المجلة الإلكترونية الشاملة متعددة التخصصات
العدد الثامن والخمسون شهر (٤) ٢٠٢٣

Research Article

Assessing the anesthesiologists' patient ratio in Jeddah, Saudi Arabia .Does itMeet Global Health Standard?

ABSTRACT

Introduction: Without referring the patient to the pharmacy or other medical departments, anesthetic medications are manufactured and administered. Our goal was to determine how frequently anesthetic medication mistakes occurred inJeddah, Saudi Arabia. The relevant elements, reporting techniques, and doctors' perceptions of the preventativeinterventions were also ascertained.

Methods: We used a validated technology to perform a cross-sectional web-based survey research. 300 anesthetic professionals in all responded to the study (146 anesthesiologists and 154 anesthesia technology specialists). We assessed the demographic parameters using descriptive statistics, and then we used inferential statistics to look at relationships and differences.

Results: 69 percent of respondents said they had at least once in their careers made a mistake using an anesthetic medicine. Haste and a severe workload were the two main variables that contributed to medication mistakes (60.3% and 60.4%, respectively). Regarding syringe labeling, 56.3% of respondents removed the medication before labeling the syringe, while 43.7% did the reverse. The chi-square test showed that doctors made mistakes more frequently when they labeled the syringe first and subsequently removed the medication (p140.036).

Keywords: anesthesiology, adverse events, drug errors, Global Health Standard, patient ratio

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Background

Several developing nations, particularly those with protracted conflicts like Cambodia, suffer from a severe lack of medical personnel and supplies. Anesthesia services are a crucial component of healthcare, making them particularly sensitive to socioeconomic development. Untrained professionals in low-income nations frequently render anesthesia services because they are seen as a low priority and lack the voice to demand access to resources. Perioperative mortality and morbidity are closely related to the caliber of anesthetic services. To better guarantee the safety and effectiveness of surgical intervention in the developing world, it is crucial to identify the fundamental issues and consequent demands in the anesthesia service. Such information is necessary to direct the operations of governments and nongovernmental groups to enhance healthcare delivery in these nations.

The World Federation of Societies of Anesthesiologists and the World Health Organization collaborated to create the International Standards for a Safe Practice of Anesthesia (ISSPA). The professional elements, infrastructure and equipment, drugs, monitoring, and anesthesia administration are just a few of the crucial topics covered by the ISSPA for anesthesia safety. The ISSPA has been suggested to evaluate the compliance and requirements of anesthesia departments, institutions, or nations. It has been recommended as a method for evaluation that enables anesthesia physicians in underdeveloped countries to evaluate their requirements and compliance. This study will assess the anesthesiologist-patient ratio in Jeddah, Saudi Arabia, to determine if they meet the Global Health Standard.

Objectives

1. To research the relationship between surgical patient morbidity and mortality and various levels of anesthesiologist staffing ratios.

2. To assess the anesthesiologists' patient ratio in Jeddah, Saudi Arabia.

3. To determine if the anesthesiologist-patient ratio in Jeddah meets Global Health Standard?

Research Questions

1. What is the relationship between surgical patient morbidity and mortality and various levels of anesthesiologist staffing ratios?

2. What is the anesthesiologists' patient ratio in Jeddah, Saudi Arabia?

3. Does the anesthesiologist-patient ration in Jeddah meet the Global Health Standard?

Literature Review

Relative to other medical specialties, anesthesiology has significantly altered how healthcare is provided now throughout the world. Anesthesiology has been involved in concerted efforts to increase patient safety from the beginning. Additionally, anesthesiologists are setting the standard for patient safety measures in the healthcare industry (Brinjikji et al., 2017). The essential medical profession to accept responsibility for attaining the objectives that will significantly improve patient safety in Europe is anesthesiology, according to the 2011 Helsinki Patient Safety Declaration (Wu et al., 2018). As a result, anesthesiologists have a unique, cross-specialty opportunity to impact patient safety and care quality.

