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Date of sending to EmeRI: 2021-05-04

DOI: 10.1016/0104-0014.2021.001

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## Brazilian Journal of Anesthesiology

Brazilian Society of Anesthesiology (SBA), Rio de Janeiro/RJ, Brasil

ISSN 0104-0014

e-mail: [editorial.bjan@sbahq.org](mailto:editorial.bjan@sbahq.org)

[www.bjan-sba.org](http://www.bjan-sba.org)

## Postmortem qualitative analysis of psychological, occupational, and environmental factors associated with lethal anesthetic and/or opioid abuse among anesthesiologists: case series

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Received by the journal on 2021-03-26

Desk review approved on 2021-04-07

Desk review approved by **Guilherme Antonio Moreira de Barros**

Serebrenic, Flavia; Carmona, Maria José Carvalho; Cunha, Paulo Jannuzzi; Malbergier, André (2021). Postmortem qualitative analysis of psychological, occupational, and environmental factors associated with lethal anesthetic and/or opioid abuse among anesthesiologists: case series (preprint submitted to: Brazilian Journal of Anesthesiology). *EmeRI - Emerging Research Information*. DOI: 10.1016/0104-0014.2021.001.

**Abstract** Background: Anesthetic and/or opioid abuse is more prevalent among anesthesiologists than in other medical specialties and it has been associated with high mortality. The aim of this study was to evaluate factors associated with lethal anesthetic and/or opioid abuse among anesthesiologists. Methods: We evaluated psychological factors, and occupational history and circumstances of death of anesthesiologists who died from anesthetic abuse. Data were obtained post-mortem from colleagues, and relatives. After finding eligible cases, we identified the key informants, who were interviewed personally or via email, through the qualitative method known as "Psychological Autopsy". Results: 18 cases of death were identified, but we were able to interview 44% of them (N=8), most of whom were young males. They died at home or at the hospital and were found 'at the scene'. Being an introspective person, who did not share personal issues at workplace was the most prevalent personal characteristic. At work, they seemed to perform very well their functions, but some present subtle changes such as to staying more than usual at the workplace and and/or neglecting some of their responsibilities. The main reported factors to explain their substance abuse were emotional problems including psychiatric, excessive hours of work and other health factors. Conclusion: This study identified that emotional disturbances, compulsive work and general health problems were the more prominent factors involved with those deaths. Further larger studies are needed to better understand how these factors could be early identified in order to timely prevent anesthetic and/or opioid abuse and several deaths among anesthesiologists.

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## **Postmortem qualitative analysis of psychological, occupational, and environmental factors associated with lethal anesthetic and/or opioid abuse among anesthesiologists: case series**

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### **Abstract**

*Background:* Anesthetic and/or opioid abuse is more prevalent among anesthesiologists than in other medical specialties and it has been associated with high mortality. The aim of this study was to evaluate factors associated with lethal anesthetic and/or opioid abuse among anesthesiologists.

*Methods:* We evaluated psychological factors, and occupational history and circumstances of death of anesthesiologists who died from anesthetic abuse. Data were obtained *post-mortem* from colleagues, and relatives. After finding eligible cases, we identified the *key informants*, who were interviewed personally or via email, through the qualitative method known as “Psychological Autopsy”.

*Results:* 18 cases of death were identified, but we were able to interview 44% of them (N=8), most of whom were young males. They died at home or at the hospital and were found ‘at the scene’. Being an introspective person, who did not share personal issues at workplace was the most prevalent personal characteristic. At work, they seemed to perform very well their functions, but some present subtle changes such as to staying more than usual at the workplace and and/or neglecting some of their responsibilities. The main reported factors to explain their substance abuse were emotional problems including psychiatric, excessive hours of work and other health factors. *Conclusion:* This study identified that emotional disturbances, compulsive work and general health problems were the more prominent factors involved with those deaths. Further larger studies are needed to better understand how these factors could be early identified in order to timely prevent anesthetic and/or opioid abuse and several deaths among anesthesiologists.

