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Anesthesia students' behaviors towards a medical errors: a phenomenological qualitative scenario study

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Abstract

Objective This study is a qualitative scenario study designed to investigate the behaviors of associate degree anesthesia program students, who will work in operating rooms after graduation, in response to medical errors they may encounter in the future and how they cope with these errors.

Materials and methods This qualitative study was conducted using interpretive phenomenology. Research data were collected from 33 students enrolled in the Anesthesia Program, selected using purposive sampling, between October 2022 and January 2023. A hypothetical case scenario was prepared for the study, which anesthesiology technicians working in the operating room environment might encounter, and data were collected using a semi-structured interview technique. The data obtained were transcribed into written form on a computer and coded according to qualitative research methods.

Results In the inductive coding process, "felt emotions" were divided into two main categories: Challenging Emotions and Functional Emotions, while "behaviors" were divided into Desired Behaviors and Undesired Behaviors.

Conclusion The research found that students viewed medical errors as "a normal situation," providing an opportunity to shed light on what students think about medical errors and to develop new educational strategies.

Keywords Anesthesia, Medical error, Healthcare services, Phenomenology, Student

Introduction

Patient safety is the most fundamental component of healthcare quality and is a priority in ensuring and improving healthcare quality. The Institute of Medicine in the United States (US) defines it as "freedom from injury due to medical care or medical errors" [1]. Medical

error is defined as an unintended consequence of an unintended interruption in the healthcare provided to a patient; an unexpected event involving death, serious physical or psychological harm, or risk of harm [2, 3].

In recent years, the importance of developing the ability to deal with medical errors for all professions in the healthcare environment has become clear. Operating rooms, intensive care units, and emergency departments, which are units where advanced technology is used, involve direct intervention in human life and are among the areas with the highest patient density. Operating rooms are high-risk healthcare areas, and preventing medical errors such as surgical site errors, medication errors, and patient falls are important issues

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in the operating room. Anesthesiologists play a vital role in providing anesthesia care and managing anesthesia-related complications. Paying attention to technical and non-technical skills is particularly important for improving services and reducing errors in sensitive environments such as operating rooms. Identifying the values, opinions, and attitudes of personnel working in this field regarding safety will be beneficial in reducing medical errors [4–7].

Understanding attitudes and perceptions regarding medical errors provides information for designing the most appropriate interventions and educational strategies for healthcare providers. A review of the literature reveals studies examining physicians', nurses', and medical students' attitudes and behaviors toward medical errors, but no studies examining anesthesia students' attitudes and behaviors toward medical errors have been found. This study revealed the attitudes and behavioral intentions of anesthesia students. Scientific approaches to defining attitudes and understanding behavior or behavioral intentions are primarily based on qualitative research. Qualitative research aims to understand how people experience the world and seeks to reveal what lies beneath people's perceptions and how they perceive things. The phenomenological approach, one of the qualitative research methods, is used to investigate phenomena that we encounter in daily life but whose meaning we cannot fully grasp. The phenomenological design was used to understand "what it is," "how it is," "what it means," and "what common meanings it represents for those who experience it" for a process/phenomenon that we are aware of but do not have in-depth knowledge about [1, 8–15]. This qualitative study is a qualitative scenario study designed to investigate the behaviors of associate degree anesthesia program students who will work in the operating room after graduation and how they cope with medical errors they may encounter in the future.

Method

Design

In this study, Interpretive Phenomenological Analysis (IPA), one of the qualitative research methods, was used to discover student behaviors regarding the problems they may encounter after starting their working life. In this approach, the main goal is not to confirm or refute hypotheses, but to reveal the participants' unique experiences on a specific topic. This approach helps to understand how people react in different situations and how they feel about their social and individual lives [16–18]. In IPA, researchers try to understand how participants perceive their worlds and usually focus on a specific event or relationship. While participants are encouraged to freely express their lived experiences, researchers

interpret these narratives within their own specific contexts. Unlike other phenomenological methods, IPA does not aim to generalize group experiences [19]. This study was designed to allow students to compare their experiences by gathering their feedback as a group, rather than focusing on individual interviews centered on each participant's personal experience.

