Cost implications of using an atraumatic dressing in the treatment of acute wounds

Three randomised controlled trials have compared a soft silicone dressing with traditional treatment on acute wounds. This analysis shows the former reduced overall costs by accelerating healing and reducing wound pain and resource use

healing rates; wound pain; resource use; cost-effectiveness

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Expenditure on wound care is significant for health-care providers around the world. In the UK, for example, the total annual cost of wound management has been reported to be as high as £3 billion.[1] In the US wound care costs the health-care system more than $20 billion each year, including more than $4 billion on wound-management products.[2]

Wounds can be classified as either acute (eg, traumatic, surgical and burns) or chronic (eg, leg ulcers and pressure ulcers). Acute wounds heal in a complex and dynamic process of overlapping and integrated phases: inflammation, tissue formation and tissue remodelling.[3,4] With the exception of burns, acute wounds generally require simple dressings to produce an environment that is conducive to healing and so are less expensive to treat than chronic wounds. Burns are complicated and tend to heal more slowly, and so are associated with high treatment costs.[5]

Hard-to-heal chronic wounds are also expensive to treat due to their longevity and the need to effectively manage associated clinical problems, such as exudate production, bioburden and pain. The financial burden that the treatment of chronic wounds and burns places on health services is considerable (Table 1).[6-15] As the prevalence of chronic wounds will rise as the population ages, so the economic burden of wound care looks set to increase. For example, the total number of people with diabetes is expected to rise from 171 million in 2000 (2.8% prevalence) to 366 million (4.4% prevalence) by 2030.[16] Consequently, the number of individuals affected by the chronic complications of diabetes, including foot ulceration, is also predicted to rise,[17] significantly impacting on the resources of health services.

Due to the limited funds available, the cost of resources used in the provision of wound care (eg, dressings and bandages; time spent by practitioners with patients) is becoming a significant area of focus for health-care providers. Resources consumed in the prevention and treatment of wounds are large in terms of disposables, equipment and, above all, nursing time. For example, over £200 million is spent annually on dressings in the UK.[18]

It is important, however, that these costs are not considered in isolation; the outcomes (general health benefits) associated with interventions (eg, wound healing, reduction in wound pain) must also be taken into account. In view of this, health-care providers are increasingly looking for detailed information on the cost-effectiveness of wound-care products and therapies.

Use of a specific dressing or treatment in wound care is dictated by limitations imposed by human and financial resources. Practitioners need to give due consideration to cost-effectiveness and the benefit to the patient when selecting a dressing. Selection based on an initial low unit cost does not necessarily equate with best value for money when trying to achieve a successful clinical outcome.[19]

Cost-effectiveness analyses are increasingly being used to provide information on the relative costs

Table 1. Wound management costs in the UK and the US

Wound type	Country	Cost	Reference
Burn	US	$95,521	6
Skin graft	US	$2397–17,220) (outpatients–inpatients)	7
Diabetic foot ulcer:	UK	£3600	8
	US	$22,000–36,000	9
Pressure ulcer:	UK	£1064–10,551 (grade I–grade IV)	10
	US	$5000–60,000	11, 12, 13
Venous leg ulcer:	UK	£546–1338	14
	US	$40,000	15

Table 2. Randomised controlled trials that compared the soft silicone wound-contact dressing with a comparator dressing

Dahlstrom[32]
Delayed split-skin grafting
Mepitel (n=32) versus paraffin gauze (n=32). Saline-soaked gauze was applied over both dressings
Mepitel was associated with significantly less wound bed adherence (p<0.001), less pain (p<0.001) and bleeding (p=0.02), and less time was needed for dressing changes, compared with paraffin gauze (p=0.02)
Bugmann et al. [33]
Paediatric burns
Mepitel covered with chlorhexidine-soaked gauze (n=41) versus silver sulphadiazine covered with a tulle gras sheet and gauze (n=35)
Mepitel was associated with faster healing (p<0.001) and fewer dressing changes (p<0.05) compared with the silver sulphadiazine regimen. Mepitel was reported to be easy to use, with atraumatic removal
Gotschall et al.[34]
Paediatric, partial-thickness burns
Mepitel (n=33) versus silver sulphadiazine (n=30). Gauze was applied over both dressings
Mepitel was associated with faster healing (p<0.001) and less eschar formation (p<0.05) compared with silver sulphadiazine. Mepitel was associated with easy, atraumatic dressing changes and fewer dressing changes (p<0.05) compared with silver sulphadiazine, thereby reducing the pain experienced and the associated treatment costs (p=0.025)

and health benefits of a wide range of interventions. They can, therefore, be viewed as a means of calculating the potential health benefits to patients, taking into account the resources associated with particular interventions. Cost-effectiveness analyses can be undertaken to show that currently adopted interventions are cost-ineffective, but conversely they can be used to identify cost-effective opportunities presented by interventions not currently utilised, that could ultimately lead to improvements in patients' health.[20]

