Pressure ulcer prevention

using Strikethrough Resistant Technology™

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Strikethrough Resistant Technology™ can meet the demands of healthcare

Jason Beckford-Ball

The prevention and management of pressure ulcers — a significant cause of morbidity and mortality and a major drain on healthcare resources — has been at the core of tissue viability nurses' daily clinical and strategic workload for decades. Today, the occurrence of pressure ulceration is used to assess the quality of care delivered by a healthcare system or facility, and the effectiveness of the preventative measures taken. Raised awareness of the costs of avoidable pressure ulceration has resulted in a political drive to reduce their incidence, and encouraged clinicians to assess and prevent pressure ulcer occurrence, when possible.

The need for a comprehensive pressure ulcer prevention plan is obvious, as the key to reducing costs is to prevent damage occurring in the first place. The role of clinically-effective and economical support surfaces as part of a preventative strategy is beyond dispute (MacFarlane and Sayer, 2006).

Healthcare-associated infections (HCAIs) are also costly for the NHS and as a result, stringent measures have been implemented to prevent and control outbreaks. The need to decontaminate multiple-use medical equipment, such as pressure-redistributing beds and mattress covers, has seen the widespread introduction of stringent cleaning regimens and regular and thorough inspection for external damage that can lead to strikethrough — staining and contamination of the mattress core — and which poses a risk of HCAI.

Under these new measures, an increasing number of beds were failing audit due to strikethrough. This was thought to be due to higher bed occupancy rates and improved cleaning and inspection policies resulting in damage to the mattress fabrics, making them vulnerable to fluid ingress. Many mattress covers were not maintaining their waterproof properties for the expected period of time (MHRA, 2010) resulting in contamination of the inner mattress.

In short a reliable mattress cover was needed that balanced infection control and pressure ulcer prevention properties, with being cost-effective and compatible with safety regulations.

This development triggered a concerted educational effort to reduce mishandling and improve cleaning techniques of mattresses, with UK mattress manufacturers launching the *Protect, Rinse, Dry* campaign, which featured a detailed guide on the care, cleaning and inspection of healthcare mattresses (British Healthcare Trades Association [BHTA], 2011).

Whether the increase in the number of beds failing audit was due to staff handling or changes in cleaning or management protocols, the view was increasingly held that the products in use were no longer fit for 21st century nursing practice.

The cost of replacing mattresses when they fail prematurely puts a tremendous strain on NHS resources, and can be disruptive to patients as well as putting them at increased risk of infection.

The solution was a product that offers high levels of protection against pressure ulcer development, while also withstanding the intensive cleaning regimens and high bed occupancy rates that are an everyday part of modern nursing. In short, a reliable mattress cover was needed that balanced infection control and pressure ulcer prevention properties, with being cost-effective and compatible with safety regulations.

In response to this demand, Invacare (South Wales) and Dartex Coatings (Nottinghamshire) developed a mattress fabric which utilises unique Strikethrough Resistant Technology™ (SRT). SRT is used on the Softform® Premier and Softform® Premier Active 2 mattresses (Invacare, Wales), and effectively addresses infection control, pressure care prevention, safety and cost-effectiveness concerns.

The results from clinical evaluations of more than 200 Softform Premier and Softform Premier Active 2 mattresses carried out in a variety of healthcare settings show that SRT may be the advance that healthcare organisations need to meet the demands of the current healthcare climate.

Jason Beckford-Ball is Editor, Wound Care Today

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Pressure ulcer prevention in the current NHS: setting the scene

Rosie Callaghan

Pressure ulcers are costly to the NHS and debilitating and painful for patients. As the patient population most at risk of developing pressure ulceration — the elderly and those with multiple comorbidities — increases in size, so too could the incidence and cost of pressure ulceration. Therefore, it is not surprising that the prevention of avoidable pressure ulcers is a key aim for all clinicians and organisations currently delivering care in the NHS. An awareness of the scale of the problem of pressure ulceration, both locally and nationally, is crucial as it provides a baseline against which to measure the success of preventative strategies. Such strategies are well recognised, and include basic and effective nursing care; the use of skin inspection, pressure-redistributing equipment, repositioning, skin care and nutrition and hydration, as outlined in best practice guidelines.

KEYWORDS:
■ Pressure ulcer ■ Prevention ■ Pressure-redistributing surfaces
■ Avoidable ■ Pressure ulcer management

The prevention and management of pressure ulcers has been at the core of the tissue viability nurse's daily clinical and strategic workload for decades. This is increasingly the case in the current NHS where the development of an avoidable pressure ulcer can result in litigation and the care of the patient being scrutinised (Wicks, 2007; Guy et al, 2013).

Today, the occurrence of pressure ulceration is used to assess the quality of care delivered by a healthcare system or facility and the effectiveness of the preventative measures taken. This article provides an overview of the costs of pressure ulceration, and outlines the government-led incentives for the use of successful prevention strategies and the collection of baseline data against which the success of preventative strategies can be measured.

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PREVENTION OF PRESSURE ULCERS

A pressure ulcer is a localised area of soft-tissue damage caused by impairment of the local vascular and lymphatic supply by pressure, shear or friction or a combination of all three (European Pressure Ulcer Advisory Panel [EPUAP], 1998; *Table 1*). The least severe pressure ulcers present as areas of non-blanching redness, while the most severe can involve full-thickness skin loss with exposure of the underlying muscle, tendon and bone (EPUAP, 1998; *Table 2; Figures 1–4*). Pressure ulcers often occur in the elderly and those with comorbidities and immobility. As the elderly population grows, and people live to an older age with complex, co-existing diseases, the incidence of pressure ulceration is also set to rise (Bottomley, 2007; Dealey et al, 2012).

