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Association for Peri-operative Practitioners in South Africa

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

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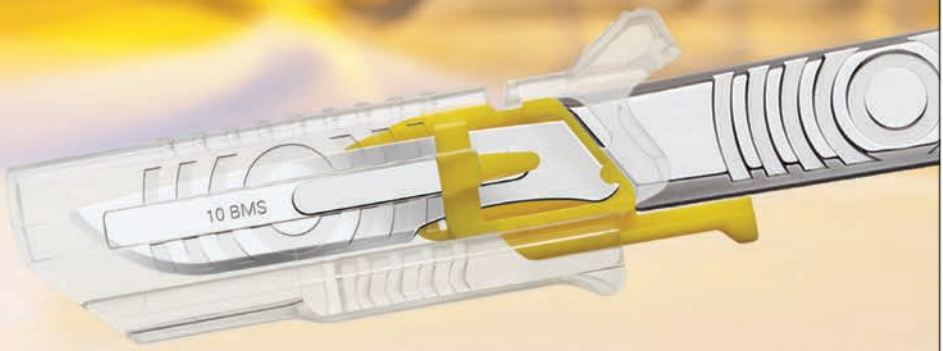

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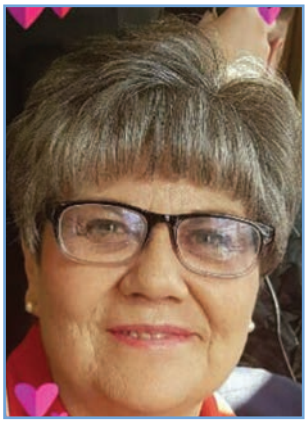

From The PRESIDENT

Welcome to 2022. It is going to be a great year. Our COVID-19 pandemic figures are on a real downward trajectory at last, they really are low, and finally we can begin to wish for a better and brighter year ahead. This means that, as APPSA, we can hopefully look forward to returning to 'normal' or whatever we want to call pre-COVID life. Part of returning to normal is for all of us to start planning in-person study days so we can get APPSA back to growing and running at full capacity again. And we can looking forward to hosting an APPSA Congress. We need to meet, to catch up, to interact on a level that is more than just work. We are social beings and while it is important that, as peri-operative practitioners, we continue with our hard work while staying as safe as possible, we need the togetherness that we have all come to associate with being a member of APPSA - the fun we used to have at the APPSA Congresses and the communal learning we used to enjoy during the educational sessions the are a hallmark of these APPSA Congresses.

So this is my appeal for 2022. Let's get back to 'doing the business of APPSA'. This is my clarion call to all the APPSA Chapter Presidents: make contact with each of your members in your region. Motivate them to come back to the study days so we can re-energise all our APPSA Chapters. And my clarion call to the APPSA members of all the regions is equally simple: make contact with your APPSA Chapter President. Encourage them to begin organising study days for you so that you can once again be part of the growing band of peri-operative practitioners in South Africa who are at the cutting edge of this profession. Once our study days are organised (within the COVID regulations of course!) bring all your colleagues along! Let the groundswell of people who thirst for knowledge push us to greatness in 2022.

Let APPSA soar to new heights this year. Let each of us recruit five new members to swell our APPSA membership numbers like never before. Each Chapter must look to become the BEST CHAPTER in APPSA during 2022. Motivate one another to achieve more. It's time South Africa's peri-operative practitioners strive to make this the year the best year in living memory ... for themselves. But that takes effort. And commitment. And dedication. And engagement. And resolve. And responsibility. And attentiveness. And a determination to get the job done. We are only be as strong as you, our members. Let's work hard and focus on APPSA again.

I really believe we can make this happen this year.

My final clarion call is to the Young Nurse Leaders who have just joined the profession or who are just entering the profession and who might be reading this APPSA Journal for the first time. If any of you would like to make an impact on the path we are cutting in South Africa, contact our national APPSA office. Join our leadership and make a difference in the South African peri-operative landscape in 2022. Let's join hands and help build a better future for APPSA in 2022.

Marilyn de Meyer

From The EDITOR'S DESK

WELCOME TO 2022! And what a wonderful, and wonder-filled year it is going to be. I strongly believe that what you put into the mind is what comes out of the mind - so let us fill our minds with positivity so that positivity will flow out of our mind. Let us wish for a better year ahead, and we will HAVE a better year ahead. A positive mindset brings positive change..

We have lived through two years of dreadful physically, emotionally, and mentally trying times. COVID-19 has cost all of us dearly. Whether it has been in monetary terms - where we have lost jobs, businesses or homes - or emotionally, where we have been stretched to the limit in our workplaces with work stress or having lost colleagues, family and friends, we have not come out of this pandemic unscathed. Every single one of us has changed because of COVID-19. And not all the changes have been positive ones.

But to those of us who are reading this APPSA Journal we have managed to come out on the other side.

And for that, I am grateful. And thankful.

Maya Angelou said: "Try to be a rainbow in someone else's cloud." That is what I want us to be in 2022. We need to change the narrative we bring to this year. We need to start off the year on a positive note and try and look for things to bring to our collective 'table' (be it at home or in the workplace) that enable us to be the rainbow to the clouds we see around us. Because there are many, many clouds. Too many to count. We can all finds the clouds - but can we find the rainbows? Do we even look for the rainbows?

It's hard looking for rainbows when there are so many clouds in the sky. But you have to make a concerted effort to look for the positives in a situation in order to move forward. You have to look for the positives, to let your dreams be bigger than your fears, if you want to make the year a year of goodness not of pain. That is the year I want for 2022. We have had two years of pain. Two years of dark clouds. I want a year of sunshine. I want a year of rainbows and hope. I don't want a year where I only see darkness around me. My faith is stronger than my fears. My actions will be louder than my words. Yours can be too - if you surround yourself with like-minded people who believe, like you do, that 2022 will be a year of positive action. It is your choice to make positivity the message you bring to 2022 and the reality you realise for the year ahead.

Let us come together, united in our common vision of a better peri-operative future, for a better South Africa.

Madeleine Hicklin

COVID-19:

The Long Shadow On Staff Mental Health

By Kate Woodhead, RGN, DMS

INTRODUCTION

The Courage of Compassion, reported on here[1, 2] identified a level of disquiet, stress and unhappiness within the workforce in the NHS with data from before and during the early stages of the COVID-19 crisis. Due to the high level of nursing and midwifery and related vacancies even before COVID-19 struck, there are examples of staff being 'broken' and 'exhausted'. It is difficult to imagine how those staff are managing with the current caseload and with their own mental well being.

This article intends to look at the context of the present workload with COVID-19 rampaging through healthcare and at the mental resilience and well being of the staff supporting those patients. It will also highlight some of the options for staff to develop their self care and raise awareness of available resources, even if they do not feel they need them now.

Healthcare staff for the most part, work in cultures where it does not 'do' to admit that we are not coping – so there is a great deal of hiding of the reality of mental disturbance and distress at work. One element that exacerbates the reluctance to disclose feelings and stress, is the external view of healthcare staff being heroes. It is hard for a hero to show 'weakness' and they will continue to deny their symptoms and this may prevent them from seeking help. There is a high degree of reluctance to admit to the stress and it is frequently taken home. This stigma needs to be addressed by healthcare organisations, professional associations and individual team leaders and staff, enabling open disclosure and a forum where they may safely display their feelings and get some help.

A report by the Society for Occupational Health Medicine[3] in 2020 speaks of the high levels of work-related stress, burnout and mental health problems identified in spring 2020; those will have risen significantly due to the exceptional pressure being experienced in 2021.

The pandemic can be described as a traumatic event of exceptional magnitude, greater than the usual range of normal human experience, together with the real fear of death. Post traumatic stress disorder (PTSD), anxiety, depression and other psycho-pathologies can result from the extreme demand faced by the health workforce. At the beginning they were dealing with a disease with unclear characteristics, no cure, no vaccine and a high mortality rate. It is no wonder that personally and professionally, staff have been stressed, and now they are weary and very tired. It has been said that this crisis is a marathon and not a sprint, but the evidence suggests that this is a continuous world of exhaustion.

Staff strive to ensure that the care which they deliver is of the highest quality however, chronic fatigue and poor mental health and well being among the staff diminishes the quality of care and increases the chance of patient safety incidents which causes further stress to others in the team.

WHAT DOES THE LITERATURE SAY?

There has not been a great deal of time for specific COVID-19 data to appear in the research although some[4] cite experience from previous epidemics such as SARS and Ebola. A total of 55 studies in a systematic review found that the psychological implications to healthcare workers (HCWs) are variable with several studies demonstrating an increased risk of acquiring trauma or stress-related disorders, depression and anxiety. Fear of the unknown or becoming infected were at the forefront of the mental challenges faced. Being a nurse and being female appeared to confer greater risk. The perceived stigma from family members and society heightened negative implications; predominantly stress and isolation. Coping strategies varied among the contrasting socio-cultural settings and appeared to differ among doctors, nurses and other HCWs. Implemented changes, and suggestions for prevention in the future consistently highlighted the need for greater psychosocial support and clearer dissemination of disease-related information.

MEASURES IDENTIFIED TO ADDRESS PSYCHOLOGICAL RISKS

From the literature it appears that self coping strategies such as acceptance, resilience, active coping and positive framing were useful. Some doctors used planning as a strategy. Other staff used exercise to help reduce the burden. Support from supervisors was found to be a significant negative predictor for psychiatric symptoms and PTSD. Self-directed learning on psychological materials had helped some staff to manage their condition, together with support from team members or colleagues. Several studies cited in the systematic review suggested that greater support would be supplied through collaboration, training and education. This appeared to strengthen teams and reduce HCW stress. Additionally, clear communication was seen to be a positive factor in reducing psychiatric symptoms[5].

To enhance recovery and well being, a range of support methods and psychological measures should be in place in the workplace. Furthermore, they should not be merely present for the duration of COVID-19, this disease will have a long shadow with the impact beginning to show in our healthcare workforce.

MEASURES EMPLOYERS CAN TAKE TO SUPPORT THE WELL-BEING OF THEIR EMPLOYEES.

In 2017, the government commissioned a review by Lord Dennis Stevenson and Paul Farmer, CEO of the mental health charity, Mind. The subsequent report[6] identified a number of core standards for employers to have in place:

- Produce, implement and communicate a mental health at work plan
- Develop mental health awareness among employees
- Encourage open conversations about mental health and the support available when employees are struggling
- Provide your employees with good working conditions
- Promote effective people management
- Routinely monitor employee mental health and well being

Whether work is causing the stress or exacerbation of an existing mental health condition, employers have a legal responsibility to help their employees. Where a risk to work-related mental health issues is identified at assessment, steps must be taken to remove it or reduce it

as far as possible[7]. Obviously in the current situation, that cannot occur, but employers can - if they have the motivation - provide extensive assistance to their employees on their intranets or by occupational health.

ADVICE AND SUPPORT

Many Trusts have their own services which they have set up over the year with well-being and mindfulness moments. I believe that many staff will not have time in their working day to review these resources, welcome as they are. A BMJ blog written in May has some simple advice which is worth repeating[8].

Top tips for surviving this phase of fatigue and keeping well for the long haul:

- Take regular breaks during your working shifts, even if you have work to do - breaks make us more efficient and productive and they help us to avoid burnout
- Remember this is a long-game and none of us are indispensable - handover to your team or another colleague so you can properly switch off during your rest period
- Consider a three-minute ritual at the end of each shift - take three deep breaths and list three things that were tough and three things that went well

Some advice from the Royal College of Nursing on a short exercise to do in a crisis[9]

Six steps to mindfulness

1. Connect to your senses to bring you into the moment - notice what you can see, hear, smell and feel
2. Take three mindful breaths, focusing on how it feels when you breathe in and out deeply
3. Be aware of your body, how it feels and any movements you're making
4. Notice the emotions you're feeling. Pause to name them, without judging or criticising yourself
5. Notice the type of thoughts in your mind, rather than specific thoughts. Name the types - are they memories, worries, past conversations or future plans?
6. Find somewhere to sit or stand to do a three-step breathing practice:
    - Awareness: notice how your body feels and what you're thinking
    - Your breath: become aware of which parts of your body move when you breathe in and
    - out and how this feels
    - Expanding: breathe deeply so it feels like each breath fills your whole body

In addition, the Royal College have produced mindfulness videos which can easily be accessed. Each of the six videos cover a different part of each day and are designed for nurses but probably suit many other healthcare workers as well. Silvercloud Health[10] has provided free access for NHS healthcare workers to help themselves by education and many different aspects of self care. Some top tips are repeated here, as they seem remarkably helpful.

Pay attention to, and notice, how you are feeling:

1. Be aware of your stress levels: stress can accumulate and become overwhelming and chronic unless managed. Keep an eye and monitor how you're doing

2. Remind yourself that feeling stressed is normal under the exceptional circumstances we are living through. It is okay not to be okay
3. You may feel like you are not doing enough and that you're not up to the task. Remember that becoming stressed or overwhelmed simply shows you are human and is in no way a reflection of your abilities
4. Some stress is helpful in energising you to keep going in the current situation, but it is important to manage it so that it does not become excessive and overwhelms you
5. You may also experience a range of unpleasant and unwelcome emotions, maybe also towards patients, on top of dealing with a lot of uncertainty on a daily basis. You may feel anger for non-compliance with social distancing restrictions, you may feel powerless at times and you may find it hard to feel compassionate towards patients at other times. This is normal and to be expected. However, it is important that you reach out for support if these feelings start becoming unsettling.

Once you recognise that things are impacting on you, you can find new ways to cope with your situation. Remember, even doing something small to look after yourself can make a big difference to your stress levels.

WHAT YOU NEED TO DO:

Self-care is hardest when you need it most. You may not feel like it is a priority when you have so much to do, but it is and cannot be negotiable at this time. You need to make sure you look after your basic physical and mental health needs or you won't be able to look after others.