In the 1960s a landmark paper showed that faster healing can be achieved by keeping wounds moist.[21] As a result, 'cheap' gauze dressings and bandages gave way to modern dressings, which interact with and manage the wound environment.[22] However, many can give rise to wound pain and tissue trauma.[23] The latter results from exogenous damage to the skin caused by repeated application and removal of adhesives tapes and dressings, which ultimately results in skin stripping. Variable levels of damage, usually involving the stratum corneum, may be inflicted. Repeated trauma may result in inflammatory skin damage, oedema, skin soreness and an adverse effect on skin barrier function.[24,25] Additionally, dried out dressings and excessive dressing adherence are the major causal factors of pain at dressing change.[26] Once adherence has occurred, dressing removal can be extremely painful and may damage the newly-formed epithelium and surrounding skin, delaying healing, increasing the risk of scar tissue formation and, potentially, increasing treatment costs.[27]

Wound pain is a known stressor, and pain-induced stress can delay healing.[28] As a consequence, there has been an increasing clinical focus on wound pain, including pain at dressing change. This has led to the publication of statements and guidelines on the management of wound pain.[26,29,30]

To reduce the damaging effect of dressings on wound tissue and peri-wound skin, technologies have been developed to avoid adhesion — one example being dressings that utilise soft silicone (Safetac) adhesive technology. This enables the dressing to adhere to intact dry skin but not to the surface of moist wounds, avoiding damage to fragile new tissue on removal.[24,31]

Mepitel (Mölnlycke Health Care, Gothenburg, Sweden), a sterile, porous, semi-transparent wound-contact layer consisting of a flexible polyamide net coated with soft silicone, was the first 'atraumatic' dressing to be introduced. It can be used on both acute and chronic wounds.

This paper compares the cost implications of using this soft silicone wound-contact dressing versus traditional dressings (defined as gauze, with or without additional agents) in the management of different wound types.

The literature search

An extensive literature search was undertaken to identify published articles that presented clinical data on the performance of this soft silicone wound contact dressing. Electronic searches of bibliographic databases (Medline and Embase) and internet sites (Cochrane Library and World Wide Wounds) were supplemented with manual searches of journals of relevance to wound management. Search terms used in the electronic databases were 'Safetac' or 'Mepitel' or 'silicone dressing', covering the period between 1990 (when Mepitel was launched) and 2008.

The literature search identified only three studies, all randomised controlled trials (RCTs),[32,33,34] that compared the soft silicone dressing with traditional dressings on a number of different wound types (Table 2). Although the studies were not robust prospective health economic evaluations, data generated from them can be used to demonstrate the cost implications of using a soft silicone dressing versus other commonly used dressings. These data were therefore used to derive health economic comparisons, based

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on key wound management-related cost factors:
- Delayed healing
- Trauma to the wound and surrounding skin on dressing removal
- Prolonged treatment time due to dressing-related wound trauma
- Pain on dressing removal (which has a negative impact on quality of life)
- Time taken for dressing changes
- Dressing costs
- Hospitalisation costs.

Direct, indirect and intangible costs, as well as a comparison of fixed versus variable costs, should be used to measure the overall cost of wound care.[35] Unfortunately, including all such variables in a cost-effectiveness analysis based on a retrospective review of published data is not always possible as the clinical trials from which the data arise may not necessarily have been designed to evaluate all of the cost-related parameters. Based on the outcomes reported in these studies, this analysis therefore used healing rates, wound pain and resource use as the key cost drivers.

Finally, the wounds presented in these studies can mostly be classed as acute, although burns have their own unique clinical obstacles. It is thought that the premise leading to cost reductions based on the parameters evaluated can be extrapolated to other wound types, including chronic wounds.[36]

Healing rates

In the RCT undertaken by Bugmann et al., healing was evaluated in burned paediatric patients. The results showed that patients treated with the soft silicone dressing had significantly higher healing rates (7.58 ± 3.12 days) than those treated with the comparator (silver sulphadiazine under tulle gras) dressing (11.26 ± 6.02 days) ($p<0.01$).[33] Chlorhexidine was used as a topical antiseptic with the soft silicone dressing, but the literature indicates that chlorhexidine has no beneficial effects on healing[37] and may even have detrimental effects due to its cytotoxicity.[38]

A similar trend in favour of the soft silicone wound-contact dressing was found in the RCT by Gotschall et al., which compared its efficacy with silver sulphadiazine under gauze in children with partial-thickness scalds. Kaplan-Meier survival curves were used to evaluate the effect of the two dressing regimens on healing times. The results showed that the median time to 100% epithelialisation was 10.5 days for the wounds treated with the soft silicone dressing and 27.6 days for those treated with the comparator (silver sulphadiazine/gauze) dressing ($p=0.0002$).[34] Obviously, dressings associated with the shortest healing time will be the most cost-effective, regardless of whether this was because the soft silicone dressing aided healing or the silver sulphadiazine was deleterious, although no published data to support the latter could be found.