Pressure ulcers can have a huge negative impact on a person's quality of life and the more severe categories can be life-threatening due to the risk and development of infection (Posnett and Franks, 2007). A 2007 study by Spilsbury et al evaluating patients' experience of having a pressure ulcer found that patients were affected emotionally, mentally, physically and socially. The participants described the pain, discomfort and stress of having an ulcer and their feelings of social isolation and lack of independence.

In addition to being a significant cause of morbidity and mortality, pressure ulceration is a major drain of healthcare resource. However, the development of many pressure ulcers is avoidable, and as such, their development has become a key measure of the quality of care delivered.

Table 1: The three factors contributing to pressure damage

Interface pressure	Interface pressure is the pressure required from an external source, such as a mattress, to close the capillaries in the skin. Exposure to prolonged or high pressure decreases blood flow in the capillaries of the skin leading to their occlusion, tissue ischaemia and death. It is most likely to occur over bony prominences
Shear	Shear is the action or stress caused by two forces shifting in opposing directions. Shear force can occlude blood flow to the skin resulting in tissue damage
Friction	Friction comes into effect as a patient moves over a surface. It can result in superficial blistering of the skin, which in turn can cause tissue damage by rapid increase in size or bursting of the blister and secondary infection developing

Table 2: EPUAP definition and grading of pressure ulcers (EPUAP, 1998)

Category 1	Intact skin with non-blanchable redness of a localised area usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its colour may differ from the surrounding area. The area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue. Category 1 may be difficult to detect in individuals with dark skin tones. May indicate 'at-risk' persons
Category 2	Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled or sero-sanginous filled blister. Presents as a shiny or dry shallow ulcer without slough or bruising*. This category should not be used to describe skin tears, tape burns, incontinence-associated dermatitis, maceration or excoriation. *Bruising indicates deep tissue injury
Category 3	Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunnelling. The depth of a category/stage 3 pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have (adipose) subcutaneous tissue and category/stage 3 ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep category/stage 3 pressure ulcers. Bone/tendon is not visible or directly palpable.
Category 4	Full thickness tissue loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunneling. The depth of a category/stage 3 pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have (adipose) subcutaneous tissue and category/stage 3 ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep category/stage 3 pressure ulcers. Bone/tendon is not visible or directly palpable.

Figure 1.
A category 1 pressure ulcer.

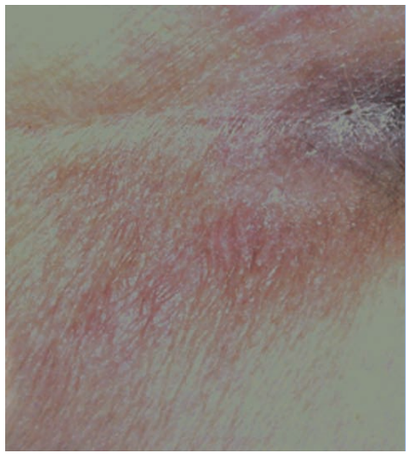

Figure 2.
A category 2 pressure ulcer.

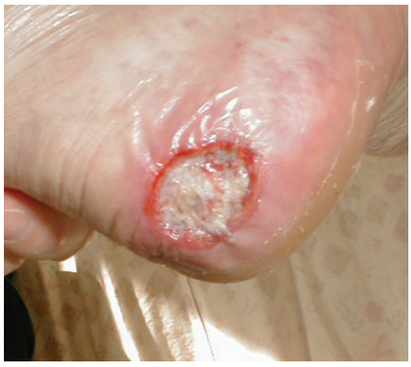

Figure 3.
A category 3 pressure ulcer.

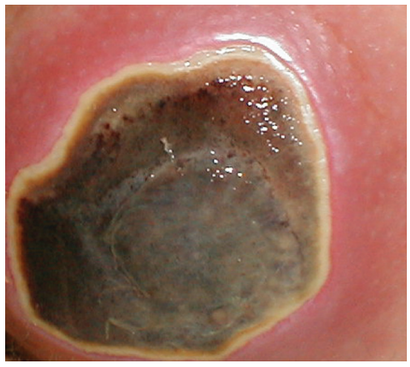

Figure 4.
A category 4 pressure ulcer.

Table 3: The SSKIN care bundle

Surface: make sure your patients have the right support
Skin inspection: early inspection means early detection; show patients and carers what to look for
Keep your patient moving
Incontinence/moisture: your patient needs to be clean and dry
Nutrition/hydration: help your patient to have the right diet and plenty of fluid

INCIDENCE AND PREVALENCE OF PRESSURE ULCERATION

Although figures vary, it has been estimated that up to 400,000 new ulcers may develop in any given year in the UK (Posnett and Franks, 2007). In acute hospitals, the point prevalence of pressure ulceration is approximately 18–20% (Vanderwee et al, 2007). NHS data gathered between April–July 2012 showed that 6.6% of patients included in the analysis had a pressure ulcer, representing the biggest single cause of harm to patients in NHS care (Department of Health [DH], 2013). Indeed, Dealey et al (2012) stated that most of the ulcers occurring in people in hospital are acquired following admission.

It is suspected that there is a high incidence of pressure ulceration in people living in nursing and residential care homes, as this patient group is particularly vulnerable but no figures exist as to the true scale of the problem. Bennett et al (2004) reported an incidence of 12–13% of patients in long-term care, while Grey et al (2006) reported 1.5–25%.

However, the recent Commissioning for Quality and Innovation (CQUIN) initiative, which will be described in detail later in this article, does not distinguish between pressure ulcers present on admission or acquired in hospital, but incentivises organisations to work to prevent pressure ulceration, regardless of source (NHS Commissioning Board, 2013).

THE COST OF TREATING PRESSURE ULCERS

Back in 2007, Drew et al estimated that the total cost of treating pressure

ulcers in the NHS was between £2bn and £3bn each year. More recent research has shown that the cost of treating a pressure ulcer per patient varies by category of ulcer from a mean of £1214 for a category 1 pressure ulcer to a £14108 for a category 4 ulcer (Dealey et al, 2012). Once damage has occurred, an ulcer may develop complications that delay healing and increase costs. For example, an episode of cellulitis adds between £1380 and £3722, depending on the category of ulcer, and osteomyelitis adds more than £30000 per episode (Dealey, 2012).