- Eat well and look after your body. Don't skip meals or breaks, take some exercise as it is the single most helpful tool to help you manage your mental health
- Beware of unhelpful coping strategies. Alcohol and tobacco fall into this bracket although they may well have a negative effect overall
- Get enough sleep - it can be a challenge at this time but is essential to making sound decisions
- Find ways to care for yourself. It may be flowers it may be chocolate. Get creative!
- Connect. Keep in touch with your nearest and dearest to reduce your isolation. They are often your best support and they will want to help
- Watch out for excessive stress, fatigue and sudden exhaustion. You may need to go further than the self help strategies and refer yourself to GP, hospital occupational health or other available support services. Many Trusts have set up new services to support staff at this time of need.

There are many apps, videos and self-help learning programmes available which may give you the support and help you need. They do not take too much looking for, use self-care, mindfulness and other key words to search for the support you need.

CONCLUSION

We will not get through this pandemic intact without looking after key workers. As surges occur but we have not yet got to a state where vaccination is helping to reduce people being infected, we have to be able to manage ourselves for the long haul. Many aspects of the current

mental health crisis can be mitigated; we can reduce fear by the correct dissemination of information and the provision of training and education. With a dynamic disease, we all need to keep up with developments and new treatments. Education of healthcare workers, their families and the wider public can lessen stigma and discrimination. Trusts must provide suitable rest and care facilities as well as taking a proactive approach to supporting their overstretched and exhausted staff.

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This article first appeared in the Clinical Services Journal. It appears here, courtesy of the author. Kate Woodhead qualified in 1978. She has worked in peri-operative care since then and runs her own business as an Operating Theatre Consultant.

Kate was Chairman of NATN from 1998 to 2001. She is the former President of the IFPN (2002 to 2006) and now works as an Advisor to WHO on the Safe Surgery Saves Lives Campaign. She is the Chairman of Trustees at Friends of African Nursing.

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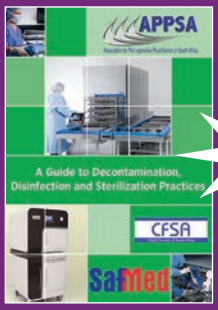

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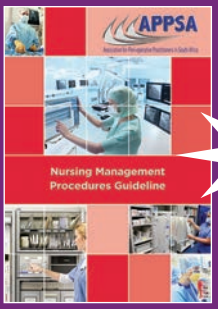

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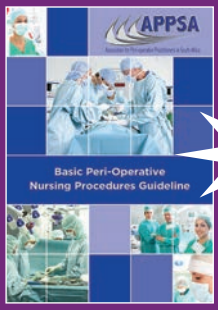

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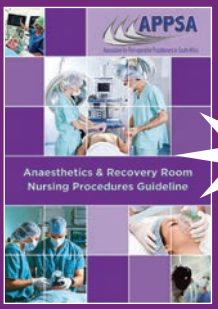

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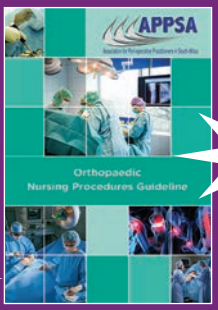

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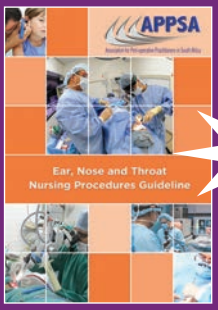

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PRE-OPERATIVE AND POST-OPERATIVE RECOMMENDATIONS TO SURGICAL WOUND CARE INTERVENTIONS:

A Systematic Meta-Review Of Cochrane Reviews

By Brigid M Gillespie; Rachel M Walker; Elizabeth Catherine Mcinnes; Zena Moore; Anne Eskes; Tom O'Connor; Emma Harbeck; Codi White; Ian Scott; Hester Vermeulen; and Wendy P Chaboyer

ABSTRACT

Background: The increasing numbers of surgeries involving high-risk, multi-morbid patients, coupled with inconsistencies in the practice of peri-operative surgical wound care, increases patients' risk of surgical site infection (SSI) and other wound complications.

Objectives: To synthesise and evaluate the recommendations for nursing practice and research from published systematic reviews in the Cochrane Library on nurse-led pre-operative prophylaxis and post-operative surgical wound care interventions used or initiated by nurses.

Design: Meta-review, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Review methods: All Cochrane Systematic Reviews were eligible. Two reviewers independently selected the reviews and extracted data. One reviewer appraised the methodological quality of the included reviews using A Measurement Tool to Assess Systematic Reviews 2 (AMSTAR 2) checklist. A second reviewer independently verified these appraisals. The review protocol was registered with the Prospective Register of Systematic Reviews.

Results: 22 Cochrane reviews met the inclusion criteria. Of these, 11 reviews focused on pre-operative interventions to prevent infection, while 12 focused on post-operative interventions (one review assessed both pre-operative and post-operative interventions). Across all reviews, 14 (63.6%) made at least one recommendation to undertake a specific practice, while two reviews (9.1%) made at least one specific recommendation not to undertake a practice. In relation to recommendations for further research, insufficient sample size was the most predominant methodological issue (12/22) identified across reviews.

Conclusions: The limited number of recommendations for pre-operative and post-operative interventions reflects the paucity of high-quality evidence, suggesting a need for rigorous trials to address these evidence gaps in fundamentals of nursing care.

BACKGROUND

Surgical wounds are the most common wounds managed in acute care settings. Surgical wound care is an interprofessional activity, although it is predominantly nurse-led. There is considerable variability in surgical wound care practice, which may reflect overuse of ineffective care, underuse of effective care or uncertainty as to what constitutes appropriate care.

The quality of the primary studies included in Cochrane Reviews may determine the level to which clinicians are able, or feel compelled, to implement reviewers' recommendations in clinical practice. Clinical recommendations made in pre-operative and post-operative surgical wound management are weak or conditional because of methodological limitations and gaps in the current evidence base. Analysis of design and methodological rigour of included reviews identified the need for larger sample sizes, longer followup periods and inclusion of economic evaluations.

INTRODUCTION

Worldwide, an estimated 4 511 operations per 100 000 population occur annually, equating to one surgical procedure each year for every 22 people[1]. Surgical wounds are the most common wounds managed in acute care settings and are associated with a variety of complications such as bleeding and dehiscence. However surgical site infections (SSI) are the most common complication – and they are also the most preventable hospital-acquired infection[2]. Internationally, SSI rates are estimated to range from 1.9%[3] to 40% of surgeries[4]. One in four patients develop post-operative complications within 14 days of hospital discharge[5]. Consequently, current estimates suggest surgical wound complications account for almost 4% of total healthcare system costs, and that proportion is rising. One case of SSI can cost up to $30 000 depending on its severity[6].

In acute care settings, there is considerable variability in surgical wound care, reflecting overuse of unhelpful and ineffective care, underuse of effective care, or clinician uncertainty as to what constitutes appropriate care. Inconsistent practices often arise due to conflicting research evidence and variations in clinician preferences, which compromises attempts to limit or reduce iatrogenic harm and patients' risk of SSI and other wound complications[7]. Although there are many SSI prevention clinical practice guidelines, they are of variable quality and differ in their recommendations[8]. Further, the plethora of wound care products and aggressive marketing strategies in the absence of strong supporting evidence accentuates the complexities bedside nurses face when attempting to use an evidence-based approach[9]. The routine use of ineffective and often expensive wound care products and/or inappropriate use of effective products is not uncommon[9, 10].

While surgical wound care involves interprofessional teams, registered nurses often lead these teams and frequently make nursing decisions, or recommendations to other health professionals, regarding various interventions for managing surgical wounds. High-quality systematic reviews of the literature, such as Cochrane Reviews, provide evidence syntheses upon which to base these decisions. Cochrane Reviews follow a stringent, peer-reviewed methodology that ensures all relevant studies are retrieved, are appraised for risk of bias, and their findings synthesised with the aim of generating and grading recommendations that guide both current practice and future research. Additionally, we have followed a similar process in focusing on only Cochrane Reviews (for the reason already stated) as have a previous group who undertook a meta-review of wound care five years ago[11]. This meta-review aimed to synthesise and evaluate the recommendations for practice and research contained within published Cochrane Systematic Reviews relating to pre-operative and post-operative surgical wound care interventions for preventing surgical site infection that were within the scope of nursing practice.

MATERIALS AND METHODS

Design: A meta-review of systematic reviews was undertaken in accordance with the Preferred Reporting Items for Systematic Reviews and Meta analyses (PRISMA) guidelines[12] and quality of individual reviews was assessed using A Measurement Tool to Assess Systematic Reviews 2 (AMSTAR 2) checklist[13]. The review protocol was registered with the Prospective Register of Systematic Reviews (number withheld for blinded review).

Inclusion/exclusion criteria: The setting (S), population (P), intervention (I), comparison (C), and evaluation (E) framework[14] was used to guide inclusion criteria, and report review characteristics.

Setting: The setting for this meta review was any care environment including hospital, home, residential aged care or long-term care.

Population: Authors focussed on Cochrane Reviews that included patients with a surgical wound, defined by the World Health Organization (WHO) as 'a wound created when an incision is made with a scalpel or other sharp cutting device and then closed in the operating room by suture, staple, adhesive tape, or glue and resulting in close approximation to the skin edges'[15 p.10]. As such, episiotomies and full thickness skin grafts were included as types of surgical wounds. For reviews that examined multiple wound types including chronic wounds (for example, venous, arterial or diabetic ulcers), only those studies or data relating to surgical wounds were included. Reviews which examined wounds outside the WHO definition of a surgical wound were excluded.

Intervention: Reviews were required to examine nursing interventions for surgical wound care, defined as pre-operative or post-operative interventions for surgical wounds that may be implemented by registered nurses or interventions that registered nurses may recommend to other health professionals to implement in any care setting. Thus, interventions included but were not limited to, skin preparation, dressing removal, negative pressure therapy devices, debridement and use of topical agents, including silver or aloe vera, and use of topical antibiotics and antiseptics. Reviews could comprise individual studies with randomised and/or non-randomised designs. Reviews were excluded if they focused only on interventions provided by other health professionals such as surgeons or interventions for which nurses cannot make recommendations. These comprised interventions performed during the intra-operative period, (such as surgery), electromagnetic therapy or medication prescriptions.

Comparator: There were no restrictions on the comparators used, and comparators were as defined by review authors.

Evaluation: This review assessed specific recommendations made as described in the 'implications for practice' and 'implications for research' sections of the reviews and within the abstract. Practice recommendations were categorised according to:

a) The level of certainty of the evidence underpinning that particular recommendation which, in some reviews, was determined using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria[16] of risk of bias, precision, indirectness, inconsistency, and selective reporting
b) How strong or unambiguous the recommendation was in regards to undertaking, or not undertaking, a specific practice

Recommendations for research were grouped into three categories (for example further/better quality research needed) and methodological issues included 10 categories (such as larger samples, greater statistical power, longer follow-up periods). Pre-operative and post-operative research outcomes from each review were classified based on 16 categories (such as cost, different setting/population, quality of life).

Search strategy: There were no date restrictions. A search of the Cochrane Library website (www.cochranelibrary.com/search) was conducted on 01 November 2018 for all published Cochrane reviews. The word 'wound' was the search term used in titles, abstract or keywords and these reviews screened. In the searches, only the word 'wound' was used to ensure that any relevant reviews were not missed. Thus, more time was allocated to screening more reviews.

Review section: Retrieved abstracts and titles were exported to an Endnote library for screening, with full-text articles obtained in cases requiring further information to enable screening. Two authors (WC, CW) independently screened all reviews to determine which should be selected based on inclusion and exclusion criteria. Instances of disagreement between the two authors regarding review inclusion were resolved by discussion and consensus.

Data extraction: Data extraction was conducted on each review independently by pairs of two authors (BG, RW, EM, ZM, AE, EH, CW) and adjudicated by a third (WC) if required. Data extraction included the following information (where available): source (author, year, reference, number of pages in full review and reference list), sample size (number of studies and participants identified), interventions and their comparators, outcomes, risk of bias (including randomisation, allocation concealment, blinding, loss to follow up) and/or certainty of the body of evidence (using GRADE criteria[16]), recommendations for practice and implications for research. The extracted data was checked between reviewers and discrepancies resolved through discussion.

A standardised structured data extraction form was developed by the authors, with two reviewers piloting this data extraction form on two reviews, which led to further refinements. To minimise potential for conflicts of interest in the review process, authors of this meta review who were also co-authors of several included Cochrane reviews were not involved in reviewing the reviews that they co-authored. Authors who undertook data extraction underwent training and extracted data from two reviews each, with further training planned if discrepancies were seen, but there were none. As Cochrane reviews are presented in a 'standard' format, a data dictionary detailing where in each review the data was to be exacted from was also developed and used to ensure consistency in data extraction. Data was also extracted on the risk of bias assessments made by the review authors on each study within their review. Notations were also made of reviews published before and after the Cochrane Library adopted the GRADE system of assessing certainty of evidence and strength of recommendations[16]. Reviews preceding GRADE criteria used risk of bias tables only, while those following both risk of bias tables and GRADE criteria, with relevant information extracted for both types of review. No attempt was made to re-appraise the reviews regarding risk of bias or GRADE criteria, with the original authors' ratings being accepted as valid.

Quality assessment: The methodological quality of the reviews was assessed using a validated 16-item measurement tool: AMSTAR 2 checklist[13]. The responses to the checklist items were scaled as 'fully performed', 'partially performed' or 'not at all performed' and 'yes' or 'no' as to whether data were pooled for meta-analysis. The AMSTAR 2 checklist identifies critical and non-

critical domains that must be met in a review, as these affect the validity of the conclusions. The creators of the tool stress that items should not be summed; rather appraisers should consider the overall quality relative to 'critical domains' (items 2, 4, 7, 9, 11, 13 and 15) and 'non-critical weaknesses' (items 1, 3, 5, 6, 8, 10, 12, 14, 16)[13]. The overall rating of confidence in the quality of reviews is based on 'high' (no or one non-critical weakness), 'moderate' (more than one non-critical weakness), 'low' (one critical flaw with or without non-critical weaknesses) and 'critically low' (more than one critical flaw with or without non-critical weaknesses). For this meta-review, two appraisers (EH, CW) independently assessed a sub-sample of 10 (45.5%) reviews and achieved good agreement (at least 80% as recommended by tool developers[13]). Then one appraiser (EH) completed the rest of the assessments, with another author (WC, BG) contacted in instances where EH was uncertain. Any disagreements were resolved through discussion and, when needed, final adjudication by a third reviewer (WC).

