Hidden costs of medical tape-induced skin injuries

KEY WORDS
- Healthcare cost
- Medical tape
- Tape-induced injury

Silicone tapes and other advanced medical adhesives have a higher initial purchase price than conventional tapes. However, these "gentle" silicone tapes have the advantage of preserving skin integrity, and thus avoiding financial costs associated with skin injuries induced by conventional tapes. Here, the author presents the results of a survey that assessed the incidence, and costs, of tape-induced skin injuries as reported by a group of hospital-based nurses in Germany.

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Healthcare providers around the world face a daily struggle to balance the quality of patient care with the need to control costs. With regard to medical products, selection must weigh the cost of acquisition against cost in use and the impact on patients, making the price per unit just one factor for consideration. Medical adhesive tape is one such product.

Available in a wide variety of configurations, medical adhesive tapes are a staple product used to secure everything from catheter tubes to surgical dressings. However, these tapes can have a negative knock-on effect on patients' – and, by extension, healthcare costs – in those cases where the constituents, application, or removal of tapes are associated with skin damage.

SKIN DAMAGE CAUSED BY MEDICAL TAPES

Skin functions as a barrier against infection, environmental damage, and physical injury. When its integrity is compromised by damage or disease, skin becomes less able to protect against further injury or infection. Skin injuries not only cause pain and discomfort, but certain patient groups are at increased risk infection and chronicity (Lober and Fenske, 1991; McGough-Csarny and Kopac, 1998; White, 2001).

Medical tape is often applied to skin that is already compromised (i.e. in patients with a range of comorbidities). The most common tape-related injuries result from frequent taping and removal of tape; improper application or removal techniques; or the selection of an unsuitable tape for a particular site, purpose, or patient skin type (Bryant, 1988). Certain adhesive materials, such as natural rubber latex, are particularly aggressive and occlusive, and can potentially cause allergic reactions that further increase the risk of skin trauma (Orentreich et al, 1966).

Tape-induced skin injuries can generally be classified into four types (Bryant, 1988):

- **Skin stripping** is caused when medical tape is repeatedly applied and removed, or when the adhesive used is too strong for the application; the epidermis is stripped away, leaving the skin denuded and raw
- **Skin tears** are mechanical injuries most common in patients with fragile skin (e.g. older people, newborns).
- **Tension blisters** occur when tape is stretched too tightly, pulling the skin at both ends of the tape segment. Polatsch et al (2004) note that tapes that resist stretching are more likely to cause tension blisters.
- **Dermatitis** occurs when irritants become trapped between the skin and the adhesive of the tape for an extended period; this occurs more frequently with highly occlusive tapes, or when the patient is allergic to the components of the adhesive itself (e.g. latex tapes).

The risk of tape-induced skin injuries is a notable concern in children (whose skin is immature and delicate) – newborns are especially vulnerable to tape-related skin damage on the head, face and extremities (Stephen-Hayes and Carville, 2011). Older patients are also at risk of skin injuries caused by medical tape; Konya et al (2010) report an incidence of 15.5% among patients aged >/=65 years. As Farage et al (2009)

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note, older people have experienced a lifetime of extrinsic and environmental damage (e.g. sun exposure) and the progressive degeneration of the quality of skin with age is a given. Over time, skin becomes more fragile and loses the ability to repair itself as the vasculature atrophies, the supporting dermis deteriorates, and collagen and elastin fibres become sparse and disordered (Farage et al, 2009). In White's (2001) study undertaken at a nursing home, an overwhelming 98.6% of registered nurses surveyed indicated that skin tears were "common" to "extremely common" among their patients.

Despite the many studies examining the adverse effects of medical tape, especially on fragile or at-risk skin, little information exists on the cost implications of tape-induced skin injuries. However, this issue is of increasing importance in nursing homes, hospitals, and other healthcare facilities. It stands to reason that an aging population means a higher incidence of tape-related skin trauma, and corresponding treatment costs. When the treatment costs of managing tape-induced injuries are taken into consideration, the true cost of medical tape use can extend well beyond the simple price of materials.

METHODOLOGY

In September 2012, an independent research firm conducted a survey to estimate the incidence, and potential cost implications, of tape-induced skin injuries.

For this quantitative analysis, nurses practicing in Germany were surveyed. The nurses answered questions on the frequency and type of tape-induced skin injuries they had observed and treated over the preceding 12 months.

The nurses surveyed spend the majority of their time in intensive care, operating rooms, oncology, medical, surgical, and paediatric units. All nurses surveyed used soft cloth tape, and the majority also used a variety of silk, cloth, paper, and plastic tapes (*Table 1*).

Table 1. Usage of different kinds of medical tape (*n*=41).

