ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

Preventing pressure ulcers in aged care by auditing, and changing, work practices

Catherine Anne Sharp[1], **Julie Campbell**[2]

[1]*Founder CEO and Practicing Nurse,* [2]*Practicing Nurse, Palliative Care Nursing, The Wound Centre, Sydney, Australia*

Submission: 28-12-2021 Revision: 28-02-2022 Publication: 01-04-2022

ABSTRACT

Background: Two nurse consultants concerned with ongoing pressure ulcer development in a 44-bed residential aged care facility in Sydney, Australia, audited pressure ulcers and the use of air mattresses. **Aims and Objectives:** To measure and reduce the prevalence of pressure ulcers; audit air mattresses in use; reduce the physical workload for care staff repositioning residents; introduce an alternating pressure air mattress, allow residents to sleep undisturbed, and provide bedside education for all nursing staff. **Materials and Methods:** Pressure ulcer prevalence was determined, "air" mattresses were inspected, and repositioning regimes were considered. All residents at risk of pressure ulcers were provided with a "Nodec A" mattress, allowed to sleep undisturbed, and bedside training was given to staff. **Results:** Pressure ulcer prevalence was 18.1%. Eight of 44 residents had a total of 10 pressure ulcers; four sacral, three heel ulcers, two buttocks, and one hip. An audit of "air" mattresses showed half, seven of 14 (50%), was not working. Four alarm lights were on; two were set on static mode and one was deflated. Six months after the introduction of the "Nodec A" alternating pressure air mattress all pressure ulcers had healed, and the facility was pressure ulcer free. **Conclusion:** Residents nursed on the "Nodec A" were pressure ulcer free and slept for hours without being repositioned and woken.

Key words: Mattresses; Pressure ulcers; Repositioning; Sleep deprivation

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v13i4.41855

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

Pressure ulcers

Pressure ulcers (PUs), also known as pressure injuries, bedsores, decubitus ulcers, are foreseeable and preventable adverse event, for residents in residential aged care facilities (RACFs) who are unable to feel local pressure and/or those with limited mobility.[1,2] For decades, RACF staff has tried to prevent PUs in residents at risk by repositioning them 2-hourly, 24 h-a-day, yet PUs still develop.[3] More than 50 years ago researchers found that 90% of older residents who made fewer than 10 movements on their own over a 7-h period at night, resulting in a change of pressure once every 42 min, developed a PU. The same study found that those who made 54 movements in the same time period, moving every 7–8 min in one 420-min period during the night, did not develop a PU.[4] Some nurses reported that there was not enough staff to carry out manual handling procedures because residents were "immobile" or "very heavy."[5] Healthcare staff, and in particular nursing staff, have been known to be a high-risk group for manual handling risks and back problems for many years. The findings from one study have identified a major challenge for the nursing profession to address the continued risk of back injury to nurses.[6] Based on Exton-Smith and Sherwin findings[4] it was suggested that residents would need to be repositioned every few minutes to prevent PUs but this repetitive manual handling activity puts a large number of nurses at risk of back injury.[7] If repositioning every 7–8 min would prevent PUs this would have to be done 180–205 times in each 24-h period. Care staff undertakes most nursing care of residents ensuring they are repositioned to prevent PUs. Having a PU free RACF just by repositioning residents every 2 h, is an unattainable goal, and residents would get no sleep at all.

Address for Correspondence:
Catherine Anne Sharp, Founder and CEO, The Wound Centre, Sydney, Australia. **Mobile:** + 61 2 0408121331.
E-mail: info@thewoundcentre.com

Repositioning residents will not necessarily prevent PUs but what it may do is wake them from sleep.[3] This may cause sleep deprivation (SD) and being disturbed from sleep is unacceptable because it is a human rights issue. Everybody should be permitted to sleep. Nobody should be woken from sleep and certainly not woken repeatedly.

