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ORIGINAL ARTICLE

The effectiveness of a twice-daily skin-moisturising regimen for reducing the incidence of skin tears

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Abstract

A cluster randomised controlled trial was conducted to evaluate the effectiveness of a twice-daily moisturising regimen as compared to 'usual' skin care for reducing skin tear incidence. Aged care residents from 14 Western Australian facilities (980 beds) were invited to participate. The facilities were sorted into pairs and matched in terms of bed numbers and whether they provided high or low care. One facility from each matched pair was randomised to the intervention group. Consenting residents in an intervention facility received a twice-daily application of a commercially available, standardised pH neutral, perfume-free moisturiser on their extremities. Residents in the control facilities received ad hoc or no standardised skin-moisturising regimen. Participant numbers were sufficient to detect a 5% difference in incidence rate between the two groups with 80% power and a significance level of $P = 0{\cdot}05$, and the inter-cluster correlation coefficient was 0·034. Data were collected over 6 months. A total of 1396 skin tears on 424 residents were recorded during the study. In the intervention group, the average monthly incidence rate was 5·76 per 1000 occupied bed days as compared to 10·57 in the control group. The application of moisturiser twice daily reduced the incidence of skin tears by almost 50% in residents living in aged care facilities.

Introduction

Skin tears are defined as partial- or full-thickness skin injuries that result from shearing, friction or blunt trauma (1,2). Skin tears are the most common wounds found amongst older adults in hospitals, residential facilities and the community (3–5), and they are predominately located on the extremities (1,3). Australians aged over 65 and 85 years account for 14·2% and 1·9% of the population, respectively, but those over 65 years will account for 25% of the population by 2056 (6). The increasing proportion of older persons will potentially result in an exponential increase in the incidence of skin tears and greater demands for health resources. Similar demands can be anticipated in other countries given the unprecedented population ageing globally.

Unfortunately, benchmarking skin tear prevalence internationally is difficult as most published reports are based on retrospective incident audits (4,7,8), not prospective skin inspections. WoundsWest (3) reported the most extensive prevalence data following patient skin inspections in 86 public hospitals in Western Australia in 2007, 2008, 2009 and 2011. These studies revealed a skin tear prevalence of 8%, 11%, 9% and 10%, respectively, and the majority of these wounds were hospital

Key Messages

- skin tears are the most common wounds found amongst elderly adults
- the study investigated the effectiveness of twice-daily skin moisturising for reducing skin tear incidence amongst aged care residents
- a total of 1396 skin tears on 424 residents were identified during the study
- the application of moisturiser twice daily reduced the incidence of skin tears by almost 50% in residents living in aged care facilities

acquired (3). Skin tears were found on patients under the care of all medical specialities and across all ages, but more commonly in the population aged 60 years and above (3). In another study, among an elderly Western Australian community veteran population aged predominately over 80 years, skin tear prevalence was shown to be 20% ($n = 155$) (5).

Unfortunately, the cost of treating skin tears is poorly reported, although one North American facility reported an annual savings of $US18 168 in labour and medical consumables when a skin tear prevention program was implemented (9). Skin tears often go under-reported although they can be complex injuries or can become significant chronic wounds that impose implicit and explicit health burdens on individuals and care agencies (5,10). An Australian study proposed that the under-reporting of skin tears occurred largely because they were perceived to be a normal manifestation of ageing skin (11).

There are a myriad of morphological and physiological changes associated with skin ageing such as retraction of rete pegs and flattening of the epidermal–dermal junction (12–14); atrophy, furrowing and reduced vascularity of the dermis (12,14); impaired collagen synthesis and thinning of the hypodermis (15); elevated pH and elastosis (14,15); and reduced skin lipids and xerosis (16–18). A significant deterioration in sweat and sebaceous gland secretion impairs skin moisture and lipid concentration, which contributes to xerosis, as also injury to the stratum corneum and increased transepidermal water loss (18–20), exposure to ultraviolet radiation, dry or cool ambient air, chemical agents, soaps and hot water, certain medications and smoking (12,13,15,20). Xerosis, skin wrinkling and impaired skin resistance to mechanical trauma predispose an individual to skin tears (15,18,21).

