

Identifying Risk Factors and Managing Recurrence of Anesthesia Awareness

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Abstract

Awareness under anesthesia is the recall of events that happened during general anesthesia. Researchers have tried for years to interpret risk factors that make patients more inclined to be affected. There are certain ramifications that this can cause, like mental health issues and further issues of distrust in healthcare professionals. This literature synthesis addresses intraoperative awareness, the risk factors, and potential resulting repercussions. The literature included articles about the causes, risk factors, management, and effects of anesthesia awareness. The current findings show that there is hope that these new risk factors and detection methods can prevent and decrease this prevailing complication. As we have found out, some of the reasons that people experience awareness are medications being ineffective, neuromuscular blocking agents, obesity, cesarean sections, equipment failures, comorbidities, heart operations, prescription of amnesic medications, and human error. This topic needs to be explored further and, in more depth, to address preventative measures to reduce this surgical complication.

Keywords: anesthesia awareness, surgical complications, intraoperative awareness, risk factors

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This research addresses intraoperative awareness, the risk factors, and potential resulting repercussions. The literature included articles about the causes, risk factors, management, and effects of anesthesia awareness. Anesthesia Awareness is a devastating complication that can lead to a sequela of adverse outcomes for the patient. According to Tamire et al., “Awareness can result in significant distress to patients and long-term psychological consequences, including symptoms associated with post-traumatic stress disorder, anxiety, nightmares, night terror, dissatisfaction with surgical service, and sometimes even suicide” (2019, p.1). The occurrence of anesthesia awareness can cause distrust in healthcare workers and negatively impact patient satisfaction and healthcare visits. It is important to nurses to have trust to build nurse-patient relationships and allow for effective communication. After comparing and contrasting the articles in the literature, further review was performed to gather more in-depth information exploring the potential reasons and risk factors for anesthesia awareness. This review will then be broken down into six headings: the background, the purpose, methods, key results, a discussion, and a conclusion to provide organization and structure to the research project.

Background

A key factor for anesthesia awareness is surgery which surrounds diagnoses, treatments, and lifesaving measures. In most surgeries, the use of regional or general anesthesia plays a role in making sure the patient is comfortable and pain-free during the procedure. Awareness under anesthesia is the recall of events that happened during general anesthesia. Researchers have tried for years to interpret risk factors that make patients more inclined to be affected. There are certain ramifications that this can cause, like mental health issues and further issues of distrust in healthcare professionals. According to Lakshmi et al. (2023), “One or two incidents of awareness

under anesthesia may happen out of every 1000 patients receiving a general anesthetic (0.1%-0.2%)” (p.1). This event is very rare but extremely devastating to the ones that it affects.

Therefore, it is crucial to uncover why it only affects certain individuals. It is also important to note that the affected individuals have different variations of awareness. Some recollect dreams that they experienced, and some completely wake up but are paralyzed by the neuromuscular blocking agents, and they are completely helpless. According to Pappal et al. (2021), “Prospective studies have estimated prevalence of awareness with paralysis during general anesthesia to be approximately 0.1% to 0.2%; 1.0% in high-risk patients given only intravenous anesthesia” (p.532). Understanding the risk factors and repercussions of anesthesia awareness would be a step forward in the right direction. This would eliminate the fear and anxiety patients might feel before procedures. Hopefully, after more research is done the chances of this complication will decrease and lead to more positive healthcare experiences.

Purpose

The primary purpose of this study is to discover risk factors for anesthesia awareness that will help determine preventative measures. Also, to identify the repercussions that result from this surgical complication. Anesthesia awareness is a preventable complication that needs further research to fully understand this phenomenon’s complexity. This literature synthesis focuses on comparing different studies to find similarities among the factors that can cause anesthesia awareness. Identifying the potential risk factors of awake anesthesia will hopefully decrease the phenomenon’s occurrence during surgery. Reducing this complication has the potential to bring benefits to the surgical atmosphere and reduce patient fear.

Understanding the repercussions that anesthesia awareness causes will be a step forward in helping the affected patients. Anesthesia advancements have allowed for lifesaving procedures

to take place. Surgeries have become more precise and accurate than ever. The field of anesthesia is based on medicines that can take patients' pain away during procedures. Still, for a percentage of individuals, their pain is heightened because of the occurrence of anesthesia awareness. After how far we have come in medicine, awareness under anesthesia should not be happening, and there should be a way of reducing the complication. There needs to be further exploration into the factors that scientists and researchers have found as to why certain people awaken during a surgery and are aware of what is happening during procedures. To take this a step further, the idea of providing resources to the affected individuals will significantly help with their complications and build trust in the healthcare community.