Patients with pressure ulcers need prolonged stays in hospital which all adds to the cost of care. An Australian study has estimated that a person with a pressure ulcer will spend an average of 4.4 extra days in hospital (Graves et al, 2005). Other studies have shown an average 5–8 additional days (Posnett et al, 2009), costing between 3000 and 4800 excess bed-days (equivalent to 10–16 beds at 80% occupancy), and £3.36 million (600 patients at £5672 per case) annually (Dealey et al, 2012).

KEY POINTS

- Pressure ulcers are a significant cause of morbidity and mortality.
- Pressure ulcers are a burden to NHS organisations, costing an estimated £2–3 million each year.
- With the belief that many pressure ulcers are avoidable, the incidence of ulceration is used to assess the quality of care delivered by a healthcare provider, and the effectiveness of preventative measures taken.
- The Department of Health's CQUIN initiative rewards the collection of baseline data on prevalence of pressure ulceration and financially rewards those organisations showing effective implementation of preventative strategies.
- Preventative strategies are multifaceted and include risk assessment, skin care, continence care, good nutrition, repositioning and the use of pressure-redistributing equipment.
- Pressure-redistributing equipment represents one of the key components of care and the need to use it is beyond dispute.
- The selection of pressure-redistributing equipment that is both clinically- and cost-effective is crucial for keeping expenditure to a minimum and obtaining satisfactory clinical outcomes.

MEASURES TO REDUCE THE INCIDENCE OF AVOIDABLE PRESSURE ULCERATION

In 1988, Hibbs stated that 95% of all pressure ulcers were preventable, a claim that was not based on evidence, and a theory that many tissue viability nurses feel is unrealistic in today's NHS (Downie et al, 2013). Despite this, the 95% figure has worked its way into pressure ulcer discussion as 'fact' (Downie et al, 2013).

Indeed, in 2011, the Department of Health proposed that pressure ulcers could be eliminated in 95% of NHS patients, and incentivised the prevention of avoidable pressure ulcers by the use of the NHS Safety Thermometer (a device that allows clinicians to measure how safe their services are and to deliver improvement locally) through the introduction of a new Commissioning for Quality and Innovation (CQUIN) initiative goal (DH, 2012).

For organisations that did not have robust data collection on pressure ulcer incidence, the CQUIN initiative rewarded the collection of data to establish a robust baseline by offering payment to do so using the P3 NHS Safety Thermometer in 2012/13. For those with already established baselines, CQUIN offers reward for the fulfilment of locally agreed improvement goals (DH, 2013).

Thus from July 2012, all NHS organisations were expected to collect data of harms, including pressure ulcer prevalence (Guy et al, 2012) and put preventative strategies in place. Trusts lose funding if they do not provide a full set of data on pressure ulcers under the CQUIN scheme, and in April 2013 were required to set targets related to pressure ulcer reduction — with a suggestion that they cut the numbers of preventable grade 2–4 ulcers by a minimum of 50% or risk being penalised.

In response, efforts to reduce the occurrence of pressure ulcers have been initiated nationally. For example, the strategic health authority (SHA) cluster of NHS Midlands and East, which serves 15 million people, established a goal of eliminating avoidable category 2–4 pressure ulcers (McIntyre, 2012). A campaign followed with a simple preventative care bundle being widely used and promoted (*Table 3*).

Data gathered by the SHA between April 2012 and March 2013 on hospital-acquired grade 3–4 pressure ulcers in five acute NHS hospitals in the east of England, was pooled to demonstrate that only 43% of grade 3–4 hospital-acquired pressure ulcers sustained were avoidable (Downie, 2013).

Regardless, raised awareness of the costs of avoidable pressure ulceration has resulted in a political drive to reduce their incidence, and has encouraged clinicians to assess and prevent where possible pressure ulcer occurrence with promising initial results (Downie et al, 2013).

PRESSURE ULCER PREVENTION STRATEGIES

The need for a comprehensive pressure ulcer prevention plan is obvious, as the key to reducing costs is to prevent damage occurring in the first place. Not all pressure damage can be avoided, but it is likely that the incidence can be reduced. Dealey et al (2012) pointed out that the cost of treating a category 1 ulcer is £1214, which is roughly equal to the cost of a systematic prevention

regimen (including risk assessment, monitoring, regular repositioning and nursing using appropriate pressure-redistributing equipment). By preventing the formation of a category 1 ulcer, not only is unnecessary suffering avoided for the patient, but also the additional cost that any complication or worsening of the ulcer would bring. Each category of pressure ulcer pushes up the price of care, with complications such as an episode of osteomyelitis adding more than £30,000 to a patient's treatment costs.

Prevention strategies are multifaceted and include risk assessment, continence care, good nutrition, skin care and an emphasis on positioning and regular movement for patients at risk of pressure ulcer development. Pressure-redistributing surfaces represent one of the most important, if not key, nursing interventions available to tissue viability specialists in the ongoing battle against pressure ulceration. Pressure-redistributing equipment reduces and relieves pressure, shear and friction which allows vascular and lymphatic circulation to continue supplying tissues unhindered (Beldon, 2007).

The need to use clinically-effective and economical support surfaces is beyond dispute (MacFarlane and Sayer, 2006), and a patient at risk of pressure ulceration must be nursed on a high quality pressure redistribution foam product at the very least (EPUAP, 1998). People with grade 3 or 4 ulcers need a more advanced mattress or bed system.

