage in long-term substance abuse. In both cases, the normal processes governed by dopamine—specifically, the "wanting" associated with anticipating rewards and the "liking" tied to the actual experience of rewards—are significantly impaired. For chronic pain patients, this reduction in capacity extends to everyday pleasures such as food and social interactions, further complicating their quality of life. Moreover, the dynamics of reward processing change dramatically in chronic pain patients. While their ability to derive pleasure from normal rewards diminishes, the salience and reward value associated with pain relief become markedly heightened. This alteration can lead to a phenomenon known as incentive sensitization, where patients develop an increased craving for pain relief as a result of their altered reward system.*(15)*As these individuals seek relief from their persistent discomfort, they may find themselves increasingly preoccupied with obtaining opioids or other forms of analgesia, setting the stage for potential addictive behaviors.

Contrary to earlier beliefs that chronic pain could serve as a protective factor against addiction, the evidence now suggests that it is, in fact, a significant risk factor for developing substance use disorders.*(16)*This paradigm shift highlights the complex relationship between pain, reward, and addiction, emphasizing the need for a comprehensive understanding of these interconnected systems in pain management. The implications of this understanding are profound. If chronic pain modifies the brain's reward circuitry in such a way that it fosters an increased likelihood of addiction, it becomes crucial for healthcare providers to recognize the challenges faced by patients with chronic pain. Instead of merely focusing on alleviating pain through opioid prescriptions, a more holistic approach is required. This approach should consider the multifaceted nature of chronic pain and its interplay with the reward system. Effective pain management strategies should incorporate a range of interventions beyond opioids, such as cognitive-behavioral therapy, physical therapy, and non-opioid analgesics.*(17)*These alternatives not only help alleviate pain but can also

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provide patients with new ways to engage with rewards and pleasures in life, counteracting the reward deficiency associated with chronic pain.

Additionally, healthcare providers should be vigilant in monitoring patients for signs of addiction, especially those with a history of chronic pain. Creating a supportive environment that encourages open communication about pain management and potential risks can empower patients to make informed choices regarding their treatment options.

Opioids' Social Roles:

As organisms evolve and become increasingly reliant on social functions, endogenous opioids take on a more significant role in facilitating socialization. In simpler organisms like amphibians, the primary function of endogenous opioids is analgesia.*(18)*However, in mammals, including humans, these opioids have developed a more complex role that is crucial for social behaviors necessary for survival. Recent arguments by Carr suggest that for humans, the modulation of pain by endogenous opioids is less significant compared to their function in "behavioral fine-tuning" aimed at enhancing the survival of the species as a whole, rather than just the individual or immediate family. This shift underscores the importance of social interactions in human survival. Research indicates that human social interactions can trigger the release of endogenous opioids, reinforcing the idea that these compounds play a vital role in social behaviors. Studies have shown that the pleasure derived from social touch is mediated by endogenous opioids, while administering a μ-opioid receptor antagonist has been found to diminish interest in social relationships. This highlights the critical role of endogenous opioids in facilitating social interactions.*(19)*

The dynamics of opioid receptor activity further illuminate the connection between social interactions and emotional well-being. When individuals experience separation from loved ones, low activity of opioid receptors leads to feelings of distress.*(20)*Conversely, when reunited, high opioid receptor activity fosters feelings of comfort and security. This interplay suggests that the reinforcement of social bonds through the rewarding effects of opioids is a vital function in human socialization. However, the impact of social experiences on opioid regulation can have significant implications for mental health. Individuals who undergo repeated social rejection or abuse—especially during childhood—may develop dysfunctional opioid regulation. This dysregulation is thought to underlie a range of neuropsychiatric disorders, including post-traumatic stress disorder (PTSD), chronic pain, substance abuse, and depression. Early research into "opioidergic" tone has indicated that the inherent properties of the endogenous opioid system, combined with adaptations to stress, could influence an individual's vulnerability or resilience to these conditions. Thus, social rejection can act as a precursor to an increased risk of opioid craving, use, and abuse.*(21)*The recognition of this intricate relationship between social interactions and the opioid system emphasizes the importance of understanding how social factors can influence health outcomes. Effective pain management and treatment of substance abuse disorders may require not only addressing physical pain but also considering the social contexts in which individuals operate.

Critical role of the pharmacist:

The role of pharmacists has become increasingly vital as a key member of the healthcare team, particularly in the context of opioid prescribing and pain management. While pharmacists have assumed significant responsibilities in managing chronic pain within care team models, their involvement in pain management after surgical procedures is still less clearly defined.*(22)*The recent SPACE trial highlighted the critical role clinical pharmacists play in developing treatment plans for chronic pain patients, especially veterans, using either opioid-intensive or opioid-avoidant prescribing strategies. This study serves as a foundational reference for expanding the role of pharmacists in perioperative settings, where effective pain management is essential.