Study setting and participant recruitment

In a qualitative study, a relatively small and purposefully selected sample can be used to increase the depth (as opposed to the breadth) of understanding. Therefore, this study used purposive sampling, a method of identifying and effectively using limited research resources to select participants most likely to provide relevant and useful information [20]. Research data was collected between October 2022– January 2023 from students enrolled in the Anesthesia Program of the Medical Services and Techniques Department at Gümüşhane University Kelkit Sema Doğan Health Services Vocational School in Turkey who had experience with the subject under investigation. The participants consisted of 33 students selected through purposive sampling from second-year students who had completed a 30-day summer internship in operating rooms across various regions of the country. The inclusion criteria were being a student in the Anesthesia Program, having completed a summer internship in an operating room, being mentally and physically fit for the interview, and being willing to participate in the study and answer questions. The exclusion criteria were students who had not completed a summer internship in an operating room and were unwilling to participate in the study. This research was conducted using the phenomenological design from qualitative research approaches. In phenomenological research, participants are selected from among individuals who can deeply convey their experiences and perceptions related to the phenomenon under investigation; therefore, the sample was created using purposive sampling. Accordingly, interviews were conducted with participants who were thought to be able to provide rich and meaningful data on the research topic. As the interviews progressed during the data collection process, it was observed that the data obtained began to repeat itself, and no new themes, meanings, or descriptions emerged; thus, it was accepted that saturation, the fundamental criterion in phenomenological research, had been reached. At this stage, the sampling process was terminated, and the study was conducted with a total of 33 participants. Data were collected using a semi-structured interview technique in the study. The interviews were conducted face-to-face with the students in a calm environment, and the location and time of the interview were determined by the participants' school and at a time specified by the participants. The average

duration of the interviews was 20 to 30 min. Participants were informed that they could withdraw from the study at any stage if they wished. Written informed consent was obtained from all participants.

Case scenario

A hypothetical case scenario was developed for anesthesiology technicians working in an operating room environment for the purposes of this study, and a semi-structured observation form was created. To ensure the validity of the study, two faculty members specializing in Guidance and Psychological Counseling were consulted regarding the content validity of the questions included in the study, and the final version of the questions was determined based on their feedback. The scenarios were then piloted over a one-week period with 10 anesthesia students who provided feedback on the functionality and comprehensibility of the scenarios. The pilot application resulted in a realistic and understandable case scenario. The data obtained from the pilot study were not included in this study. The case scenario for the study was as follows:

"A 32-year-old male patient who underwent general anesthesia was taken to the recovery room after surgery. To assess whether the effects of anesthesia had worn off, painful stimuli were applied to the patient by pressing on the joint areas of the right and left jawbones. During the application of painful stimuli, the jawbone was dislocated from the joint area."

The case scenario was prepared as follows. After preparing the case scenario, the following questions were asked to the students:

1. "You were the one performing the procedure and you were alone. How would you feel, what would you do?"
2. "You were with a colleague during the administration of the painful stimulus, and your colleague witnessed the situation. What would you do?"
3. "You were with a colleague during the administration of the painful stimulus, and your colleague caused the situation and you witnessed it firsthand. What would you do?"
4. "Why should the painful stimulus be administered during the process of waking the patient from anesthesia?" Four questions were asked in this format.

The case scenario was read to each student at different times by the researcher (HE), and students were asked to write their answers in a semi-structured form. In terms of the reliability process, the research questions were clearly

stated, the researcher's own position in the research process was clearly defined, and four open-ended questions were asked to the participants, and the data was collected in accordance with the purpose of the research.

Data analysis

In the data analysis process, each participant was assigned a number and coded as P1, P2, P3, etc. The obtained data were transcribed into a computer environment and examined in depth in line with the basic principles of the Interpretive Phenomenological Analysis approach proposed by Smith and colleagues [18, 21]. In this context, the researchers reviewed the raw data in detail through multiple readings and defined units of meaning; without referring to pre-determined codes and themes, all codes were inductively derived from the data. Each researcher coded the participants' statements independently, then the codes were compared, and any inconsistencies were reconciled through group discussions, and the validity of the codes was additionally verified by at least one other researcher. The relationships between codes were integrated within an interpretive framework to form overarching themes and subthemes; multiple coding was used when some statements covered more than one theme. The resulting themes were reevaluated and refined by the faculty team, after which the frequencies of the final themes were calculated and presented in the findings section as bullet points, supported by participant quotations, without commentary. To enhance the reliability and internal validity of the analytical process, researcher diversity was utilized, the analysis was repeated at different times to check code-theme consistency, and the transparency of the findings was ensured through direct quotations. Data were managed using Microsoft Word and Excel; no specialized software for qualitative data analysis was preferred.