Data synthesis: Recommendations for practice and research were synthesised in narrative form, with evidence tables provided which contained quantitative effect estimates underpinning the recommendations, where available. Recommendations were categorised as being either 'specific' or 'general'. Specific recommendations included interventions that directly related to wound care practice and/or management, whereas general recommendations were considered as applicable to any areas of clinical practice, such as cost issues, patient condition. Content analysis of research recommendations using both inductive and deductive techniques was undertaken, and results presented in tabular format for both pre-operative and post-operative surgical wound interventions. This content analysis was directed by the following questions:

- Are practice and/or research recommendations made? (no/yes)
- What are the practice and/or research recommendations?
- How many practice recommendations are made to undertake a practice (in other words to do something)?
- How many recommendations are made to not undertake (or stop) a practice (in other words to not do something)?
- What is the certainty or quality of the body of evidence for each recommendation?

RESULTS

Identification and selection of reviews: Figure 1 displays the PRISMA flow chart of Cochrane Reviews used to identify and select reviews for inclusion. Our search identified 408 records, of which 386 were excluded after screening titles and abstracts, and a further four excluded after reading full-text articles, leaving 22 reviews that were included for analysis based on selection criteria. All reviews were published between July 2006 and October 2018. Of the 22 included reviews, one review[17] assessed both pre-operative and post-operative interventions.

Characteristics of the included reviews: Study characteristics relative to pre-operative and post-operative reviews respectively are provided in the supplemental material. Of 22 included reviews, 11 reviews focused on pre-operative interventions and 12 focused on post-operative interventions, with one[17] focusing on both pre-operative and post-operative interventions. There were 183 primary studies on surgical wounds from 33 countries across the included reviews. The top three countries where the primary studies were conducted were the United States (n = 54), the United Kingdom (n = 32) and Denmark (n = 10). Three reviews included studies that were multinational[18–20].

Twelve (54.5%) reviews were published after 2014 and reported the additional GRADE criteria, and six (27.3%)[17, 21–25] were published by authors who were not members of the Cochrane Wounds group. Sixteen (72.7%) reviews comprised solely randomised controlled trials, while five (22.7%) included both randomised and quasi-randomised control trials. A single review had no studies[24] although it met the inclusion criteria and represented a gap in knowledge relative to education as a pre-operative intervention.

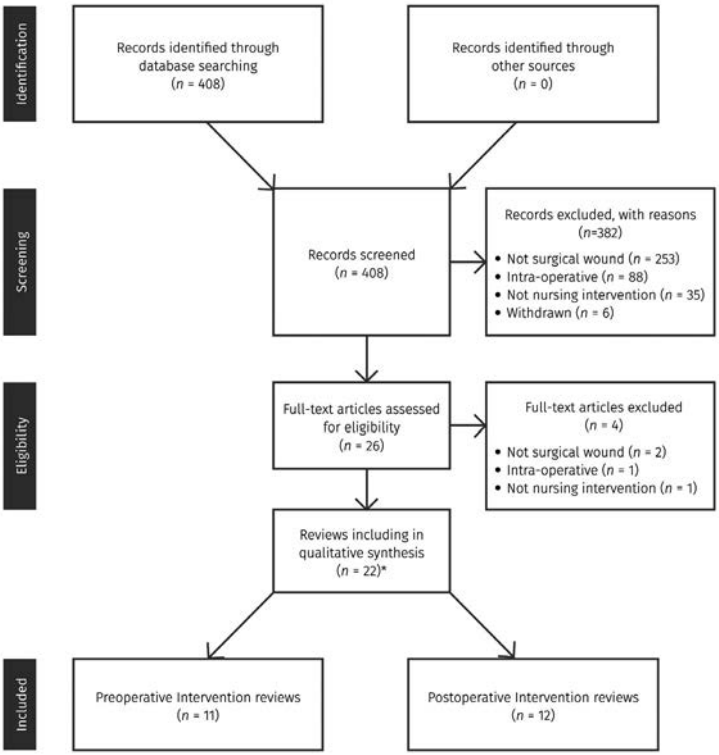

Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flow chart

* One review assessed both pre-operative and post-operative interventions for surgical wounds.

Findings of the included systematic reviews: Across all reviews, review authors made eight specific 'to do' recommendations and two specific 'not to do' recommendations. Table 1 details the recommendations for clinical practice across the pre-operative and post-operative Cochrane Reviews. Of the 11 pre-operative reviews, five reviews made at least one specific 'to do' recommendation while one review made at least one 'do not do' recommendation. Of the 12 post-operative reviews, three made at least one specific recommendation to do something while one review made at least one specific recommendation not to do something. In all, eight specific recommendations were made to do something, and two specific recommendations were made not to do something. Across reviews, there were 10 general recommendations, such as considering costs, patient preferences, relative benefits and potential harms.

Table 1: Clinical recommendations for pre-operative and post-operative surgical wound practice (n = 22)

	Area of surgical wound care practice	Specific 'to do' recommendations	Specific 'do not do' recommendations	General recommendations	Review reference
Pre-operative practices	Removal of nail polish and rings	1. Develop local policies based on expert opinion of clinicians.			Arrowsmith et al. (2001)
	Pre-operative skin antiseptics			1. Consider potential side effects of alternative skin preparation solutions. 2. Consider costs.	Dumville et al. (2015)
	Vaginal cleansing with antiseptic solution before caesarean section	2. Implement pre-operative vaginal cleansing with povidone-iodine or chlorhexidine before caesarean deliveries.			Haas et al. (2018)
	Nasal decontamination in *Staphylococcus aureus* carriers.			3. Consider potential side effects when choosing between alternatives. 4. Consider costs	Liu et al. (2017)
	Prevention of infection in arterial reconstruction	3. Use antibiotic prophylaxis using antibiotics that fight staphylococcal and Gram-negative bacteria.			Stewart et al. (2006)
	Pre-operative hair removal	4. If hair removal is needed, clip.			Tanner et al. (2011)
	Pre-operative shaving		1. Shaving should not be part of routine clinical practice.		Tanner et al. (2011)
	Pre-operative bathing or showering with skin antiseptics to prevent surgical site infection	5. Focus on interventions where effect is evident.			Webster and Osborne (2015)
Post-operative practices	Negative pressure wound therapy for skin grafts and surgical wounds healing by primary intention		1. Avoid using negative pressure wound therapy following orthopaedic surgery until safety in this population is established.	1. Consider patient preferences when choosing dressings. 2. Consider costs.	Webster et al. (2014)
	Dressings or surgical incisions	1. Use antibiotic prophylaxis.		3. Use existing evidence and guidelines, e.g., hand hygiene.	Dumville et al. (2016)
	Early versus delayed post-operative bathing or showering	2. Consider the quality of water. 3. Consider the type of wound (i.e., primary/secondary closure).			Toon et al. (2015)
	Water for wound cleansing			4. Consider relative benefits of cleansing clean surgical wounds. 5. Consider the patient's general condition, including comorbidities	Fernandez and Griffiths (2012)
	Pin site care for external bone fixators			6. Implement general strategies to reduce cross-infection.	Lethaby et al. (2013)

Recommendations for research: The supplemental material shows the recommendations for future research in respect to methodological issues and recommendations in relation to other outcomes identified across reviews of pre-operative and post-operative SSI prevention interventions respectively. In terms of pre-operative interventions, 10 reviews recommended that further research was needed in gauging the certainty of effects of the interventions trialled, with five reviews concluding more rigorous research was needed in overcoming insufficient sample

sizes (7/11), short follow up periods (3/11) and sub-optimal compliance with the reporting standards of the CONsolidated Standards of Reporting Trials Statement (3/11). Topics cited as in need of more investigation included adverse events/effects (6/11) and new comparisons between different interventions (6/11). Regarding reviews of post-operative SSI prevention interventions, all included reviews recommended the need for further high-quality research (see supplemental material 3) in dealing with issues of insufficient sample sizes (6/12) and limitations in allocation concealment (6/12). Analyses of cost-effectiveness (9/12) and quality of life (7/12) were nominated as topics for future studies.

Quality of included reviews: The methodological quality of the reviews as determined by the AMSTAR 2 checklist is shown in the supplemental material. For reviews that did not include any identified studies or were not able to conduct a meta-analysis, some items were not able to be analysed. Therefore, one review could not assess items 8 and 11 to 15, while seven reviews could not assess items 11, 12 and 15. Across reviews, the percentage of all reviews meeting each criterion ranged from 57% to 100% in regards to the denominator of assessable items. In all, 15 reviews were rated as 'high quality'[17–24, 26–32], two as 'moderate quality'[34, 35], four as 'low quality'[35–38] and one 'critically low quality'[25]. A single review[24] found no studies that met their eligibility criteria and so a term 'no studies identified' was used as some items could not be assessed.

DISCUSSION

This meta-review of Cochrane Reviews described pre-operative and post-operative surgical wound interventions within nurses' scope of practice and examined their methodological quality and synthesis of recommendations for practice and research. Undoubtedly, registered nurses' scope of practice varies across countries relative to what is considered extended practice (for example, debridement, prescription of topical ointments). Therefore, the application of these recommendations may necessarily differ. Most recommendations for clinical practice were general rather than specific, such as within the context of cost[20, 27, 35], quality of the body of evidence[18, 20, 33, 37, 38], likelihood of harm[27, 30, 35], and/ or patients' and clinicians' preferences[20]. Recommendations made by review authors to either stop, or not do something clearly focussed on reducing potential side effects or harm[20, 37]. Our findings suggest that most clinical practice recommendations across reviews were tentative or conditional because of methodological limitations and gaps in the evidence base. Given these apparent high levels of uncertainty in wound care[8, 9, 26, 20], the guidance given to clinicians is more general than specific.

Despite a strong desire to adopt evidence-based practice, many clinicians practice within the constraints of on-going uncertainty, and base their clinical decision-making on intuition[39], personal experience, peer opinions, professional norms, and past teaching[9, 40, 41]. When confronted with a clinical conundrum, health professionals often make decisions founded on their internalised tacit guidelines and mental 'rules of thumb' (or heuristics)[39]. Although this approach may suffice for many decisions, intuitive decision-making is predisposed to various types of 'cognitive biases' that can distort the synthesis and accurate interpretation of information presented[39]. Cognitive biases such as 'attribution bias' (based on my clinical experience I believe this intervention is effective), 'impact bias' (this intervention is working well and the patient's wound seems to be improving) and 'ambiguity bias' (I am unsure about what to do so I will stick with what I know and what everyone else seems to do)[39] influence clinical decision-making in wound care.

However, it is difficult to determine whether the clinical care delivered is low value or high value when the evidence is so poor or non-existent. In the absence of high-quality evidence, there is a risk that what may eventually be shown to be ineffective or even harmful care is perpetuated over time. For instance, despite the very low certainty of evidence on the prophylactic use of negative pressure wound therapy in preventing SSI, the use of these devices is increasing in surgical care because of clinicians' preferences and the prolific marketing by industry[9, 20]. Therefore, there is a propensity to make clinical decisions based on limited/weak evidence, or on outdated evidence, which increases the risk that at least some of this care is likely to be of low value. Low-value care is care that provides limited or no benefit, may cause patient harm, or may yield costs that are disproportionate to added benefits[7].

While all but one review[21] recommended that further trials be undertaken to expand the base of high-quality evidence, what remains unclear is the extent to which some of the questions/topic areas highlighted in these reviews are most important to clinicians and consumers. For example, it is questionable whether more research would be of value in investigating removal of nail polish prior to surgery. Further, in surgical wound care and recovery, attention is now being focussed more on lifestyle interventions (such as nutrition, early post-operative mobilisation) in combination with other wound care interventions. Nonetheless, interventions such as nutrition have more upstream and diffuse impacts and are not the subject of these Cochrane Reviews which focus on 'just in time' prevention. In all reviews, authors recommended comparisons with multiple other interventions, not just one or two, to be included in the same trials. Mapping research questions against published systematic reviews may identify evidence-rich and evidence-poor areas of clinical practice which can help identify and prioritise directions and focus of future research. For example, one analysis demonstrated that over 50% of published studies are designed without reference to existing systematic reviews of the evidence[42], contributing to wasted effort on researching practices for which the evidence is already well established. Compounding this problem are estimates of over 50% of published research being seriously flawed in design or being unusable because of poor reporting, or both[43].

Limitations: We were selective in our approach and included only systematic reviews drawn from the Cochrane database because of their robust methodological approach. While we are aware of other systematic reviews in the area of wounds[44–46] we focused on Cochrane Reviews because of their explicit sections on implications for practice and research. However, the results of this review are inherently limited by not only the quality of the reviews, but also the quality of the evidence from the primary studies. Over the 12-year period these Cochrane Reviews were published, methodological and reporting standards have improved.However, appraising the overall quality of the reviews using the AMSTAR 2 checklist has some limitations. First, the recommended scoring system marks reviews down where meta-analyses (Q11, 12 and 13) are not possible because of high heterogeneity among primary studies. Second, the tool does not assess the logic underpinning the choice of methods for conducting a particular review. Third, the tool does not specify which risk of bias instruments review authors should use to assess non-randomised trials and downgrades all such studies irrespective of differences in risk of bias.

CONCLUSIONS

The results of this meta-review suggest much uncertainty persists around the evidence to support many of the practices used in surgical wound care. To provide better healthcare, there is a

compelling need for better evidence. Despite the availability of well-conducted systematic reviews, their contribution to clinical practice and research is ultimately determined by the quality of the primary studies. Clearly, there is a link between poor research and poor information, making clinical decision-making difficult and perpetuating what may turn out in the future to be a significant burden of low-value care in surgical wound practice.

