

Wound programmes in residential aged care: a systematic review

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ABSTRACT

Background: Older people residing in residential aged care (RAC) facilities are becoming more dependent, have higher rates of chronic disease and are at risk for skin injuries and developing chronic wounds. The importance of evidence-based and sustainable wound programmes in RAC facilities to prevent and manage wounds is essential.

Aim: To establish the composition and effect of wound-related programmes, implementation strategies, resident and clinical staff outcomes and programme sustainability in RAC facilities.

Method: Fifty-one studies met the inclusion and exclusion criteria and were then appraised according to the grading criteria; this resulted in 11 observational or descriptive studies included in the review. Heterogeneity across the studies meant pooling of data could not be performed; hence this systematic review is presented in narrative form.

Results: Three syntheses emerged: educational outcomes; implementation strategies; and organisational culture. Results indicated pressure injury programmes could improve knowledge and care processes to reduce pressure injury rates. Recommendations to help implement programmes into RAC facilities are provided.

Conclusion: Pressure injury programmes can reduce pressure injury rates and improve management for residents residing in RAC. Data is limited to provide conclusions for wound programmes other than for pressure injuries and is an area for future research.

Keywords: Residential aged care facilities, education, pressure injuries.

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INTRODUCTION

Population ageing is a well established phenomenon with rising life expectancy rates^{1,2}. Longevity is associated with higher rates of chronic disease and disability which, in turn, places additional burden on health and disability services providing acute and long-term care³⁻⁵.

Residential aged care (RAC) facilities are complex organisations confronted with significant challenges when caring for the frail older person. These can include but are not limited to high patient dependency; inadequate resident funding and resources in the RAC sector; care provided mostly by unregulated workers; high staff turnover; and reduced opportunities for staff education and training⁶⁻⁸.

Wound prevention and management practice is a rapidly growing industry demanding ongoing knowledge and education to ensure best practice treatment and cost-effective care is delivered^{9,10}. The older person is at risk for developing wounds related to ageing, chronic disease and disability; this risk can increase for older people residing in RAC facilities related to higher dependency factors^{6,11-15}. Health care professionals working within RAC facilities require the knowledge and skill to prevent and manage wounds and reduce the risk of chronic wounds developing¹⁶. This, in turn, will improve a resident's quality of life, provide cost-effective management and reduce the potential burden on secondary health care services^{16,17}.

METHOD AND ANALYSIS

The purpose of this review was to determine the effect of wound prevention and/or management programmes in RAC facilities. Objectives included establishing the composition of wound-related programmes, implementation strategies, and resident and clinical staff outcome measures.

Inclusion criteria:

- Experimental, observational, descriptive or qualitative primary studies.
- Adults aged 65 years and older, living in RAC facilities including rehabilitation homes, rest homes, hospitals, and dementia- and psychogeriatric-level care.
- Educational or quality improvement programmes with wound prevention and/or management components delivered to RAC nurses or health care assistants.
- Outcome measures related to the programme.
- Articles published in English from 2000.

Exclusion criteria:

- Adults aged less than 65 years.
- Research undertaken in home-based care, secondary and tertiary hospital level settings (non-RAC facilities).

The search period conducted from 4 December 2012 to 18 March 2013 included clinical databases and reference lists of articles from the year 2000 onwards. Medical subject headings (MeSH) and keywords were established. The databases searched included: ACP Journal Club, BMJ, CINAHL (EBSCO host), Cochrane Library: Central Register of Controlled Trials and reviews, Embase, Google Scholar, International Journal of Evidence-Based Healthcare, Joanna Briggs Institute, nzresearch.org.nz, Ovid MEDLINE, PubMed, SUMSearch and Trip database.

Across the databases, 849 results were identified. The removal of duplicate studies occurred first, and then the relevance of each article according to the title, keywords and abstract; this excluded 750 articles, leaving 94 potentially relevant studies. An additional five studies were included from reviewing study reference lists, resulting in 99 retrieved full-text articles for examination. Application of inclusion and exclusion criteria resulted in the exclusion of 48 of the 99 studies, leaving 51 studies for appraisal.

Methodological quality of grade seven or higher (set by the author and supervisor) was evaluated using the Joanna Briggs Institute (JBI) Critical Appraisal Tools¹⁸. The JBI Critical Appraisal Tools provide a structured approach to ensure studies of the highest quality and relevance were selected for data extraction¹⁸. The Meta Analysis Statistics Assessment and Review Instrument (MAStARI) was used for quantitative studies which included randomised controlled trials (RCTs)/pseudo-randomised controlled trials, comparable

cohort/case control and descriptive/case series¹⁸. The Qualitative Assessment and Review Instrument (QARI) critical appraisal tools were used for qualitative studies¹⁸. The excluded RCTs commonly did not meet the JBI criteria for blinding participants to treatment allocation, did not maintain treatment group concealment from the allocator, the outcomes of people who withdrew were not described or included in the analysis, and assessors were not blind to study treatment allocation. Descriptive and case series studies were the most used and many frequently did not meet the criteria for randomisation or pseudo-randomisation sampling, often confounding factors were not identified or what strategies were used to deal with them, where comparisons were made there was insufficient group descriptions, and people who withdrew were not described or included in the analysis.

Of the 51 appraised studies, 11 observational or descriptive studies met the grading process (Figure 1 provides an overview of this process). The JBI MAStARI Data Extraction Tool¹⁸ was used to extract and displayed data for analysis. Study bias was analysed using the Cochrane Collaboration Grades of Recommendation, Assessment, Development and Evaluation (GRADE)¹⁹ (Table 1). Due to methodological heterogeneity across studies, statistical pooling of data could not be performed. The data was then analysed to identify recurring findings. From this process, three key syntheses and nine categories were developed (Figure 2).