Reliability and rigor

Two different anesthesiologists were asked to read the case scenario to determine whether it was realistic, and feedback was obtained on whether the scenario reflected reality. To ensure credibility in this study, assistance was sought from two academics who had completed their doctorates in psychology and psychological counseling. The academics read the interview reports in detail and coded them independently of each other. The coding performed by the two academics was compared with the coding performed by the researcher. The data were listed without interpretation and presented with the participants' statements, thus attempting to ensure the reliability of the research. To ensure the validity of the content analysis, the analysis was repeated at different times, and the opinions of different researchers were also taken into account in terms of researcher variation.

Table 1 Demographic characteristics of associate degree anesthesia students

Demographic Characteristics		
Age	Mean $\pm$ SD	21.4 $\pm$ 3.2
Gender	Female	29
	Male	4
Internship duration	30 days	
Units where the internship is conducted	Operating Room - Intensive Care	

Similar participant views were separated into sub-themes related to interpersonal relationships. The emerging themes were triangulated with an independent qualitative researcher (OOT) specializing in the subject and the researchers, thus ensuring the triangulation of the findings and increasing the plausibility of the results.

Results

Forty anesthesia program students were recruited for the study; however, seven students were excluded from the study because they did not meet the inclusion criteria, and the study was conducted with 33 participants. All students participating in the study ($n = 33$) were second-year anesthesia program students, 29 of whom were female (87.8%). All had completed a 30-day summer internship, which they completed in the operating room and intensive care units (Table 1).

The participants' responses to the first question of the case scenario, "You were the one administering the painful stimulus and you were alone. How would you feel, what would you do?", are presented in Table 2 with their codes and categories.

When examining Table 2, it is noteworthy that when looking at the emotions felt by undergraduate anesthesia students when administering painful stimuli alone during an example case of medical error, they can be categorized into two types of emotions: challenging and functional. When examining the reasons for experiencing these emotions, it is seen that they include feeling responsible, the incorrectness of the procedure performed, harming the patient, medical errors being a common occurrence, the problem being correctable, and it not being an intentional situation. Examples of related statements are given below:

"I feel bad. Because I harmed the patient, even if unintentionally." (P3) and "I would feel guilty and bad because I gave the painful stimulus incorrectly or excessively." (P17).

"Of course, I didn't do it intentionally. It could have happened without panicking..." (P4) and "I don't feel anything; these things can happen." (P20).

Table 2 Frequency, Categories, and codes of the feelings and behaviors experienced by associate degree anesthesia students when administering painful stimulation alone during a sample case related to medical errors

Themes	Categories	Codes	Sample Statement/Statements
Emotions	Challenging Emotions	-Fear of feeling responsible -Feeling guilty and bad about the action taken -Feeling inadequate because of the action taken -Panic and feeling bad because you think you have harmed the patient -Feeling uneasy about it -Feeling sorry for the patient	<i>"I feel bad. Because I harmed the patient, even if unintentionally." (P3)</i> <i>"I felt guilty and bad because I gave the painful stimulus incorrectly or excessively." (P17)</i>
	Functional Emotions	-Not feeling bad because I thought such situations could happen -Not panicking because I thought the dislocated jaw could be reset -Not panicking and staying calm because it wasn't done intentionally	<i>"Of course I didn't do it on purpose. Since it's a situation that can happen without panicking..." (P4)</i> <i>"I don't feel anything; such things can happen." (P20)</i>
Behaviors	Desired Behaviors	-Notifying relevant individuals (doctor, specialist, etc.) and seeking help -Share this situation with someone or a colleague and look for a solution -Stay with the patient -Monitor the patient -Explaining the situation to the patient -Ensuring the patient does not move -Calm the patient -If a mistake was made, take care not to repeat the same mistake in subsequent applications -Report the accident	<i>"If the patient is awake and calm, I would explain the situation." (P2)</i> <i>"I would notify the relevant units before the patient wakes up and consult with the doctor about the treatment that can be done at that moment. I would wait by the patient's side until their jawbone is set." (P17)</i> <i>"I would explain the necessary information to the doctor and keep a report because it was an accident." (P24)</i>
	Undesirable Behaviors	-Hiding the accident from the patient and specialists and intervening individually -Sedating a patient who cannot remain calm -Escaping the situation	<i>"If the patient wakes up, I will not mention that their jaw is dislocated. I will take action to treat the patient. However, I do not want my superiors and supervisors to know about this situation. I will try to resolve the situation without anyone finding out." (P10)</i>

