Learning from theatre-acquired pressure ulceration

KEY WORDS
- Perioperative care
- Pressure ulcer prevention
- Service improvement
- Theatres

Studies suggest that between 5–53.4% of hospital-acquired pressure ulceration (HAPU) occurs in patients who have experienced prolonged or multiple surgical procedures (Kirkland-Walsh et al, 2015). The reduction of HAPU remains a key quality indicator for the author's Trust, a large teaching hospital based in the UK. Between April 2016 and April 2017, two Category 3 pressure ulcers were identified as acquired during the perioperative period. In-depth investigations were conducted to identify causal factors for pressure damage formation and areas of learning from the incidents. This article summarises the areas of learning identified and the work undertaken by a newly formed Theatres Tissue Viability Steering Group, which was implemented as a result of the incidents.

LUCY HOSIE
Training Fellow in Advanced Nursing Practice, Tissue Viability, Oxford University Hospitals NHS Foundation Trust

Pressure ulcers (PUs) are localised injuries to the skin and/or underlying tissue resulting from sustained pressure or pressure in combination with shearing forces (European Pressure Ulcer Advisory Panel [EPUAP], 2014). International studies have suggested that between 5 and 53.4% of hospital-acquired pressure ulceration (HAPU) occur in patients who have experienced prolonged or multiple surgical procedures (Kirkland-Walsh et al, 2015). PUs have been cited as a cause of increased economic burden, prolonged hospital admissions, reduced quality of life for patients and in some cases increased morbidity (Dealey et al, 2012; Chan et al, 2013). Like in many healthcare settings across the UK and according to current NHS pressure ulcer definition and measurement guidance (NHS Improvement, 2018), the reduction of HAPUs remains a key care quality indicator for the author's Trust, Oxford University Hospitals NHS Foundation Trust, a large teaching hospital based in the UK.

During the Trust's financial year 2016/2017, two Category 3 HAPUs were reported as acquired during the perioperative period. All reported HAPU Category 3 or 4 incidents, validated by the Tissue Viability Team using the EPUAP (2014) categorisation system, are discussed at the Trust's Serious Incident review forum to determine if incidents meet the NHS England Serious Incident framework criteria (NHS England, 2015). Following discussions at the forum, one theatre-acquired incident was identified as a serious harm and the other as a moderate harm incident. Further in-depth investigations were undertaken to identify areas of learning specific to the prevention of PU formation during the perioperative period of a surgical patient's admission.

RISK FACTORS FOR PERIOPERATIVE PRESSURE ULCERATION

There are a number of risk factors for PU development that can be intrinsic or extrinsic to the patient, such as: mobility, nutrition, comorbidities, equipment or medical devices and moisture levels on the patients skin (Flanagan, 2013). For patients, undergoing surgical procedures, additional risk factors may arise from prolonged surgical intervention, haemodynamic or thermodynamic compromise, or poor positioning technique and inappropriate equipment use intraoperatively (Strasser, 2012; EPUAP, 2014; Kirkland-Walsh et al, 2015). Recent studies by Kim et al (2018) and O'Brien et al (2013) demonstrated links between preoperative low albumin and lactate levels and intraoperative blood product transfusions with post-operative PU formation. Whilst it is recognised that there are some study design limitations when researching perioperative PU formation, there is increasing recognition

Table 1. Learning identified	
Education and training	• Inconsistent training provision and engagement • No theatre-specific PU guidance — PU preventative measures and actions to take on identification of a PU from theatres (inherited or acquired)
SSKIN care bundle	
Skin inspection	• No skin inspection guidance/standardisation • Different documentation across the five theatre departments
Surface/equipment	• No standardisation of equipment or supportive devices used to aid patient positioning and PU prevention • No standardised stock levels for supportive devices • Inconsistent auditing and replacement programmes of theatre tables, equipment or supportive devices
Keep moving/positioning	• Multiple patient positioning techniques — positioning often dependent on surgeon or anaesthetist preference • Inconsistent documentation regarding patient positioning and supportive equipment such as gel overlays or supports used to aid patient positioning • Inconsistent documentation regarding patient repositioning and assisted exercise during prolonged cases or within recovery • Inconsistent use of transfer/slide sheets • Inappropriate use of equipment
Incontinence/moisture management	• Procedural sheets not consistently removed following skin preparation • Procedural sheets used to wrap/support limbs and patient positioning and provide 'padding' to pressure points
Nutrition	N/A

that the risk of perioperative PU formation is multifactorial (Bateman, 2012; Meehan et al, 2016; Kim et al, 2018). There are a few pilot studies, such as Munro (2010), which describe the development of a perioperative risk assessment tool (to support identification of surgical patients at increased risk of PU development); however, larger studies are required to support validation.

