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It's time for the perioperative community to recommit to the WHO Surgical Safety Checklist

For over a decade, the World Health Organization (WHO) Surgical Safety Checklist has been recognised as an essential perioperative safety tool.

The first landmark multi-national study demonstrated a remarkable 47 per cent reduction in mortality and a 36 per cent reduction in surgical complications, which was confirmed in subsequent studies. Although effective in a research environment, the checklist has been challenging to implement. Today, hospitals worldwide still struggle to use the checklist as designed and maintain enthusiasm for its sustained use. Is it time for the perioperative health care community to revisit the checklist and recommit to safer surgery?

The WHO developed the checklist as part of its Global Patient Safety Challenge. This Safe Surgery Saves Lives program brought together surgeons, anaesthetists, perioperative nurses, infection control experts, patient advocates and human factors engineers to identify opportunities to improve the safety of surgical care. Although checklists were not new to the field of safety, or even medicine, it was a novel (and some might say overdue) innovation in surgery.

In Australia, the checklist was launched to much fanfare by the Minister of Health at an event held in Canberra attended by representatives of all the major surgical professional bodies. Royal Australasian College of Surgeons (RACS), Australian and New Zealand College of Anaesthetists (ANZCA), Australian College of Perioperative Nurses (ACORN) and other colleges and associations went on to enthusiastically endorse the checklist, which was adopted as the standard of care.

I recognise the Surgical Safety Checklist as a turning point in my career. As a freshly minted clinical nurse specialist, I was given the task of implementing the checklist into a large metropolitan hospital. I can honestly say that the mission was a complete failure. I vividly remember a prominent surgeon standing nose to nose with me, challenging the need for 'experienced professionals' to complete a safety checklist. Ironically, this surgeon had attended the launch of the checklist in Canberra, where his college had endorsed it. I remember being astonished by how difficult it was to implement. My manager was more than astonished; she was infuriated that I had failed, given the three supernumerary days she had provided me.

More than a decade later, and after completing a PhD in implementation science, I still struggle to ensure consistent and reliable use of the checklist in practice. My only comfort is knowing that adoption has been inconsistent around the globe. The European Surgical Outcomes Study reported wide variation in checklist use. Denmark, France, Ireland, the Netherlands and the UK had near 100 per cent compliance, at the same time Croatia, Cyprus, Czech Republic,

Estonia, Greece, Hungary, Latvia, Lithuania, Poland and Slovakia had only 30 per cent or lower.[1] The GlobalSurg Consortium estimates that compliance with the checklist is approximately 50 per cent in middle and low-income countries.[2] This is similar to the African Surgical Outcomes Study with checklist use reported in 57 per cent of surgical procedures.[3]

In Australia, a study conducted at 11 hospitals across four states found a significant discrepancy between what was documented (86% compliance) and what was observed (27% compliance).[4] Although my facility was not a site in this study, the results ring true. Poor implementation has exacerbated the discrepancy between documented and actual practice. For example, many facilities have made it essential to complete the checklist in the electronic medical record before the case notes can be viewed – this is referred to as a forcing function. An unintended consequence of this forcing function is that busy nurses complete the checklist in advance, often well before the patient enters the room. This results in 100 per cent compliance on computer-generated reports but significantly less compliance in reality.

A checklist is a communication tool that provides a structured approach to assessing and communicating safety among the perioperative team. However, the mere presence of a checklist in the medical record does not improve safety. The checklist must be used with a high degree of consistency and reliability to be effective. Achieving this requires careful planning and strategic implementation, something that was missing from the 2009 rollout. Thankfully, the team who led the checklist development, under the direction of surgeon Atul Gawande, has developed an implementation guide[5] based on the lessons learned from over 4000 facilities globally. The guide is freely available at www.SafeSurgery2015.org.

I urge you to use the guide to reimplement the checklist in your facility. Let's all recommit to safer surgery!

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One step forward or two steps back?

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The Surgical Assistant Working Group (SAWG) draft report has been released, which proposes to allow nurses in the surgical assistant role to access a patient rebate from the Medicare Benefits Schedule (MBS). This will address some of the issues affecting access to surgery in Australia. While an initial read of the report has buoyed the spirits of those closely involved, it is with circumspection that we venture forward.

The SAWG, a sub-committee of the newly formed Medicare Benefits Schedule Review Advisory Committee (MRAC), released its draft final report in late August 2022. The MRAC builds on the work of the Medicare Benefits Schedule (MBS) Review Taskforce that concluded in June 2020. Despite extensive work by the Nurse Practitioner Reference Group, a sub-committee of the taskforce, the MBS Review Taskforce vetoed all recommendations aimed at increasing patient access to health care and improving the health care system in relation to work done by nurse practitioners (NPs). So, what can we expect from the new government committee, the new sub-committee and the new proposal?

The report proposes access to an MBS patient rebate if a 'medical practitioner, *suitably qualified nurse or nurse practitioner*, other than the surgeon, the anaesthetist or the assistant anaesthetist' undertakes the surgical assistant role. The amendment to the explanatory note is the addition of the words 'suitably qualified nurse or nurse practitioner'. This report is open for public consultation until 7th October 2022.

While the addition of nurses and NPs is encouraging, there are two points that require addressing – the definition of 'suitably qualified' and the process of accessing the MBS.

What defines 'suitably qualified'?

Medical practitioners, NPs and nurses are registered with the Australian Health Practitioner Regulation Authority (AHPRA) which, combined with the boards of national professional bodies, sets standards for all registered health practitioners. Interestingly, nurses and NPs must be suitably qualified to act as a surgical assistant but medical practitioners undertaking the surgical assistant role do not have the words 'suitably qualified' applied to them. Additionally, medical practitioners acting as a surgical assistant can access MBS patient rebates as soon as one year after completing university.

It is outlined in its report that the SAWG considers the surgeon to be the best person to assess whether someone is a good assistant; and the report advocates that the surgical assistant be chosen by surgeon preference, and work with surgeon oversight.

Capability for acting as a surgical assistant is also determined by the hospital credentialing process. All surgical assistants must satisfy the rigorous process of hospital credentialing which requires proof of qualifications and multiple references from surgeons. This process is a requirement of the Australian Commission on Safety and Quality in Health Care (ACSQHC) and is verified at the time of hospital accreditation.

Any surgical assistant who is registered with AHPRA, chosen by the surgeon and satisfies hospital credentialing is suitably qualified. These processes allow nurses who have been performing the surgical assistant role for many years and nurses with various post-registration graduate certificates, graduate diplomas or master's degrees to continue adding value to the health care system. Application of the phrase 'suitably qualified' that excludes nurses from performing the surgical assistant role, and denies patients access to rebates, would impact access to surgical care for patients. This is particularly true for highly specialised procedures and procedures performed out-of-hours or in regional or rural areas.

The process of accessing the MBS

While medical practitioners and NPs are able to access MBS patient rebates, nurses who are not endorsed NPs are not able to. Gaining access to MBS patient rebates is where nurses need to invest their energy. A precedent for non-NP nurses to access MBS patient rebates has been set by mental health nurses and diabetic nurse educators. Nurses acting as surgical assistants must adopt a similar process.

The phrase 'suitably qualified' can potentially lure the nursing profession into spending much time and energy discussing the minutiae of the various educational pathways to the surgical assistant role. This could fracture the response from the nursing profession as each faction tries to secure the legitimacy of their qualifications. It must be acknowledged that education, and therefore qualifications, follow many pathways. A pathway to MBS patient rebates for non-NP nurses will recognise not only qualifications but also skills, expertise, professional development and experience.

If nurses can unite and seize the opportunity to broaden access to MBS patient rebates when they act as surgical assistants, it will be one giant step forward for the nursing profession. Sadly, what is prominent in the minds of the profession is the lack of support for nurses that was displayed at the conclusion of the 2020 MBS review. If the work of the SAWG and the MRAC is vetoed by those in the Department of Health who wish to protect the turf of the medical practitioner rather than advance the cause of the patient, it will be two giant steps backward for health care in Australia.

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Mothers' satisfaction with distraction as a post-operative pain management intervention for their child: An interventional study

Abstract

Aim: This study aimed to investigate mothers' levels of satisfaction with distraction as a post-operative pain management intervention for their child.

Background: Although the number of studies on paediatric pain management has increased over time, research into non-pharmacological post-operative pain management remains inadequate, indicating that more research is required.

Design: A posttest-only control group design was adopted to measure mothers' levels of satisfaction with distraction as a non-pharmacological post-operative pain management intervention for their child.

Methods: The study included 160 mothers and their children undergoing elective surgery in a paediatric surgical unit. Mothers and children were randomly allocated to intervention and control groups (80 intervention, 80 control). The children in the intervention group received age-appropriate distraction interventions for three post-operative days along with the usual care. Children in the control group received only usual care. Data on parental satisfaction with pain management interventions was assessed on the day of discharge using a parental satisfaction questionnaire.

Results: In the intervention group 48 mothers (60%) were 'very satisfied' and 22 mothers (40%) were 'moderately satisfied' with pain management interventions for their child. In the control group 27 mothers (34%) were 'very satisfied' and 53 (66%) were 'moderately satisfied. The mean and standard deviation of mother's satisfaction in the intervention group and control group was 42 ±5.23 and 34 ± 6.64 respectively. The present study identified that there was a significant difference in the level of mother's satisfaction between the intervention and control groups ($p<.05$).

Conclusion: The level of satisfaction with pain management intervention for their child was higher for mothers in the intervention group that the control group. The distraction intervention provided for the children during the post-operative period improved the mothers' satisfaction level.

Keywords: children, distraction, mother, pain, satisfaction

Introduction

Despite the number of studies on paediatric pain management having grown over time, children's post-operative pain management remains poorly understood, indicating that further research is needed.[1] As most younger children are unable to report their pain, caregivers believe that children with developing nervous systems do not experience pain as much as adults.[2] Research has shown that 20 to 35 per cent of children and adolescents suffer from moderate to severe pain.[2–5] If post-operative pain is left untreated it delays recovery, increases the demand for analgesics,[6] increases the length of hospital stay and decreases immunity among children.[7] It is important to include parents in pain management, as they can understand their child's behaviour and may make a significant contribution to their child's pain assessment and non-pharmacological pain management interventions.[8] If parents are involved in post-operative pain management they may help in managing the child's pain which, in turn, increases their satisfaction with the interventions provided.[9]

It has been observed that most of the time there is a lack of parental involvement in the post-operative care of a child.[10] A combination of pharmacological and non-pharmacological interventions to manage post-operative pain has been identified as highly beneficial for children.[11] Non-pharmacological interventions can be provided either by a nurse or parent.[12] In the literature, there is a lack of studies assessing parental satisfaction with pain management interventions for children; hence the need to conduct a study to assess parental satisfaction with pain management interventions in a paediatric surgical unit.

