An audit of patient outcomes in the management of skin tears using silicone dressings

KEY WORDS

- Nursing homes
- Silicone dressings
- Skin tears
- Wound healing

This article reviews the literature on skin tear (ST) management and presents the results of an audit of silicone dressings in nursing homes. Fifty nursing homes were contacted and asked whether they would like ST training, backed up with a ST audit of their residents. Forty-two teaching sessions took place. The ST training covered the physiology of the skin, ST prevention, risk factors, STAR classification and first aid management. Four silicone dressings were used: Allevyn Gentle Border, Mepilex Border, Advazorb Border and Kliniderm Border. Dressing changes were performed and monitored by the tissue viability nurse consultant on days 1, 3, 7 and 14. Dressing performance in relation to the peri-wound skin, maceration, dermatitis, inflammation, irritation and dryness was evaluated. The amount of exudate was recorded by weighing the dressing after removal. Ease of dressing removal was noted. The analysis found similar age, body mass index, Waterlow scores and Malnutrition Universal Screening Tool scores. The differences in sizes of the STs was not significantly different and they healed within consistent time frames. Healing time increased with ST size and STAR classification. The Advazorb Border dressing was significantly better at staying in place and was removed more easily than the other dressings.

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For the first time in history, there are 11 million people aged 65 or over in the UK and 3 million people aged 80 or over (Office for National Statistics, 2014). The number of people over age 85 in the UK is predicted to double in the next 20 years and nearly treble in the next 30 years (Office for National Statistics, 2013). In the light of these facts, skin tear prevalence can be expected to escalate in line with the ageing population (Carville et al, 2007); therefore a challenge facing clinicians treating the increasing elderly population will undoubtedly be the increase in the number of skin tears.

Skin tears commonly occur in individuals at the extremes of age, or in those who are critically ill or medically compromised and who require assistance with personal care (Carville et al, 2007; Payne and Martin, 1990, 1993). Patients who are dependent on others for total care needs are at the great risk. Frequently, skin tear injuries are linked to the use of wheelchairs, blunt trauma and patient transfers (Banks and Nix, 2006; Le Blanc et al, 2008). Dependent patients frequently acquire skin tears during routine activities, such as washing, dressing, repositioning and transferring, with the second highest at-risk group being independent, mobile patients. The majority of skin tears occur on lower limbs (Le Blanc et al, 2011). Patients within care homes are vulnerable to skin tears. A 2011 audit of 52 care homes with a total of 2,200 patients over a 12-week period identified 49 patients with skin tears (Stephen-Haynes et al, 2011).

The incidence of skin tears is increasing in both the acute and community settings but the actual incidence and cost to the NHS is unknown (Stephen-Haynes et al, 2011). This is because these wounds go largely unreported, especially in the community (Malone et al, 1991; White et al, 1994), where patients may self-treat them at home or be treated by a community nurse or GP. Skin tears are under-reported in healthcare settings due to poor assessment and inadequate

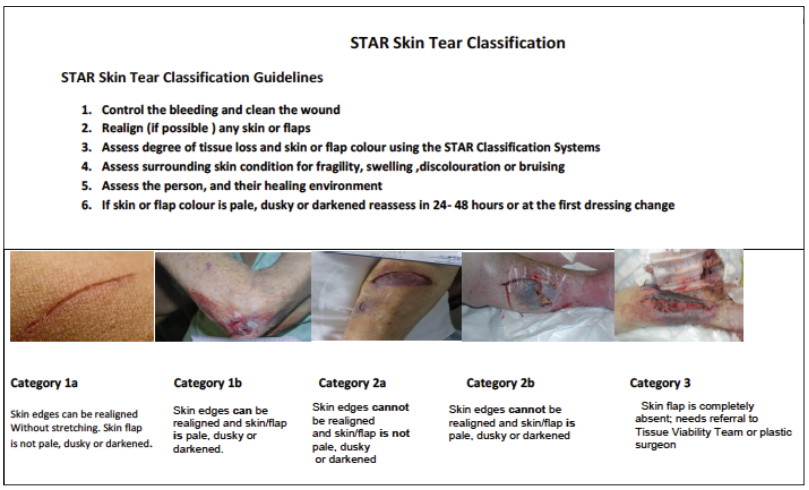

Figure 1. STAR skin care classification cards given to staff to aid in the management of skin tears (adapted from Carville et al, 2007)

management (Le Blanc et al, 2011). They can be complex in the elderly, particularly if the wound becomes infected or if the person has comorbidities that can lead to a delay in wound healing. Patients are often taken to accident and emergency or minor injury units for assessment and may require hospital admission.