Wound pain

Pain resulting from the wound itself or trauma during dressing changes or other interventions can adversely affect patients' quality of life and delay healing.[28] Regarded by some as the 'fifth vital sign' to be routinely assessed along with blood pressure, pulse, temperature and respiration,[39] pain is clearly associated with a hidden cost in wound management.[40,41]

In a prospective RCT, Dahlstrom evaluated patients' subjective perception of pain on dressing removal of split-skin grafts.[32] The visual analogue scale (VAS), a well-recognised and validated pain assessment tool, was used to evaluate pain severity.[42,43] Eighty-four per cent of patients treated with the soft silicone dressing rated their pain severity between 0 and 1, compared with 31% of those treated with the comparator dressing (paraffin gauze). Conversely, 16% of those given the soft silicone dressing rated their pain severity between 2 and 10 compared with 69% of those treated with the comparator dressing ($p<0.001$). Paraffin gauze has been used for many years, but because of its relative cheapness is perceived to be cost-effective. It is still used in the clinic and is seen as a valid dressing for this indication, although problems with wound adherence have been identified.[44,45]

Gotschall et al. measured pain at dressing changes using the objective pain scale (OPS).[46,47] Silver sulphadiazine is still the most widely used treatment for partial- thickness burns[48] and is rated as the 'gold standard', although there are potential cytotoxicity issues[49] and it has been implicated with bacterial resistance to silver.[50] The mean OPS score for patients treated with the soft silicone dressing was significantly lower than for the comparator dressing (3.8 versus 4.6 respectively) ($p<0.05$).[34]

These findings clearly demonstrate that the atraumatic dressing removal significantly benefits both the patient and the healing process.

Resource use

All three studies looked at resource requirements associated with dressing changes.

In the study by Dahlstrom significantly more dressing changes took less than 10 minutes in the soft silicone dressing group (25/32; 78%) compared with the comparator dressing group (15/32; 47%). Conversely, the number of dressing changes lasting 10 minutes or longer was significantly lower in the soft silicone wound-contact dressing group (7/32; 22%) than in the comparator (paraffin gauze) group (17/32; 53%) ($p=0.02$).[32]

In the study by Bugmann et al., the mean number of dressings used in the group treated with the soft silicone dressing was significantly lower than in the comparator (silver sulphadiazine and tulle gras) group (3.64 ± 1.5 versus 5.13 ± 2.9 respectively, $p<0.05$).[33]

In the study by Gotschall et al., the soft silicone

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dressing was associated with significantly quicker average dressing changes compared with the comparator dressing (22 versus 31 minutes) (p=0.05).[34]

One of the primary cost drivers in the treatment of wounds is the time taken by nurses to complete dressing changes. The results of these studies indicate that the soft silicone dressing can significantly reduce the time (and hence costs) required for dressing changes.

The most detailed appraisal of costs involved in wound care was undertaken by Gotschall et al., who found significant differences in the costs associated with the soft silicone and comparator dressings. The soft silicone dressing group incurred significantly lower total charges for dressing changes (US$739 versus US$413; p=0.02), mean total daily hospital charges (US$2316 versus US$1937; p<0.025) and pain medication charges (US$132 versus US$52; p<0.001) than the comparator group.[34]

Other related data

Other articles pertaining to, but not meeting, the search criteria have reported that the soft silicone dressing may be left on the wound for extended periods of up to 14 days in some instances,[51] limiting disturbance to grafts and wounds but allowing frequent changes of secondary dressings.[52] Gates compared the use of the soft silicone dressing with previous management regimens (all advanced wound dressings) in the treatment of leg ulcers. Labour costs dropped by two-thirds and dressing costs by one-third, resulting in an almost 50% reduction in overall treatment costs (£216.95 to £105.48).[36]

A study that evaluated treatment protocols for skin tears in the elderly showed that the soft silicone dressing resulted in a healing rate of 11 days, compared with 37 days for the previous treatment regimens which involved the use of traditional dressings. Although the initial treatment costs were higher than those for the traditional dressings, the soft silicone dressing needed to be changed less often, resulting in an overall reduction in expenditure by about two-thirds.[54]

Conclusion

Clinicians and health-care providers are increasingly undertaking cost-effectiveness analyses to evaluate and compare different interventions, including dressings and regimens relating to wound care. The data analysis presented here is not a formal 'cost-effectiveness' evaluation. Instead, the data relate to the cost implications of using such a dressing on acute wounds (eg, traumatic wounds and burns), when compared with other dressings still widely used, which could be extrapolated to other wound types such as the more expensive-to-treat chronic wounds.[36] Although only three studies met the search criteria, the results still show that use of soft silicone dressings is more cost-effective than conventional dressings. ■

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