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A QUALITY IMPROVEMENT INITIATIVE
To Prevent Surgical Site Infections

By Kate Woodhead, RGN, DMS

INTRODUCTION

OneTogether is a group of representatives from professional organisations who have a passion for reducing surgical site infections (SSI), which cause such misery to patients. The organisations which founded and continue to support the quality improvement initiative are The Royal College of Nursing, The Infection Prevention Society, The Association for Peri-operative Practice, the College of Operating Department Practitioners, 3M company and the Central Sterilising Club. The group devise infection prevention resources for use in hospital operating rooms to ensure that practice is in line with evidence based guidance. The resources are freely available on the OneTogether website (www.onetogether.org.uk/resources). There is an annual conference, except in 2020 for reasons of COVID-19, where Awards are given for quality practice development.

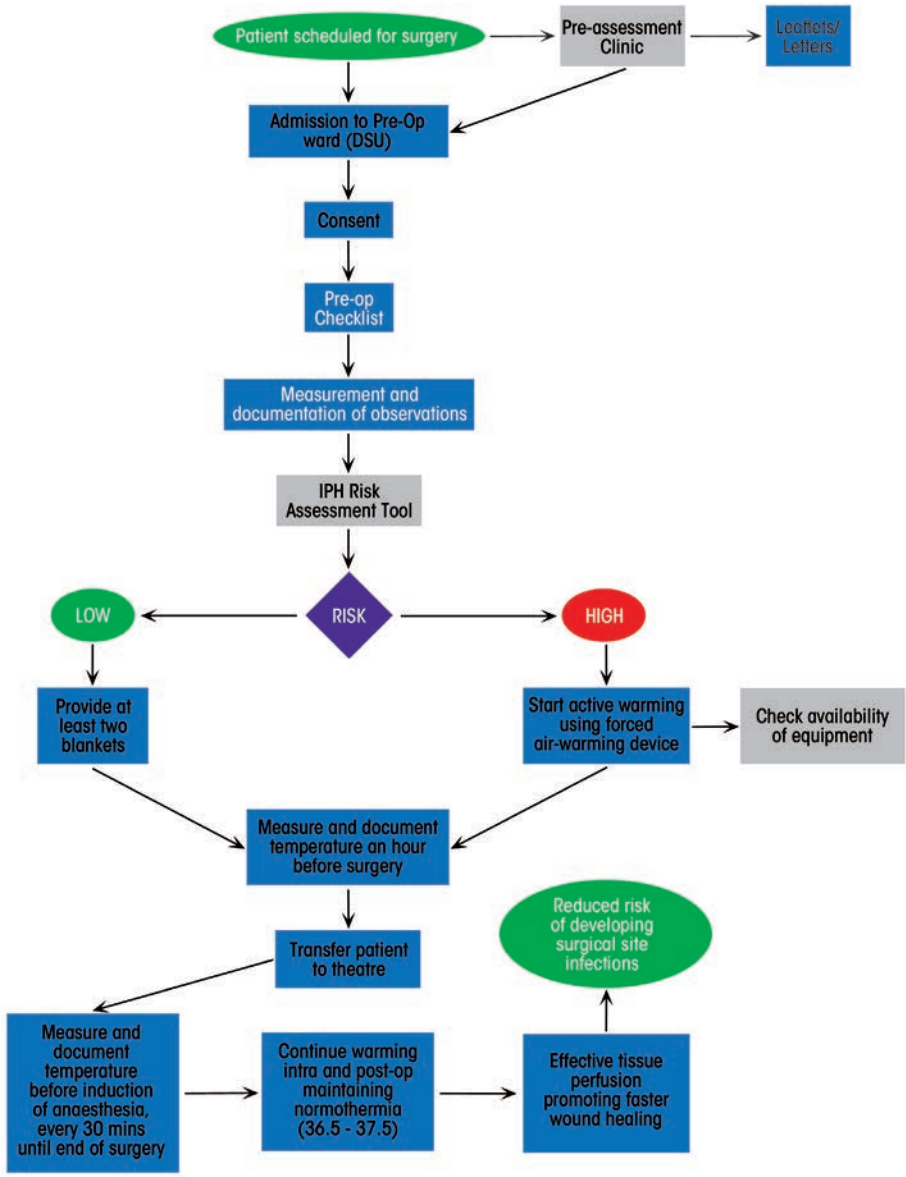
The team who undertook the quality improvement initiative work at the Gloucestershire Hospitals NHS Foundation Trust were led by Nur-in Mohammad, the Chief Nurse Fellow in Surgery. She and the team won the OneTogether Small Steps Award in 2019. This article describes their project and results.

There was concern at the level of SSI being suffered by patients at the hospital and as part of the response to first quarter data from the audit of small and large bowel surgeries, Nur-in Mohammad decided that one of the aspects of the care bundle to reduce SSI[1] which could improve in the Trust was patient warming during peri-operative care. There is a significant volume of research and NICE guidance to assist teams and practitioners towards developments in practice. The main aim of the quality improvement project was therefore to explore best practice and to amend the practices for all patients undergoing elective surgery in one of the Trust Hospitals and to implement NICE guidance. This would require changes to current practice and staff education specifically on monitoring and documentation of the patient's temperature and the rationale for perioperative measurement.

First steps – See 'intended state' process map below.

Nur-in created two process maps to guide practitioners during the surgical pathway, as shown in Figure 1, the intended state process map. She also set up a working group consisting of an infection control specialist, ward managers, theatre matron, a theatre practice development nurse and a consultant anaesthetist. The group decided that they should create a risk assessment tool based on the NICE guidance.[2] This they have called the Inadvertent Peri-operative Hypothermia Risk Assessment Tool (Table 1) and is based on NICE Guidance and the OneTogether Assessment Toolkit to measure the standards.

FIGURE 1. INTENDED STATE PROCESS MAP



RISK ASSESSMENT TOOL - TABLE 1

Risk Factors For Inadvertent Peri-operative Hypothermia	Tick
ASA Grade 2 and above	
Undergoing combines general and regional anaesthesia	
Undergoing major or intermediate surgery	
Age more than 75 years	
Low BMI - less than 20	
1 or below - LOW RISK **2 or above - HIGH RISK**	

In order to collate all the elements, Nur-in undertook a PDSA cycle which aimed to ensure that all patients are risk assessed according to the guidelines. PDSA cycles have proved to be a useful tool to use when working through an issue and wanting to ensure that it is a sound initiative providing clarity for what the change might deliver. The model for improvement provides a framework for developing, testing and implementing changes leading to improvement[3]. The model helps to ensure that the aims and objects of the improvement are clear, how the change will be measured and what the measures of success are going to be. The four stages of the model are:

Plan: The change to be tested or implemented
Do: Carry out the test or change
Study: Based on the measureable outcomes agreed before starting out, collect data before and after the change and reflect on the impact of the change and what was learned
Act: Plan the next change cycle or full implementation

In order to ensure that all staff were fully informed and engaged with the project, a study session was held for those staff working in the Day Surgery Unit so that they were able to use the Risk Assessment tool in Table 1. It also included what staff actions should be, once they had assessed the risk and had a score for each patient. The intervention guidelines devised for staff to follow were based on clinical evidence from NICE recommendations and the OneTogether framework.

EQUIPMENT CHALLENGES

To keep the project cost neutral, it was known that there were insufficient warming machines to pre-warm all the patients that might need them, so the working group team decided that they would use blankets instead and progress the procurement issue later in the project. Therefore, the lack of equipment would not prevent the project taking place, but that they would use the resources that they had. In addition to fewer Forced Air Warming machines than necessary, they were using tympanic thermometers which are not recommended for their ability to measure core temperature accurately[4]

The latter are known to be less accurate than direct measurement using pulmonary artery catheters; distal oesophageal and urinary bladder are considered the most accurate methods and sites for direct core temperature measurement or direct estimation of core temperature.[5]

INTERVENTION GUIDELINES - TABLE 2

LOW RISK	HIGH RISK
• Measure and document baseline score body temperature, retake an hour before transfer to theatre • Provide two blankets • Advise patient to keep warm and inform nurse/HCA when feeling cold	• Measure and document baseline core body temperature, retake an hour before transfer to theatre • Start active warming using Forced Air Warming Equipment 30 minutes before transfer to theatre
Note: If patient's body temperature is below 36°C, start active warming IMMEDIATELY, regardless of risk for Inadvertent Peri-Operative Hypothemia	

DOCUMENTATION CHALLENGES

In addition to the equipment difficulties, the teams were finding challenges in the documentation from surgical pre-assessment clinics who were failing to document the patient's ASA grading. An essential element of the identification and management of the individual patient is determined by their ASA grading. A review of their pre-assessment documentation identified that only 65% of all patients were being ASA graded and therefore the next PDSA cycle focused on improvement of the patient's ASA grading documentation. The solution to this aspect of care and of the quality improvement initiative was to run a study session with the pre-assessment team. ASA grading is not only important to the warming of patients but to their general risk assessment prior to surgery, as it highlights co-existing diseases and functional capacity.

ASA GRADING - TABLE 3

ASA1	A normal healthy patient, that is without any clinically important co-morbidity and without a clinically significant past/present medical history
ASA2	A patient with mild systemic disease
ASA3	A patient with severe systemic disease
ASA4	A patient with severe systemi disease that is a constant theat to life
ASA5	A moribund patient who is not expected to survive without the operation

In addition to the pre-assessment documentation issue, it was noted that documentation of intra-operative temperatures was not all that it could be, especially for short procedures. The theatre team were the next group to have a training session led by Nur-in to establish better processes for charting patient temperatures throughout their surgery. NICE recommends a measurement is taken every 30 minutes, and is documented.[7]

QUALITY IMPROVEMENT OUTCOMES

As an on-going project, the outcomes from the first three months were very positive, showing compliance to the NICE guidance improved significantly. The incidence of peri-operative hypothermia dropped by 20%. Documentation of intra-operative temperature increased from 43% to 95% and while the ASA grading documentation still leaves a bit to be desired, the overall improvement is significant. The challenge will be to ensure that the changes are embedded and sustainable.

Plans for additional changes include a further training session for all ward staff on the risk assessment tool. In addition, the risk assessment will be incorporated into the existing pre-operative checklist, which will be further trialled to ensure its' prominence is appropriate. Patient leaflets are also planned to be revised to inform patients of goals for managing their warmth before, during surgery and in recovery. There will also be an on-line learning package devised for in-house staff. Link personnel in operating theatres complete the package of change, to keep a close eye on the quality improvement and to ensure that it becomes a normalised element of every surgical care pathway.

CONCLUSION

The hard work that went into the quality improvement initiative was rewarded by winning the Small Steps Award from OneTogether and it is hoped that the motivation of the team at Gloucestershire Hospitals Trust feel after their win, will encourage others to engage with quality improvement work to benefit all of their patients.

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This article first appeared in the Clinical Services Journal in April 2020. It appears here, courtesy of the author. Kate Woodhead qualified in 1978. She has worked in peri-operative care since then and runs her own business as an Operating Theatre Consultant.

Kate was Chairman of NATN from 1998 to 2001. She is the former President of the IFPN (2002 to 2006) and now works as an Advisor to WHO on the Safe Surgery Saves Lives Campaign. She is the Chairman of Trustees at Friends of African Nursing. For more information on FoAN please go to www.foan.org.uk

PERI-OPERATIVE RISK FACTORS FOR RECOVERY ROOM DELIRIUM

After Elective Non-Cardiovascular Surgery Under GA

By Jiayi Wu, Shaojie Gao, Shuang Zhang, Yao Yu, Shangkun Liu, Zhiguo Zhang and Wei Mei

ABSTRACT

Background: Although post-operative delirium is a frequent complication of surgery, little is known about risk factors for delirium occurring in the post-anaesthesia care unit (PACU). The aim of this study was to determine pre-operative and intra-operative risk factors for the development of recovery room delirium (RRD) in patients undergoing elective non-cardiovascular surgery.

Methods: RRD was diagnosed according to the Confusion Assessment Method for the Intensive Care Unit (CAMICU). We collected peri-operative data in 228 patients undergoing elective non-cardiovascular surgery under general anaesthesia and performed uni-variate and multi-variate logistic regression to identify risk factors related to RRD. PACU and post-operative events were recorded to assess the outcome of RRD.

Results: 57 (25%) developed RRD. On multi-variate analysis, maintenance of anaesthesia with inhalation anaesthetic agents (OR = 6.294, 95% CI 1.4–28.8, corrected p = 0.03), malignant primary disease (OR = 3.464, 95% CI = 1.396–8.592, corrected p = 0.018), American Society of Anaesthesiologists Physical Status (ASA-PS) III–V (OR = 3.389, 95% CI = 1.401–8.201, corrected p = 0.018), elevated serum total or direct bilirubin (OR = 2.535, 95% CI = 1.006–6.388, corrected p = 0.049), and invasive surgery (OR = 2.431, 95% CI = 1.103–5.357, corrected p = 0.035) were identified as independent risk factors for RRD. RRD was associated with higher healthcare costs (31,428 yuan [17,872–43,674] versus 16,555 yuan [12,618–27,788], corrected p = 0.002), a longer median hospital stay (17 days [12–23.5] versus 11 days [9–17], corrected p = 0.002), and a longer post-operative stay (11 days [7–15] versus 7 days [5–10], corrected p = 0.002]).

Conclusions: Identifying patients at high odds for RRD pre-operatively would enable the formation of more timely post-operative delirium management programmes.

INTRODUCTION

Delirium is an acute brain organ dysfunction characterised by changes in level of consciousness, inattention, and disorganised thinking. Post-operative delirium, one of the most frequently encountered complications observed post-operatively, is a transient mental dysfunction that can result in increased morbidity, delayed functional recovery, and prolonged hospital stay (Lepouse *et al.* 2006). In clinical practice, it is common to classify delirium as: (1) hypoactive subtype, characterised by reduced alertness, sedation, and reduction of motor activity; (2) hyperactive form, associated with hyper-vigilance, psychotic features (for example, hallucinations and delusions) and agitation (Fields *et al.* 2018); and (3) a more prevalent mixed subtype with overlapping features of the previous two forms.