SKIN PHYSIOLOGY AND RISK FACTORS FOR SKIN TEARS

Physiological changes to the skin become apparent as ageing progresses. Intact skin is a major part of the body's immune system that provides a mechanical barrier to the ingress of microorganisms and waterproofing with lipids (Butcher and White, 2005). With age, skin tends to thin, have reduced elasticity due to changes in collagen structure, and be increasingly dry due to a reduction in the number of sweat glands and reduced sebum production (Timmons, 2006). In the elderly the propensity for dry skin occurs most often on the lower legs, hands and trunk (Norman, 2003). Natural oils are removed from the skin surface when bathing, which exacerbates the potential for dry skin, particularly in the elderly as natural oil production is diminished; replacement with emollients is therefore essential (Le Blanc and Baranoski, 2009). Using alkaline soaps increases the skin's pH, thus reducing its protective acid mantle (Le Blanc et al, 2008; Le Blanc and Baranoski, 2009). Other influencing factors are the weather, which can dry out the skin in the colder months, and central heating, which dries the air (Le Blanc et al, 2008).

The epidermis and dermis weaken as the papillae lose strength and the skin flattens (Beldon, 2012). This flattening, along with natural thinning of the skin, begins after age 70 and increases skin's susceptibility to moisture and friction (Cooper, 2006), while reducing its resistance to shear forces (Voegell, 2010). The 20% reduction in the thickness of the dermis layer causes a reduction in blood supply, the number of nerve endings and amount of collagen (Baranoski and Ayello, 2004). This results in reduced sensation, poor temperature and moisture control, and rigidity (Cooper, 2006).

Subcutaneous fat is also lost with age and veins become more prominent and easily damaged (Nazarko, 2007). The amount of elastin in the skin is reduced, leading to reduced suppleness and increased risk of injury (Beldon, 2012). Malone et al (1991) identified specific areas of the body where the subcutaneous layer becomes thinner and atrophy and skin tears occur; namely the face, neck and dorsal aspect of hands. The vascular bed becomes more fragile, which can result in bruising that can lead to skin tears (White et al, 1994). Consequently, the smallest knock or bump can result in skin damage (LeBlanc et al, 2011). The very young and very old, the critically ill and end-of-life patients produce immature skin cells, and are thus more susceptible to skin tears (LeBlanc et al, 2011).

An international consensus panel defined skin tears as: "A wound caused by shear, friction and or blunt force resulting in separation of skin layers. A skin tear can be partial thickness (separation of the epidermis from the dermis) or full thickness (separation of both the epidermis and dermis and dermis from underlying structures)" (LeBlanc et al, 2011). The development of taxonomy for skin tear classification began over 20 years ago. The first was the Payne–Martin classification system (1993). In Australia, Carville et al (2007) developed the STAR classification for skin tears:

- S: Select appropriate dressing
- T: Tissue alignment
- A: Assess
- R: Review and reassess.

The audit by Stephen Haynes et al (2011) proved the STAR classification to be easy to use

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and helped in the development of guidelines to standardise timely and appropriate care. The STAR acronym enables appropriate assessment and treatment of skin tears (Stephen-Haynes and Carville, 2011).

SILICONE DRESSINGS

Current best practice dictates that skin tears should be managed by providing comfortable and appropriate dressings to maintain an optimal wound environment that does not create trauma on removal. Soft silicone dressings reduce damage to the skin surrounding pressure ulcers and decrease the maceration and trauma associated with dressing change (Meaume et al, 2003). These types of dressings protect vulnerable and fragile skin, minimising friction and shear (Meuleneire and Rucknagel, 2013).