Xerosis has been reported to affect up to 38·9% of persons in the community and up to 58·3% of aged care residents (17). Xerosis is commonly treated with moisturisers (lotions, creams, gels or ointments), which act as a physical epidermal barrier that prevents water loss from the stratum corneum and softens the skin (17). However, the effectiveness of and ideal frequency for applying moisturiser to the skin of elderly persons with the intent of optimising its mechanical resistance to trauma had not been determined previously. Therefore, this study aimed to assess the impact of a twice-daily standardised moisturising regimen in the prevention of skin tears among elderly residents in aged care facilities.

Methods

Study design and sample

A cluster randomised controlled trial (C-RCT) was conducted across 14 residential aged care facilities in metropolitan Perth, Western Australia (Australian and New Zealand Clinical Trails Registry Number: ACTRN12611001089921). The facilities had a total of 980 beds, and were paired in terms of high or low care and as closely as possible in bed numbers. In Australia, high-care residential facilities for aged care are licensed to provide 24-hour nursing care to support activities of daily living, and behavioural or complex health care requirements of highly dependent individuals, whilst low-care facilities provide care for people with low to moderate care needs or for less dependent individuals (22).

One facility from each of these seven matched pairs was randomised to the intervention group and the other to the control group. Given the relatively equal numbers of beds and participants in the control and intervention groups, this was calculated as sufficient to detect a difference in incidence rates between the two groups at the 5% level with 80% power and a significance level of $P = 0{\cdot}05$. The variance component, which was because of the clusters (accommodation facilities), was small, leading to an inter-cluster correlation coefficient (ICC) of 0·034. This suggested that the analysis could ignore this potential source of variance, so the results are based on comparisons between respondents in the study, disregarding their specific accommodation location. The low ICC also confirms that the power of the study to detect the given differences will be maintained using the projected numbers of participants.

Ethical approval to conduct the study was obtained from the Curtin University (HREC: HR81/2011) Ethics Committee and the Aged Care Organisation Research Committee. All cognitively aware residents were invited to participate in the study and consent was sought for participation from non-cognitively aware residents' nominated representatives. The residents' medical practitioners were informed of the study and they were requested to identify any resident who was to be excluded for any medical reason. Residents with known or suspected allergies to the moisturising lotion, or who objected to its application for any reason, or who were receiving other conflicting skin treatments were excluded, as were residents who were transferred between intervention or control group facilities, because of the risk of protocol violation. Residents who were admitted for short-stay respite care during the study were also excluded as their duration of stay and care needs varied compared to those of long-stay residents. Figure 1 outlines the enrolment process.

Study intervention

The study intervention involved the twice-daily application of a standardised commercially available, pH neutral (pH 5–6), perfume-free, moisturising lotion (Abena®) to body extremities in a gentle, downwards direction (see Table 1 for lotion ingredients). The lotion was applied by care staff or by residents if they were able, in the morning and the evening, and preferably following bathing. All staff within the 14 facilities received education on skin tear classification and reporting, and the staff in the 7 intervention facilities received additional education on the intervention regimen and its implementation in their facility. The education was repeated at regular intervals for protocol reinforcement and for the benefit of newly employed staff.

Data collection

The study was conducted over 6 months from October 2011 to March 2012. Prior to the study, baseline data were collected across all facilities for 6 months to determine the rigour of the electronic reporting systems and the classification of skin tears across all facilities. Randomly selected care staff from all facilities were invited to complete a written survey before (85 respondents) and following data collection (104 respondents),