Risk factors related to post-operative delirium have been identified previously (Inouye and Charpentier 1996; Marcantonio *et al.* 1994). Inouye *et al.* reported that a risk factor intervention strategy significantly reduced the number and duration of delirium episodes (Inouye *et al.* 1999). Despite the importance of early recognition and timely management of delirium, recovery room delirium (RRD) in the post-anaesthesia care unit (PACU) has not been extensively investigated (Card *et al.* 2015; Fields *et al.* 2018; Lepouse *et al.* 2006; Radtke *et al.* 2008; Sharma *et al.* 2005). As a result of different diagnostic criteria and definitions of delirium, the incidence rate of RRD ranges from 3% to 21.1% (Juliebo *et al.* 2009; Lepouse *et al.* 2006; Radtke *et al.* 2008). Previous studies have mainly considered the hyperactive subtype of post-operative delirium (agitation) and not the hypoactive subtype (Lepouse *et al.* 2006). Several scales have recently been validated for assessing delirium in the PACU setting (Radtke *et al.* 2008). User-friendly and reliable tools, such as the Confusion Assessment Method for the Intensive Care Unit (CAM-ICU), allow the clinician to identify both hyperactive and hypoactive delirium in the posto-perative setting (Card *et al.* 2015; Ely *et al.* 2001).

CAM-ICU was validated for delirium assessment for mechanically-ventilated, critically-ill patients (Ely *et al.* 2001) or non-intubated patients (Van Rompaey *et al.* 2008) in various settings such as surgical ICU (Guenther *et al.* 2010), emergency department (Han *et al.* 2010), mixed intensive care unit (van Eijk *et al.* 2009), surgical and trauma intensive care unit (Pandharipande *et al.* 2008), trauma unit (Soja *et al.* 2008), as well as PACU setting (Card *et al.* 2015). The CAM-ICU has a higher specificity than sensitivity for delirium when used in the PACU (Neufeld *et al.* 2013). Identifying patients at high odds for RRD pre-operatively would enable the formation of more timely post-operative delirium management programmes (Munk *et al.* 2016). In this prospective study, we used the CAM-ICU to investigate the proportion of, and risk factors, associated with RRD in PACU after elective non-cardiovascular surgery under general anaesthesia. We also investigated which post-operative factors occurred at a significantly higher proportion in patients who developed RRD.

METHODS

Patients

This observational study was reviewed and approved by the Hospital Institutional Review Board of Tongji Hospital, Huazhong University of Science and Technology, Wuhan, China, and registered with Clinical Trials (NCT00991913). All patients gave written informed consent before induction of anaesthesia. Patients older than 18 years, who were admitted to the PACU after elective non-cardiovascular surgery under general anaesthesia during regular working hours, 09:00 am to 17:00, were screened on eight randomly selected working days in June 2010. Patients were not included consecutively, due to a lack of personnel capacity for delirium evaluation in the busy PACU setting, but were representative of the patient population at the Tongji Hospital of the Huazhong University of Science and Technology, Wuhan, with respect to age, comorbidity, and surgical procedures.

The 12-bed PACU is located next to the operating rooms (ORs) in Tongji Hospital, a general university teaching hospital. Two well-trained researchers in the PACU were responsible for patient evaluation. The anaesthetist in charge was responsible for patient discharge. Transition from PACU to the surgical ward was considered safe when the patient had achieved a Modified Aldrete Score of 9 (Aldrete 1995). All patients received 1mg to 2mg midazolam soon after arriving in the

OR. General anaesthesia was induced with propofol or etomidate in combination with fentanyl or remifentanil, followed by neuromuscular block with either vecuronium or rocuronium to facilitate endotracheal intubation. Anaesthesia was maintained by total intravenous anaesthesia (TIVA) using propofol or inhalation anaesthetics, either isoflurane or sevoflurane. The anaesthetist in charge was free to use opioid analgesics and muscle relaxants as needed. All patients were extubated in the OR at the end of surgery. The anaesthesiologist responsible for the patient's care was not aware of the inclusion of the patient in the study before or during surgery. Exclusion criteria were age <18 years, refusal to sign consent form, operation under regional anaesthesia, history of substance dependence (including opioid, alcohol, or nicotine), neuro-surgical procedure, history of primary neurologic disease, and admission to PACU with stays of less than 10 minutes.

Outcome

Our primary outcome was the presence of delirium in PACU determined by CAM-ICU (Ely *et al.* 2001). The CAM-ICU Simplified Chinese version was obtained from http://www.icudelirium.org/. Ten minutes after the arrival of patients in the PACU, the patients were assessed with Richmond Agitation-Sedation Scale (RASS). If RASS was < -2, then the patient was assessed again after 5 minutes. If RASS was ≥ -2 or more, trained research assistants assessed delirium by the CAM-ICU.

In order to make a reliable diagnosis of recovery room delirium in the very busy PACU setting, we have chosen CAM-ICU based on the following considerations: (1) CAM-ICU flowsheet was proved to be the most reliable instrument for delirium assessment in many settings under various cultures including surgical ICU settings in Germany (Guenther *et al.* 2010; Luetz *et al.* 2010), a Swedish ICU setting (Larsson *et al.* 2007), a mixed medical-surgical ICU setting in the Netherlands (Spronk *et al.* 2009), ICU setting in Chinese populations (Chuang *et al.* 2007), and PACU setting (Card *et al.* 2015); (2) CAM-ICU flowsheet allows a quick assessment that needs only 50 s (interquartile range, 40–120 s) in patients with delirium vs 45 s (interquartile range, 40–75s) in those without delirium to complete assessments (Guenther *et al.* 2010), which would be a great advantage for use of CAM-ICU in the busy settings such as PACU; (3) PACU settings are similar with surgical ICU settings in our hospital, and Chinese version of CAM-ICU was tested in a prior study in Chinese population shown good validity and reliability (Chuang *et al.* 2007).

The CAM-ICU evaluates the following four 'features' of delirium: (i) an acute change in mental status or fluctuation in the level of consciousness over the prior 24 h, (ii) inattention, (iii) disorganized thinking, and (iv) an altered level of consciousness. The CAM-ICU has a higher specificity than sensitivity for delirium when used in the PACU (Neufeld *et al.* 2013). Thus, we expected fewer false positives than false negatives, thereby taking a conservative approach to the determination of the proportion of delirium in our cohort. The CAM-ICU was administered in the PACU by two research assistants who each received one-on-one training plus quality assurance review of 10 independent assessments before the start of the study by a CAM-ICU expert at our institution (WM). The k-statistic for agreement between the expert and each of the assessors was 1.0 indicating perfect agreement.

Candidate predictors

Predictors in the present study were selected according to their clinical importance and based on the results of previous studies. Demographic and pre-operative and intra-operative variables,

including age, gender, weight, American Society of Anaesthesiologists Physical Status (ASA-PS) (III–V versus I–II), pre-operative haemogram (white blood cell count, haemoglobin, and haematocrit), pre-operative serum biochemistry (sodium, potassium, chloride, calcium, creatinine, blood urea nitrogen (BUN), cholesterol, uric acid, glucose, total bilirubin, direct bilirubin, albumin, and total protein), pre-operative routine hepatic enzymes (alanine transaminase and aspartate transaminase), diagnosis of primary disease (malignant versus benign), type of surgery (invasive versus mini-invasive), location of surgery (head and neck, intra-thoracic, intra-abdominal, urogenital, musculoskeletal and spinal, or peripheral), maintenance of anaesthesia (inhalation anaesthetic versus TIVA), pre-operative and intra-operative haemodynamic parameters (maximal and minimal heart rate, maximal and minimal systolic/diastolic blood pressure), pre-operative and intra-operative oxygen saturation, intra-operative fluid application, intra-operative loss of body fluid (including blood loss, urinary production, and any other obvious fluid loss), duration of surgery ($\geq$ 2 h versus < 2 h), and peri-operative hospital length of stay (LOS) were evaluated by viewing patient data records. We categorised the laboratory values as normal or abnormal based on the normal values of the clinical laboratory at Tongji Hospital. We performed uni-variate and multi-variate analyses to identify independent risk factors for delirium.

We also recorded PACU and post-operative events, including maximal heart rate; maximal and minimal systolic blood pressure (SBP) in PACU; mean oxygen saturation in PACU; PACU-LOS, post operative-LOS, and total hospital-LOS; total healthcare costs and healthcare costs per day during hospital stay, to assess the relationship between RRD on these variables.

Statistical analysis

Descriptive statistics were computed for all study variables. We used Kolmogorov-Smirnov and Shapiro-Wilk tests and normal-quantile plots to determine whether continuous variables were normally distributed. Because most variables had a non-normal or asymmetric distribution, we have reported results as median [25% to 75% percentiles] rather than mean ± SD and used non-parametric statistical tests. Differences between the two patient groups (delirium versus no delirium) were tested by uni-variate and multi-variate methods. We conducted Chi-square tests (Fisher's exact test) or Mann-Whitney *U* tests for each variable to reduce the number of variables included in the multi-variate model. *P* values in univariate analysis were not adjusted. In order to reduce the number of variables to be included in the multi-variable logistic regression model, variables with a p value ≤ 0.05 in uni-variate analysis or those identified in previous studies as potential risk factors were further subjected to the multi-variate analysis as described previously (Mei *et al.* 2010).

In brief, we used backward-elimination to examine and determine risk factors for RRD; the entry criteria of 0.05 and removal of 0.10 for the model were set to find the possible risk factors. The statistical significance of partial regression coefficients was analysed with Wald's chi-square test. Odds ratios (OR) with 95% confidence intervals and the corresponding p values were determined for each risk factor. Interactions were not tested. Goodness of fit was determined by the Hosmer-Lemeshow statistic. For multi-variable logistic regression and for the analyses of determining which post-operative factors occurred at a higher proportion in the patients who experienced RRD, corrections of p value were performed with Benjamini and Hochberg false discovery rate (FDR) method (Benjamini and Hochberg 1995) using an R function p.adjust (R Core Team (2018). R: a language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/). FDR is the expected proportion of

rejected hypotheses that are mistakenly rejected. FDR is a somewhat less conservative/more powerful method for correcting for multiple comparisons than procedures like Bonferroni correction that provide strong control of the family-wise error rate. The FDR is defined as 5% in current study. We used SPSS (Version 12, Chicago, IL 60606, USA) for all statistical analysis.

RESULTS

During the study period, 766 patients were admitted to PACU. Exclusion criteria were age < 18 years (n = 117), refusal to sign consent form (n = 107), operation under regional anaesthesia (n = 13), history of substance dependence (including opioid, alcohol, or nicotine) (n = 83), neurosurgical procedure (n = 51), history of primary neurologic disease (n = 30), and admission to PACU with stays of less than 10 minutes (n = 132). Data from five patients were excluded because of incomplete interviews or missing data (see Figure 1). Patients who received general anaesthesia but recovered in locations outside the recovery room (such as ambulance surgery, angiography, endoscopy or electroconvulsive therapy, and cardiac surgery) were not included in this study.

Of the 766 patients admitted to the PACU during the study period, 233 were enrolled in this study, and data from 228 (30%) patients were analysed (see Figure 1). Of these patients, 57 (25%) had delirium, and 171 had no delirium by CAM-ICU. On univariate analysis, the two groups of patients differed with respect to age, ASA-PS, pre-operative serum calcium, creatinine, glucose, total or direct bilirubin, serum albumin or total protein, diagnosis of primary disease (malignant or benign), type of surgery (mini-invasive or invasive), location of surgery, maintenance of anaesthesia (inhalation anaesthetic or TIVA), total intraoperative fluid application, total intra-operative body fluid loss, and duration of surgery (See Table 1).

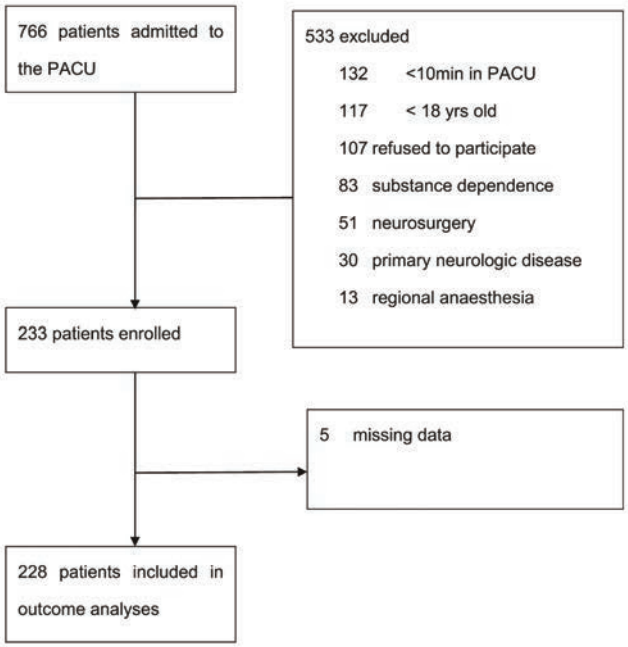

Fig. 1 Flow of patients in study cohort

PrionTex

WHEN IT COMES TO CHOOSING YOUR NEXT SET OF SCRUBS...

It is important to first consider your options. What fabrics are there to choose from? And how knowing the difference could help you make an informed decision. We have to agree that reading an article on fabric types for medical uniforms, is probably not the first thing to do on your bucket list. However, we hope that the following short, informative summary, will assist you in deciding which scrubs fabric is best suited for you.

KNOWING WHAT IS OUT THERE

There are a variety of scrub suit fabric options in our healthcare market such as cotton, polyester and blends. The choices can be very confusing if you are not a textile guru, but for the sake of keeping things simple, let's take a closer look at 100% cotton scrubs vs 100% polyester scrubs.

100% COTTON SCRUBS

Cotton is a soft, fluffy, natural fiber that grows in a protective case, around the seeds of the cotton plant. The fiber is almost pure cellulose. The fluffy white fibers are then harvested, spun into yarn, and woven into fabric.