It is stated that students will exhibit desired behaviors such as informing relevant persons, waiting at the patient's bedside, sharing the situation and seeking a solution, and calming the patient, and that they will exhibit undesirable behaviors such as concealing the incident and putting the patient back to sleep.

For the second question of the study, "You were with a colleague during the administration of a painful stimulus, and your colleague witnessed the situation. What would you do?", the participants' answers are given in Table 2 with their codes, sub-themes, and categories.

When Table 3 is examined, the behaviors of undergraduate anesthesia students during the administration of painful stimuli in a sample case of medical errors, when a colleague witnesses the incident, are divided into two categories: desired and undesired behaviors. Desired behaviors are examined in three subcategories: seeking help, patient follow-up and intervention, and reporting behavior. Examples of related statements are provided below.

"Even if my colleague was next to me, I would not intervene with the patient; I would still wait for help." (P11). "Then things would get complicated because there is a witness to the crime. I would immediately call a code team. I would remain calm." (P31). "I would still want them to do the same things and witness it. Because it could be thought that I did something else." (P32).

"It would be better if I had someone with me to monitor the patient while I called the necessary team for the other person. After all, these things can

happen in the field, there's no need to panic." (P4). "I would ask my colleague for help. We would intervene together." (P6). "I would report this situation to my unit supervisor, so as not to put myself and the patient at risk (for reporting and taking minutes if necessary)" (P14).

Students also exhibit undesirable behaviors such as keeping the incident secret and acting according to the attitude of the person in charge. The reasons for exhibiting this behavior may be that the incident is perceived as something that should not be heard or kept secret.

"It would be better to have a witness. I don't need to explain the situation, and I would calmly approach it and try to resolve the situation without it being heard, with their help. However, if my supervisor is understanding and has crisis management skills, meaning I think they will help me, I would share it with them too." (P10). ".....I would try to keep the incident confidential." (P20).

The participants' responses to the third question of the study, "You were with your colleague when the painful stimulus was administered, and your colleague caused the situation, and you witnessed it yourself. What would you do?" are presented in Table 4 with their codes, sub-themes, and categories.

When examining Table 4, the behaviors of undergraduate anesthesia students witnessing a painful stimulus being administered by a colleague in a sample case of medical error were divided into two categories: desired

Table 3 Frequency, Categories, and codes of undergraduate anesthesia students' behaviors when a colleague witnesses the administration of a painful stimulus based on a sample case of medical errors

Theme	Categories	Subcategories	Codes	Sample Statement/Statements
Behaviors	Desired Behaviors	Seeking Help	-Notifying relevant people and asking for help -Asking a friend to call for help -Wait for help without intervening	<i>"Even if my colleague were with me, I wouldn't intervene with the patient; I would still wait for help." P11</i> <i>"Then things would get complicated because there would be a witness to the crime. I would immediately call a code team. I would remain calm." P31</i> <i>"I would still ask them to do the same things and testify. Because it could be thought that I did something else." P32</i>
		Patient Monitoring and Intervention	-Waiting by the patient's side -Intervening together in the situation	<i>"It would have been better if someone had stayed with me to monitor the patient while another person called for the necessary team. After all, these things can happen in the field, there's no need to panic." P4</i> <i>"I would ask my colleague for help. We would intervene together." P6</i> <i>"While I wait at the patient's bedside, I would want my colleague next to me to notify the specialist." P23</i>
		Reporting	-Reporting	<i>"I would report this situation to my unit supervisor to avoid putting myself and the patient at risk (for reporting and taking minutes if necessary)." P14</i>
	Undesirable Behaviors	-	-Acting according to the supervisor's attitude -Attempting to keep the incident confidential	<i>"It would be better to have a witness. I don't need to explain the situation, and I can calmly approach it and try to resolve it without anyone else finding out, with their help. However, if the person in charge is understanding and has crisis management skills, meaning I think they will help me, then I would share it with them too." P10</i> <i>".....I would try to keep the incident confidential." K20</i>