Methods

Reliable library resources were utilized, to find scholarly articles, including search engines PubMed, One Search, and ProQuest. The search parameters included only articles published in the past five years. This assures any readers that all the information is up to date and makes the literature review strong. Only peer-reviewed and scholarly articles were retained. The research started with broad search terms, including “anesthesia awareness” or “intraoperative awareness.” This was to gain enough knowledge to understand the topic better. Since the initial terms were broad, there were 1,924 results from One Search, 1,465 results from PubMed, and 14,409 results from ProQuest.

After reading several articles, it was highlighted that the concept needed to be more specific to result in more appropriate articles. A meeting with a librarian, Mrs. Carrie Forbes, discussed various ways to search and find information within a database to group specific concepts into parentheses and separate them with “AND.” By grouping the keywords, the database can easily be found in the order searched. The first set of concepts that were searched

was “(anesthesia awareness) AND (risk factors).” This allowed multiple articles to be found that were more appropriate and related to the topic. When searched 258 results were found on One Search, 176 on PubMed, and 10,037 results on ProQuest. After getting an abundance of articles with this search, the concepts were edited to add the repercussions of anesthesia awareness with the search (anesthesia awareness) AND (repercussions). This search found five results on One Search, two on PubMed, and 467 from ProQuest. Not many articles were found that strictly related to the after-effects of anesthesia awareness and how patients deal with them, which was still a part of the topic that needed discussion. So, the search was edited again to (anesthesia awareness) AND (effects). This led to more results that were more in the range of the topic. It gained 530 results from One Search, 587 from PubMed, and 11,830 from ProQuest.

Although various search terms and concepts were used, the results for relevant articles were minimal. This was due to anesthesia awareness being so rare and the fact that not a lot of research has been done on this topic yet. This prompted the search parameters to expand to the publication date of the last ten years instead of five. By changing the search parameters, articles that were more relevant to the literature synthesis topic. The first search using the keywords (anesthesia awareness) AND (risk factors) returned 448 results from One Search, 308 results from PubMed, and 112,788 results from ProQuest. The search (anesthesia awareness) AND (effects) gained 1,040 results on One Search, 1,043 on PubMed, and 70,208 results from ProQuest. Many of the articles found revolved around intraoperative awareness from 2007-2017. The lack of recent information was an interesting finding and somewhat intriguing since the advancement in modern medicine and technology. The impact of COVID-19 significantly impacted surgical operating rooms in many cases completely closing for extensive time periods.

During the COVID- 19 Pandemic there was not any ability to have any type of studies or documentation, due to only necessary roles in the operating room.

Articles were also found by looking through the references for specific articles related to the topic, known as a scoping review. The scoping review found that many of these prestigious studies were mainly referenced from sources over five years old and some older than ten years old. Also, some of the articles that were in line with the topic did not allow assessment at times for unknown reasons. When finding the articles that fit the topic, they were saved to a computer and printed out for review. Since there seem to be few studies done on this topic it took an extensive further review to find the scholarly articles that were relevant and peer-reviewed. ProQuest was the most beneficial in result numbers and led to most of the articles that were utilized.

Results

The first study, titled *Strategies to relieve patients' pre-operative anxiety before anesthesia: Experiences of nurse anesthetists*, Clair et al. (2020), found that strategies that nurse anesthetists can utilize to reduce anxiety and lead to a better perioperative experience for these patients. This includes answering all questions that the patients and family may have, making eye contact, and being safe. According to Clair et al. (2020), “Only six participants were included in the study, all working in the same surgical department, it could be seen as a weakness” (para. 37). According to the author Clair et al. (2020), “Nurse anesthetists experienced that a major source of concern and anxiety was due to the patient not receiving sufficient information about the anesthesia” (para. 39). Strategies to relieve anxiety could significantly reduce fear and anxiety felt pre-operative which could be a risk factor for intraoperative awareness.

The article *Relationship between knowledge toward anesthesia and Fear of Anesthesia in the Patients and their companions in teaching hospitals of Golestan University of Medical Sciences* determined the relationship between awareness and patient's fear. Similar to the first article, both of these studies found that increased fear about anesthesia leads to worse conditions postoperatively (Bakhsha, 2017). However, many of the authors of the study could adequately determine that no correlation was found between fear and anesthesia awareness among patients; this is a strength. This study concluded that fear and anxiety can have very dangerous consequences for the surgery. Bakhsha et al. (2018) further stated, "The highest item of fear was fear of not waking up and falling asleep forever in anesthesia" (p.12). Educating patients about anesthesia and its related factors while having anesthetic counseling could decrease fear and anxiety related to surgery.