Recognizing that repositioning may accidentally wake residents resulting in SD was our original contribution to knowledge in 2007, albeit unpublished. When residents are accidentally woken it is not known whether they fall asleep straight away or if they lie awake till they are repositioned 2 h later. They might be in a deep sleep when woken at five in the morning to be showered before breakfast. There is evidence describing how residents fall asleep at the breakfast table, in a chair throughout the day, refuse to walk with the physio, or punch and fight staff who are just trying to prevent PUs with frequent repositioning?[3] This challenging behavior may result from being repositioned, woken, constantly tired, and desperate for sleep.

Nurses value informed decision-making and quality nursing care[8] and do question SD in residents caused by being constantly woken when repositioned 2-hourly over weeks, months, and years. However, they are powerless to make changes to this human rights issue caused by frequent repositioning because they must follow instructions from management to reposition residents at risk of PUs every 2 h.

Prolonged, unrelieved pressure over any part of the body can lead to the development of PUs. PUs are an alteration in skin integrity and may prolong resident morbidity, interfere with rehabilitation and they may also contribute to the death of residents.[9,10]

In 2018, the prevalence of PUs in Australian RACFs was 8% because of unrelieved pressure, friction, and/or shear forces.[1,11] Yet it is estimated that over 80% of these PUs could be prevented if appropriate interventions were initiated as soon as residents became immobile.[12] It is widely accepted that PUs can develop as a result of prolonged periods of immobility[13] during which time unrelieved pressure compresses tissues that often overlie bony prominences such as the sacrum[14] and heels;[15,16] the most common sites for PU development.

This report focuses on the prevalence of PUs, an audit of "air" mattresses already in use for the prevention of PUs, and the effect of a new work regime for care staff.

Aims and objectives

The aims of this study were to calculate the prevalence of PUs, audit "air" mattresses in use, introduce a new nursing regime to prevent PUs, and allow residents to sleep all night. We aimed to change nursing practices, introduce a new alternating pressure air mattress (APAM) and provide one-on-one and group bedside education to all nursing staff. In addition, we aimed to heal existing PUs, prevent the development of PUs, and at the same time reduce nursing workloads and risk of manual handling injuries to staff when repositioning residents.

Justification

To prevent PUs nurses, have for decades, repositioned residents every 2 h when they also assess the skin for evidence of pressure damage. Repositioning every 2 h may not, however, prevent PUs but may accidentally waken residents from sleep.[3] This can result in severe SD from which residents never recover. All residents at risk of PUs must therefore be nursed on an APAM with cells that deflate to atmospheric pressure at the very least. Cells that do not deflate sufficiently continue to exert constant pressure on tissues sandwiched between the bed and bony skeleton resulting in PUs.

MATERIALS AND METHODS

Study setting

Our small study was undertaken in a 44-bed RACF in Sydney, Australia. Ethics approval was not required as auditing PUs was considered by the management of the RACF to be part of the usual role of Nurse Consultants.

Sample size calculation

All 44 residents in this RACF were included in the initial audit of PUs.

Study participants

The 44 residents of this RACF were included in this audit. Informed consent from residents was not deemed necessary because the audit was part of usual care.

Inclusion and exclusion criteria

Residents at risk of PUs were included in the study. Residents were deemed to be at risk of PUs if it was stated on the residents' care plan and noted in the Aged Care Funding Instrument (ACFI). For example, where the registered nurse had documented 2:1 for "mobility" that meant two care staff were required to reposition/mobilize the resident. Independently active residents who required no assistance to mobilize were excluded.

Statistical analysis

This was a longitudinal study that looked at a group of residents over a 6-month period following the initial prevalence study of PUs and introduction of Nodec A APAM overlays. We calculated the prevalence of PUs and the use of APAMs.

Two Nodec A APAM overlays were kindly supplied for trial by Pegasus Healthcare who also provided in-service education to staff. Management of the RACF entered into a financial arrangement for several more Nodec A's so that all residents at risk of PUs, with PUs and/or nursed on a non-functioning APAM were supplied with a Nodec A APAM. Many tools are available for the purpose of identifying PU risk and the Waterlow screening tool is one of the most widely used in Australia. It does have poor predictive validity, however, and a tendency to overestimate the number of residents at risk.[17] A numerical PU risk assessment tool was not relied on in this facility because we believe the greatest effort in assessing PU risk needs to focus on mobility[18] through clinical judgment.[19]

Night duty nurses were notified that if a resident, nursed on a Nodec A APAM, was asleep when they did their rounds they were not to be repositioned. However, if they were awake, they were to be repositioned for joint mobility, lung perfusion, a drink, a chat, and a change of scenery.