Hospitalisation and paediatric surgery are stressful situations for children and their parents.[13] The evidence indicates that 64 per cent of children experience moderate to severe pain after surgery, and 29 per cent experience unbearable pain.[14] Some parents find it impossible to support their child during post-surgical pain[15] because of their own pre-and post-operative anxiety. And parental anxiety or stress can cause children having surgery to respond to the unpleasant situation in a variety of ways.[16]

Assessment of patient satisfaction is an important part of evaluating health care and improving current practice.[17] Assessment of satisfaction in parents of younger children is a reliable way to measure the effect of any treatment and evaluate the quality of care provided in the hospital setting.[18] A number of studies have looked at how satisfied parents are with their children's medical treatment.[19–22] Some studies have concentrated on neonatal treatment[23,24] while others have looked at emergency departments,[25] in-patient wards,[26] and outpatient care.[27]

While limited research has looked into parental satisfaction towards pain management interventions for children,[28,29] there is evidence that increased medical awareness and information contribute to increased parental trust which, in turn, helps the child feel protected and comfortable.[30] Parental anxiety, on the other hand, may have the opposite effect and result in fearful and frightened patients.[31] There is an association between parental fear and how parents rate quality of care.[32]

The researchers could not identify any studies into parental satisfaction with non-pharmacological intervention (distraction) provided by the nurse with mother involvement in the post-operative period. As parental satisfaction is an important factor to assess the implementation of pain management interventions in paediatric surgery the researchers felt the need to conduct this study. This study aimed to investigate levels of parental satisfaction with distraction as a post-operative pain management intervention for their child in a paediatric surgical unit.

Methods

Design and setting

This study used a quantitative research approach with a posttest-only control group design. The study was carried out between May 2019 and February 2021 in a tertiary care hospital in Karnataka, India.

Study participants

The study participants were 160 children, aged between two and seven years, undergoing elective surgery and their accompanying mothers. Mothers who were unable to be with the child for three post-operative days were excluded from the study.

Ethical approval

Before starting the study, ethical approval was obtained from the Institutional Research Committee (IEC: XX/2019).

Data collection procedure

The study was explained to the mothers in the paediatric surgical unit. Informed consent from the mothers and assent from the children was obtained. In this study, the mothers were randomly allocated to the intervention (n = 80) and control (n = 80) groups. The researcher assigned for the data collection was blinded to the

allocation of the mothers into the intervention and control groups. The children in the intervention group received age-appropriate distraction interventions for three days after the surgery. The children were distracted with the help of a distraction kit that was prepared by the researchers based on a literature review. Considering the safety of the children three distraction kits were prepared for the three days and each day a new kit was offered to the children.

Different distraction kits were prepared for different age groups. The distraction kit for children aged two to four years consisted of soft toys of different colors, a book with animal pictures, simple blocks for construction, push and pull toys and breathing activities (blowing colorful feathers and party blowers). The distraction kit for the children aged five to seven years consisted of role-play game cards, matching cards with different colors, coloring books and an interactive app that involved identifying missing items, matching items, counting and identifying similar items.

The children were asked to pick any items from the distraction kit they liked and there was no restriction on choosing items from the kit. The children were distracted for thirty minutes for three post-operative days. Along with the distraction interventions the children received the usual care of pharmacological treatment. Children in the control group received only the usual care of pharmacological treatment. The pharmacological treatment included analgesics (injection or oral paracetamol) in all cases.

To assess the mothers' satisfaction with pain management interventions, a parental satisfaction questionnaire was administered to the mothers on the day of discharge. All the mothers in both the intervention and control groups completed the questionnaire.

Outcome measures

The outcome of this study was the mother's level of satisfaction with their child's post-operative pain management interventions.

Data collection tools

Demographic proforma

In this study, the mothers' sample characteristics were obtained on the day of admission. The data included the mother's age, annual income, education and occupation.

Parental satisfaction questionnaire

Data on the mother's satisfaction with their child's post-operative pain management interventions were collected on the day of discharge. A questionnaire using the Likert scale was developed by the researchers for the study purpose. The questionnaire consisted of ten items that the mothers rated on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire had a minimum score of 20 and a maximum score of 50. The interpretation of the questionnaire tool was based on two categories: very satisfied (score of 40–50) and moderately satisfied (score of 20-39). Higher scores indicated a higher level of satisfaction. The questionnaire was validated by experts from the departments of paediatric surgery, anaesthesiology, psychology and child health nursing. All the items were clear and no changes were made to the questionnaire. The reliability of the questionnaire was tested by administering it to 20 mothers in the paediatric surgical unit and the questionnaire was found to be reliable (r = 0.87). Therefore, the questionnaire was administered to the 160 mothers in this study on the day their child was discharged. The average time taken by the mothers to complete the tool was between ten and 15 minutes.

Data analysis

Data obtained from the mothers were coded using SPSS 23.0 program. Demographic characteristics were described by frequency and percentage. The independent t-test was calculated to identify statistically significant differences between the groups. The chi-square test was used to assess the association between satisfaction levels and demographic variables.

Results

Description of demographic variables

Table 1 shows the distribution of demographic variables among the 160 study participants. The mean age of the mothers was 30.6 in the intervention group and 31.2 in the control group with 41 mothers (51%) in the intervention group and 34 (42.5%) in the control group being between the age of 29 and 33 years. The parental annual income was more than 15 000 rupees (AUD 284) for 52 (65%) of participants in the intervention group and for 50 (62.5%) in the control group. It was observed that 34 (42.5%) of the mothers in the intervention group and 36 (45%) in the control group had completed tertiary education. The children in the study were aged between two and seven years, with a mean age of 4.2 in both the intervention and the control group. All the children in the study underwent either abdominal or urogenital surgeries.

Satisfaction levels

Data on level of satisfaction with their child's post-operative pain management interventions were collected from 160 mothers on the day of discharge when the

Table 1: Distribution of demographic variables of participants (N = 160)

Demographic characteristics	Variables	Intervention group (n = 80)		Control group (n = 80)		Total	
		f	%	f	%	f	%
Age of mother in years	24–28	20	25.0	20	25.0	40	50.0
	29–33	41	51.2	34	42.5	75	46.8
	34–38	19	23.8	26	32.5	45	28.2
Family income in rupees	5000–10000	10	12.5	3	3.8	13	8.1
	10 000–15 000	18	22.5	27	33.8	45	28.1
	>15 000	52	65.0	50	62.5	102	63.8
Education level of mother	primary	12	15.0	10	12.5	22	13.8
	secondary	34	42.5	34	42.6	68	42.6
	graduate	32	40.0	35	43.7	67	41.8
	postgraduate	2	2.5	1	1.2	3	1.8
Occupation of mother	housewife	47	58.7	50	62.6	97	60.6
	coolie worker	23	28.7	21	26.2	44	27.5
	other*	10	12.5	9	11.2	19	11.8

* teacher, tailor, working in general store

researcher responsible for data collection administered the parental satisfaction questionnaire. A 'very satisfied' level was recorded for 48 mothers (60%) in the intervention group and 27 mothers (34%) in the control group. A 'moderately satisfied' level was recorded for 32 mothers (40%) in the intervention and 53 mothers (66%) in the control group (Figure 1). The mean and standard deviation of maternal satisfaction was 42 ±5.23 in the intervention group and 34 ±6.64 in the control group. An independent t-test was performed to determine whether the difference between and within the groups was significant and it was found that there was a significant difference between the intervention and control groups ($t = 8.037$, mean difference = 7.6, degree of freedom 158, $p<0.05$).

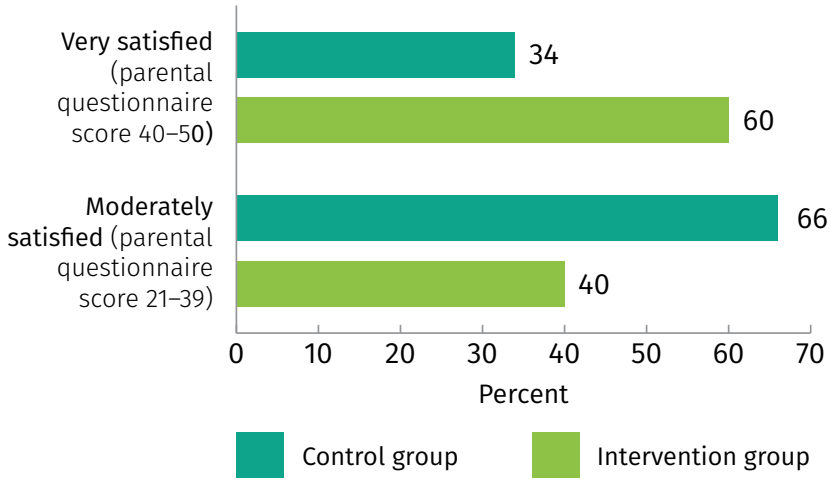

Figure 1: Mothers' levels of satisfaction with their child's post-operative pain management interventions

Table 2 shows the ten items in the parental satisfaction questionnaire and their mean scores and standard deviations. In the intervention group the mean scores were between 3.99 and 4.18 (out of 5), with the item 'I am overall happy with the pain management intervention given to my child' having the lowest mean score and the item 'I was more secure in handling my child during the surgical pain' having the highest.

Table 2: Mean and standard deviation for questionnaire items (N = 160)

Item	Intervention group		Control group	
	Mean score	SD	Mean score	SD
I was informed regarding my child's pain after surgery.	4.12	0.700	3.78	0.693
The pain intervention took away most of my child's pain after surgery.	4.09	0.508	3.39	1.000
Pain interventions made my child comfortable during the post-surgical period.	4.04	0.702	3.16	1.012
I was more secure in handling my child during the surgical pain.	4.18	0.546	3.44	1.017
Pain intervention helped to improve the child's post-surgical behaviour.	4.16	0.605	3.48	0.900
I managed my child's pain through guidance.	4.12	0.682	3.56	0.898
The pain intervention changed my thoughts and feelings regarding surgical pain.	4.06	0.663	3.58	0.868
Pain management interventions are useful to children after surgery.	4.14	0.347	3.59	0.867
If my child needs to have another surgery I will recommend the same pain management intervention.	4.10	0.686	2.98	1.091
I am overall happy with the pain management intervention given to my child.	3.99	0.646	3.14	1.064

In the control group the mean scores were between 2.98 and 3.78 with the item 'If my child needs to have another surgery I will recommend the same pain management intervention' having the lowest mean score and the item 'I was informed regarding my child's pain after surgery' having the highest.

Association between satisfaction levels and demographic variables

Table 3 shows association between satisfaction levels and demographic variables (age, annual income, education and occupation) using Chi-squared tests. Only two levels of satisfaction were analysed ('very satisfied' and 'moderately satisfied') because no responses fell into the 'not satisfied' level. A significant difference between the satisfaction level and the mother's age was observed ($\chi 2 = 8.107$, $p = 0.017$).

Discussion

A study by Chng et al.[8] in Singapore identified that, despite their children experiencing moderate post-operative pain, parents were generally satisfied with the post-operative care they received; however, the study did not identify what contributed to the parents' satisfaction. The current study aimed to investigate mothers' levels of satisfaction with distraction as a post-operative pain management intervention for their child. We found that 48 (60%) of the mothers whose children received the intervention of distraction as well as usual care were very satisfied with their child's pain management interventions, compared to only 27 (34%) of the mothers whose children receive usual care only. This suggests that the distraction intervention increased the mothers' satisfaction with pain management interventions provided to their child.

We observed that children in the intervention group were easier to handle when experiencing post-operative pain compared to the children in the control group. We also found that distraction is effective and easily implemented in low-resource hospital settings. Furthermore, we found it to be beneficial when mothers participated in providing the distraction intervention with a nurse and we believe this also contributed to the increase in maternal satisfaction level.

Table 3: Association between parental satisfaction and demographic variables (N = 160)

Demographic characteristics	Variables	Intervention group		Control group		χ2/ Fisher's exact value	df	P-value
		Moderately satisfied	Very satisfied	Moderately satisfied	Very satisfied			
Age of mother in years	24–28	8	30	28	16	8.107	2	**0.017***
	29–33	22	17	27	9			
	34–38	2	1	0	0			
Family income in rupees	5000–10000	6	4	3	0	7.015	2	0.143
	10 001–15 000	8	10	15	12			
	>15 000	18	34	37	13			
Education level of mother	primary	7	9	5	5	6.729	2	0.151
	secondary	12	19	30	4			
	graduate	13	20	20	16			
Occupation of mother	housewife	15	32	33	17	2.129	2	0.345
	coolie worker	12	11	18	3			
	other*	5	5	4	5			

* teacher, tailor, working in general store

In addition, we found a significant association between satisfaction levels and the mother's age. The reason could be due to experienced mothers being more comfortable handling their children compared to less experienced mothers.