Table 4 Frequency, Categories, and codes of undergraduate anesthesia students' behaviors when witnessing a painful stimulus administered by a colleague in a sample case related to medical errors

Theme	Categories	Subcategories	Codes	Sample Statement/Statements
Behaviors	Desired Behaviors	Seeking Help	-Notifying relevant persons, acting together -Reporting mistakes to the appropriate authorities	"If my colleague is worried, I first try to address their concerns and fears, explain that they may encounter such situations frequently, then suggest working together to resolve the situation and notify the relevant persons." P1 "I report my friend's mistake to the appropriate authorities." P24
		Providing Psychological Support to a Colleague	-Try to alleviate your colleague's concerns -Try to calm your colleague down	"If my colleague encountered such a situation and was afraid, I would try to calm them down and call someone to deal with the situation." P11
		Not leaving your colleague alone at work	-Help and support your colleague	"I would directly help my colleague." P6 "I would follow the same procedure for my colleague and support them during the process. I would prevent the procedure from being perceived differently." P32
	Undesirable Behaviors	Selfishness	-Avoiding responsibility	"Since I didn't do it, there's no problem." P28

and undesired behaviors. Desired behaviors were examined in three subcategories: seeking help, providing psychological support to the colleague, and not leaving the colleague alone. It is observed that the behavior of helping is exhibited because it is thought that the colleague will panic and be afraid in the face of the incident and therefore needs support.

"If my colleague is anxious, I first try to address their anxiety and fear, explain that they may encounter such situations frequently, then suggest working together to resolve the situation and notify the relevant people." (P1). "If my colleague encountered such a situation and was afraid, I would try to calm them down and call someone to deal with the situation." (P11).

Table 5 shows the codes, sub-themes, and categories of the participants' answers to the fourth question of the study: "Why should painful stimuli be administered when waking the patient from anesthesia?"

When Table 5 is examined, the participants' opinions are divided into two categories: painful stimuli should be applied and should not be applied. The category of painful stimuli should be applied consists of four subcategories: not harming the patient, ensuring the patient wakes up, application conditions, and working conditions.

"I think it should be done, but without exaggeration, and not starting with the jaw, but with less risky areas such as the nipple, earlobe, and small taps. If the patient does not react much, we should resort to this method." (P7). "It should be done (the level of painful stimulation should not be excessive). It helps the patient wake up faster, so painful stimulation should be used." (P14).

However, 5 participants stated that painful stimuli should not be administered because it harms the patient, and 2 participants stated that it should not be administered due to staff attitude.

"After witnessing painful stimuli, I think it should not be done. Because if you wait patiently, the patient wakes up. As far as I can see, things like earlobe, nipple, jawbone compression, etc., are harmful to the patient. If the patient's purpose is to protect and improve their health, we cannot cause more harm; it should not be done." (P2). "I think it should not be done in general. Most technicians administer painful stimuli violently just so they don't have to wait at the bedside. If patients are given a little time, they may wake up on their own. People who administer painful stimuli properly, not violently, should do it. And staff should be informed and trained on this subject." (P6).