**Key words:** Anesthetics; Anesthesiologists; Drug abuse.

**Submitted:** Mar 26, 2021

**Approval compliance review:** April 7, 2021

**By the associate editor:** Guilherme Antonio Moreira de Barros

*Análise qualitativa postmortem de fatores psicológicos, ocupacionais e ambientais associados a abuso letal de anestésicos e/ou de opioides entre anesthesiologistas: série de casos*

**Resumo**

*Introdução:* O uso abusivo de anestésico e/ou opioide é mais prevalente entre anesthesiologistas do que em outras especialidades médicas e tem sido associado a alta mortalidade. O objetivo do presente estudo foi avaliar os fatores associados a uso abusivo letal de anestésico e/ou opioide entre anesthesiologistas.

*Métodos:* Avaliamos os fatores psicológicos, e história ocupacional e circunstâncias do óbito de anesthesiologistas que morreram em decorrência de uso abusivo de anestésico. Os dados foram obtidos post-mortem de colegas e familiares. Após encontrar casos elegíveis, identificamos os informantes-chave, que foram entrevistados pessoalmente ou por e-mail, através do método qualitativo conhecido como "Autópsia Psicológica".

*Resultados:* 18 mortes foram identificadas, mas conseguimos entrevistar 44% deles (n = 8), a maioria jovens do sexo masculino. Morreram em casa ou no hospital e foram encontrados no local da ocorrência. Ser uma pessoa introspectiva que não compartilhava questões pessoais no local de trabalho foi a característica pessoal mais prevalente. No trabalho, pareciam realizar bem suas funções, mas apresentaram algumas mudanças sutis, tais como permanecer mais tempo que o usual no local de trabalho e /ou negligenciar algumas de suas responsabilidades. Os principais fatores relatados para explicar o uso abusivo de drogas foram problemas emocionais incluindo psiquiátricos, excesso de horas de trabalho e outros fatores de saúde.

*Conclusão:* O presente estudo identificou os transtornos emocionais, trabalho compulsivo e problemas gerais de saúde como os mais proeminentes fatores envolvidos com as mortes. Estudos futuros maiores são necessários para melhor entender como esses fatores podem ser identificados precocemente para prevenir a tempo uso abusivo de anestésico e/ou opioide e várias mortes entre anesthesiologistas.

**Palavras-chave:** Anestésicos, Anesthesiologistas; Drogas, abuso.

## Introduction

At the moment, death from drug overdose, fentanyl in particular, overcomes other causes of death in United States of America (USA), such as gun homicides or car crashes (1). Physicians are at high risk for abuse of prescription drugs (2). Among them, anesthesiologists have 2.79 more chances to die from substance related causes (RR 2.79, 95% CI 1.87 - 4.15) compared to other specialties (3). The first five years after graduation is the period of highest risk for death and suicide related to substance use (4). The rigorous training, personal sacrifice, easy access to prescribed drugs, and high expectations that physicians experience during and after training put them at increased risk to develop a substance use disorder (SUD). Another explanation for this fact is that young medical students are highly exposed to use more potent anesthetics during residency (4). Substance abuse, work-related stress, burnout, depression, and anxiety are intertwined and tend to lead to medical errors and patient harm (2). For these reasons, anesthesiology could be considered a high-risk career, especially when compared to other dangerous professional careers such as freight trucking (29/100,000) (5,6,7).

The most common substances used by anesthesiologist residents are alcohol, cannabis, cocaine, anesthetics and opioids (8). A recent study about emerging worldwide trends in substances diverted for personal non-medical use by anaesthetists showed that whilst the use of alcohol and opioid medications remains the most likely reason an anaesthetist with SUD would be referred to a facility for treatment, there are emerging trends also involving the use of non-opioid anaesthetic agents, particularly propofol (9).

