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Abusive Self-Medication with Opioid and Non-Opioid Anesthetic Drugs among Anesthesia Professionals: A Comprehensive Integrative Review Associated with IRAMuTeQ Analysis

Automedicação Abusiva com Anestésicos Opióides e Não Opióides entre Profissionais de Anestesia: Uma Revisão Integrativa Abrangente Associada à Análise IRAMuTeQ

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Keywords
Anesthesiologists; Clinical Competence; Opioid-Related Disorders; Professional Impairment; Substance-Related Disorders.

Palavras-chave
Anestesiologistas; Competência Clínica; Distúrbios Relacionados ao Uso de Opioides; Distúrbios Relacionados ao Uso de Substâncias; Inabilitação Profissional.

ABSTRACT

Introduction: Substance abuse among anesthesiologists is a serious occupational health issue, impacting patient safety and the quality of care provided. We aimed to identify the prevalence, determinants, and impacts of abusive self-medication with opioid and non-opioid anesthetics among anesthesiologists and propose prevention and monitoring strategies.

Methods: This is an integrative review conducted from February to November 2024 in the PubMed, Scopus, Cochrane, Embase, LILACS, Web of Science, and BVS databases. Screening was performed in Rayyan, and lexical and thematic analyses were conducted using IRAMuTeQ. The quality of studies was assessed using JBI, NOS, SANRA, CASP, and GRADE tools, applied according to each study's methodology. A total of 20 studies were included, categorized according to patterns of abuse, occupational factors, and professional impacts.

Results: The mean prevalence of opioid and non-opioid abuse among professionals was 42.03 ± 22.03. The most commonly abused opioids were fentanyl and sufentanil, followed by propofol and benzodiazepines. Major associated factors included excessive workload, chronic stress, and occupational exposure, while the consequences encompassed overdose, deterioration of mental health, and increased risk of medical errors. Preventive strategies, such as toxicological screening and rehabilitation programs, demonstrated variable effectiveness, limited by institutional barriers, professional stigma, and regulatory deficiencies.

Conclusion: The findings reveal significant variability in the prevalence of substance abuse among anesthesiologists and the influence of occupational, psychological, and institutional factors. While intervention strategies show potential, they lack robust evidence. There is a pressing need for institutional policies that promote safe environments, reduce stigma, and strengthen preventive actions.

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RESUMO

Introdução: O abuso de substâncias entre anestesiologistas é um grave problema de saúde ocupacional, com impacto na segurança do doente e na qualidade dos cuidados prestados.

Este estudo tem como objetivo identificar a prevalência, os determinantes e os impactos da automedicação abusiva com anestésicos opioides e não opioides entre anestesiologistas, bem como propor estratégias de prevenção e monitorização adequadas.

Métodos: Trata-se de uma revisão integrativa realizada entre fevereiro e novembro de 2024, com pesquisa bibliográfica nas bases de dados PubMed, Scopus, Cochrane Library, Embase, LILACS, Web of Science e BVS. A triagem dos artigos foi conduzida no Rayyan e a análise lexical e temática realizada no IRAMuTeQ. A qualidade dos estudos foi avaliada através dos instrumentos JBI, NOS, SANRA, CASP e GRADE, aplicados de acordo com a tipologia de cada estudo. Foram incluídos 20 estudos, categorizados segundo padrões de abuso, fatores ocupacionais e impactos profissionais.

Resultados: A prevalência média do consumo abusivo de opioides e não-opioides entre os profissionais foi de 42,03 ± 22,03. Os opioides predominantes foram fentanil e sufentanil, seguidos por propofol e benzodiazepinas. Os principais fatores associados incluíram excesso de carga horária, stress crónico e exposição ocupacional, enquanto as consequências abrangeram overdose, deterioração da saúde mental e aumento do risco de erros médicos. Estratégias preventivas, como triagem toxicológica e programas de reabilitação, demonstraram eficácia variável, limitada por barreiras institucionais, estigma profissional e deficiências regulamentares.

Conclusão: Os achados revelam uma elevada variabilidade na prevalência do abuso de substâncias entre anestesiologistas e a influência de fatores ocupacionais, psicológicos e institucionais. As consequências afetam a saúde do profissional e a segurança do doente. Reforça-se a necessidade de políticas institucionais que promovam ambientes seguros, reduzam o estigma e fortaleçam ações preventivas.

INTRODUCTION

Substance abuse among anesthesiologists is an occupational health issue, compromising both the well-being of professionals and patient safety. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), substance use disorders (SUD) are characterized by a problematic pattern of consumption, resulting in functional impairment and significant distress.[1]

Anesthesiology is one of the medical specialties most vulnerable to this issue due to the easy access to potent opioids, as well as non-opioid substances, which have a high potential for abuse due to their sedative and euphoric effects.[2,3] Previous studies indicate that illicit opioid use among anesthesiologists is three times higher than in other medical specialties,[3] significantly increasing the risk of dependence and associated complications.