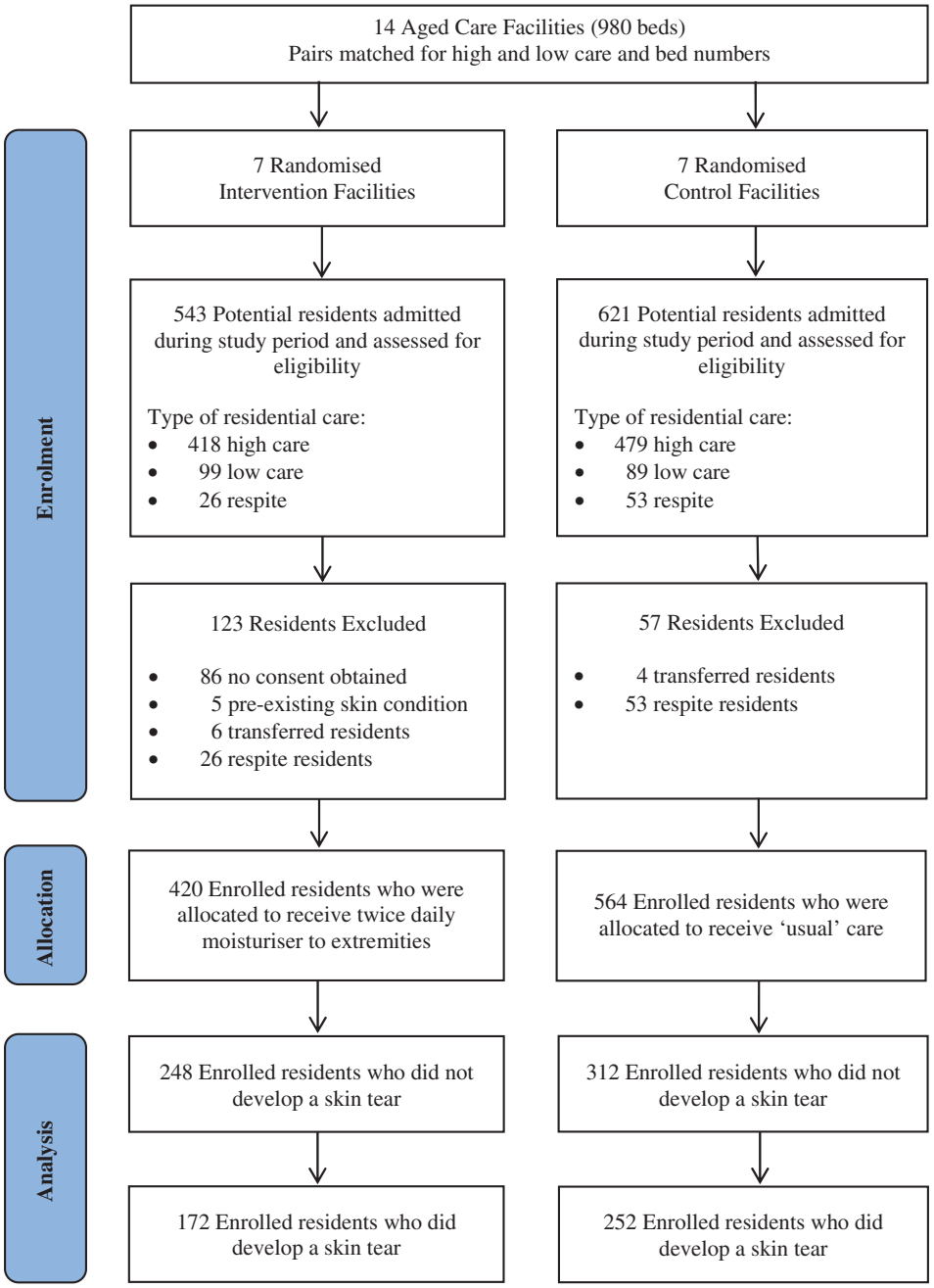

Figure 1 Resident enrolment flowchart.

and all facility managers were interviewed before and after data collection to determine the type of 'usual' skin care practices in regards to the type of moisturising agents and their use over the preceding 6 months. These survey and interview data were supplemented with an audit of a convenience sample of residents' care plans to confirm the description of 'usual' care within each facility at these two time points. This enabled us to ascertain the extent of practice change within the intervention group as well as to identify any change or possible contamination in 'usual' care that could potentially have occurred in the control group.