Self-medication of anxiety and depression is mentioned by up to 65.1% of the subjects, suggesting that drug use could be a kind of “psychological relief” associated with heavy workload. Fentanyl, in particular, is used by 1.6% anesthesiologist residents (10) and may become more prevalent given its abuse is increasing also on the general population (11). Substance abuse among this population could lead to very serious consequences: residents with SUD, are 15 times more likely to give up studies, 10 times more likely to fail to obtain the professional Board (American Board of Anesthesiology), 7 times more likely to have adverse medical licensure actions after residency, and 7.9 times more likely to dying during residency (12). Studies have shown a high mortality rate among anesthesiologist residents who have SUD varying from 26 to 37%. When not treated during residency, SUD could result in future serious problems as loss of medical license or restrictions from the practice of medicine (9). For professionals with SUD, the mortality rate is also high, reaching 20% (13). Mortality due to substance use including anesthetic abuse among anesthesiologists is high, varying from 9% to 19% (14,15).

SUD in anesthesiologists is difficult to detect for various reasons. First, physicians are afraid to disclose their problem as it could lead to negative consequences for their job and career(6). Secondly, most of the professional don't have the technical knowledge and emotional conditions to make the self-diagnosis correctly (16).

Despite the high lethality of the problem, to our knowledge, there are no previous post-mortem studies focusing on specific psychological and occupational factors associated with drug use deaths among anesthesiologists.

To understand more in depth the circumstances of death of these physicians we used a methodology called *Psychological Autopsy*. It is an investigative method dating back to the 1950s that aims to reconstruct data and situations of the deceased that preceded his death through the interview with people close to the victim. First used in a legal context to confirm the cause of death by the police, it was used in the 70s and 80s to explore factors associated with suicide (17).

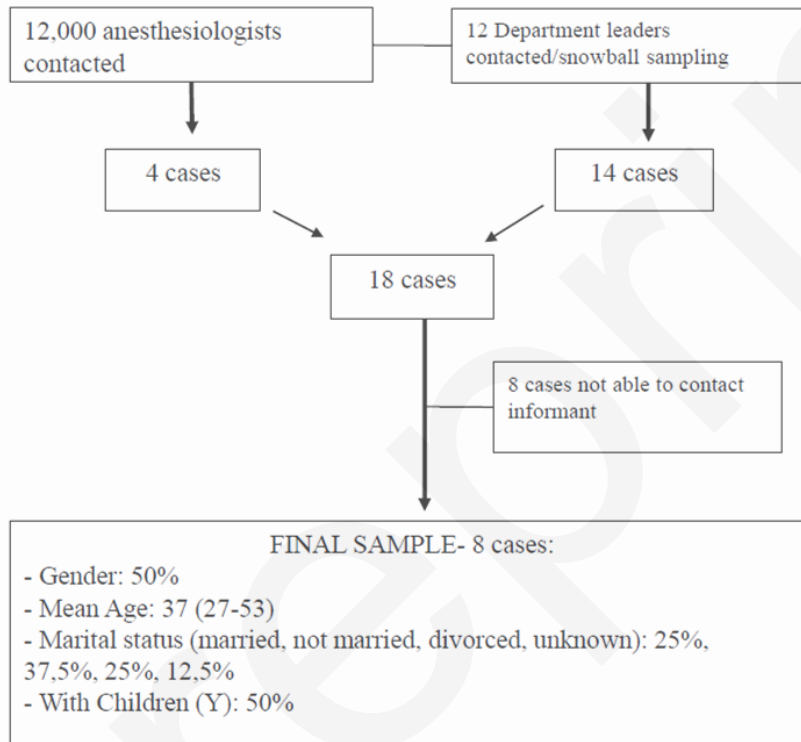
The goal of the present study was to evaluate psychological, occupational and environmental factors associated with lethal substance and/or opioid abuse among anesthesiologists. The main reason of studying individuals who died from substance overdose is to identify predisposed factors and to better understand the circumstances of deaths, thus providing evidence-based information that may guide early detection and other prevention programs for this serious and emerging problem in the medical practice.

## Materials and methods

### Subjects

We used three main search strategies in order to find the anesthesiologists who died from anesthetic abuse: 1) official contact with 12,000 professionals registered at the Brazilian Anesthesiology Society (SBA) via email in October, 2014 and again in February, 2015; 2) contact with leaders of the main anesthetic departments in universities and public hospitals mainly in São Paulo and 3) snowball sampling (Figure 1).