Discussion

This qualitative study was conducted to investigate the behaviors of associate degree anesthesia program students who will work in the operating room after

Table 5 Undergraduate anesthesia students' thoughts on the administration of painful stimuli based on a sample case of medical errors: Frequency, Categories, and codes

Theme	Categories	Subcategories	Codes	Sample Statement/Statements
Thoughts	Painful Stimulation Should Be Performed	Do No Harm to the Patient	-Should be performed in a way that does not harm the patient -It should be performed in less risky areas -Should be performed without exaggeration	"It should be done, but without exaggeration and in a way that does not harm the patient." P3 "I think it should be done, but without exaggeration and not starting with the chin; we should resort to this method after trying less risky areas such as the nipple, earlobe, and small taps, if there is no significant reaction from the patient." P7 "It should be done, but not exaggerated. I think it's a waste of time to wait for them to wake up on their own." P20
		Ensuring the Patient Wakes Up	-It should be done to ensure that the patient is awake -It should be done because it helps the patient wake up faster	"Painful stimulation should be done because the patient needs to wake up completely, and we need to be sure of this." P5 "It should be done (the level of painful stimulation should not be excessive). It helps the patient wake up faster, so painful stimulation should be performed." P14
		Application Conditions	-Varies depending on the person performing it -Varies by hospital	"Actually, this varies depending on the person performing it. Healthcare workers who interpret painful stimulation differently may apply excessive pain to patients; there is no issue with administering the dose as prescribed." P4 "It may vary depending on the hospital. If the hospital has a post-op unit, we should not take the patient there and wait after surgery. However, if the hospital is small, there is no post-op unit, and there are few operating rooms, painful stimuli can be administered carefully to avoid overcrowding." P22
	Painful Stimulation Should Not Be Performed	Working Conditions	-If there is an emergency, it should be done	"If we have an urgent task after that patient, we can administer painful stimuli, but not to the extent of dislocating their jaw. We need to administer the stimuli carefully without overly disturbing the patient. If they are not waking up, I don't think there's much point in forcing it; we'll have to wait." P16
		Avoid Harming the Patient	-It should not be done because waiting causes the patient to wake up and harm the patient -The possibility of causing harm to the patient due to the use of disproportionate force	"After witnessing painful stimuli, I believe it should not be done. Because when you wait patiently, the patient wakes up. As far as I can see, ear lobe, nipple, jaw-bone compression, etc. are things that harm the patient. If the patient's purpose in coming there is to protect and improve their health, we cannot cause more harm; it should not be done." P2 "I don't think painful stimuli are necessary. The patient should be awakened by simply calling out to them or touching their shoulder. Because there is a disproportionate amount of force involved, which could lead to situations like jaw dislocation." P8
		Staff Selfishness	-Not staying by the patient's side	"I think it should not be done in general. Most technicians use painful stimuli violently just to avoid waiting at the bedside. If patients are given a little time, they can wake up on their own. People who use painful stimuli properly, not violently, should do it. And staff should be informed and trained on this subject." P6

graduation and how they cope with medical errors they may encounter in the future.

A qualitative analysis was performed on the students' written responses regarding how they would handle a hypothetical error scenario, focusing on the emotions they would experience if they were alone during the occurrence of a medical error and not witnessing the event; These emotions were divided into two categories: challenging emotions (fear, feeling guilty, feeling inadequate, etc.) and functional emotions (not panicking, being able to remain calm). The study found that the majority of students experienced distressing emotions. In a study conducted to determine medical students' behavioral intentions towards medical errors, it was found that when students themselves caused the error, emotional reactivity was more dominant, whereas when a colleague caused the error, students were more inclined

to communicate, report the error, and take preventive action. It has been noted that students show an emotional response when involved in error production, are emotionally affected, and even feel guilty [8]. In a study conducted with nursing students, it was found that students often did not report a medication error to the instructor and supervisor due to "fear of humiliation and blame" and "fear of losing grades and being scolded by the professor." Additionally, it was found that students sometimes considered reporting the error insignificant and concealed it, and one reason for refusing to report medication errors was that they were considered insignificant from the nurses' perspective [22]. A study with nurses found that more serious errors, where the patient was in serious danger, stayed with them longer, and that a negative work environment and more intense negative emotions were another factor contributing to the subsequent

effects. In contrast, participants stated that the positive attitude they received from their seniors and colleagues minimized their fears. It was found that appropriate support from others alleviated the distress of healthcare workers, while a lack of support increased their psychological burden. It was reported that the support received mostly came from colleagues who had experienced similar situations in the past and from seniors who helped them cope with the mistake rather than blaming the nurses [23]. Similarly, in our study, it can be said that the majority of students experienced emotions that could negatively affect their mental health because they felt guilty due to the mistake originating from themselves and therefore exhibited emotional reactions such as fear and anxiety. The phenomenon known as “secondary victimization,” which describes the emotional and psychological distress experienced by healthcare workers following patient safety incidents, has been described in the literature [24, 25]. It can be said that healthcare workers involved in adverse patient events, medical errors, or patient-related injuries may subsequently experience trauma due to the incident.