The study findings highlight the benefit of age-appropriate distraction as a pain management intervention for children in the post-operative period. Nurses need to be educated about paediatric pain assessment and encouraged to provide distraction along with the usual care in the post-operative period.

Limitations

This study measured satisfaction levels of mothers of children undergoing surgery, but it did not measure satisfaction levels of the children.

Conclusion

A comparison of satisfaction levels of mothers in the intervention and control groups of this study found that mothers whose children had received the distraction pain management intervention as well as usual pharmacological care had higher satisfaction levels than mothers whose children had received only usual pharmacological care. The distraction intervention improved the children's pain management and increased the mothers' satisfaction level.

Declaration of conflict of interest and funding statement

The authors declare that there is no conflict of interest. This study has not received any source of funding.

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Strategies to prevent inadvertent retained surgical items: An integrative review

Abstract

Background: The surgical count process is currently the recommended strategy for preventing unintentionally retained surgical items (RSIs) in Australia. Despite this, RSIs still occur and remain an internationally recognised issue and sentinel event associated with morbidity and mortality. There are numerous new and emerging strategies to prevent inadvertent RSIs, apart from the surgical count, and many involve the use of technology. These strategies are not currently specified in *Standards for Perioperative Nursing in Australia* (the ACORN Standards).

Aim: To provide an integrative synthesis of the literature to identify current and emerging strategies for preventing RSIs during surgical procedures.

Design: An integrative review process was undertaken.

Method: The literature search was conducted in the CINAHL, ClinicalKey and Medline databases and included primary research papers of any design about RSIs and prevention strategies in humans that were published in English between 2008 and 2022. Data was extracted and developed into a table. Quality assessment was undertaken using the Mixed Method Assessment Tool (MMAT).

Findings: Based on the inclusion and exclusion criteria, 186 articles were screened and 18 studies were included following quality assessment. Data were grouped into categories according to the prevention strategies of surgical count, radiography, radiofrequency technology, barcode technology and other technologies.

Conclusions: RSIs occur despite the mandated use of the surgical count, a human-based process. The use of adjunct, technological prevention strategies is not yet feasible as more research is needed into efficacy and cost-effectiveness.

Keywords: retained surgical item, prevention, count, perioperative, safety

Background

The occurrence of unintentionally retained surgical items (RSIs) is an internationally recognised issue and in Australia RSIs are recognised as a sentinel event.[1] In the operating theatre, patient safety is the main priority for the perioperative team. RSIs occur when any foreign body, such as a surgical sponge or surgical instrument, is inadvertently left inside the patient during an operation. RSIs are referred to by a number of other terms including 'retained foreign bodies', 'retained surgical sponges' and 'retained surgical instruments'. Due to the variety of terms used, they will be referred to as RSIs for the remainder of this paper.

While the risk of RSI is present in all surgeries the risk is higher in emergency surgery and surgeries of longer duration, on patients with increased BMI (>30kg/m^2), with

unexpected events or unplanned changes, with intra-operative bleeding or with increased number of staff present.[2,3] Sponges are typically the item most often retained, followed by gauze and, less commonly, surgical instruments and needles.[4–6] RSIs of any type can have a significant impact on patients; the impacts include infection, the need for reoperation, and even death.[6] The mortality rate resulting from RSIs has been estimated to be as high as 35 per cent.[4,8] There are also significant costs associated with RSIs and the reconciliation of discrepancies in the surgical count. This can include additional operating theatre time or the use of additional resources such as radiography.[9]

Aims

To provide an integrative synthesis of the literature to identify what strategies can be used to prevent RSIs in surgical patients.

Methods

Design

This review used an integrative review design. An integrative review incorporates various study methodologies and summarises past research to draw conclusions from the body of literature on a particular topic.[10] This integrative review was conducted according to steps adapted from the framework by Whittemore and Knafl.[11] The steps were:

- identifying a problem
- establishing a research question
- searching the literature
- extracting the data
- analysing and evaluating the data
- presenting the review.

Table 1: Inclusion and exclusion criteria for the review

Inclusion criteria	papers on RSIs and prevention strategies
	primary research papers of any design
	papers published in English
	papers published between 2008 and 2022
Exclusion criteria	case reports, case studies
	animal studies

Literature search methods

The research question guiding the integrative review was 'What strategies can be used to prevent inadvertent retained surgical items in surgical patients?'

The databases CINAHL (Cumulative Index to Nursing and Allied Health Literature), ClinicalKey and Medline were used to search for literature. Final search terms for both databases were: retained surgical item OR RSI AND prevent AND surgical count OR count process AND safety. The reference lists of articles identified in initial searches were also manually searched to ensure a wide search for primary studies.

Inclusion and exclusion criteria

Table 1 shows the inclusion and exclusion criteria for the literature review. Primary research papers of any design about RSIs and prevention strategies in humans that were published in English between 2008 and 2022 were included. This 14-year search period was chosen as it was initially a 10-year period from when the review was first conceived in 2018. A 10-year span was deemed sufficient to include a wide body of the most recent evidence, including technological advances. Case reports, case studies and animal studies were excluded.

Data extraction

Guided by research aims and inclusion criteria, the titles and abstracts of all articles were reviewed for relevance. Following this, a full-text review of all articles identified as suitable was undertaken for data extraction. Data were extracted and summarised according to author, year of publication and country of origin; aim; design, sample and setting; key findings, and study limitations. (See supplementary material for a table of the characteristic data extracted.)

Data evaluation

This review used the Mixed Methods Appraisal Tool (MMAT) to evaluate the quality of the evidence.[12] The MMAT is a critical appraisal tool which covers five categories of study design – qualitative, descriptive, non-randomised, randomised controlled trials and mixed methods. Papers were appraised as per instructions given in the MMAT user guide.[12] Each study was subject to two preliminary screening questions related to the research question clarity and appropriateness of data collection methods. Papers could be screened out if receiving a 'no' or 'can't tell' answer to one or both questions, indicating further appraisal was not feasible or appropriate. Next, each study was classified by design type, and the appropriate set of five questions

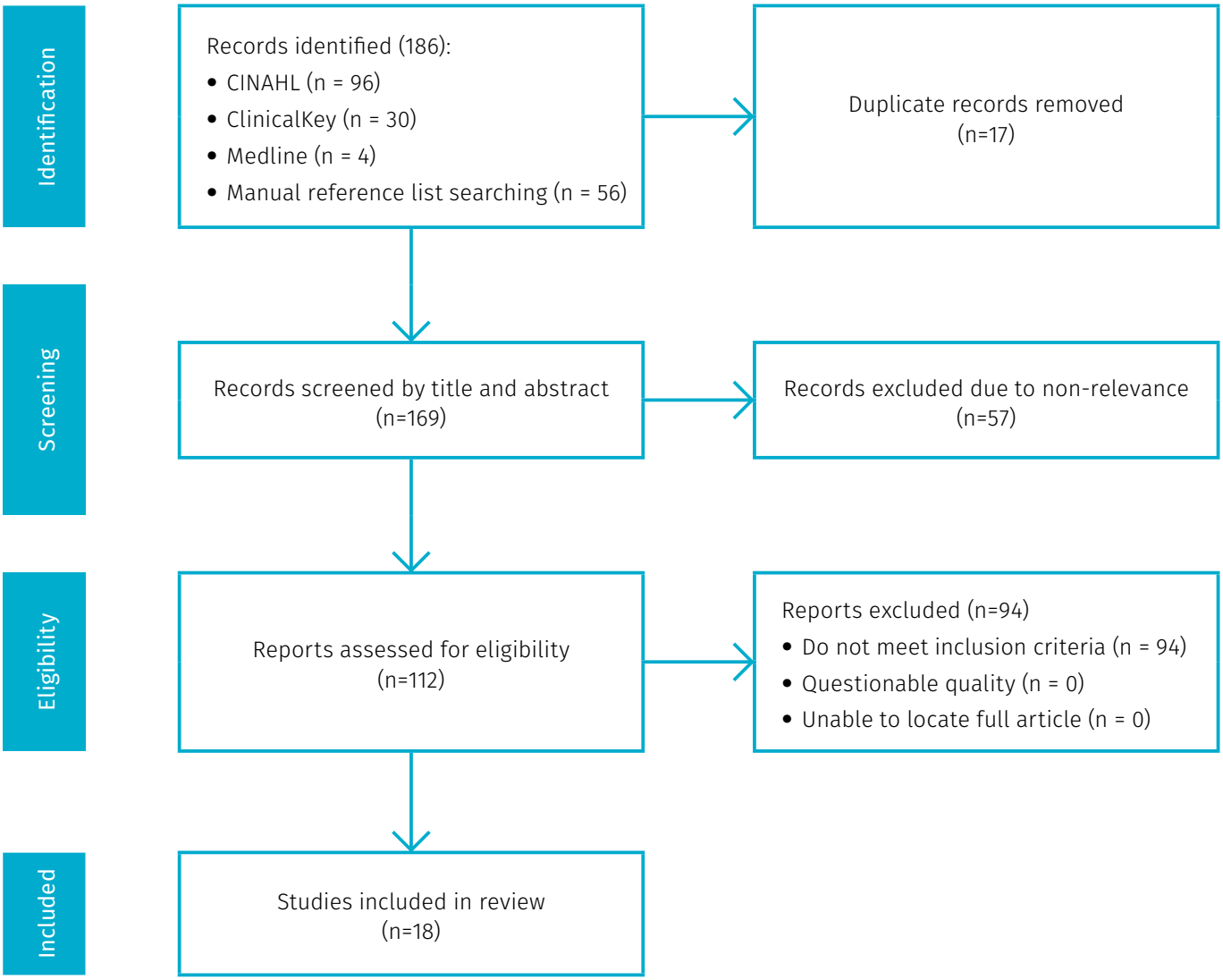

Figure 2: PRISMA flow diagram of paper selection process

was answered. These questions varied depending upon study design, with twenty-five separate questions in total. Notes on any perceived flaws which existed in the study were made. (Please see supplementary material for the quality appraisal table.)

Data synthesis

As per Whittemore and Knafl,[11] the included studies were synthesised using thematic analysis to distinguish themes, differences and commonalities. Patterns were able to be identified and data could be grouped into categories dependent upon which preventative strategy they examined. These categories allowed the literature to be organised and compared accordingly.

Selection process

The first search identified 186 articles from three databases and other resources. CINAHL and ClinicalKey yielded the most results based on the search criteria. Of the 186 articles identified, 17 duplicates were removed. The titles and abstracts of 169 articles were screened and 57 were excluded due to non-relevance. The full texts of the remaining 112 articles were then assessed and a further 94 were excluded for not meeting inclusion criteria. This resulted in 18 studies being included in the final review, 16 from the United States of America (USA),[2,3,5,6,9,13–23] one from Brazil[7] and one from Australia.[24] This is represented in Figure 2 as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.[25]

Discussion of findings

The 18 included studies were grouped into categories based on the preventative strategy they examined. The categories identified were surgical count, radiography, radiofrequency (RF) technology, barcode technology and other technologies such as computerised tomography (CT), fluoroscopy and ultrasound. This type of categorisation method allowed for the extracted data to be synthesised.