Pharmacists contribute significantly to optimizing pain management and opioid prescribing in various ways, particularly by emphasizing medication safety just before dispensing analgesic products. Their involvement encompasses multiple aspects of patient care, including expanding access to naloxone and other opioid safety initiatives within hospital systems and the broader community.*(23)*Pharmacists have led efforts to ensure that patients have the tools they need to use opioids safely and responsibly, particularly in light of the ongoing opioid crisis. One of the pivotal roles that pharmacists are taking on is interaction with state prescription drug monitoring programs (PDMPs). These programs have become a standard requirement for prescribers to identify risks associated with unsafe medication

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use. Recently, many states have begun to encourage or mandate similar responsibilities for pharmacists, recognizing their potential to intervene effectively in managing opioid prescriptions. However, feedback from both pharmacists and patients indicates some uncertainty about how much pharmacists should directly engage with patients concerning safety issues related to prescription opioids.

Pharmacists also have unique opportunities to improve pain management after surgery through mechanisms such as providing partial fills of opioid prescriptions and counseling patients on nonopioid alternatives.*(24)*These strategies can help address concerns about overprescribing and facilitate a more balanced approach to pain management. While there may be ongoing debates regarding the extent to which pharmacists should act as gatekeepers in opioid prescribing, their role as advocates for safe and evidence-based medication practices is increasingly acknowledged.*(25)*

In addition to direct patient care, pharmacists help overcome barriers to optimal pain management by educating both the perioperative team and patients about evidence-based guidelines. Medication reconciliation is another essential function of pharmacists, allowing them to assess a patient's current medications and identify any that might increase the risk of adverse events when combined with opioids.Moreover, pharmacists provide crucial education on the safe use, storage, and disposal of opioids, ensuring that patients and their caregivers are well-informed. They also instruct caregivers on the appropriate use of naloxone, equipping them with the knowledge necessary to respond to potential opioid overdoses. As the public health crisis surrounding opioid misuse continues to evolve, the expertise and active involvement of pharmacists are invaluable to both patients and perioperative teams. By enhancing pain management practices and ensuring the safe use of opioids, pharmacists play an essential role in addressing the complexities of pain management in modern healthcare. Their contributions not only improve patient outcomes but also support broader public health initiatives aimed at curbing the opioid crisis.*(27)*

Future Guidelines for Pain Management After Surgery:

The increasing focus on opioid prescribing has efforts to reduce or eliminate the use of opioids after surgery by optimizing opioid-sparing therapies. In some cases, complete elimination of prescription opioids is being explored as part of the strategy to improve postoperative pain management.(27) Opioid-free recovery is already accepted for minor or minimally invasive surgeries in the United States, and there is potential to extend this approach to more invasive procedures through programs such as enhanced recovery after surgery (ERAS). These programs aim to improve patient outcomes while minimizing opioid use, although careful monitoring is necessary to ensure that pain control, functional recovery, and overall surgical outcomes are not negatively affected by reducing or eliminating opioids.*(28)*

Cultural differences can play a significant role in shaping patient expectations and satisfaction with pain management, which may contribute to the lower opioid prescribing rates seen in countries such as Japan, Germany, and Austria. In these countries, there is a greater acceptance of opioid-sparing therapies, possibly due to cultural perceptions of pain and recovery, which allow for reduced reliance on opioids. However, transitioning to opioid-free surgical recovery in other countries, particularly the United States, requires a careful and methodical approach to ensure that patient care is not compromised. Pain management strategies must still effectively control postoperative pain while minimizing opioid exposure to avoid long-term risks associated with opioid use.*(29)*

Achieving opioid-free surgical recovery, particularly for more invasive surgeries, will likely involve excluding opioids at every stage of the perioperative experience. This includes providing opioid-free anesthesia during surgery and continuing with opioid-free analgesia in the postsurgical recovery period.*(30)*While this concept is promising, the feasibility of avoiding opioids entirely depends on the development of effective alternative pain management strategies that can be implemented safely in the perioperative setting. Acute pain specialists play a critical role in these efforts, especially within the framework of enhanced recovery programs, which focus on multimodal pain management approaches that emphasize non-opioid options. Enhanced recovery after surgery (ERAS) programs already incorporate multimodal analgesia, which combines various non-opioid medications and techniques to manage pain while minimizing the need for opioids.*(31)*The expansion of these programs to include completely opioid-free recovery could reduce the risks associated with opioid use, such as addiction, overdose, and other adverse effects. However, the benefits of an entirely opioid-free surgical experience are still being studied, and further research is needed to determine whether this approach leads to better overall outcomes for patients, particularly in terms of pain relief, functional recovery, and long-term health. Despite the potential challenges, pursuing opioid-free recovery is a worthwhile goal