Epidemiological data indicate that between 10% and 12% of physicians present substance use disorders, with a particular emphasis on opioids. Approximately 14% develop dependence throughout their careers, being more common in the first five years after graduation. In a study involving 904 physicians, more than half of the cases were concentrated in five specialties, including anesthesiology (10.9%).[3]

Additionally, a recent study revealed that up to 23% of Brazilian anesthesiologists have used psychoactive substances, with a considerable portion reporting frequent use.[2] SUDs is particularly concerning in this professional group, where the mortality rate is high, reaching 20%.[3]

In Brazil, cases of substance abuse among anesthesiologists are frequently reported, often associated with suicides, highlighting the psychological and occupational impact of the specialty, where the high pressure of the profession, combined with easy access to controlled substances, can be aggravating factors. Despite the relevance of the topic, scientific literature remains limited, with most studies concentrated in North America and Europe, leaving a significant gap in understanding the issue in Latin American countries, including Brazil, where fentanyl is on the list of substances subject to special and strict control by the Agência Nacional de Vigilância Sanitária (ANVISA).[4] The lack of robust research compromises the development of public policies and intervention strategies adapted to local realities. Furthermore, the lack of uniform guidelines for the reintegration of recovering anesthesiologists compromises both their rehabilitation and perioperative safety. Late identification and the absence of standardized protocols hinder the recovery of anesthesiologists with substance dependence, which may jeopardize the safety of both patients and professionals.[5]

Given this scenario, the choice of anesthesiologists as the focus of this study is justified by their vulnerability to the abuse of potent drugs, such as opioids and sedatives, which are routinely used in the specialty. Constant exposure to these highly addictive agents places them at a significantly higher risk compared to other medical fields.[3,5]

Although the topic is relevant, the scientific literature presents significant gaps, especially in investigating the prevalence among anesthesiologists and assessing the effectiveness of preventive interventions. Therefore, this integrative review aims to identify the prevalence, determinants, and impacts of abusive self-medication with opioid and non-opioid anesthetics among anesthesiologists and propose prevention and monitoring strategies.

METHODS

This is an integrative literature review conducted from February to November 2024, following the methodological framework proposed by Whittemore and Knafl (2005) and the PRISMA 2020 guidelines.[6,7] The review adhered to the PICOTT model (Population, Intervention, Comparison, Outcomes, Time, and Type of Study), structuring the research questions, objectives, and inclusion criteria.

The literature search was conducted in the PubMed, Cochrane, Scopus, Embase, *Biblioteca Virtual em Saúde* (BVS), Web of Science, and Literatura *Latino-Americana e do Caribe em Ciências da Saúde* (LILACS) databases, using the descriptors "Anesthesiologists," "Substance-Related Disorders," "Opioids, Non-Opioids," and "Drug Abuse, Dependence," with no time restrictions.

Quantitative, qualitative, and mixed-method studies were included, along with theses, dissertations, and systematic reviews. Exclusion criteria encompassed studies that did not address anesthesiologists, had an inadequate focus on substances, employed an inconsistent methodological design, were unavailable, or did not present relevant outcomes.

The screening was conducted using Rayyan software, allowing for an independent and blinded review by the researchers.[8] To ensure the organization of extracted data, a structured spreadsheet was created, including variables such as the study's country, year of publication, study type, sample characteristics, analyzed substances (opioids and non-opioids), consumption patterns, associated occupational and psychosocial factors, health and professional practice impacts, and methods of substance access. Two researchers independently extracted the data, ensuring greater methodological reliability.

Due to the heterogeneity of the studies, the choice of mixed criteria aimed to evaluate different methodological designs, using specific assessment instruments as permitted in an integrative review.[6] The JBI (Joanna Briggs Institute)[9] was used for systematic reviews and qualitative studies, ensuring internal validity and reproducibility.[2,3,10-13] The Newcastle-Ottawa Scale (NOS)[14] evaluated observational studies, considering selection, comparability, and outcomes.[15-17] The Scale for the Assessment of Narrative Review Articles (SANRA)[18] was applied to narrative reviews, ensuring coherence and scientific justification.[5,19-23] The Critical Appraisal Skills Programme (CASP)[24] was used for critical analysis of qualitative studies.[25-29] The Grading of Recommendations, Assessment, Development, and Evaluation (GRADE)[30] classified the quality of evidence and the strength of recommendations for all studies. The combined use of these tools ensured a rigorous methodological evaluation.

The software IRAMuTeQ (Interface de R para Análises Multidimensionais de Textos e Questionários, version 0.7 alpha 2)[31] was used for the qualitative analysis of textual data. The initial processing included lexical analysis, determining the frequency and distribution of words in the textual corpus. Subsequently, a co-occurrence analysis was conducted, examining words that are frequently used together, highlighting relationships between key concepts and themes.

