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Association for Peri-operative Practitioners in South Africa
Vol 12 Issue 2 May 2026
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GENERAL INFORMATION

- The Journal is the official publication of APPSA (Association for Peri-operative Practitioners in South Africa). It provides personnel in the operating room and related services with original, practical information, based on scientific fact and principle

- APPSA is a non-profit organisation which exists for the benefit of its members. This is accomplished by way of congresses, local meetings and travel grants, with the express goal of raising the standard of peri-operative practice in South Africa

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REGULAR FEATURES

From The President

Dear Colleagues and fellow peri-operative practitioners,

It is with great pleasure and pride that I write to you as we reflect on another remarkable period of growth and collaboration within APPSA. I am certain that all our Chapters have held their study days with great success, and I have been delighted to witness the positive response to the new booking process introduced through our head office, including the streamlined payment procedure. It is evident that our delegates are thoroughly enjoying the training sessions, and this speaks to the dedication of everyone involved. A heartfelt thank you to Mariaane Oosthuizen and the head office team for seamlessly taking over the payment process. The transition has been handled with exceptional professionalism. Your commitment to ensuring that our administrative systems run smoothly is greatly appreciated by the entire APPSA family. I would also like to extend a sincere thank you to all our trade partners who have been involved in and supported these study days. Your partnership and commitment to our profession remains invaluable, and we are deeply grateful for your continued support.

Chapter Study Day Statistics – 2026

Chapter	Study Day Date	Delegates	Exhibitors / Sponsors	Next Study Day
Free State	28 Feb 2026	70	Augustine Medical	9 May 2026
KZN	28 Mar 2026	50	K2 Medical, Augustine Medical, Biosurge, Hartmann, Adcock Ingram	July 2026
Eastern Cape (PE)	18 Apr 2026	60	Envision Africa, Oculte (Pty) Ltd	TBC
Eastern Cape (East London)	–	–	Venue cancelled – awaiting rescheduling	TBC
Gauteng	7 Mar 2026	183	JA Medical Supplies, Biogenix, Solventum, Alida SL Trade, Vertice Healthcare	16 May 2026
TOTAL		363 delegates		

I would also like to thank every Chapter President and Committee Member for your tireless dedication and hard work. It is through your unwavering efforts that we are able to achieve our goals. Without you, none of this would be possible, and APPSA would not be the successful and respected organisation that it is today. You are truly the backbone of our association. As you read this letter, I am certain that you have all had the wonderful opportunity to celebrate International Nurses Week 2026, which was held from 06 to 12 May 2026. This special week is a time to recognise and honour our hard-working nurses who give so much of themselves on a daily basis, often under extremely difficult circumstances. We acknowledge the severe nursing shortage currently experienced across South Africa, and we recognise the extraordinary resilience and dedication shown by every nurse in our country in the face of these challenges. Your sacrifice and service do not go unnoticed. The official theme for International Nurses Day 2026, as announced by the International Council of Nurses (ICN), was: ***Our Nurses. Our Future. Empowered Nurses Save Lives***. This powerful theme emphasises the critical importance of empowering nurses to maximise their life-saving impact globally. It also highlights the need for safe and fair work environments, full professional practice, leadership opportunities, and meaningful recognition of the immense contributions nurses make to healthcare systems worldwide. As peri-operative practitioners, this message resonates deeply with each one of us. Let us continue to support and uplift one another, and let us carry the spirit of this theme into everything we do as APPSA members. Together, we are stronger, and together, we make a difference. Thank you all for your continued dedication, passion, and commitment to our noble profession.

Warm regards,
Marilyn de Meyer: APPSA National President

From The Editor

Have we lost the essence of our profession?

I have been associated with APPSA for 27 years - since just before the 1999 Congress organised by the SATS Gauteng Chapter, under the guidance of Villi Pieterse.

I have watched the organisation's ebbs and flows - and mourned the passing of many of our stalwarts.

Today, as I recall the recent celebration of International Nurse's Day on 12 May, I have been forced to confront an uncomfortable truth: many of us have abandoned our Nursing Code of Caring, Commitment and Compassion. This applies to our patients, colleagues and ourselves.

In my current position as a Spokesperson on Health in Gauteng, I am bombarded by hundreds of complaints by patients and their families about the treatment - or should I say abuse - they receive at the hands of nurses and peri-operative practitioners, in both state and private hospitals and clinics. I am horrified.

What has happened to our noble profession? Why have we become a profession dominated by UNCARING, inconsiderate people? We scream at patients. We don't value their dignity - and mock their families when they are at their lowest points in life.

What if it was your child lying in that bed. On that operating table. In that A&E. Or your mother, father, brother or - heaven forbid - grandparent? Or a colleague. Or yourself. Would we want that kind of treatment to be meted out to our family … or to us? I think not.

Society is judged by the way it treats its children, its elderly and its animals. If I look at the way we are treating our elderly (in particular) I am horrified. We are particularly harsh and impatient with them. We were the children in THEIR care - and they weren't harsh with us.

Our children, similarly, deserve our protection the most. Let's do it NOW - before it's too late. We are harming our own people. And history will judge us harshly if we do not mend our ways. We have to change - sooner, rather than later.We have lost our direction. And we have to find it again. We have to regain our centre: our compassion and our sense of community before it is too late.

Madeleine Hicklin
Editor

Exploring Surgical Trends

By Kate Woodhead, RGN DMS

BACKGROUND

Advances made in surgery over the last couple of decades have offered significant patient benefits including enhanced quality, reduced invasiveness and decreased post-operative pain for their recovery. The innovations look set to continue with developments including the increased use of robots, artificial intelligence (AI), augmented and virtual reality, and three-dimensional printing (3D), to name just a few.

There are a number of challenges associated with implementing new approaches to surgery, not least of which include training and governance. Patients increasingly need to have full disclosure of the innovations and the surgeon who will perform the surgery needs to ensure that informed consent is obtained with transparency. Surgical teams need to stay up to date with all the latest techniques, technologies and patient-safety protocols.

New technologies can include new techniques, modified procedures or new devices to achieve the desired outcome such as in the development 30 years ago of the minimally-invasive (MIS) approach to abdominal surgery which has revolutionised that specialism. Evidence-based practice and increased governance protocols have fundamentally changed the way that innovation in surgery has to take place. The Royal College of Surgeons (England)[1] has led the way in identifying steps for safe implementation of new technologies and the Medical Research Council[2] has published guidance on the development and evaluation of complex intervention research. The pace of innovation in many aspects of modern medicine is continuing exponentially, so it is to be expected that all health professionals will be involved at some time. Structured and well-designed training programmes are needed to ensure the safe implementation and dissemination of novel technology.

MINIMALLY INVASIVE SURGERY (MIS)

It is surprising to learn that the first laparoscopic cholecystectomy was undertaken only in 1985 and began a huge change in surgery. The main advantages were the small incisions, reduction in surgical site infections (SSIs), early discharge from hospital and less post-operative pain for the patient. This innovation in surgery has been described as a paradigm shift in surgical practice. MIS techniques have small incisions, specialised instruments and advanced imaging technologies enabling the surgeon to work in small and often difficult to access areas.

Since the first laparoscopic intervention, the technique has been used in many different procedures, each tailored to different anatomical sites and medical conditions. Patients undergoing laparoscopic surgery experience less blood loss, lower opportunity for SSIs and improved cosmetic outcomes. The approach results in less trauma to surrounding tissues, leading to decreased post-operative complications.

The future of MIS holds great promise, driven by other technological advances such as artificial intelligence (AI), robotics and telemedicine.

ROBOTIC-ASSISTED SURGERY

Advantages cited in the literature[3] of robotic-assisted surgical procedures can provide surgeons with enhanced dexterity, precision and surgical navigation while reducing the invasiveness of the procedure. It has come about by technological developments in robots, in imaging and in sensing technologies - which, in turn, have improved stability, motion accuracy and the likelihood of accessing anatomies located in previously difficult-to-access areas.

Robots were first developed for use in healthcare to provide greater accuracy in manipulation and visualisation, moving from the laparoscopic 2D vision to the present robotic 3D vision. Robotic surgery has seen significant growth in urology, gynaecology and general surgery and is set to expand to other specialisms and where it is hoped they will have good impact on patient care. However, there are some hurdles to overcome for widespread acceptance. These can include, but are not limited to high system costs, complex technology and a resource-heavy training requirement needed to familiarise surgeons with robotic surgery.

The expiry of key patents in the da Vinci robotic system, and others, has opened up the market to a new generation of more advanced surgical robots. It can be seen that the entire sector has been bottlenecked and has prevented innovation[4]. It is expected that the newly freed market for robots will generate a great deal of interest in surgery and adoption by many other specialties. The modern designed robots are likely to have AI integrated into them, which will revolutionise the area further, driving advances in precision, efficiency and patient care.

Despite the potential for expansion, there is a lack of clinical evidence, and at present, no robust regulatory framework to delineate the responsibilities between the technology and the surgeon. It is also noticeable that there is no national training programme to enhance the readiness of the workforce to meet the rapid expansion of the surgical approach.

PERSONALISED MEDICINE

Personalised medicine is a field which aims to tailor surgical treatments on the basis of individual patient characteristics including genetic, environmental and lifestyle factors. Advances in genomics and bio-informatics have enabled the identification of genetic markers associated with disease risk and treatment response[5]. This information can guide the selection of surgical techniques, additional adjuvant therapies and the management of post-operative care. A study being undertaken by the North West Genomic Medicine Service Alliance is investigating how genetic insights can be incorporated into everyday prescribing practices in primary care.

Pharmaco-genomics uses genetic information to improve medication safety and effectiveness reducing adverse drug reactions and enhancing patient outcomes. Genetic profiling can help identify patients who

are at greater risk of complications or recurrence, enabling more personalised and proactive care. Advances in bio-informatics and machine learning will enable the analysis of large datasets, allowing the identification of therapeutic targets and novel bio-markers. It remains to be seen, how surgery will be impacted.

ENHANCED RECOVERY AFTER SURGERY (ERAS)

The ERAS guidelines emphasise multi-modal pain management, early mobilisation and nutritional support to accelerate recovery and reduce complications[6]. Recent studies have shown that ERAS leads to shorter hospital stays, reduced post-operative pain, and lower rates of complications. The guidelines identify the multi-disciplinary nature of ERAS, which encompasses pre-operative counselling, carbohydrate loading, opioid-sparing analgesia and early post-operative feeding and mobilisation - preferably in theatre recovery. There is nothing very new about the practice of ERAS but it can contribute a lot to patient comfort, confidence and recovery and can equally be added to by some of the available technology. Further developments are indicated by patient's personal wearable technologies. The remote monitoring which can be undertaken may help to support the implementation of ERAS protocols.

Initially, ERAS implementation was patchy and slow but now that there is demonstrable evidence that ERAS can reduce the length of hospital stays as well as decreased morbidity by as much as 50%. This has also been accompanied by significant cost cutting either through the reduction in complications following surgery or by more efficient use of resources including hospital beds. Successful implementation requires the training and education of staff members and good clinical leadership.

TELEMEDICINE

Advances in low latency, high-speed internet connections may pave the way for remote surgery where surgeons can operate on patients located in different regions. This concept is at an early stage of development, although it holds promise for increasing access to specialised surgical expertise. COVID-19 enabled the domestic development of telemedicine apart from hospitals using it for complex innovations. During COVID, there were multiple benefits that facilitated pre-operative consultations, post-operative follow-ups and remote patient monitoring. This approach - which has continued in some areas - has benefitted patients by not having to travel to hospitals for consultations thus reducing the opportunities for infections and saving patients time and money.

Wearable devices will become more widespread in future which will enable real-time tracking of patient health metrics, including vital signs, physical activity and wound healing. This valuable data can inform clinical decision making, enhance patient engagement and enable timely interventions where complications are developing. There are a number of potential uses for training and the use of virtual reality for simulation exercises.

TRAINING AND PATIENT SAFETY

The risks faced by patients from innovative new techniques can be substantial. The history of innovation

into healthcare is sadly littered with experiments which did not go well and patients were harmed. Surgical innovation has often been driven by one surgeon's enthusiasm. In this day and age, it is safe to say that there is a great deal of advice and guidance to reduce risks to patients, to train junior surgeons and to mitigate the risks from a new device or technique. Most surgery now takes place in teams and effective teamworking results in better outcomes for patient safety. Even so, there remain issues about[7]:

- The processes by which a surgeon (and the rest of the surgical team) train in a new approach
- The oversight and quality assurance underpinning the training
- How patients are selected
- How consent is obtained
- How the outcomes of the new approach are audited

The issues are key to the development of the next generation of surgeons that not only do they have an opportunity (many times over) to become familiar with the technology, but also to practise the techniques. A key focus will be on maintaining the importance of conventional surgical skills amid the rise of accessibility to new technologies. Integrating these new technologies into surgical training has never been more important.

