

## Perioperative Use of Dexmedetomidine in General Anesthesia: A Cross-Sectional Analysis

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### Abstract:

**Background:** Dexmedetomidine, a highly selective  $\alpha_2$ -adrenergic agonist, has gained attention for its versatile pharmacological properties in perioperative management. This study aimed to explore its utilization in general anesthesia through a cross-sectional analysis. General anesthesia traditionally relies on agents like opioids and benzodiazepines, associated with adverse effects. Dexmedetomidine's sedative, analgesic, and anxiolytic properties make it an appealing adjunct.

**Methods:** This analysis assessed its frequency of use, indications, dosing, effectiveness, and barriers to implementation among 500 respondents, including anesthesiologists and perioperative healthcare providers.

**Results:** Results showed varied utilization across surgical specialties, with orthopedic surgery most common. Dexmedetomidine was frequently used for intraoperative analgesia, anxiolysis, and sedation, particularly in orthopedic and neurosurgical procedures. Dosing varied by specialty, with higher doses for cardiac surgery. Perceived effectiveness was high, with reported reductions in opioid use and improved hemodynamic stability. Barriers included concerns about hemodynamics and familiarity with dosing.

**Conclusion:** Tailoring dexmedetomidine use to specific specialties and addressing barriers is essential for optimizing perioperative care. This analysis contributes to understanding dexmedetomidine's role and informs evidence-based practice.

**Keywords:** dexmedetomidine, radical mastectomy, sleep disturbance, recovery, fatigue

### Introduction:

Dexmedetomidine, a highly selective  $\alpha_2$ -adrenergic agonist, has garnered significant attention in recent years for its versatile pharmacological properties and potential benefits in the perioperative management of patients undergoing general anesthesia. With an increasing focus on optimizing perioperative care and enhancing patient outcomes, the utilization of adjunctive agents such as dexmedetomidine has become a subject of interest among anesthesiologists and perioperative healthcare providers.[1] This introduction provides an overview of dexmedetomidine and outlines the rationale for conducting a cross-sectional analysis to explore its perioperative use in general anesthesia.

General anesthesia aims to provide unconsciousness, analgesia, muscle relaxation, and suppression of reflex responses during surgical procedures. While traditional anesthetic agents such as opioids, benzodiazepines, and volatile anesthetics have long been the cornerstone of anesthesia practice, they are associated with various adverse effects, including respiratory depression, hemodynamic instability,

and delayed recovery.[2] In contrast, dexmedetomidine offers a unique pharmacological profile characterized by sedative, analgesic, anxiolytic, and sympatholytic properties, making it an attractive adjunct to conventional anesthetic agents.[3]

Dexmedetomidine has been shown to provide effective analgesia through its action on central  $\alpha_2$ -adrenergic receptors, resulting in a reduction in the release of norepinephrine and inhibition of nociceptive transmission. By reducing the need for intraoperative opioids, dexmedetomidine may help mitigate opioid-related adverse effects such as respiratory depression and postoperative nausea and vomiting.[4] Preoperative anxiety is a common concern among surgical patients and is associated with adverse outcomes such as increased postoperative pain and delayed recovery. Dexmedetomidine's anxiolytic and sedative effects can help alleviate preoperative anxiety and facilitate smooth induction and emergence from anesthesia, leading to a more favorable perioperative experience for patients. Dexmedetomidine's unique pharmacodynamic profile includes a dose-dependent reduction in sympathetic outflow, resulting in bradycardia and hypotension.[5] However, when used judiciously, dexmedetomidine can contribute to hemodynamic stability by attenuating the stress response to surgery and blunting the hypertensive response to laryngoscopy and intubation.