In the similarity analysis, a network of connections between terms is constructed based on graph theory, considering the frequency of co-occurrence and the proximity between words in the corpus. The software graphically represents these relationships, where the words and edges represent the strength of the connections between them. The more often two words appear together, the greater the weight of this connection, allowing for the visualization of interconnected groups of terms and the identification of central concepts within the textual corpus.[31]

In the Descending Hierarchical Classification (DHC), the terms are organized into distinct thematic groups by analyzing the similarity in vocabulary used in each segment.[31] The process begins with the fragmentation of the corpus into smaller segments, which can be sentences or paragraphs. The software then compares these segments based on the frequency and distribution of words, grouping those that share similar vocabulary. This statistical calculation determines the lexical proximity of the terms, forming distinct classes within the corpus. Finally, these classes are organized into a hierarchical structure, represented by a dendrogram, where the branches indicate the relationship between the formed groups. The closer two branches are, the greater the similarity between the texts analyzed within those categories.

Data were analyzed using descriptive statistics, including mean and standard deviation, to estimate the prevalence of opioid and non-opioid substance abuse among anesthesiologists. The analyses were conducted using the Statistical Package for the Social Sciences (SPSS), version 22.0.[33]

RESULTS

From the search in the databases, 766 references were identified: BVS (2), Cochrane Library (120), Embase (325), LILACS (1), PubMed (119), Scopus (132), and Web of Science (67). After removing 160 duplicates and two articles with indexing errors, 604 references remained. In the initial screening, titles and abstracts were evaluated according to the eligibility criteria, and 583 studies were excluded, primarily due to thematic irrelevance (343), inappropriate population (186), focus on pharmacotherapy (43), inadequate methodological design (32), unavailability of the full text (4), and incompatibility with the analyzed outcomes (4).

Subsequently, 21 references advanced to full-text reading, of which one was discarded for not meeting the specific scope and exceeding the focus of the review by including anesthesiologists, surgeons, and alcohol consumption.[32] This resulted in the final inclusion of 20 articles. **Fig. 1** presents the detailed flowchart of the selection process.

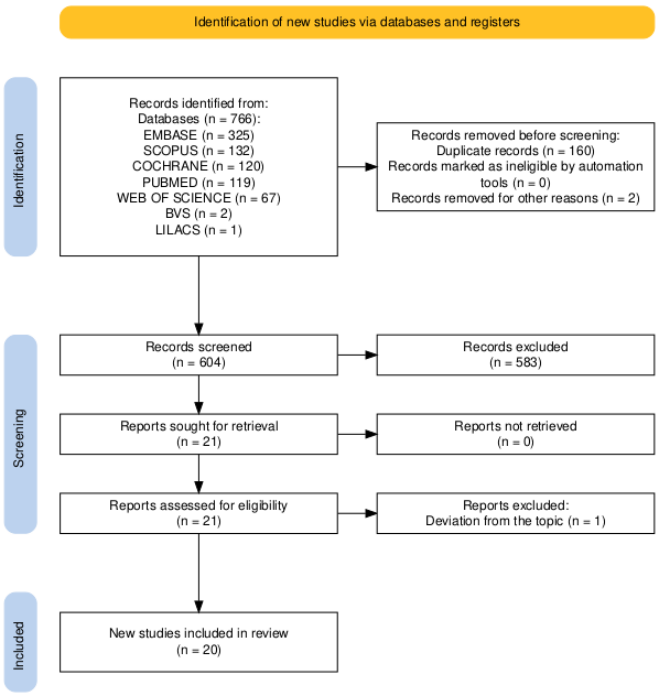

Figure 1. Fluxogram of studies selected for inclusion in the review following PRISMA Items[7]

The selected studies provide a comprehensive overview of substance abuse among anesthesiologists, highlighting occupational, social, and psychological influences.

Regarding the characteristics of the analyzed studies, they were published between 1983 and 2021, with the majority conducted in the USA.[5,10,11,13,15-17,20,22,23,25,28] and Brazil,[2-3,21,27] while Spain,[19] Germany,[12] Jordan,[26] and South Africa presented lower representation.[26,29] A methodological diversity was observed, including capillary analyses, interviews, and epidemiological studies, which highlighted associations between occupational stress, self-medication, and substance use.[15,25]

The mean prevalence of opioid and non-opioid abuse among professionals was 42.03 ± 22.03. Of the 20 studies analyzed, (*n*=15) presented numerical data on the prevalence of opioid and/or non-opioid abuse. Among these, (*n*=8) studies reported prevalence for both substance classes,[3,5,16,20,22,23,26,29] while (*n*=7) reported values exclusively for opioids.[2,17,19,21,25,27,28] The remaining (*n*=5) studies[10,11-13,15] did not provide numerical prevalence data, only listing the substances, and were therefore excluded from the calculation of the mean and standard deviation. In total, 18 prevalence values were analyzed and computed.