There is no doubt that the current method of training future surgeons needs to be transformed so that there is space for learning and integrating the new technologies into conventional training programmes. With the rate of change occurring, leadership needs to be part of the development. Hospital leaders, as well as senior surgeons, need to be cognisant of the pace of change and to enable those learning to practise the new techniques.

CONCLUSION

Without a doubt, the pace of change is extraordinary and peri-operative teams of all shapes need to be aware of the developments and ensure they keep up. 30 years ago many of the laparoscopic changes were a little haphazard, with maybe one key surgical innovator driving the changes together with medical device companies leaping onto the bandwagon. There was no effective governance or oversight from peers to ensure that the surgery being undertaken was appropriate for the patient and had good outcomes.

It is therefore to be welcomed in no uncertain terms that the guidance from the Royal College is valuable and needs to be understood and implemented with all the correct frameworks in place. We all know that the interests of patients are paramount - new techniques need to be added to the hospital risk register. We can only hope that all the frameworks and guidance do not subsume innovation, as it is very often the pioneers who push the boat out a little further than colleagues who make the difference.

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7. *Ibid*

Kate Woodhead qualified in 1978. She has worked in peri-operative care since then and runs her own business as an Operating Theatre Consultant. Kate was Chairman of NATN from 1998 to 2001. She is the former President of the IFPN (2002 to 2006) and now works as an Advisor to WHO on the Safe Surgery Saves Lives Campaign. She is the Chairman of Trustees at Friends of African Nursing. For more information on FoAN please go to www.foan.org.uk

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Beyond The Count: Operationalising Risk-Based Prevention Of Retained Surgical Items

By Professor Jed Duff PhD, RN, FACORN

Inadvertently retained surgical items (RSIs) remain among the most serious and persistent adverse events in peri-operative care. Despite their classification as 'never events', RSIs continue to occur across surgical specialties and healthcare systems, resulting in avoidable patient harm, professional distress, and substantial medico-legal consequences. Their persistence suggests that the problem is not one of awareness or intent, but of how prevention is conceptualised and enacted in practice.

Contemporary peri-operative standards increasingly acknowledge that RSI risk is variable rather than uniform. Both the Australian College of Peri-operative Nurses (ACORN) and the Association of peri-Operative Registered Nurses (AORN) identify patient, procedural and system-level factors that elevate RSI risk[1,2]. In principle, this reflects a risk-based understanding of the problem. In practice, however, RSI prevention remains overwhelmingly count-centric. Counting continues to represent the primary, and often the only, formalised safety control.Risk is acknowledged conceptually, but it rarely alters the preventive pathway. This disconnect has been recognised within the peri-operative nursing literature itself. Integrative reviews published in the *Journal of Peri-operative Nursing* (JPN) have demonstrated that counting is vulnerable to patient, procedural, environmental and human factors, and that adjunct strategies such as technology-assisted detection are emerging but not yet embedded in routine practice or standards[3,4]. Australian analyses of RSI-related case law further demonstrate that RSIs can and do occur despite adherence to counting procedures, highlighting gaps between policy compliance and patient safety outcomes[5].

The assumption that correct counts equate to safety is not supported by the broader evidence base. Seminal work by Gawande *et al.*[6] demonstrated that RSIs frequently occur despite counts being documented as correct. Subsequent studies have confirmed both the frequency of discrepancies in surgical counts and, more concerningly, the occurrence of retained items in cases where no discrepancy was identified[7,8]. Counting is therefore necessary, but demonstrably insufficient as a standalone prevention strategy. Counting is inherently vulnerable to the same human and system factors that undermine other checklist-based processes. It relies on attention, communication, shared mental models and stable team composition in environments characterised by time pressure, interruptions, staff turnover and competing priorities. Counting also fails to account for procedural complexity and intra-operative changes, particularly when additional materials are introduced in response to bleeding, anatomical challenges or unplanned procedural extension. When counting is treated as the endpoint of RSI prevention, there is a risk that procedural compliance will displace situational awareness and critical appraisal.

Importantly, RSI risk is not randomly distributed. It is patterned, predictable and stratifiable. A comprehensive meta-analysis by Moffatt-Bruce *et al.*[9] synthesised known RSI risk factors and explicitly proposed a risk stratification system, arguing that cumulative risk profiles should guide prevention strategies rather than uniform application of controls[9]. Duggan and colleagues[10] extended this work by proposing a probabilistic risk model for retained foreign object prevention, drawing on safety engineering principles used in other high-reliability industries. More recently, the development and psychometric testing of a retained surgical items risk assessment scale reflect an emerging shift toward formalised risk measurement rather than reliance on implicit judgement alone[11]. Collectively, this literature demonstrates that risk-based approaches to RSI prevention are not novel. They have been conceptualised, empirically supported and discussed within peri-operative nursing scholarship, including in JPN. Yet they have not been widely operationalised in routine practice. This limited uptake reflects structural and cultural barriers rather than evidentiary gaps. Counting is familiar, auditable and easily codified in policy.

Risk assessment, by contrast, requires judgement, inter-disciplinary discussion and local adaptation - activities that are harder to standardise and measure. There is also a persistent discomfort with differentiated practice, where uniformity is equated with safety. However, uniform processes applied to variable risk represent efficiency masquerading as safety. A genuinely risk-based approach to RSI prevention would explicitly link risk assessment to proportionate preventive strategies. Pre-operative or early intra-operative assessment would consider patient factors (such as body mass index and anatomical complexity), surgical factors (including duration, positioning, and anticipated blood loss), team and system factors (such as multiple teams or handovers) and the volume and type of retainable items introduced into the surgical field. Crucially, the purpose of this assessment would not be documentation, but escalation.

Lower-risk cases may reasonably rely on standardised counting processes performed at defined time points. In contrast, higher-risk cases should trigger enhanced, layered controls supported in the literature. These include counting all retainable items rather than restricted lists, structured sponge and instrument management practices designed to reduce cognitive load and interruption, and deliberate cavity exploration at critical stages of wound closure[2–4,9]. For cases assessed as highest risk, additional safeguards include mandatory use of adjunct technologies, such as bar-coded sponges and selective intra-operative imaging when indicated, and the introduction of redundancy through an additional independent end-of-case verification[2,8–10]. These strategies already exist within contemporary guidelines and the empirical literature. What is missing is a structured pathway that reliably translates identified risk into mandated escalation of preventive action. In the absence of such pathways, risk assessment is at risk of becoming performative rather than protective, and counting remains the default response regardless of context.

For peri-operative nurses, a shift toward risk-based RSI prevention represents an affirmation rather than a dilution of professional expertise. Risk assessment, anticipation and co-ordination are core nursing competencies. Embedding RSI prevention within a structured risk framework positions peri-operative nurses as safety leaders who integrate technical processes with contextual judgement. It also reframes accountability - rather than asking whether counts were correct, teams are prompted to ask whether the controls matched the risk.

In summary, current ACORN and AORN guidelines already acknowledge that RSI risk is variable. The problem is not conceptual, but operational. Until risk meaningfully alters how prevention is enacted, RSI strategies will remain count-centric and vulnerable to the same failures that have persisted for decades. The peri-operative nursing literature - including work published in this journal - supports a different approach. If RSIs are truly unacceptable, then prevention must move beyond the count.

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Prevalence Of Missed Nursing Care In The Operationg Room: A Scoping Review

By Pedro Ribeiro; Verónica Rita Dias Coutinho; António Ramalho Mostardinha; Ana Sofia Mota

ABSTRACT

Background: Increasing surgical complexity and limited resources contribute to missed nursing care (MNC) in the operating room (OR), with potential impacts on patient safety.

Objectives: To map the prevalence of MNC in the OR, identify the most frequently omitted interventions, examine contributing factors and explore clinical and organisational implications.

Methods: A scoping review was conducted following the Joanna Briggs Institute (JBI) guidelines. A population, concept and context (PCC) framework was used to develop the review question. Searches were performed in MEDLINE, CINAHL and DOAJ. Eligible sources included quantitative and qualitative research, mixed-methods studies, reviews and relevant grey literature. Screening, data extraction and descriptive synthesis were performed.

Results: Six studies met the inclusion criteria. Two of the six were validation studies that confirmed the validity of the MISSCARE Survey-OR. Types of MNCs identified in the studies involve communication, peri-operative documentation, patient surveillance and patient education. Contributing factors identified included mental fatigue, inadequate staffing, insufficient skill mix, workload, perceived competence, organisational environment and communication patterns.

Conclusion: The causes of MNC in the OR are multi-factorial. Interventions should focus on staffing optimisation, skills re-inforcement and improved communication and documentation processes. Further multi-centre and longitudinal studies are needed to link MNC with clinical outcomes and patient-reported outcomes.

INTRODUCTION

Surgical safety is a global priority, and nursing plays a critical role in ensuring effective, continuous and safe care in the OR. However, the increasing complexity of surgical procedures, combined with shortages of human and material resources, has contributed to the emergence of missed care, also known as missed nursing care (MNC). MNC is defined as necessary interventions that are omitted, either partially or completely, during the provision of care[1].

International studies recognise that the OR environment is vulnerable to MNC due to its highly technical nature, demand for rapid responses and the heavy workload of nursing teams[2]. Frequently-reported types of MNC include patient surveillance, inter-professional communication, accurate documentation and preventive interventions, all of which may directly compromise clinical outcomes, recovery time and patient satisfaction[3,4]. The causes of MNC are multi-factorial and encompass excessive workload, staff shortages, frequent interruptions, mental fatigue and deficiencies in intra-team communication.

Despite the growing recognition of this phenomenon, research specifically addressing the OR remains scarce, particularly within European and Lusophone contexts. There is, therefore, an urgent need to systematically map the available evidence to clarify the actual prevalence of MNC interventions in peri-operative care and the factors influencing their occurrence.

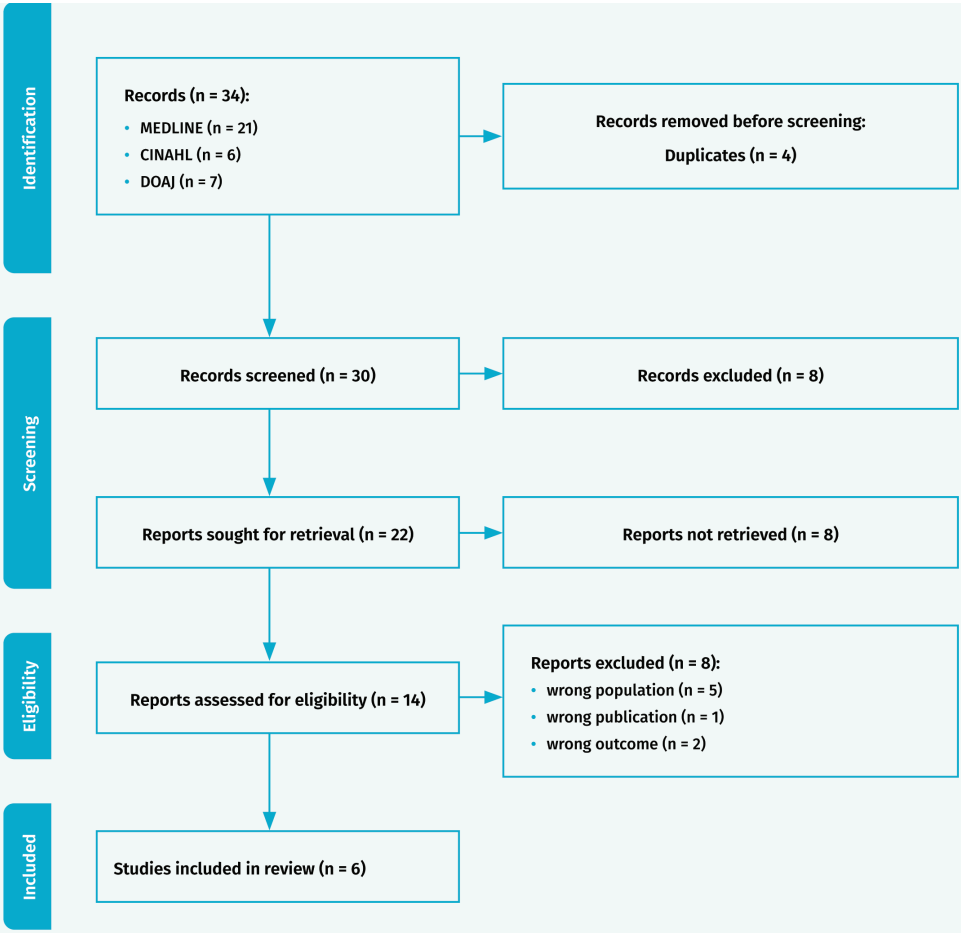

Figure 1: PRISMA flow diagram of the paper selection process

REVIEW QUESTION AND OBJECTIVES

This scoping review was conducted in accordance with the Joanna Briggs Institute (JBI) guideline[5]. The review question was developed using the population (or participants), concept and context (PCC) framework.