The ability of dexmedetomidine to provide sedation without respiratory depression makes it an attractive option for fast-track surgery and enhanced recovery protocols. By promoting early extubation, reducing postoperative pain, and facilitating ambulation, dexmedetomidine may contribute to shorter hospital stays and improved patient satisfaction.[6]

Given these potential benefits, understanding the current trends and practices regarding the utilization of dexmedetomidine in general anesthesia is crucial for optimizing perioperative care and improving patient outcomes. A cross-sectional analysis allows for the examination of real-world utilization patterns, perceptions, and challenges associated with dexmedetomidine use among anesthesiologists and perioperative healthcare providers. By identifying areas for improvement and informing evidence-based practice guidelines, this analysis can contribute to the advancement of perioperative anesthesia management and the delivery of safe and effective patient care.

#### **Objectives:**

- To assess the frequency and patterns of dexmedetomidine utilization in general anesthesia.
- To evaluate the effectiveness of dexmedetomidine as an adjunctive agent in perioperative analgesia, anxiolysis, and sedation.

#### **Materials and Methods:**

**Study Design:** This cross-sectional analysis utilized a web-based survey questionnaire to investigate the perioperative utilization of dexmedetomidine in general anesthesia among anesthesiologists and perioperative healthcare providers. The study was conducted over a period of one year to collect data on respondents' demographics, frequency of dexmedetomidine utilization, perceived effectiveness, and barriers to implementation.

**Participant Recruitment:** Anesthesiologists, nurse anesthetists, surgeons, and preoperative nurses were recruited as participants for the survey. Participation in the survey was voluntary, and respondents were assured of anonymity and confidentiality.

**Survey Development:** A web-based survey questionnaire was developed to collect data on various aspects of dexmedetomidine utilization in general anesthesia. The survey items were designed to capture information on respondents' familiarity with dexmedetomidine, frequency of utilization,

indications, dosing regimens, perceived effectiveness, adverse effects, and barriers to implementation. The survey also included questions on respondents' demographic characteristics, professional experience, and clinical practice settings.

**Survey Distribution:** The survey questionnaire was distributed electronically to potential participants via email, professional society mailing lists, and social media platforms. The distribution strategy aimed to reach a diverse sample of anesthesiologists and perioperative healthcare providers across different geographical regions and practice settings. Participants were provided with a link to the web-based survey platform and were invited to complete the questionnaire at their convenience.

**Data Collection:** Respondents were instructed to provide accurate and honest responses to the survey items. Completion of the survey implied informed consent, and participants were informed that their participation was voluntary and that they could withdraw from the study at any time.