The prevention of pressure ulceration using these components of care is not new, with each element having been extensively researched and discussed in the literature over the last few decades (Guy et al, 2013). However, with the spotlight now on preventative strategies, the benefits of these initiatives will be seen more frequently in clinical practice. Part of the preventative approach will include the selection of pressure-redistributing products that are clinically and cost-effective, which will be discussed in the remainder of this supplement.

CONCLUSION

Pressure ulcer prevention is high on the list of priorities for the NHS, and policy states that trusts will now incur financial penalties if they do not meet pressure ulcer reduction targets. The cost of pressure ulcers to the NHS is huge and investing in pressure ulcer prevention plans makes financial sense to a service which already has huge demands on spending. Not all pressure ulcers are preventable, but the majority can be avoided by instigating a comprehensive pressure ulcer prevention plan. This will result in financial savings and — more importantly — patients will be spared the physical, emotional and psychological pain of having a pressure ulcer.

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Is mattress cleaning increasing the risk of healthcare-associated infection?

Rosie Callaghan

The prevention and control of healthcare-associated infection (HCAI) is a priority for the NHS, and guidelines include improved hygiene measures such as regular decontamination of medical equipment, including pressure-relieving surfaces and mattresses. The introduction of more stringent auditing of mattress covers and their internal core to check for signs of 'strikethrough' — soiling and contamination which could prove an infection risk and which results in the mattress being withdrawn from use — has seen a large number of mattresses fail audit. This is in part thought to be due to the introduction of more frequent, rigorous cleaning of medical equipment leading to breakdown of the mattress cover, rendering it permeable to fluids. With increased cleaning testing the polyurethane structures of mattress covers to the limit, the question is, are the majority of pressure-redistributing mattress covers suitable for use in a 21st century healthcare environment?

KEYWORDS:
■ Pressure-redistributing equipment ■ Healthcare-associated infection
■ Strikethrough ■ Mattress cleaning ■ Mattress inspection

Healthcare-associated infections (HCAIs) are defined as infections resulting directly from healthcare interventions such as surgery, or from exposure to contaminated people or equipment within a healthcare setting including hospitals, patient homes, care homes and GP surgeries. Such diverse locations present a challenge for the control of infection (Royal College of Nursing [RCN], 2012). Regardless, all healthcare workers in these settings have a responsibility to prevent infection occurring.

The term HCAI covers a wide range of infections, including those caused by micro-organisms such as meticillin-resistant *Stapylococcus aureus*, meticillin-sensitive *Staphylococcus aureus*, *Clostridium difficile* and *Escherichia coli* (NICE, 2011).

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HCAIs pose a serious risk to patients, staff, and anyone exposed to the healthcare environment. Patients are particularly vulnerable, especially the elderly, those with multiple comorbidities, or those who have undergone surgery or other invasive procedures (RCN, 2012).

THE COST OF HCAIS

It is estimated that 300,000 patients a year in England acquire a HCAI as a result of care within the NHS. HCAIs cause significant morbidity to those infected. They can exacerbate existing or underlying conditions, delay recovery and adversely affect quality of life (National Institute for Health and Clinical Excellence [NICE], 2012), with patients experiencing pain, requiring additional interventions, and needing extended length of stay and long-term physical and psychological effects as a result of infection (RCN, 2012). In the worst cases, HCAI can result in death. In 2007, MRSA bloodstream infections and *C.difficile* infections caused 9000 deaths in primary and secondary care in England (NICE, 2012).

In England alone, it is estimated that HCAIs cost £1 billion per year (Plowman, 1999), with just under half of this expenditure going on the nursing care (42%) required as a result of prolonged in-patient stays, while £56 million was spent on patients developing infection following discharge from hospital (NICE, 2012).

It is not surprising, therefore, that infection prevention and control is a key priority for the NHS, particularly against a backdrop of the current austerity measures. With the introduction of the Health Act (Department of Health [DH], 2006) it became a legal requirement to have systems in place to minimise the risk of HCAIs (NICE, 2011).

MATTRESSES AS A SOURCE OF INFECTION

As a result of the long-term focus on the prevention and control of HCAI, awareness of the possible vectors for infectious disease has increased, including the pressure-redistributing surfaces used as a key part of pressure ulcer prevention.

A study by Loomes et al (1988) reported on a HCAI outbreak caused by a resistant strain of *Acinetobacter baumannii* in burns and intensive care patients, despite implementation of strict isolation procedures. During the outbreak, one mattress was found to be badly stained and wet inside. Further investigation revealed 23 mattresses with stained covers and strikethrough, with the resistant

strain of *A.baumannii* isolated from inside nine of the mattresses, and other bacterial species from inside a total of 15 mattresses.

Similarly in 2008, 18 patients died in a Scottish hospital as a consequence of a *C.difficile* outbreak (Clews, 2009). This resulted in significant media attention and consequently a police enquiry that galvanised the Scottish Government into setting up the Healthcare Environmental Inspectorate (HEI). The role of the HEI (now a part of Health Improvement Scotland, formed in April 2011) was to carry out unannounced inspections on every acute hospital in Scotland. The first wave of audits revealed stained mattresses that posed a significant risk of HCAI and inconsistent use of routine mattress inspections on some wards (*Nursing Times,* 2010).

Catalano et al (1999) found a strain of *A. bauumani* on a bed rail during a 4-month outbreak, demonstrating that dry vectors such as beds and mattresses can harbour bacteria during outbreaks, highlighting the importance of thorough cleaning and mattress inspection.

This evidence and the focus on the prevention and control of HCAI means that the rigorous cleaning and inspection of mattress covers and mattresses formed part of local and national guidelines (British Healthcare Trades Association [BHTA], 2011).

DECONTAMINATION OF EQUIPMENT

Bed frames and mattresses may become contaminated by micro-organisms such as *S.aureus* through exposure to skin, body fluids, urine and faeces and organisms transmitted via unwashed hands (Patel, 2005). Therefore, decontamination is required between use by each patient, and on a weekly basis if the same patient remains on the bed.