The elements of PCC were defined as follows:
- Population (or participants) - OR nurses/peri-operative practitioners
- Concept - MNC
- Context - OR

From these elements, the resulting review question was: 'What is the prevalence of MNC interventions in the OR context?' The primary objective was to determine the prevalence of MNC interventions in the OR.

The secondary objectives were to:
1. Identify which nursing interventions are most frequently omitted in this setting
2. Map the factors associated with MNC in the OR
3. Analyse the clinical and organisational implications of missed interventions for patient safety

METHODS

This review included quantitative and qualitative studies. Quantitative studies comprised experimental and observational designs, qualitative studies included qualitative data analysis. Reviews meeting the eligibility criteria were also considered.

Eligibility criteria

Studies were included if they addressed MNC among peri-operative nurses/practitioners or nursing teams in the peri-operative environment. Quantitative and qualitative research, mixed-methods studies and systematic reviews focused on MNC within the peri-operative period (pre-operative, intra-operative, or post-operative) were eligible for inclusion.

Studies were excluded if they did not directly address the phenomenon of MNC, or if they were conducted in contexts other than the peri-operative environment. Excluded contexts included intensive care units, general wards, home care or long-term care facilities. Publications not involving nursing practice, as well as editorials, letters to the editor, opinion pieces or commentaries lacking empirical data, were also excluded. Studies unavailable in full text were likewise excluded.

Search strategy

To ensure a comprehensive and methodologically-robust search, three electronic databases were selected based on their relevance to the topic, disciplinary focus and accessibility to peer-reviewed literature. These databases were MEDLINE (via PubMed), CINAHL Complete and the Directory of Open Access Journals (DOAJ).

We selected MEDLINE for its status as the leading biomedical database, ensuring access to high-quality empirical studies on MNC in peri-operative settings. CINAHL Complete focuses on nursing and allied health. It captures clinically-oriented research, including qualitative studies, practice guidelines and validation of tools such as the MISSCARE survey. These are relevant to peri-operative nursing. DOAJ broadens coverage, identifying open access and regionally-published studies not indexed in traditional databases. This approach follows the JBI framework for scoping reviews. JBI emphasises diverse sources to reduce publication bias and enhance evidence mapping.

The strategic use of these three databases integrates disciplinary specificity, empirical rigour and publication diversity. This strategy identifies relevant literature on MNC in the peri-operative environment. Search terms were defined as shown in the supplement. Searches employed Boolean operators and filters to optimise the retrieval of relevant results. Search strategies for each database are presented in Tables 2 to 4 of the supplement.

Selection process

A total of 34 articles were identified via MEDLINE (n = 21), CINAHL (n = 6) and the DOAJ (n = 7). Of the 34 articles, four duplicates were removed, leaving 30 articles for title and abstract screening. After this screening, eight were excluded. The remaining 22 articles were considered potentially relevant. However, eight full-text articles could not be retrieved. Among the 14 full-text articles assessed for eligibility, another eight were excluded for not meeting the inclusion criteria (for example wrong context, non-nursing focus or lack of empirical data). Six studies met the inclusion criteria and were included in this scoping review (see Figure 1).

RESULTS

A total of six studies were identified as relevant to the scoping review. The key characteristics of each study are summarised in Table 1. Of the six included studies, four examined the prevalence and associated factors of MNC in the peri-operative/OR environment. Table 2 summarises their main characteristics, presented according to country of origin.

Table 1: Key characteristics of each study

Authors (year)	Study design	Setting	Main findings
Gillespie et al. (2024)[6]	cross-sectional study	perioperative (including intra-operative)	Most MNC was related to communication practices. Statistical differences observed between nursing roles.
von Vogelsang et al. (2025)[4]	methodological validation study	perioperative	Swedish version of MISSCARE OR survey is valid with an item response rate of 95.3% and reliable (α = 0.76–0.95). Survey is useful for strategic planning and quality improvement.
Liu et al. (2025)[7]	cross-sectional and methodological validation study	operating room	High reliability (α = 0.94–0.96) and validity of the Chinese version of MISSCARE OR survey as an appropriate tool for assessment and planning.
El-Sayed et al. (2023)[5]	cross-sectional correlational study	operating room (intra-operative)	Job embeddedness negatively affects MNC. Polychronicity acts as a partial mediator.
Rahmani et al. (2025)[2]	descriptive cross-sectional study	perioperative (pre-, intra- and post-operative)	Mental fatigue positively correlated with MNC ($r = 0.319$, $p < 0.001$). Need for psychological support and organisational improvements.
Gillespie BM et al. (2023)[3]	cross-sectional study	operating room	Greater competence associated with lower MNC. Experience influences perceived competence.

Table 2. Analysis by country

Country	Authors (year)	Main missed interventions	Associated factors
Australia	Gillespie et al. (2023)[9] Gillespie et al. (2024)[6]	• time-intensive tasks • intra-team • communication • patient education • documentation	• staffing shortages • workload • fatigue • complacency • perceived competence
Iran	Rahmani et al. (2025)[2]	• patient surveillance • hygiene practices • communication with patients	• mental fatigue ($p < 0.001$)
Egypt	El-Sayed et al. (2023)[8]	• team coordination • communication • documentation	• job embeddedness (protective) • polychronicity (partial mediator of MNC)
China	Liu et al. (2025)[7]	• not specified (tool validation only)	• environmental factors • communication • resource availability • empowerment
Sweden	von Vogelsang et al. (2025)[4]	• communication • safety checks • documentation	• organisational culture • communication gaps • personal factors

In Australia, a structural model was tested involving 602 OR nurses/peri-operative practitioners[9]. The analysis demonstrated that socio-demographic characteristics (notably age), job satisfaction, intention to leave and perceived competence significantly influenced the frequency of MNC, with the model explaining 22.6 percent of the variance[9]. A subsequent Australian national survey of 612 OR nurses/peri-operative practitioners found that communication-related tasks, particularly handovers between team members and compliance with surgical time-outs, were the most frequently omitted[6]. The most common reasons included insufficient staffing, inadequate skill mix, fatigue and complacency, all of which were perceived to undermine teamwork and patient safety[6]. In Egypt, the relationship between job embeddedness, polychronicity and MNC was investigated among 210 nurses from nine hospitals[8]. Stronger organisational attachment and a greater ability to manage multiple tasks were significantly associated with lower levels of MNC, highlighting the protective role of these individual factors[8].

An Iranian survey of 385 OR nurses/peri-operative practitioners reported that 77.9 percent experienced varying levels of mental fatigue[2]. Mental fatigue was positively correlated with MNC, underscoring cognitive and psychological strain as an important risk factor in peri-operative care[2].

Across these studies, communication, documentation, patient surveillance and patient education consistently emerged as the most vulnerable domains. Contributing factors operated at both the individual level (including mental fatigue, competence, job embeddedness) and the organisational level (for example staffing shortages, skill mix and communication deficits). Two studies in different countries, China and Sweden, addressed the psychometric validation of the MISSCARE Survey-OR. In China, the instrument was adapted and tested among 700 nurses from six tertiary hospitals[7]. The study demonstrated excellent

internal consistency and confirmed validity through factor analysis, supporting its reliability in capturing peri-operative MNC[7]. In Sweden, the instrument was translated and culturally adapted to the Swedish peri-operative context, involving 107 nurses[4]. The tool showed high acceptability and strong psychometric properties (See Table 1).[4]

DISCUSSION

This scoping review mapped available evidence on the prevalence of MNC in the OR, underscoring its multi-factorial nature and consistent impact on key domains such as communication, documentation, patient monitoring and education across diverse healthcare systems. Cross-country comparisons revealed contextual differences. In high-income countries such as Australia and Sweden, MNC was mainly associated with staff mix, team dynamics and perceived competence, suggesting that organisational efficiency and communication protocols may outweigh material constraints. In lower-resource contexts, including Iran and Egypt, structural deficits such as staff shortages and mental fatigue emerged as primary contributors. Despite these variations, intra-team communication and documentation consistently appeared as vulnerable domains across all settings, pointing to persistent systemic challenges in peri-operative nursing.

These findings are in line with broader international evidence. An overview of reviews identified staffing adequacy, teamwork and communication breakdowns as recurring predictors of MNC with clear links to adverse patient outcomes[10]. Similarly, a large-scale survey of OR nurses in the USA demonstrated that organisational characteristics such as facility size, nurse education level and perceived staffing adequacy were significantly associated with the frequency of missed peri-operative care[11]. Another review identified reasons nurses omit or delay care, emphasising the role of workload, prioritisation and organisational culture in shaping the occurrence of MNC across settings[12]. Together, these studies strengthen the argument that MNC is not an isolated phenomenon, but a systemic issue influenced by both individual and institutional factors. The factors associated with MNC in the peri-operative environment spanned both individual and organisational domains. At the individual level, mental fatigue, age, years of experience and perceived competence influenced the likelihood of MNC, with higher competence acting as a protective factor. Protective mechanisms such as job embeddedness and polychronicity also reduced the risk of MNC. At the organisational level, staffing shortages, inadequate skill mix and poor communication were consistently identified as major contributors.

The validation of the MISSCARE Survey-OR in China and Sweden further underscores the need for robust tools to measure MNC. Reliable, culturally adapted instruments are essential not only to identify high risk domains, but also to monitor trends and evaluate the impact of interventions. Nevertheless, heterogeneity in measurement and reporting continues to hinder direct comparisons of prevalence rates across contexts.

This review has several limitations. Most of the included studies used cross-sectional designs, limiting causal inference. The majority were single-country investigations, which reduces generalisability across cultural and organisational contexts. Inconsistencies in reporting approaches constrained comparability and few studies examined the direct clinical consequences of MNC such as surgical site infections, complications and patient-reported outcomes, limiting understanding of its real-world impact.

Future research should therefore prioritise longitudinal and multi-centre studies, comparative analyses across countries and integration of MNC data with clinical outcomes and electronic health records. Incorporating patient-reported outcome measures would add valuable insights into how MNC affects patients' perceptions of safety and surgical experience. Standardisation of measurement tools across peri-operative contexts is also critical to enhance comparability and strengthen the evidence base. From a practice perspective, the evidence highlights the need for nursing managers and hospital administrators to address both systemic and individual contributors to MNC in the peri-operative setting. Interventions should focus on optimising staffing models, reducing workload and improving team communication, while also supporting nurses' competence, resilience and professional engagement. Addressing MNC in the OR is not merely a matter of workflow optimisation, but a fundamental strategy for ensuring patient safety and fostering a culture of quality in peri-operative nursing.

Supplement: Search terms and strategies

Table 1: MeSH/DeCS terms, CINAHL headings and natural language keywords

	MeSH/DeCS	CINAHL headings	Natural language
Participant (P)	nursing nursing staff	nursing nursing staff	nurse nursing nursing staff
Concept (C)	missed care*	nursing care, missed	missed nursing care care left undone unfinished care rationed care tasks undone nursing omissions
Context (C)	operating rooms	operating room nursing	operating room nursing surgical nursing

* Although not a MeSH/DeCS term, it was considered given its relevance to the present review.

Table 2: Search strategy used in the MEDLINE complete database

#	Enquiry	Results
S3	(Nursing OR Nursing staff OR Nurse) AND (missed care OR nursing missed care OR care left undone OR unfinished care OR rationed care OR tasks undone OR nursing omissions) AND (operating room OR surgical nursing OR operating room nursing)	21
S2	(Nursing OR Nursing staff OR Nurse) AND (missed care OR nursing missed care OR care left undone OR unfinished care OR rationed care OR tasks undone OR nursing omissions)	479
S1	Nursing OR Nursing staff OR Nurse	1286153

Table 3: Search strategy used in the CINAHL complete database

#	Enquiry	Results
S3	(Nursing OR Nursing staff OR Nurse) AND (Nursing Care, Missed OR nursing missed care OR care left undone OR unfinished care OR rationed care OR tasks undone OR nursing omissions) AND (operating room nursing OR surgical nursing)	6
S2	(Nursing OR Nursing staff OR Nurse) AND (Nursing Care, Missed OR nursing missed care OR care left undone OR unfinished care OR rationed care OR tasks undone OR nursing omissions)	107
S1	Nursing OR Nursing staff OR Nurse	1043344

Table 4: Search strategy used in the DOAJ

#	Enquiry	Results
S3	Nursing AND missed care AND operating room nursing	7
S2	Nursing AND missed care	443
S1	Nursing	210 894

CONCLUSION

This scoping review shows that MNC in the operating room is a widespread and multi-factorial problem. Despite contextual differences between high-resource and low-resource settings, MNC in communication and documentation consistently emerged as a universal vulnerability in peri-operative nursing.