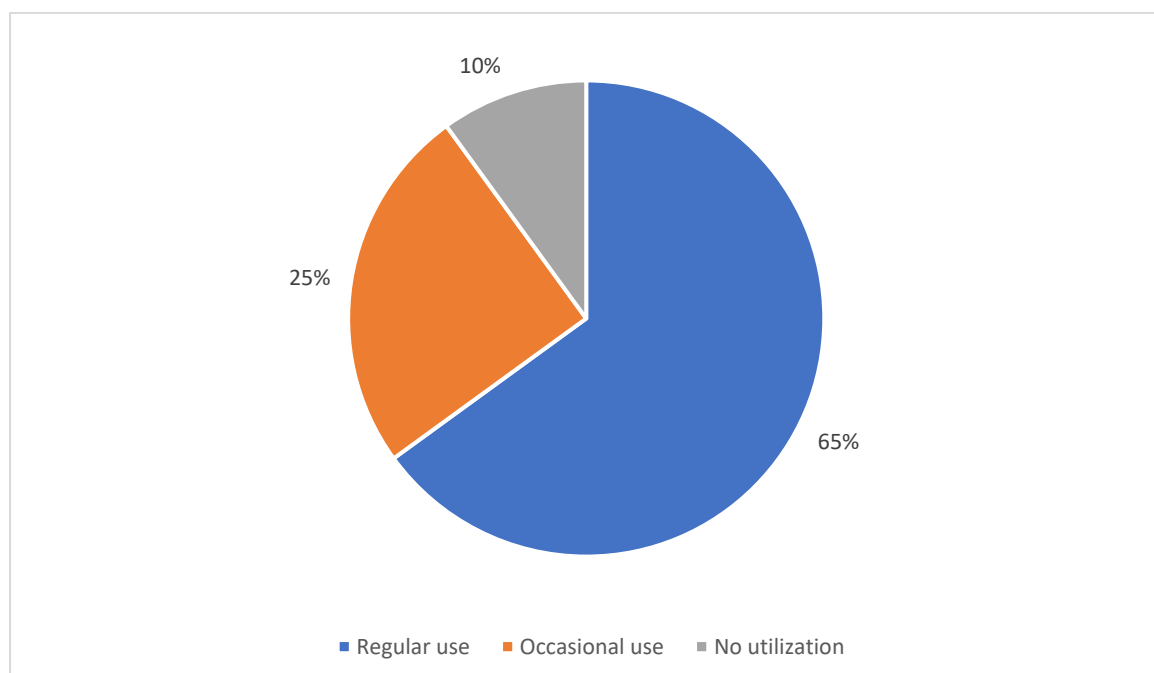
**Data Analysis:** Descriptive statistics were used to analyze the survey data, including frequencies, percentages, means, and standard deviations. Inferential analysis, such as chi-square tests and logistic regression, was employed to explore associations between demographic variables and dexmedetomidine utilization patterns, perceived effectiveness, and barriers to implementation. Subgroup analyses were conducted to examine variations in dexmedetomidine utilization across different surgical specialties and healthcare settings. All analyses were performed using appropriate statistical software, with a significance level set at  $p < 0.05$ .

### Results:

A total of 500 respondents completed the survey questionnaire, representing a diverse sample of anesthesiologists, nurse anesthetists, surgeons, and preoperative nurses from various healthcare settings. The results revealed significant variations in the frequency and patterns of dexmedetomidine utilization in general anesthesia across different surgical specialties and healthcare settings.