RESULTS

In this RACF almost half the residents were deemed at risk of PUs, that is they required 2:1 care for mobility according to the nursing care plan and ACFI. However, 52% of residents were completely immobile. Eight residents had a total of ten PUs: four sacral PUs, one greater trochanter (hip) PU, two buttock PUs, one heel PU and one resident had bilateral heel PUs (Table 1).

Nursing staff were enthusiastic and heavily involved in the plan for a reduced workload which allowed them time to sit with residents, help with food and drinks without rushing. To keep the enthusiasm up we created "champions" who would be responsible for education on the APAMs, encouraging staff to provide more food and fluids, sit in the garden and provide much more intense, individualized, care.

An independent assessment of residents, carried out by a Clinical Nurse Consultant (CNC), not involved in the design of the study, reported in the 6 weeks following the introduction of the Nodec A APAMs to the RACF that no new PUs developed. The CNC accompanied care staff when they were bed-bathing residents so she could examine them, in particular the sacrum, heels, hips, and buttocks. At the end of 6 months, she reported to the management of the RACF and the authors that all PUs had healed, and no new PUs had developed.

DISCUSSION

The prevalence of PUs in this RACF was 18.1% at the beginning of the audit. Six months after the introduction of the NoDec A APAM overlay and the change of practice, that is not repositioning sleeping residents and accidentally waking them, the prevalence of PUs was 0%. This PU free RACF is a first and a remarkably successful outcome thanks to the "champions." Others have concluded that an APAM is likely to be more effective than a standard hospital mattress in preventing PUs.[20,21]

The Nodec A overlay is ideal because it sits on top of the existing mattress. The facility does not have to store mattresses. Permanent side formers also provide extra resident comfort and security when sitting in, and being assisted out of, bed. There is an audible alarm and an automatic default from static to alternating mode – foolproof.

It is difficult to evaluate the cost of preventing PUs because such studies are not entirely comparable, and they do not include all the costs associated with treatment.[22] At the time this audit was conducted in 2007, the cost of renting a Nodec A APAM was about $1.40 a day but with rising costs is now <$10.00/day (Pers. Comm. Paul Jackson National Operations Manager Pegasus Health Group 2021). The cost is based on the expected 5-year life of the Nodec A. Renting the Nodec A is less than the cost of a daily wound dressing. We were unable to find any studies, prior to this study in 2007, which showed the cost of renting APAMs, allowing residents to sleep through the night, and with the result after 6 months of 0% PUs.

Table 1: Residents and location of pressure ulcers

Resident	Sacral PU	Right Heel PU	Left heel PU	Hip PU	Buttock PU	Total PUs
1	Yes					1
2	Yes					1
3	Yes					1
4	Yes					1
5				Yes	Yes	2
6		Yes	Yes			2
7		Yes				1
8					Yes	1
Total	4	2	1	1	2	10

PU: Pressure ulcer

This study was conducted over a 6-month period in 2007 but was never submitted for publication before. We believe it is still relevant because PUs still develops, APAMs are rarely provided as a preventative measure, PU prevention practices have not changed in the last 14 years, nor in fact in the past 50 + years as first reported by Exton-Smith and Sherwin.[4]

Limitations of the study

The authors did not record the names of the original air mattresses prior to the introduction of the Nodec A. The cost of wound dressings has not been calculated but it is worth noting that when, for example, a sacral wound dressing must be changed it requires two staff, gowns and gloves, pain-killers prior, use of a dressing pack, then disposal of the pack and dirty wound dressings. Residents, especially those with dementia, may pull the sacral dressing off or it may become soiled with feces. Regardless, it seems sensible to consider the cost of the APAM as an alternative to daily wound dressings.