Decontamination is a combination of processes — cleaning, disinfection and/or sterilisation — that are used to ensure a reusable medical device or piece of equipment is safe for further use. Any piece of equipment that is designated for multiple use must be made safe following use to prevent micro-organisms being transferred from equipment to patients and potentially resulting in HCAI (RCN, 2012).

Figure 1.
The correct cleaning of pressure-relieving mattress covers removes organic soiling and 80% of microorganisms reducing the risk of HCAI.

Blood and other body fluids must be removed with paper towels or by other means before cleaning agents and disinfectants are applied. After cleaning and disinfection, the polyurethane coating of the mattress must be thoroughly rinsed with water and dried until it is completely dry.

Abrasive cleaners and sponges must not be used for cleaning or drying, as they may cause the polyurethane-coated surface to break down and allow fluids to pass through, otherwise known as strikethrough.

A clean water rinse must also be applied immediately after the activation phase of chlorine and alcohol-based disinfectants.

If the cover is heavily soiled or has been exposed to bodily fluids such as blood, it will require a more thorough cleaning procedure.

Large spillages of blood on soft surfaces including mattresses or cushions should be disinfected by use of chlorine-releasing solutions instead of granules; other body fluids should be absorbed and removed with paper towels followed by use of chlorine-releasing solutions instead of granules.

The surface should then be rinsed using clean water with a clean cloth.

The cover should be wiped using a single use wipe and a 0.1% chlorine solution (1,000ppm) and cold water. If required a 1% chlorine solution (10,000ppm) and cold water may be applied.

Rinse thoroughly with clean water and a damp single use wipe. Make sure the mattress and cover are completely dried before being re-used.

Frequent or prolonged exposure to higher concentration disinfectant solutions may prematurely age the fabric cover of mattresses.

Figure 2.
Guidelines for mattress cleaning (BHTA, 2011).

Beds and mattresses are classified as a low risk for HCAI, therefore they require decontamination through cleaning with detergent and hot water. This process physically removes organic soiling and 80% of micro-organisms if carried out correctly, whereas inadequate decontamination is frequently associated with outbreaks of

1. Inspect the exterior surface of each mattress cover for signs of damage, including:
   -Signs of tearing and/or punctures.
   -Seams for any signs of splitting.
   -Zip(s) for any signs of damage.
   -Signs of permanent staining.
2. Remove the cover and inspect its inside surface and the mattress core for staining or contamination (*Figure 4*).
3. Safely dispose of any covers showing signs of damage or staining.
4. Arrange for contaminated mattress cores to be either: cleaned and decontaminated in accordance with the manufacturer's instructions; or safely disposed of.
5. Ensure that a frequent inspection regimen is established for all mattresses before and during use.

Figure 3.
Guidelines for mattress inspection (BHTA, 2011).

infection in hospitals (*Figure 1*). Drying following cleaning removes residual moisture and reduces the potential for microbial growth (Patel, 2005). If the mattress cover is contaminated with blood, it should be disinfected with a chlorine-releasing solution (*Figure 2*).

Most pressure-redistributing mattresses have a protective, waterproof, multi-stretch, moisture vapour permeable, polyurethane-coated fabric cover, which is designed to protect both the patient's skin and the inner mattress from damage.

However, the structure of the polyurethane coating that provides the mattress cover with its properties, also means that it can absorb liquids for short periods during cleaning, which causes a temporary change to the polyurethane characteristics. When wet, the mattress cover swells temporarily and is more vulnerable to physical damage during this time, while it is drying, and for a period after it is completely dry. After this period, it reverts back to its previous state.

The polyurethane-coated fabrics used for mattress covers differ in formulation and performance characteristics, meaning that the period of time that a damp mattress is vulnerable to damage varies. However, for all mattress covers, frequent and prolonged exposure to higher concentration disinfectant solutions may prematurely age the fabric cover.

MATTRESS DAMAGE

Currently, the incidence of mattress damage is significantly higher in the UK than in Europe where the same mattress products are used. This may be a consequence of an increase in inspection rates (*Figure 3*) and bed occupancy rates of 90% or higher, which lead to more frequent cleaning and disinfecting of mattresses, and which may allow insufficient time for drying after cleaning has taken place.

Previously, pieces of equipment were audited every six months to a year, whereas they are now inspected upon discharge of the patient, or as a minimum once every week, depending on local protocol. Cleaning is now performed using chlorine-based products in some cases, which while destroying pathogens, can also test the mattress cover materials to the limit.

The adoption of moving and handling guidance, which involves more frequent use of mechanical transfer devices, can also result in mattress covers being exposed to physical damage (BHTA, 2011).

CASE STUDY

Across NHS Scotland, well established mattress brands were increasingly suffering from audit failure with Greater Glasgow alone investing over £250,000 in a mattress replacement programme. The procurement departments believed that these replacement programmes would furnish the Health Boards with equipment expected to last up to seven years in alignment with the manufacturers' guarantees and warranties, however, this proved not to be the case. In some Glasgow locations, within three months a number of the new products began to fail. This was identified as being due to fluid ingress and was mirrored across the aforementioned Health Boards. While a large number exhibited damage referred to as 'chattering' or 'scagging', often there was no sign of obvious traumatic damage. However, close inspection revealed what looked like multiple microscopic holes in the material.

These failures accelerated, primarily among the new stock and the suppliers were called upon by the Health Boards to honour the product guarantees. Small numbers were replaced until the Medicines and Healthcare products Regulatory Agency (MHRA) published new guidelines (MHRA, 2010), effectively placing more onus on staff neglect rather than manufacturer failures. Thus, the Health Boards had to replace equipment at their own expense, in some instances replacing new stock in its entirety within one year of purchase. Of particular concern was the noted phenomenon of newer product failing at a far higher rate than the older stock. Whether this was due to staff handling or due to the changes in the cleaning or management protocols, the view was increasingly held that the products in use were no longer fit for 21st century nursing practice.