RESULTS

Synthesis one: Educational outcomes

The education of nurses and health care assistants can lead to improved knowledge and be measured in practice. Within this synthesis, two categories developed: pressure injury prevention and management, and knowledge transfer.

Category: Pressure injury prevention and management

Educational programmes included risk assessment and preventative strategies to prevent pressure injuries; the reduction and improved management of pressure injuries was transferred into practice. Ten studies implemented pressure injury programmes²⁰⁻²⁹ and variability was evident in the method of measurement of pressure injury rates across studies. In addition, education was included for leg and diabetic foot ulcers^{22, 28} and skin tears²². A significant reduction of venous leg ulcers and category three skin tears was reported by one study²². A single study implemented a skin care programme and regime alone for residents with incontinence to prevent incontinence-associated dermatitis and pressure injuries³⁰. Six studies implementing pressure injury programmes demonstrated a significant reduction in the rate of pressure injury (*p*-values of less than .05)^{22,23,25-27,30}. Whilst three studies reported reduced pressure injury rates, the statistical significance of these findings was not reported^{24,28,29}. The reporting of pressure injury stages also varied between studies. Pressure injury stages I to IV were combined in seven studies^{20,22,24,26-29}. Significant reduction was found in incidence rates of stage III and IV pressure injuries and stage II developing to stage IV²³ and stage II, III and IV pressure injury²⁵ whereas, pressure injury severity and number per resident did not reduce in two

studies^{26,27}. Healing time for stage II, III and IV pressure injury was measured in one study and did not reach significance²³. One study measured incontinence-associated dermatitis and pressure injury rates over these sites and found incontinence-associated dermatitis and stage I pressure injury incidence significantly reduced³⁰. The authors further reported an increase in stage II pressure injury and a reduction in stage III; however, statistical details were not provided³⁰.

Essential to pressure injury programmes was the implementation of pressure-relieving support surfaces to prevent pressure injury development or reduce the risk of wound deterioration. The use of pressure-relief mattresses and overlays significantly increased for residents at high risk, or with existing pressure injuries in the four studies reporting this measure^{20,21,26,28}. One study reported a non-significant increase in the use of pressure-reducing strategies²². However, whilst there was no significant improvement in the use of chair cushions, the increased use of heel pressure relief did reach significance in one study measuring this outcome²¹.

Category: Knowledge transfer

Transfer of knowledge into practice first requires understanding and retention of information. Three studies measured and demonstrated an improvement in staff knowledge^{24,25,28}. An online computer

program included pre- and post-knowledge testing of 753 RAC staff across seven facilities and found significant knowledge improvement in pressure injury prevention and management²⁴. Rosen *et al.*²⁵ reported 96% of staff completed pressure injury and skin care computer-based training with all staff attaining the set 80% pass rate when financial incentives were utilised. A one and a half hour programme provided over two months to 10 nurses in one facility tested knowledge pre- and post-pressure injury education and showed mean baseline test scores continued to improve at the first and second test phases²⁸. Further testing one month after the programme indicated staff had retained this knowledge²⁸.

Documentation audits provide evidence of staff transferring their learning into practice. Four studies²⁰⁻²³ demonstrated improvements in staff documentation of resident pressure injury risk assessment; additionally, a significant increase in the use of skin integrity and skin tear assessment tools was reported²². The evidence demonstrated a significant increase in the documentation of pressure injury healing^{23,28}, and for wounds other than pressure injuries^{22,28}. Furthermore, the quality of description of pressure injuries increased^{21,28}, as did the frequency of documentation about wound dressings^{22,28}. In contrast, one study could not measure pressure injury healing time due to wound healing documentation not being routinely completed²⁹. An Australian study found more facilities