Silicones are synthetic compounds that take the form of oils, rubbers or resins (Meuleneire and Rucknagel, 2013). Soft silicone is hydrophobic and is made malleable and 'tacky' so that it lies on the surface of the wound bed, while only adhering to the dry skin and leaving the bed wound free from damage. This makes silicone dressings ideal for fragile skin. The silicone is designed to protect the wound bed and be non-traumatic on removal, but allows the passage of exudate (Meuleneire and Rucknagel, 2013).

AIM AND OBJECTIVES

The aim of the audit was to determine the clinical efficacy and cost-effectiveness of four silicone dressings (Advazorb Border, Allevyn Gentle Border, Mepilex Border and Kliniderm Border) in 80 patients' wounds in the nursing home setting. The primary objective was to determine whether there was any difference between the four silicone dressings in absorbing exudate, improving the peri-wound skin and reducing the frequency of dressing change. How much the exudate weighed on dressing removal was also measured. The secondary objectives were to evaluate:

- Odour, infection and wound healing
- The costs of silicone dressings

METHODOLOGY

The managers of 50 nursing homes were contacted and asked whether they would like to undertake skin tear training, supported by a skin tear audit on their residents. There were 30 nursing homes that participated in the audit. Permission for the audit to take place was obtained from the local tissue viability team and managers from the participating nursing homes. Forty-two teaching sessions took place. The skin tear training was delivered to registered and unregistered staff, and covered the physiology of the skin, skin tear prevention, risk factors, STAR classification and first aid management. Most staff stated they had not had training on skin tear management at all. Once trained, staff received a first aid bag with which to manage skin tears; this contained saline, Steri-Strips, dressing pack including a selection of Advazorb Border, Allevyn Gentle Border, Mepilex Border and Kliniderm Border dressings in various sizes, bandages and adhesive removal spray. Additionally staff members were given laminated A6-size STAR classification cards (*Figure 1*) to keep in their pockets. An A4 size version was provided for clinical rooms and offices, as was a flow chart of the audit.

Table 1. Demographics and test scores for patients in the dressing groups

Dressing group	M/F (*n*=20)	Mean age (years)	Mean body mass index	Mean Waterlow score	Mean MUST score
Advazorb Border	7/13	90.0	20.0	20.0	0.60
Allevyn Gentle Border	4/16	88.0	21.0	90.0	0.95
Kliniderm Border	5/15	86.9	21.0	20.0	1.25
Mepilex Border	4/16	89.6	19.9	19.9	0.70

Key: M/F: males/females in group; MUST: Malnutrition Universal Screening Tool

Patient identification and recruitment

Nursing staff contacted the tissue viability nurse consultant (TVNC) and informed her that their nursing home had a patient who had sustained a skin tear. The TVNC checked that staff had applied the randomly selected silicone dressing from the first aid bag, and that they had carried out the first aid correctly. She then arranged a time to assess the patient within 24 hours of the injury. Written consent was obtained from the patient or a relative when possible. Where the patient was unable to give consent, the senior nurse in the nursing home authorised the TVNC

Table 2. Location and number skin tears that were included in the audit

Location of tear	Number
Tibia	25
Forearm	23
Elbow	12
Hand	11
Upper arm	4
Knee	3
Ankle	1
Head	1

Table 3. STAR classifications for skin tears that occurred during the audit

Dressing	Classification				
	1a	1b	2a	2b	3
Advazorb Border	0	10	6	2	2
Allevyn Gentle Border	1	8	6	1	4
Kliniderm Border	2	9	8	1	0
Mepilex Border	2	12	2	2	2