All 14 facilities used an organisation-wide electronic data management system for recording resident demographics, care interventions and outcomes, and incident data. De-identified study data were collected from this database and checked for accuracy. If a discrepancy in data collection was noted, a follow-up visit to the resident and care staff was made and any required data obtained. Measurements included age and gender; the type of care facility (high- or low-care); day and time of skin tear occurrence; anatomical location of skin tears and their STAR Skin Tear Classification (23); and each resident's location when a skin tear occurred. The STAR Skin Tear Classification (23) is a validated tool that classifies a skin tear according to its characteristics such as loss of tissue and the presence of haematoma or ecchymosis (see Figure 2).

Table 1 Contents of the moisturiser used in the study

Ingredient	%	Function
Aqua	70–90	Carrier
Ethylhexyl stearate	2–5	Veg. emollient
Glyceryl stearate, ceteareth-20, ceteareth-12, cetearyl alcohol, cetyl palmitate	2–5	O/W emulsifier
Olus oil	2–5	Veg. emollient
Glycerin	2–5	Moisturiser
Butyrospermum parkii butter	0–1	Veg. emollient
Phenoxyethanol, benzoic acid, dehydroacetic acid	0–1	Preservation
Cetearyl alcohol	0–1	Consistency
Glyceryl stearate SE	0–1	Emulsifier
Acrylates/C10–30 alkyl acrylate crosspolymer	0–1	Consistency
Lactic acid	0–1	pH adjuster
Sodium hydroxide	1–2	pH adjuster

As soon as a skin tear occurred or was identified, the reason for its occurrence was discussed with the resident or staff on duty and the reporting staff member recorded a 'contributory factor' (skin condition, nutritional status, corticosteroid use, or a fall, shearing, and friction forces) as the hypothesised reason for the injury. It was possible to have multiple contributory factors recorded against any tear.

Data analysis

The IBM Statistical Package for the Social Sciences (SPSS) version 19 was used to analyse the data. Descriptive statistics were used to summarise resident demographics and characteristics and χ^2 and Mann–Whitney *U*-tests applied to ascertain significant differences between the groups. The Mann–Whitney *U*-test was used for the continuous variables of age and number of skin tears as they were not normally distributed. A 5% level of significance was used and all probability tests were two-tailed. The primary outcome measure was the average monthly incidence of skin tears over the 6-month study period in the intervention group as compared to the control group. Monthly skin tear incidence rates were calculated as (number of skin tears/resident occupied bed days) × 1000.

Results

A total of 420 eligible residents enrolled in the intervention group and 564 residents enrolled in the control group. Amongst these residents, 424 (172 in the intervention group and 252 in the control group) had developed at least one skin tear and were included in the analysis (see Figure 1).

Age and gender

There was no statistical difference between both groups in regards to age ($P = 0{\cdot}097$) and gender ($P = 0{\cdot}083$). Overall, residents were predominately female (65·8%) and over 80 years of age. There were three male residents aged 40, 56 and 62 who were recipients of high care (two in the intervention group and one in the control group). In Australia, persons under 65 years with dementia or severe disability can be found in aged care facilities and thus they were included in the analysis (see Table 2).

Type of residential aged care

The distribution of high- and low-care residents amongst the intervention and control groups was similar ($P = 0{\cdot}917$). Residents in the high-care facilities had significantly more skin tears in the control group than in the intervention group ($n = 813$ versus $n = 362$, $P = 0{\cdot}018$). There was no statistical difference between the control and intervention groups in low-care facilities in terms of skin tear numbers ($n = 133$ versus $n = 88$, $P = 0{\cdot}762$).

Skin tear incidence rates

Of the 424 residents who developed skin tears, 172 (40·57%) residents were in the intervention group as compared to 252 (59·43%) residents in the control group. A total of 1396 skin tears were recorded among the 424 residents (mean = 3·29 skin tears/resident SD ± 3·99, range = 1–36). The resident with the

Figure 2 The STAR Skin Tear Classification (23).