Validated tools such as the MISSCARE Survey-OR enable systematic monitoring of MNC, but further standardisation and integration with patient outcomes are required to strengthen evidence. Future research should focus on longitudinal and multi-centre studies that link MNC to clinical outcomes and patient-reported experiences, while also enabling meaningful cross-country comparisons.

For nursing leaders and hospital administrators, the findings highlight the urgent need to optimise staffing, enhance team communication and strengthen professional competence. Reducing MNC in peri-operative care is not only essential for workflow efficiency, but also a cornerstone strategy to improve patient safety, nurse well-being and the overall quality of surgical care.

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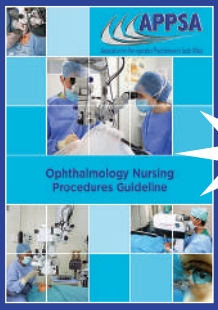
APPSA GUIDELINES



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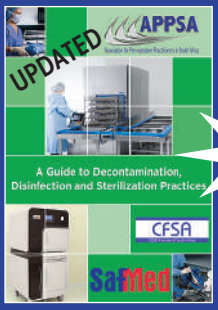

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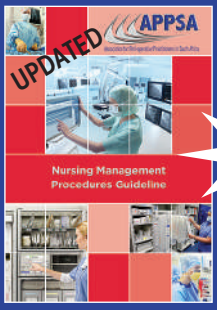

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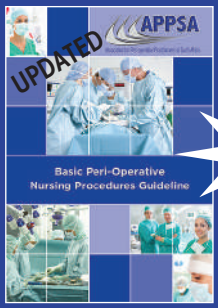

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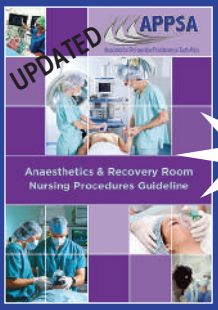

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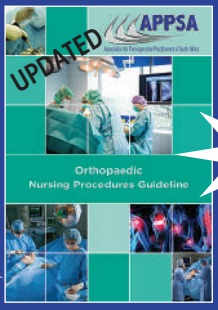

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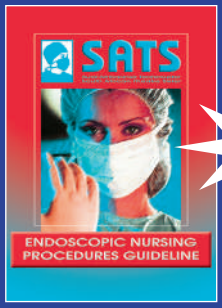

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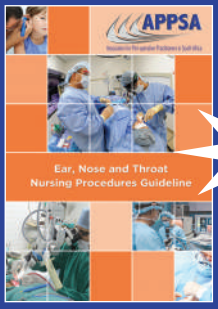

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Professional Behaviour In Theatre Complexes: A Foundation For Safe And Effective Surgical Care

By Siyabonga Dumisani Buthelezi, MSc (Nursing), PGDip (Nursing Education), Adv. Dip (Critical Care Nursing), CCNS.

ABSTRACT

Professional behaviour within operating theatre complexes is pivotal to the delivery of safe, ethical, and high-quality surgical care. The theatre environment is complex and high risk, requiring the seamless integration of technical proficiency with ethical conduct, effective communication, accountability, and respect for patients and colleagues. Persistent challenges, including entrenched hierarchies, inconsistent induction to theatre etiquette, workload-related stress, and variable team dynamics, can erode professional standards and compromise patient safety.

This article presents a narrative synthesis of professional behaviour in theatre settings, articulating how non-technical skills such as situational awareness, leadership, and closed-loop communication complement sterile technique and procedural competence to enhance outcomes (WHO, 2009; RCSEng, 2023). It further discusses the influence of hospital-wide culture and leadership on professional identity formation and team cohesion, arguing that professionalism functions as a practical clinical asset with measurable benefits for patient outcomes, staff morale, and institutional credibility (Cruess, Cruess, & Steinert, 2019; ACS, 2016). Standardised Strategic interventions in training, simulation-based learning, mentorship, clear behavioural policies, and decisive action against bullying are proposed to cultivate and sustain professionalism (RCSEng, 2023; Mohi-ud-din & Yadav, 2024).

The future of surgical services will depend on interprofessional collaboration, shared decision making, and resilient teams grounded in professional values that centre the patient and uphold excellence in perioperative practice (Cruess, Cruess & Steinert, 2019; WHO, 2009).

INTRODUCTION

Professional behaviour within operating theatre complexes forms the cornerstone of safe, ethical, and high-quality surgical care, where multi-disciplinary collaboration and reliable conduct are inseparable from clinical excellence (WHO, 2009). In this high-acuity environment, professionalism extends beyond technical competence to encompass respect for patients and colleagues, sound ethical judgement, and a sustained commitment to behaviours that protect dignity and safety. As Cruess, Cruess and Steinert (2019) argue, professionalism is both a set of behaviours and a developmental process that shapes identity and purpose in clinical practice (Cruess, Cruess & Steinert, 2019). When consistently enacted in theatre, these values translate into clearer communication, stronger trust, and more resilient teams.

Modern understandings of professionalism integrate moral values with communication skills, emotional intelligence, and fidelity to institutional standards that collectively safeguard patients during the peri-operative journey (ACS, 2016). Theatre personnel, including surgeons, anaesthetists, nurses, and technicians, must co-ordinate under time pressure and uncertainty, making non technical skills as consequential as procedural expertise (WHO, 2009). The adoption of closed-loop communication, structured briefings, and debriefings reduces ambiguity at critical moments, while situational awareness allows practitioners to anticipate and mitigate risk before errors escalate (RCSEng, 2023). In this sense, professionalism is not ornamental; it is a core clinical resource that supports the safe conduct of surgery (ACS, 2016).

Notwithstanding its centrality, professionalism is challenged by entrenched hierarchies that can suppress psychological safety and inhibit speaking up, particularly for junior staff and those in traditionally marginalised roles (RCSEng, 2023). When deference to authority outweighs open dialogue, near-misses may go unreported, and latent safety threats may remain unaddressed. Inconsistent induction to theatre etiquette further compounds this problem, producing variability in behaviours such as punctuality, adherence to sterile technique, and information handover (Mohi ud din & Yadav, 2024). Prolonged exposure to workload-related stress can erode empathy and collegiality, culminating in depersonalisation, communication breakdowns, and avoidable conflict (ACS, 2016). Addressing these dynamics requires institutional commitment to professional culture as a fundamental patient safety strategy (WHO, 2009). Expected standards of conduct in theatre reflect a shared commitment to patient- centred care and surgical safety. Respectful interactions, appropriate attire, and rigorous maintenance of asepsis form the visible substrate of professional behaviour, while deeper competencies, leadership, judgement, and the ability to calibrate one's role within the team (RCSEng, 2023).

The World Health Organisation's (WHO) safe surgery agenda underscores the importance of structured checklists, briefings, and role clarity, all of which depend on professional adherence to protocol and the willingness to challenge deviations that threaten safety (WHO, 2009). When leaders model humility and inclusivity, they normalise constructive challenge and enable the team to re prioritise the patient's interests above professional ego (Cruess, Cruess & Steinert, 2019). Professional conduct in theatre cannot be divorced from the broader hospital culture in which it is embedded. Hospitals that foreground respect, inclusivity, and ethical standards create conditions in which professionalism is expected, supported, and re-inforced across disciplines (ACS, 2016). Leadership is particularly consequential: by visibly upholding behavioural standards, resourcing training, and responding decisively to unprofessional conduct, leaders shape the social norms that govern everyday practice (Cruess, Cruess & Steinert, 2019). These cultural factors influence how clinicians communicate with patients and families, co-ordinate across departments, and sustain morale during periods of service pressure (Mohi ud din & Yadav, 2024). Ultimately, a professional culture strengthens public trust and institutional credibility, outcomes that are themselves protective of patient safety (ACS, 2016).

The benefits of sustained professionalism are evident in improved patient outcomes, reduced conflicts, and smoother inter-disciplinary co-ordination, which together decreases the likelihood of preventable harm (WHO, 2009). Teams that communicate respectfully are more likely to detect and recover from emerging errors, while psychologically-safe environments encourage timely escalation of concerns (RCSEng, 2023). Staff retention and well-being also improve when civility and fairness are normative,

lowering organisational costs associated with burnout and turnover (ACS, 2016). In this respect, professionalism should be understood as both an ethical imperative and a pragmatic, system level intervention that yields measurable gains in quality and safety (Cruess, Cruess & Steinert, 2019).

Sustaining professionalism requires structured and deliberately designed strategies. Standardised training that addresses theatre etiquette, ethics, and communication helps align expectations across diverse roles (RCSEng, 2023). Simulation-based learning provides a safe context to rehearse non-technical skills such as leadership, decision-making, and closed-loop communication under realistic time pressure (WHO, 2009). Mentorship by experienced clinicians supports identity formation, provides constructive feedback, and models adaptive coping strategies during high stakes scenarios (Cruess, Cruess & Steinert, 2019). Clear policies with credible enforcement signal zero tolerance for bullying and disruptive behaviour, protecting team cohesion and patient safety (ACS, 2016). These initiatives are mutually re-inforcing and most effective when implemented as part of a coherent institutional programme rather than isolated interventions (Mohi ud din & Yadav, 2024).

The future of surgical services will increasingly depend on inter-professional collaboration, shared decision making, and the cultivation of resilient teams grounded in clear values and behavioural norms (Cruess, Cruess & Steinert, 2019). As care pathways become more complex and demand grows, professional behaviour will remain an indispensable scaffold for safe, efficient, and compassionate peri-operative practice (WHO, 2009). There is a need to invest in professionalism through leadership, education, and supportive policies that represent a strategic commitment to clinical excellence and patient-centred care across the surgical continuum (RCSEng, 2023; ACS, 2016).

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Mr Siyabonga Dumisani Buthelezi delivered this paper at an APPSA Gauteng Study Day, It appears here, courtesy of the author.

Nurses' Knowledge Regarding Recommended Practices On Using Surgical Attire In The Operating Theatre

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INTRODUCTION

The operating theatre presents a demanding and dynamic setting for nurses, where they utilise cutting-edge equipment and technologies to assist the surgeon conducting surgical procedures (Blomberg, Bisholt & Lindwall 2018). Failure to adhere to infection control and prevention in this environment can lead to patients developing surgical site infections (SSI) and sepsis (Al Laham 2012). SSIs manifest following the completion of a surgical procedure and represent the most prevalent complication that occurs in patients after surgery (Russo, Watkins & Centers for Disease Control and Prevention 2018). It is estimated that 8% of hospital-acquired infections (HAIs) are categorised as SSIs, and an estimated 2% to 5% of patients undergoing surgery may experience SSIs during their hospitalisation, potentially resulting in prolonged hospital stays of patients as well as more hospital costs and an increased risk for long-term infections or even death of patients (Mockford & O'Grady 2017; O'Brien, Gupta & Itani 2020; Safe Care Campaign 2018).

Enhancing the prevention of SSIs can be achieved by maintaining proper handling of surgical equipment, ensuring a clean and sterile environment and utilising the appropriate and correct surgical attire throughout surgical procedures (Jenkins 2017). There is evidence suggesting that clean and sterile surgical attire, including gloves and surgical gowns (to a large extent), as well as skull caps, a surgical mask, scrubs, boots and an apron (to a lesser extent), can prevent the transmission of micro-organisms from healthcare personnel (including nurses) to the patient, reducing the risk for SSIs in this setting (Association of periOperative Registered Nurses' [AORN] 2018; Cowperthwaite & Holm 2015; McHugh *et al.* 2014; Salassa & Swiontkowski 2014). For example, surgical attire, such as surgical masks, if correctly worn, covering the mouth and nose, safeguard patients from pathogens originating within the surgical team. Further, wearing of clean, dry, sterilised surgical scrubs and gowns as well as headgear covering the entire head reduces the outflow or shedding of organisms from the surgical team to the patient, which decreases the number of bacteria in the air (Cowperthwaite & Holm 2015; McHugh *et al.* 2014). Wearing of dedicated shoes or boots that are used only in operating theatre or shoe covers and cleaning of handheld mobile devices such as cell phones prevent contamination of the operative field (Tateiwa *et al.* 2020). Further, home laundering of surgical scrubs is not recommended as it lacks required parameters for hot and/or cold water temperature, detergent or water treatments (AORN 2015).