Table 4. Sizes of skin tears in the four dressing groups

Measurement	Advazorb Border	Allevyn Gentle Border	Kliniderm Border	Mepilex Border
Length in cm (ANOVA p=0.29)				
Mean	4.3	3.7	3.1	3.5
Standard deviation	2.7	1.8	1.6	2.0
Median	3.0	3.2	3.0	3.2
Low	2.0	1.5	1.0	1.0
High	13.0	8.0	7.0	8.0
Width in cm (ANOVA p=0.16)				
Mean	2.1	2.8	1.8	1.8
Standard deviation	1.3	2.2	1.6	1.2
Median	2.0	2.25	1.5	1.5
Low	0.5	0.2	0.2	0.5
High	7.0	9.0	7.0	5.0
Area in cm^2 (ANOVA p=0.51)				
Mean	10.5	11.5	6.8	7.7
Standard deviation	12.1	12.6	10.7	9.7
Median	6.8	7.5	3.0	4.6
Low	1.25	0.3	0.7	0.75
High	49.0	54.0	49.0	40.0

to deliver the dressing change in the best interest of the patient and took photographs for clinical purposes only. This was recorded in the patient's notes and care plan.

To be included in the audit, patients had to be aged 18 years or older, consent to participate (written, informed consent/witnessed verbal consent/consultee agreement) and expected to comply with the follow-up schedule. Patients were excluded if they expressed that they were unwilling to participate or would not keep the dressing on due Alzheimer's disease, had clinically-infected wounds or had a changeable condition that compromised normal treatment.

Assessment and dressing regimen

All skin tears were assessed using the STAR classification system by the same TVNC assessor. Patient demographics, age, sex, nutritional status, medical conditions, wound information, site of the skin tear(s) and duration of the wound were recorded along with the STAR classification. The location of the wound and the time of day the skin tear was sustained were also noted.

The silicone dressing was used as a primary dressing. Data were collected on the frequency of dressing change and the dressing products involved. Every patient had their dressing change performed and monitored by the TVNC on days 0, 3, 7 and 14. The time frames were the same as those used in the audit by Stephen Haynes et al (2011). The absorbance capacity, the amount of peri-wound skin, maceration, dermatitis, inflammation, irritation and dryness were evaluated. The amount of exudate was recorded by weighing the dressing that was removed and comparing it to the weight of the unused dressing. The exudate characteristics were recorded (World Union of Wound Healing Societies, 2007). Any additional dressing changes and their frequency were recorded. Every assessment followed the TIME (Tissue management, Inflammation and infection control, Moisture balance, Epithelial (edge) advancement) framework (Dowsett, 2008). All wounds were photographed and clinical assessments included wound exudate measurement and odour. Wound healing progress was noted in relation to the type of skin tear. If a patient withdrew from the audit for any reason, this was noted. These data were excluded from the analysis. All data were recorded manually on paper and then input into Microsoft Excel.

Data analysis

Audit data were analysed by an independent statistician using Microsoft Excel and VassarStats (http://vassarstats.net/). All continuous variables were analysed. Where data were apparently non-Gaussian or ordinal, non-parametric statistical tests (Mann–Whitney, Kruskal–Wallis or χ^2 tests) were used. For Gaussian data, student t-testing was applied.

Table 5. Sizes of dressings used

Size of dressing	Number used
10 cm × 10 cm	35
7.5 cm × 7.5 cm	20
15 cm × 15 cm	9
10 cm × 12.5 cm	8
12.5 cm × 12.5 cm	5
15 cm × 17.5 cm	2

RESULTS

Ninety-three patients were recruited, 13 of which did not complete the audit (six died, six were withdrawn as they were non-concordant with keeping the dressing *in situ*, and one patient was admitted to hospital). The audit therefore reports on 80 patients in nursing homes, with 20 patients in each of the silicone dressing groups (*Table 1*). The baseline demographics showed no significant difference between the ages in the four groups, which ranged from 70 to 107 years, or in body mass index (BMI). The mean Waterlow scores did not significantly vary, however there were differences in the mean Malnutrition Universal Screening Tool scores. In the Kliniderm Border group, the mean MUST score was higher than in the other dressing groups, but not statically significantly so. The majority of patients (n=53) were very immobile, being either wheelchair- or bed-bound. In addition to this, the majority of patients (n=60) were cognitively impaired or had dementia.