Table 2 Age, gender and type of residential aged care

	Intervention ($N=172$)		Control ($N=252$)		Overall ($N=424$)		
Residents with skin tears	*n*	%	*n*	%	*n*	%	*P* (between groups)
Type of care							0·917
Low care	38	22·09	58	23·02	96	22·64	
High care	134	77·91	194	76·98	328	77·36	
Age							0·097
Mean (SD)	87·13 (7·98)		85·95 (7·24)		86·43 (7·56)		
Range	40–104*		56–101†		40–104‡		
Gender							0·083
Male	50	29·07	95	37·70	145	34·20	
Female	122	70·93	157	62·30	279	65·80	

*One male resident aged 40 with Huntington's disease.
†One male resident aged 56 with Huntington's disease and dementia and one male resident aged 62 with bipolar disease and dementia.
‡All the three residents were in high-care facilities.

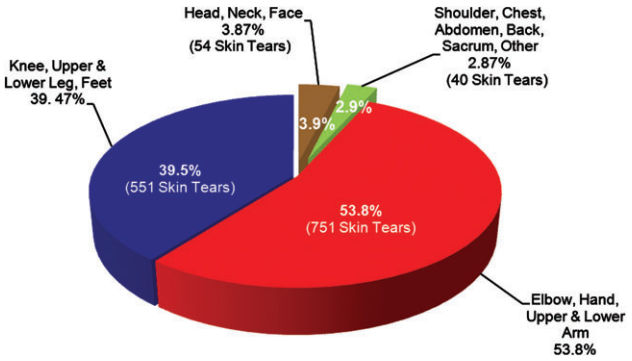

Figure 3 Overall skin tear anatomical locations.

Table 3 Skin tear anatomical locations collapsed by groups*

	Intervention		Control		Overall	
	n	%	*n*	%	*n*	%
Upper limb (elbow, hand, upper and lower arm)	243	54·00	508	53·70	751	53·80
Lower limb (knee, upper and lower leg, feet)	181	40·22	370	39·11	551	39·47
Face and trunk (head, neck, face, shoulder, chest, abdomen, back, sacrum, buttocks, groin, hips)	26	5·78	68	7·19	94	6·73

*No significant difference among groups ($P=0·599$).

greatest number of skin tears in the control group had 36 skin tears, whereas the intervention group resident with the greatest number of tears had 26 skin tears over the 6-month period. In the intervention group, the average monthly incidence rate was found to be 5·76 per 1000 occupied bed days (a total of 450 skin tears over 6 months) as compared to 10·57 per 1000 occupied bed days (946 skin tears over 6 months) in the control group ($P=0·004$).

Anatomical location

Skin tears were found on all anatomical locations, but those on the extremities equated to 93·27% of the total (see Figure 3). The upper limbs had 53·8% of these skin tears, the lower limbs 39·47% and other sites 6·73%. There was no significant difference ($P>0·599$) between the intervention and control groups when anatomical locations were collapsed by upper limbs, lower limbs, face and trunk (see Table 3).

However, there was a significant difference between low-care and high-care residents in the control group ($P=0·028$, χ^2). Residents in low care had more skin tears on the lower limbs (49·62%) than residents in high care (37·39%) and residents in high care had more skin tears on the upper limbs (55·23%) than those in low care (44·36%). There was no difference between type of care in the intervention group ($P=0·232$, χ^2) (see Table 4).

STAR Skin Tear Classification

As shown in Table 5, there was a significant difference ($P=0·000$, χ^2) between the groups in terms of the proportion of each STAR category of skin tear (23). The intervention group had a smaller proportion of category 1a and 1b skin tears (62·89%) than the control group (69·34%). However, a greater proportion of the skin tears in the intervention group were category 2a and 2b (26·89%) compared to the control group (21·78%). The proportion of category 3 skin tears was similar in the intervention (10·22%) and control (8·88%) groups.

Contributory factors

Hypothesised 'contributory factors', as reported in Table 6, were collected by the facilities as a component of their incident reporting. The main contributory factor for skin tears in both the intervention (36·15%) and control (40·4%) groups was found to be fragile skin. Overall, 72·39% of the contributory factors for skin tears were found to be fragile skin, outcome of a fall, and poor skin turgor. While shearing and friction forces associated with residents' transfer activities, residents' poor nutritional state, and 'other reasons' accounted for nearly a quarter of the injuries, those associated with wound dressings, adhesive tapes or bandages used, corticosteroid medications and 'unknown reasons' were relatively rare.