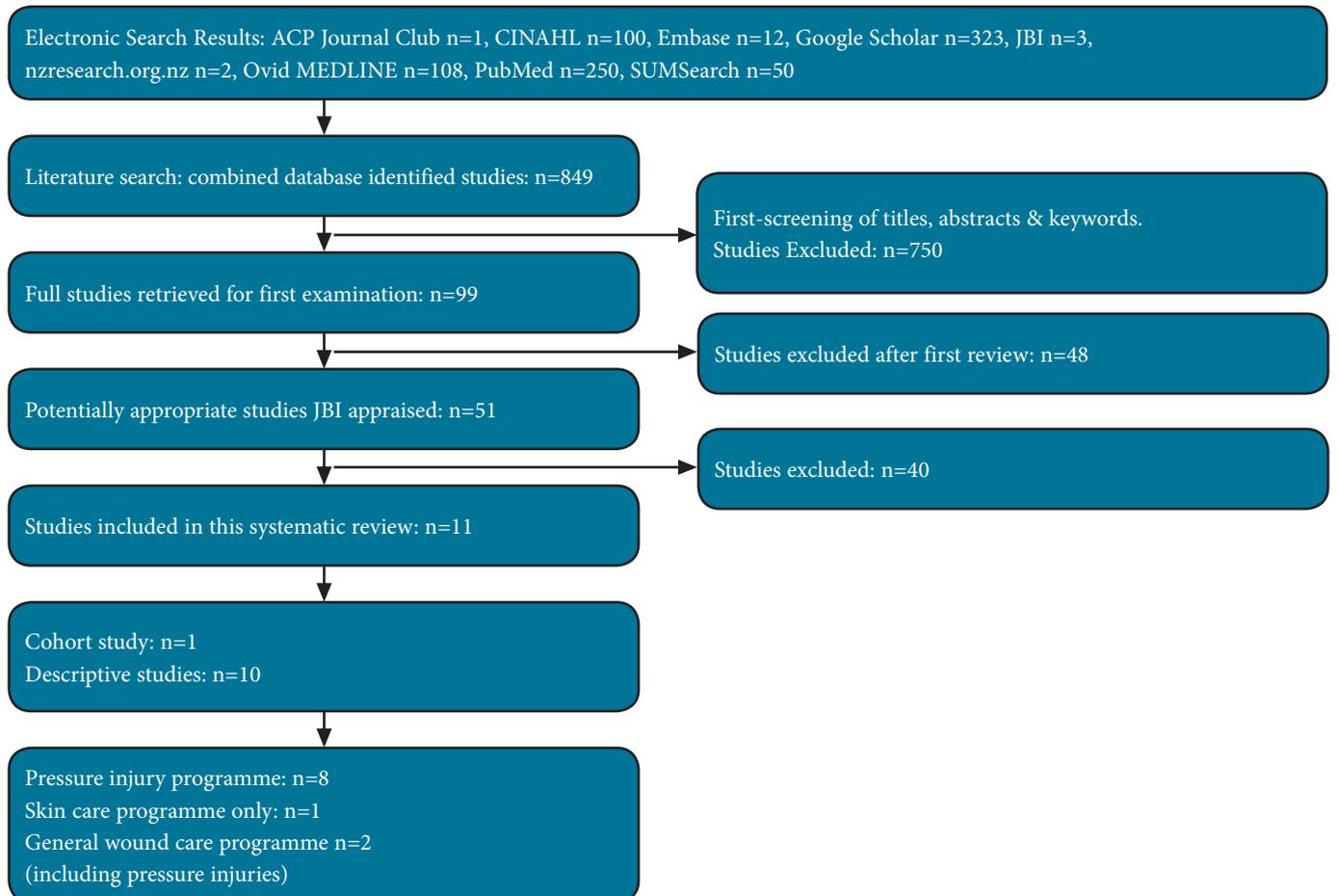


Figure 1: Review articles identified

Table 1: Study bias

| Author/s | Selection bias | Performance bias | Detection bias | Attrition bias |
|---------------------------------|----------------|------------------|----------------|----------------|
| Abel <i>et al.</i> (2005) | Yes | Yes | Yes | Not applicable |
| Baier <i>et al.</i> (2003) | Yes | Yes | Yes | Not applicable |
| Bale <i>et al.</i> (2004) | Unclear | Yes | Yes | Yes |
| Edwards <i>et al.</i> (2010) | Unclear | Yes | Yes | Not applicable |
| Lynn <i>et al.</i> (2007) | Yes | Yes | Yes | Not applicable |
| McDonald & Walton (2007) | Yes | Yes | Yes | No |
| Rosen <i>et al.</i> (2005) | Yes | Yes | Yes | Unclear |
| Santamaria <i>et al.</i> (2009) | Yes | Yes | Yes | Yes |
| Shannon <i>et al.</i> (2012) | No | Yes | Yes | Unclear |
| Thomas (2012) | Yes | No | Yes | No |
| Timmerman <i>et al.</i> (2007) | Yes | Yes | Yes | Yes |

implemented wound management procedures post education²²; whereas another found more pressure injury plans reflected the wound care procedure but did not find an improvement in number of facilities implementing wound protocols²⁰.

Synthesis two: Implementation strategies

Implementation strategies embraced the challenge of introducing programmes into RAC facilities and many approaches were employed to achieve outcomes. This synthesis links to four categories: evidence-based practice, staff empowerment, support resources and collaboration.

Category: Evidence-based practice

To facilitate the implementation of evidence-based practice, nine of the 11 studies implemented multiple interventions. These consisted of classroom education^{20-23,25-30} and computer-based learning using a post-knowledge testing program^{22,24,25}. Education was supported by evidence-based resources as discussed under category 'support resources'^{20-23,25-27,29,30}. The effect of staff learning is covered in the category: 'knowledge transfer'.

Category: Staff empowerment

Educational programmes empowered staff to implement wound programmes by improving knowledge, defining role responsibilities and extending work capabilities to improve resident outcomes. Nursing staff were included in all education programmes and health care assistants were included in eight studies^{20,22,24-27,29,30}. The involvement of staff to effect change enhances empowerment; four studies provided the opportunity for staff to review and modify programme resources prior to implementation^{20,22,25,30}. Pivotal to implementing programmes was the development of 'project champions' and quality improvement teams within facilities to drive initiatives; this facilitated ownership, leadership and self-sufficiency^{21-23,27,29}. Across studies the project champion role and

teams were nurtured and supported with learning resources, education and mentoring^{21-23,27,29}. Enrolled nurses (an enrolled nurse practises under the direction and delegation of a registered nurse or nurse practitioner)³¹ and health care assistants reported the project champion role increased their skills, knowledge and work recognition²². Internal committees also provided programme guidance and support in two studies^{22,29}, but were not formally evaluated.

Category: Support resources

The use of expert clinicians to actively work with facilities and staff was reported in seven studies and encompassed on-site visits and/or regular telephone or teleconference contact^{20-23,25,27,29}. In addition, three studies reported using email for discussions and updates^{22,23,29}. The intensity of external support varied across studies and the effect of this support was not evaluated.

