ACORN AUSTRALIAN COLLEGE OF PERIOPERATIVE NURSES | JOURNAL OF PERIOPERATIVE NURSING

Volume 35
Issue 1 *Journal of Perioperative Nursing*

Article 6

2-28-2022

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Recommended Citation

Bull, Dawn and Foran, Paula (2022) "Awareness under anaesthesia: The role of the perioperative nurse," *Journal of Perioperative Nursing*: Vol. 35 : Iss. 1 , Article 6.
Available at: https://doi.org/10.26550/2209-1092.1184

https://www.journal.acorn.org.au/jpn/vol35/iss1/6

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Awareness under anaesthesia: The role of the perioperative nurse

Abstract

Intra-operative awareness is very rare yet represents a serious complication of general anaesthesia. The ongoing consequences of such an event may cause significant distress and long-term effects such as insomnia, depression, anxiety and post-traumatic stress disorder (PTSD). To provide safer anaesthesia, it is critical to identify contributing factors related to both the patient and the anaesthesia to prevent intra-operative awareness in at-risk patients. It is also vital to provide education to Post Anaesthesia Care Unit (PACU) nurses and surgical ward nurses about the appropriate way to manage a situation when a patient reports intra-operative awareness following anaesthesia.

General anaesthesia with neuromuscular blockade is still considered the highest risk factor for intra-operative awareness. Depth of anaesthesia monitoring has come under the spotlight to try and address this complication; however, there is yet to be a device or technique that provides 100 per cent accuracy in measuring depth of anaesthesia.

It is the collective responsibility of all perioperative staff to identify patients at high risk of intra-operative awareness, manage the intra-operative complexities and offer support and expert counselling post-operatively when intra-operative awareness is reported.

Keywords: intra-operative awareness, recall, depth of anaesthesia monitoring, perianaesthesia, BIS, entropy, PACU nursing

Introduction

Intra-operative awareness is defined as 'post-operative recall of events during the period of general anaesthesia'.[1(p.115)] It is a distressing complication of anaesthesia where patients have reported paralysis, hearing intra-operative conversations, feeling surgical manipulations and sometimes pain, with associated feelings of being helpless and afraid.[2]

The fear of intra-operative awareness is second only to that of post-operative nausea and vomiting.[3] With the introduction of neuromuscular blockade, the significance of a patient being able to move (such as raising a hand or arm) as evidence of adequate anaesthesia has been significantly diminished; the first reported case of insufficient anaesthesia was reported in 1950.[4] The incidence of intra-operative awareness is estimated to be between 0.1 and 0.2 per cent,[5] with 10 to 25 per cent of cases considered to be associated with adequate anaesthetic dosing.[6] Clinical signs, such as elevated blood pressure and elevated heart rate, do not always occur in patients with awareness[2] thus using these signs as monitoring for depth of anaesthesia are unreliable.[6]

While the reported incidence of awareness may be considered low, some clinicians suspect intra-operative awareness is grossly underreported.[7] Intra-operative awareness can have significant, long-term and long-lasting effects on patients, such as anxiety, sleep

disturbances and PTSD.[3] Techniques to measure the depth of anaesthesia have come under the spotlight in an attempt to further reduce this phenomenon. There have been advances in technology, such as the forehead electroencephalogram (EEG) monitors, bispectral index (BIS) monitoring and entropy monitoring.[3] However, there is still no one modality that offers 100 per cent accuracy and reliability in determining the depth of anaesthesia.[1]

Following extensive reading on this subject, three themes emerged: risk factors for adult patients, depth of anaesthesia monitoring and detection of post-operative awareness. This discussion paper will present information on awareness under these themes and discuss implications for perioperative nurses and how they can advocate and care for patients who suffer this serious complication.

Risk factors for adult patients

Published studies divide risk factors, or predictors, into patient and anaesthesia factors.[7] Patient factors include previous episodes of awareness, anxiety, genetic mutations, being female and being young.[8] However, Sleigh et al. suggest that the awareness with recall phenotype is only shown when patients are receiving anaesthesia, thus too late for any preventative measures.[6] Other contributing patient factors include alcohol or drug abuse, chronic pain and long-term opioid use, metabolism-enhancing medications, anti-retroviral medications and high dose betablockers.[9]