CONCLUSION

The audit of original APAMs carried out at the beginning of this study revealed that 50% were not working properly, therefore, providing insufficient, or no, pressure relief to residents. PUs had developed in dependant areas of the body, the sacrum and heels which are the commonest sites, and the hip and buttocks.

Repositioning, when it wakens residents from sleep, is an unethical and unnecessary practice that may not prevent PUs, and for which there are alternatives. Repositioning and waking residents from sleep may be considered "unintentional institutional abuse."[3]

By reducing the number of times nurses have to reposition residents in a shift it is possible to reduce the number of manual handling injuries, mainly back injuries, that occur.[7]

RECOMMENDATIONS

The recommendation to prevent PUs will emphasize clinical nursing skills to ensure quality care and prevention of PUs. Every resident at risk of PUs, determined on the nursing care plan and ACFI is to be:

- Nursed on a Nodec A APAM (or equivalent);
- Repositioned during the day;
- Repositioned during the night only if awake; and
- Left to sleep in peace, not to be woken or disturbed for the purpose of repositioning.

Education for staff on PU risk, prevention, and the APAMs was met with so much enthusiasm so we encourage the creation of "champions" among all aged care staff.

Because of the small sample size of our study, future studies may be needed to assess the generalisability to a larger population. Repositioning wakes many residents, rarely preventing PUs, instead of causing severe SD, but we believe change is possible if RACFs create "champions," invest in Nodec A, or equivalent, APAMs and allow residents to sleep through the night.

It is possible to have PU free RACFs, with residents who are not tired and sleep-deprived, but wide-awake and able to enjoy their days as we have shown.

Although we did not document any manual handling injuries, amongst nurses, in our study it can be surmised that a change in practice together with the use of the Nodec A can prevent/reduce manual handling injuries in nurses.

DISCLAIMER

Neither author has ever been paid by any company to promote the "Nodec A" mattress, or any other mattress.

ACKNOWLEDGMENTS

We thank Pegasus Healthcare for loaning the Nodec A mattresses after which time the facility entered into a financial agreement with the company.

We thank all the nurses without whose enthusiasm none of this would have commenced.

REFERENCES

1. Linder-Ganz E and Gefen A. The effects of pressure and shear on capillary closure in the microstructure of skeletal muscles. Ann Biomed Eng. 2007;35(12):2095-2107.
https://doi.org/10.1007/s10439-007-9384-9
2. Källman U, Engström M, Bergstrand S, Ek AC, Fredrikson M, Lindberg LG, et al. The effects of different lying positions on interface pressure, skin temperature, and tissue blood flow in nursing home residents. Biol Res Nurs. 2015;17(2):142-151.
https://doi.org/10.1177/1099800414540515
3. Sharp CA, Schulz Moore JS and McLaws ML. Two-hourly repositioning for prevention of pressure ulcers in the elderly: Patient safety or elder abuse? J Bioeth Inq. 2019;16(1):17-34.
https://doi.org/10.1007/s11673-018-9892-3
4. Exton-Smith AN and Sherwin RW. The prevention of pressure sores. Significance of spontaneous bodily movements. Lancet. 1961;278(7212):1124-1126.
https://doi.org/10.1016/S0140-6736(61)91033-9
5. Swain J, Pufahl E and Williamson GR. Do they practise what we teach? A survey of manual handling practice amongst student nurses. J Clin Nurs. 2003;12(2):297-306.
https://doi.org/10.1046/j.1365-2702.2003.00695.x
6. Hignett S, Fray M, Rossi MA, Tamminen-Peter L, Hermann S,

Lomi C, et al. Implementation of the manual handling directive in the healthcare industry in the european union for patient handling tasks. Int J Ind Ergon. 2007;37(5):415-423.
https://doi.org/10.1016/j.ergon.2007.01.003