**Figure 1.** Flowchart showing our search strategies to find the cases and sociodemographic information of anesthesiologists who died from anesthetic abuse.



During 2 years of search (2013-2015), we identified 18 cases of doctors who died from anesthetic abuse in universities and public hospitals mainly in São Paulo in the last 15 years. From the 18, 10 were males and 8 females. We were able to have more details only from 8 cases (Table 1), mainly because we could not have access to the other case informants'. Half of the sample of the physicians who died were male. The age ranged from 27 to 53 years, 62.5% (n=5) below 30 years and 33% (n=3) between 45 and 53 years of age. Although the email from SBA was sent to professionals of the whole country, all the cases were from São Paulo State.

Table 1 presents basic information about how, when and why we were not able to contact half of the sample, including details about the 18 initial cases. Although we received a list of possible cases from leader of anesthesiology services, and we tried to contact all of them, only 8 were included. The first informant was asked to indicate our *key informant*, who could be either a relative or an ex-colleague close to the anesthesiologist who died from anesthetic abuse. Of the 10 people interviewed, only one was from the family of the professional who passed away. The others were close work colleagues who had limited knowledge of the person in question. A close relationship with the professional who died was considered an objective criterion in order to find key informants who could effectively provide more more reliable information for the purpose of this study.



'TABLE 1: Gender distribution of anesthesiologists with lethal anesthetic abuse and information about key-contacts.

nº	Case gender	Contact	Interview, when and if not, why not	How
1	male	spouse	we were not able to contact the informant; we could not find her contact	
		colleague	Oct/2013	Personally
		colleague	Nov/2013	Personally
2	male	Brother	Dec/2013	Personally
		colleague	we were not able to contact the informant; we could not find his contact	
		colleague	we were not able to contact the informant; we could not find his contact	
		friend	we were not able to contact the informant unknown reason (did he not answer our calls?)	
		friend	Feb/2014	Personally
3	male	father	we were not able to contact the informant; we could not find his contact	
		colleague	we were not able to contact the informant; we could not find his contact	
		colleague	we were not able to contact the informant; we could not find his contact	
4	female	father	we were not able to contact the informant; we could not find his contact	
		colleague	Apr/2015	Personally
		colleague	we were not able to contact the informant; she did not answer our calls	
		colleague	we were not able to contact the informant; he did not answer our calls	
5	male	colleague	did not know doctor who died	
6	male	colleague	we were not able to contact the informant; we could not find his contact	
7	male	colleague	Sept/14	Personally
8	male	colleague	Oct/14	Email
9	female	colleague	Nov/14	Email
10	female	husband	we were not able to contact the informant we could not find his contact	
11	female		we were not able to contact the informant; we could not find anyone who knew her	
12	female	colleague	we were not able to contact the informant; we could not find his contact	
13	male	cousin	we were not able to contact the informant; he did not answer our calls	
14	female	mother	we were not able to contact the informant; she did not answer our calls	
15	male	daughter	we exchanged mail but did not return call	
16	male	colleague	we were not able to contact the informant; he did not answer our calls	
17	female	colleague	Oct/14	Email
18	female	Colleague/friend	Feb/15	Email

After identifying the eligible cases, an initial contact was made by telephone with the *key informants*. The *key informant* was invited to participate after all explanations about the aim of the study. For those who agreed to participate in the study protocol, we invited to provide the necessary information. Two interview alternatives were offered: by email or in person. At the time of the interview, the purpose of the study was explained again and the Informed Consent Form ensuring the confidentiality of the information provided was signed. In the case of an internet interview, the consent form was sent by mail. We interviewed 10 people, of whom 60% (n=6) were in person. The others answered by email. Of the 10 people interviewed, 4 were via SBA, from where we received 5 returns via email, but only 3 people answered the questionnaire (one person answered about 2 different cases). We identified a case whose family refused to participate and 2 close colleagues who did not want to get involved. We ended up including the case, as another colleague provided adequate information about the case.