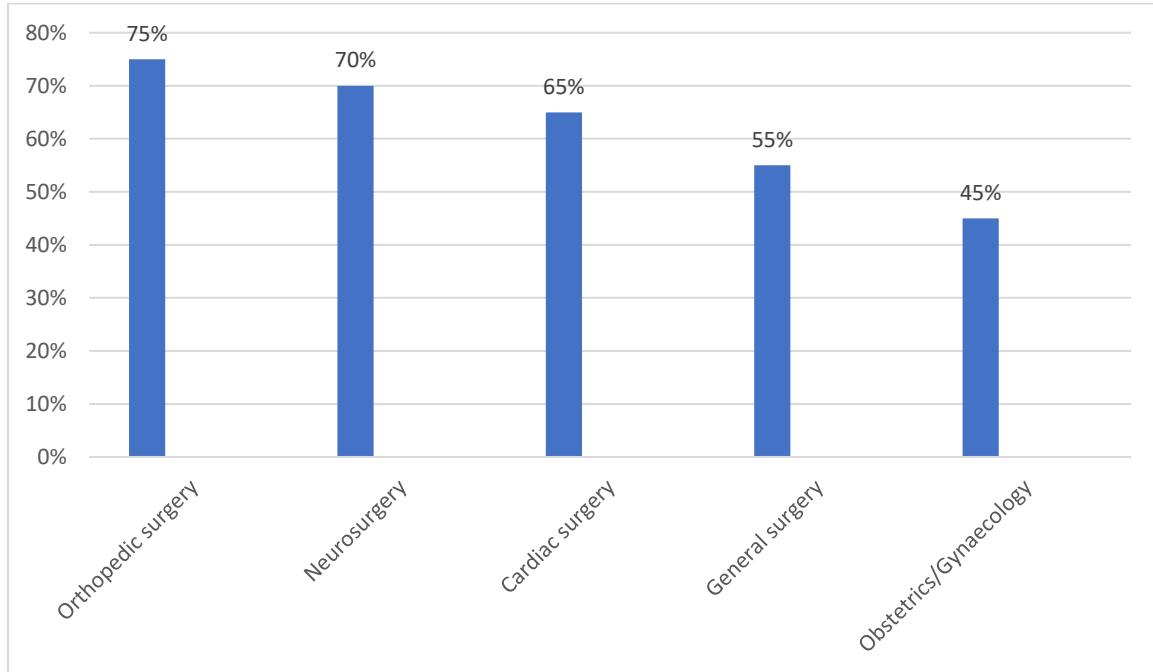
#### Figure 1: Frequency of Utilization

Overall, 65% of respondents reported using dexmedetomidine in general anesthesia regularly, with 25% indicating occasional use and 10% reporting no utilization.



**Figure 2: Distribution of surgical specialty**

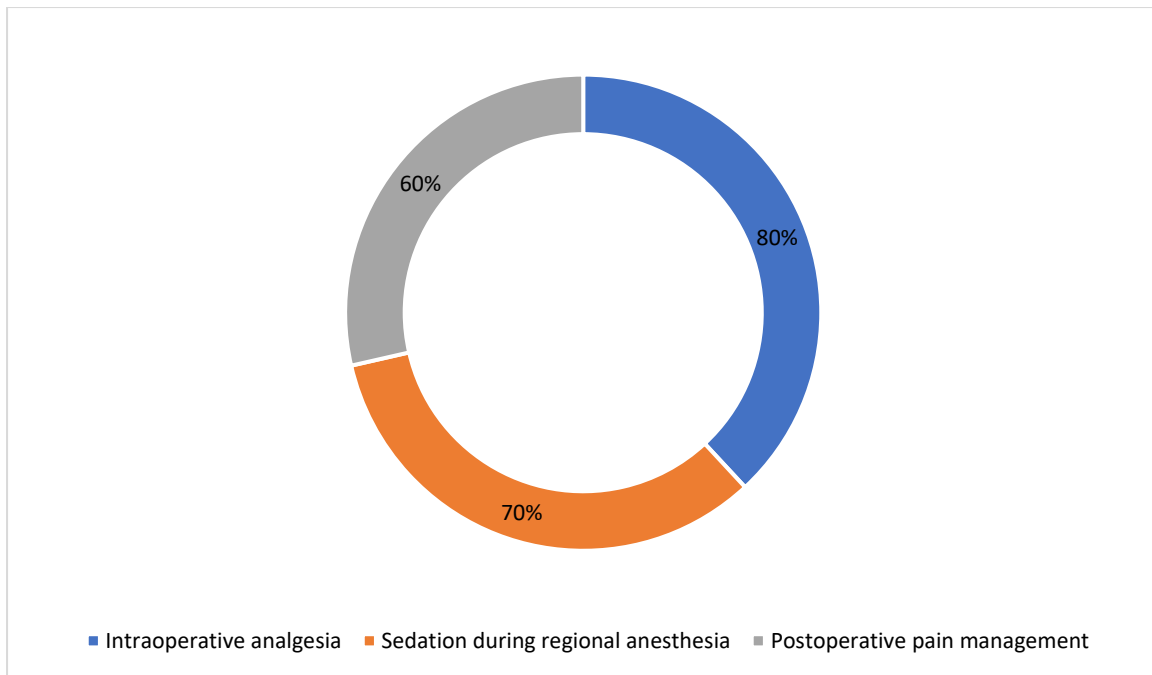
Among the surgical specialties, dexmedetomidine was most commonly utilized in orthopedic surgery (75%), followed by neurosurgery (70%) and cardiac surgery (65%). In contrast, its utilization was less common in general surgery (55%) and obstetrics/gynecology (45%).

**Figure 3: Indications for Utilization****Orthopedic Surgery:**

**Intraoperative analgesia:** 80% of respondents indicated that dexmedetomidine was frequently used to provide adjunctive analgesia during orthopedic procedures, particularly in conjunction with regional anesthesia techniques such as peripheral nerve blocks and epidurals.