Programme resources included pressure injury prevention and management guidelines for staff use^{20-23,26,27,29}, and intervention reminders such as quick reference guides, pocket-guides, brochures and posters^{20,22,25,27,29,30}. One study incorporated an algorithm to guide pressure injury interventions²⁷. The use of computer training (incorporating knowledge-evaluation testing) provided an on-site accessible learning resource for staff to use at any time^{22,24,25}.

Category: Collaboration

The use of collegial support networks across RAC facilities facilitated sharing and learning of programme experiences and provided motivation^{21,29}. One study used this approach to evaluate programme outcomes post implementation and to develop strategies to help facilities to sustain programmes²². In RAC, doctors are part of the clinical team and provide residents with medical care; three studies discussed medical involvement^{20,22,29}. One study used a fax communication form to alert doctors of

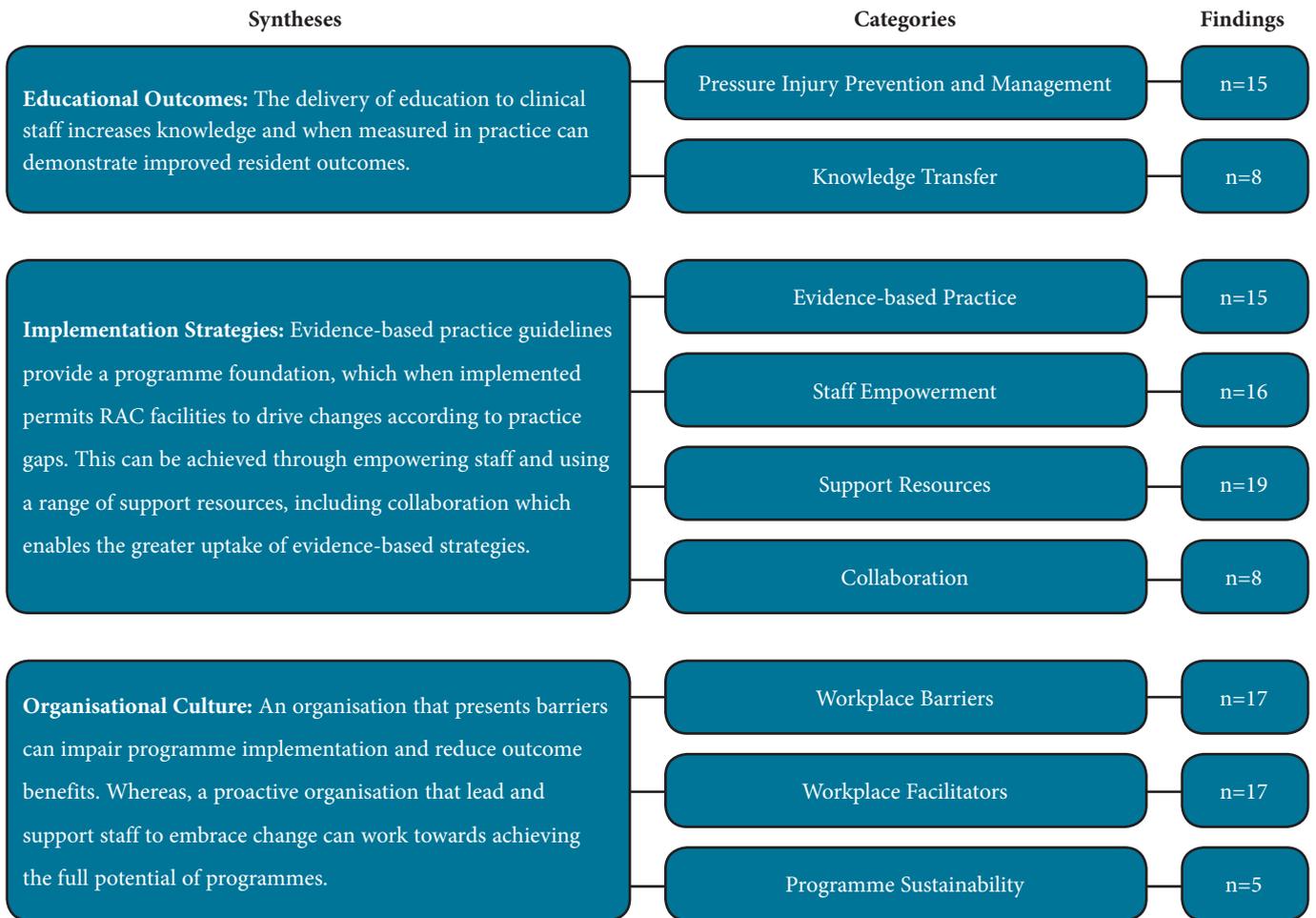


Figure 2: Synthesised findings

residents’ needs and current interventions²⁰. Another incorporated doctors as part of an advisory group to provide project team advice and guidance; though it was reported a small number of doctors did not support the project champion role nor acknowledge best practice wound care²². Six of seven facilities recruited a doctor onto a wound care committee although most RAC leaders reported receiving minimal committee support as lines of responsibility were not clearly defined²⁹. To aid programme implementation, the inclusion of wound education for residents and family was deemed important in two studies^{20,22}. Residents and family were actively informed and involved in the programme, resulting in improved wound prevention and management education with the inclusion of education pamphlets and flyers²². In Abel *et al.*’s study²⁰, a brochure was introduced about pressure injury risk factors and prevention, which focused on the role residents and families have in assisting health care professionals, but the effect of resident and family education was not measured.