### *Interviews*

The method used in this study was the *Psychological Autopsy*, mentioned above, which basically is a method characterized by an interview that sought the detailed and descriptive report of the circumstances of the death. This method was implemented in our study to understand more in depth the circumstances of death of these physicians. In this regard, occupational and psychological factors of the subject and the characteristics of his/her substance and/or opioid abuse were important topics of the interview.

### *Data analysis*

Data were analyzed according to a quantitative and qualitative method called *Discourse of the Collective Subject (DCS)* that allows to investigate the meaning of collective opinions. DCS-based research is characterized by individual interviews using basically open questions in order to stimulate a discursive behavior that allows the idea to be expressed and qualitatively preserved. DCS is a complex process, subdivided into several moments, carried out through a series of operations based on the verbal material collected. In order to identify the DCSs, four operators / operations are required, which are: a) *Key Expressions (Ech)*: selected excerpts from the verbal material of each testimonial, which best describe its content; b) *Central Ideas (Ics)*: synthetic formulas that describe the meaning (s) present in the verbal material and also in the sets of responses of different individuals, which has similar or complementary meaning; c) *Anchors (Acs)*: synthetic formulas that no longer describe the senses but the ideologies, values, beliefs, usually presented in the verbal material of individual responses or grouped, in the form of generic statements intended to describe particular situations; d) Discourses of the Collective Subject (DCSs) *per se*. The DCS method considered that there are anchorages only when explicit discursive marks of these generic statements are presented in the verbal material.

The Discourses of Collective Subjects are the Key Expressions present in the statements, which have Central Ideas and / or Anchorages of similar or complementary meaning (18). These Key Expressions of similar meaning form collective statements written in the first person singular, with the primary purpose of expressively marking the presence of collective thinking in the person of a Subject and a Collective Discourse. It is as if everyone spoke as if they were (or by means of) one. A typical DCS survey is an opinion poll on a given topic, divided into a few open questions, aimed at being answered by a given population sample. Each of these answers generates a varied number of different placements, i.e, from different DCSs. These DCSs are qualitatively different in that they convey different opinions and positions, and from a quantitative point of view, since each of them is the result of the contribution of a certain number of interviews or testimonies of individuals. In addition, using the software - Qualiquantisoft (19), the results can be quantified by working with well selected large samples of individuals and, to the register embedded in the program, segment results by the registration variables.

Based on this methodology, we evaluated responses to 2 questions: 1) "how was his/her personality?" 2) "how was the doctor professionally?".

### *Ethical Procedures*

This study was conducted at Hospital das Clinicas in São Paulo and was approved by the Ethical Committee of the Institution.

### **Results**

From the 8 cases, 50% were male, mostly married, with a mean age of 37 (27-53) and 50% had children as showed in Figure 1.

Table 2 summarizes the information about psychological factors, occupational characteristics, the circumstances of death, and possible factors associated with substance abuse and death.. The main substance(s) involved in the episode of lethal use was also registered. In most cases, anesthetic opioid was cited. Alcohol was cited in only one episode. In only one case there was evidence of an addiction. Among others, it seems that the substance was used as an attempt to "alleviate" psychological negative emotions and in a few cases we found clues to interpret the anesthetic and/or opioid abuse as a suicide rather than an accidental overdose. The death occurred at home (50%) or at workplace (50%) in the same proportion.

**Table 2.** Personal and professional characteristics of anesthesiologists who died from anesthetic abuse: circumstances of death, substance use and possible other factors involved.