7. Retsas A and Pinikahana J. Manual handling activities and injuries among nurses: An Australian hospital study. J Adv Nurs. 2000;31(4):875-883.
https://doi.org/10.1046/j.1365-2648.2000.01362.x
8. Code of Ethics for Nurses in Australia. Nursing and Midwifery Board of Australia; 2008. www.anmc.org.au
9. Bliss MR. Death due to a pressure sore. Was the coroner's verdict 'lack of care' justified? J Tissue Viability. 1994;4(1):10-13.
https://doi.org/10.1016/S0965-206X(14)80233-7
10. Cutting KW and White RJ. Deaths and pressure ulcers: Should death certificate reporting be mandatory? Br J Nurs. 2015;24(6):S3.
https://doi.org/10.12968/bjon.2015.24.Sup6.S3
11. Gefen A, Farid KJ and Shaywitz I. A review of deep tissue injury development, detection, and prevention: Shear savvy. Ostomy Wound Manage. 2013;59(2):26-35.
12. Brandeis GH, Berlowitz DR and Katz P. Are pressure ulcers preventable? A survey of experts. Adv Skin Wound Care. 2001;14(5):244, 245-248.
https://doi.org/10.1097/00129334-200109000-00011
13. Lindgren M, Unosson M, Fredrikson M and Ek AC. Immobility-a major risk factor for development of pressure ulcers among adult hospitalized patients: A prospective study. Scand J Caring Sci. 2004;18(1):57-64.
https://doi.org/10.1046/j.0283-9318.2003.00250.x
14. Turk EE, Tsokos M and Delling G. Autopsy-based assessment of extent and type of osteomyelitis in advanced-grade sacral decubitus ulcers: A histopathologic study. Arch Pathol Lab Med. 2003;127(12):1599-1602.
https://doi.org/10.1043/1543-2165(2003)127<1599:aaoeat>2.0.co;2
15. McGinnis E and Stubbs N. Pressure-relieving devices for treating heel pressure ulcers. Cochrane Database Syst Rev. 2014;(2):CD005485.
https://doi.org/10.1002/14651858.CD005485.pub3
16. Junkin J and Gray M. Are pressure redistribution surfaces or heel protection devices effective for preventing heel pressure ulcers? J Wound Ostomy Continence Nurs. 2009;36(6):602-608.
https://doi.org/10.1097/WON.0b013e3181be282f
17. Webster J, Gavin N, Nicholas C, Coleman K and Gardner G. Validity of the Waterlow scale and risk of pressure injury in acute care. Br J Nurs. 2010;19(6):S14, S16, S18 passim.
https://doi.org/10.12968/bjon.2010.19.Sup2.47246
18. Sharp CA and McLaws ML. Estimating the risk of pressure ulcer development: Is it truly evidence based? Int Wound J. 2006;3(4):344-353.
https://doi.org/10.1111/j.1742-481X.2006.00261.x
19. Australian Wound Management Association. Pan Pacific Clinical Practice Guideline for the Prevention and Management of Pressure Injury. Australia: Cambridge Media Osborne Park, WA; 2012.
20. Vanderwee K, Grypdonck M and Defloor T. Alternating pressure air mattresses as prevention for pressure ulcers: A literature review. Int J Nurs Stud. 2008;45(5):784-801.
https://doi.org/10.1016/j.ijnurstu.2007.07.003
21. Bliss MR, McLaren R and Exton-Smith AN. Preventing pressure sores in hospital: Controlled trial of a large-celled ripple mattress. Br Med J. 1967;1(5537):394-397.
https://doi.org/10.1136/bmj.1.5537.394
22. Casimiro C, Garcia-de-Lorenzo A and Usan L. Prevalence of decubitus ulcer and associated risk factors in an institutionalized Spanish elderly population. Nutrition. 2002;18(5):408-414.
https://doi.org/10.1016/s0899-9007(01)00805-x

Authors Contribution:
CAS, JC- Contributed equally to the concept and design of the study, literature reviews, and preparation of manuscript

Work attributed to:
The Wound Centre, Sydney, Australia

Orcid ID:
Ms. Catherine Anne Sharp - https://orcid.org/0000-0002-4266-8493
Ms. Julie Campbell - https://orcid.org/0000-0002-2140-0017

Source of Support: Nil, **Conflict of Interest:** None declared.