Synthesis three — Organisational culture

Organisational culture provides insight into the complexity of implementing programmes in RAC facilities. The categories explore barriers and facilitators within facilities when implementing programmes, and the importance of organisational support to establish and sustain programmes.

Category: Workplace barriers

Workplace barriers impact on the ability of RAC facilities and staff to effectively apply wound programmes into clinical practice. The effect of staff turnover on programme implementation and outcomes was a recurring barrier^{20,22,23,25,28}. Staff skill-mix issues²² and the loss of crucial staff holding key positions were posited as impediments to programme implementation²³.

The work demands associated with wound programme implementation was reported in five studies^{20-22,28,29}; additionally the lack of financial reimbursement for staff to attend learning sessions was identified as a barrier^{22,29}. These issues led to reduced staff attendance at education sessions or meetings, and inconsistent training^{20,22,29}. Furthermore, these factors impeded the implementation of RAC support committees whose purpose was to support project champions and aid with programme implementation^{22,29}. One study reported that as a result of these issues, some staff reverted to pre-study procedures and omitted required documentation²⁰, whilst others were resistant to new wound documentation that was poorly introduced²⁹. Alongside time constraints, four studies highlighted organisational priorities as programme barriers; for example compulsory regulatory reporting requirements and routine administrative demands^{20,21,23,25}. A lack of management support and leadership to drive programmes

was an identified barrier in three studies^{20,22,25}. Phase I of a quality improvement study reported no measurable outcomes after 23 months, despite using staff empowerment and motivational methods in two RAC facilities²⁵. This was thought to be due to managers curbing initiatives, which resulted in the loss of staff motivation; hence when these barriers were addressed in phase II it resulted in improved outcomes and reduced pressure injury rates²⁵. Conflict from some staff with higher qualifications towards less qualified staff holding the project champion role was reported in one study²².

Category: Workplace facilitators

The utilisation of people and processes assisted with programme implementation. An essential element to programme success was the use of continuous quality improvement methods which permitted programme adjustments, and facilitated the uptake of process improvement in the workplace^{20-23,25,29}. The use of audit and feedback was deemed a motivating element to inform staff of progress and areas in need of improvement^{21,22,25,29}. Additionally, staff financial incentives were used for completed computer training modules and if targets for reduced pressure injuries were met, staff obtaining an 80% computer pass-rate received further financial incentives²⁵. The use of external mentors was instrumental to programme implementation by providing expert advice and guidance, and increased staff confidence to effect change^{20-23,25,27,29}. Additionally, RAC managers' support was associated with positive outcomes^{21,22,26}.

Category: Programme sustainability

To uphold continued improvement, RAC facilities needed to support programmes to ensure sustainability. In one study, five out of eight facilities retained pressure injury quality teams three years post-intervention and most facility pressure injury rates improved or remained the same after one year; this was attributed to embedding the programme through quality improvement processes²¹. Post study, a workshop with project champions to develop goals for sustainability was conducted and strategies were identified to maintain educational resources and project champion roles alongside relationships with external wound experts²². In two larger facilities, outreach wound clinics were commenced for both residents and staff to enable continued practical wound training²². In contrast, one study measured pressure injury rates post programme at two 12-week intervals and found reduced rates were not sustained²⁵. This was attributed to the short intervention period to embed change, the cessation of staff training, high staff turnover and, as audit and feedback was discontinued, this resulted in decreased staff motivation²⁵. Two studies identified the need for continual staff education and included this into compulsory education programmes in order to sustain staff learning and best practice^{22,28}.

DISCUSSION

The findings of this study have determined pressure injury programmes for residents aged 65 years and older residing in RAC facilities can improve staff knowledge and care for residents. However, there was a dearth of studies to determine if other

programmes prevented or improved management for leg and diabetic foot ulcers, skin tears or skin care programmes alone.

Pressure injury prevention and management programmes were implemented in 10 of the 11 studies. This emphasises the importance that these injuries are mostly preventable, are considered a sensitive measure of quality of care and are used as a key performance indicator in practice^{11,14,15}. Although seven pressure injury programmes were conducted in the USA, two in Australia and one in Canada, pressure injury prevention and management guidelines are comparable^{11,32-34} and can be customised to accommodate cultural and facility requirements.

However, not all pressure injuries were preventable^{23,26-28} and many factors associated with ageing increase this risk such as impaired mobility and sensory perception, cognitive impairment, chronic illness, compromised nutrition, reduced tissue tolerance and incontinence¹². Once a pressure injury develops in the compromised older person, healing is often prolonged or not achievable³⁵. This was shown in one study that reported healing time of stage II, III and IV pressure injuries did not improve²³. Hence, expected healing time of pressure injuries in older people may be protracted or not an attainable outcome measure³⁵.

Through testing, education was shown to increase staff knowledge^{24,25,28}. Two studies used education as a single implementation strategy and showed staff knowledge can be improved; although inadequate study data and a short follow-up period means the long-term study effect cannot be determined in these studies^{24,28}. Evidence of knowledge transfer into practice was shown from improved resident assessments, associated documentation and processes of care^{20-23,28}. The process of knowledge dissemination and utilisation is challenging, Farkas *et al.*³⁶ present an adapted conceptual framework titled the "4 E": exposure, experience, expertise, and embedding. This framework is focused on learning deficits and has been applied in the gerontology field for health professionals and consumers³⁶; much of these strategies have been applied in the review studies. The exposure method requires information to be presented in an interactive way to increase knowledge; though cheap and quick if used alone is the least effective³⁶. Experience is used to increase knowledge and positive attitudes and can include mentoring and role modelling³⁶. Expertise increases competence through use of interactive training manuals and programmes utilising train-the-trainer methods to help transfer knowledge³⁶. To ensure increased knowledge is ongoing, it needs to be embedded into practice and is acknowledged as the most challenging strategy³⁶. This strategy targets ongoing assistance and organisational support, such as continued use of experts and funding, and other 'power strategies' that require organisations to adhere to programmes; these can include legislation and government-driven requirements³⁶.