Case	Personality characteristics	How was at work?	Circumstances of death	Substances involved	Main factors possibly involved in death
1*	Intelligent and a little impulsive (A)  Pleasant, sociable, vain, handsome, outgoing (B)	Available (F)	At the hospital. At the comfort room, in the following day, in the bathroom, 'the door had to be broken and found him dead there, already in deadly rigidity. They found a bulb of dolantine and another of dormonid on the floor. He was tied with a sock on his arm and a syringe injected into his arm, with a needle in his arm.'	Dolantine and midazolam	Impulsivity, relationship issues (being married and maybe liking another man) Stress, doing a lot at the same time, financial problem
2	B	Average (G)	At the hospital	Sevoflurane	A chronic problem with former husband, and a tendency to seek relief from the use of prescribed drugs
3	Strong personality, arrogant (C)	Excellent (H)	At the hospital. Was on duty at the hospital, she left a suicide letter, she made some noise after injecting the drugs, which caught the attention of the staff of the surgical center, she was locked in the duty room, the door was broken open and she was already in a cardiorespiratory arrest, resuscitation was attempted without success	Midazolam, Fentanyl and propofol	Depression that generated opioid dependence, from which she could not get rid of
4	Introspective and arrogant, frank, polite and reserved (D)	Competent but negligent (I)	At home	Fentanyl	He had a severe clinical illness and must have gotten depressed. Because of the illness, he started using the opioids. Too much medication. Doubt about if he had missed the dose of what he was using or had done on purpose.
5	B	Irresponsible (J)	At home, found dead with syringe connected to the arm, containing white liquid	Propofol	'Do not believe he committed suicide, think he thought he had control of the situation.' If it was really propofol, think he challenged the danger too much. Always gave a lot of 'duties', maybe he really suffered from severe insomnia.
6	D	I	At home, found by her son on the bathroom in the morning.	Probably Alcohol	Depression, fatality



**Table 2.** Personal and professional characteristics of anesthesiologists who died from anesthetic abuse: circumstances of death, substance use and possible other factors involved (cont.).

Case	Personality characteristics	How was at work?	Circumstances of death	Substances involved	Main factors possibly involved in death
7	C	H, Competent but arrogant (K)	At home. Alone and did not answer the phone, the bride went home and found him lying on the floor, with a syringe on his side and a glass that seems to be used to applied some substance. It is possible that he had aspirated, that he had a respiratory depression due to the use of the substance, there probably had a respiratory depression, aspired and died. 'He lost his hand, it was not suicide.'	Fentanyl	'Confused relationship with drugs. He used alcohol in a deleterious way and this may have been transferred to another deleterious drug. .. Being an anesthetist so you have access to the drugs, and the fact that he knew what they were used for, facilitate the use.' 'Very ambitious personality , he would never settle down.'
8**	Agitated and full-mouthed (E)	No answer (L)	Hospital, was working and was found dead in the duty room.	Not known	Not known

**Notes:** \*informants: 2 colleagues; \*\*informants: 1 colleague and 1 family member; the other had one informant (a colleague)

Regarding to the DCS, for the first question regarding personality, the following categories were observed: A) Intelligent and a little impulsive (one answer). B) Pleasant, sociable, vain, handsome, outgoing (3 answers); C) Strong personality, arrogant (2 answers); D) Introspective and arrogant, frank, polite and reserved (2 answers); E) Agitated and full-mouthed (one answer). For the second question regarding the doctor professionally, we observed the following categories: F) Available (one answer); G) Average (one answer); H) Excellent (2 answers); I) Competent but negligent (2 answers); J) Irresponsible (one answer); K) Competent but arrogant (one answer). In terms of circumstances of death, half of the sample died at the hospital during work time and half at home. All of them were found alone, mainly in the bathroom and sometimes after the lethal circumstance itself. In most cases, substances involved were anesthetics (dopamine, propofol and sevoflurane. n=4), fentanyl (n=3), midazolam (n=1), and alcohol (n=1). Main factors possibly involved in death vary: personality traits such as impulsivity, depression, and difficulties in controlling drug use; relationship problems, and severe clinical illness.

In terms of personality and psychological factors, some of them were described as having personality problems and narcissist/arrogant tendencies, while others were evaluated as more introspective/reserved as well as pleasant, sociable, or even 'outgoing'. At work, they were generally considered excellent and competent while performing their jobs, but, closer to the fatal incident, it was reported that some of them started to stay excessively at work and/or became negligent with their responsibilities.

## Discussion

This small qualitative study allowed us to observe similar characteristics in this case series analyzed through the Psychological Autopsy.