Opioid abuse was identified in 90% of the studies (18/20), with fentanyl being the most prevalent (75%, *n*=15). Jungerman *et al* (2012) indicated that 89.5% of anesthesiologists with a history of abuse used opioids,[21] with a predominance of parenteral administration, a factor associated with the rapid progression to dependence.[5] Among non-opioid drugs, propofol (50%), benzodiazepines (35%), ketamine (30%), and nitrous oxide (25%) were prominent. It was identified that the broad hospital availability and the pharmacological characteristics of these substances favor their recreational use (**Table 1**).

Table 1. Drug abuse patterns by anesthesiologists.

Authors / Year	Drugs and prevalence	Ways of accessing
1. Barros *et al* 2021[2]	**Opioids:** Unspecified type (**67%** opioid abuse) / **Non-Opioids:** Benzodiazepines	Easy access
2. Fitzsimons *et al* 2018[15]	**Opioids:** Fentanyl, Meperidine (*Data unavailable*) / **Non-Opioids:** Ketamine, Norketamine	Easy access
3. Oreskovich *et al* 2009[5]	**Opioids:** Fentanyl, Meperidine, Remifentanil, Morphine (**34%** abused parenteral opioids) / **Non-Opioids:** Propofol (**70%** for non-opioids)	Easy access, workplace exposure (e.g., inhalation)
4. McAuliffe *et al* 2006[16]	**Opioids:** Fentanyl (**25%** abuse) / **Non-Opioids:** Propofol, Benzodiazepines (10% sedatives)	Easy access
5. Gold *et al* 2004[10]	**Opioids:** Fentanyl, Morphine (*Data unavailable*) / **Non-Opioids:** Propofol	Medication diversion
6. Alvarez *et al* 1994[19]	**Opioids:** Fentanyl, Meperidine, Sufentanil (73% opioid abuse) / **Non-Opioids:** Diazepam, Ketamine (*Data unavailable*)	Easy access and lack of oversight
7. Gravenstein *et al* 1983[25]	**Opioids:** Heroin, Others (17% abuse among professionals) / **Non-Opioids:** Nitrous oxide, Ketamine, Barbiturates (*Data unavailable*)	Data unavailable
8. Kintz *et al* 2005[11]	**Opioids:** Fentanyl, Sufentanil, Alfentanil, Meperidine, Codeine, Morphine (*Data unavailable*) / **Non-Opioids:** Midazolam, Flunitrazepam, Propofol, Sevoflurane (*Data unavailable*)	Medication diversion
9. Maier *et al* 2012[12]	**Opioids:** Fentanyl, Sufentanil, Tilidine (*Data unavailable*) / **Non-Opioids:** Propofol, Ketamine (*Data unavailable*)	Medication diversion
10. Habchi *et al* 2020[13]	**Opioids:** Fentanyl, Morphine, Meperidine (*Data unavailable*) / **Non-Opioids:** Ketamine, Propofol, Midazolam (*Data unavailable*)	Multiple illicit means (e.g., theft, fake prescriptions, illegal manufacturing, doctor shopping)
11. Al-Maaz *et al* 2019[26]	**Opioids:** Fentanyl, Sufentanil / **Non-Opioids:** Benzodiazepines, Nitrous oxide / **General prevalence: 26.9%** of professionals reported abuse	*Data unavailable*
12. Zuleta *et al* 2017[20]	**Opioids:** Unspecified type (**62%** abuse) / **Non-Opioids:** Propofol, Nitrous oxide, Sevoflurane, Ketamine, Benzodiazepines (**41%**) / **Other drugs unspecified (37%)**	*Data unavailable*
13. Jungerman *et al* 2012[21]	**Opioids:** Fentanyl, Sufentanil (**89.5%**) / **Non-Opioids:** Propofol, Unspecified inhalants (*Data unavailable*)	*Data unavailable*
14. Palhares Alves *et al* 2012[27]	**Opioids:** Fentanyl (**33%**) / **Non-Opioids:** Propofol, Benzodiazepines (*Data unavailable*)	*Data unavailable*
15. Serebrenic *et al* 2021[3]	**Opioids:** Fentanyl, Meperidine / **Non-Opioids:** Propofol, Sevoflurane, Midazolam / **General prevalence: 29.5%** of professionals reported abuse	Medication diversion
16. Bryson *et al* 2018[22]	**Opioids:** Fentanyl / **Non-Opioids:** Propofol, Benzodiazepines, Ketamine, Nitrous oxide, Hydrocarbons / General prevalence: Overall SUD **15.4%**, higher incidence in men	Easy access
17. Hamza *et al* 2011[28]	**Opioids:** Fentanyl, Sufentanil, Demerol, Hydromorphone, Morphine, Lortab, Percocet (**36.6%** reported use during anesthesia administration) / **Non-Opioids:** Midazolam, Propofol, Nitrous oxide (*Data unavailable*)	Easy access
18. Bryson *et al* 2008[23]	**Opioids:** Fentanyl, Sufentanil / **Non-Opioids:** Propofol, Lidocaine, Ketamine, Sodium Thiopental, Nitrous oxide (*Data unavailable*) / **General prevalence: 16%** incidence of use	Medication diversion
19. Skipper *et al* 2009[17]	**Opioids:** Unspecified type (**55%** reported abuse) / **Non-Opioids:** Unspecified type (*Data unavailable*)	Medication diversion
20. Van der Westhuizen *et al* 2019[29]	**Opioids:** Heroin, Morphine, Methadone, Fentanyl, Sufentanil, Codeine / **Non-Opioids:** Propofol, Nitrous oxide / **General prevalence: 28.6%** reported abuse	*Data unavailable*