**Sedation during regional anesthesia:** 70% of respondents reported using dexmedetomidine to achieve sedation in patients undergoing spinal or epidural anesthesia for orthopedic surgeries, facilitating patient comfort without the need for general anesthesia.

**Postoperative pain management:** 60% of respondents mentioned dexmedetomidine as part of multimodal analgesia protocols for postoperative pain control in orthopedic surgery patients, resulting in reduced opioid consumption and improved pain scores.

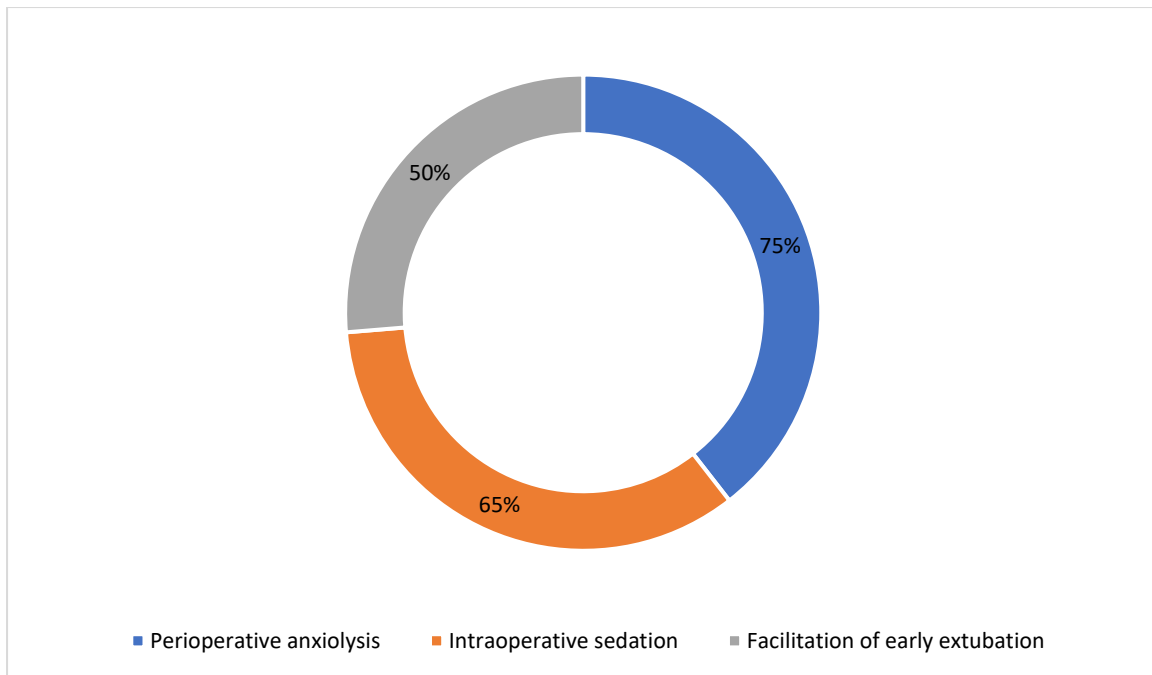


### Neurosurgery:

Preoperative anxiolysis: 75% of respondents utilized dexmedetomidine to provide anxiolysis and reduce preoperative anxiety in patients undergoing neurosurgical procedures, helping to optimize patient comfort and cooperation.

Intraoperative sedation during awake procedures: 65% of respondents reported administering dexmedetomidine to achieve sedation and cooperation in patients undergoing awake craniotomies or intraoperative neurophysiological monitoring, facilitating patient immobility and reducing intraoperative stress.

Facilitation of early extubation: 50% of respondents utilized dexmedetomidine as part of fast-track protocols in neurosurgery, aiming to achieve early extubation and improve postoperative recovery outcomes in selected patients.