Health care harm reduction is a global concern, leading to a tremendous rise in attempts to enhance patient safety over the past years, thanks to the growth of patient safety science. The prevention, mitigation, and amelioration of adverse outcomes or injuries resulting from healthcare delivery as opposed to the patient's underlying medical condition were characterized as patient safety (Yoo et al., 2019). Most orthodox medicine curricula' spotlight clinical skills, including disease diagnosis, therapeutic interventions, follow-up care, and follow-up (Shash et al., 2022). Regrettably, these curricula do not emphasize other skills necessary for patient safety, including systems thinking, root cause analysis, implementation of human factor science, and communications skills.

The relationship between overlapping anesthesiologist responsibilities and patient outcomes has not yet been researched, despite recent studies examining the impact of nurse-to- patient staffing ratios or intersecting surgeon duties on patient outcomes (Ing et al., 2017). In Jeddah and Riyadh, the Kingdom's two biggest cities, where the Saudi Anesthetic Association holds most of its meetings, most of the responders work in public hospitals (Hao et al., 2020). It should be no surprise that fewer respondents completed fellowships in regional anesthesia abroad (Kadry et al., 2021). This emphasizes the requirement for establishing a Saudi Regional Anesthesia Fellowship Program to produce skilled, seasoned clinical professionals whose proficiency in regional anesthetic will promote better and safer treatment outcomes in routine anesthesia suites.

Increased anesthesiologist covering duties were linked to higher risk-adjusted surgical patient morbidity and death, according to a recent study (Abolfotouh et al., 2020). Clients confronted a rise in risk-adjusted illness and death when the anesthesiologist covered two to three intertwining processes (adjusted odds ratio, 1.04) and when the anesthesiologist covered three to four intersecting operations (modified odds ratio, 1.06) as opposed to when the anesthesiologist covered more than one but no more than two complementary processes (adjusted odds ratio, 1.15) (Al Amer, 2020). Consequently, workforce ratios in intraoperative team models must be considered in attempts to provide clinical treatment.

All facilities providing regional anesthetics should adopt the service structure, particularly the inclusion of the designated block room that researchers recently discussed. According to the latest survey results, 75.3% of professionals were still administering regional blocks in operating rooms (White et al., 2020). Due to their need to complete their scheduled lists quickly, surgeons usually refuse to do this, which could extend the duration of anesthesia (Albejaidi & Nair, 2019). Others discovered that the effective blockage and transposition necessity for a needle during manipulation is significantly reduced when ultrasonography and a nerve stimulator are used together, with no statistically significant variations in the quality of regional anesthetic (Qutub et al., 2021). In addition, to verify closeness to the target, electrical nerve activation and ultrasonic guiding should be combined.

Methodology

The random sampling method will be used for this study. We used a validated technology to perform a cross-sectional web-based survey research. 300 anesthetic professionals in all responded to the study (146 anesthesiologists and 154 anesthesia technology specialists). We assessed the demographic parameters using descriptive statistics, and then we used inferential statistics to look at relationships and differences.

The questionnaire method will be used for data collection. Age, American Society of Anesthesiologists classification, diagnosis, surgery type, and anesthetic method will all be collected in a standardized form. Additionally, two questionnaires (based on the ISSPA) will be created to make up for the data missing from the recording charts: one on the frequency of

problems and the other on the accessibility of pharmaceuticals and equipment. The department's anesthetists will be asked for free-text suggestions on increasing anesthesia services' safety after the questionnaires. The data will then be analyzed using excel and presented in graphs and charts.

With the authors' consent, we carried out a cross-sectional web-based survey study using a validated technology. The poll was developed using Google Forms and then disseminated among anesthesiologists and anesthesia technology specialists via Twitter after receiving ethical permission from our institution. Between June and September 2020, a total of 4 months were spent gathering the replies. By completing the survey, the participant indicated their agreement to engage in the study, which was waived by the institutional review board. Before they began the survey, we gave each participant a page of material outlining the study's goals and the primary investigator's contact information. We secured the study participants' information and upheld their confidentiality.