Table 4 Skin tear anatomical locations collapsed by groups and type of care*

	Low care		High care	
	n	%	*n*	%
Intervention group				
Upper limb (elbow, hand, upper and lower arm)	52	59·09	191	52·76
Lower limb (knee, upper and lower leg, feet)	34	38·64	147	40·61
Face & trunk (head, neck, face, shoulder, chest, abdomen, back, sacrum, buttocks, groin, hips)	2	2·27	24	6·63
Control group				
Upper limb (elbow, hand, upper and lower arm)	59	44·36	449	55·23
Lower limb (knee, upper and lower leg, feet)	66	49·62	304	37·39
Face & trunk (head, neck, face, shoulder, chest, abdomen, back, sacrum, buttocks, groin, hips)	8	6·02	60	7·38

*No significant difference in intervention group ($P = 0{\cdot}232$); significant difference in control group ($P = 0{\cdot}028$).

Table 5 STAR Skin Tear Classification

	Intervention		Control		Overall	
	n	%	*n*	%	*n*	%
1a	140	31·11	428	45·24	568	40·69
1b	143	31·78	228	24·10	371	26·58
2a	43	9·56	114	12·05	157	11·25
2b	78	17·33	92	9·73	170	12·18
3	46	10·22	84	8·88	130	9·31

Table 6 Contributory factors for skin tears

	Intervention		Control		Overall	
	n	%	*n*	%	*n*	%
Fragile skin	295	36·15	671	40·40	966	39·00
Outcome of fall	154	18·87	298	17·94	452	18·25
Poor skin turgor	149	18·26	226	13·61	375	15·14
Resident transfer activities	100	12·25	175	10·54	275	11·10
Poor nutritional status	52	6·37	157	9·45	209	8·44
Shearing and friction	44	5·39	57	3·43	101	4·08
Corticosteroid medications	2	0·25	10	0·60	12	0·48
Dressings, adhesive tapes or bandages used	3	0·37	7	0·42	10	0·40
Other and unknown reasons	17	2·08	60	3·61	77	3·11

Location where skin tears occurred

Skin tears occurred most commonly in the residents' bedrooms and the bathrooms. All other facility locations such as the lounge, dining room, activity area, corridor, entrance foyer or grounds represented less than a quarter of overall skin tear incident locations, and a small proportion of skin tears occurred whilst the residents were off-site (see Table 7).

Table 7 Locations where skin tears occurred

	Intervention		Control		Overall	
	n	%	*n*	%	*n*	%
Residents' bedrooms	303	67·33	658	69·56	961	68·84
Bathrooms	48	10·67	58	6·13	106	7·59
Other locations in the facility	81	18·00	168	17·76	249	17·84
Outside, in the grounds	9	2·00	40	4·23	49	3·51
Off-site (hospital visit, car trip)	9	2·00	22	2·33	31	2·22

Week day and time when skin tears occurred

Overall, more skin tears occurred on a Saturday, whilst the least occurred on a Thursday. Skin tears occurred more frequently during peak manual handling times such as when residents were being transferred into and out of their beds or when they were being assisted with bathing (see Figure 4).

Defining usual skin care practices

The results of the pre-study survey and interviews, which were conducted to identify usual skin care practices, showed that none of the facilities had pre-existing standardised skin-moisturising protocols that described the skin-moisturising lotions to be used or their frequency of application. Employed carers most often moisturised the residents' skin, and the frequency of application varied between carers and facilities, occurring either daily, twice daily or ad hoc. The post-study survey and interviews found significant changes in practice in the intervention group, associated with time of day and type of moisturiser used, as well as frequency of application, and these changes equated to the intervention protocol. The pre- and post-intervention staff survey results confirmed that the moisturising intervention was implemented as per the study protocol, and that the control group moisturising practices had changed little during the study.