This led to National Procurement (Scotland), and the Scottish Health Boards looking for a clinical and cost-effective mattress cover to stop the waste of precious funding and all the management problems associated with mattress failure. UK mattress manufacturers responded by launching the *Protect, Rinse, Dry* campaign, which featured a detailed guide on the care, cleaning and inspection of healthcare mattresses (BHTA 2011) while Invacare (South Wales)

started to work on the development of a new cover that would answer these problems using Strikethrough Resistant Technology™, which is explained in detail in the remainder of this supplement.

CONCLUSION

HCAIs are costly for the NHS and as a result, stringent measures have been implemented to prevent and control outbreaks. One such measure relating to the decontamination of multiple-use medical equipment, such as pressure-redistributing beds and mattress covers, has seen the widespread introduction of stringent cleaning regimens and regular and thorough inspection for external damage, that leads to strikethrough and internal contamination of the mattress core.

As a consequence, possibly due to high bed occupancy rates and improved cleaning and inspection policies, the number of beds failing audit because of strikethrough has increased. This has triggered a concerted educational effort to reduce mishandling and improve cleaning techniques of mattresses but the question remains: are the demands of 21st healthcare in terms of cleaning and usage testing the majority of mattress covers to their limits?

KEY POINTS

- HCAIs are costly to both individuals in terms of morbidity and mortality and the NHS in terms of expenditure, costing approximately £1 billion per year.
- The control and prevention of HCAIs is a key priority for the NHS.
- All healthcare settings must have an infection control policy in place, including the decontamination of pressure-redistributing mattresses and mattress covers.
- Mattress and mattress covers can become infected with micro-organisms that cause HCAI through exposure to blood, faeces and hand contact.
- Rigorous cleaning of mattresses kills these micro-organisms but can temporarily transform the polyurethane coating of the mattress cover fabric, making it susceptible to damage, that makes it permeable to fluids.
- Once damaged, the mattress cover allows the ingress of fluid, resulting in strikethrough on the inner core of the mattress, rendering it no longer fit for purpose.
- Mattresses in the UK are failing inspection as a result of strikethrough arising from damage due to the rigorous demands made of their covers. This raises the question, are the majority of mattress covers in use fit for 21st health care?

Figure 4.
The mattress core should be examined for signs of staining and contamination.

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A new type of mattress coating: Strikethrough Resistant Technology™

Jo Milnes

A significant number of polyurethane covers currently used on pressure-redistributing mattresses in healthcare settings are becoming damaged, allowing the ingress of fluid into the mattress core, which results in the mattress having to be replaced and incurs expense to cash-strapped organisations. The frequency with which strikethrough damage leads to premature mattress failure has highlighted a need for cost-effective mattress covers that can withstand rigorous cleaning, maintain high infection control standards and provide a clinically-effective and safe surface for people at risk of pressure ulcer formation. Strikethrough Resistant Technology™ has been developed and used to create mattress covers that meet these requirements.

KEYWORDS:
■ Strikethrough Resistant Technology™ ■ Strikethrough
■ Pressure-redistributing equipment ■ Polyurethane

The need to use clinically and cost-effective support surfaces to prevent pressure damage in today's NHS is beyond dispute (MacFarlane et al, 2006; European Pressure Ulcer Advisory Panel [EPUAP], 2009). The challenge is finding a product that offers high levels of protection against pressure ulcer development, but that can also withstand the intensive cleaning regimens and high bed occupancy rates that are an everyday part of modern nursing. Many mattress covers are not maintaining their waterproof properties for the expected period of time (MHRA, 2010) resulting in contamination of the inner mattress. Strikethrough can be caused by premature ageing, chemical or physical damage (*Table 1*), and in some cases occurs after a short period of use. The cost of replacing mattresses when they fail prematurely puts a tremendous strain on NHS resources and can be disruptive to patients as well as putting them at increased risk of infection.

Reliable mattress covers are needed that balance infection control and pressure ulcer prevention properties, as well as being cost-effective and compatible with safety regulations.

In response to this demand, Invacare® (South Wales) and Dartex Coatings (Nottinghamshire) developed a mattress fabric which utilises unique Strikethrough Resistant Technology™ (SRT). SRT is used on the Softform Premier and Softform Premier Active 2 mattresses (Invacare, Wales), and effectively addresses infection control, pressure care prevention, safety and cost-effectiveness concerns to meet the challenges of modern healthcare.

POLYURETHANE MATTRESS COVERS

Most pressure-redistributing mattresses are covered with a polyurethane-coated fabric that is designed to provide a balance between protecting the patient's skin from pressure damage, and maintaining infection control by protecting the inner mattress from soiling and contamination (MHRA, 2010).

Polyurethanes are a good choice for mattress covers because:

- They have excellent stretch and recovery properties which facilitates pressure redistribution
- They have moisture vapour transmission (MVT) properties that can help maintain the skin's microclimate contributing to pressure ulcer care and prevention

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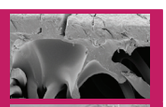
Table 1: Causes of strikethrough when using a mattress cover

Premature ageing	Premature ageing of the polyurethane can lead to the loss of the barrier film properties of the coated textile. This is sometimes known as hydrolysis, although other reaction pathways could achieve the same result	
Chemical damage	Chemical damage can also result in the loss of the film barrier properties. This is often associated with a colour change and the effect being apparent in a splash shape	
Physical damage	Force can result in damage to the polymer film making it discontinuous and liable to be breached by body fluids	

- They can be wiped clean with a range of cleaning agents and can also be laundered in accordance with the Sterilization, Disinfection and Cleaning of Medical Equipment: Guidance on Decontamination from the Microbiology Advisory Committee to Department of Health (MAC Manual) (MHRA, 2006) and CDC requirements (CDC, 2008)
- They have good surface properties producing a 'dry' coating.