The use of multiple interventions was the most preferred method of programme implementation and is recommended to increase programme effectiveness³⁷⁻⁴⁰. However, the issue of applying multiple interventions increases the risk of not being able to identify which strategies were most effective in implementing programmes,

especially when process evaluations were not performed⁴¹⁻⁴³. A literature review investigating education and training in RAC facilities supports education and training for health care assistants, commenting that they have the most direct resident contact and are generally the least trained^{44,45}. Additionally, pressure injury prevention requires a team effort and a continual collaborative approach of all team members, including health care assistants⁴⁶. One Australian study identified English was not a first language for some staff and residents, therefore requiring educational resources to be simplified or translated²². Hence, when developing and implementing programmes, the importance of culturally appropriate educational resources and programme information is paramount for all health care workers and residents.

Continuous quality improvement systems provide an adaptable approach which allows for interventions based on identified deficits and is a recognised pathway for the implementation of best practice guidelines in RAC facilities^{46,47}. To achieve this, the organisational culture needs to be receptive to change, which may take three to five years to fully achieve and sustain^{46,47}. In the main, studies using quality improvement methods implemented longer programmes, (six months to over a year), to help embed best practice^{20-23,25,29}.

Overall, a positive and supportive organisational culture with effective leadership that involves all departments and teams within the organisation is integral to the success of quality initiatives in RAC facilities^{15,45,47-50}.

RECOMMENDATIONS FOR PRACTICE

The available evidence indicates pressure injury programmes based on RAC facility practice deficits can improve staff knowledge and care processes to reduce pressure injury rates. The use of RCTs applying 'process evaluations' using qualitative and quantitative approaches would provide more rigorous study data and are appropriate to evaluate quality improvement interventions^{42,43}.

The practice recommendations drawn from this review include:

1. To increase programme success, pre-assess facilities to determine the readiness for change, the organisation's culture and potential programme barriers and facilitators.
2. Evidence-based pressure injury programmes in RAC are recommended to increase staff knowledge and skill to improve resident care and reduce pressure injury rates.
3. Continuous quality improvement methods provide an adjustable and effective process to plan, implement, evaluate and sustain programmes in RAC facilities. Audit and feedback is an essential element to motivate staff and monitor adherence.
4. Allow a sufficient period of time for programmes to be implemented, measured and evaluated.
5. Engage, involve and update relevant RAC key stakeholders, including administrators, managers, nurses, health care assistants, doctors, residents and family before, during and after implementing programmes.

6. The use of multiple programme interventions is recommended to increase the success of programme implementation and outcomes.
7. To increase staff engagement, use staff incentives when developing, implementing and evaluating programmes.
8. Plan flexible, realistic and achievable programmes in anticipation of staff turnover, and resident and administrative work demands.
9. Project teams and/or champions are recommended to build staff confidence and skills, leadership and facilitate self-sufficiency and programme ownership. Enrolled nurses and health care assistants should be considered in these roles to work alongside registered nurses. These roles need to be supported by managers and staff alike.
10. Use expert external mentors to assist facilities and staff to identify practice issues, develop programmes, model and guide best practice.
11. Programmes implemented into compulsory staff training schedules ensure evidence-based updates are routinely provided for current and new staff.

LIMITATIONS

The review included English studies only and an insufficient number of studies were available to determine the effect of other wound-related programmes other than for pressure injuries. The appraisal process eliminated RCTs; therefore, observational or descriptive studies have been reviewed, which provide lower levels of evidence for intervention effectiveness¹⁹. Caution in generalising findings must additionally be taken since the available studies were of low methodological quality and hence present a high risk of study bias (Table 1)¹⁹.

CONCLUSION

The implementation of evidence-based pressure injury programmes can improve staff knowledge and care processes to reduce pressure injury rates and improve management for residents in RAC facilities. Organisational culture and preparedness can equate to programme success or failure, and influence future sustainability and should not be underestimated when implementing programmes. The use of continuous quality improvement approach, within a positive organisational culture, possessing supportive management and leadership, can empower health care workers and managers to implement programmes effectively, gain outcomes and sustain programmes. To provide more robust findings, randomised controlled and non-randomised trials using process evaluations are required in this practice setting. The data is limited in ability to provide conclusions for wound programmes other than for pressure injuries and is an area for future research.