Web-based surveys may be finished fast and without spending any money but they do have some limitations that need to be addressed. One of the key drawbacks is selection bias, which makes it uncertain if the respondents really reflect the target demographic. We specified the needs of the target group and made sure that the study objectives were understood by the participants prior to the survey in order to minimize selection bias. Another drawback is social desirability bias, which occurs when respondents give less accurate answers in an effort to fit in. We made sure that the respondents were anonymous, and given the nature of web-based surveys (the researcher's absence), we encouraged them to be more honest in their responses. To prevent response bias, which occurs when respondents lose interest and give biased answers, the survey had to be finished within three to five minutes.

Participants in the Study and Sampling

Anesthesiologists and anesthesia technology professionals from general and private hospitals in Jeddah, Saudi Arabia made up the target population. Using the Raosoft sample size calculator (http://www.raosoft.com/ samplesize.html), a sample size of 377 was calculated for a population of 20,000, with a 5% margin of error and a 95% confidence interval. Since we employed convenient sampling, all

The questionnaire was filled out by 300 anesthesia professionals in total, with a response rate of 79.6%. We included anesthesia practitioners who worked in the OT and assisted with the preparation and administration of medications.

Analysis of Data

The Statistical Package for Social Science (SPSS) for Mac version 23 was used to analyze the data (IBM Corp, Armonk, NY). As frequencies and percentages, the results of the descriptive statistics for nominal categorical variables are presented. Median scores, IQR, and mean rankings are used to show ordinal categorical variables (Likert Scale data). Inferential statistics were performed using nonparametric tests. To assess the relationships between nominal variables between the two groups, we used the Pearson chi-square test. To examine group differences, we used the Mann-Whitney U test.

It was deemed statistically significant with a p-value of 0.05. To create the charts, we utilized SPSS and Microsoft Excel.

Table 1. Demographic characteristics of the study participants (N ¼ 300)

Characteristic	Participants, n (%)
Specialty	
Anesthesiologist	146 (48.7)
Anesthesia technology specialist	154 (51.3)
Total	300 (100)
Anesthesia practice (years)	
, 5	134 (44.7)
5–9	57 (19)
10–14	42 (14)
15–19	27 (9)
≥ 20	40 (13.3)

Table 2. Experience of anesthetic medication errors(N ¼ 207)

Item	Participants, n (%)
Anesthesiologists	
Yes	116 (56)
Anesthesia technology specialists	
Yes	91 (44)
Total	207 (100)
Approximate frequency of errors	
Few times a month	5 (2.4)
Once a month	11 (5.3)
Once every 3 months	17 (8.2)
Once a year	62 (30)
Only once to date	112 (54.1)

Workplace region	
Eastern	161 (53.7)
Central	79 (26.3)
Western	35 (11.7)
Southern	23 (7.7)
Northern	2 (0.7)
Hospital	
Governmental	271 (90.3)
Time of experiencing drug errors	
Daytime	39 (18.8)
Night shift	40 (19.3)
Not related to any time of work	128 (61.9)
Experience of associated drug error adverse event (cardiac arrest, permanent neurological damage, etc)	
Yes	21 (10.2)
No	175 (84.5)
Not willing to give information	11 (5.3)

RESULTS

The poll was completed by 300 anesthesia medical professionals (146 anesthesiologists and 154 anesthesia tech- nology specialists). The demographic details of the research participants are shown in Table 1. According to the results, 44.7% of respondents had less than five years' experience, while 13.3% had more than twenty years. The eastern area employed half of the respondents (53.7%), while the other half (46.3%) worked in other parts of Jeddah, Saudi Arabia. The majority of responders (90.3%) worked at a public hospital.