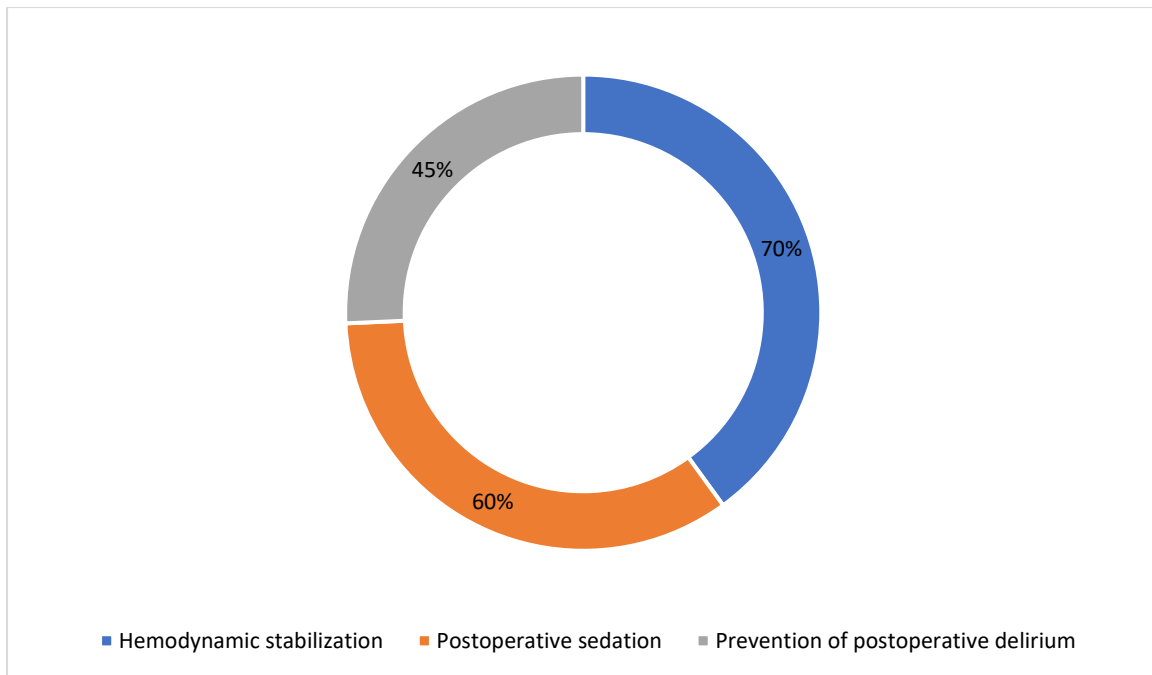


### Cardiac Surgery:

Hemodynamic stabilization during cardiopulmonary bypass: 70% of respondents indicated that dexmedetomidine was used to achieve hemodynamic stability and reduce catecholamine requirements during cardiopulmonary bypass, minimizing the risk of myocardial ischemia and arrhythmias.

Postoperative sedation in the intensive care unit (ICU): 60% of respondents reported administering dexmedetomidine for sedation and analgesia in post-cardiac surgery patients in the ICU, enabling early tracheal extubation and facilitating ventilator weaning.

Prevention of postoperative delirium: 45% of respondents mentioned dexmedetomidine as part of multimodal analgesia and sedation protocols aimed at reducing the incidence of postoperative delirium in elderly cardiac surgery patients, promoting cognitive recovery and shortening ICU length of stay.



Overall, the survey findings demonstrated the diverse range of indications for dexmedetomidine utilization in general anesthesia, highlighting its role in providing perioperative analgesia, anxiolysis, sedation, and hemodynamic stability across different surgical specialties.