A preventative strategy suggested by *Standards for Perioperative Nursing in Australia* (the ACORN Standards)[26] is a two-person counting process for all items to be used in the surgical procedure including surgical instruments, sharps, absorbent items and other items at risk of being retained.[14,15,17,27] Multiple studies have found that the count process is time consuming and only partially effective. Adjunct technologies such as radiography, RF technology, barcoding technology, CT, fluoroscopy and ultrasound can and are being used to minimise the incidence of RSIs.

Surgical count

The surgical count or manual count is perhaps the oldest and most common strategy used to prevent RSIs.[20] The ACORN Standards[26] suggests the two-person counting process. Surgical counts warrant the undivided attention of those counting and have a high cognitive demand.[16] Although the surgical count is identified as the most common preventative strategy, it is also highlighted as being time consuming and only partially effective; although the error rate is low, it is inherent. This is due to the count process being a manual, person-led exercise.[6] One study found 90 per cent of RSI events were associated with some type of individual or team error.[19]

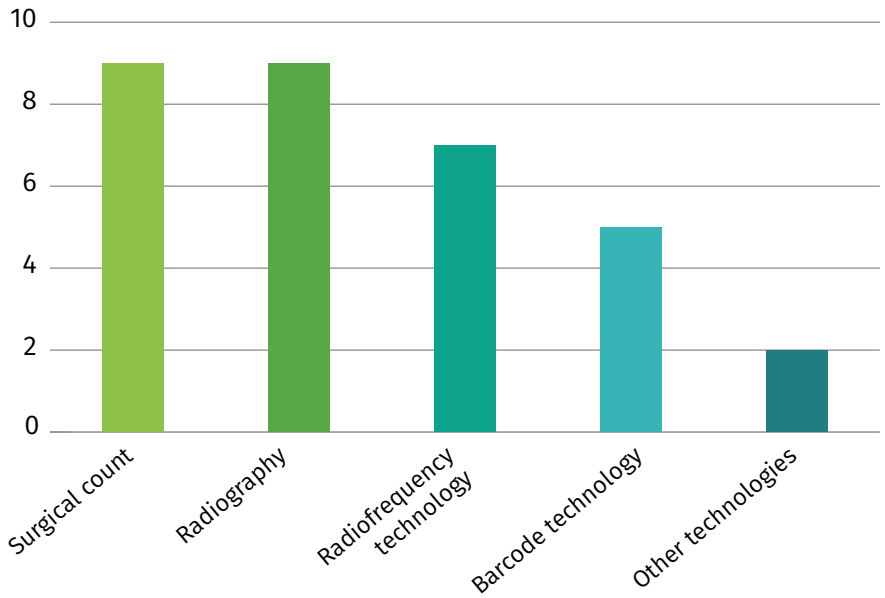

Figure 2: Number of papers reporting on RSI prevention strategies
Note: Some papers discuss multiple prevention strategies.

There is also evidence to suggest that the more times the surgical count is performed, the higher the incidence of a possible error.[5] This can be due to variability in practice.[5] Although policies and frameworks exist to guide practice, they are open to interpretation and variability in practice can occur.[14] In Edel's study,[14] participants reported recording the surgical count on both the instrument count sheet available at the facility, as well as scrap paper. Specific count practices varied as well with some nurses counting sponges by separating them and placing them on the table and others just fanning them apart. Although there are guidelines by which institutions must operate, it is the responsibility of each facility to decide on policies for standardised practice and to measure compliance with those policies.[6,14] A study by Freitas et al.[7] in São Paulo also highlighted that a range of procedures and customisation of practices occurred in the operating theatre, even within the same hospital.

Discrepancies in the count should never be dismissed as just human error, but rather should prompt a thorough search and reconciliation process.[15] Although incorrect surgical counts are often an indicator for RSIs, RSIs may still occur with a correct surgical count. Some studies stated this occurred in 62 to 88 per cent of RSIs.[2,19]

The surgical count is a person-led approach, making it inexpensive to carry out, but it is prone to errors. Despite the lack of supporting evidence it is currently the most widely used strategy to prevent RSIs.

Radiography

Radiography, such as X-ray, is often used as a strategy to detect RSIs either intra-operatively or post-operatively, and as a routine investigation, as per policy, or to investigate suspected RSI.

Although RSIs can sometimes be identified by an incorrect count, this is not true in all cases. Some studies suggest routine X-rays be implemented as an important

safety measure in preventing RSIs.[17] However, routine X-rays to prevent RSIs could be costly.[17] One study by Primiano et al.[9] estimated the cost of intra-operative radiographs to resolve discrepant counts to be US$226 per procedure.

Although X-rays may be taken to assist in identifying RSIs, there are cases in which the item is not identified or detected upon X-ray interpretation.[19] X-rays taken intra-operatively and post-operatively should be reviewed by a radiologist, but the radiologist must also know what the RSI is and what it looks like.[9]

Radiography as a strategy for preventing RSIs can be harmful as it exposes the patient to unnecessary radiation.[2] This is true in low-risk surgical procedures when an X-ray may still be performed to rule out RSIs as per a facility's routine X-ray policy.[2] In addition, radiography is not as effective in patients with obesity and usually requires multiple images.[2] In some institutions, it is policy for X-rays to be taken when the count is discrepant.[20] However, intra-operative radiography is suboptimal and one study found it failed to identify 33 per cent of RSIs which were later found.[20] This includes small items such as needles.[23]

Radiography is a popular strategy used to prevent RSIs and is often used as an adjunct to the surgical count. Depending upon hospital or health service organisation policy, radiographs may be taken on a routine basis, when there is a count discrepancy or when there is suspicion of an RSI. Radiographs are an effective way to quickly visualise if there is an RSI in a body cavity but they require trained staff to interpret the images and incur a cost to use the equipment.

Radiofrequency technology

Radiofrequency (RF) technology is an emerging strategy to prevent RSIs. RF technology includes both radiofrequency identification and detection systems.

A radiofrequency identification (RFID) system uses unique radiofrequency tags sewn into pockets of surgical sponges, allowing sponges to be differentiated and counted. This system consists of a scanning bucket with a wand attached into which the sponges are placed and automatically counted to find any missing sponges to reconcile the count.[2]

A radiofrequency detection system (RFDS) is a system made up of three components: radiofrequency tags which are sewn into a pocket in surgical sponges, a handheld wand or mat that contains the antennae and detection system, and a computer console which emits a visual and audio signal when a sponge has been detected.[20] An RFDS does not count sponges or distinguish between types of sponge, but rather alerts the user of the presence of a sponge in relation to the detection unit.[20]

RF technology has been found to improve patient safety and is a highly accurate way to mitigate common risk factors in the operating theatre such as distraction, multitasking and time pressures.[2,20] One study found the use of RF technology was associated with 68 per cent fewer reports of near misses of RSIs and unresolved miscounts.[9] A study focusing specifically on RFDS found that it had a level of accuracy which far surpassed the surgical count and was more useful than intra-operative radiography.[2] RF technology was also found to reduce time spent searching to resolve a miscount.[9] When using RFDS, the RF wand was found to be more useful than an RF mat in patients with a high BMI. This was due to the RF mat being narrow and the abdominal cavity exceeding the width of the mat, causing false negative detections.[21]

RF technology is an emerging strategy that has been investigated in some settings for the prevention of RSIs. It has been trialled alongside the surgical count to promote more accurate results.[27] This technology allows for real-time detection of RSIs.[18] However, as RF technology is relatively new its implementation as a strategy would require equipment and education and training for staff which would result in significant cost.[9]

Barcode technology

Barcode technology is a preventative strategy which makes it easier to locate and catalogue surgical items.[23] It is similar to RF technology in that each sponge or surgical instrument has a unique data-matrix code affixed to it which can be scanned to track when the item is in use.[13,20] Items can be counted in and out, and the system prevents the double-scanning of a single item.[13,15] Potential drawbacks of barcode technology are that background scanning can occur when surgical items are in the vicinity but not intended to be counted and disruption may occur if attempting to scan items out when the scanner is set to scan items in.[15]

In terms of effectiveness, a randomised controlled trial by Greenberg et al.[15] found that discrepancies in sponge counts were detected more often using barcode technology compared to the manual surgical count. In a study by Regenbogen et al.[17] barcode technology was predicted to be cost-effective in comparison to X-rays. However, the use of

barcode scanning technology was found to be more time consuming than a manual count.[16]

Barcode technology is an emerging strategy for the prevention of RSIs. Studies that have been conducted have assessed it, alongside the surgical count, as an adjunct technology.

Other technologies (CT scans, fluoroscopy, ultrasound)

Other modalities used to prevent or identify RSIs include CT scans, fluoroscopy and ultrasound. In a study by Stawicki et al.[19] CT scans were ordered and performed due to suspicion or symptoms of RSIs in 24 out of 71 studied cases. RSIs were detected via CT scans in two cases. CT scanning can also be used post-operatively to assess for RSIs, even after a negative intra-operative radiograph.[23] Fluoroscopy and ultrasound were also used to detect the presence of RSIs in three cases.[19] Further research into these technologies is needed before they are used in the operating theatre.[19]

Implications for perioperative nursing practice or research

This review indicates there are emerging prevention strategies to prevent RSIs, many of which rely on technology. However, these technologies are still being trialled and assessed for cost-effectiveness, therefore the surgical count remains the most common and cost-effective prevention strategy for RSIs. Despite the inherent risk of error and its time-consuming nature, this strategy is still recommended by the ACORN Standards.

The results of this review do not constitute a final recommendation, and there is no alternative strategy to the surgical count at this point in time. Further research into emerging preventative strategies must be undertaken before they can be integrated into clinical practice.

Limitations

This review has several limitations. Some articles may have been missed despite a thorough and systematic search. Papers written in languages other than English were omitted but may include relevant findings. Only one randomised controlled trial was identified and included, but more quantitative studies of this design may have changed the conclusions of this review. The quality of included studies was assessed by one individual and despite using a validated tool such as MMAT, subjectivity was not able to be controlled.

Conclusion

This integrative review has provided an overview of the recent literature on current and emerging RSI prevention strategies. It is evident that, despite the mandated used of the surgical count, RSIs continue to occur. Although there are emerging technological prevention strategies that exist, they are still in the developmental phase. There is currently not enough research to support their use as a prevention strategy alongside, or instead of, the surgical count.

RSIs continue to be reported as a sentinel event both nationally and internationally. The surgical count is the most utilised strategy to prevent RSIs but presents an inherent error rate, mainly due to human error. This review highlights the error margin which can occur when the manual count is used as the primary RSI prevention strategy.

There are several new and developing technologies which are being tested for use in conjunction with or instead of the surgical count. This includes radiography, RF technology, barcode technology CT scans, fluoroscopy and ultrasound.

Future research into risk factors would be valuable, including the development of a risk assessment tool to pre-operatively assess the risk associated with a particular patient having a particular procedure. This could take into consideration those risk factors commonly associated with RSIs such as high BMI (>30kg/m^2), long length of surgery and increased number of team members involved. Highlighting these risk factors pre-operatively could ensure adequate prevention strategies are implemented to prevent the occurrence of RSIs. This type of tool would ensure unnecessary strategies, such as routine radiographs, were not implemented in low risk cases but that effective adjunct strategies were used in high-risk cases.