During the occurrence of medical errors, student behaviors were categorized into desired and undesired behaviors. It was observed that the majority of students exhibited desired behaviors (seeking help, providing psychological support, reporting, etc.) when medical errors occurred. The rate of seeking help by informing relevant persons was high, while the rate of reporting was low. Similar to our study, in a study conducted with surgical nurses, the responsible nurses stated that they communicated with the responsible physician when there was a problem related to patient safety in the ward where they worked [26]. In a study conducted to determine the tendency of nursing students toward faulty medical practice, the statement “The person who makes the medical error is not at fault” received the highest score. This may be due to students’ low awareness of the importance of medical errors and their tendency to feel overly blamed [27]. A study with nurses found that nurses did not report medical errors because they feared job threats, legal liability, negative economic effects, reputation recovery issues, and other negative consequences of reporting. Nurses believe that reporting medication errors leads to blaming colleagues rather than the system, holding them responsible for subsequent reporting errors, and fear of reprimand and punishment. This fear is exacerbated by inadequate training, which makes nurses feel unprepared and insecure in their roles, contributing to reluctance to report [28]. A study conducted with Romanian nurses indicated that nurses working in the surgical unit used communication styles affected by procedural complexity [29]. The strong positive correlations between hospital errors and emotional exhaustion, desensitization, and

decreased personal accomplishment highlight the significant psychological impact of these errors on clinicians [30]. Fear of potential negative consequences or the lack of clear definitions of reportable events may also be factors contributing to low reporting rates.

In our study, students were asked about their behavior when a colleague witnessed an incident occurring, and the majority of students responded with seeking help, patient follow-up and intervention, and reporting. The medical error approach refers to the attitude of hospital management and colleagues towards reporting errors. However, reporting actual incidents and near misses is vitally important in the context of institutional patient and staff safety. Studies have shown that when medical errors are reported, they are rarely disclosed due to fears of blame or punishment, leading to underreporting, concealment, and a negative attitude toward medical errors [11, 12, 14, 31]. A study with medical students revealed that communication behaviors are influenced by personal characteristics, psychological processes, complex interactions in the clinical setting, and a sense of responsibility. Proactive attitudes, confidence in knowledge, positive experiences, and a strong sense of responsibility for patient safety encouraged communication, especially in stable scenarios or within supportive teams. Conversely, hierarchical barriers, inaccessible supervisors, fear of criticism, and negative past experiences such as dismissal hindered communication. Additionally, students who felt less responsible for clinical outcomes were less likely to speak up and often delegated responsibility to senior physicians [32]. These findings highlight the need to boost students’ confidence in their knowledge and communication skills, address hierarchical challenges, create supportive environments, and foster a shared sense of responsibility to encourage speaking up and reporting incidents, as well as seeking help. Students’ failure to report incidents may be attributed to reasons such as not viewing certain situations as errors, being reluctant to openly admit their mistakes due to fear of reprimand from coworkers or faculty, believing they lack formal authority to sign off on reports, and fearing punishment. Providing non-punitive responses to errors plays a critical role in fostering positive attitudes toward patient safety. Encouraging a non-punitive approach is vital, as punitive measures can create an environment of fear and silence, jeopardizing the transparency and learning necessary for excellence in care [33].