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given the well-documented risks of opioids, both in the short term and the long term.*(32)*Opioid-free recovery may not be suitable for every patient or procedure, but it represents a significant shift in pain management that could reduce the opioid burden on individuals and the healthcare system. As more research is conducted and more patients experience opioid-free recovery, healthcare providers will be better equipped to determine when and how to implement opioid-sparing strategies effectively.*(33)*

III. CONCLUSION

In conclusion, the pursuit of opioid-free surgical recovery represents a significant advancement in pain management strategies, aiming to mitigate the risks associated with opioid use while ensuring effective pain relief for patients. As healthcare providers explore and implement multimodal analgesia approaches within enhanced recovery after surgery (ERAS) programs, the potential for minimizing opioid prescriptions becomes increasingly viable. Cultural perceptions and expectations surrounding pain management play a crucial role in shaping prescribing practices, indicating the need for a tailored approach that considers individual patient needs and societal attitudes. While challenges remain in fully eliminating opioids from the perioperative experience, ongoing research and collaboration among healthcare teams will pave the way for innovative solutions. Ultimately, achieving opioid-free recovery can enhance patient safety, improve surgical outcomes, and contribute to broader public health efforts to address the opioid crisis, fostering a more sustainable and effective model for pain management in surgical settings.

REFERENCES

[1]. Nimmo SM, Foo IT, Paterson HM. Enhanced recovery after surgery: pain management. Journal of surgical oncology. 2017 Oct;116(5):583-91.

[2]. Hyland SJ, Brockhaus KK, Vincent WR, Spence NZ, Lucki MM, Howkins MJ, Cleary RK. Perioperative pain management and opioid stewardship: a practical guide. InHealthcare 2021 Mar 16 (Vol. 9, No. 3, p. 333). MDPI.

[3]. Bicket MC, Brat GA, Hutfless S, Wu CL, Nesbit SA, Alexander GC. Optimizing opioid prescribing and pain treatment for surgery: review and conceptual framework. American Journal of Health-System Pharmacy. 2019 Sep 15;76(18):1403-12.

[4]. Hyland SJ, Brockhaus KK, Vincent WR, Spence NZ, Lucki MM, Howkins MJ, Cleary RK. Perioperative pain management and opioid stewardship: a practical guide. InHealthcare 2021 Mar 16 (Vol. 9, No. 3, p. 333). MDPI.

[5]. Bicket MC, Brat GA, Hutfless S, Wu CL, Nesbit SA, Alexander GC. Optimizing opioid prescribing and pain treatment for surgery: review and conceptual framework. American Journal of Health-System Pharmacy. 2019 Sep 15;76(18):1403-12.

[6]. Marterre B, Kopecky K, Miller P. Primary palliative care for surgeons: a narrative review and synthesis of core competencies. Annals of Palliative Medicine. 2022 Feb;11(2):88506-906.

[7]. National Academies of Sciences, Medicine Division, Committee on Evidence-Based Clinical Practice Guidelines for Prescribing Opioids for Acute Pain. Framing opioid prescribing guidelines for acute pain: developing the evidence.

[8]. Bicket MC, Brat GA, Hutfless S, Wu CL, Nesbit SA, Alexander GC. Optimizing opioid prescribing and pain treatment for surgery: review and conceptual framework. American Journal of Health-System Pharmacy. 2019 Sep 15;76(18):1403-12.

[9]. Ballantyne JC, Sullivan MD. Discovery of endogenous opioid systems: what it has meant for the clinician's understanding of pain and its treatment. Pain. 2017 Dec 1;158(12):2290-300.

[10]. Hebb AL, Poulin JF, Roach SP, Zacharko RM, Drolet G. Cholecystokinin and endogenous opioid peptides: interactive influence on pain, cognition, and emotion. Progress in Neuro-Psychopharmacology and Biological Psychiatry. 2005 Dec 1;29(8):1225-38.

[11]. Trang T, Al-Hasani R, Salvemini D, Salter MW, Gutstein H, Cahill CM. Pain and poppies: the good, the bad, and the ugly of opioid analgesics. Journal of Neuroscience. 2015 Oct 14;35(41):13879-88.

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International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
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[12]. Penney LS, Ritenbaugh C, DeBar LL, Elder C, Deyo RA. Provider and patient perspectives on opioids and alternative treatments for managing chronic pain: a qualitative study. BMC Family Practice. 2016 Dec;17:1-5.

[13]. Stein C. Opioids, sensory systems and chronic pain. European journal of pharmacology. 2013 Sep 15;716(1-3):179-87.