We questioned respondents regarding the preparation and administration of anesthetic medications. It was discovered that the anesthesiology consultant (56%, n 168) and the anesthesia technology specialist under supervision (75.7%, n 227) frequently loaded the anesthetic medicine into the syringe and administered it to the patient. The majority of responders (85%, n 255) always read the medicine label on the syringe before giving it to the patient; 12.7% (n 38) did so frequently; and only 2% (n 6) did it occasionally or never.

The majority of responders (84.7%, n 254) utilized color-coded labeling for syringes. The experience with anesthetic drug mistakes is shown in Table 2. Sixty-nine percent of all respondents (n 207) admitted to making a medication mistake throughout the course of their work. To date, half (54.1%, n 112) have only made one mistake, and the other half (45.9%, n 95) have made many mistakes. These mistakes did not damage patients for the vast majority of responders (84.5%, n 175), nor were they associated with a particular period of occurrence (61.9%, n 128).

To investigate the relationship between demographic factors and the likelihood of medication mistakes, we used the chi-square test. The test showed that experience and the incidence of mistakes were connected, despite the lack of a statistical correlation between speciality and the rate of errors occurring: Less experienced clinicians have made more mistakes than more experienced clinicians (Fig. 1). (V2(4) 12.301, p 0.015, Pearson chi-square value) Cramer V 0.202 indicated a reasonably substantial correlation. There was no correlation between the frequency of mistakes and the period during which they occurred or the emergence of significant morbidities in patients.

Figure 1. Association between experience and the occurrence of errors (N ¼ 300).

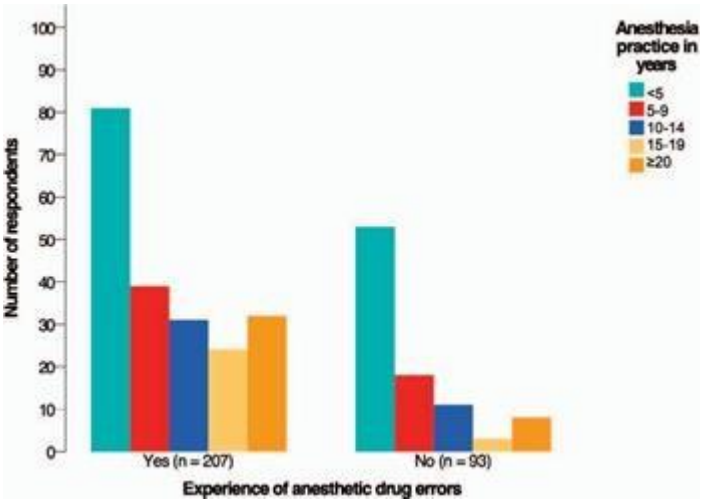


Figure 3. Barriers to reporting medication errors (N 300 participants, 576 responses).