To reduce the risk for SSIs in the operating theatre environment, it is therefore important for nurses to have knowledge of, and adhere to, recommended practices regarding the use of surgical attire (AORN 2016). On-going education and training through, for example, educational interventions could assist in promoting nurses' knowledge on recommended practices in the clinical field, including the use of surgical attire in operating theatres. Educational interventions have been repeatedly used to improve nurses' knowledge regarding recommended practices, with promising results (Häggman-Laitila, Mattila & Melender 2016). Although few eductional interventions have been implemented among nurses in the operating theatre (Fereidouni *et al.* 2022; Kalantari *et al.* 2021; Sutherland-Fraser *et al.* 2012), no research has been published in South Africa regarding an educational intervention that influences nurses' knowledge on recommended practices related to the use of surgical attire. Therefore, this educational pilot study aimed to evaluate the effect of an educational intervention on nurses' knowledge regarding recommended practices related to the use of surgical attire in operating theatre.

RESEARCH METHODS AND DESIGN

Study design

An educational pilot study, employing a quasi-experimental, two-group, pre-test, post-test design, was conducted from March 2019 to August 2019. Participants were selected to an intervention group or a control group. Both groups received a pre-test and a post-test questionnaire. The primary outcome of the study was to improve nurses' knowledge regarding recommended practices related to the use of surgical attire in operating theatre. The secondary outcome (although not measured in this study) included reduced numbers of SSIs, length of stay and patient mortality.

Setting

The study was conducted in one of the six health districts in the Eastern Cape Province, South Africa. The four largest hospitals in the health district - two private and two public hospitals - were included in the study. Each hospital has a cardiac and/or thoracic theatre, urology theatre, orthopaedic theatre, ophthalmology theatre, neurological theatre and general theatre where laparoscopic and diagnostic interventions and surgical operations are done. Nurses working in these operating theatres are all trained (whether formal through post-graduate qualifications in Operating Theatre Nursing or informal through in-service training) to offer care and perform scrub, anaesthetic, circulating and recovery functions. Most nurses in the study setting rotate in these functions while a few have specialised in these functions and do not rotate. At the time of the study, institutional statistics in some of the hospitals included in the study revealed SSIs to be as high as 10.0% (Opadotun 2019).

The researcher noted a deficiency in knowledge among professional nurses working in operating theatres, which led to practices that heightened the likelihood of SSIs. These practices included the re-use of surgical gowns upon returning to the operating theatre, inadequately covering the hair with head covers, improper hand hygiene, such as not thoroughly drying hands up to the elbow, resulting in water dripping onto surgical scrubs and gowns before commencing scheduled operations (Jenkins 2017; Mockford & O'Grady 2017).

Participants

Because of the small sample size of the population and the geographic proximity of the selected

hospitals, which could have led to possible contamination of the intervention, randomisation was not possible. Therefore, convenience sampling was used to select all 85 nurses, working at operating theatres, offering care and performing functions related to scrub, anaesthetic, circulating and/or recovery in four hospitals, which were purposively allocated to an intervention group (Hospital 3 - public and Hospital 4 - private) and a control group (Hospital 1 - public and Hospital 2 - private). To have similar sample sizes, one private hospital and one public hospital were purposively selected to be included in each group.

Because of the limited population size, there was no need to compute a minimum sample size, and the research plan aimed to include the largest possible sample size. In total, 68 nurses participated in the pre-test questionnaire, and out of these participants, 56 were involved in the post-test questionnaire. The sampling framework is illustrated in Figure 1.

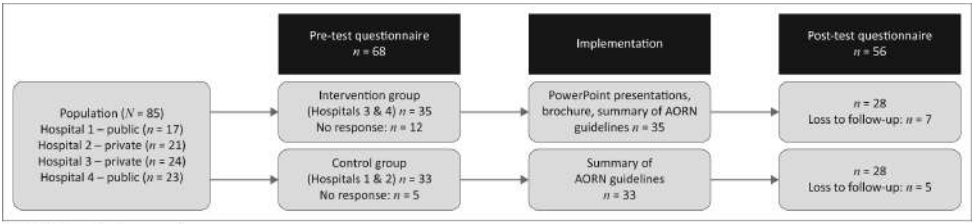

FIGURE 1: Sampling framework per group.

The educational intervention

An existing educational intervention, based on the AORN (2015) guidelines regarding the use of surgical attire in the prevention of SSIs in operating theatres, was used. The AORN guidelines were chosen because it covers all the topics related to the use of surgical attire - namely headgear, surgical facemasks, laundering of surgical scrubs, shoe covers, surgical scrub suits, surgical gown, jewellery, gloving, personal protective equipment (PPE) (eye gear and aprons) and electronic devices (such as cell phones,tablets and other personal handheld devices). Furthermore, these are evidence-based guidelines that specifically emphasise patient safety and the achievement of optimal outcomes, and they have been previously put into practice (AORN 2015).

The educational intervention consisted of an interactive training session, brochures, as well as a summary of the AORN guidelines. The educational intervention was deemed suitable as the methods were not time consuming and could be implemented in a busy environment, such as the operating theatre, without disruption of patient care (see Table 1.

For the intervention group, a once-off 20-minute interactive training session was conducted with all participating nurses that offer care and perform functions related to scrub, anaesthetic, circulating and recovery on day duty by the first author, a male registered nurse. The intervention was conducted consistently for both of the two hospitals in the intervention group. It occurred at the same time of day during a week typically considered to have lower activity, with fewer scheduled operations. A private, quiet room was used to avoid participant fatigue and enhance their attention.

TABLE 1: Contents of the educational intervention for the intervention and control groups.

Educational tool	Mode of delivery	Content AORN guidelines (AORN 2015)
Intervention group		
27 Slides PowerPoint presentation based on original presentation by Seifert et al. on behalf of AORN (2015)	20-min, face-to-face, interactive training session	• One slide listing the objectives of the session. • Pictures and text, outlining the reasons, recommended use and justification of the following: ▪ Head covering ▪ Surgical face mask ▪ Surgical scrub suits ▪ Shoe covers ▪ Home laundering of surgical attire ▪ Jewellery ▪ Gloving ▪ PPE: eyewear and aprons ▪ Electronic devices (cell phones, tablets and other personal handheld devices)
Four-page brochure	Hardcopy, distributed to participants immediately after the presentation as part of the training session	Pictures and text, outlining the recommended use and justification of the following: • Headgear • Surgical face mask • Scrub suits • Shoe covers • Home laundering of surgical attire • Jewellery • Gloving • PPE: eyewear and aprons • Electronic devices (cell phones, tablets and other personal and handheld devices)
Intervention and control groups		
Two-page summary of the AORN guidelines (AORN 2015)	Hardcopy, left at each nursing station of the operating theatre in the selected hospitals	Text: Takeaway message and explanation of surgical attire (laundering and type of scrub attire), covering of arms, jewellery, and electronic equipment (cell phones, tablets and other personal handheld devices)

AORN, Association of periOperative Registered Nurses; PPE, personal protective equipment.

On the same day, for all participating night staff working 19:00 to 07:00, the training session was repeated at 19:30 after handover. The session was followed by the distribution of hard copy brochures to each participating nurse, and a hard copy of a summary of the AORN guidelines was left at each nursing station of the operating theatre in the selected hospitals. The brochures and the summary of the guidelines aimed at re-iterating the information in the training session and permitted nurses to become acquainted with the suggested evidence-based practices related to the utilisation of surgical attire in preventing SSIs.

In the control group, participants in the designated two hospitals received only a summary of the AORN guidelines, which was ethically required because of high SSI rates across selected hospitals in both groups. The implementation timeframe was three months, which was deemed acceptable to provide sufficient time for participants to familiarise themselves with the AORN guidelines and recommended practices regarding the use of surgical attire, as recommended elsewhere in a similar setting (Falconer *et al.* 2021). Nurses could contact the first author telephonically or via email if they had any concerns or questions during the implementation time frame.

A review panel consisting of two individuals holding honours degree in Advanced Nursing in Operating Theatre and one with a master's degree in Operating Theatre Nursing reviewed the educational intervention. Each of the reviewers possessed significant experience, ranging from 10 to 20 years, in both public and private operating theatre care. This collective experience was instrumental in evaluating the intervention's feasibility, appropriateness for the South African context, and its overall design and readability prior to its implementation.

Pre-test and post-test questionnaires

Data were collected by means of hard copy self-administered pre-test and post-test questionnaires. The pre-test questionnaire was the same as the post-test questionnaire, and the questionnaires were the same for both groups in order to test the nurses' knowledge regarding recommended practices related to the use of surgical attire. The pre-test and post-test questionnaires were formulated and designed in alignment with the existing educational intervention based on the AORN guidelines regarding the use of surgical attire (AORN 2015; Braswell & Spruce 2012).

The questionnaires included two sections - section one entailed demographic questions (four items, involving participants' basic and additional education, working experience and affiliated hospital) and section two consisted of a total of 31 items related to 11 practices on the use of surgical attire to prevent SSIs in operating theatres, as follows: guideline adherence, headgear, surgical facemask, laundering of surgical scrubs, shoe covers, scrub suits, surgical gown, gloving, jewellery, PPE: eye gear and aprons, and electronic devices.

Possible responses for each item included 'Yes', 'No' or 'Don't know'. To enhance validity, the questionnaires were reviewed by the same three reviewers who also reviewed the educational intervention. No amendments to the questionnaires were required.

Data collection

After the relevant ethical clearance and permissions from each hospital were obtained, all nurses at the

selected operating theatres were approached during their tea breaks, provided with both verbal and written information about the study and invited to participate in the study. Those who agreed to participate in the study completed consent forms that were issued prior to completion of the questionnaire.

The first author distributed the questionnaires to the participants for completion. Participants were asked not to discuss items or answers among each other or use any information to answer the questionnaire. The completed questionnaires were collected by the first author immediately after completion. The questionnaire took approximately 15 minutes to complete. No incentives were given to participants to partake in the study.

Data for the post-test were collected in the same manner as the pre-test questionnaire. For both groups, the same pre-test and post-test questionnaires were used. This was done after the three-month post implementation phase of the intervention. After the post-test was completed, the full educational intervention was shared with the nurses in the control group.

Data analysis

The pre-test and/or post-test data were captured and analysed employing descriptive and inferential statistics in Microsoft Excel, with the assistance of a statistician. The chi-square test of independent variance was used to determine any significant relationships between the responses. A chi-square p-value less than 0.05 was considered statistically significant. Cohen's d was used to determine whether the improvement in knowledge (post-test minus pre-test scores) was significant, with values 0.2 (small), 0.5 (medium) and 0.8 (large). The knowledge regarding recommended practices' scores of 1.00 to 3.99 was regarded low, while 4.00 to 4.38 was regarded average and 4.39 to 5.00 was regarded high.

Ethical considerations

The study received approval from the Institutional Review Board of Nelson Mandela University, under Approval Number H18-HEA-NUR-020. Additionally, consent was sought from all participants, and their involvement in the study was entirely voluntary. The questionnaires used were anonymous and did not seek any personally identifiable information.

RESULTS

Out of a total of 85 potential participants, 68 participated in the pre-test (33 from the control group and 35 from the intervention group), resulting in an overall 80.0% response for the pre-test. A total of 56 participants participated in the post-test (28 in the control group and 28 in the intervention group), resulting in an overall 65.1% response rate for the post-test.

Demographic data

The demographic data are outlined in Table 2. Demographic data were similar for both the control and intervention groups. The main findings for both groups are therefore as follows: most participants had a bridging course (aimed at upskilling nurses without a diploma in nursing to a three-year diploma containing basic training as a nurse and midwife) or a four-year diploma (basic training as a nurse and midwife without honours or specialised training in operating theatre nursing) and about half had an additional qualification (honours or master's degree in Operating Theatre Nursing). Most participants had

more than five years of work experience. A majority of the participants in the control group and a slightly smaller portion in the intervention group were employed in private hospitals. No statistical significance was found for the demographic characteristics for both pre- and post-test.

TABLE 2: Demographic data.