Discussion

The study found that the twice-daily application of moisturiser to the extremities of residents in aged care facilities as compared to 'usual' skin care practices reduced skin tear incidence by almost 50%. The pre- and post-study surveys, which identified the usual skin care practices, provided a degree of confidence that practice contamination had not occurred between the two groups, and the lower incidence rate in the intervention group was attributable to the intervention. Furthermore, the main contributory factor for skin tears in both groups was found to be fragile skin, which is largely contingent upon xerosis and age-related changes.

As is the case with other reports, skin tears were found to be more prolific on the extremities and they were predominately STAR category 1a and 1b, where the edges can be realigned to the normal anatomical position without undue stretching (1,3,4,24). Among the low-care residents, skin tears occurred more frequently on the lower limbs, which could be assumed to relate to knocks and falls suffered by frail ambulant individuals. The more dependent high-care residents were found to have

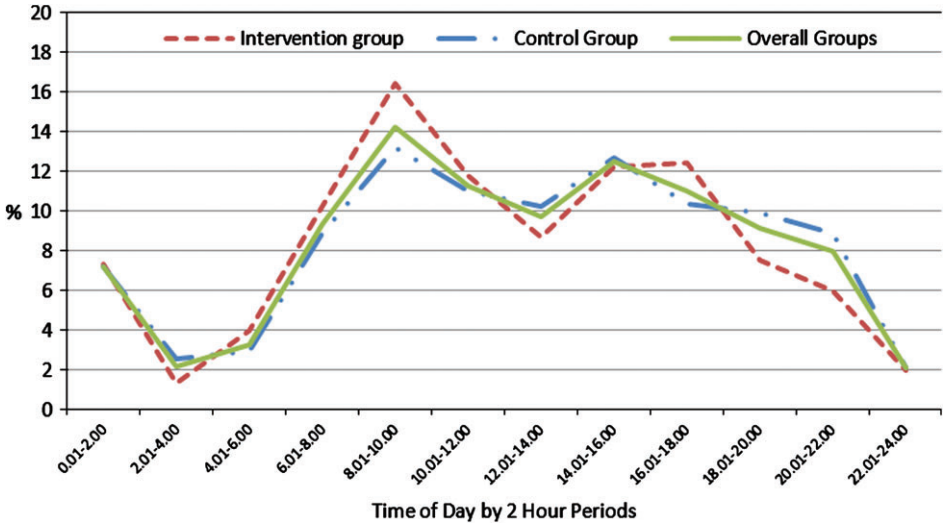

Figure 4 Times when skin tears occurred.

more skin tears on the upper limbs, and it is proposed that the arms are more at risk when dependent residents are being repositioned or transferred (1,4,7). This assumption was reflected in the finding that the most common facility location for injury was the residents' bedrooms and that the injuries occurred during times when residents were most likely to be transferred out of, or into, bed. Similar associations have been made by other authors (4). Although not the focus of this study, beds, bed-rails, chairs and wheelchairs have been reported as high-risk factors for skin tears, and prudent selection and use of these devices is warranted, as is the selection and use of skin protective devices and manually handled assistive devices (4,24).

The study findings highlight the need for standardised twice-daily skin-moisturising protocols and mandatory staff education on skin tears and their prevention. Nonetheless, 450 skin tears occurred in the intervention group despite the intervention, and this indicates the need for more studies to test other interventions to further reduce the impact of these injuries on the well-being of individuals and health expenditure in general.

A limitation of this study was that the sample comprised frail elderly Caucasians, who lived in a country with high sun exposure. Therefore, the findings of this study cannot be generalised to other populations. The need to replicate the study amongst Asian and dark-skinned elderly populations as well as those who live in more temperate or humid climates is warranted to determine if the same results can be achieved.

Conclusion

The study determined that the simple and relatively inexpensive application of pH neutral, perfume-free moisturiser twice daily can substantially reduce skin tears among aged care residents. Given the high prevalence of skin tears reported in hospitals as well as aged care facilities and the community, it is strongly recommended that this practice be adopted and promoted across all sectors. A reduction in skin tears and their often considerable consequences will not only result in the improved well-being of individuals, but also reduce the health care burden for agencies and individuals.

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