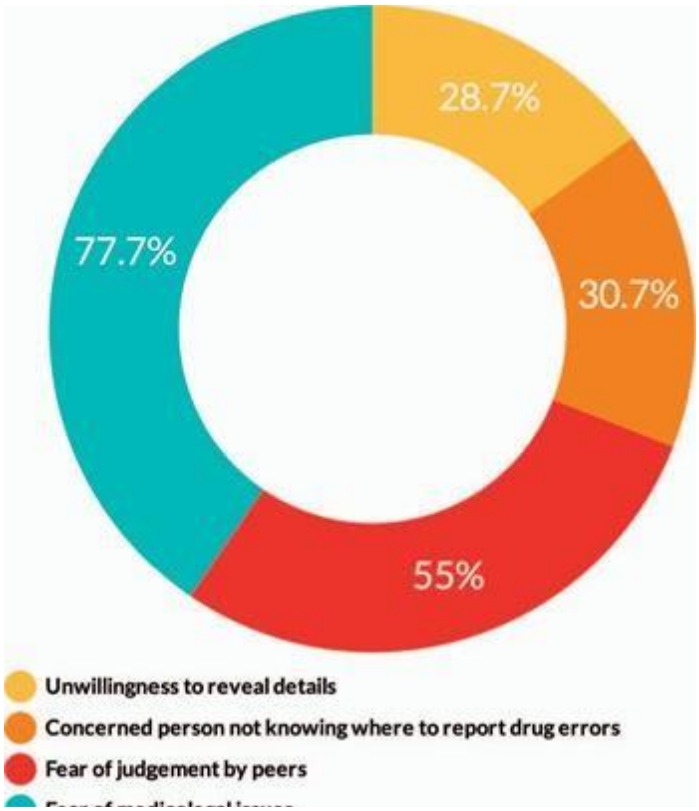
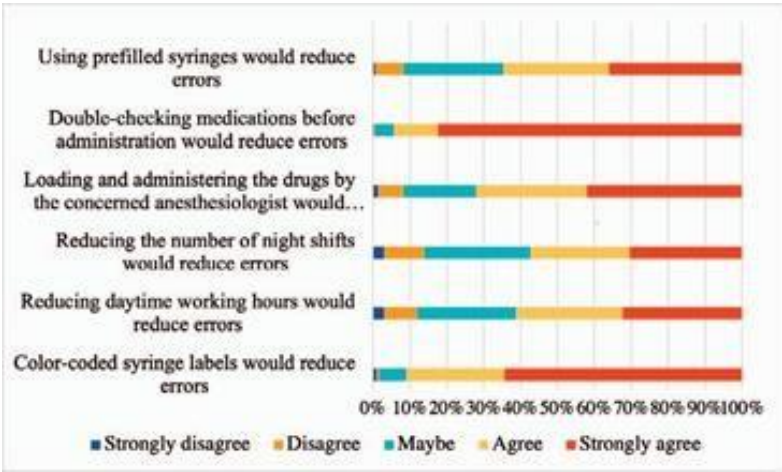


Figure 4. Preventive measures of medication errors (N ¼ 300).



DISCUSSION

Errors in anesthetic medication usage

This study used a survey questionnaire to evaluate the prevalence and contributing factors of medication mistakes among anesthesia practitioners in Jeddah, Saudi Arabia. Additionally, we identified the methods for reporting errors and looked at what clinicians thought of the safety precautions. According to our findings, 69% of respondents made at least one drug mistake while practicing anesthesia. There have been several survey studies that have documented the frequency of anesthetic drug mistakes.

The frequency was high, ranging from 70 to 95 percent. A prospective observational research was carried out by Nanji et al to evaluate medication mistakes and unfavorable outcomes. One inaccuracy was found for every 20 medications provided during the observation of 277 procedures using 3671 substances. It is important to note that our findings are lower than the reported drug mistakes. Due to the presence of an experienced observer, observational research can identify mistakes at a higher rate than self-reporting survey studies, which tend to underestimate the prevalence of errors due to the possibility of unreported or undetected errors.

Less experienced physicians in our study made more mistakes than more experienced clinicians. Similar findings were made by Cooper et al. and Alshammari et al. who observed that less experience was linked to medication mistakes. These results imply that as doctors gain expertise, they grow more used to drug management. Additionally, we discovered that the majority of respondents thought drug mistakes happened at random times. However, McCawley et al. and Erdmann et al. observed more mistakes happening during daylight working hours, whereas Amponash et al. discovered more errors occurring during night shifts. One of our main results is that, in line with other studies, the majority of respondents reported no patient damage as a result of medication mistakes.

Causes of Medication Errors

The majority of responders named a severe workload and hurry as the most frequent causes of drug mishaps. This conclusion adds to the body of research by Alshammari et al., who found that excessive workload was the main contributor to mistakes in their study and accounted for 31.6% of the 71,332 errors across 265 government hospitals in Jeddah, Saudi Arabia.