Demographic items	Control group (N = 61)				Intervention group (N = 63)				p pre-test	p post-test
	Pre-test (n = 33)		Post-test (n = 28)		Pre-test (n = 35)		Post-test (n = 28)			
	n	%	n	%	n	%	n	%		
Basic qualification	11	33.3	9	32.2	13	37.1	10	35.7	0.167	0.904
4-year diploma	17	51.5	13	46.4	10	28.6	11	39.3	-	-
Bridging course	4	12.1	6	21.4	8	22.9	7	25.0	-	-
4-year degree	1	3.1	0	0.0	4	11.4	0	0.0	-	-
Additional qualification										
Yes	14	42.4	14	50.0	17	48.6	15	53.6	0.514	0.789
No	19	57.6	14	50.0	18	51.4	13	46.4	-	-
Years of working experience										
Less than a year	9	27.2	3	10.7	3	8.6	2	7.1	0.213	0.594
1–2 years	5	15.2	5	17.9	7	20.0	4	14.3	-	-
3–4 years	4	12.1	5	17.9	3	8.6	2	7.1	-	-
5–9 years	5	15.2	7	25.0	4	11.4	7	25.0	-	-
10 and above	10	30.3	8	28.5	18	51.4	13	46.5	-	-
Private or public hospital										
Private	19	57.6	17	60.7	17	48.6	12	42.9	0.457	0.181
Public	14	42.4	11	39.3	18	51.4	16	57.1	-	-

Knowledge regarding recommended practices related to the use of surgical attire

The t-test scores for knowledge regarding recommended practices related to the use of surgical attire are outlined in Table 3.

Out of the 11 knowledge items related to recommended practices for the use of surgical attire to prevent SSIs, the control group showed a substantial and statistically significant improvement in their understanding of the guidelines for surgical attire to prevent surgical site infections (Score 1) ($p < 0.000$ and Cohen's $d = 1.38$). Additionally, a substantial and statistically significant improvement was observed in their understanding regarding the cleaning of electronic devices when entering and leaving the operating theatre (Score 11) ($p < 0.000$ and Cohen's $d = 1.25$) for the control group. A moderate and statistically significant difference was also noted in knowledge regarding the use of personal protective equipment in the theatre (Score 10) ($p = 0.019$ and Cohen's $d = 0.62$).

In the intervention group, a significant and substantial improvement was observed between the pre-test and post-test questionnaires for participants' knowledge on the use of headgear in the operating theatre (Score 2) by the participating nurses ($p < 0.000$ and Cohen's $d = 1.24$). Similarly, a substantial and statistically significant improvement was noted in knowledge for the cleaning of electronic devices (Score 11) ($p < 0.000$ and Cohen's $d = 1.38$) in the same group. Moderate significance was found in participants' knowledge regarding the use of surgical facemasks to prevent SSIs (Score 3) ($p = 0.48$ and Cohen's $d = 0.52$), as well as in the laundering of surgical scrubs (Score 4) ($p = 0.013$ and Cohen's $d = 0.65$), shoe cover practices (Score 5) ($p = 0.019$ and Cohen's $d = 0.61$) and the use of scrub suits in the operating theatre (Score 6) ($p = 0.044$ and Cohen's $d = 0.52$).

Knowledge scores of 1.00 to 3.99 were regarded low, while 4.00 to 4.38 were regarded average and 4.39 to 5.00 were regarded high. The nurses' knowledge scores pertaining to recommended practices were

generally low for both the control and intervention groups during the pre-test, and they reached an average level in the post-test. Notably, there was a significant and substantial improvement in the intervention group between the pre-test and post-test questionnaires ($p < 0.000$ and Cohen's $d = 1.26$).

TABLE 3: T-test scores for knowledge on recommended practices regarding the use of surgical attire for control groups and intervention groups pre- and post-test.

Variables	Group	Pre- and/or post-test	*n*	Mean	SD	Difference	t	*d.f.*	*p*	Cohen's d
Score 1 (guidelines)	Control	Pre-test	33	4.73	0.67	0.98	5.53	59	**< 0.000**	**1.38 Large**
		Post-test	28	3.75	0.75	-	-	-	-	-
	Intervention	Pre-test	35	4.63	0.65	0.24	1.31	61	0.196	-
		Post-test	28	4.39	0.79	-	-	-	-	-
Score 2 (headgear)	Control	Pre-test	33	3.25	1.05	-0.18	-0.71	59	0.478	-
		Post-test	28	3.43	0.89	-	-	-	-	-
	Intervention	Pre-test	35	2.48	0.83	-1.20	-2.02	60	**< 0.000**	**1.24 Large**
		Post-test	28	3.68	1.13	-	-	-	-	-
Score 3 (facemask)	Control	Pre-test	33	3.84	0.42	-0.14	-1.44	59	0.154	-
		Post-test	28	3.98	0.30	-	-	-	-	-
	Intervention	Pre-test	34	3.77	0.65	-0.28	-2.02	60	**0.048**	**0.52 Medium**
		Post-test	28	4.07	0.35	-	-	-	-	-
Score 4 (laundering of surgical scrubs)	Control	Pre-test	33	4.21	1.34	0.43	1.18	59	0.242	-
		Post-test	28	3.79	1.47	-	-	-	-	-
	Intervention	Pre-test	35	3.17	1.82	-1.01	-2.56	61	**0.013**	**0.65 Medium**
		Post-test	28	4.18	1.12	-	-	-	-	-
Score 5 (shoe covers)	Control	Pre-test	33	4.54	0.64	0.35	1.83	59	0.073	-
		Post-test	28	4.19	0.83	-	-	-	-	-
	Intervention	Pre-test	35	4.09	0.97	-0.49	-2.49	61	**0.019**	**0.61 Medium**
		Post-test	28	4.58	0.50	-	-	-	-	-
Score 6 (scrub suits)	Control	Pre-test	33	3.71	0.71	-0.03	-0.22	59	0.827	-
		Post-test	28	3.74	0.41	-	-	-	-	-
	Intervention	Pre-test	35	3.42	0.74	-0.32	-2.06	61	**0.044**	**0.52 Medium**
		Post-test	28	3.74	0.39	-	-	-	-	-
Score 7 (surgical gown)	Control	Pre-test	33	4.67	0.58	-0.04	-0.26	59	0.798	-
		Post-test	28	4.70	0.49	-	-	-	-	-
	Intervention	Pre-test	35	4.62	0.66	-0.19	-1.33	61	0.189	-
		Post-test	28	4.81	0.41	-	-	-	-	-
Score 8 (jewellery)	Control	Pre-test	22	4.49	1.09	0.46	1.38	43	0.175	-
		Post-test	23	4.03	1.13	-	-	-	-	-
	Intervention	Pre-test	27	4.21	1.11	-0.34	-1.23	46	0.223	-
		Post-test	21	4.56	0.73	-	-	-	-	-
Score 9 (gloving)	Control	Pre-test	33	4.70	0.43	-0.07	-0.66	59	0.510	-
		Post-test	28	4.77	0.40	-	-	-	-	-
	Intervention	Pre-test	35	4.27	0.68	-0.21	-1.19	61	0.240	-
		Post-test	28	4.48	0.73	-	-	-	-	-
Score 10 (personal protective equipment: eye gear and aprons)	Control	Pre-test	32	3.04	1.16	-0.63	-2.41	58	**0.019**	**0.62 Medium**
		Post-test	28	3.67	0.77	-	-	-	-	-
	Intervention	Pre-test	33	3.39	1.12	-0.30	-1.22	59	0.229	-
		Post-test	28	3.70	0.75	-	-	-	-	-
Score 11 (electronic devices, e.g. cell phones, tablets and other personal handheld devices)	Control	Pre-test	32	2.47	1.54	-1.71	-4.84	58	**< 0.000**	**1.25 Large**
		Post-test	28	4.18	1.12	-	-	-	-	-
	Intervention	Pre-test	33	2.39	1.34	-1.86	-5.36	59	**< 0.000**	**1.38 Large**
		Post-test	28	4.25	1.35	-	-	-	-	-
Overall score	Control	Pre-test	33	3.96	0.40	-0.06	-0.57	59	0.572	-
		Post-test	28	4.01	0.38	-	-	-	-	-
	Intervention	Pre-test	35	3.68	0.47	-0.53	-4.97	61	**< 0.000**	**1.26 Large**
		Post-test	28	4.22	0.36	-	-	-	-	-

Note: Chi-square: *p*-value less than 0.05 is statistically significant (in bold); Cohen's d 0.2 (small), 0.5 (medium) and 0.8 (large) significant (in bold).
n, natural numbers; SD, standard deviation; t, time; *d.f.*, degrees of freedom.

DISCUSSION

This pilot study aimed to evaluate the effect of an educational intervention on nurses' knowledge regarding recommended practices related to the use of surgical attire in operating theatre. The findings of the study indicated that the educational intervention, which included a 20-minute interactive training session, distribution of brochures and a summary of the AORN 2015 guidelines related to the use of surgical attire, had a beneficial impact. Specifically, it improved the nurses' understanding of the recommended practices for using surgical attire to prevent SSIs in operating theatres, aligning with AORN's recommendations. This finding was congruent with other, similar research studies (Bassyouni, Wegdan & El-Sherbiny 2016; Rinaldi *et al.* 2016). Hence, it is advisable to put this educational intervention into practice within operating theatres. However, when implementing the educational intervention, the latest AORN 2020 guidelines on the use of surgical attire should be used (Link 2020), as this version was not yet published when the pilot study was conducted.

In this study, knowledge regarding certain practices related to the AORN 2015 guidelines regarding the use of surgical attire, including headgear, face masks, laundering of surgical scrubs, shoe covers, scrub suits and PPE (eye gear and aprons), significantly improved in the post-test in either the control group or the intervention group, while the use of electronic devices improved significantly for both groups. This could be explained as the control group did receive a summary of AORN's guidelines related to the use of surgical attire, indicating some operating theatre nurses in the control group may have read these guidelines.

Information on recommended practices specifically related to the utilisation of head covering in the operating theatre and cleaning of electronic devices should be accessible to all nurses in operating theatre, as these showed a large significant improvement in this study. Although there seems to be a paucity in published intervention studies conducted on the topic, a quantitative study conducted in Egypt as well as an observational study in Turkey found that compliance to correct use of surgical attire and PPE was generally high among nurses in operating theatre (Awadalla, Garas & Hanafy 2019; Gülsen *et al.* 2021). Furthermore, the pre-test and post-test questionnaires conducted in both groups may have led to more awareness of the use of surgical attire among participants.

With regard to demographics, it must be noted that about half of the nurses in this study did not possess an additional post-basic qualification. Possessing an additional education was not found significant related to improved knowledge regarding recommended practices related to the use of surgical attire among our study participants. However, an additional education (such as postgraduate studies, including honours and master's degree in Operating Theatre Nursing) can lead to an improvement in knowledge reflecting in improved adherence to recommended practices, including the use of surgical attire (McHugh & Lake 2010; Sethi et al. 2018), which is important as knowledge scores among study participants were low (pre-test) and average (post-test) as highest scores. Nurses are thus encouraged to acquire additional qualifications or in-service training (compulsory or optional professional development activities to maintain or upgrade professional qualifications and competencies) as these will help in improving skills and knowledge necessary to meet the complex healthcare demands (University of Texas Arlington 2019). In light of the results from the present study, it is advisable to consider education and training, either formally (such as pursuing an additional qualification) or informally (through regular in-service training) as nurses' knowledge regarding recommended practices on the use of surgical attire improved

post-implementation of the educational intervention irrespective of nurses possessing basic versus specialised training. Furthermore, the questionnaire designed for this study could be used by managers in operating theatres to identify gaps in knowledge regarding recommended practices related to the use of surgical attire in operating theatres, to tailor in-service training to the identified practice gaps and monitor improvement in both knowledge and adherence to recommended practices.

However, to prevent SSIs, providing education using an educational intervention that promotes the correct use of surgical attire alone may not be sufficient. It is recommended that the use of surgical attire must be adhered to, together with general infection prevention and control principles, such as hand hygiene and overall cleanliness of the operating theatre, as well as the administration of prophylactic antibiotics and appropriate hair removal procedures without a razor, ensuring normothermia, employing chlorhexidine gluconate in combination with alcohol-based skin preparation agents, conducting decolonisation with intra-nasal anti-staphylococcal agents and anti-staphylococcal skin antiseptics for high-risk procedures, monitoring peri-operative glucose levels and utilising negative pressure wound therapy have demonstrated effectiveness in diminishing the incidence of SSIs (Mckenna, Hutchinson & Butler 2019; Seidelman, Mantyh & Anderson 2023; Woodruff & Hohler 2018). Further, as implementation of strict operating theatre attire policies, including complete covering of both the ears and facial hair, has no proven effect on SSI rates (Farach *et al.* 2018), consideration should be given to implementing surgical attire in accordance with procedures that are proven to reduce infection rates, especially for countries with limited available resources (Bhutta 2019; Petrilli *et al.* 2018).

Education and training on the use of surgical attire to reduce SSIs should therefore include the above infection control principles and interventions while considering the available resources. Subsequently, to facilitate training, a dedicated person with expertise in infection control or an entire multi-disciplinary infection control team, consisting of nurses, microbiologists and physicians who have undergone training on infection control, should be appointed as this has proven to enhance knowledge and adherence to infection control practices, including the correct use of surgical attire (Cima *et al.* 2013).