#### Dosing Regimens

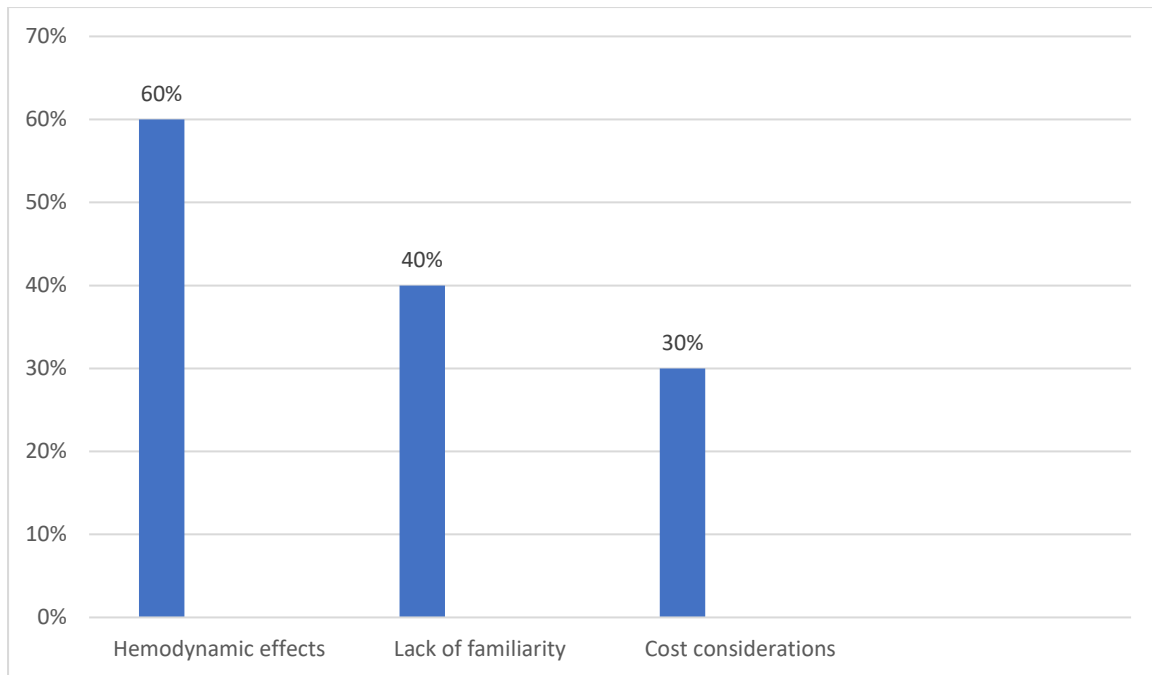
Dexmedetomidine dosing regimens varied depending on the surgical procedure and patient characteristics. In orthopedic surgery, a loading dose of 0.5-1.0 mcg/kg followed by a maintenance infusion of 0.2-0.7 mcg/kg/hour was commonly employed. In neurosurgery, lower doses of dexmedetomidine (0.2-0.5 mcg/kg/hour) were used to achieve mild sedation without compromising neurological assessment. In cardiac surgery, higher doses of dexmedetomidine (1.0-1.5 mcg/kg/hour) were administered to achieve hemodynamic stability and facilitate early extubation.

#### Perceived Effectiveness:

Overall, respondents perceived dexmedetomidine to be effective in achieving perioperative analgesia, anxiolysis, and sedation. The majority of respondents (80%) reported that dexmedetomidine reduced the need for intraoperative opioids and promoted hemodynamic stability. Additionally, 70% of respondents indicated that dexmedetomidine improved postoperative pain control and facilitated early recovery.

#### Figure 4: Barriers to Implementation

Despite its perceived effectiveness, barriers to the implementation of dexmedetomidine in general anesthesia were identified. The most commonly reported barriers included concerns regarding hemodynamic effects (60%), lack of familiarity with dosing regimens (40%), and cost considerations (30%). Additionally, logistical challenges, such as availability of infusion pumps and monitoring equipment, were cited as barriers in certain healthcare settings.