In our study, students were asked about their behavior when a colleague committed an error and they witnessed it. While the majority of students exhibited the desired behavior, one student stated, “It’s okay because I didn’t do it.” At the same time, statements such as “these things can happen” in our study show that students view the incident as a “normal situation.” Making mistakes is a

normal human experience. However, in the medical profession, making mistakes has historically been considered deviant. In fact, medical culture implicitly expects doctors and other healthcare professionals to be free from normal human error, emphasizing perfectionism. The idea that making mistakes is human and that errors can occur seems correct to students, and medical errors continue to be common [9, 34–36]. The fundamental principle of ethical behavior in medical practice is to act in the patient's best interest. Patient safety attitudes and culture are important factors in efforts to reduce medical errors and increase patient safety. The knowledge, skills, and attitudes that develop a patient safety mindset and facilitate learning from errors can be acquired through clinical and theoretical education [37–40]. Low psychological and emotional safety in units can lead to reluctance to voice concerns and advocate for patients. Such a work environment can further normalize bystander behavior in teams. It has been explained that the more people are involved in a critical situation, the less likely it is that someone will take action against the negative situation. The greatest bystander effect occurs when no one intervenes because everyone believes that no one else has noticed the emergency [41]. Students' situation may be described as stemming from the spectator effect or the adoption of a human factors approach. Human factors acknowledge the universality of human error. Human elements in healthcare are significant and can sometimes lead to fatal outcomes. It is crucial to acknowledge the potential for human factor errors due to unfamiliar tasks, time constraints, stress, fatigue, illness, cultural factors, and risky attitudes, and to implement strategies and protocols to minimize their impact in order to enhance the safety of healthcare systems. Students may not fully understand what constitutes a medical error. To increase students' sense of accountability for disclosure, they should be provided with specific guidance on disclosure and encouraged to view every error as a learning opportunity [42].

Anesthesia is a reversible, controlled state of unconsciousness. Recovery from anesthesia refers to the process of the patient intentionally regaining consciousness after surgery and the discontinuation of anesthetic drugs. Recovery from anesthesia is seen by most physicians, patients, and their families as a successful indicator of a return to the pre-anesthesia physiological state after surgery. There is no standard postoperative awakening; it varies depending on the surgery performed, the patient's general condition, and the experience of the anesthesia team performing the awakening [43–45]. The duration of emergence from anesthesia is influenced by patient factors, anesthetic factors, the duration of surgery, and painful stimuli. The presence of postoperative pain accelerates recovery. Since there is no specific tool

for monitoring recovery after anesthesia, clinical assessment is performed using the Glasgow Coma Scale, which is frequently used to measure the level of consciousness in various situations. Although the Glasgow Coma Scale was developed for the examination and prognosis of traumatic brain injuries, it also provides a useful approach for determining the level of consciousness after general anesthesia [46, 47]. The majority of students stated that "painful stimuli should be applied" when waking the patient from anesthesia. The fact that the majority of students stated that "painful stimuli should be administered" may be due to the administration of painful stimuli during the Glasgow Coma Scale assessment or their interpretation that painful stimuli are administered during neurological assessment to wake the patient.

Limitations

Since our sample consisted only of students enrolled in Associate Degree Anesthesia programs in Turkey and was coded by Turkish researchers, the transferability of the data may be limited.

The absence of a study containing the final question of the research is also among the limitations in terms of data comparison. However, as it is the first in this field, it will shed light on future research.

Conclusion

This study represents the behaviors of anesthesia program students in response to medical errors they may encounter in the future through a hypothetical scenario and how they cope with these errors. The qualitative responses provided by the students revealed aspects that cannot be measured by medical error attitude scales. It provided a perspective on healthcare regarding what should be done when medical errors occur, while also involving anesthesia technicians, the unsung heroes of operating rooms, in the process. Regarding medical errors, educators gained insight into where the error might have originated and identified student perspectives, providing an opportunity to develop new educational strategies. Error reporting training should be an explicit part of the health profession curriculum at the undergraduate and graduate levels and should not be left to chance. Additionally, institutional support for error reporting is essential.

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Authors' contributions

Conceptualization: H E, H K Data curation: H E Investigation: H E Methodology: H E Project administration: H K Supervision: H K Writing—original draft: H E Writing—review & editing: H K.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval consent to participate

The work was conducted according to the Declaration of Helsinki [48]. For its ethical consideration, written permission was taken from Karadeniz Technical University Health Sciences Scientific Research Ethics Board (2023/E-13562490-199-350469-30). In addition, the study was conducted with volunteering anesthesia students. Additionally, institutional permission was obtained from the Gumushane University Vocational School of Health Services on June 6, 2023, with the reference number E-18562243-044-176626.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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