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Strategies to prevent inadvertent retained surgical items: An integrative review

Supplement 1: Characteristics of included studies

Author (year) Country of origin	Aim	Design Sample Setting	Key findings	Limitations
Cima et al. (2008)[1] USA	To investigate incidence and characteristics of potential and actual retained foreign object (RFO) events in surgical patients.	Retrospective study All RFO events, near misses and actual reported on an adverse event line from 2003–2006. Mayo Clinic, Rochester. 98 main ORs, 3 obstetrical ORs and 8 labour and delivery rooms.	• The more times the count is performed, the incidence of a possible error increases exponentially. • Compounded by performing simple counting process in complex environment. • Important component of problem is non-modifiable human factor; therefore, technological solution to sponge counting might be desirable. • Intra-operative imaging is poor for certain items such as needles (13% detection of needles < 13mm, no detection of needles < 10mm). • Barcode and radiofrequency identification technology have been incorporated to improve reliability of counting products. • Because majority of RFOs occurred in setting of a correct count, routine X-ray (using high-resolution radiographic equipment in a dedicated imaging area, not a portable X-ray intra-op) in all patients is a very important safety process.	Nature of practice and high number of complex cases that involve multiple specialties and large blood loss means staff and support systems might be more sensitised to the risk associated with procedures and might contribute to increased vigilance and avoidance of RFO. Findings might not be representative of the more general surgical practices throughout the country.
Cima et al. (2011)[2] USA	To assess the impact of the implementation of a data-matrix-coded sponge (DMS) system after 18 months.	Randomised controlled trial Surgical practice at Mayo Clinic Rochester.	• Cotton sponges are the most commonly retained item despite the national standards for sponge counting. • No retained sponge events in 18 months and no increase in operative time. • Use of DMS identified more count discrepancies. • Increased sponge counting time but not overall case length. • Targeted screening for RSIs on the basis of risk factors. • DMS was most cost-effective technology.	Represents only a single institution's experience with the technology.
Edel (2021)[3] USA	To review current count policy practices and identify any necessary improvements; define a new count policy based on the assessment of staff member practices.	Qualitative study n = 120 staff members St Luke's Episcopal Hospital, 46 ORs, 3 surgical departments.	• Interpretation of count policy varied widely among staff. • Obstacles affecting accurate counting: unfamiliar with policy, anaesthetists needs and counting while they are preparing infusion lines, poor communication between OR nurses, interruptions, inconsistent passing of sharps, death in the OR, multitasking, equipment (instrument set wrong), need for count to be completed before time out. • Identified need for standardisation of the count.	Did not assess all staff members' practices.
Freitas et al (2016)[4] Brazil	To analyse the surgical count process according to reports of nurses working in surgical centres.	Cross-sectional study n = 55 nurses 15 hospitals across São Paulo, 16 surgical centres across these 15 hospitals.	• A range of procedures and customisation of practices occurred in the OR, even within the same hospital. • Circulating technician was person responsible for counting. • Literature recommends standardisation of the surgical count. • Evidence indicating new technologies may help reduce frequency of retained surgical items.	Size of the sample and development of the study in a single city may be inferred. Data analysis was based on reports of nurses and relevant aspects of the surgical count process may not have been considered.
Greenberg et al (2008)[5] USA	To evaluate a computer-assisted method for counting sponges using a barcode system.	Randomised controlled trial n = 56 nurses / surgical technicians, 36 surgeons Brigham and Women's Hospital in Boston.	• Computer-assisted counting with a barcode sponge system significantly increased the detection of misplaced and miscounted sponges, compared with traditional manual counting protocol. • Increased time devoted to sponge counts by approximately three minutes per case.	Unable to determine whether the barcode system could decrease the rate of retained sponges because of the impossibly large sample size required. Current analysis limited to elective general surgery operations and did not test emergency operations which are recognised at higher risk of retained sponges.

Author (year) Country of origin	Aim	Design Sample Setting	Key findings	Limitations
Kertesz et al (2020)[6] USA	To investigate prevalence and description of surgical count interruptions.	Prospective, observational study n = 50 surgeries, 150 surgical counts Large tertiary teaching hospital in New York.	• Initial count has highest number of people entering/exiting due to room preparation, schedule changes, consultations. • Surgical counts warrant undivided attention with high cognitive demands – high levels of interruption interfere with and impact patient safety. • Growing evidence that distractions add to length of surgery.	Individual coping strategy in response to distraction or interruption cannot be measured through observation. Did not include emergency cases, which may have more frequent interruptions.
Moffatt-Bruce et al (2012)[7] USA	To identify risk factors for intravascular retained surgical items (ivRSIs).	Retrospective, multi-centre study n = 83 ivRSI events 5 tertiary referral academic medical centres.	• All but one patient in this study had to undergo an additional procedure to remove the ivRSI. • Many ivRSIs were missed on the confirmatory post-procedure films, but were found within 48 hours. • No patient's outcome was ultimately affected by retention of ivRSIs. But was a significant patient dissatisfier to have to undergo an additional invasive procedure to remove ivRSI.	Retrospective nature of study and small sample size. Lack of intra-procedural details pertaining to unexpected events and equipment malfunctions/failures.
Primiano et al. (2020)[8] USA	To compare incidence of retained sponges before and after routine integration of radiofrequency (RF) technology and compare patient outcomes.	Quality improvement project Incident reports for adult patients from September 2013 to 2015. Main OR of 641-bed academic medical facility in northeast Ohio.	• Use of RF technology was associated with 68% fewer reports of near misses and unresolved miscounts. • Average length of time for extensive count resolution process was 18 minutes, costing US$1162 per occurrence. • 34 fewer occurrences in post-implementation period, estimated US$39 508 savings. • Cost to resolve counts is US$226 per procedure. • With 29 fewer incidences of radiography to resolve counts, saving of US$6554. • Total cost savings US$424 292 after implementation costs.	Lack of control for our risk factors or specific diagnosis types associated with miscounted sponges. Project design did not allow for inferences of causation between RF technology and patient-related outcomes.
Regenbogen et al. (2009)[9] USA	To estimate cost-effectiveness of standard counting against alternative strategies such as universal or selected X-ray, barcoded sponges and radiofrequency (RF) tagged sponges.	Decision-analytic model For base case, data used from 4-year study of 200 000 operations performed in institution that routinely screens all patients undergoing operations involving a body cavity with high-resolution post-operative radiography.	• Standard counting detects 82% of retained surgical sponges (RSS). • Barcoding prevents 97.5% for an additional US$95 000 per RSI averted. • If RF were as effective as barcoding, would cost US$720 000 per additional RSS averted. • Universal and selective X-rays for high-risk operations are more costly but less effective than barcoding.	Effectiveness estimates for each of the new preventative strategies are crude and somewhat uncertain because of limited clinical evidence to inform estimates.
Rupp et al. (2012)[10] USA	To evaluate the effectiveness of a radiofrequency detection system (RFDS) as an adjunct to manual counting protocols for tracking surgical sponges.	Prospective clinical study. All patients undergoing surgery from September 2009 to August 2010. University of North Carolina (UNC) hospitals.	• Majority of procedures during the study were confined to the abdominal cavity (58%), with 13% chest (cardiac and thoracic) and 9% 'other cavity' such as spinal column, perineum or breasts. • Most frequent type of procedure performed was open, elective surgery (61%) followed by laparoscopic, elective (21%), open emergency (7%) and endoscopic (5%). • 36 action events identified during study period with no true RSIs identified. • Reliance on manual counting, which has a low but inherent error rate, is a circumstance that lends itself to potentially devastating consequences.	Budget prevented developing a study arm to compare our RFDS findings against the gold standard. While high-resolution X-rays were obtained after all surgical invasive procedures in Cima, it is not the institutional policy at UNC to obtain X-rays for every patient unless clinically indicated. Lack of long-term patient follow-up. Average institutional follow-up of 20 months for study but some papers report RSIs being discovered up to 40 years post-operatively.

Author (year) Country of origin	Aim	Design Sample Setting	Key findings	Limitations
Stawicki et al. (2014)[11] USA	To determine clinical signs, symptoms, diagnostic evaluation, anatomic locations and intra-operative characteristics associated with RSIs.	Post hoc examination of data from retrospective study 71 RSI occurrences 7 teaching institutions	• Plain imaging and computerised tomography (CT) were the most common localising modalities. • Human errors (single individual, not team error) in 7/71 cases (<10%). • Team or system errors (no single individual could be pinpointed) 50/71 cases (70%). • Combination of individual and team error in 14/71 cases (20%). • Combined, 90% RSI events were associated with some type of team/system error.	Retrospective design, relatively small patient sample size, lack of uniform data availability for all variables across all reported cases. Categorisation of clinical signs/ symptoms and pathologic findings into narrowly define groups limits the overall resolution of the reported data. Intra-operative events reported here are limited by availability and inherent bias of retrospectively recorded documentation. Likely reporting bias for subjective variables such as imaging/tagging interpretation, team communication or adherence to protocols.
Steelman (2011)[12] USA	To evaluate the sensitivity and specificity of the detection of surgical sponges embedded with a radiofrequency (RF) chip through the torsos of subjects of varying body habitus.	Prospective, crossover, observer blinded study n = 210 subjects Large midwestern academic medical centre and US Department of Veterans Affairs medical centre.	• RF sponge technology found to be much more sensitive than a previous report of the surgical count. • In a recent study, sensitivity of surgical counts was only 77%. • Studies show between 62% and 88% RSIs occur when counts were correct. • Failure modes and effects analysis found 57 potential failures in surgical counts; distraction, multitasking, time pressure. • RF sponge technology is a highly accurate way to mitigate these failures in the surgical setting.	Sponges placed behind the backs of subjects, rather than in the abdominal cavity – may not accurately approximate the intra-abdominal assessment. Density of the additional tissue may pose a greater challenge for sponge detection.
Steelman and Cullen (2011)[13] USA	To describe perioperative processes to prevent retained sponges, identify potential failures in these processes and to rate causes, probability and severity of these failures.	Observational study 10 RNs and 6 surgical technologists 593-bed veterans affairs hospital that serves eastern Iowa and western Illinois.	• Surgical count has long been considered a standard of care, but retained sponges continue to occur in the presence of the count. • Intra-operative radiography is suboptimal – failing to identify 33% RSIs later found in one study – and two overlapping films are needed for morbidly obese patients, exposing patient to unnecessary radiation. • Barcode technology: each sponge has unique matrix barcode affixed to it, initial research showed it identified more count discrepancies than traditional counting including misplaced and miscounted sponges. • Radiofrequency (RF) technology: RF chip sewn into sponge and wand connected to console to detect sponges – 100% detected in tests. • RF identification detection: counts sponges and detects sponges left in the patient, can also be used affixed to bins to receive sponges directly from sterile field.	Surgeries observed for process mapping routine were colon resections – no change in personnel involved and studying more complex procedures with changes of personnel may identify additional steps not discussed in this study. Sample for focus group was one of convenience and may not be generalisable to all settings. Surgeons were not included in the focus group.
Steelman and Alasagheirin (2012)[14] USA	To evaluate the sensitivity and specificity of radiofrequency (RF) mats for detection of surgical sponges through torso of patient and compare sensitivity of RF mat to RF wand.	Prospective, crossover, double-blinded study 320 partcipants: Phase one 203 Phase two 117. Large midwestern academic medical centre.	• Use of the RF wand is preferable to use of the RF mat in patients with a high BMI, due to RF mat being narrow and abdominal cavity can exceed width of mat, likely causing false negatives. • Count discrepancies require additional searching time which can easily add more than 15 minutes to operation time. • RF scanning detects the presence of a sponge in less than 1 minute. • Can also be used to locate a sponge in linen or trash receptacle.	Sponges were placed outside of the abdominal cavity – may not accurately approximate the intra-abdominal assessment.