However, there is a delicate balance between these properties and often when one property in their performance is maximised, another is reduced as a result. For example, when the moisture vapour transmission property is increased, the polymer becomes softer and will swell more on contact with water, making the surface more prone to damage (Uhlig, 1999; Milnes, 2012). To improve the strikethrough resistance of the polymer, it has to have excellent chemical resistance and very low swell on the application of cleaning materials.

EVALUATING THE PERFORMANCE OF MATTRESS COVERS WITH SRT

In the absence of tests that allow the comparison of the performance of different polyurethanes as mattress covers, Dartex developed tests based closely on existing evaluations to assess and confirm the improved performance of SRT compared to standard mattress covers.

Surface durability

The stretch and durability of a soft polymer, a medium polymer, SRT Crib 5 and SRT Crib 7 (see *Figure 3* for an explanation of CRIB ratings) were tested using a crockmeter when the fabrics were dry and following wiping with 70% IPA then allowing the fabrics to dry. The fabrics were wiped five times on the polyurethane face when dry using a smooth perspex cylinder rubbed back and forth across the surface with a load of 900g, to mimic the patient moving across the surface. The fabrics were then dampened and the test repeated when the polyurethane surface was still visibly wet and swollen. During the crockmeter test, the fabrics were allowed to stretch, as they would when used in clinical practice.

The performance of the fabric after this test was assessed by measuring if there had been a change in how waterproof the fabric remained after exposure to the force. This property is measured as its resistance to water penetration.

Results revealed that all of the tested materials maintained their waterproof properties when dry, and the SRT fabrics also maintained their waterproof properties after cleaning (*Figure 1*). However, when the test was repeated after applying 70% IPA solution to the other fabrics, testing resulted in damage to the polyurethane coatings to different extents (*Figure 1*). By backlighting the fabrics the damage can be seen where the light penetrates the fabric. No damage was visible in the SRT fabrics. These results are also shown graphically in *Figure 2*.

Surface properties

In order to understand durability testing, the changes to the 'stickiness' of the surface of the SRT fabric were compared to those of an inferior, softer grade polymer as it dried after cleaning. This was achieved through the measurement of both the static and dynamic co-efficient of friction.

This test involved attempting to move a weighted block on top of the fabrics by gradually increasing the force applied at a steady rate, and then measuring the force at which the weighted block begins to move. For an object pulled or pushed horizontally, the normal force is simply the weight.

To replicate a healthcare environment as closely as possible,

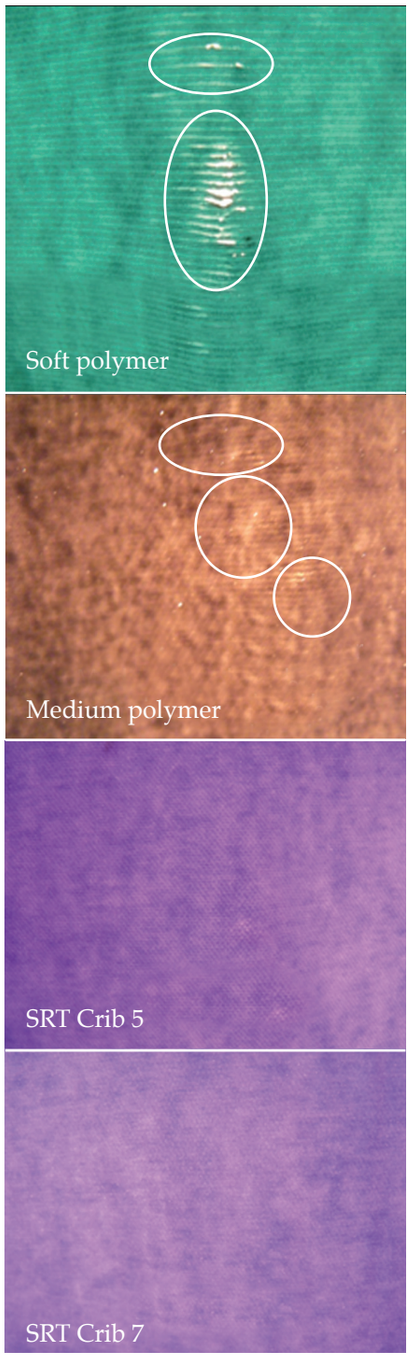


Figure 1.
Comparison of damage with the crockmeter test.

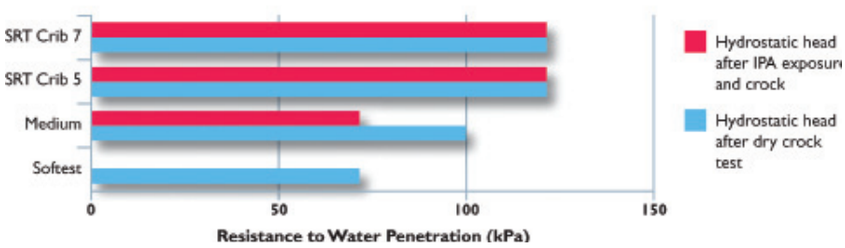


Figure 2.
Impact of IPA exposure on Resistance to Water Penetration after crockmeter testing.

these properties were measured with the test material compared with a piece of poly-cotton sheeting. The results showed a marked difference between the two fabrics. The SRT material dried a lot quicker compared with the inferior, softer grade of polymer, which despite looking dry remained 'sticky', and therefore prone to damage for up to 45 minutes. The coefficient of friction of the SRT surface gradually reduced over the same time. The results showed that the SRT cover's tensile strength was greater than the control and was thus better equipped to withstand the frequent washing and drying necessary in clinical practice, particularly when there is a rigorous infection control regimen in place.