Being an introspective person, who did not share personal issues at workplace was the most prevalent psychological characteristic that was found among anesthesiologists who accidentally died from substance overdose. At work, most professionals used to perform well their jobs, but right before the lethal incident they started staying excessively at workplace and/or working a lot, but also neglecting their responsibilities. In general, they were found dead alone in the bathroom, at work (hospital) or at home. The main reported reasons to use substances were excess of work, emotional problems, divorce/separation, depression, physical illness, and impulsivity. The reasons regarding professional stress go along with other studies that report work pressure leading to

anesthetic abuse (2,4,20) as well as a comorbid psychiatric history. However, other situations described in the present study such as divorce or personality characteristics are not reported elsewhere as risk factors.

In general, the demographic and behavioral characteristics seemed somewhat diverse, which made not possible to define a unique type of personality among them. Considering the obvious impossibility of having performed a previous semi-structured clinical interview with the subjects who died, we could not classify them in terms of use or abuse diagnosis.

Our results reinforce that psychological and occupational particularities among anesthesiologists in terms of professional daily activities (such as easy access to medication, a lonely and stressful medical activity, and the long working hours) and environmental factors (such as a recent divorce, among others) might have contributed to the abuse of substances and death. Also, details regarding the circumstances of their deaths and psychological characteristics could suggest a possible concomitant psychiatric illness (21,22). In this regard, the “self-medication” hypothesis seems to be a relevant risk factor for substance experimentation and chronic use (23) precisely because of the easy access to large quantities of strongly addictive substances, becoming easier to deviate small quantities of this substance for personal use (4,15, 24,25). The intense professional life with long work hours might lead to chronic emotional stress and the abuse of those substances could be interpreted as tentative to “relief” such psychological burden, leading inadvertently to death.

However, few anesthesiologists have been referred to treatment: Wilson et al (2008) (26) reported that in the USA, 31 of 106 interviewed doctors (29%) were considered addicted, with only 48% of them being referred to rehabilitation. In our sample, none of them was receiving psychological or psychiatric treatment in the period when the lethal use occurred. Physicians' elevated social status brings many rewards, but it may also include an isolating effect when they become addicted, which include a devastating social stigma. The consequence is probably a significant delay in the recognition of their substance abuse as a relevant problem, and consequently another delay in the process of beginning an intervention to prevent substance abuse, thus culminating in a more elevated risk of death by inadvertent overdose or suicide (27). Additionally, many health professionals sometimes do not have appropriate knowledge about how to deal with this complex problem (5), leading to what has been called ‘conspiracy of silence’ involving families, colleagues and the affected doctors as well (6). When the substance user is a senior professional, the others tend to fear being punished to bring up the subject. Delay in the diagnosis process includes concern of disclosing an addictive illness and losing not only prestige but also the license to practice medicine and thus livelihood. Families recognize the problem but also fear talking about it at workplace and have to deal with financial and occupational consequences. The false belief that addiction is a personal choice and not a brain disease also limits significantly the medical attention to that matter. Although the literature shows an association between anesthetic/opioid use and suicide among doctors (4) and that prevalence of suicide ideation among medicine students is high (20,28,29), it is unclear whether the deaths we searched, in this particular study, were suicides or not. Further studies are needed to disentangle the real motive in other particular lethal cases.

More recently, it has been discussed how important is early detection of afflicted colleagues since the beginning of their training program and the discussion of the issue in medical school (30).

We consider that the qualitative methodology was consistent in terms of providing a set of possible explanations to a better understanding of the circumstances or personal/professional factors that lead those individuals to die from non-prescribed anesthetic and/or opioid abuse. This was possible through the application of an in-depth qualitative method of analysis, based on a psychological autopsy as a method of data collection, both of them original in this kind of investigation. At the best of our knowledge, this is possibly the first *post-mortem* qualitative study to show evidences of a set of particular characteristics in terms of psychological issues, occupational factors, circumstances of death and characteristics of anesthetic and/or opioid abuse among this specific and vulnerable population, derived from reports provided by colleagues and other more close friends and relatives.