Author (year) Country of origin	Aim	Design Sample Setting	Key findings	Limitations
Steelman et al. (2019)[15] USA	To describe reports of unintentionally retained foreign objects (URFOs) including the types of objects, anatomic locations, contributing factors and harm, in order to make recommendation to improve perioperative safety.	Descriptive study 308 events reported to Joint Commission's Office of Quality and Patient Safety from October 2012 to March 2018.	• 307 URFO events including instruments, catheters, drains, needles, blades, packing, implants and specimens. • 1516 contributing factors were identified including human factors, leadership and communication. • Human factor issues included distraction and multitasking. • Inadequate policy or no policy for prevention of URFOs were identified in 160 cases. • Found surgical count only had 77.2% sensitivity and time-consuming.	Reporting to the Joint Commission is voluntary, so all URFO events may not be reported. Definition of URFO varies, so those discovered while patient is still in OR may not have been reported or may be underreported. List of keywords for search was not comprehensive.
Steelman et al. (2019a)[16] USA	To estimate time spent searching for sponges and using radiography to rule out the presence of retained sponges; incidence of unreconciled final closing counts and estimated costs of searching for sponges and using radiography to rule out the presence of retained sponges.	Observational study Operative and other invasive procedures from nine months before implementation and nine months after implementation. Large midwestern academic medical centre and Level 1 trauma centre.	• Estimated annual reduction in cost of OR time to be US$3803.04 per 1000 procedures, or US$57 045.60 per annum in a hospital performing 15000 procedures per year. • Count process is time consuming and only partially effective. • Number of searches for missing sponges was reduced by 77%.	Relied on perioperative nurses to record the number of minutes spent searching for sponges in their documentation, may have underreported because of documentation fatigue. Sample size in study was too small to evaluate appropriately the effect of the RF sponge detection system on retained surgical sponges. Results cannot be generalised to other similar technology.
Walter et al. (2015)[17] USA	To determine performance of a protocol for locating surgical items after a miscount, in which intra-operative radiography included a radiograph on an unaccounted-for item.	Retrospective study Sets of intra-operative patient and overlooked-item radiographs for surgical miscounts between January 2011 and April 2013. Large, urban, tertiary-care hospital.	• In 2/3 cases of false-negative intra-operative radiographs for suture needles, missing needles were not detectable on intra-operative radiographs even in retrospect but were visible on post-operative portable radiographs or other modalities such as CT. • Suboptimal intra-operative radiographic imaging quality decreases sensitivity for detecting surgical items, particular small items such as needles. • Counting protocols for surgical items have been found to be important but imperfect methods of prevention. • More sophisticated interventions to improve perioperative safety have emphasised the detectability of surgical items as a means to prevent both miscounts and retention e.g. standard, embedded radiopaque markers in surgical sponges. • Barcoding systems and radiofrequency technology create easier location and cataloguing of surgical items.	Cases identified only by review of radiographs obtained for miscounts did not identify cases of retained items in which the manual count was erroneously correct. Small number of cases of RSI in study group so rigorous statistical analysis could not be performed – such an analysis would require combined data from multiple health care centres.
Warwick et al. (2021)[18] Australia	To measure and describe perioperative nurses' surgical count practices using the Surgical Count Observation Tool (SCOT), to measure conformity with standardised processes and identify barriers and enablers influencing nurses' practices.	Observational study 83 nursing staff over 57-hour period. Large public tertiary hospital in Western Australia.	• Instrument and circulating nurse were observed counting aloud and together during 17 cases in initial count but only the instrument nurse counted aloud in final count, indicating lack of consistency. • Count process was interrupted on many occasions. As per behavioural indicator, count should be recommenced from the beginning but it was often commenced from the point of interruption. • Inconsistency in who notifies surgeon of count outcome. Was often the circulating nurse, but not always acknowledged before proceeding with surgical duties. • Tray lists were often discarded and therefore not used to count and check off instrumentation. • Accountable items being removed from the OR may occur depending on procedure but was not observed by researcher in this study. • Overall compliance rate to ACORN Standards was 60%. • Observations suggest perioperative nurses often under pressure to complete surgical count quickly by the surgery finishing quickly and by the surgeon themselves or anaesthetic team pushing drapes off to wake patient up. • Knowledge enabled perioperative nurses to question and challenge practices – junior nurses may have found it easier to follow others instead of the correct process.	Use of single hospital – practices undertaken may be different to the general perioperative nursing population. Possibility of a Hawthorne effect – changing practice or behaviour while being watched. During observations, participants were aware of the researcher being present but tended to revert to normal activities once procedures commenced.

Supplement 2: Quality appraisal table

	Author (year) country	Clear research question	Addresses research question	Approach is appropriate to answer question	Data collection methods adequate to address question	Findings adequately derived from data	Interpretation of results substantiated by data	Coherence between qualitative data sources, collection, analysis and interpretation
Qualitative studies	Edel (2021) USA[3]	✓	✓	✓	✓	✓	✓	✓
	Freitas et al (2016) Brazil[4]	✓	✓	✓	✓	✓	✓	✓
	Kertesz et al. (2020) USA[6]	✓	✓	✓	✓	✓	✓	✓
	Rupp et al. (2012) USA[10]	✓	✓	✓	✓	✓	✓	✓
	Stawicki et al. (2014) USA[11]	✓	✓	✓	✓	✓	✓	✓
	Steelman and Cullen (2011) USA[13]	✓	✓	✓	✓	✓	✓	✓
	Steelman et al. (2019a) USA[16]	✓	✓	✓	✓	✓	✓	✓
	Walter et al. (2015) USA[17]	✓	✓	✓	✓	✓	✓	✓

	Author (year) country	Clear research question	Addresses research question	Appropriate randomisation	Groups comparable at baseline	Complete outcome data	Outcomes assessors blinded to intervention provided	Participants adhere to assigned intervention
Quantitative RCTs	Greenberg et al. (2008) USA[5]	✓	✓	✓	✓	✓	Can't tell	✓
	Cima et al. (2011) USA[2]	✓	✓	✓	✓	✓	✓	✓

Quantitative non-randomised	Author (year) country	Clear research question	Addresses research question	Participants representative of target population	Measurements appropriate regarding both outcome and intervention	Complete outcome data	Confounders accounted for in design and analysis	Intervention administered as intended during study period
	Steelman (2011) USA[12]	✓	✓	✓	✓	✓	✓	✓
	Steelman and Alasagheirin (2012) USA[14]	✓	✓	✓	✓	✓	✓	✓

Quantitative descriptive	Author (year) country	Clear research question	Addresses research question	Sampling strategy relevant to address question	Sample representative of target population	Measurements are appropriate	Low risk of nonresponse bias	Statistical analysis is appropriate to answer the question
	Moffatt-Bruce et al. (2012) USA[7]	✓	✓	✓	✓	✓	✓	✓
	Primiano et al. (2020) USA[8]	✓	✓	✓	✓	✓	✓	✓
	Regenbogen et al. (2009) USA[9]	✓	✓	✓	✓	✓	✓	✓
	Steelman et al. (2019) USA[15]	✓	✓	✓	✓	✓	✓	✓

Mixed methods	Author (year) country	Clear research question	Addresses research question	Adequate rationale for using this design	Different components effectively integrated to answer question	Outputs of integration of qualitative and quantitative components adequately interpreted	Divergences and inconsistencies between quantitative and qualitative results addressed	Different components of study adhere to quality criteria of each tradition of methods involved
	Cima et al. (2008) USA[1]	✓	✓	✓	✓	✓	✓	✓
	Warwick et al. (2021) Australia[18]	✓	✓	✓	✓	✓	✓	✓

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Leading with emotional intelligence in perioperative nursing: An integrative review

Abstract

Background: Emotional intelligence has increasingly become synonymous with effective leaders within successful organisations. The perioperative environment is a complex setting within an organisation that requires nurse leaders to possess self-awareness that allows them to understand and control their emotions while using this insight to benefit others. Perioperative nurse leaders can use their emotional intelligence to manage conflict, negotiate between multidisciplinary team members, motivate staff to provide high level safe patient care and promote a positive work culture that can increase staff retention.

Review methods: A literature search of databases of CINAHL, Pubmed, Medline and Scopus was conducted to extract qualitative, quantitative and mixed method studies published between 2016 and 2022. Whittmore and Knafl's method for integrative reviews and the preferred reporting items for systematic reviews (PRISMA) guidelines were followed. Papers were reviewed and assessed using critical appraisal tools from the Johanna Briggs Institute ensuring only quality scholarly literature was included in this review.

Findings: Peer-reviewed, scholarly literature was identified from database screening (n=797). Following the removal of duplicate papers, abstract and title screening and individual critiquing of articles, a final 16 papers were considered suitable to include in this review. Five themes emerged, namely self-awareness, self-regulation, motivation, empathy and social skills.

Conclusion: Emotional intelligence in perioperative nurse leaders is essential to ensure a productive, engaged and satisfied workforce. Emotional intelligence is associated with positive outcomes in retention of staff and job satisfaction; therefore, it is important that perioperative nurses not only understand the vital role emotional intelligence can play in nurse leadership but also learn emotional intelligence so this essential skill set is present in nursing leaders of the future.

Due to the scarcity of research, further investigation is warranted into emotional intelligence in the perioperative workforce and specific educational interventions that would be suited to the perioperative environment.

Keywords: perioperative nursing, emotional intelligence, leadership, transformational leadership, resilience

Introduction

Perioperative nursing was the first nursing speciality, born from the need for nurses to assist surgeons during surgery, and has continued to develop and reflect the ever-changing nature of global health care.[1] As a result of increasing health care costs, a growing and ageing population and continual technological advances, the perioperative nursing role has continued to adapt and evolve.[2] Contemporary perioperative nursing practice should be underpinned by evidence-based research to provide safe patient outcomes[3] and,

increasingly, nurses are recognising the value of continuing education to improving individual practice.[3] Perioperative nurses must be proficient in aseptic technique, principles of sterilisation, the use of relevant technology and situational awareness regarding patient safety.[4] Perioperative nurse leaders must develop additional essential skills and abilities, including emotional intelligence (EI), to be effective leaders in the current perioperative setting.[5] Current research suggests that EI is vital for effective change management, conflict resolution and implementation of clinical standards that promote patient safety.[6,7]

Emotional intelligence has five aspects or traits – self-awareness, self-reflection, internal motivation, empathy and social awareness.[8,9] These traits are essential to successful leadership in one's personal and professional life as they guide thinking, feeling, decision-making, learning and problem solving.[10] EI is the ability to regulate one's own emotions as well as understanding the emotions of others, and use this information to inform critical decision making.[11] EI is essential to successful nurse leadership for the delivery of holistic patient care.[5] The perioperative nurse leader must be proficient in clinical expertise, administration, negotiation and managing human and material resources.[5,12] An effective nurse leader also uses self-awareness and reflection to manage stress while demonstrating the ability to understand others' needs and lead others through turbulent situations.[13]

Despite an abundance of literature on EI and leadership within nursing and other fields, there is little regarding its application to the perioperative setting.[14] This integrative review explores the importance of EI to developing nurse leaders, its application in the perioperative setting, barriers to implementing it in practice and opportunities for education and training.

Method

This integrative review was informed by Whittmore and Knafl's method for integrative reviews[15] and has addressed the question 'is emotional intelligence important to nurse leadership within the perioperative setting?' A literature search for qualitative, quantitative and mixed methods studies was conducted using databases Medline, CINAHL, Scopus and Pubmed. The reference lists of identified papers was also searched. Boolean operators, truncation and search terms of 'periop* OR 'surg* OR 'operating room AND 'lead* OR 'manag* AND 'emotional intelligence' AND 'nurs* were used.