Poor syringe labeling was regarded by research participants as the third most significant cause causing drug mistakes, after severe workload and hurry. Syringe swapping, or the unintended delivery of the wrong medication, is caused by syringes with incorrect labels. The medication must be chosen by anesthesia professionals by examining the syringe label. However, because anesthesia practitioners frequently multitask, it is possible for them to mistakenly identify a drug while attending to another duty. Inadequate labeling frequently leads to syringes being misidentified, according to the research.

Along with bad labeling, our respondents said that poor communication was responsible for 48% of mistakes. 70% of the 2400 unfavorable occurrences that Leonard et al. examined were attributed to poor communication. Clinicians' ability to communicate effectively might suffer in an OT with noise and distractions. Additionally, our respondents mentioned that being tired might contribute to mistakes. A tremendous workload leads to fatigue, which impairs physicians' capacity to make the best choices. Although not statistically significant (p 14 0.081), Salam et al. found that doctors with severe workloads were twice as likely to make at least one pharmacological mistake per month as those with a sufficient workload.

Preparation and Administration of Anesthesia Drugs

According to this study, anesthesiologists and experts in anesthesia technology were frequently involved in the preparation and administration of anesthetic drugs. The patient's anesthesia services, including the administration of anesthetic medicine, are the responsibility of the anesthesiology consultants in Jeddah, Saudi Arabia.

According to the American Society of Anesthesia Technologists & Technicians, anesthesia technology experts support anesthesiology consultants and work under their close supervision as capable members of the anesthesia team (ASATT).

The majority of responders "always" read the medicine name before administering it and used syringes with different colors. Contrarily, Orser et al discovered that the majority of anesthesiologists read the medicine label "most of the time" and that only a small minority thought it was essential to do so in order to identify the drug. According to a different survey, 42% of respondents acknowledged that they typically do not read the medicine label, which is prevalent in emergency situations. Some claim that anesthetic medical professionals can identify the medicine from the color of the syringe label without even reading the name. However, a seminal work by Radhakrishna emphasizes the need for anesthesia doctors to always read the syringe label before to use and not only depend on color.

Our research revealed a link between the frequency of mistakes and the labeling procedure for medications: labeling the syringe first, then removing the medicine, had resulted in more mistakes than the reverse. The literature reveals opposing points of view: some advocates labeling before drug withdrawal, while others argue that medicine should be formulated before labeling.

To encourage the safe use of medications, the National Patient Safety Agency advises filling out the syringe first, then labeling (one dose at a time). The only time it is ever appropriate to label an empty syringe is after the drug has been withdrawn from it. Our findings demonstrate that respondents' syringe labeling varied, pointing to a lack of uniform anesthetic medicine labeling. Safe medication administration for patients depends on uniform labeling. According to Alkhani et al., there were several drug mistakes in Jeddah, Saudi Arabia as a result of noncompliance with the labeling procedures.

Reporting Medication Errors

The majority of survey participants knew that their hospital had an incident reporting system. However, the reported mistakes were audited differently by respective hospitals, and some respondents were unaware of how or when errors were audited. This data would suggest that professionals were unaware of the hospital's rules for reporting errors. The results also demonstrate that some respondents were reluctant to admit their mistakes. This discovery raises some questions, but it is in line with earlier studies.

Alsulami et al. discovered that 44.8% of healthcare professionals (62 doctors and 303 nurses) had never reported a pharmacological mistake throughout the course of their professional lives. It is asserted that some medical professionals choose not to report errors if they think the patients were not harmed. In another study, 23.9% of participants (117 physicians) admitted to making pharmaceutical errors, but only 6% were ready to share their mistakes. Clinicians may be discouraged from reporting errors because they feel ashamed, guilty, or blamed after confessing mistakes.