Likewise, the study titled *Effects of pre-operative anxiety and general anesthetic administration on intraoperative awareness in patients undergoing cesarean section* investigated the result of pre-operative anxiety and the general administration of analgesics on anesthesia awareness, specifically in patients who were undergoing cesarean sections (Gençoğlu, 2019). A weakness found in the study was that high-risk pregnancy patients were included, and it could not be determined whether the results could be generalized, especially among high-risk pregnancies. Gençoğlu found that since pre-operative anxiety levels are low in cesarean sections patients could not assess the effect on awareness. However, (Gençoğlu, 2019) did believe that the anesthetic Ketamine caused more dreaming and hearing sounds, which could cause awareness as these can be common side effects with that medication. According to Gencoglu et al. (2019), "As a result, we point out that the use of propofol for anesthesia induction is appropriate for a cesarean section" (p.120). Since patients undergoing cesarean section are

considered high risk for anesthesia awareness, this study can be beneficial in determining what medication should be administered based on the potential side effect profile.

The article *Awareness Among the Patients Under General Anesthesia: A Cross-Sectional Study* estimated the incidence of awareness among those undergoing general anesthesia. This study found a correlation between awareness and comorbidity among the patients. The study included patients who underwent endoscopic sinus surgery, septoplasty, mastoidectomy, or laparoscopic appendectomy under general anesthesia. Lakshmi et al. utilized the Brice Scale in this study. The Brice scale is a questionnaire that can be used to assess awareness during general anesthesia. In the article, Lakshmi et al. (2023) stated, “The incidence of awareness among the study participants was 2 percent, according to the modified Brice questionnaire” (p.5). This contributes to the fact that this is a rare but impactful occurrence. Although a weakness of the study was that risk factors were not considered, it was discovered that low and high BMI is potentially a risk factor for example. One weakness that was found was the current study did not measure the depth of anesthesia. The questionnaire is also subjective, which could have influenced the results.

Correspondingly, the article titled *The ED-Awareness Study: A Prospective, Observational Cohort Study of Awareness With Paralysis in Mechanically Ventilated Patients Admitted From the Emergency Department* assessed the number of incidences of awareness of paralysis in ED patients receiving mechanical ventilation. Pappal et al. (2021), “The percentage of prevalence of awareness with paralysis was 2.6%” (p.542). As shown, the rare occurrence of awareness makes researchers struggle to find answers to the cause of such a devastating complication. This study revealed that rocuronium exposure in the Emergency Department, which is associated with mechanical ventilation, led to the prevalence of awareness of paralysis.

Rocuronium is a neuromuscular blocking agent that relaxes skeletal muscles to facilitate tracheal ventilation. They also found that the longer-acting neuromuscular blocking agents are an important risk factor for awareness of paralysis. According to Pappal et al. (2021), “In this study, all patients with awareness with paralysis events that appeared temporally associated with the postintubation phase of care had a longer-acting neuromuscular blocking agent administered” (p.542). These findings should suggest that healthcare professionals increase patient-centered monitoring for complications that could exist with the use of rocuronium. A weakness of the study is the overall sample was small and derived from a single center. Along with the other studies, there is subjectivity in assessing awareness with paralysis.

The article *Clinical Effectiveness of Bispectral Index To Reduce The Risk Of Awareness For Elective Surgical Patients Under General Anesthesia: An Observational Study* focused more on whether the Bispectral Index (BIS) can reduce the risk of intraoperative awareness. The BIS is a brain-monitoring device that measures the depth of consciousness. In the past, all that was used to measure anesthetic adequacy was vital signs to monitor patient status. The depth of anesthesia is a very important factor in preventing awareness and complications that potentially can follow. As stated by Dikkala et al. (2023), “BIS monitoring successfully reduces anesthetic use while preventing patient awareness resulting in quicker emergence from anesthesia decreased post-anesthesia care unit time” (p.215). This shows that this specific monitoring could minimize the following complications like post-traumatic stress disorder. The study only identified one patient out of the 98 who experienced awareness during surgery. Using a larger sample size could have given more information about the Bispectral Index during intraoperative awareness.

The study titled *Detection method of intraoperative awareness: a randomized comparative study* compared the effectiveness of different questioning methods and times that are used in intraoperative awareness research to detect the incidence. The study's weakness was that, as a single-centered study, the number of cases was limited compared to similar studies. The questioning methods matter since it is challenging to determine the prevalence of intraoperative awareness with certainty. It is important to note that almost all of these articles have used the Brice questionnaire to determine the incidence. The study involved different questioning methods and questioning times to decide the correct method. Bektas (2022) concluded that the Brice questionnaire with guided questions, was superior to anesthesia quality control and assurance evaluation for determining the incidence. Bektas (2022) identified that the incidence of awareness was 5 times greater in the Brice questioning. Opposing other articles, found that interviewing several days after the use of general anesthesia led to fewer awareness reports. According to Bektas et al. (2022), "The incidence of awareness was higher in the 1st interview, but lower in the 2nd interview after 24 h" (p. 2001). Compared to the other articles, there were increased reports in the 2nd and 3rd interviews due to memory recovery.