In 45% of the analyzed studies, the hospital environment was cited as the main source of substance acquisition (**Table 1**). The most frequent forms of drug access included medication diversion (30%), followed by manipulation of records, falsification of prescriptions, and syringe adulteration (20%). Although less frequent, fraudulent prescriptions and thefts from hospital pharmacies were also mentioned.[11-13,23]

Regarding occupational impacts and patient safety, it was found that substance abuse compromises cognition, psychomotor performance, and decision-making, which can increase the risk of medical errors (**Table 2**). Hamza *et al* (2020) reported that 36.6% of anesthesiologists admitted to drug use during anesthesia administration;[28] and frequent occupational exposure was associated with a higher risk of dependence.[5] Bryson *et al* (2018) highlighted the need for strict monitoring, especially for substances such as propofol and benzodiazepines.[22] The implementation of urinary screening programs and structured rehabilitation showed effectiveness in reducing substance use and facilitating professional reintegration.[15] Psychosocial aspects, such as stress and emotional exhaustion, and environmental factors, such as easy access to substances, were the most associated factors with substance abuse among anesthesiologists (**Table 2**). It is noteworthy that compulsive use was linked to mental health impacts, overdose risk, and professional impairment.

The lexical analysis of the textual corpus revealed a high frequency of terms such as fentanyl (16 mentions), propofol (14), ketamine (9), and sufentanil (8). Psychosocial aspects associated with substance abuse included stress (12), anxiety (10), and depression (8). Health impacts were represented by terms such as overdose (9), death (10), and suicide (7), while environmental factors were linked to "easy access" (11).

In the similarity analysis, co-occurrences and connections between terms related to substance abuse among anesthesi-

Table 2. Factors influencing substance abuse.

Authors / Year	Motivation for use	Workplace and psychological stressors	Consequences
1. Barros *et al* 2021[2]	*Data unavailable*	Depression, anxiety, burnout, stressful environment	Overdose, death, medical errors, patient harm
2. Fitzsimons *et al* 2018[15]	*Data unavailable*	*Data unavailable*	Data unavailable
3. Oreskovich *et al* 2009[5]	*Data unavailable*	*Data unavailable*	Overdose, life-threatening incidents
4. McAuliffe *et al* 2006[16]	Escape from work-related stress	Escape from work-related stress	Escape from work-related stress
5. Gold *et al* 2004[10]	Escape from work-related stress	Chronic stress, lack of control, easy drug access	Overdose, death
6. Alvarez *et al* 1994[19]	Physical and psychological stress	Anxiety, depression, insomnia, denial of risks, culture of silence	Suicide, overdose, workplace accidents, ethical and professional issues
7. Gravenstein *et al* 1983[25]	*Data unavailable*	Depression, anxiety, burnout	Suicide
8. Kintz *et al* 2005[11]	*Data unavailable*	Depression, anxiety, stress, long working hours, competitive career	Suicide, medical errors, resignations
9. Maier *et al* 2012[12]	Escape from exhaustion	Chronic work stressors (high workload, emotional fatigue)	Overdose, hallucinations, Propofol Infusion Syndrome, workplace accidents
10. Habchi *et al* 2020[13]	Escape from reality	*Data unavailable*	Overdose, death
11. Al-Maaz *et al* 2019[26]	Escape from work-related stress	Emotional distress (burnout, high workload), chronic exposure to anesthetics	Compromised health and patient care
12. Zuleta *et al* 2017[20]	Escape from work-related stress	Escape from work-related stress	Suicide, overdose, neglect of duties, compromised patient safety
13. Jungerman *et al* 2012[21]	Relieve mental distress	Psychiatric disorders (anxiety, depression), chronic stress, easy drug access	Suicide, relapse risk, workplace accidents
14. Palhares Alves *et al* 2012[27]	Work pressure, emergency situations, night shifts	Psychiatric disorders (anxiety, insomnia), toxic work environment	Suicide, hospitalization, workplace and marital problems
15. Serebrenic *et al* 2021[3]	Relieve stress	Depression, impulsivity, introspection	Overdose, death, workplace accidents
16. Bryson *et al* 2018[22]	Relieve work stress	Severe stress (mental fatigue, anxiety, burnout)	Relapse, death, failure to complete training, professional sanctions
17. Hamza *et al* 2011[28]	Initially for pain relief, later for rewarding effects	Work-related stress	Relapse
18. Bryson *et al* 2008[23]	Relieve workplace stress	Genetic susceptibility, psychiatric disorders (ADHD, depression), high-stress environment	Neglect of personal life, mood swings
19. Skipper *et al* 2009[17]	*Data unavailable*	Easy access to drugs	Overdose, relapse, job loss, license revocation
20. Van der Westhuizen *et al* 2019[29]	Relieve work stress	Fatigue, chronic work stressors (high workload, burnout)	Suicide, death