PRESENTATION OF PERIOPERATIVE-ACQUIRED PRESSURE ULCERATION

The author's clinical experience would suggest that not all perioperatively-acquired PUs are identifiable in the perioperative or immediate postoperative period when a patient is transferred from the theatre table to the hospital bed. In the two cases investigated, the pressure damage presented as Suspected Deep Tissue Injury (SDTI) within the first 48 hrs following the patients' surgical procedures. The SDTI was subsequently classed as a Category 3 PU, which had developed despite implementation of the appropriate, preventative, postoperative measures. Both incidents were deemed to have been perioperatively acquired based on the anatomical position and patterning of the PU, which were specific to procedural or supportive device positioning perioperatively.

No robust studies were found that specifically examined the perioperative period for PU development in isolation. A number of studies are available that review perioperative factors which increase the risk of postoperative PU development within the first 2–5 days following surgery (O'Brien et al, 2013, Hayes et al, 2014, Meehan et al, 2016 Riemenschneider, 2018; Kim et al, 2018). Further research, however, is needed into perioperative PU development to advance the clinical understanding of causal factors and guide appropriate preventative measure implementation.

INVESTIGATION FINDINGS

The PU prevention strategy within the local Trust's clinical areas is based around the SSKIN care bundle. The SSKIN care bundle is a group of five evidence-based interventions, which when dependably implemented, reduces the risk for patients to develop PUs (NHS Midlands and East, 2012). As research regarding PU prevention specific to the perioperative period is limited (Meehan et al, 2016), the investigation team applied, where appropriate, the principles of the SSKIN care bundle to the theatre setting (anaesthetics through to recovery).

In both incidents, there was variable documentation of skin assessment completion and frequency and PU prevention in line with the SSKIN bundle throughout the patient's theatre department journey. Although only two of the Trust's five theatre departments were involved in the incidents, the investigations highlighted areas for learning and improvements in practice

Table 2. Action plan	
Education and training	• Tissue viability training added to theatres foundation course programme — attended by all new theatre practitioners • Update training provided on theatre department audit and training days • Establishment of a theatre tissue viability link practitioner group • SSKIN documentation audits • Development of a theatre specific PU management pathway — inherited and acquired
SSKIN care bundle	
Skin inspection	• Introduce a skin inspection protocol — skin inspection to be performed and documented pre- and postoperatively and in recovery (>2hr). • Skin inspections and repositioning/assisted exercise to be performed (where appropriate) at frequent intervals throughout long theatre cases
Surface/equipment	• Procurement project for equipment standardisation and replacement programme following clinical evaluation • Monthly audits of theatre tables, equipment and supportive devices
Keep moving/positioning	• Development of patient positioning protocol for standard perioperative positions, e.g. supine/prone • Introduction of a patient positioning safety check — completed upon positioning and at frequent intervals throughout long cases to ensure safe patient positioning maintained
Incontinence/moisture management	• Patient positioning safety check to ensure procedural sheets removed following skin preparation • Review of absorptive underlays for use during operations with high moisture levels
Nutrition	N/A

Table 3. Comparison data				
	Cat 1	**Cat 2**	**Cat 3**	**Cat 4**
2016/17	23	9	2	0
2017/18	40	21	1	0

development, applicable to all departments and surgical specialities across the Trust (*Table 1*).

DEVELOPMENT OF A THEATRE TISSUE VIABILITY STEERING GROUP

Care delivery and documentation regarding PU prevention was found to vary between the different theatre departments. This was considered a significant risk as staff working between theatre departments had varying levels of knowledge regarding PU prevention, were unsure of appropriate equipment use and at times felt unsupported in challenging non-evidence based practice or ritualistic care. Since the establishment of the Tissue Viability Team in 2014, a significant emphasis had placed been on educating and supporting staff with PU prevention within the ward-based settings compared with the education and support within the theatre departments.