The location of the skin tears varied (*Table 2*). There were no significant differences between the groups regarding the sites of the skin tears. The day was broken down into three periods: morning, afternoon and night. Thirty patients sustained skin tears in the morning, 32 patients in the afternoon, and 18 patients at night. There were no significant differences relating to the time of day at which a skin tear occurred (p=0.27). When time of day *versus* STAR classification was tested by simple correlation

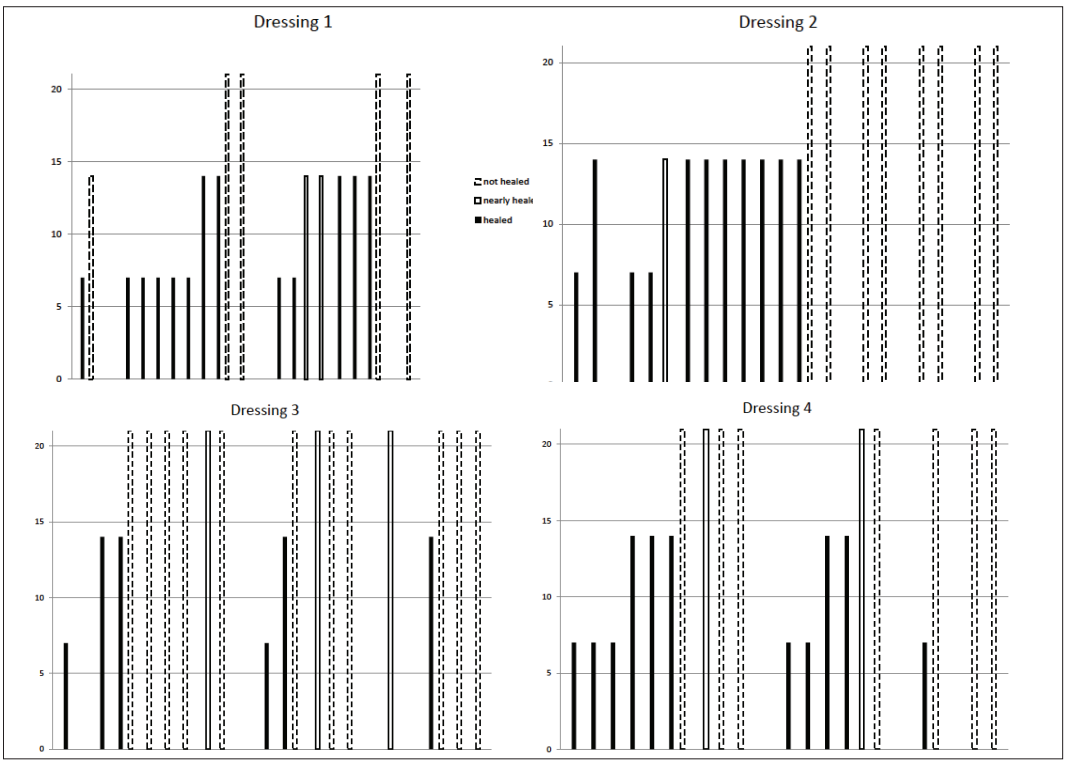

Figure 2. Skin tear STAR classification and healing time for the four dressings

Table 6. Ability of the dressings to stay in place

Dressing group	Number that stayed in place (%)	Number that did not stay in place (%)
Advazorb Border	55 (98.2)	1 (1.8)
Allevyn Gentle Border	48 (82.8)	10 (17.2)
Kliniderm Border	44 (89.8)	5 (10.2)
Mepilex Border	41 (74.5)	14 (25.5)

Table 7. Ease of dressing removal and the use of adhesive removal spray in the different dressing groups

Dressing group	Dressing removal		Spray required	
	Difficult (%)	Easy (%)	Yes (%)	No (%)
Advazorb Border	18 (21.2)	67 (78.8)	18 (21.2)	67 (78.8)
Allevyn Gentle Border	38 (63.7)	22 (36.6)	49 (94.2)	3 (5.8)
Kliniderm Border	43 (63.2)	25 (36.8)	59 (95.1)	3 (5.8)
Mepilex Border	33 (49.2)	34 (50.2)	48 (76.2)	15 (23.8)

(r=0.125; t=1.111; df=78; 2-sided p=0.27), the differences were not significant. Each group's STAR classifications were compared (*Table 3*). These classifications were similar, however there were no STAR 3 skin tears in the Kliniderm Border group.