Inclusion and exclusion criteria

Peer-reviewed articles and literature relevant to the key terms that were published in English between 2016 and 2022 were included. The five-year time limit was applied to ensure the review of recent contemporary literature.

Data extraction and synthesis

The titles and abstracts were screened for relevance, critiqued and synthesised. The data extraction for the included literature were author and year, study design and purpose, key findings, limitations and quality rating. Sixteen studies were chosen as relevant for inclusion (see supplementary material for literature matrix). Articles were synthesised using thematic analysis to identify common themes.

Reliability and validity

Reliability and validity of included articles were ascertained using critical appraisal tools. Qualitative research articles (n=4) were appraised using the Johanna Briggs Institute (JBI) checklist for qualitative research (CQR).[16] Cross-sectional studies (n=2) were appraised using the JBI checklist for cross-sectional studies (CCSS).[17] All research reviews (n=4) were appraised using the JBI 'checklist for systematic reviews and research synthesis' (CSRRS).[18] Discussion papers (n=6) were appraised using Wallace and Wray's critical appraisal tool.[19] Most of the included articles (n=14) were rated as very high quality with one rated as high quality and one rated as medium quality (see supplementary material).

Selection process

The first search identified 797 articles from four databases and other resources. Of those articles, 435 duplicates were removed. The titles and abstracts of 362 articles were screened and 331 were excluded based on non-adherence to inclusion criteria. Thirty-one full-text articles were then assessed and a further 15 were excluded for not meeting inclusion criteria. This resulted in 16 studies being included in the final review. This is represented in Figure 1 as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.[20]

Thematic analysis

Included articles were read until saturation had occurred and no further themes could be identified. Five themes emerged through the research and corresponded to the five aspects of EI. Thematic analysis also revealed a strong correlation between EI and the 'transformational leadership' style.

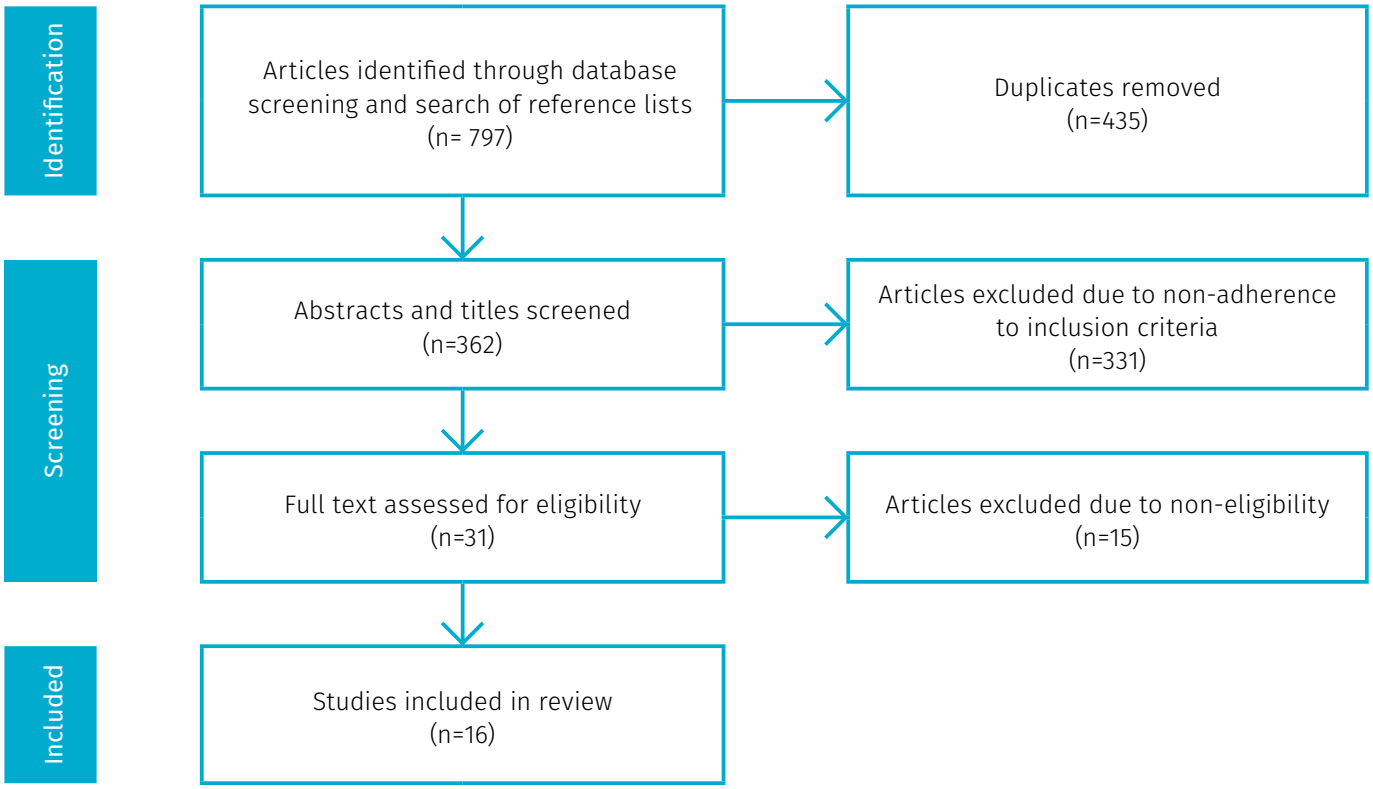

Figure 1: PRISMA flow diagram of paper selection process

Discussion

Thematic analysis revealed five themes: self-awareness, self-regulation, motivation, empathy and social skills. These themes, which correspond to the core traits of EI, are each discussed. Thematic analysis also revealed a strong correlation between EI and the 'transformational leadership' style and this is also discussed.

Core traits of EI and transformational leadership

Self-awareness

Beydler[5] describes self-awareness as understanding one's own strengths and weaknesses and being able to accept responsibility for mistakes that are made. Being receptive to feedback is important for clinical leaders as a way to initiate self-growth and model ideal behaviour to others.[5]

The ability to remain calm during a situation of heightened emotions is imperative to strong leadership.[21] A systematic review of quantitative research by Cummings et al.[22] identified calmness and self-assurance as traits that are associated with leadership.

In his discussion paper, Lucas[23] identified self-compassion and the ability to stop negative self-talk as important aspects of EI. Beydler[5] also suggested that nursing leaders within the perioperative environment should view their yearly professional development tool as a way to improve their performance and identify key areas for future development.

Self-reflection

Self-reflection is an important part of EI, as the ability to recall personal practice and then to make improvements based on reflection has been shown to improve patient outcomes.[21] Lambert[21] describes this cycle as 'closing the loop', which is an essential component to any quality improvement exercise. Nurse leaders use self-reflection as a way to analyse a high conflict situation, taking time to consider their response to prevent their emotions from taking over.[5] Perioperative nurse leaders benefit from self-regulation and embracing new ideas while working in an environment that is subject to constant change.[5,21]

Another important tool for perioperative nurses to encourage and embrace is debriefing.[24] Participating in debriefing provides the opportunity to identify areas of clinical practice that require improvement, therefore contributing to a safety culture.[24]

Motivation

Emotionally intelligent leaders exhibit a desire to maintain personal integrity and to continue to develop professionally.[25] In a small qualitative study (n=15), nurse leaders identified the importance of achieving personal and professional development goals to facilitate best patient outcomes and engage staff.[26] According to Beydler[5] these qualities in leaders, in turn, motivate productivity and team cohesiveness. A cross-sectional study (n=20) of how leaders' EI affects nurses' job satisfaction reported a statistically significant link between nurse leaders' ability, leadership and support and nurses' job satisfaction ($r = .82$, $P < .01$).[27] Perioperative nurse leaders with EI practice evidence-based nursing, seek others as mentors to improve and develop, invest time in others to do the same, and inspire others to work with passion to establish and maintain a culture of safe patient care.[5]

Empathy

Empathy is a core component of EI and nurse leaders who possess it have the ability to lead a team toward organisational stability.[26] In their qualitative study (n=15), Arakelien et al.[26] found that nurse leaders who were visible in the workplace and had compassion for staff contributed to a positive workplace where staff felt comfortable and understood. A phenomenological study (n=5) by Mansel and Einon[28] supports these findings, reporting that compassion is a strong theme related to EI. Another qualitative study of nurse managers (n=12) further supports these assertions, with communication and 'an open door policy' being described as important practice to ensure staff productivity and satisfaction.[12] Perioperative nurse leaders with EI are visible within the workplace, available for staff to bring concerns to, respond with active listening, act as a mentor and are willing to give feedback.[5]

Social skills

According to Beydler[5], social skills are the combination of all other EI traits; and social skills are related to successful management.[29] Social awareness is required to understand people's thought processes and feelings and respond accordingly.[10] The ability to skilfully negotiate with others in the workplace to achieve optimal patient outcomes and work toward organisational goals is a hallmark of exceptional nursing leadership.[5] Nursing leaders who possess EI were found to be able to understand the ever-changing direction of organisational strategy.[28] Leaders who are able to read others emotions and put others needs above their own are more likely to build trust, strengthen relationships and collaborate effectively.[21] Within a perioperative context nurse leaders build trusting relationships with the multi-disciplinary team, negotiate with clinical representatives and collaborate with managers within and outside the unit to ensure evidence-based decisions are made to create a safety culture.[5,24,29]

Transformational leadership and EI

The reviewed literature revealed a strong correlation between EI and a 'transformational leadership' style. Transformational leadership (TL) is a relationship-oriented leadership style that involves the nurse leader not only having a vision and goals for the organisation but also encouraging and empowering others to share this common goal.[21,24]

Nurses with a TL approach are risk-takers who embrace innovative ideas, are passionate about practice, act as role models and motivate others to perform better.[24] Several of the research studies identified the strong link between TL and EI.[21,22,24,25,29–31] Results from one cross sectional study (n=535) into how managerial style and nurses' EI affects nurses' intention to stay in their jobs found a mean score of 4.23 (SD=0.67) for TL and 3.99 (SD=0.66) for EI, suggesting a strong correlation between the two.[30] A random sampling trial (n=47) by Hartiti et al.[31] reported that the EI of 'on duty' nurses improved within three months when leaders adopted TL. However, Carragher et al.[25] found that although EI has been linked to TL, the congruent or authentic leadership styles are better aligned with EI as they are more collaborative as opposed to leader–follower.

The presence of EI in a nurse leader is associated with job satisfaction and low attrition rates among nursing staff.[12,22,27,29,30] Nurse leaders with EI act as role models, are perceptive to staff needs and promote a positive workplace culture.[27] In a qualitative study (n=15), Arakelian et al.[26] found that a key reason for perioperative clinical nurse specialists' intention to stay was the EI of their nurse manager. In their cross-sectional study (n=535), Wang et al.[30] reported a 34.3 per cent positive variance in relation to EI, TL and nurses' intention to stay in their jobs. Being seen, heard and understood by an empathetic nurse manager is an important morale booster and offers the staff member a reason to stay.[26]

In another qualitative study (n=13) of perioperative nurse managers' intention to stay, participants were found to display strong empathy toward staff and the courage to support and lead staff through difficult circumstances.[12] Resilience is a key concept associated with

EI, and an Australian integrative study found a correlation between staff with EI and the ability to manage patient care within the context of added stressors.[32] Nurse leaders with EI have the skills to positively influence their team by demonstrating positivity, understanding and a strong commitment to safe patient care.[5]

In a phenomenological study (n=5) of nurse leaders' EI, barriers to implementing and fostering EI were noted.[27] Staff shortages and time constraints can lead to poor quality patient care[27] and nurse leaders often feel overwhelmed by under-resourcing and the multifaceted demands that come with managing a unit.[27] The reviewed literature contained no recommendations on how to remedy this beyond managing existing resources effectively.[27]

There is paucity in the literature linking any specific leadership style directly to EI in perioperative leaders.