One theme arising from research is whether a correlation exists between high pre-operative anxiety levels and an increased risk for intra-operative awareness.[1,10] In research by Altinsoy et al. researchers conducted a prospective, observational, cross-sectional study (n = 799) that involved administering a pre-operative anxiety screening tool known as the state trait anxiety inventory, which is widely used and accepted as the gold standard for determining anxiety.[10] While the results of the study did not show definitive links, results did demonstrate that patients with high scores in their pre-operative anxiety testing belonged to similar cohorts to those considered high risk for intra-operative awareness, suggesting this may be an avenue for future research.[10] These sentiments are echoed by Odor et al. who suggested routine pre-operative anxiety testing should become standard pre-operative anaesthesia practice, as it is only through evaluating data, assessing risk factors and understanding which patients are at high risk that a fuller and broader understanding of this phenomenon can occur.[11]

Anaesthesia factors are the use of total intravenous anaesthesia (TIVA) and neuromuscular blockade (NMB) agents[8] with the use of NMB agents representing the greatest risk factor for intra-operative awareness.[11] While intra-operative awareness can still occur using volatile anaesthesia, the additional monitoring parameters of minimum alveolar concentration and end-tidal gas analysis may reduce the incidence.[12]

Depth of anaesthesia monitoring

The Australian and New Zealand College of Anaesthetists (ANZCA) 'PG18(A) Guideline on monitoring during anaesthesia' advocates for the use of equipment to monitor the effects of anaesthesia on the brain, when clinically indicated or for those patients who are considered high risk for awareness.[13] As early as the 1930s, it was postulated that EEG monitoring could be used to determine anaesthetised states.[14] Monitoring patients' clinical signs was always considered an appropriate measure for assessment of the depth of anaesthesia monitoring[15] until the early 1990s when forehead sensors such as BIS and entropy monitors were introduced into anaesthesia practice as new depth of anaesthesia (DOA) monitoring.[16]

The BIS monitor is predominately used for DOA monitoring in Australia.[17] BIS monitors have a forehead sensor that is placed on the patient and connected to a monitor, measuring the EEG signals of the brain.[16,18] Through sophisticated algorithms, the monitor interprets the EEG signal and provides a numerical value between 0 and 100 with 90–100 considered fully awake.[16,18] A value of less than 60 is considered asleep, with some surgeries requiring lower numerical values.[14] The use of a BIS monitor in conjunction with clinical sign assessment may be a valuable tool in assisting with the assessment of depth of anaesthesia and in preventing recall.[14] A criticism of BIS monitors is that they are slow to respond to changes after administration of anaesthesia, taking approximately 10 seconds to interpret and respond to changes in EEG activity.[3]

Entropy monitors process both EEG and frontal electromyography (FEMG) data, converting these signals to give two numerical values state entropy (SE) and response entropy (RE).[19] RE is based on both EEG and FEMG signals and provides an indication of a patient's responses to external stimuli as well as possibly signalling early awaking.[19] The SE is a stable parameter based on EEG and can be used to assess the hypnotic effect of anaesthetic agents on the brain.[19]

RE is always higher or equal to the SE value.[19] Due to the RE parameter entropy monitoring responds to changes in stimuli in about two seconds; however, as it measures FEMG signals it is not useful in patients who are not paralysed or have underlying nervous conditions such as Parkinson's disease.[19]

The B-Aware trial was the salient research conducted on awareness by Myles et al. using a prospective, randomised, double-blind multicentre trial where adult patients (n = 2463) at high risk for intra-operative awareness were randomly allocated to either a clinical care group (n = 1238) or a BIS-guided anaesthesia group (n = 1225).[2] There were two reports of awareness in the BIS-guided anaesthesia group, and 11 reports in the routine care group (p = 0.022), indicating that BIS-guided anaesthesia reduced the risk of awareness by 82 per cent (95% CI 17–98%).[2] Since this research in 2004, some studies have supported the B-Aware trial findings[9,12,18] while others have not[8,16,20] revealing that evidence supporting the use of brain monitoring is conflicting.[15] As with any tool or monitoring device, there are limitations to the use of EEG-based monitoring, including connectivity of the forehead sensor.[21]

The detection of post operative awareness

It is currently unknown how long someone must experience an episode of intra-operative awareness to generate a memory that can be recounted after general anaesthesia.[11] An additional gap in knowledge is the effect that general anaesthesia may have on perceptual and episodic memory.[11] This is why post-operative interviews are considered important in detection of intra-operative awareness.[11,22]

Bombardieri et al. conducted post-operative interviews with 17 875 patients from multiple sites within a single health service who were considered high risk for intra-operative awareness.[22] Of the participants 622 reported a specific intra-operative memory that occurred between induction and emergence (3.48%, 95% CI 3.22%–3.78%) with 282 of these reporting a feeling or sensation of pain, paralysis and/or distress (1.58%, 95% CI 1.40%–1.78%).[22] Bombardieri et al. conducted the first interview prior to the patients leaving the PACU,[22] which is different to other studies that conducted the first post-operative interview between day one and day three post-operatively.[5,7,8] Bombardieri et al. found that 50 per cent of the reported cases were detected in PACU.[22] The PACU is the first place where a patient has the 'opportunity to communicate their own thoughts and feelings' post-operatively.[23 (p.193)]