ologists were identified (**Fig. 2**). Three main lexical communities were observed, with "fentanyl" as the central term and the highest number of connections. Terms such as "propofol, ketamine, stress, occupational stress, anxiety, depression, insomnia, introspection, overdose, and death" grouped around it, forming strongly interconnected thematic cores. The expression "easy access" emerged associated with this set, highlighting the relationship between hospital availability and misuse. The lexical communities reveal three central axes involving the substances used, psychosocial repercussions, and environmental factors, which broaden the understanding of the complexity of substance abuse.

The CHD identified five thematic classes (**Fig. 3**). Class 1 (47.87%) grouped terms related to the use of opioids and non-opioids, including fentanyl, propofol, and benzodiazepines. Class 2 (25.12%) associated psychological and environmental factors, such as occupational stress, anxiety, and burnout. Class 3 (15.17%) focused on the serious risks and consequences of abuse, such as overdose, death, and medical errors. Class 4 (8.06%) highlighted working conditions,

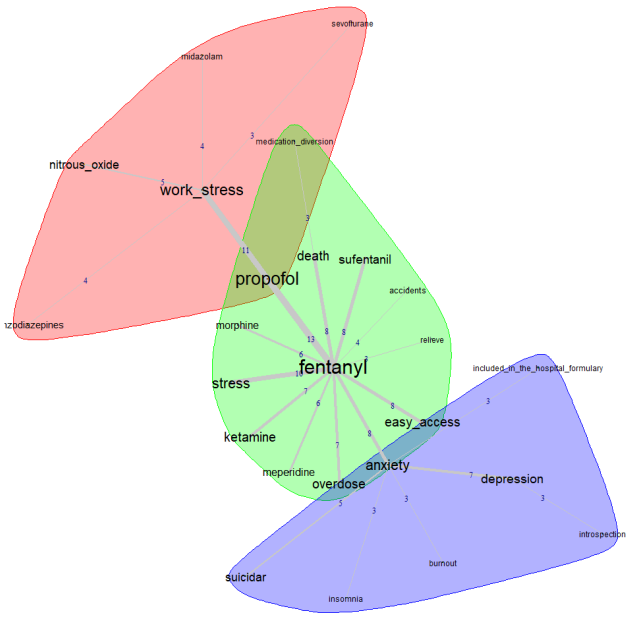

Figure 2. Similitude analysis of metadata (IRAMuTeQ)[31]

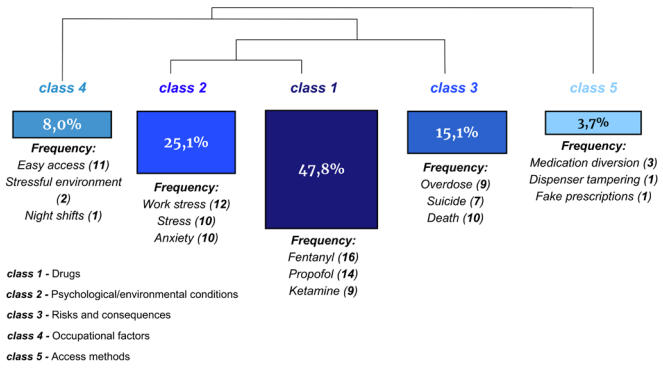

Figure 3. Descending hierarchical classification (CHD) (*IRAMuTeQ*)[31]

including exhausting shifts and easy access to substances. Finally, Class 5 (3.79%) emphasized illicit methods of obtaining substances, such as medication diversion and prescription falsification. These classes highlight consumption patterns, their determinants, the work contexts, and clinical outcomes, reinforcing the urgency of interventions aimed at addressing substance abuse among anesthesiologists.

The evaluation of study quality indicated that longitudinal studies[15-17] and cross-sectional studies[25-29] had moderate quality, although the latter had a high risk of bias in selection and measurement. Narrative studies,[5,13,19-23] case reports,[10,12] and clinical series[3,1] had methodological limitations and low generalizability.

According to GRADE,[30] of the included studies, *n*=1 (5%) had moderate-quality evidence.[2] Most were classified as having low[1,4,8,11-12,14-15,17-20] (*n*=11; 55%) or very low-quality evidence[3,5-7,9,10,13,16] (*n*=8; 40%). This is mainly due to limitations such as: limited comparability,[1,4] non-systematic selection and incomplete data,[8] high heterogeneity[13] selection bias,[7,14,20] response bias,[7,11] lack of intervention data[9] and narrative reviews lacking methodological rigor.[18] Some studies presented vague objectives or flawed methodology[5,6,10] (**Table 3**).