The research study had the following identified limitations: the findings were derived from data gathered via a self-administered questionnaire, which may not accurately represent the participants' actual knowledge of recommended practices concerning the use of surgical attire in operating theatres. Consequently, it is advisable to conduct an observational study. Additionally, a reduced level of participation from nurses at certain sites, possibly due to lack of enthusiasm, led to a lower response rate, especially in the post-test questionnaire. The questionnaire did not include age and gender as part of the demographic items and did not measure its reliability and validity. There is thus a need to further develop and test the questionnaire.

Given the time limitations and the study's restricted focus, the inclusion of healthcare professionals beyond nurses offering care and performing functions related to scrub, anaesthetic, circulating and recovery in operating theatres was not feasible. Hence, findings cannot be generalised to a larger population of nurses in operating theatres and other non-nursing members of the surgical team. Additionally, the educational intervention was based on existing guidelines for the use of surgical attire and included only practices outlined in these guidelines, which may not have included all practices nurses should have knowledge about related to the use of surgical attire.

Finally, the current study neither measured the effect of the implemented educational intervention on patient outcomes, including SSI rates, nor its prolonged impact on practice outcomes over time (for example, by repeating the post-test). It is therefore recommended that further development and testing of the educational intervention should be done by conducting a similar study, which includes a larger sample size as well as various members of the multidisciplinary team in the operating theatre, testing its long-term effect on knowledge retention as well as its effects on surgical site infections in the operating theatre setting.

CONCLUSION

This pilot study aimed to evaluate the effect of an educational intervention on nurses' knowledge regarding recommended practices related to the use of surgical attire in operating theatre. The tailored educational intervention, carried out in the two chosen hospitals within the intervention group, demonstrated a significant enhancement in nurses' knowledge of recommended practices related to the use of surgical attire, particularly the use of headgear in the operating theatre and cleaning of electronic devices, in the prevention of SSIs in operating theatres but requires further exploration and testing. For the control group, there were also significant changes in knowledge reported which were not because of the educational intervention. Further, access to evidence-based educational materials, including best practice guidelines, formal education, consideration of general infection control principles and resources, and a multi-disciplinary approach would enhance and sustain the success of the intervention. The findings of this pilot study can be utilised by nurses to enhance knowledge of and adherence to best practices regarding the use of surgical attire to prevent SSIs in operating theatres.

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Accidental Awareness During General Anaesthesia

By Peter M. Odor

ABSTRACT

This narrative vignette illustrates accidental awareness during general anaesthesia (GA) through the case of a 40-year-old woman who experienced vivid recall of intra-operative events during myomectomy, including suffocation sensations and abdominal pain, leading to post-traumatic stress disorder (PTSD) despite debriefing. Accidental awareness during GA is defined as unintended consciousness occurring despite planned absence of consciousness during anaesthesia. Awareness stems from inadequate anaesthetic delivery, which fails to disrupt thalamocortical circuits and higher order processing. It manifests as explicit recall (detailed memories) or implicit (subtle behavioural changes). Incidence varies by method used to identify the phenomenon: 1:19,600 for spontaneous reports (NAP5) versus 1–2:1000 via direct questioning, with elevated risks in obstetrics (1:256–670), obesity, emergencies and when using neuromuscular blocking drugs. Prevention involves vigilant dosing, risk assessment and monitoring; management emphasises immediate debriefing, root-cause investigation and psychological support to mitigate distress.

CLINICAL VIGNETTE

A 40-year-old female patient was distressed upon emerging from anaesthesia after open myomectomy surgery. She immediately reported to her recovery nurse that she could remember aspects of what she thought might have been surgery occurring. She had a medical history of fibroids, a body mass index of 38, but was otherwise healthy. This was the first time she had undergone GA. She recalled hearing voices asking for numbered objects, feeling her neck being extended further back, then a plugging sensation in her mouth and a sense of suffocation. The patient tried to cry and shout out to indicate that she was still awake, but was unable to move or communicate. The patient recalled being moved and feeling a sharp pain in her lower abdomen, after which her memories became blank. The patient remembers being scared about how this would end and if she would survive. Despite a detailed debrief and explanation provided by her anaesthetist, the patient later developed post-traumatic stress disorder (PTSD) with intrusive flashbacks, panic attacks and fear of future anaesthesia, and received regular counselling from a psychologist.

CLINICAL QUESTION

How can accidental awareness during general anaesthesia (AAGA) be prevented and managed to minimise psychological harm in patients undergoing surgery?

DISCUSSION

Patients expect GA to be associated with unconsciousness and an absence of memory for the duration that anaesthesia is provided. Failure of both these processes is termed accidental awareness during

general anaesthesia (AAGA), which describes an unintended return of consciousness between the planned induction and emergence periods of general anaesthesia. AAGA remains a fundamental complication of anaesthetic practice and one of the few complications experienced by surgical patients that anaesthetists have sole, undivided responsibility for. Even though AAGA is rare, the vast number of surgical procedures carried out worldwide means that the odds are high that someone, somewhere, experiences awareness each day.

Understanding AAGA relies upon an appreciation of the underlying complexity of the apparently simple goal of anaesthesia: to safely take a patient from a conscious to an unconscious state, then back again. Both consciousness and GA are complex phenomena, with multiple theories and levels of understanding regarding mechanisms of action. Activation of depressant protein channel receptors, GABAA, is a key feature of general anaesthetic drugs, leading to disrupting communication between key brain regions and thalamocortical circuits. Higher doses of GA drugs preferentially reduce brain activation in higher order regions, responsible for information integration, over primary sensory areas[1,2]. This conceptual model has implications for understanding how awareness is perceived and how other higher order cortical processing, such as memory, is affected during general anaesthesia.

The easiest to detect (and arguably most important) form of AAGA is with declarative memory or explicit recall in which the patient can remember and report, in detail, the events that occurred during the awareness episode. But return of consciousness may also occur without a clear memory of the experience being encoded or able to be retrieved later. This form of awareness is known as implicit recall, and may manifest as behavioural changes, depression or sometimes not at all. The process of dimming, then loss, of consciousness is experienced by most patients with the same clear pattern: one moment they remember being in the operating or anaesthetic room, lying on their back, with a mask delivering oxygen over their mouth and an anaesthetist beside them. The next moment, they wake with a total 'blackout' in between, feeling like no time has passed and with no memory of intra-operative events. This experience is exactly our intention as anaesthetists: to generate hypnosis, analgesia and amnesia, and therefore make the intolerable process of surgery tolerable and possible.

As a frightening iatrogenic complication, AAGA has a high public profile, increases patients' apprehension of surgery, and affects the medical–legal risks[3] associated with anaesthesia. The root cause is always the inadequate delivery of an effective dose of an anaesthetic drug to a patient's brain, which can occur for a variety of reasons (for example, situational challenges to the delivery of anaesthesia for emergency patients, variability in patient responses to anaesthesia drugs or equipment malfunction). Consciousness is multi-dimensional and has several components, including felt experience, self-awareness, perception and attention. Our window of measurement of consciousness is limited, as experience is inherently first person, highly subjective, multi-faceted and reliant on communication to share understanding. For this reason, it is better to think about the interaction of GA with consciousness as less of a binary 'on-off' switch, but rather as dynamic effects on a panel of dimmer switches, each manipulating different neural bases that contribute to conscious experience.

By far the most common AAGA experiences are trivial, consisting only of brief, hazy recollections. Less commonly, patients recall more specific details of sensory input from their surroundings during surgery. This may be a feeling of something in a patient's mouth, hearing noises or feeling touch. Most patients

who report awareness during surgery do not feel pain and report brief experiences, lasting less than 5 minutes. Common experiences include: hearing voices or the noise of equipment; trying to move to alert staff and being unable to; feeling anxious that something has gone wrong with the operation and being powerless to do anything; or feeling frightened that things are going to get worse. Half of patients reporting memories of awareness find the experience distressing, with pain and paralysis being strongly associated with distress.

Lack of consciousness is generally inferred from external signs, such as a lack of response or measurement of brain electrical activity, using tools such as processed electro-encephalograms (pEEG). These limited diagnostic tools and observational methods do not fully capture internal awareness across the continuous spectrum of consciousness, including hidden or partial conscious states. One example of how our simple monitoring tools are limited is in the common situation of patients receiving drugs used to paralyse skeletal muscles (called neuro-muscular blocking drugs) as part of GA. These drugs are administered to facilitate the placement of airway support devices and maintain appropriate conditions for safe surgical operations. However, a patient accidentally provided with neuro-muscular blocking drugs with inadequate dosing of hypnotic anaesthetic drug may have incomplete ablation of consciousness, despite appearing completely unresponsive. Neuro-muscular blocking drugs do not affect consciousness, instead they block the window of observation used to measure the conscious state[4]. In this situation, a patient may still perceive experiences, but be unable to signal a response due to the inability to trigger muscle activation. To complicate matters further, pEEG monitors, which are now frequently used to monitor the effects of anaesthesia on brain function, are subject to potential error and misinterpretation in the absence of electrical signals from muscle activity[5]. As such, pEEG can provide false reassurance to anaesthetists providing care to patients receiving paralysis drugs, and introducing potential risk of AAGA without appropriate interpretation.

Furthermore, due to the differential effects of general anaesthetic drugs on cortical activity, sensory stimuli can sometimes still be detected during GA. Playing a piece of music to a patient receiving anaesthesia drugs can activate the auditory cortex, although this information is not necessarily transmitted to higher order centres responsible for consciousness processing[6]. In a sense, the music is heard but not perceived. Another vivid example comes from an infrequently used anaesthetic monitoring approach called the 'isolated forearm technique' (IFT)[7, 8].

IFT consists of the inflation of a blood pressure cuff on a patient's arm to above systolic blood pressure during the induction of general anaesthesia. Neuro-muscular blocking drugs are injected intravenously; however, because the arm is vascularly isolated from the rest of the circulation the distal hand remains unparalysed. Surgery can proceed (with the cuff deflated after 20 minutes) if the patient is asleep. If awake, the patient could use this unparalysed arm to communicate. It is also possible to issue verbal instructions to the anaesthetised patient to test for appropriate motor reactions, too.

Although studies of response during IFT are small in sample size and few in number, remarkably up to 5% of tested patients can respond to verbal commands by contracting with their hands; almost all report no memory of doing so afterwards[9, 10]. This is despite no otherwise apparent clinical signs of awareness and provision of GA sufficient to obtund a response to surgical stimulation, and no spontaneous movement in the absence of command.

The state of wakefulness without recall that is detected by IFT may be very similar to that of intended sedation with amnesia (for example by use of drugs like midazolam). In contrast, the responses may also be explained by a distinct brain state in which conscious perceptions are uncoupled from surgical stimulation, but responses are not uncoupled from verbal stimulation. This state has been termed 'dysanaesthesia'[7]. Understanding how the neurobiology of memory is modulated by both the pharmacology and process of anaesthesia is important when interpreting AAGA reporting. Not only do most anaesthetic drugs have amnesic properties at sub-anaesthetic threshold, but all memories are vulnerable to bias or being overwritten by later similar events, which can impair their subsequent retrieval. When patients regain consciousness during emergence at the end of surgery, the memory of this episode of waking may be more easily understood and recalled, suppressing any intra-operative memory of wakefulness.

Reported patient experiences of AAGA can therefore be thought of in concentric circle terms, with the most frightening complications occurring only to a small minority[11]. Most patients undergoing surgery experience no awareness whatsoever (the outermost ring). However, a smaller proportion of patients might experience a period of return of consciousness during surgery but have no memory of that process (these patients may be those represented by a positive response to verbal command during IFT). An even smaller proportion will remember being awake, but variations in the encoding of memories mean that they may require prompting or direct questioning to retrieve the memory. A tiny minority experience awareness and can immediately and spontaneously describe their experience after surgery (the innermost circle).

The largest ever study of AAGA was The Fifth National Audit Project (NAP5) of the Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland 'Accidental Awareness during General Anaesthesia in the United Kingdom and Ireland', published in 2014[12]. In contrast with previous research involving direct questioning of patients about potential memories shortly after GA, NAP5 collected only reports made spontaneously by patients to clinical teams. Although reports were only admissible if they were collected during a hospital admission in the UK and Ireland between June 2012 and May 2013, the awareness event could occur at any time in the past.