It is important to point out that the market also offers different types of cotton, ranging in quality, texture and price. You may have received a high-quality organic cotton piece of clothing as a gift at some point in time, yet it doesn't mean every piece of cotton clothing will compare equally.

Generally, cotton is lightweight, breathable and freely available. As a natural fiber it has limitations.

Being in a profession where you are required to wear scrubs for long hours with lots of movement and daily washing, the disadvantages of cotton scrubs may become clear.

THE COTTON DOWNSIDE

Keep in mind, cotton shrinks! Caring for your cotton scrubs will require special care.

Unfortunately, any natural fiber will wear down faster than its synthetic fiber counterparts. Your cotton scrubs will not be as durable, and sooner or later may have holes, especially when the same set of scrubs are worn day after day.

Cotton fabric is absorbent, but not in a good way. If you require barrier protection, cotton when wet creates a pathway for bacteria and possible infectious agents. Unforeseen spills will take longer to dry and sweat stains are inevitable. Because it is very absorbent, cotton requires more water for washing than most synthetic alternatives.

Cotton releases fluff, sometimes referred to as lint. These particles can become airborne and are a potential carrier of bacteria. Lint should be avoided in a healthcare environment.

100% POLYESTER SCRUBS

Cotton and polyester are worlds apart. Let's compare them quickly. Polyester is man-made or synthetic fiber created in a laboratory. The process of manufacturing polyester fabric involves melting down small polyester pellets, which are then forced through tiny-tiny holes and then stretched.

Once the process of cooling and solidifying is complete, it produces a very strong fiber. These synthetic fibers are then spun and woven into the polyester fabric.

Polyester fabric date back to the 1940's and technology has played a great role in its development. Today, we have high-quality performance polyester fabrics, with amazing touch-and-feel properties.

THE POLYESTER UPSIDE

Polyester is a very strong fiber that will withstand heavy washing. Polyester scrubs are colourfast, lightweight, and durable. Your polyester scrubs will look newer for longer.

Polyester scrubs will offer very low linting compared to cotton scrubs - a key factor for consideration in the operating theatre environment.

Polyester is hydrophobic. In other words, polyester scrubs will dry faster, wicking moisture away from your skin, and leaving you cool and comfortable for longer periods of time.

Polyester fabric is naturally wrinkle-resistant and will not shrink. A professional look is easily achieved with polyester scrubs.

So, the next time you are considering buying a set of scrubs, think of them as your endurance uniform. They need to withstand far more wear and tear than your average dress or shirt. Just like an athlete needs the very best garment for optimal performance, so do you!

As a leading manufacturer of performance medical textiles, PrionTex recommends scrubs that are manufactured from a high quality 100% polyester microfiber fabric.

Choose your scrubs, demand the best.

PrionTex

SUPPORTING FRONTLINE SUPERHEROES

On multi-variate logistic regression analysis, maintenance of anaesthesia with an inhalation anaesthetic agent (OR = 6.294, 95% CI 1.4–28.8, corrected $p = 0.030$), malignant primary disease (OR = 3.464, 95% CI = 1.396–8.592, corrected $p = 0.018$), ASA-PS III–V (OR = 3.389, 95% CI = 1.401–8.201, corrected $p = 0.018$), elevated serum total or direct bilirubin (OR = 2.535, 95% CI = 1.006–6.388, corrected $p = 0.049$), and invasive surgery (OR = 2.431, 95% CI = 1.103–5.357, corrected $p = 0.035$) were identified as independent risk factors for RRD in non-cardiovascular surgery patients (See Table 2). The model fitted the data well ($p = 0.68$ by the Hosmer-Lemeshow test).

Table 1 Patient demographic and clinical characteristics

Clinical characteristics	No delirium ($n = 171$)	Delirium ($n = 57$)	p value
Age (years)	37 [28–48]	46 [37.5–55]	< 0.001
Age (categories)			0.029
18 ≤ age < 60	162 (76.8%)	49(23.2%)	
Age ≥ 60	9 (52.5%)	8 (47.1%)	
Gender			0.395
Female	101 (77.1%)	30 (22.9%)	
Male	70 (72.2%)	27 (27.8%)	
BMI	21.5 [19.5–24.5]	21.5 [19.4–25.2]	0.713
ASA-PS			< 0.001
I–II	158 (79.4%)	41 (20.6%)	
III–IV	13 (44.8%)	16 (55.2%)	
Primary disease			< 0.001
Benign	156 (80.0%)	39 (20.0%)	
Malignant	15 (45.5%)	18 (54.4%)	
Preoperative LOS	4 [3–6]	5 [3–7]	0.114
Pre-operative blood results			
White blood cell count			0.790
4–10 × 10^9/L	148 (75.5%)	48 (24.5%)	
< 4 × 10^9/L	15 (75.0%)	5 (25.0%)	
> 10 × 10^9/L	8 (66.7%)	4 (33.3%)	
Haemoglobin			0.338
110–150 g/L	135 (77.1%)	40 (22.9%)	
< 110 g/L	25 (65.8%)	13 (34.2%)	
> 150 g/L	11 (73.3%)	4 (26.7%)	
Haematocrit			0.716
37–48%	79 (73.1%)	29 (26.9%)	
< 37%	91 (76.5%)	28 (23.5%)	
> 48%	1 (100.0%)	0 (0.0%)	
Serum sodium			0.052
136–145 mmol/L	126 (73.3%)	46 (26.7%)	
< 136 mmol/L	2 (40.0%)	3 (60.0%)	
> 145 mmol/L	43 (84.3%)	8 (15.7%)	
Serum potassium			0.219
3.5–5.1 mmol/L	142 (77.2%)	42 (22.8%)	
< 3.5 mmol/L	28 (65.1%)	15 (34.9%)	
> 5.1 mmol/L			
Serum chloride			0.993
98–107 mmol/L	146 (74.9%)	49 (25.1%)	
< 98 mmol/L	3 (75.0%)	1 (25.0%)	
> 107 mmol/L	22 (75.9%)	7 (24.1%)	
Serum calcium			0.020
2.16–2.60 mmol/L	155 (77.5%)	45 (22.5%)	
< 2.16 mmol/L	16 (57.1%)	12 (42.9%)	
Serum creatinine			0.041

Table 1 Patient demographic and clinical characteristics *(Continued)*

Clinical characteristics	No delirium (n = 171)	Delirium (n = 57)	p value
54-92 μmol/L	78 (67.8%)	37 (32.2%)	
< 54 μmol/L	83 (82.2%)	18 (17.8%)	
> 92 μmol/L	10 (83.3%)	2 (16.7%)	
BUN			0.916
3.2–7.3 mmol/L	143 (74.5%)	49 (25.5%)	
< 3.2 mmol/L	14 (77.8%)	4 (22.2%)	
> 7.3 mmol/L	14 (77.8%)	4 (22.2%)	
Serum total cholesterol			0.882
2.9–5.2 mmol/L	130 (75.6%)	42 (24.4%)	
< 2.9 mmol/L	10 (76.9%)	3 (23.1%)	
> 5.2 mmol/L	31 (72.1%)	12 (27.9%)	
Serum uric acid			0.783
214–488 μmol/L	141 (75.8%)	45 (24.2%)	
< 214 μmol/L	24 (72.7%)	9 (27.3%)	
> 488 μmol/L	6 (66.7%)	3 (33.3%)	
Serum glucose			0.042
3.9–6.4 mmol/L	155 (77.1%)	46 (22.9%)	
< 3.9 mmol/L	10 (71.4%)	4 (28.6%)	
> 6.4 mmol/L	6 (46.2%)	7 (53.8%)	
Elevated serum total or direct bilirubin			0.013
No	154 (77.8%)	44 (22.2%)	
Yes	17 (56.7%)	13 (43.3%)	
Decreased serum albumin or total protein			0.005
No	146 (78.9%)	39 (21.1%)	
Yes	25 (58.1%)	18 (41.9%)	
Elevated hepatic enzymes			0.065
No	142 (72.8%)	53 (27.2%)	
Yes	29 (87.9%)	4 (12.1%)	
Surgical parameters			
Type of surgery			< 0.001
Mini-invasive	100 (88.5%)	13 (11.5%)	
Invasive	71 (61.7%)	44 (38.3%)	
Location of surgery			< 0.004
Head and neck	32 (86.5%)	5 (13.5%)	
Intrathoracic	14 (56.0%)	11 (44.0%)	
Intra-abdominal	49 (65.3%)	26 (34.7%)	
Urogenital	62 (80.5%)	15 (19.5%)	
Musculoskeletal and spinal	9 (100.0%)	0 (0.0%)	
Peripheral	5 (100.0%)	0 (0.0%)	
Maintenance of anaesthesia			< 0.001
TIVA	40 (95.2%)	2 (4.8%)	
Inhalation anaesthetic with isoflurane or sevoflurane	131 (70.4%)	55 (29.6%)	
Preoperative heart rate	75 [66–88]	76 [70.5–92]	0.318
Preoperative systolic BP	117 [108–134]	124 [111–135]	0.103
Preoperative diastolic BP	72 [63–81]	76 [67–87.5]	0.038
Preoperative SpO2 (%)	100 [98–100]	100 [98–100]	0.885
Maximal intraoperative heart rate	90 [80–102]	94[83.5–104.5]	0.201
Minimal intraoperative heart rate	59 [55–65]	57 [52–66]	0.343
Maximal intraoperative systolic BP	131 [120–140]	134 [127–145.5]	0.111
Minimal intraoperative systolic BP	90 [84–96]	89 [82–96]	0.531
Total intraoperative fluid application	1100 [500–1750]	1500[1125–2250]	< 0.001
Total intraoperative body fluid loss	9 [0–400]	300 [45–800]	< 0.001
Duration of surgery			< 0.001
< 120 min	98 (85.2%)	17 (14.8%)	
≥ 120 min	73 (64.6%)	40 (35.4%)	

Data are median [25–75% percentiles] or n (%)

Patients with RRD had significantly higher maximal SBP (141mmHg [131–151] versus 132mmHg [122–143], corrected $p = 0.005$) and higher minimal SBP (120mmHg [115–132] versus 115 [106–125], corrected $p = 0.002$), had higher total healthcare costs (31,428 yuan [17,872–43,674] versus 16,555 yuan [12, 618–27,788], corrected $p = 0.002$), had a longer median length of hospital stay (17 days [12–23.5] versus 11 days [9–17], corrected $p = 0.002$), and longer post-operative stay (11 days [7–15] versus 7 days [5–10], corrected $p = 0.002$]), and longer PACU stay (34 min [25–43.5] versus 29 min [23–37], corrected $p = 0.030$) (See Table 3).

Table 2 Independent risk factors for RRD after general anaesthesia in elective non-cardiovascular surgery patients

	Regression coefficient (SE)	Odds ratio	95.0% CI for odds ratio		Corrected *p*
			Lower	Upper	
Maintenance of anaesthesia with inhalation anaesthetic	1.840 (0.775)	6.294	1.377	28.759	0.030
Malignant primary disease	1.242 (0.464)	3.464	1.396	8.592	0.018
ASA-PS III-V	1.221 (0.451)	3.389	1.401	8.201	0.018
Elevated serum total or direct bilirubin	0.930 (0.472)	2.535	1.006	6.388	0.049
Invasive surgery	0.888 (0.403)	2.431	1.103	5.357	0.035

Other variables included in the model were older age, gender, BMI, location of surgery, decreased serum albumin or total protein, preoperative serum creatinine, preoperative serum calcium, preoperative serum glucose, intraoperative fluid application, total intraoperative body fluid loss, and duration of surgery. *p* values were corrected with Benjamini and Hochberg false discovery rate method

DISCUSSION

According to CAM-ICU flowsheet, one quarter of the patients in our study experienced RRD after general anaesthesia for elective non-cardiovascular surgery. Our results are similar to previous studies (Card *et al.* 2015; Fields *et al.* 2018). Using the Confusion Assessment Method (CAM) score, Sharma *et al.* reported 45% of elderly patients have RRD after hip-fracture repair surgery (Sharma *et al.* 2005). Using the Riker Sedation-Agitation Scale, Lepouse *et al.* reported a delirium rate of 4.7% in adults in the PACU (Lepouse *et al.* 2006). Radtke *et al.* reported that delirium in the recovery room was seen in 21 patients (14%) with the Diagnostic and Statistical Manual of Mental Disorders -IV (DSM-IV) criteria, in 11 patients (7%) with the CAM score, in four patients (3%) with the Delirium Detection Score (DDS), and in 37 patients (24%) with the Nursing Delirium Screening Scale (Nu-DESC) in the same patient population (Radtke *et al.* 2008). The prevalence rate for delirium is greatly affected by the diagnostic formulation used (Card *et al.* 2015; Fields *et al.* 2018; Voyer *et al.* 2009). The definition of the outcome measure, the length of the post-operative observation period, and the patient population also cause differences in observed delirium rates. Exclusion criteria may also affect delirium rates, as cardiac surgery and neurosurgery are major contributors to post-operative delirium (Oh *et al.* 2008; Rudolph *et al.* 2009). Development of a widely accepted scale for detecting RRD in the post-operative setting would improve the timely diagnosis and management of RRD.