DISCUSSION

The prevalence of substance abuse among anesthesiologists shows significant variability across studies, with a average of 42.03 ± 22.03, representing a problem that affects both the health of professionals and patient safety. This broad variation may be attributed to differences in diagnostic criteria, heterogeneous population samples, and distinct methodological approaches used by the included studies. This review confirmed that opioids, particularly fentanyl, are the most commonly abused drugs, followed by propofol and benzodiazepines. In the United States, opioids predominate, while in Europe, there is a higher consumption of ketamine and inhaled agents, which may reflect differences in regulations and drug accessibility.[5,16,25]

The variability in the prevalence of substance abuse among anesthesiologists can be attributed to methodological differences in assessment criteria, variations in sample sizes, and distinct research contexts, reflecting the heterogeneity of the available studies. For example, Skipper *et al* (2009) reported 55% substance abuse, while Zuleta *et al* (2017) identified 62% for opioids and 41% for non-opioids.[17,20] Bryson *et al* (2018) estimated a global prevalence of 15.4% for substance use disorders (SUDs), with a predominance of opioids.[22]

The consumption patterns also vary by gender, with men being more prone to opioid use, while women tend to abuse benzodiazepines, with stress being a common motivating factor in both cases.[22] Continuous exposure to these substances in the hospital environment, coupled with easy access, represents one of the main predisposing factors, making the adoption of stricter preventive strategies necessary.[10]

The development of substance dependence among anesthesiologists has been linked to occupational stress, excessive working hours, and sleep deprivation.[3] In addition to these factors, the weakness in hospital dispensing control systems has been identified as a facilitator for illicit substance acquisition, as also indicated by the lexical analysis. Practices such as record manipulation, reuse of waste, and substitution of substances are recurring and documented.[16,25] Additionally, this context is worsened by professional isolation and the lack of institutional support, hindering the early detection of the problem.[15,20-21]

The centrality of the term "fentanyl" in the similarity analysis reinforces its significance in the identified consumption patterns, aligning with epidemiological data that highlight this opioid as one of the most involved substances in cases of abuse in anesthesiology practice. The centrality of the identified categories emphasizes that substance abuse should not be understood merely as an individual deviant behavior but as a reflection of an institutional environment that fosters the vulnerability of anesthesiologists. The focus on the use of opioids and non-opioids, particularly in settings with widespread hospital availability, supports previous findings that point to occupational exposure as a critical factor for the initiation and maintenance of substance use.[16,21]

Another relevant aspect concerns psychosocial stress, such as occupational stress, anxiety, and burnout, which highlight emotional overload as a triggering factor for substance use in response to the demands of anesthesiology practice. Changes in healthcare policies, increased professional demands, and the complexity of clinical cases intensify this scenario, making the work environment, characterized by exhausting shifts and easy access to substances, a potential trigger for dependence.[22]

The identified consequences, such as overdose, death, and clinical failures, reveal not only the impact on the health of the professional but also on patient safety.[27] Thus, the problem goes beyond individual choices, being strongly influenced by the environment and working conditions of anesthesiologists, which increase their vulnerability to substance use.[3,22-26]

Regarding preventive and monitoring strategies, proposals such as random toxicological screening and rehabilitation programs for professionals in recovery were identified.[5,22] Random toxicological screening involves the application of tests without prior notice to early detect the use of psychoactive substances or controlled medications among anesthesiolo-

Table 3. GRADE System: Classification of Quality of Evidence and Strength of Recommendation[30]

Authors / Year	Quality of evidence (GRADE System)	Strength of Recommendation
1. Barros *et al* 2021[2]	⊕⊕◯◯ **LOW** Absence of control group and bias due to lack of comparability	Conditional
2. Fitzsimons *et al* 2018[15]	⊕⊕⊕◯ **MODERATE** Although the sample is of good quality, comparability is limited	Conditional
3. Oreskovich *et al* 2009[5]	⊕◯◯◯ **VERY LOW** Narrative review with high subjectivity and interpretation bias	Weak
4. McAuliffe *et al* 2006[16]	⊕⊕◯◯ **LOW** Low internal validity and reduced comparability, leading to confounding bias	Conditional
5. Gold *et al* 2004[10]	⊕◯◯◯ **VERY LOW** Case report with methodological flaws and selection bias	Weak
6. Alvarez *et al* 1994[19]	⊕◯◯◯ **VERY LOW** Vague methodology and unclear objectives, leading to methodological inconsistency bias	Weak
7. Gravenstein *et al* 1983[25]	⊕◯◯◯ **VERY LOW** High self-report bias, selection bias, and measurement bias	Weak
8. Kintz *et al* 2005[11]	⊕⊕◯◯ **LOW** Non-consecutive inclusion and missing demographic data, suggesting selection bias	Conditional
9. Maier *et al* 2012[12]	⊕◯◯◯ **VERY LOW** Lack of intervention data, compromising the validity of findings	Weak
10. Habchi *et al* 2020[13]	⊕◯◯◯ **VERY LOW** Insufficient data and unclear objectives, generating clarity bias	Conditional
11. Al-Maaz *et al* 2019[26]	⊕⊕◯◯ **LOW** Small sample size and use of self-report, indicating sampling and self-report bias	Conditional
12. Zuleta *et al* 2017[20]	⊕⊕◯◯ **LOW** Unclear objectives, generating clarity bias, despite a solid database	Conditional
13. Jungerman *et al* 2012[21]	⊕◯◯◯ **VERY LOW** High heterogeneity and limited comparability, suggesting heterogeneity bias	Weak
14. Palhares Alves *et al* 2012[27]	⊕⊕◯◯ **LOW** Selection and measurement biases due to lack of randomization and proper control	Weak
15. Serebrenic *et al* 2021[3]	⊕⊕◯◯ **LOW** Clear methodology, but local applicability is limited, leading to generalization bias	Conditional
16. Bryson *et al* 2018[22]	⊕◯◯◯ **VERY LOW** Superficial discussion and narrative review, leading to interpretation bias	Weak
17. Hamza *et al* 2011[28]	⊕⊕◯◯ **LOW** Imprecise analysis and lack of clarity, suggesting analysis bias	Conditional
18. Bryson *et al* 2008[23]	⊕⊕◯◯ **LOW** Narrative review without systematic search, causing search bias	Conditional
19. Skipper *et al* 2009[17]	⊕⊕◯◯ **LOW** Poor comparability between groups, indicating selection bias	Conditional
20. Van der Westhuizen *et al* 2019[29]	⊕⊕◯◯ **LOW** Selection bias and low response rate	Conditional