Of the 300 reported cases of awareness, a committee judged 141 to be certain or probable cases of awareness. Based on the results of a previous activity survey, the incidence of spontaneously reported awareness was estimated as 1:19,600. This proportion is so markedly low compared with outcomes reported by studies in which patients are directly questioned about their memories of anaesthesia (for example 1:600 in the Sandin *et al.* study of 12 000 prospectively recruited patients in Sweden from 2000[13]) that its value cannot be interpreted without critical discussion of the discrepancy. In this context, given relatively similar patient cohorts and anaesthetic techniques to those in other UK and USA studies, there must be a difference in outcomes detected. The explanation returns to the concentric circle model for awareness reporting; suggesting that some awareness occurs, but is not remembered by patients without direct prompting, and a smaller proportion of cases are always recalled.

One conclusion of these findings is that direct questioning detection is weighted towards sensitivity, whereas measuring only spontaneous reports of AAGA may be more specific and reliable. However, sensitivity may be compromised by factors that interfere with decisions or the capacity of patients to file a report. For these reasons, it is reasonable to consider NAP5 as the most powerful study for describing

the relative risks of AAGA between different patient populations; however, the absolute risk values are subject to variable interpretation. Therefore, there is no simple answer to exactly how rare AAGA is, as it depends on how you detect, categorise and measure the outcome. However, most estimates using direct questioning consistently put the risk of recalling some memories attributable to the intra-operative period at approximately 1–2:1000[13–19]. Several major findings on relative risk are clearly evident. Especially that obstetric, emergency and cardiac surgery patients, obese patients or those with difficult airway management are all at elevated risk of experiencing AAGA. Obstetric patients were markedly over-represented in reported cases of AAGA in NAP5, accounting for 0.8% of all GAs in the NAP5 activity survey, but almost 10% of AAGA reports. This translated into an incidence of awareness of approximately 1:670 GAs (versus ~1:8000 in non-pregnant patients receiving neuro-muscular blockade drugs during anaesthesia).

A more recent study by Odor *et al.* used direct question screening to detect AAGA in 3 000 UK patients following obstetric surgery with GA, estimating the risk to be as high as 1:256[20]. One of the major findings from this study was an association between AAGA and use of the older anaesthetic hypnotic drug thiopental, which has persisted in obstetric anaesthetic practice despite declining use elsewhere. Appreciation of AAGA risks has catalysed the removal of thiopental from routine use in the UK, meaning that the current AAGA risk for patients is likely to be much lower than the values reported in the Odor *et al.* study from 2018.

Interestingly, there are two other important trends for the relative risk of AAGA. The first is that AAGA is an overwhelming complication that occurs in patients receiving neuro-muscular blockade drugs (~1:8000 versus ~1:136,000 in patients with no paralysis in the NAP5 study). This is because paralysis removes one of the most vital and immediate signs of inadequate anaesthesia, that of patient movement in response to painful stimuli. The second is that young, female patients (characterised exclusively by the obstetric patient cohort) are most resistant to the effects of GA hypnotic drugs, requiring higher doses, emerging more rapidly after anaesthesia and having, by far, the highest response proportion during IFT.

The skill and experience of a trained anaesthetist are vital in carefully selecting and adjusting the dose of hypnotic agent, which is likely to be sufficient to prevent awareness in the majority of patients. The use of depth of anaesthesia monitoring devices, alongside recognition of their inherent limitations, helps to guide the continual titration of anaesthetic dosing throughout surgery. As a consequence, GA is remarkably safe and, mostly, uneventful despite the complexity of the interactions that occur. Nevertheless, incidences of AAGA persist, with many being potentially avoidable. Improving anaesthetist education, drawing attention to the issue of AAGA, developing more reliable monitoring techniques and establishing best organisational practice for vigilance of drug errors and pre-operative assessment of risk factors are all vital steps in preventing awareness. Providing a vigilant and safe environment for delivery of anaesthetic care, with particular focus on continuous and adequate hypnotic drug delivery, especially when risk factors for AAGA are present, is essential[21].

Should AAGA occur, then early identification and supportive intervention may reduce the risk of developing psychological harm. Aftercare focuses on providing prompt, sympathetic communication alongside an investigation of the root cause of the event and shared learning[21]. In some cases, a duty of candour response may be required. The presence of signs of anxiety state or depression is an indicator for formal psychological assessment and on-going support (such as cognitive behaviour therapy).

Disclaimer

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Declarations and conflicts of interest

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Consent for publication statement

Narrative articles are based on clinical vignettes and created to provide a framework for discussion and maximise learning. These are not based on real individual patients and do not describe discrete patient interactions or outcomes. The objective is to summarise an interesting topic in peri-operative medicine in response to a specific clinical question posed by the authors.

Conflicts of interest statement

The author declares no conflict of interest with this work.

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Merger Of APPSA Pretoria And APPSA Johannesburg Chapters

By Marilyn de Meyer, APPSA National Executive President

To all APPSA members, Chapter Presidents and Executive Board Members

This notice serves to inform you that, as of 02 March 2026, there will be an IMMEDIATE merger of the APPSA Pretoria and APPSA Johannesburg Chapters in Gauteng.

It is with pleasure that I formally notify the Association for Peri-operative Practitioners of South Africa (APPSA) of the successful merger of the APPSA Gauteng Pretoria Chapter with the APPSA Gauteng Johannesburg Chapter. This merger has been carried out in full accordance with the provisions of the APPSA Constitution, Paragraphs 16.1 and 16.2, and is hereby declared Constitutionally valid and duly constituted, with effect from 02 March 2026 as per the authorising resolution issued by the Executive President on that date.

BACKGROUND AND LEGAL BASIS
This merger was formally initiated at the request of the APPSA Gauteng Pretoria Chapter Board, whose members voted unanimously in favour of dissolution and amalgamation with the Gauteng Johannesburg Chapter.

The following Pretoria Chapter board members voted in favour of the merger:
Dineshri Kisten; Susan Steyn; Natasha Joubert; Maruanda Liebenberg; and Nadine Nuane

The Executive Board was formally informed of this amalgamation on 03 February 2026, and the Executive President issued the formal merger directive on 02 March 2026. That directive constitutes the legal founding document of the merger. It has been duly incorporated.

MEMBER VOTE AND CONSTITUTIONAL COMPLIANCE
In accordance with the APPSA Constitution, all registered delegates of the Gauteng Pretoria Chapter for 2026 were duly notified of the proposed dissolution and amalgamation. A formal vote was conducted, and a valid quorum was achieved. The outcome of the vote met and exceeded the constitutional threshold of 7 io/o-member approval, and was accordingly confirmed as legally valid and fully compliant with the APPSA Constitution.

ESTABLISHMENT OF THE APPSA GAUTENG CHAPTER
With effect from 02 March 2026, the merged entity shall be known as the APPSA GAUTENG CHAPTER. The new chapter is hereby formally constituted and recognised as an official chapter of APPSA.

CHAPTER LEADERSHIP
Mrs Marilyn de Meyer will serve in the dual capacity of National Executive President of APPSA and Chapter President of the APPSA Gauteng Chapter. This arrangement ensures continuity of leadership and effective oversight of the newly constituted chapter at both national and regional level.

COMMITTEE COMPOSITION
The committee of the APPSA Gauteng Chapter will be composed of members from both the former Gauteng Pretoria Chapter committee and the former Gauteng Johannesburg Chapter committee.

All members of the APPSA Gauteng Pretoria Chapter committee will join and be formally incorporated into the APPSA Gauteng Johannesburg Chapter committee, forming a single unified committee for the APPSA Gauteng Chapter. The composition of this committee will be communicated to all members in due course.

ASSET AND RECORDS TRANSFER
All assets, funds, property, records, minutes, and books of accounts previously held by the APPSA Gauteng Pretoria Chapter have been, or are in the process of being, transferred to the APPSA Gauteng Chapter in accordance with the Constitution. No assets or funds have been - or will be - distributed to any individuals for personal benefit.

CONTINUITY OF CHAPTER ACTIVITIES
The APPSA Gauteng Chapter will honour and maintain all existing arrangements with trade companies and will continue to organise study days and all other Chapter activities without interruption. All trade relationships previously held by the APPSA Gauteng Pretoria Chapter will be incorporated and maintained going forward.

We extend our sincere gratitude to all members of both the former APPSA Pretoria and APPSA Johannesburg Chapters for their co-operation, dedication, and professionalism throughout this process. We look forward to a strong and united APPSA Gauteng Chapter that will continue to advance the standards and interests of peri-operative practitioners across Gauteng.

Should you have any queries, please do not hesitate to contact the National Office.

Yours in service,
Mrs Marilyn de Meyer
National Executive President, APPSA
Chapter President, APPSA Gauteng Chapter

APPSA Eastern Cape Study Day 2026 A Celebration Of Learning, Collaboration And Excellence In Peri-Operative Practice

On 18 April 2026, peri-operative practitioners from across the Eastern Cape gathered at the Old Grey Club in Gqeberha, for an inspiring and educational APPSA Study Day. The event brought together nurses, trade representatives, educators, and healthcare professionals committed to advancing peri-operative excellence and promoting safe surgical care throughout South Africa.

A true highlight of the day was the overwhelming support and attendance, with 60 attendees joining the event - surpassing the original target of 40-50 delegates. This remarkable turnout is a testament to the passion, dedication, and enthusiasm within the Eastern Cape peri-operative community for ongoing learning and professional growth. The energy in the room was one of connection, inspiration, and shared purpose, creating a vibrant atmosphere that reflected the strength and unity of APPSA's mission. Exceeding attendance expectations not only marked the event as a clear success but also reinforced the growing importance of platforms that foster collaboration, innovation, and excellence in peri-operative practice.

The day commenced with a warm Welcome Address by Phumza Cakwebe, setting the tone for innovation, reflection, and professional development.

The first presentation, "Care versus Cash," delivered by Gareth Hueff, challenged attendees to reflect on the delicate balance between financial sustainability and patient-centered care. The discussion highlighted the importance of maintaining compassion and ethical standards while navigating the increasing financial pressures within modern healthcare environments.

This was followed by a thought-provoking session from Jeffrey Fry, titled "Navigating the Pre-Operative Journey: Bringing Calm to the Chaos – AI in Healthcare." Delegates were introduced to the growing role of artificial intelligence in streamlining patient pathways, improving operational efficiency, and supporting clinical decision-making. The presentation encouraged delegates to embrace technological innovation while preserving the essential human connection that remains at the heart of quality nursing care.

An engaging and reflective presentation, "Old School vs New School Nursing Practices," was delivered by Annemarie Crause and Palesa Matyeni. Their discussion explored the evolution of peri-operative nursing, comparing traditional values and techniques with contemporary advancements. Attendees were reminded of the importance of honouring foundational nursing principles while adapting to the demands of a rapidly changing healthcare landscape.

The programme continued with Dr Chris Gouws' presentation on "The Ideal Characteristics of an Ophthalmic Registered Nurse." His insights emphasized the specialised knowledge, technical precision, adaptability, and compassionate care required to excel in this important field of peri-operative practice.

The focus then shifted to the future of professional development with Dr Boretti's presentation on "The Future of Anaesthetic Nurses Training in South Africa." This session highlighted the urgent need for structured educational pathways, continued investment in nursing education, and the development of highly skilled practitioners equipped to meet the growing demands of anaesthetic care in South Africa. The attendees urged Dr Boretti for SANC accredited Anaesthetic Nursing Training.

The final educational session, "The Then and the Now in Sterilization," presented by Nadine Nunan via Teams, provided a fascinating overview of how sterilization practices have evolved over time. The session reinforced the critical role that sterile processing and infection prevention continue to play in safeguarding patient outcomes and maintaining excellence in peri-operative care.

The APPSA Eastern Cape - Gqeberha Study Day concluded on a high note, with delegates leaving inspired, informed, and motivated to implement new ideas and strengthen best practices within their own healthcare settings. Beyond the valuable educational content, the event fostered meaningful collaboration and professional connection among colleagues who share a common commitment to patient safety and peri-operative excellence.

The success of this year's Study Day demonstrates the growing impact and importance of APPSA as a professional body dedicated to supporting peri-operative practitioners throughout the Eastern Cape. As the organisation continues to create opportunities for learning, advocacy, and professional development, events such as these serve as powerful reminders of what can be achieved when healthcare professionals come together with a shared vision for excellence.

Congratulations to Phumza Cakwebe for being elected as the new APPSA president of the Eastern Cape -Gqeberha subchapter following the resignation of Janine Prince. On behalf of APPSA Eastern Cape – Gqeberha, we would like to extend our heartfelt gratitude to Janine Prince for her dedicated leadership and unwavering commitment. APPSA Eastern Cape - Gqeberha looks forward to building on this success and welcoming even more delegates to future study days, as we continue to learn, lead, and advance peri-operative practice together.

Zandri Pieterse
APPSA Eastern Cape - Gqeberha – Secretary

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