There were no significant differences in skin tear size (*Table 4*). This demonstrates that the STAR classifications were evenly distributed across the dressing groups.

The four brands of dressings are available in various sizes, ranging from 7.5 cm × 7.5 cm to 15 cm × 15 cm. There was no significant difference in the sizes of dressings used between groups. The most frequently used size of dressing was 10 cm × 10 cm (*Table 5*).

There were no significant differences in rates of healing between the dressing groups when tested using analysis of variance (ANOVA) and student's t-test (p=8.5). The duration to healing times for each of the STAR classifications were comparable (*Figure 2*), with the more severe STAR classification taking over 20 days to heal. The time to healing related to the size of the wound.

The Advazorb dressing was significantly better at staying in place than the other dressings (χ^2=3.95, p=0.26) (*Table 6*). Compared to the other groups, dressing removal was significantly easier in patients in the Advazorb Border group (χ^2=36.5, $p\leq0.0001$) and the use of adhesive removal spray was significantly lower in this group (χ^2=121.69, $p\leq0.0001$), *Table 7*.

The weights of the dressings at removal were recorded, but there was minimal exudate and therefore no significant difference. The odour was found to be minimal due to the type of wound under audit.

None of the patients had indications of an infection at any time during the 14-day audit period. After this time, two patients developed lower grade cellulitis and were given antibiotics. Both patients had skin tears to their lower legs and had lymphoedema as a long-standing medical condition.

Cost of dressings

All dressings are available for sale in the UK and the prices were taken from the March 2016 *Drug Tariff* (*Table 8*). The price of the 50 ml Easy Peel™ spray was £7.10. One unit lasted 3–4 weeks per patient.

DISCUSSION

The patients included in this audit were taken from a convenience sample and were characteristic of patients at risk of skin tears. The analysis found age, BMI, and Waterlow and MUST scores to be similar. The ages of the participants in this audit ranged between 70 and 107 years, which agrees with Woolhouse and Moola's (2014) statement that patients over the age of 65 years are more susceptible to skin tears due to changes in the ageing skin. All patients had BMI scores in the healthy category, as demonstrated by the mean scores given in *Table 1*. The Waterlow score indicated that all patients were at very high risk for pressure ulcers, which in turn correlates with an increased risk of skin tears. This risk includes factors of advancing age, impaired mobility, poor nutrition and comorbidities.

The results of this audit concur with previous studies on the locations of skin tears, the highest numbers being the on the tibia, forearm, elbow and the hands. Stephen-Haynes and Carville (2011) state that skin tears in the elderly are often sustained on the extremities, such as the upper and lower limbs and the dorsal aspect of the hand. Interestingly, this audit found no differences in the time of day skin tears occurred (p=0.27). LeBlanc et al (2011) state that skin tears frequently occur during routine activities such

as dressing, bathing, repositioning and transferring patients, which are more likely to occur during the day.

The sizes of the skin tears did not differ significantly between groups and healed in consistent time-frames. The higher STAR 3 tears in this audit took slightly longer than 21 days to heal. This is consistent with the findings from other studies. Holmes et al (2013) demonstrated a healing time of 10 days for category 1, and 14–21 days for categories 2 and 3. Payne and Martin (1993) demonstrated that category 1 skin tears healed within 10 days, and categories 2 and 3 healed in 14–21 days. Stephen-Haynes and colleagues' recent evaluation showed that skin tears healed at between 7 and 21 days (Stephen-Haynes et al, 2016).