Overall, the results underscored the widespread utilization of dexmedetomidine in general anesthesia and highlighted the importance of tailoring dosing regimens to specific surgical specialties and patient populations. Addressing barriers to implementation, such as hemodynamic concerns and cost considerations, is crucial for optimizing the perioperative use of dexmedetomidine and improving patient outcomes across diverse healthcare settings.

#### **Discussion:**

The findings from this cross-sectional analysis provide valuable insights into the utilization patterns, indications, dosing regimens, perceived effectiveness, and barriers to the implementation of dexmedetomidine in general anesthesia across different surgical specialties and healthcare settings. The discussion will focus on interpreting these results in the context of current clinical practice, identifying potential implications for perioperative care, and discussing strategies for optimizing dexmedetomidine utilization.

The survey results revealed significant variations in the frequency and patterns of dexmedetomidine utilization across different surgical specialties. Orthopedic surgery emerged as the specialty with the highest utilization of dexmedetomidine, followed by neurosurgery and cardiac surgery. This variation may reflect differences in patient populations, surgical techniques, and anesthesia practices among different specialties. The high utilization of dexmedetomidine in orthopedic surgery may be attributed to its efficacy in providing perioperative analgesia and sedation, particularly in conjunction with regional anesthesia techniques such as peripheral nerve blocks and epidurals.[7,8] The survey findings highlighted a diverse range of indications for dexmedetomidine utilization in general anesthesia, including intraoperative analgesia, preoperative anxiolysis, sedation during awake procedures, and postoperative pain management. These findings are consistent with the pharmacological properties of dexmedetomidine, which include analgesic, anxiolytic, sedative, and sympatholytic effects.[9] The utilization of dexmedetomidine for hemodynamic stabilization during cardiopulmonary bypass and prevention of postoperative delirium in cardiac surgery patients underscores its potential role in improving perioperative outcomes beyond analgesia and sedation.



The survey results provided insights into the dosing regimens and perceived effectiveness of dexmedetomidine in general anesthesia. The dosing regimens varied depending on the surgical procedure and patient characteristics, with higher doses used for cardiac surgery to achieve hemodynamic stability and facilitate early extubation. Overall, respondents perceived dexmedetomidine to be effective in achieving perioperative analgesia, anxiolysis, and sedation, with the majority reporting reductions in intraoperative opioid requirements and improvements in hemodynamic stability and postoperative pain control. Despite its perceived effectiveness, barriers to the implementation of dexmedetomidine in general anesthesia were identified, including concerns regarding hemodynamic effects, lack of familiarity with dosing regimens, and cost considerations.[10] Addressing these barriers is essential for optimizing the perioperative use of dexmedetomidine and improving patient outcomes.[11] Strategies for overcoming these barriers may include provider education and training on dosing and titration strategies, the development of institutional protocols for dexmedetomidine use, and cost-effectiveness analyses to justify its utilization in clinical practice.

The survey findings underscore the importance of tailoring dexmedetomidine utilization to specific surgical specialties and patient populations based on individualized risk-benefit assessments. Dexmedetomidine may offer significant advantages in perioperative pain management, anxiolysis, and sedation, particularly in patients at risk of opioid-related adverse effects or hemodynamic instability. However, careful consideration of dosing, hemodynamic monitoring, and patient selection is warranted to optimize its perioperative use and minimize the risk of adverse events.[12]

#### **Conclusion:**

This cross-sectional analysis provides valuable insights into the utilization patterns, indications, dosing regimens, perceived effectiveness, and barriers to the implementation of dexmedetomidine in general anesthesia. The findings underscore the widespread utilization of dexmedetomidine across different surgical specialties and highlight its potential role in improving perioperative outcomes. Addressing barriers to implementation and tailoring dexmedetomidine utilization to specific patient populations is crucial for optimizing its perioperative use and enhancing patient care. Further research is warranted to explore the long-term outcomes and cost-effectiveness of dexmedetomidine in general anesthesia and to inform evidence-based practice guidelines.

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