Education in EI

Research suggests that EI can be learned[29] so it is important for perioperative nurse leaders to engage in education and training in EI.[33] The Australian College of Perioperative Nurses (ACORN) standard 'Professional development'[4] suggests responsibility for professional development lies not only with the individual but also with managers and organisations. More research is needed to identify education that is appropriate for developing EI. Lucas[23] suggests that nurse leaders can assist their team members to develop EI through coaching in self-awareness and reflection, participating in Schwartz rounds (forums where staff can share and reflect on clinical incidents) and clinical supervision. Further, Drigas and Papoutsi[10] posit that EI can be learned and they propose a nine-layered pyramid that one can work through to gain levels of emotional unity. Carragher and Gormley[25] support the assertion that EI can be learned with appropriate evidence-based interventions, and suggest further study should be undertaken to understand what they may be.

Lambert[21] describes journal keeping as a tool for personal self-awareness and reflective development. Other studies suggest organisations should implement workshop interventions and health promotion programs to teach resilience.[32]

Staff retention and increased job satisfaction

Studies have found a correlation between nurse leaders with EI and nursing staff motivation and empowerment as well as high levels of safe patient care.[29] Nurse leaders with EI act as role models[27] encouraging EI in others. ACORN's wellbeing standard[35] also highlights the importance of traits associated with EI to nurse recruitment and retention. Wang et al.[30] found that nurses who exhibited a high degree of EI were more optimistic and able to maintain positive relationships inside and outside of the workplace. Nurses with EI demonstrated higher levels of problem-solving skills and were able to self-regulate and be more adaptable during times of stress; this is likely to have a positive effect on their intention to stay.

Implications for perioperative nursing

The reviewed literature highlights the importance of EI in perioperative nurse leaders. EI in perioperative nurse leaders has positive effects on both staff job satisfaction and retention of staff as well as safe patient care. As EI can be learned, appropriate education and training in EI is imperative for both perioperative nurses and their leaders.

Limitations

This review has limitations relating to scarcity of primary research specific to EI and perioperative nurse leaders. One study did not reveal the evaluation tool used for reliability of data.[29] A further limitation is the exclusion of non-English language research so research papers written in languages other than English may have been missed. The time limit set for contemporary literature, 2016 to 2022, may have also resulted in other relevant studies being missed in this review.

Conclusion

This literature review has addressed the question of whether EI is important to nurse leadership within the perioperative setting. Themes related to this topic were identified and consisted of the core traits of EI, namely, self-awareness, self-regulation, motivation, empathy and social skills. Research findings also revealed that there was a strong correlation between EI and transformational leadership. Findings from scholarly literature have revealed that EI in perioperative nurse leaders promotes a productive, engaged and satisfied workforce that aligns with organisational goals and promotes patient safety. Given this, it is recommended that EI is promoted in perioperative workplaces and education and training in EI is provided to perioperative nurses and leaders. In addition, further investigation into EI in the perioperative area and specific educational interventions that would be suited to the perioperative environment are warranted and would be welcomed.

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Leading with emotional intelligence in perioperative nursing: An integrative review

Supplement: Characteristics of included studies

Author Year	Aim	Design Sample Setting Data collection methods	Key findings Recommendations	Limitations	Quality rating (appraisal tool)
Arakelian et al.[1] 2019	To ascertain why operating room nurses stay in a health care setting.	Qualitative 15 nurses - Individual interviews	• Organisational stability contributed to low staff turnover, with good spirits between colleagues, representing everyone's equal value and resulting in a feeling of homelikeness. • Sustained development in one's own profession. • A humane head nurse who was at hand, who was a facilitator, who knew staff members and eliminated obstacles for them.	• Although invited to participate, staff under 33 were not in the study. • Male nurses were under-represented (n=2) compared to female nurses (n=13).	Very high (JBI CQR)
Arakelian et al.[2] 2020	To find out what gives nurse managers the strength to keep going as leaders.	Qualitative 12 nurse managers - Individual interviews	• Seeing strengths of other nurses by working beside them. • Being appreciated by nursing staff as a fair leader. • Self-reflection and awareness. • Leading with integrity.	• Small sample size • No male nurse managers represented.	Very high (JBI CQR)
Badu et al.[3] 2020	To identify and synthesise evidence of workplace stress and resilience in Australian nursing workforce.	Mixed methods (integrative review) 41 papers included in review Australian nursing workforce Mixed methods appraisal tool	• Resilience relates to four themes: - levels of stress (causative factors and impacts) - individual attributes to build resilience - organisational resources to build resilience - workplace resilience intervention. • Individuals' attributes (including emotional intelligence) and organisational resources contribute to managing workplace stress.	• search words, language, scope (Australian setting)	Very high (JBI CSRRS)
Beydler[4] 2017	To discuss higher performance in perioperative nursing when demonstrating EI.	Discussion paper	• EI has been linked to increased job satisfaction, increased success, decreased turnover, decreased burnout. • Emphasis on value of holistic nursing with EI. • Previous focus on technical skills. • Behaviour is important to workplace. • Align with organisational goals. • Personal assessment. • Ongoing training.	(This cell is intentionally empty.)	Very high (W&W CAT)
Carragher and Gormley[5] 2017	To discuss leadership and emotional intelligence within nursing.	Discussion paper	• Congruent and authentic leaderships related to EI. • Need for more resources and education regarding EI and leadership.	• Use of google scholar and grey literature in research for article.	Very high (W&W CAT)
Coladonato et al.[6] 2017	To ascertain how EI affects clinical nurse job satisfaction.	Descriptive, cross-sectional study Clinical nurses - The EQ-i 2.0 (an assessment tool based on the Bar-On model of emotional-social intelligence) measured participant EI.	• Majority of nurse leaders scored average to high when measuring EI. • Managers with high EI develop strong working relationships with nursing staff and are able to manage emotions. • Strong correlation between nurses' job satisfaction and mangers' level of EI. • More research needed to understand EI professionally, academically and personally.	• Conducted at a single organisation. • Instruments were self-administered and nurse managers directly reported to researcher. • Sample size small. • Group comparisons couldn't be made due to confidentiality.	Very high (JBI CCSS)

Author Year	Aim	Design Sample Setting Data collection methods	Key findings Recommendations	Limitations	Quality rating (appraisal tool)
Cummings et al.[7] 2017	To identify determining factors of nursing leadership, and the effectiveness of interventions to enhance leadership in nurses.	Systemic review of quantitative research 93 papers included in review, 9 databases searched	• EI may be positively correlated with nurse leadership; however, more robust research is required. • Targeted educational interventions are recommended for developing nurse leaders. • For future research; what components of interventions are most useful for nurse leadership?	• Published work tends to overemphasise positives so may be biased.	Very high (JBI CSRRS)
Donnelly[8] 2017	To discuss leadership in the perioperative setting, briefing and debriefing.	Discussion paper	• Link between EI and effective leadership, increased team cohesion, increased productivity. • IQ is unaffected by training but EI can be learned. • EI necessary to improve communication and professional skills.	(This cell is intentionally empty.)	Very high (W&W CAT)
Drigas and Papoutsi[9] 2018	To suggest a nine-layered model to improve EI.	Discussion paper	• EI is as important as IQ. • EI is separate from but associated with IQ.	(This cell is intentionally empty.)	Very high (W&W CAT)
Frias et al.[10] 2021	To understand impact of emotional intelligence training on transformation leadership.	Quasi experimental pre/post experimental survey 45 nurse leaders/ managers Hospital/ outpatient cancer facilities Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF) Statistical software for statistical analysis	• EI training and subsequent follow-up reinforcement education is vital to successful leadership behaviours. • Buddying up with a peer colleague is recommended to maintain accountability and to continue to increase and maintain EI practices.	• Inability of researchers to know which participant completed which parts of intervention. • Does not mention how many completed post survey. • Small sample size (N=45) • Potential disengagement because of four-month period of study. • Participants started with higher EI so may have bias.	Very high (JBI CQR)
Hartiti et al.[11] 2020	To examine soft skills as leadership skills.	Study, literature review and analysis Qualitative 65 on-duty nurses - Analysis of variance (ANOVA)	• EI as important as IQ. • Interpersonal set of competencies. • EI is linked to transformational leadership. • Transformational leadership is a good model to improve performance of staff.	• Lack of supervision between researcher and room leaders. • Relied on honesty regarding self-evaluation. • Small sample (18 nursing students and 47 duty nurses).	Very high (JBI CSRRS)
Lambert[12] 2021	To understand the role of EI in nursing leadership. To identify practical activities to develop EI skills.	Discussion paper	• Human relationships rely on understanding why people do what they do and what they need. • Understand how you and others behave in situations and using this information to guide decision making. • EI in leadership is important to support others in moments of stress and to make them feel valued. • Delegate, develop trust within team, engage and communicate what is happening. Do not micromanage. • Collective leadership.	(This cell is intentionally empty.)	Very high (W&W CAT)
Lucas[13] 2019	To ascertain how four leadership intelligences relate to development of leadership skills.	Discussion paper	• All nurses are leaders. • Encourage nurses to seek educational opportunities to develop EI. • Schwartz rounds for group reflection.	(This cell is intentionally empty.)	Very high (W&W CAT)

Author Year	Aim	Design Sample Setting Data collection methods	Key findings Recommendations	Limitations	Quality rating (appraisal tool)
Mansell and Einon[14] 2019	To investigate EI and its relationship to nursing leadership.	Qualitative 5 nurse managers One Welsh health board Semi-structured interviews and interpretative phenomenological analysis (IPA) methods	• Importance of sensing others. • Team building. • Reading the flux of an organisation. • Barriers: time pressure, staffing levels, less time for reflective practice.	• Small sample size may not be relevant beyond the study setting. • Nurse leaders may be more motivated individuals.	High (JBI CQR)
Prezerako[15] 2018	To examine qualitative and quantitative literature on the role of EI in nursing leadership and the rigor of the studies reviewed.	Literature review 11 papers included in review	• Important for nurse leaders to relate to the needs of their nursing staff. • EI linked with transformational leadership. • EI management 'triggers' productivity.	• Possible lack of effective evaluation tool for literature.	Medium (JBI CSRRS)
Wang et al.[16] 2018	To examine the relationship between staff nurse emotional intelligence, transformational leadership and intent to stay in their jobs.	Cross sectional study 535 nurses - Use of Wong and Law emotional intelligence scale ITS (intent to stay) scale measured nurse intent to stay	• Transformational leadership and EI are significant positive factors in nurses' intent to stay, with a 34.3% variance. • Emphasises positive aspects of manager EI on influencing staff EI and intent to stay in workforce. • Results may be valuable for future managers and policy makers in developing organisational goals.	• Limited sampling method and limited to small regional area. • Limited by cross-sectional design, suggests longitudinal design for future research.	Very high (JBI CCSS)

JBI = Johanna Briggs Institute, CQR = checklist for qualitative research, CSRRS = checklist for systematic reviews and research synthesis, EI = emotional intelligence, W&W CAT = Wallace and Wray's critical appraisal tool, CCSS = checklist for cross-sectional studies, IQ = intelligence quotient

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