The silicone dressings were changed on days 1, 3, 7 and 14, which resulted in effective wound healing. Despite the majority of patients being cognitively impaired, most silicone dressings stayed in place. The most frequently used dressing size was 10 cm × 10 cm, followed by 7.5 cm × 7.5 cm. The cost of the 10 cm × 10 cm dressing ranged from £1.63 (Kliniderm Border) to £2.10 (Advazorb Border). Given that the Advazorb Border dressings stayed in place longer and were removed more easily, rarely requiring the use of an adhesive removal spray, the additional cost can be justified. Dressing changes in patients with cognitive impairment and dementia can be challenging for practitioners and upsetting for the patients, so having a silicone dressing that can be removed without using an adhesive spray can be very beneficial to the patient.

Nurses should be aware of the risk factors associated with patients sustaining a skin tear and know how to manage tears effectively. Education relating to the older person's skin and its appropriate management can optimise healthcare resources. Woolhouse and Moola (2014) undertook a project promoting best practice in the management and ongoing treatment of skin tears to improve outcomes in an elderly care setting. They concluded that ongoing education on skin tears and the development of an evidence-based care pathway can help to improve skin integrity and prevent skin tears. The development of strategies to reduce the incidence of skin tears, such as falls prevention, medication management and behaviour management, are required. In the current audit, nurses in the nursing homes found the evidence-based skin tear management protocol invaluable. Anecdotally, due to the staff's increased awareness of skin tear prevention there was a decrease in the number of skin tears in their nursing homes. The first aid kit and skin tear care pathway, plus the option of contacting an expert if there were any problems, enabled staff to effectively manage skin tears *in situ*. Some of the STAR 3 tears were thus managed in the nursing home, avoiding a hospital admission.

Table 8. Product size and price (*Drug Tariff*, March 2016)

Dressing group	Dressing size	Price per dressing
Advazorb Border	7.5 cm x 7.5 cm	£1.19
	10 cm × 10 cm	£2.10
	12.5 cm × 12.5 cm	£2.58
	15 cm × 15 cm	£3.15
Allevyn Gentle Border	7.5 cm × 7.5 cm	£1.49
	10 cm × 10 cm	£2.19
	15 cm × 15 cm	£4.00
Kliniderm Border	7.5 cm × 7.5 cm	£1.18
	10 cm × 10 cm	£1.63
	15 cm × 15 cm	£3.95
Mepilex Border	7.5 cm × 7.5 cm	£1.39
	10 cm × 12.5 cm	£2.72
	15 cm × 17.5 cm	£4.74

Limitations

This audit had a few limitations. As the sample size was small, a larger controlled/comparative trial in multi nursing homes was used to confirm and establish the results identified in this audit. A large sample size would allow healing rates to be compared against the STAR classification categories. Data were only collected over a 6-month period, which will not demonstrate whether the decrease in skin tears noticed was incidental or due to training and increased awareness, and if so whether it was sustained.

All patient assessments were undertaken by one TVNC, which could introduce bias. To overcome this, the statistical analysis was undertaken independently and was totally blinded. The recruitment of patients with the same type of wounds (skin tears) resulted in a

Box 1. Recommendations for clinical practice

- Always use an atraumatic dressing
- Always remove with adhesive spray, if skin is considered at risk of further damage
- Redress STAR classification 1–2a skin tears on day 3 and every 7 days thereafter
- Redress STAR classification 2b skin tears on day 3 and every 4 days thereafter to monitor for infection.

participant pool consistent with the classic at-risk population; however, patients' ability to consent was limited. Written consent was obtained from the patient or a relative when possible. In other cases, the senior nurse in the nursing home gave witness assent. It was not possible to gain patient's perceptions of the dressings due to most patients having dementia.

CONCLUSION

Silicone dressings have been widely used to manage skin tears. This audit on silicone dressings has provided a valuable insight into the management of skin tears in patients in a nursing home environment. All of the silicone dressings used in this audit had positive clinical outcomes, with healing or progression to healing in all cases. Of the four dressings audited, the Advazorb Border dressing was the easiest dressing to remove and rarely required adhesive removal spray.

The results of this audit endorse best practice in skin tear management, which avoids further trauma, prevents infection, manages exudate and uses moist wound therapy to heal the skin tear in a timely fashion. Delays in healing due to infection and other complications can add to healthcare costs, whereas comprehensive assessment and the effective management of skin tears can expedite healing in this very vulnerable client group. WUK

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