Table 3 PACU events, LOS, and healthcare costs

	No delirium ($n = 171$)	Delirium ($n = 57$)	Corrected *p* value
Maximal heart rate in PACU (bpm)	90 [80–100]	86 [77–98]	0.293
Maximal SBP in PACU (mmHg)	132 [122–143]	141 [131–151]	0.005
Minimal SBP in PACU (mmHg)	115 [106–125]	120 [115–132]	0.002
Mean SpO2 (%) in PACU	99 [97–100]	98 [96–100]	0.340
PACU LOS (min)	29 [23–37]	34 [25–43.5]	0.030
Total hospital LOS (days)	11.0 [9.0–17.0]	17.0 [12.0–23.5]	0.002
Postoperative LOS (days)	7.0 [5.0–10.0]	11.0 [7.0–15.0]	0.002
Healthcare costs per day (yuan)	1459 [1217–1966]	1696 [1285–2106]	0.064
Total healthcare costs(yuan)	16,555 [12,618–27,788]	31,428 [17,872–43,674]	0.002

Data are median [25–75% percentiles]; Bonferroni corrected *p* value is 0.006. *p* values were corrected with Benjamini and Hochberg false discovery rate method

In the present study, a greater proportion of patients who received isoflurane or sevoflurane for maintenance anaesthesia experienced RRD than patients who received TIVA. Multi-variate logistic regression analysis confirmed that isoflurane or sevoflurane for maintenance anaesthesia was the strongest risk factor for RRD. Previous studies have shown that inhalation anaesthetics such as isoflurane and sevoflurane are associated with post-operative delirium during recovery, particularly in young children or elderly patients (Aono *et al.* 1997). Very few studies have compared the incidence of delirium in adults anaesthetised with inhalation anaesthetics and those anaesthetised with propofol (Lepouse *et al.* 2006; Nishikawa *et al.* 2004). Lepouse *et al.* found more agitated patients had been anaesthetised with inhalation anaesthetics (62%) than with propofol (37%), but multi-variate analysis did not confirm this result (Lepouse *et al.* 2006). Several studies have demonstrated a protective effect of propofol on post-operative delirium in children (Aouad *et al.* 2007), although this is controversial (Konig *et al.* 2009). Old rats are more profoundly influenced than young adult rats by isoflurane anaesthesia with regard to reductions in acetylcholine release and stress responses (Jansson *et al.* 2004). In addition, isoflurane-induced beta-amyloid protein oligomerization and apoptosis may contribute to the risk of post-operative cognitive dysfunction (Xie *et al.* 2006). Inhalation anaesthetic agents may thus increase the odds of post-operative delirium in specific populations. Testing this hypothesis in a well-designed prospective study may give further evidence in this direction.

Our data showed that patients undergoing surgery for malignant disease had higher proportion of RRD than patients with benign disease, and our multi-variate logistic regression analysis confirmed malignant primary disease as an independent risk factor for RRD. Delirium occurs in 26% to 44% of cancer patients (Centeno *et al.* 2004), and 74% of patients with advanced cancer experience an episode of delirium (Bruera *et al.* 2009). Structural brain lesions and toxic or metabolic encephalopathy are thought to be causes of delirium in cancer patients (Doriath *et al.* 2007). Our data suggest that cancer patients undergoing surgery are at increased odds of RRD. Whether interventions for the prevention of delirium in cancer patients result in better short-term or long-term outcomes after surgery are unknown. Prevention of delirium, however, is desirable for cancer patients and their anaesthetists (Siddiqi *et al.* 2007). Uni-variate analyses showed a higher proportion of patients with RRD were ASA-PS III–V. Multi-variate logistic regression analyses confirmed higher ASA-PS to be an independent risk factor for RRD. Clinical studies of such differences have produced conflicting results. Higher ASA-PS was identified as a risk factor after abdominal surgery in univariate but not in multi-variate analysis in a previous study with a small patient population (Koebrugge *et al.* 2009). Illness severity was also associated with risk of delirium in a prospective study in hospitalised elderly (Francis *et al.* 1990). Moreover, delirium was the most common neuropsychiatric complication experienced by patients with advanced illness, occurring in up to 85% of patients in the last weeks of life (Breitbart and Alici 2008). Consistent with our study, Zakriya *et al.* reported ASA physical status > II to be one of three significant predictors of post-operative delirium in geriatric patients (OR = 11.3, 95% CI 2.6–49.2, $p < 0.001$) (Zakriya *et al.* 2002).

Elevated serum total or direct bilirubin was more frequent in the RRD group, and multi-variate analysis confirmed elevated total or direct serum bilirubin as an independent risk factor for RRD. Literature examining the relationship between bilirubin and delirium is limited. Dubois *et al.* demonstrated that abnormal bilirubin levels were associated with delirium in the intensive care unit (Dubois *et al.* 2001). Direct bilirubin is also assumed to play a role in the pathogenesis of hepatic encephalopathy (Muller *et al.* 1994). Due to the small number of patients with elevated

bilirubin in our population (n = 30), we recommend caution in interpreting this result. We showed that invasive surgery was an independent risk factor for RRD, in accordance with many previous studies. Low operative stress procedures such as cataract surgery resulted in delirium in 4.4% cases (Milstein *et al.* 2002), whereas higher stress procedures such as acute hip fracture surgery resulted in delirium in 40% of cases (Marcantonio *et al.* 2002). Shiiba *et al.* reported that post-operative delirium was associated with extensive surgery for oral carcinoma (Shiiba *et al.* 2009). The degree of operative stress may be one of factors affecting RRD. Mini-invasive endoscopic surgery may prevent RRD in high-risk patients, but a proper randomised trial would be required to test this hypothesis.

Several studies demonstrated that older age (Koebrugge *et al.* 2009); abnormal pre-operative sodium, potassium, or glucose levels (Galanakis *et al.* 2001; Marcantonio *et al.* 1994); diabetes mellitus (Gao *et al.* 2008); haemoglobin < 100 g/L (Gao *et al.* 2008); hypo-albuminemia (Robinson *et al.* 2009); longer operation time (Yildizeli *et al.* 2005); massive blood transfusion (Katznelson *et al.* 2009b); abnormal post-operative sodium, potassium, or glucose levels (Yildizeli *et al.* 2005); and post-operative haematocrit < 30% (Marcantonio *et al.* 1998) were important in influencing post-operative delirium. In our study, older age, decreased pre-operative serum calcium, elevated pre-operative serum glucose, decreased pre-operative serum total protein or albumin, location of surgery, total intra-operative body fluid loss and intra-operative fluid application, and duration of surgery were significant in uni-variate but not multi-variate analyses. While both young and old age have been associated with delirium, our cohort had only a few patients ≧ 60-year old (n = 17), potentially negating the impact of age on delirium in our study. Difference in study design, study population, and the definition of outcome parameters may account for the variance. Some of these parameters seem to play a role, however, and should be included in future prospective studies.

We did not include some variables reported to influence post-operative delirium such as a history of central nervous system disorder (Gao *et al.* 2008), pre-existing dementia (Robinson *et al.* 2009), pre-operative depression (Katznelson *et al.* 2009b), pre-operative alcohol use (Williams-Russo *et al.* 1992), post-operative pain (Oh *et al.* 2008), and pre-operative medication such as betablockers (Katznelson *et al.* 2009a) in our analyses. Many of these variables are not included in our routine clinical data with enough reliability, and we excluded patients with central nervous system disease. We are thus unable to report on the relative contribution of these factors in our patients.

Delirium in the surgical/trauma ICU cohort is associated with more days of mechanical ventilation and more days in ICU and hospital (Lat *et al.* 2009). Elderly subjects with post-operative delirium have a greater hospital LOS, are more likely to be institutionalised after discharge, and have a higher six-month mortality than those without delirium (Robinson *et al.* 2009). After elective surgery in older adults, delirium significantly prolonged hospital LOS (Gleason *et al.* 2015). Post-operative delirium after liver transplantation is associated with increased intensive care unit and hospital LOS (Beckmann *et al.* 2017; Bhattacharya *et al.* 2017). As with former studies, our uni-variate analyses demonstrated that patients with RRD stayed longer in PACU and had longer hospital and post-operative stays. Franco *et al.* demonstrated that post-operative delirium is an extremely costly disorder in patients undergoing elective surgery (Franco *et al.* 2001). After spine surgery in older adults, the development of delirium was independently associated with higher hospital charges (Brown *et al.* 2016). Patients with post-operative delirium after urologic cancer

surgeries experienced worse outcomes, prolonged LOS, and increased admission costs (Ha *et al.* 2018). Consistent with previous study, our study demonstrated that patients with RRD had higher total healthcare costs. It has been reported that intra-operative hypotension was not associated with the occurrence of delirium after cardiac surgery (Wesselink *et al.* 2015), whereas a recent study demonstrated that a progressive decrease in mean arterial blood pressure during surgery was associated with the increased odds of developing post-operative delirium (Radinovic *et al.* 2019). In elderly hip fracture patients, both very high and very low levels of mean arterial blood pressure were associated with significantly increased risk of postoperative delirium (Wang *et al.* 2015). In addition, increased blood pressure fluctuation was predictive of early post-operative delirium after non-cardiac surgery (Hirsch *et al.* 2015). In consistent with previous study, our data demonstrated that patients with RRD had higher SBP in PACU. These may imply that blood pressure level may be associated with delirium in a context-dependent nature.

Our study has several limitations. Due to the observational design, a causal link between the proposed risk factors and RRD cannot be inferred. Choosing exclusion criteria to reduce the possibility of confounding factors may have influenced the results, as excluding patients undergoing cardiac surgery, neurosurgery, as well as patients with history of substance dependence (including opioid, alcohol, or nicotine), may have reduced the proportion of RRD. The patient group we investigated was not a consecutive sample so selection bias is possible. In addition, the time of the study was performed in 2010. However, the patients in this study were representative of the type of patients treated in our hospital. We believe that the data in this study is still valuable and could provide reference for clinical practice.

CONCLUSION

This is the first study concerning recovery room delirium (RRD) in Chinese populations. One quarter of elective non-cardiovascular surgery patients experienced RRD after general anaesthesia. On multi-variate analysis, maintenance of anaesthesia with inhalation agents (sevoflurane or isoflurane), malignant disease, ASA-PS III-V, elevated serum total or direct bilirubin, and invasive surgery were identified as risk factors for RRD in these patients. Our results show delirium is a major complication in the PACU that is associated with higher healthcare costs and increased post-operative LOS. Identifying patients at risk of RRD after non-cardiovascular surgery should enable earlier recognition and intervention in postoperative delirium, which may lead to improved short-term and long-term patient outcomes (Siddiqi *et al.* 2007).

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SAFETY, CULTURE
Critical Thinking And How We Get There

By Sheila L Allen, BSN, RN, CNOR, CRNFA (E)

INTRODUCTION

There are many components that comprise the fabric of our being. Throughout our lives we weave together the life skills that create the quilt of our character. How we allow our problems to define our present, or impact our future, is really a matter of choice. Only we can decide whether we want to have high or low expectations; whether to take pride in our work, or merely look good, going through the motions; or whether we want to settle for mediocrity, or strive for excellence. Our choices can have an impact on the outcomes of safety in our environment.

CULTURE

Culture is related to our beliefs, attitudes, and values. The environment in which we practice reflects our ethics, the things for which we advocate, our shared goals, and our attitudes toward information seeking, innovation, risk-taking, openness to questions, and critical thinking.

Defining critical thinking is easier to do than actually doing it. Critical thinking: A process of purposeful, self-regulatory judgment in which the thinker gives reasoned consideration to evidence, contexts, conceptualisations methods, and criteria. (Facione, Facione & Sanchez, 1996). The process of deciding what to do and when, how, where, and why to do it. Oxford language: the objective analysis and evaluation of an issue in order to form a judgment. Critical thinking is the intellectually disciplined process of actively and skillfully conceptualising, applying, analysing, synthesising, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action.

Our values influence our behaviours and those behaviours impact outcomes. Effective communication, team cohesiveness, and professional growth have a positive impact on desired clinical outcomes, lead to fewer errors and thus a safer workplace.

What does your institution value? Perhaps these are the main ones that are listed:

- Safety
- Efficiency, effectiveness
- Resource allocation
- Timeliness
- Market share
- Costs/expenses and revenue, margins
- Standing or position in the community, state, or nation

How do those values align with your personal values which could be as follows:

- Safety
- Patient-centredness
- Duty (ethical, professional)
- Competence, respect
- Fairness, equitable care, diversity
- Wages, salary, compensation, benefits
- Feeling valued
- Making a difference

The alignment of these form the joint values that govern the environment or culture. Perhaps we can compare comments and behaviours that promote critical thinking and those that squelch that important behaviour to keep from creating and maintaining a safe environment.

Critical Thinking Comments

Promoting	**Squelching**
That's an interesting question	Now, that's a dumb question!
Do you have a different idea on how to do this?	We've always done it this way!
Let's explore this ...	That's the wrong way to do it!
Tell me about what you learned here	Mistakes are not tolerated here
Let's review this policy/protocol so that so I can answer any questions you may have	Don't worry about it! Just follow the procedure card

Critical Thinking Behaviours

Promoting	**Squelching**
Use a neutral tone of voice	Roll eyes
Use an enthusiastic voice tone	Smirk, scowl, frown or laugh
Sit silently and patiently	Tap feet or fingers
Look at the person (active listening)	Look at the clock - frequently
Lean forward to demonstrate interest	Non-verbal demonstrations of anger, irritation, frustration

By contrasting these comments and behaviours, it is easy to comprehend how these actions demonstrate more than mere words can convey.

Question? (for thought)
If you were precepting a new nurse whether new graduate or newly hired, what would you consider t**he five most critical risks to patient safety** within your clinical specialty that needs to be addressed with your preceptee/protégé?

CRITICAL THINKING SKILLS

The key critical thinking skills are: analysis, interpretation, inference, explanation, self-regulation, open-mindedness, and problem-solving. It can be said that skepticism may be a factor in critical thinking that leads to patient safety. What will be the important questions you ask and answer to form your critical thinking? Perhaps the following can assist in the process of developing your questions:

- Questioning – What is known? What is not known?
- Assessing the Evidence – What do you think you see?
- Identifying the problems – What are the challenges? What are the resources?
- Selecting the possible solutions – Are your solutions plausible?
- Making the decision(s) – How did you integrate the information? Did you explore all the options?
- Dealing with ambiguous, insufficient information – How much ambiguity can be tolerated? What must you include? What do you do about getting more information?
- Evaluating if my decision made patient care safer – What was the outcome for the patient? Will the same action lead to a positive result?