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REFERENCES

1. Statistics New Zealand. New Zealand's 65+ Population: A statistical volume. Wellington: Statistics New Zealand, 2007.
2. United Nations. World population ageing: 1950–2050. New York: United Nations, 2002. Available from: <http://www.un.org/esa/population/publications/worldageing19502050>
3. Australian Wound Management Association Incorporated & New Zealand Wound Care Society Incorporated. Australian and New Zealand clinical practice guideline for prevention and management of venous leg ulcers. Western Australia: Cambridge Publishing, 2011.
4. Christian R & Baker K. Effectiveness of nurse practitioners in nursing homes: a systemic review. *Joanna Briggs Inst Syst Rev* 2009; 7(30):1333–52.
5. Ministry of Health. Population ageing and health expenditure: New Zealand 2002–2051. Wellington: Ministry of Health, 2004.
6. Boyd M, Connolly M, Kerse N, Foster S, Von Randow M, Lay-Yee R et al. Changes in aged care residents' characteristics and dependency in Auckland 1988 to 2008: findings from OPAL. Auckland: University of Auckland, 2009.
7. Carryer J, Hansen CO & Blakey JA. Experiences of nursing in older care facilities in New Zealand. *Aust Heal Rev* [Internet]. 2010 Mar; 34(1):11–7. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20334750>
8. New Zealand Human Rights Commission. Caring counts Tautiaki tika: report of the inquiry into the aged care workforce. Wellington: New Zealand, 2012.
9. Flanagan M. Barriers to the implementation of best practice in wound care. *Wounds UK* 2005; 1(3):74–82.
10. Gottrup F. Optimizing wound treatment through health care structuring and professional education. *Wound Repair Regen* [Internet]. 2004; 12(2):129–33. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/15086763>
11. Australian Wound Management Association Incorporated. Pan Pacific Clinical Practice Guideline for the Prevention and Management of Pressure Injury. Western Australia: Cambridge Publishing, 2012.
12. Grant Thornton. Aged Residential Care Service Review. New Zealand: Grant Thornton International Ltd; 2010.
13. Leblanc BK, Christensen D, Orsted HL & Keast DH. Best practice recommendations for the prevention and treatment of skin tears. *Wound Care Canada* 2008; 6(1):14–30.
14. White-Chu EF, Flock P, Struck B & Aronson L. Pressure ulcers in long-term care. *Clin Geriatr Med* [Internet]. Elsevier Ltd; 2011 May [cited 2013 Feb 15]; 27(2):241–58. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21641509>
15. Maas ML, Specht JP, Buckwalter KC, Gittler JD & Bechen K. Nursing home staffing and training recommendations for promoting older adults' quality of care and life. Part 1. Deficits in the quality of care due to understaffing and undertraining. *Res Gerontological Nurs* 2008; 1(2):123–34.
16. Van Rijswijk L & Gray M. Evidence, research, and clinical practice: a patient-centered framework for progress in wound care. *J Wound Ostomy Continence Nurs* [Internet]. 2012 [cited 2014 Jul 14]; 39(1):35–44. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22124460>
17. European Wound Management Association. Position document: Hard-to-heal wounds: a holistic approach. London: MEP Ltd, 2008.