In order to address the issues identified through the investigations, a Theatre Tissue Viability Steering Group was instigated in April 2017. The objective of the steering group was to review current practice and work towards standardisation of education and perioperative care regarding tissue viability issues such as, but not limited to, PU prevention. Meetings were planned to be held bi-monthly, chaired by the Tissue Viability Team, with senior and junior clinician engagement from anaesthetics and recovery, scrub and theatre clinical educator and practice development departments. *Table 2* outlines the actions undertaken and scheduled by the steering group to address PU prevention within the theatre setting.

RESULTS — 1 YEAR ON

Table 3 displays theatre HAPU incidents pre-and post implementation of the Theatre Tissue Viability Steering Group. There is a notable increase in Category 1 and 2 PUs reported within 2017/18. *Figure 1* and *Figure 2* display the theatre HAPU reporting trends over 2016/17 and 2017/18. The initial increase in reporting in 2017/18 is believed to be due to improved accuracy of PU identification following education within theatres and a change in the Tissue Viability HAPU validation process resulting in more accurate reporting.

Prior to April 2017 — although reporting of all categories of pressure damage was required by clinical areas — only Category 3, 4 and SDTI HAPU incidents were validated by the Tissue Viability Team. Category 1 and 2 incidents for 2016/17 are therefore 'un-validated' and origin inaccurate for theatre-acquired pressure damage. From April 2017, as a Trust-wide initiative to

REFERENCES

Chan B, Ieraci L, Mitsakakis N et al (2013) Net costs of hospital-acquired and pre-admission PUs among older people hospitalised in Ontario. *J Wound Care* 22 (7): 341–46

Dealey C, Posnett J, and Walker A (2012) The cost of pressure ulcers in the United Kingdom. *J Wound Care* 21 (6): 261–6

European Pressure Ulcer Advisory Panel (2014) *Prevention and Treatment of Pressure Ulcers: Quick Reference Guide.* Available at http://www.npuap.org/wp-content/uploads/2014/08/Updated-10-16-14-Quick-Reference-Guide-DIGITAL-NPUAP-EPUAP-PPPIA-16Oct2014.pdf (accessed 24.09.2018)

Hayes R, Spear M, Lee S et al (2014) Relationship between time in the operating room and incident pressure ulcers: a matched case–control study. *Am J Med Qual* 30 (6): 591–7

Kim J, Lee H, Ha T, Na S (2017) Perioperative factors associated with pressure ulcer development after major surgery. *Korean J Anesthesiol* 71 (1): 48–56

Kirkland-Walsh H, Wilson M, Raingruber B (2015) Pressure mapping comparison of four OR surfaces. *AORN J* 102 (1): 61.e1 – 9

Flanagan M (2013) *Wound Healing and Skin Integrity Principles and Practice.* John Wiley & Sons Ltd, Chichester

Meehan A, Beinlich N, and Hammonds T (2016) A nurse-initiated perioperative pressure injury risk assessment and prevention protocol. *AORN J* 104 (6): 554–65

Munro C (2010) The development of a pressure ulcer risk-assessment scale for perioperative patients. *AORN J* 92 (3): 272–87

NHS England (2015) *Serious Incident Framework.* Available at: https://www.england.nhs.uk/wp-content/uploads/2015/04/serious-incidnt-framwrk-upd.pdf (accessed 24.09.2018)

NHS Improvement (2018) *Pressure Ulcers: Revised Definition and Measurement Framework.* Available at https://improvement.nhs.uk/resources/pressure-ulcers-revised-definition-and-measurement-framework/ (accessed 24.09.2018)

NHS Midlands and East (2012) Guidelines to support Pressure ulcer Bundle. Available at http://nhs.stopthepressure.co.uk/path/docs/Bundles%20Guidelines%20final%20v2.pdf (Accessed 5.9.17)

O'Brien D, Shanks A, Talsma A et al (2013) Intraoperative risk factors associated with postoperative pressure ulcers in critically ill patients: a retrospective observational study. *Crit Care Med* 42 (1): 40 – 47