Succinctly, what could be seven steps to improve critical thinking skills:

1. Pinpoint the issue
2. Collect information
3. Examine and scrutinise
4. Decide what is relevant
5. Self-evaluate
6. Draw conclusions
7. Explain your conclusions

The questions we ask as we encounter challenges and ordinary decisions will help to shape how we formulate these skills that comprise critical thinking. Activities that promote and support critical thinking as we incorporate it into safety will foster positive outcomes.

SAFETY

Often to help me remember things, I have to think of ways to make it easier. For the following safety tips, I think of the Six B's that comprise the characteristics we utilise as we promote a culture of safety in our environments. Because they represent each **STEP (Safety Takes Every Person),** the following section explores the Six B's with some explanation and examples:

1. **Be present.** The easiest way to think of this is SHOW UP. Each person must have a situational awareness. Details are important as missing the details can cause major difficulties. Each must be vigilant and be a **STAR (stop, think, act, review).** To illustrate:
   What does the ECG monitor show? Where is the crash cart? What's the patient's background? What are my resources?
2. **Be a clear communicator.** Active communication is important. You may need to take the lead and be assertive to provide clarification and close the loop. Use of tools such as **SBAR (Situation, Background, Assessment, Recommendation and Response).** For instance: "Mary, get the crash cart!" "Jane, prep!" "…..Dr. Jones, Mrs. Smith stated we were to repair her left knee and the X-Ray shows left knee damage. Please clarify the site and side of Mrs. Smith's surgery."
3. **Be a skeptic.** Ask questions. Trust but verify. It can be important to question authority, For example: "The defibrillator is in the synchronous mode, do you want that?" Dr. Johnson said this would be a quick case and we don't need a scrub; but we'll assign John to scrub."
4. **Be a coach.** Remember to temper firmness with fairness. Create scenarios for the team to explore similarities and differences. Identify, provide, and promote opportunities and review from different perspectives. Review lessons learned and discuss how to avoid mistakes in the future.
5. **Be a team player.** Learn from everyone. Try new skills with assistance. Assist with intubation; offer to prep; everybody can offer an opportunity for growth.
6. **Be a problem-solver.** When a problem/issue/concern is identified, use available tools to provide solutions. For instance: necessary equipment not in the room. Alert team (Stop). Before proceeding, secure another device; solicit ideas for improving (brief/debrief); partner with others to create lasting solutions.

CONCLUSIONS

What we believe and think matters. Therefore, we need to scrutinise our thinking to be sure it is congruent, consistent, and applicable to our practice. We can choose to go through the motions and choreograph each mediocre step and script, every predictable response, or we can continue to learn and test our thinking to continually strive for excellence. What we think and do impacts the safety of our patients and colleagues. We cannot claim to advocate and protect our patients if we do not advocate, protect, and nurture our colleagues and ourselves. What we think and do directly contributes to the culture in which we function and the outcomes of patients.

Each of us by our words and deeds are the necessary foundation to the construction of a safe environment.

Sheila Allen served as the National AORN President between 2001 and 2002 and the IFPN Secretary between 2001 and 2007. She is a regular contributor to the APPSA Journal and offers contemporary studies and opinions of great value and interest. She wrote this paper specifically for the APPSA Journal.

THE INCIDENCE OF PERIPHERAL NERVE INJURIES RELATED TO PATIENT POSITIONING DURING ROBOTIC-ASSISTED SURGERY: An Evidence Summary

By Tina Oblak and Brigid M Gillespie

BACKGROUND

To provide optimal intra-operative exposure and visualisation, patient positioning during urologic, gynaecologic and colorectal robotic-assisted surgery (RAS) often requires the lithotomy positioning with steep Trendelenburg (up to 45°)[1–6]. Incorrect patient positioning or even extended operative time in this position places the patient at potential risk of several complications[4]. As expected, due to steeper angles of Trendelenburg positioning, patients have a greater tendency of cephalad migration (sliding down toward the direction of the head)[5]. The most observed complications are peripheral nerve injuries (PNIs) discovered in the upper and lower extremities[2, 7]. Researchers, however, also report central nervous system complications haemodynamic and respiratory disturbances, ocular injuries and complications in the urinary and gastro-intestinal systems[2, 8, 9].

Sub-optimal positioning of extremities and lack of assistive devices increases the risk of nerve injury from stretch and compression, generalised ischaemia and metabolic disorders[1, 2, 7]. PNIs may have profound impacts on patients, as they can culminate in loss of limb function and thus compromise quality of life[7, 10]. To ensure that patients are not exposed to injury, knowledge of injury mechanisms, anatomy and physiology and appropriate patient positioning as well as intra-operative attention to vital signs and assessment of specific risk factors (for example, obesity, pre-existing neurological conditions, >240 minutes operative time) are essential[1, 2, 11–14].

RESEARCH QUESTION

Systematic reviews following rigorous methodological approaches, can take a substantial amount of time to complete, and they may not meet the specific needs of the end-user[15]. Evidence summaries are short, easily read documents that provide a succinct presentation of the available evidence in a particular clinical area. While they are not as comprehensive as literature reviews, evidence summaries are less time consuming to undertake. Further, evidence summaries have emerged to synthesise the evidence on defined questions and assist policy makers and practitioners in using the best available evidence to decide on clinical interventions[15–17].

The purpose of this evidence summary is to identify clinical considerations in relation to patient positioning during urologic, gynaecologic and colorectal RAS procedures. Thus, we aimed to describe the related incidence and anatomical locations of PNI as well as patient risk factors. Our research was underpinned by the research question: 'What is the incidence of PNI related to steep Trendelenburg patient positioning during RAS?'. This question was framed based on the PIO (Population, Issue, Outcome) framework:

P - Patients undergoing RAS
I - Steep (up to 45°) Trendelenburg patient positioning
O - PNI

SEARCH STRATEGY

This evidence summary is based on a structured search of recent systematic reviews[3, 6, 11] published between January 2019 and August 2021 in the Cochrane Library, PubMed, ProQuest and Google Scholar databases. Search terms 'patient positioning', 'robotic-assisted surgery', 'Trendelenburg', 'complication' and 'injury' with medical subject headings (MeSH) were used to execute searches.

A summary of selected studies

The characteristics and key findings of the systematic reviews are summarised in Table 1.

Table 1: The characteristics and key findings of the systematic reviews

Author (year)	Types of included studies, time period	Review question	Findings	Limitations	Implications for practice and research
Bjørø et al. (2020)[3]	11 quantitative studies, including 6 registry-based, 3 longitudinal prospective, 1 RCT and 1 combined register-based with survey design. Articles published Jan 2000 to Feb 2019.	To determine: • the incidence of IPNI • risk factors for IPNI • pain and symptoms of IPNI in patients undergoing RAS laparoscopic urologic, gynaecologic and colorectal procedures in lithotomy positioning with steep Trendelenburg • the impact of IPNI on patients' function and quality of life	The overall incidence of IPNI ranges from 0.16% to 10.0%. The incidence of upper extremity injury ranges from 0.1% to 3.6%, and lower extremity injury ranges from 0.2% to 10%. Risk factors for IPNI related to positioning were prolonged operative time, patients' comorbidities and high ASA and BMI scores.	Most data were retrieved from registry-based studies, as retrospective reviews. Recording of IPNI was dependent on the reporting of symptoms, prospective standardised tools for reporting complications were not used in the studies. Studies were not designed to systematically record IPNI due to positioning or evaluate IPNI at the time of incidence.	Knowledge of mechanisms for injury, positioning, anatomy/physiology and evaluation of risk factors to ensure that patients are not exposed to IPNI is crucial. Further research should focus on: • reduction of IPNI associated with positioning in RAS • how IPNI affects patients' function and quality of life • the physiological consequences of IPNI related to the patients' positioning in RAS.
Cornelius at al. (2021)[11]	6 studies, including 1 prospective RCT and 5 retrospective cohort studies. Articles published Jan 1990 to Mar 2020.	To review: • the frequency of IPNI • the impact of positioning related post-operative PNI in patients undergoing RARP	The incidence of PN associated with RARP varies from 1.3% to 10.8% for lower extremities and from 1.1% to 1.9% for upper extremities. Increased intraoperative time, ASA score, patients' comorbidities and positioning correlate with the incidence of post-operative PN.	Techniques for detecting and reporting PN and a detailed description of patient positioning were not standardised. Due to the low number of eligible studies and heterogeneity of study designs, it was impossible to draw recommendations regarding favourable patient positioning.	Further research should focus on: • prevention of PN after RARP • the impact of BMI • comparison between standardised Trendelenburg versus steep Trendelenburg position.
Das et al. (2019)[6]	7 studies, including 3 RCT and 4 case studies. Articles published Jan 2003 to Mar 2018.	To evaluate: • techniques, devices and equipment for patient positioning • the cephalad patient slide and neuropathy on patient outcomes in laparoscopic and RA gynaecologic surgery	The mean cephalad patient slide ranged from 1.07 ± 1.93 cm to 4.5 ± 4.0 cm. The overall incidence of neuropathy was 0.16%. The duration of surgery and BMI did not correlate with an increase in position-related injuries.	Due to the heterogeneity of the studies, a meta-analysis across studies could not be undertaken, limiting any definitive conclusions regarding the best technique and devices to prevent cephalad slide and neuropathy in RA laparoscopic gynaecologic procedures.	Further research should focus on: • head-to-head comparisons of anti-slide devices and techniques that also evaluate patient displacement • degree of Trendelenburg position and transient or permanent neuropathy • other relevant information – time to position the patient, cost of devices, impact of BMI, operative time.

Abbreviations: RCT – randomised control trial, IPNI – intraoperative peripheral nerve injury, PN – peripheral neuropathy, RA – robot-assisted, RAS – robot-assisted surgery, RARP – robot-assisted laparoscopic radical prostatectomy, ASA – American Society of Anaesthesiologists physical status classification system, BMI – body mass index.

QUALITY OF SELECTED STUDIES

We did not undertake a formal quality appraisal of the included systematic reviews. Rather, our intention was to present a concise summary of the evidence in this area, that is user-friendly for busy clinicians. For a more detailed evidence synthesis such as a review of reviews (that is to say an 'umbrella review'), the AMSTAR 2 (A Measurement Tool to Assess systematic Reviews 2)[18] has been designed to evaluate different aspects of reviews.

A summary of the evidence

The incidence of PNI associated with patient positioning during RAS was reported in all reviewed studies[3, 6, 11] (Table 2). Overall incidence rates varied from 0.16% to 10.8%. The cephalad patient migration was reported in one study[3]; the mean migration/slide distance using various devices ranged from 1.07cm ± 1.93cm to 4.5cm ± 4.0cm.

Table 2: The incidence of PNI associated with patient positioning during RAS

Author (year)	Number of studies in the review	Number of patients	The incidence of PNI		
			Overall	Upper extremities	Lower extremities
Bjøro et al. (2020)[11]	11	179.802	0.16% – 10.0%	0.1% – 3.6%	0.2% – 10.0%
Cornelius et al. (2021)[6]	6	63.667	1.1% – 10.8%	1.1% – 1.9%	1.3% – 10.8%
Das et al. (2019)[3]	7	2.024	0.16%	NR	NR

Abbreviations: PNI – peripheral nerve injury, NR – not reported.

The most common anatomical positions of injuries in extremities related to patient positioning during RAS, as identified in systematic reviews by Bjøro *et al.*[11] and Cornelius *et al.*[6], are displayed in Table 3.

Table 3: Common anatomical positions of injuries in extremities related to patient positioning during RAS

Upper extremities	Lower extremities
• brachial plexus[6,11]	• sciatic nerve[6,11]
• ulnar nerve[11]	• femoral nerve[11]
• median nerve[11]	• obturator nerve[11]
• radial nerve[11]	• femoral cutaneous nerves[6,11]
• humeral nerve[11]	• common peroneal nerve[6]

PNIs associated with patient positioning during RAS were related to patient risk factors such as high BMI (body mass index) and ASA (American Society of Anaesthesiologists physical status classification system), prolonged procedure time and multiple comorbidities (Table 4).

Table 4. Relation of patient risk factors and positioning during RAS

Author (year)	Patient risk factors			
	Higher BMI	Higher ASA score	Increased intraoperative time	Patient comorbidities
Bjøro et al. (2020)[11]	related	related	related	related
Cornelius et al. (2021)[6]	NR	related	related	related
Das et al. (2019)[3]	not related	NR	not related	NR

Abbreviations: BMI – body mass index, ASA – American Society of Anaesthesiology

What can operating room (OR) teams do to minimise the incidence of PNI related to patient positioning during RAS?

- Develop institutional policies based on the best available evidence to guide practice
- Cautiously select suitable patients and evaluate their risk factors[4]
- Formulate a dedicated robotic OR team introduced by skilled preceptors[4]
- Increase knowledge of anatomy/physiology and extend understanding of the mechanisms of injuries[11]
- Where appropriate, use a modest angle for Trendelenburg positioning[5]
- Constantly observe the patient's position throughout the operating procedure and implement regular routine checks

IMPLICATIONS AND RECOMMENDATIONS

Due to the heterogeneity of study designs, techniques and combinations of devices used, it is impossible to determine the best approach and assistive devices to prevent PNI. However, to minimise the incidence of PNI during RAS with steep Trendelenburg patient positioning, this evidence summary supports the need for increased attention to frequent checks and monitoring of patients during the RAS procedure. All the actions taken should be precisely documented using the surgical safety checklist for RAS19. Moreover, patients need to be fully informed about the potential risk of RAS-related complications.

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IBT (branch code):	632005

(Please insert your name and membership number CLEARLY on the deposit slip)

PrionTex

COTTON SCRUBS VS POLYESTER SCRUBS

100% POLYESTER SCRUBS

THE UPSIDE

- Naturally wrinkle-resistant and will not shrink.
- Very durable, colour fast and light weight.
- Polyester scrubs will dry faster, wicking, moisture away from your skin.
- Very low linting

100% COTTON SCRUBS

THE DOWNSIDE

- Cotton shrinks!
- Less durable
- Cotton is very absorbent and when wet creates a pathway for bacteria and possible infectious agents.
- Cotton fluffs which is not ideal for any operating theatre environment

https://www.priontex.com/shop/