A term occurring in the literature is 'thrice Brice'[11]. This refers to conducting post-operative interviews using a structured or modified Brice questionnaire on three separate occasions.[11] A lower sensitivity in reporting occurred when using unstructured interviews.[7] With the notable exceptions of the studies by Bombardieri et al.[22] and early research conducted in 2000 by Sandin et al.,[24] the literature recommends conducting structured interviews on the following three occasions: first on day one to three post-operatively,[5,7,8,11] second around 10–14 days post-operatively[5,7,8,11] and a final interview at 30 days post-operatively.[5,7,8,11,22] The second interview is highly regarded as the most beneficial in the reporting of intra-operative awareness, with authors suggesting 50 per cent of awareness reports occur at this stage.[11,23,22] A school of thought exists whereby all patients considered high risk should have 'thrice Brice' interviews conducted post-operatively as a means of using holistic measures and in an effort to address the gaps in knowledge.[5, 7,8,11,22,23]

Implications for perioperative nurses

It is the collective responsibility of all members of the perioperative team to understand the risk factors and management of intra-operative awareness.[23] As patient advocates, perioperative nurses have the opportunity to use their expertise and knowledge to identify those patients who may be considered high risk for intra-operative awareness and communicate this to the treating anaesthetist and intra-operative team members.[23] If pre-operative anxiety screening becomes routine practice, the perioperative nurse may play a vital role in administering the questionnaires.[25] Several authors believe the best management of intra-operative awareness is prevention.[1,7,9,11,26]

Anaesthesia nurses are required to have a knowledge base specific to their profession, including knowledge and training in EEG monitoring.[23] Therefore, the anaesthesia nurse, as an essential member of the intra-operative team, allows accurate EEG monitoring by ensuring sensors are correctly placed on the patient's forehead (specific for each different brand of EEG monitor), intra-operatively monitoring changes such as responses to stimuli, and understand what the numerical value signifies.[23] The role of advocating for patients is paramount and, while there is currently no perfect detection method, perioperative nurses can encourage the use of all available detection methods for their patients.

Patients are often afraid to report events of awareness for fear of not being believed or fear of reprisal.[27]

Dealing with these reports requires compassion and involves providing reassurance and psychological and emotional support.[28] Should a patient report an episode of awareness, it is vitally important that the PACU nurse listens to the patient, accepts what the patient is recalling and reassures the patient by reminding them that they are in the PACU, that the procedure is over and that they are now safe.[2] The PACU nurse has a unique opportunity to define this episode of care for the patient[28] and inform both the anaesthetist and their health service organisation immediately about this occurance.[26]

In some health service organisations, perioperative nurses conduct post-operative phone calls and therefore nurses can play an essential role reporting information provided by patients such as intra-operative awareness.[19] If adopted into routine practice for patients considered high risk for awareness, perioperative nurses should be familiar with the 'thrice Brice' practice[11] and, where possible, they may conduct the phone calls,[29] participate in the interviews and compile the survey responses.[19]

Conclusion

Despite the low incidence of intra-operative awareness, it is still an area of particular concern for clinicians working in anaesthesia due to the potentially harmful and long-lasting effects on patients. The perioperative nurse plays an important role throughout all aspects of the patient's perioperative journey in helping to advocate for use of detection monitoring and manage instances of intra-operative awareness that may be reported in the PACU. Research suggests understanding and detection of episodes of intra-operative awareness may be improved through genetic research and testing and pre-operative anxiety screening, both of which may be commonplace in future practice.

Perioperative nurses should be knowledgeable about intra-operative awareness and able to identify patients at risk, understand depth of anaesthesia monitoring and use patient advocacy skills to report and manage incidents of patient intra-operative awareness. It is plausible that perioperative nurses performing a perianaesthesia nursing role may be essential to the emerging trend of genetic testing by conducting blood sampling and implement anxiety screening by administering anxiety questionnaires.

Acknowledgment

This paper was submitted to the University of Tasmania as part fulfilment of subject CNA803, Advanced Clinical Nursing Practice, for the Master of Clinical Nursing (Anaesthetic and Recovery Nursing). The author sincerely wishes to thank Dr Paula Foran, unit coordinator, for her guidance throughout the master course and work in preparing this paper for publication.

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