This study has some limitations. First, the retrospective design of this investigation based on people's memories of a time in the past could be a limiting factor. Secondly, in spite of all the effort to search for lethal cases (death registration system and search for well-known people, mainly colleagues through snowball sampling, contact with anesthesia service chiefs in our context and mailing –from the local anesthetic society), there was a great difficulty to identify eligible cases. Moreover, it was not easy to contact the *key-informants*. When available, they

had little information due to the socially restricted behavior that we found among the sample. Also, most of the families were not available. After some attempts to contact them, we gave up in some cases because we perceived that it would be extremely sensitive for them to talk about their relatives' deaths. There was only one familiar who showed to be more available to talk about the subject, perhaps because of his professional background in Psychiatry. Also, it was difficult to find more than one person to talk about the same doctor who died. It seems that they felt very uncomfortable when talking about the person, not wanting to 'commit' themselves. 'Substance abuse and overdose' are delicate topics to talk about and it seems that people tend to talk only good things about those who are dead, particularly the family of the deceased, in a way to 'preserve their souls'. In general, doctors do not feel comfortable to intervene in what they call 'personal life' of their colleagues. In the USA, residency program directors did not consistently report SUD to the American Board of Anesthesiology (8).

This is an exploratory study that in our opinion offers precious and original material for designing some initial preventive strategies and should be replicated in a larger scale. First of all, it is clear the need to think about preventive strategies to minimize the significant negative consequences of the illicit anesthetic and/or opioid use and to avoid a very frustrating/traumatizing end such as an overdose. Knowing better the profile of more 'at risk' anesthesiologists would facilitate an early detection of more vulnerable individuals in order to approach the physician. Some other possible interventions might help dealing with this problem: 1- basic preventive efforts could focus on providing information about the substances and their effects through psychoeducation, 2- demystifying the topic for users and for colleagues (chiefs and professionals) who could refer them for a proper diagnosis, 3- implementing a systematic control of substances used in surgical procedures or under sedation or anesthetic diagnosis and 4- urine and hair analyses could be systematically implemented for a more precise control, as well as to invest in mental and physical health of professionals who care for people seems to be crucial. It is also relevant to promote an open field for discussion/reflection among professionals about this subject and maximize the support network for health professionals.

In sum, our investigation identified some specific characteristics of this sample, but more studies are needed to better understand the factors associated to the abuse of anesthetics among the medical professionals, as well as how preventive strategies may contribute to a more stable and healthy professional life for anesthesiologists.

## **Conclusion**

Our results suggest that a particular anesthetic occupational routine (such as easy access to medication, a lonely and stressful medical activity, and the long working hours), recent emotional problems (i.e., divorce), impulsive personality, and being introspective were relevant factors that might have contributed to the abuse of substances/opioids and consequent overdose/death among anesthesiologists. Possible concomitant psychiatric illness and "self-medication" also seem to be significant risk factors for substance abuse and overdose. Further larger studies are needed to better understand how these factors could be early identified in order to timely prevent anesthetic and/or opioid abuse and several deaths among anesthesiologists.

## **Acknowledgements**

We would like to thank the SAESP (São Paulo Anesthesiology Society) in the name of Dr Marcelo Torres for their help in sending the email as well as Dr Nancy Conti for their help in finding the informants.

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#### **Authors' contributions:**

Flavia Serebrenic: She was the main researcher who conducted the research from the beginning, she collected and centralized the data and gave the pace to the writing progress.

Maria José Carvalho Carmona: She was the person who first noticed the phenomena of anesthesiologists' abuse of anesthetics. She is the person on the team who had direct experience with anesthesiology. As a director of an Anesthesiology Division, she had many contacts, therefore she helped the main researcher to get access to the cases. She also review the paper.

*Desk-reviewed and formatted by the depositing journal.*

Paulo Jannuzzi Cunha: He has experience in writing, so he came into the team later on, at the time of writing the article. He gave a lot of input in organizing the data.

André Malbergier: He is the most experienced professional in terms of drug use. He helped the main researcher on the research design, methodology and follow all the research steps from the stretch to the article review.

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