10.3% of those who responded to our survey claimed that their hospital lacked a reporting mechanism. It is generally recognized that one of the obstacles to reporting errors is the absence of a defined policy. The most frequent obstacles to reporting errors, according to respondents, are judgment and the fear of medicolegal difficulties. The reporting procedures for pharmaceutical mistakes have been the subject of several research in Jeddah, Saudi Arabia, and the results are consistent. The OT was connected to the greatest instances of prescription mistakes (20.4%) out of the 642 examples of litigation against healthcare practitioners that AlJarallah and AlRo- waiss looked into.

Legal claims related to anesthetic drug mistakes were found to be worth more than £4,000,000 in a UK research. Our findings imply that Jeddah, Saudi Arabia has a blame culture and that underreporting of pharmaceutical mistakes may occur due to worry about legal repercussions and blame. According to Albalawi et al, a blame-free workplace environment might encourage professionals to disclose errors more frequently.

Keeping medication mistakes at bay

The majority of respondents concurred that using color-coded syringes and double-checking the medication were crucial preventative measures. Numerous investigations produced comparable findings: The best drug safety precaution was to double-check before taking medication out of the bag and giving it to someone else. To confirm, McCawley et al. were not accessible. Due to the difficulties in confirming the availability of a second physician, the two-person confirmation is, nevertheless, restricted. A recent invention by Wu et al. functions as an electronic two-person confirmation.

The anesthesia professional verbally enters the drug's name and dosage once the syringe has been loaded with medicine and affixed to the apparatus. Automatic audio is produced to notify the anesthesia physician of the medicine name and dose as soon as the syringe is removed from the device to give the medication. When a second doctor is not present, electronic confirmation facilitates independent medicine delivery. People who responded favored color-coded labeling. Gordon's findings support ours in that color-coded syringes significantly cut down on mistakes. Some researchers have expressed worry, nevertheless, that color-coding would lead to additional mistakes if practitioners relied just on the label's color instead of reading it.

Surprisingly, employing prefilled syringes did not receive positive feedback from respondents: 36% were unconvinced of its use in lowering mistakes. Similar to this, participants in a prior study had mixed feelings regarding the usefulness of prefilled syringes. However, by removing the possibility of extracting the incorrect medicine in tense emergency situations, prefilled syringes might minimize mistakes for high-risk medications like epinephrine and ephedrine. In our study, anesthesiologists thought that letting the accountable anesthesiologist remove and deliver the medicine would cut down on mistakes.

Limitations

Our study has a number of drawbacks. First, self-report is used as a basis for survey research, which is a known flaw in survey questionnaires and may have under- or overstated the frequency of medication mistakes. Second, the generalizability of the results was constrained since the sample size was insufficient to reflect the complete population of anesthesiologists and anesthesia technology experts in KSA and because the majority of replies were from the eastern and central areas. Third, 44.7% of the survey participants had less than five years of experience. Clinicians with more experience are better comfortable with the pharmaceutical procedure and make less mistakes. Our results indicate a high frequency rate of anesthetic medication mistakes notwithstanding these constraints.

Conclusion

This conclusion is helpful in avoiding poor communication, which the respondents previously identified as a common source of mistakes. In our study, anesthesiologists likewise held the view that fewer night shifts would result in fewer mistakes. This result can be explained by fatigue, which is more likely to occur at night. It had previously been connected to the frequency of pharmaceutical mistakes. According to Amponsah et al., night shifts (26.4%) and the afternoon (42.5%) were the times where drug mistakes happened most frequently.

This study sought to evaluate the prevalence of medication mistakes among anesthesia practitioners in Jeddah, Saudi Arabia and identify the causes and mitigation strategies. We came to the conclusion that the majority of anesthesiology doctors had made at least one drug error in their career, and some had made many errors. Clinicians with more expertise made fewer mistakes than those with less experience. The majority of mistakes, according to the respondents, do not result in patient damage.