[14]. Rizvi SJ, Gandhi W, Salomons T. Reward processing as a common diathesis for chronic pain and depression. Neuroscience & Biobehavioral Reviews. 2021 Aug 1;127:749-60.

[15]. Berridge KC. The debate over dopamine's role in reward: the case for incentive salience. Psychopharmacology. 2007 Apr;191:391-431.

[16]. Martell BA, o'Connor PG, Kerns RD, Becker WC, Morales KH, Kosten TR, Fiellin DA. Systematic review: opioid treatment for chronic back pain: prevalence, efficacy, and association with addiction. Annals of internal medicine. 2007 Jan 16;146(2):116-27.

[17]. Kaye AD, Granier AL, Garcia AJ, Carlson SF, Fuller MC, Haroldson AR, White SW, Krueger OL, Novitch MB, Cornett EM. Non-opioid perioperative pain strategies for the clinician: a narrative review. Pain and Therapy. 2020 Jun;9:25-39.

[18]. Ballantyne JC, Sullivan MD. Discovery of endogenous opioid systems: what it has meant for the clinician's understanding of pain and its treatment. Pain. 2017 Dec 1;158(12):2290-300.

[19]. Løseth GE, Eikemo M, Leknes S. Effects of opioid receptor stimulation and blockade on touch pleasantness: a double-blind randomised trial. Social Cognitive and Affective Neuroscience. 2019 Apr;14(4):411-22.

[20]. Panksepp J, Solms M, SchläpferTE, Coenen VA. Primary-process separation-distress (PANIC/GRIEF) and reward eagerness (SEEKING) processes in the ancestral genesis of depressive affect.

[21]. Johnston KJ, Huckins LM. Chronic pain and psychiatric conditions. Complex Psychiatry. 2023 Sep 15;9(1-4):24-43.

[22]. Chisholm-Burns MA, Spivey CA, Sherwin E, Wheeler J, Hohmeier K. The opioid crisis: origins, trends, policies, and the roles of pharmacists. American journal of health-system pharmacy. 2019 Apr 1;76(7):424-35.

[23]. Bicket MC, Brat GA, Hutfless S, Wu CL, Nesbit SA, Alexander GC. Optimizing opioid prescribing and pain treatment for surgery: review and conceptual framework. American Journal of Health-System Pharmacy. 2019 Sep 15;76(18):1403-12.

[24]. Chisholm-Burns MA, Spivey CA, Sherwin E, Wheeler J, Hohmeier K. The opioid crisis: origins, trends, policies, and the roles of pharmacists. American journal of health-system pharmacy. 2019 Apr 1;76(7):424-35.

[25]. Kosobuski L, O'Donnell C, Koh-Knox Sharp CP, Chen N, Palombi L. The role of the pharmacist in combating the opioid crisis: an update. Substance Abuse and Rehabilitation. 2022 Dec 31:127-38.

[26]. Kosobuski L, O'Donnell C, Koh-Knox Sharp CP, Chen N, Palombi L. The role of the pharmacist in combating the opioid crisis: an update. Substance Abuse and Rehabilitation. 2022 Dec 31:127-38.

[27]. Duong A, Ponniah AK, VanDeCapelle C, Mossuto F, Romeril E, Phillips S, Johal H, Al-Asiri J, Tushinski D, Wood TJ, Peterson D. Effect of a postoperative multimodal opioid-sparing protocol vs standard opioid prescribing on postoperative opioid consumption after knee or shoulder arthroscopy: a randomized clinical trial. JAMA. 2022 Oct 4;328(13):1326-35.

[28]. Hyland SJ, Brockhaus KK, Vincent WR, Spence NZ, Lucki MM, Howkins MJ, Cleary RK. Perioperative pain management and opioid stewardship: a practical guide. InHealthcare 2021 Mar 16 (Vol. 9, No. 3, p. 333). MDPI.

[29]. Mitra S, Carlyle D, Kodumudi G, Kodumudi V, Vadivelu N. New advances in acute postoperative pain management. Current pain and headache reports. 2018 May;22:1-1.

[30]. Shanthanna H, Ladha KS, Kehlet H, Joshi GP. Perioperative opioid administration: a critical review of opioid-free versus opioid-sparing approaches. Anesthesiology. 2021 Apr 1;134(4):645-59.

[31]. Chen Q, Chen E, Qian X. A narrative review on perioperative pain management strategies in enhanced recovery pathways—The past, present and future. Journal of Clinical Medicine. 2021 Jun 10;10(12):2568.

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[32]. Ballantyne J, Tauben DJ, editors. Expert Decision Making on Opioid Treatment. Oxford University Press; 2013 Jan 29.

[33]. Nassif GJ, Miller TE. Evolving the management of acute perioperative pain towards opioid free protocols: a narrative review. Current medical research and opinion. 2019 Dec 2;35(12):2129-36