Riemenschneider K (2018) Prevention of pressure injuries in the operating room: a quality improvement project. *J Wound Ostomy Continence Nurs* 45 (2): 141–5

Strasser L (2012) Improving skin integrity in the perioperative environment using an evidence based protocol. *Journal of the Dermatology Nurses Association* 4 (6): 351 – 60

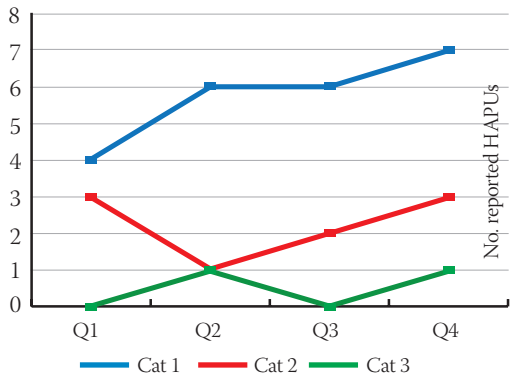

Figure 1. Theatre HAPU reporting trends 2016/17

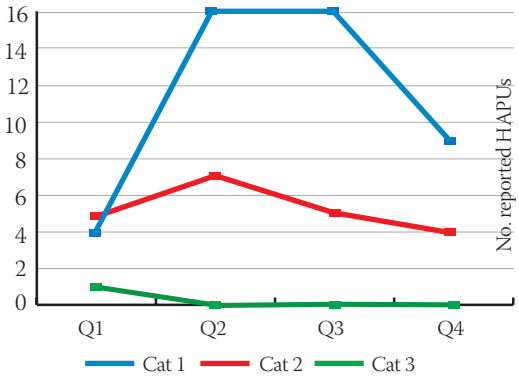

Figure 2. Theatre HAPU reporting trends 2017/18

improve reporting accuracy and to continue working towards reducing HAPUs, all Category 2, 3, 4 and SDTI HAPU incidents reported were validated by the Tissue Viability Team. HAPUs that developed 24–48 hrs postoperatively in surgical patients were reviewed to determine if the damage was perioperatively acquired or acquired postoperatively under the care of the postoperative ward. Postoperative care in relation to the SSKIN care bundle was reviewed along with theatre SSKIN care bundle delivery. Location and patterning presentation of the pressure ulcer was also reviewed in the clinical context to theatre positioning and perioperative events to determine origin of the HAPU. If incidents were deemed to be theatre acquired, rather than acquired on the post-operative ward reporting the skin damage, the incident origin was updated to reflect the accurate origin.

One Category 3 HAPU developed shortly after setting up the Theatre Tissue Viability Steering Group at the end of April 2017. Following discussion at the Trust's Serious Incident review forum, improvements were noted from previous incidents such as documentation of preoperative, postoperative and recovery skin inspections and appropriate SSKIN preventative measures and documentation were in place resulting in the incident being investigated at a local level.

Figure 2 shows the latter trend for theatre HAPUs reported in 2017/18, revealing a reduction in Category 1 and 2 incidents. Ongoing monitoring by the Tissue Viability Steering Group is needed to support that this reduction in reporting is reflective of the changes being embedded into theatre practice.

CONCLUSION

The perioperative phase of a surgical patient's journey presents complex challenges for maintaining skin integrity. The prevention of theatre-acquired PUs therefore requires a consistent and collaborative approach from the inter-disciplinary care team across the whole of the theatre department, working symbiotically with specialist services to reduce pressure ulcer incidences and increase quality of care delivery.

Theatre specific PUP training and instigation of the Theatre Tissue Viability Steering Group with cross-theatres engagement has improved the level of staff knowledge and awareness around PUP. The steering group has facilitated shared learning and support between theatre departments and significant improvements in perioperative care delivery and incident reporting. The steering group will continue to review practice and monitor the impact of changes made on patient care outcomes over 2018/19.

With ongoing advancements in both health care and theatre technologies collaborative research is needed between the Tissue Viability, perioperative and research specialities. Further research is needed to identify the specific risk factors for perioperative pressure damage formation and to support the validation of a theatre-specific risk assessment tool. Research is also needed to develop innovative technology which can be used throughout the surgical patient's pathway to minimise the identified risks of perioperative-acquired pressure ulceration. WUK