The International Standards for a Safe Practice of Anesthesia were developed in cooperation between the World Federation of Societies of Anesthesiologists and the World Health Organization (ISSPA). The ISSPA covers several important subjects for anesthesia safety, including the role of professionals, infrastructure and equipment, medications, monitoring, and anaesthetic administration. To assess the compliance and needs of anesthesiology departments, institutions, or nations, the ISSPA has been proposed. It has been suggested as a technique for assessment that enables anesthesia doctors in developing nations to assess their needs and compliance. In order to ascertain if Jeddah, Saudi Arabia, complies with the Global Health Standard, this study will evaluate the anesthesiologist-patient ratio there.

The safety precautions for medication management, such as reading the medicine name before taking it, checking the medication twice, and utilizing color-coded labeling, were typically followed. Syringe labeling was not uniform across responders, though. We discovered that doctors made mistakes more frequently when they opted to label the syringe before taking the drug out of the patient. The most common cited causes of drug mishaps were a heavy workload and a hurry. The most frequent obstacles to reporting mistakes were the fear of legal action and peer criticism. Our research adds to the sparse but expanding amount of knowledge regarding the security of anesthetic drugs in Jeddah, Saudi Arabia.

The study's conclusions have some practical applications. Anesthesia physicians and regulators may develop safety recommendations for anesthetic drug management, including preventative, corrective, and reporting efforts, by understanding the factors that lead to medication mistakes. Our results further emphasize the significance of updating and harmonizing the requirements for syringe labeling. Even though we didn't question respondents about the typical anesthetic medications linked to mistakes, we think this is a crucial subject for further study. To encourage clinicians to report errors regularly, it is also crucial to look at what forms a supportive and nonpunitive workplace culture in OT.

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Questionnaire form

Part I: Demographic characteristics:

1. **Age:** ……...

2. **Specialty:**

   1. Anesthesiologist ( )
   2. Anesthesia technology specialist ( )

3. **Anesthesiologist's practice years:**

   1. > 5 ( )
   2. 5 – 9 ( )
   3. 10 – 14 ( )
   4. 15 – 20 ( )
   5. ≤ 20 ( )

4. **Anesthesiologist's workplace:**

   1. Governmental hospital ( )
   2. Private hospital ( )

5. **Anesthesiologist's workplace region:**

   1. Eastern ( )
   2. Western ( )
   3. Southern ( )
   4. Northern ( )
   5. Centeral ( )

Part II: Experience of anesthetic medication errors:

1. **Approximate frequency of anesthetic medication errors:**
   1. Few times a month ( )
   2. Once a month ( )
   3. Once a year ( )
   4. Only once to date ( )

2. **Time of experiencing anesthetic drug errors:**
   1. Daytime ( )
   2. Night shift ( )
   3. Not related to any time of work ( )

3. **Experience of adverse event associated with anesthetic drug errors (cardiac arrest, permanent neurological damage, etc):**
   1. Yes ( )
   2. No ( )
   3. Not welling to give information ( )

4. **Causes of anesthetic medication errors:**
   1. Hurry ( )
   2. Excessive workload ( )
   3. Poor syringe labeling ( )
   4. Poor communications ( )
   5. Fatigue ( )

5. Barriers to reporting anesthetic medication errors:

1. Fear of judgment by peers. ( )
2. Fear of medicolegal issues. ( )
3. Concerned person not knowing where to report drug errors. ( )
4. Unwelling to reveal details ( )

6. Preventive measures of anesthetic medication errors:

	Items	Strongly agree	Agree	Maybe	Disagree	Strongly disagree
1	Double-checking medications before administration would reduce errors.					
2	Using prefilled syringe would reduce errors.					
3	Color-coded syringe labels would reduce errors.					
4	Loading and administering the drugs by the concerned anesthesiologist would reduce errors.					
5	Reducing the number of night shifts would reduce errors.					
6	Reducing daytime working hours would reduce errors.					