The article *Magnitude and Associated Factors of Awareness with Recall under General Anesthesia in Amhara Regional State Referral Hospitals* discusses the possible associated factors of awareness with recall (2018). Similarly to the other studies, this article also used the Brice questionnaire to detect awareness. This article also mentioned that the first case of awareness ever recorded was the first administration of an anesthetic. It brought attention to the prevalence of awareness in 3rd world countries being higher due to a lack of new advanced technology or medication. After their research study, they found a new possible risk factor associated with awareness. As stated by Tamire et al. (2019), "The multivariable logistic regression analysis

showed that patients who are not premedicated with benzodiazepines or atropine were at increased risk of awareness with recall under general anesthesia” (p.3). This article was beneficial in discussing a new solution to this phenomenon. Likewise, this article also recommended researchers interview patients more than once for a better diagnosis of awareness with recall. A detailed interview of patients who reported awareness of recall was not done, which could have helped confirm awareness detection.

Discussion

As previously stated, anesthesia awareness is a serious complication that needs to be further researched to find prevention. If the factors that make awareness more prevalent are not identified the number of patients affected will continually rise and lead to more psychological disorders and complications. All the articles have utilized the Brice questionnaire to detect the incidence of anesthesia awareness in patients. The article *Detection method of intraoperative awareness: a randomized comparative study* revealed that this questionnaire was a successful tool for determining awareness (2022). The Brice questionnaire is a reliable and standardized method for identifying people that experience awareness. Since the incidence is subjective, it is of equal importance to find the correct tool to determine the prevalence.

The prevalence of anesthesia awareness is essential to this topic because we need to understand if the number of patients with this effect increases or decreases. Which would allow researchers to identify potential risk factors. The articles *Awareness Among the Patients Under General Anesthesia: A Cross-Sectional Study* and *The ED-Awareness Study: A Prospective, Observational Cohort Study of Awareness With Paralysis in Mechanically Ventilated Patients Admitted From the Emergency Department* both focused their research on the number of incidences of the individuals either in the Emergency Department or undergoing certain

procedures like septoplasty and mastoidectomy. Both showed that around 2% of the cohort had an incidence of anesthesia awareness. This can challenge researchers to find the risk factors and discover solutions to this potential risk of anesthesia because it is a rare occurrence. In many of these articles, they explained what they believed to be probable risk factors. Obesity, underdosing of anesthesia, administration of longer-acting neuromuscular blocking agents, and lack of sedation depth monitoring were the most frequently identified as potential risk factors. For example, Pappal et al. (2021) stated, “Literature has demonstrated that for ED patients receiving longer-acting neuromuscular blocking agents such as rocuronium, postintubation sedation is initiated at lower doses and with greater delays compared with those who receive succinylcholine” (p.533). A simple choice of medication can potentially decrease the risk of suffering from this rare but impactful complication in anesthesia.

Another point to mention that was addressed in many of these articles was the idea that postoperatively, when you interview the patient for the study, you get more reports of awareness in the 2nd and 3rd interviews than the 1st or initial immediately after waking up from surgery. Lakshmi et al. (2023) stated, “Some people might not recall what happened right after surgery, but they might remember 1-2 weeks later” (p.1). Some articles recommended waiting weeks after an operation to interview, and others said that because they only did one interview with the patient, the data was limited.

The level of evidence is designed to categorize studies by the quality and evidence of the study. Also known as the hierarchy of evidence, it can be ranked based on the strength of the evidence within the study. The level of evidence varied in the articles between levels six and two. Many studies had a qualitative and quantitative approach, making them less reliable than some randomized control trials. It should be remembered that this topic is challenging to

research because it continues to be relatively unknown and rare. However, since some of the articles seemed to be more about quality control and did not have a higher level of evidence, my evidence would be moderate. Moderate evidence is evident due to one or more well-designed studies that were randomized controlled experiments.

Conclusion

The current findings show that there is hope that these new risk factors and detection methods can prevent and decrease the prevalence of anesthesia awareness. As we have found out, some of the reasons that people experience anesthesia awareness are medication's lack of efficacy, neuromuscular blocking agents, obesity, cesarean sections, equipment failures, comorbidities, heart operations, prescription of amnesic medications, and human error. It is recommended that these risk factors be examined before an operation and that the BIS monitor be used to ensure the appropriate level of consciousness intra-operatively. If a patient does report signs and symptoms of a possible experience of intraoperative awareness, then it is critical to intervene earlier than later. Possible effects of anesthesia awareness are post-traumatic stress disorder, nightmares, distrust in health care professionals, and even suicide. This topic needs to be researched further and in more depth to isolate preventative measures to reduce this surgical complication.

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