gists. However, its effectiveness is limited by the short detection window, the difficulty in identifying certain substances, and the resistance of professionals to its implementation.[22,23]

According to the literature, in addition to the technical challenges of screening, there are ethical and psychological implications, as many anesthesiologists perceive this practice as invasive, which can lead to resistance and affect the trust relationship within the medical team. Therefore, screening should be integrated into a broader set of measures, including psychological support and programs for reducing occupational stress, ensuring that it serves as a preventive tool rather than just a punitive one.[10,17]

Another alternative was the rehabilitation program, which combined psychological follow-up interventions, substance use monitoring, and support for reintegration into the work environment for anesthesiologists.[5] However, the relapse rate among anesthesiologists remains high due to continuous exposure to the drugs previously abused and the stigma associated with substance dependence, which prevents many professionals from seeking help for fear of professional repercussions.[5,16]

In light of these challenges, a more integrated approach is essential, combining efficient screening, adequate psychological support, rehabilitation focused on a safe return to the work environment, and continuous monitoring to ensure professional recovery adherence. Moreover, creating a welcoming institutional environment and reducing stigma are crucial to encourage anesthesiologists to seek help without fear of retaliation.[10,17]

Although this review contributed to a broader understanding of substance abuse among anesthesiologists, some limitations should be considered. Initially, the included studies showed methodological heterogeneity, particularly in the absence of standardization in assessing abuse, which compromises the comparability of results and impacts the robustness of conclusions regarding the prevalence and associated factors of substance abuse.

Nevertheless, the integrative approach allowed for the synthesis of available data. There is a scarcity of studies, especially in Latin American countries, which restricts the global generalization of the findings, as most research was conducted in North America and Europe. Finally, the lack of robust intervention studies limits the evaluation of the effectiveness of the proposed strategies for prevention and monitoring.

In light of these limitations, there is a need for future research that delves deeper into understanding the mechanisms involved in the initiation, maintenance, and recurrence of substance use among anesthesiologists. Longitudinal approaches and intervention studies evaluating strategies such as toxicological screening, psychological support, and continuous monitoring are essential to consolidate scientific knowledge. The influence of organizational culture and institutional barriers in seeking treatment remains underexplored in the literature.

Factors such as occupational pressures, fear of professional repercussions, and lack of support hinder adherence to rehabilitation programs, highlighting the need for institutional strategies that minimize these barriers. It is also suggested that qualitative approaches, such as in-depth interviews and ethnographic methodologies, may contribute to understanding the individual and institutional barriers, providing support for the development of preventive strategies and reintegration policies.

CONCLUSION

The prevalence of substance abuse among anesthesiologists shows high variability, characterized as a multifactorial issue influenced by occupational, psychological, and institutional factors. The easy access to opioids and sedatives, coupled with exhausting work hours and chronic stress, makes these professionals particularly vulnerable, compromising not only their health but also patient safety. The stigma associated with chemical dependency and fear of professional repercussions often hinder the seeking of help, perpetuating cycles of abuse and social withdrawal.

Coping strategies should go beyond individual accountability, requiring a structured institutional response. Measures such as toxicological screening, as well as programs offering psychosocial support and rehabilitation, are important steps to reduce recurrence and facilitate professional reintegration. Nonetheless, continuous scientific evaluation of these interventions is crucial to consolidate their effectiveness and guide evidence-based improvements.

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All authors contributed to the design of the study and approved the final version to be published.

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