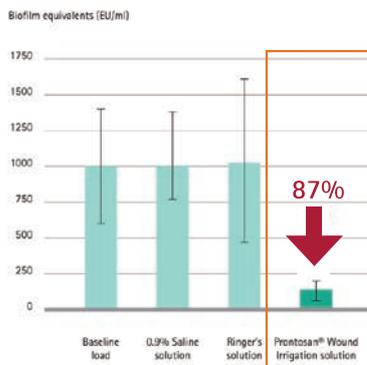
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18. The Joanna Briggs Institute. Joanna Briggs Institute Reviewers' Manual 2008. Adelaide: The Joanna Briggs Institute, 2008.
19. Higgins JPT & Green S (Eds). Cochrane handbook for systematic reviews of interventions [Internet]. Chichester, UK: The Cochrane Collaboration & John Wiley & Sons Ltd, 2008. Available from: <http://www.google.co.nz/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=5&ved=0CEkQFjAE&url=http%3A%2F%2Fxa.yimg.com%2Fkq%2Fgroups%2F18751725%2F96463393%2Fname%2F0470699515.pdf%25E2%2580%258E&ei=abmGUomoHuHsiAe85oH4Ag&usq=AFQjCNHBqt-G3xbN11-qIr6wacLIVJCzg>.
20. Abel RL, Warren K, Bean G, Gabbard B, Lyder CH, Bing M *et al.* Quality improvement in nursing homes in Texas: results from a pressure ulcer prevention project. *J Am Med Dir Assoc* 2005; 6(3):181–8.
21. Baier RR, Gifford DR, Lyder CH, Schall MW, Funston-Dillon DL, Lewis JM *et al.* Quality improvement for pressure ulcer care in the nursing home setting: the Northeast pressure ulcer project. *J Am Med Dir Assoc* 2003; 4(6):291–301.
22. Edwards H, Chang A, Finlayson K, Lonne R & Duthie D. Creating champions for skin integrity: final report [Internet]. Queensland, 2010. Available from: http://cms.qut.edu.au/_data/assets/pdf_file/0009/39573/EBPRAC_CSI_FinalReport.pdf
23. Lynn J, West J, Hausmann S, Gifford D, Nelson R, McGann P *et al.* Collaborative clinical quality improvement for pressure ulcers in nursing homes. *J Am Geriatr Soc* [Internet]. 2007 Oct [cited 2012 Dec 6]; 55(10):1663–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17714457>
24. MacDonald CJ & Walton R. E-learning education solutions for caregivers in long-term care (LTC) facilities: new possibilities. *Educ Heal* [Internet]. 2007 Nov; 20(3). Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18080957>
25. Rosen J, Mittal V, Degenholtz H, Castle N, Mulsant B, Rhee Y *et al.* Organizational change and quality improvement in nursing homes: approaching success. *J Healthc Qual* 2005; 27(6):6–14, 21,44.
26. Santamaria N, Carville K, Prentice J, Ellis I, Ellis T, Lewin G *et al.* Reducing pressure ulcer prevalence in residential aged care: results from phase II of the PRIME trial. *Wound Pract Res* 2009; 17(1):12–22.
27. Shannon RJ, Brown L & Chakravarthy D. Pressure ulcer prevention program study: a randomized, controlled prospective comparative value evaluation of 2 pressure ulcer prevention strategies in nursing and rehabilitation centers. *Adv Skin Wound Care* [Internet]. 2012 Oct; 25(10):450–64. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22990343>
28. Thomas A. Assessment of nursing knowledge and wound documentation following a pressure ulcer educational program in a long-term care facility: a capstone project. *Wound Pract Res* 2012; 20(3):142–58.
29. Timmerman T, Teare G, Walling E, Delaney C & Gander L. Evaluating the implementation and outcomes of the Saskatchewan pressure ulcer guidelines in long-term care facilities. *Ostomy Wound Manage* 2007; 53(2):28–43.
30. Bale S, Tebble N, Jones V & Price P. The benefits of implementing a new skin care protocol in nursing homes. *Tissue Viability Soc* 2004; 14(2):44–50.
31. Nursing Council of New Zealand. Competencies for enrolled nurses. Wellington, 2012.
32. European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel. Prevention ulcer prevention: quick reference guide. Washington DC: National Pressure Ulcer Advisory Panel, 2009.
33. European Pressure Ulcer Advisory Panel and National Pressure Ulcer Advisory Panel. Pressure ulcer treatment: quick reference guide. Washington DC: National Pressure Ulcer Advisory Panel, 2009.
34. Registered Nurses' Association of Ontario. Risk assessment and prevention of pressure ulcers (Revised 2011) [Internet]. Toronto, Canada: Registered Nurses' Association of Ontario; 2005. Available from: http://rnao.ca/fr/sites/rnao-ca/files/Risk_Assessment_and_Prevention_of_Pressure_Ulcers.pdf
35. Maklebust J. Pressure ulcers: the great insult. *Nurs Clin North Am* [Internet]. 2005 Jun [cited 2013 Oct 30]; 40:365–89. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/15924900>
36. Farkas M, Jette AM, Tennstedt S, Haley SM & Quinn V. Knowledge dissemination and utilization in gerontology: an organizing framework. *The Gerontologist* 2003; 43(1):47–56.
37. Havig AK, Skogstad A, Kjekshus LE & Romøren TI. Leadership, staffing and quality of care in nursing homes. *BMC Health Serv Res* [Internet]. BioMed Central Ltd; 2011 Jan [cited 2013 Aug 26]; 11:327–40. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3295728&tool=pmcentrez&rendertype=abstract>
38. Niederhauser A, VanDeusen Lukas C, Parker V, Ayello EA, Zulkowski K & Berlowitz D. Comprehensive programs for preventing pressure ulcers: a review of the literature. *Adv Skin Wound Care* 2012; 25(4):167–88.
39. Registered Nurses' Association of Ontario. Toolkit: Implementation of clinical practice guidelines. [Internet]. Toronto, Canada, 2002. Available from: http://www.ha-ring.nl/download/literatuur/Implementatie_Toolkit.pdf
40. Toohar R, Middleton P & Babidge W. Implementation of pressure ulcer guidelines: what constitutes a successful strategy? *J Wound Care* 2003; 12:373–82.
41. Agabegi SS & Stern PJ. Bias in research. *Am J Orthop* [Internet]. 2008 May; 37(5):242–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/18587501>
42. Auerbach AD, Landefeld CS & Shojania KG. The tension between needing to improve care and knowing how to do it. *N Engl J Med* 2007; 357(6):608–13.
43. Oakley A, Strange V, Bonell C, Allen E & Stephenson J. Process evaluation in randomised controlled trials of complex interventions. *BMJ* 2006; 332:413–6.
44. Maas ML, Specht JP, Buckwalter KC, Gittler JD & Bechen K. Nursing home staffing and training recommendations for promoting older adults' quality of care and life. Part 2. Increasing nurse staffing and training. *Res Gerontological Nurs* 2008; 1(2):134–52.
45. Nolan M, Davies S, Brown J, Wilkinson A, Warnes T, McKee K *et al.* The role of education and training in achieving change in care homes: a literature review. *J Res Nurs* [Internet]. 2008 Sep 1 [cited 2013 Jan 7]; 13(5):411–33. Available from: <http://jrn.sagepub.com/cgi/doi/10.1177/1744987108095162>
46. Berlowitz DR & Frantz RA. Implementing best practices in pressure ulcer care: the role of continuous quality improvement. *J Am Med Dir Assoc* [Internet]. 2007 Mar [cited 2013 Feb 27]; 8(3 Suppl):S37–41. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17336874>
47. Compas C, Hopkins KA & Townsley E. Best practices in implementing and sustaining quality of care. A review of the quality improvement literature. *Res Gerontological Nurs* 2008; 1(3):209–16.
48. Daly J, Speedy S & Jackson D. Nursing Leadership. New South Wales: Elsevier, 2008.
49. Jeon Y-H, Merlyn T & Chenoweth L. Leadership and management in the aged care sector: a narrative synthesis. *Australas J Ageing* [Internet]. 2010 Jun [cited 2013 Oct 29]; 29(2):54–60. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20553534>
50. Scott-Cawiezell J. Are Nursing Homes Ready to Create Sustainable improvement? *J Nurs Care Qual* 2005; 20(3):203–7.