Soft cloth tape	100
Silk tape	78
Cloth tape	68
Paper tape	66
Plastic tape	59
Other	7

RESULTS

All the nurses surveyed (*n*=41) played a role in medical tape product selection: 2% were decision-makers; 12% were members of a decision-making committee; and all others gave feedback to the decision-maker or committee.

Incidences of tape-induced skin damage

Almost all the nurses surveyed had treated tape-related skin injuries in the 12 months prior to the survey. The nurses surveyed saw an average of 70 patients per month each during the previous year; 7.1% of patients who had medical tape applied developed one or more skin injuries as a result – on average, those patients with skin damage suffered 2.8 injuries each.

During the 12-month period investigated, the nurses surveyed treated 254 tape-induced skin injuries. Of these cases, skin stripping (28%; 71/254) and skin tears (28%; 71/254) were the most common presentations, followed closely by tension blisters (24%; 61/254) and dermatitis (20%; 51/254). Multiple treatment applications were generally necessary to manage these tape-induced injuries, although treatment methods and healing times depended on patient age, concurrent medical conditions, and other factors. The nurses reported treating patients with tape-induced injuries approximately five times a week, with the average total number of treatments for a tape-induced injury being 7.8 per patient.

Calculating the cost of tape-related skin injuries

The method of calculating the cost of tape-related skin injuries from the results of this survey is summarised in *Box 1*.

Hydrocolloid, foam, and other wound care dressings were the most common treatment for tape-induced injuries, followed by antiseptics, antibiotic creams, and corticoid ointments. The cost of materials were calculated according to prices of the most commonly used products and their frequency of use. The average cost per treatment application was found to be €1.23.

Although cumulative materials costs are substantial, far greater is the cost of nursing time. Each treatment application for the management of tape-induced injury was estimated to take approximately 18 minutes of a nurse's time. The costs of nursing time was based on the German Federal Ministry of Finance's rate of €29.57/hour for a nurse working at a state-owned hospital.

Thus, the cost of nursing time for one treatment application would be €8.92, bringing the cost of a single treatment to €10.15. Six minutes (€3.01) of additional nursing time was reported to be required for documentation (i.e. medical notes on the diagnosis, therapy, and follow-up) for each patient. In general, doctors were only involved in 8–10% of skin injury cases; when they are called for a consultation, costs rise accordingly.

Based on these figures, the total cost of one tape-induced injury was found to be €82.24. This includes all treatment materials and nursing time for the entire healing period, including documentation time. Thus, for every hundred patients to whom tape is applied, a cost of €5.83 per patient is spent on the management of injuries sustained as a result.

DISCUSSION

Tape selection and skin injury prevention

Traditional medical tapes are effective and easy to apply, but their removal can lead to skin injuries and the need for wound management. These data identified that 7.1% of patients on whom conventional medical tapes have been used will sustain a subsequent tape-induced injury; this survey also calculated an average treatment cost of €82.24 per patients.

Many clinicians view such skin damage, and the accompanying costs of treatment, as the inevitable side effects of using medical tape. However, these injuries – and their financial impact – are largely avoidable. Proper tape application and removal technique helps minimise damage to skin, and, in many cases, choice of tape can also help protect skin integrity.

As Bryant (1988) notes, considerations in product selection and application include location on the body, moisture from wound drainage, thick hair or oily skin, and any existing skin damage. Hard-to-tape areas (e.g. the scalp) may require a strong adhesive, while more flexible, less aggressive products should be used on sensitive areas and fragile skin. Special care should be taken with older patients as they are particularly susceptible to skin injuries, and even traditional "gentle" tapes can cause damage to extremely fragile skin.

Evolving gentle-to-skin tape technologies

A new class of silicone-based tapes is proving to be a viable alternative for fragile sensitive skin. These tapes have been shown to remove cleanly, without disrupting fragile layers of skin or causing patients unnecessary pain (Grove et al, 2011; Loperfido and Smith, 2011; 2012).

Silicone tapes secure firmly, while providing an atraumatic release, fully adhering to skin without pulling hairs or stripping skin cells upon removal. Silicone-based adhesives are more elastic and sheer forces exerted during tape removal are dissipated in the silicone adhesive itself, rather than through the skin itself, as is the case for traditional adhesives.

When silicone tape is removed, it does not disrupt the underlying skin, resulting in fewer injuries. Because silicone adhesives have low surface tension, they quickly conform and adhere to the skin's surface despite bumps, hairs, and other irregularities. While traditional adhesive bond strength increases over time (making the eventual removal more traumatic), silicone maintains a constant level of adhesion, so the tape can be repositioned or removed more easily and with less potential skin damage. This ability to preserve patients' skin integrity has been confirmed in a number of clinical studies (Grove et al, 2011; Loperfido and Smith, 2011; 2012).

Box 1. Calculation of tape-related injury (TRI)-associated costs.

Each TRI treatment has an average materials (M) cost	[M= €1.23]
Each TRI treatment has an average nursing time (NT) cost	[NT= €8.92]
The average number of treatments (T) required to achieve healing	[T=7.8]
Nursing time cost for documentation (ND) for the management of an episode of TRI	[ND=€3.01]
Total cost per patient with skin injuries after tape application	[T x (M + NT) + ND] = €82.24]

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Traditional adhesive technologies play an important role in patient care. For example, acrylate tapes are essential for securing critical tubing and use in high-moisture areas. However, novel gentle-to-skin technologies, such as silicone tapes, are a promising evolution that could greatly benefit patients with fragile, compromised, or at-risk skin. Moreover, as this survey suggests, a reduction in tape-induced injuries is likely to reduce healthcare costs.

CONCLUSION

While a relatively small percentage of patients treated with medical tape experience tape-induced skin injuries as a result, the incidence of tape-induced skin injuries is likely to rise as the patient population ages. Even at the low rates reported here, clinician time and materials costs are currently at a premium and cost savings need to be found. The cost of treating these skin injuries is roughly equivalent to adding €5.83 to the cost of care of every patient using conventional medical tape – in those cases where wound infection follows tape-induced injuries the potential cost to both patient and healthcare providers are much greater.

Economic realities dictate that expenses must be carefully managed. However, controlling costs does not have to imply any compromise in quality of care. Tape-induced skin injuries may be more common in patients with fragile skin, but they are nonetheless preventable. Once skin integrity is compromised, the choice of medical tape becomes even more critical. Tape selection should be carefully considered based on the application, location on the body, skin health, and patient factors. Nurses, with their frequent patient contact and close observation of medical tape efficacy and adverse effects, are uniquely qualified to play a key role in product selection.

Silicone tapes and other advanced medical adhesives have a higher initial purchase cost than conventional tape technologies. However, when weighed against the treatment costs of tape-induced skin injuries, these "gentle" tapes offer a cost-effective investment. Furthermore, avoiding these unnecessary injuries can help improve both patient outcomes and quality of life.

Nurses, with their frequent patient contact and close observation of medical tape efficacy and adverse effects, are uniquely qualified to play a key role in product selection. Gentle-to-skin products, such as silicone tapes, used in conjunction with best practices for taping application and removal, can help lower the risk of infection, avoid extended healing times, reduce the cost of treatment and spare patients needless pain and suffering. WUK

REFERENCES

Bryant RA (1988) Saving the skin from tape injuries. *Am J Nurs* 88(2): 189–91

Farage MA, Miller KW, Berardesca E, Maibach HI (2009) Clinical implications of aging skin: cutaneous disorders in the elderly. *Am J Clin Dermatol* 10(2): 73–86

Grove GL, Zerweck C, Houser T et al (2011) Adhesive tape trauma evaluation of two gentle tapes in healthy human subjects. Poster presented at the 43rd Annual Wound, Ostomy and Continence Nurses Conference, New Orleans, LA, 4–8 June 2011. Available at: http://bit.ly/WUwrO1 (accessed 11.02.2013)

Konya C, Sanada H, Sugama J et al (2010) Skin injuries caused by medical adhesive tape in older people and associated factors. *J Clin Nurs* 19(9–10): 1236–42

Lober CW, Fenske NA (1991) Cutaneous aging: effect of intrinsic changes on surgical considerations. *South Med J* 84(12): 1444–6

Loperfido B, Smith G (2011) *Customer Evaluation of a New Gentle-to-Skin Medical Tape by 217 Clinical Evaluators*. 3M Health Care, St Paul, MN. Available at: http://bit.ly/WeNevl (accessed 11.02.2013)

Loperfido B, Smith G (2012) *Customer Evaluation of a New Gentle-to-Skin Medical Tape by Over 950 Pediatric And Neonatal Clinical Evaluators*. 3M Health Care, St Paul, MN

McGough-Csarny J, Kopac CA (1998) Skin tears in institutionalized elderly: an epidemiological study. *Ostomy Wound Management* 44 (Suppl 3A): 14S–25S

Orentreich N, Berger RA, Auerbach R (1966) Anhidrotic effects of adhesive tapes and occlusive film. *Arch Dermatol* 94(6): 709–11

Polatsch DB, Baskies MA, Hommen JP et al (2004) Tape blisters that develop after hip fracture surgery: a retrospective series and a review of the literature. *Am J Orthop (Belle Mead NJ)* 33(9): 452–6

Stephen-Hayes J, Carville K. (2011, November). *Skin Tears Made Easy*. Wounds International, London. Available from bit.ly/U9NOfn (accessed 11.02.2013)

White R (2001) Skin tears: a descriptive study of the opinions, clinical practice and knowledge base of RNs caring for the aged in high care residence facilities. *Primary Intention* 9(4): 138–49