THE CLINICAL BENEFITS OF SRT TECHNOLOGY

These proven properties of SRT confer a number of advantages when compared to standard mattress covers, including:

- Improved chemical resistance
- Balanced moisture vapour transmission
- Fire retardancy to CRIB 5 and 7
- Improved infection control.

Improved chemical resistance

The new Softform Premier with SRT fabric is made from a polyurethane polymer that is chemically more resistant than existing mattress covers. The fabric contains a specific polymer that swells less upon water contact. As a result, during cleaning the material changes less and reverts more quickly to its natural state. This means that the time it is prone to physical damage is significantly reduced.

Balanced moisture vapour transmission

Increased moisture leads to skin maceration that increases the rate of tissue breakdown, moisture lesions or pressure ulceration, but too little moisture will desiccate the wound (Schultz et al, 2003). The new material allows for an MVT that helps to achieve this balance. The polymer also allows pressure redistribution via multiple supporting contact points.

Fire retardancy to Crib 5 & 7

The majority of pressure redistributing mattresses on the market require an interliner to achieve Crib 7 certification to both top and bottom tests. The SRT fabric is available to Crib 5 or Crib 7 fire retardancy, which is a significant advance in safety and is achieved without compromising the breathability of the material.

It is a legal requirement that furniture that is not intended for domestic use must meet strict fire regulations. All beds, mattresses and divans that are in use in a non-domestic environment (e.g. hospitals and care homes) must comply with Crib 5/source 5 flammability standard BS 7177 UK regulations. The regulations comprise of the following tests:

- BS EN597-1 (Cigarette)
- BS EN597-2 (Match)
- Crib 5 - BS6807

Ignition resistance tests are carried out using a standard smoldering cigarette and simulated match flame. In addition to cigarette and match resistance, mattresses must be ignition resistant to the Crib 5 test. A crib is a standard pine wood 'bonfire' which is positioned on the mattress and ignited.

All of these tests are carried out on a section of mattress/bed base that replicates the make-up of the unit and the surface properties such as tufting, quilt lines and tape edges. Testing involves placing the sources of ignition on all of these surface features.

If a mattress or a bed is to be used in a high risk area such as on oil rigs, in mental institutions and prisons, it is a legal requirement that the product must meet Crib 7/ Source 7 flammability BS7177 UK regulations. Crib 7 (high hazard) testing uses a significantly larger wooden frame than a Crib 5.

Figure 3.
The legal requirements for fire retardancy; CRIB testing.

Improved infection control

The new cover from Invacare is made in a single piece top cover with corner welds to avoid seams. This reduces opportunities for accumulation of dust and liquid residues while providing softer edges. This flexibility adds to the strength of the cover without any clinical compromise, as materials that are too rigid will increase the risk of friction and shear, the forces responsible for pressure ulceration in at risk patients.

All of these properties do not compromise the proven pressure-redistributing properties of the Softform mattress range.

CONCLUSION

Strikethrough Resistant Technology has been designed to respond to the modern NHS' needs regarding pressure care, infection control and the risk of cross-infection, as well as addressing cost implications that demand reliable products that do not prematurely fail. The unique polymers used in SRT make the Softform Premier mattress range with SRT robust enough to withstand the rigorous demands of today's healthcare environments.

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The clinical and cost-efficacy of Strikethrough Resistant Technology™

Leyton Stevens

The unique Strikethrough Resistant Technology™ used on Invacare's Softform® Premier and Softform® Premier Active 2 mattresses has several advantages over standard mattresses as demonstrated in laboratory tests, including superior resistance to chemical cleaning and fire retardancy. This article outlines the clinical evaluation of the mattresses in different hospital settings, and presents initial findings into their clinical and cost-efficacy.

KEYWORDS:
■ Strikethrough Resistant Technology™ ■ Softform
■ Clinical evaluation ■ Cost-efficacy ■ Mattress cover

Premature failure of mattresses within healthcare settings as a result of damage and strikethrough has a negative effect on nurse management time and resources, as well as a major impact on procurement budgets. There are considerable management implications for every failed product; from the physical process of identifying the failed product, to its removal and storage, and the subsequent warranty inspection, all of which use valuable resources. This is further compounded by the efforts required to store, transport and install replacement equipment, including the disruption to the day-to-day operation of the ward/clinical area where the equipment can no longer be used. In real terms, this means unavailable beds.

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As stated earlier, further management time is taken up in establishing if the product is under warranty, and the financial implications faced if it is not. This can also be measured in terms of the failure rate and subsequent opportunity cost implications of holding funds in reserve for mattress replacement programmes.

Thus, healthcare management requires proof that new products will be free from fluid ingress and strikethrough failure, due to normal wear and tear in the ward environments over a sustained period.

CLINICAL EVALUATION OF SOFTFORM PREMIER WITH STRIKETHROUGH RESISTANT TECHNOLOGY™ (SRT)

The Softform Premier with Strikethrough Resistant Technology™ (SRT) mattress range has been evaluated in a range of clinical settings to determine:

- The clinical efficacy of the new covers
- If it is possible to have both a clinically-efficient mattress and one that is robust enough to withstand the rigorous demands of the 21st century nursing environment
- If the new cover resists chemical damage significantly better than conventional covers
- If the new cover resists fluid ingress significantly better than conventional covers.

This article outlines the initial findings of the clinical evaluations and uses the findings to establish the cost-efficacy of using mattresses with SRT versus standard mattresses.

CLINICAL EVALUATIONS

In January 2012, Greater Glasgow Health Board agreed to carry out a one-year evaluation of 200 Softform Premier mattresses with SRT. Two types of the mattresses were supplied, one with Crib 5 and one with Crib 7 fire retardancy. One hundred and fifty of the new Softform Premier mattresses with SRT were placed throughout carefully selected wards in the Southern General Hospital and the New Stobhill Hospital, while fifty of the new mattresses were placed in selected units under the direct supervision of tissue viability and infection prevention disciplines.

The units were chosen because of the patient mix and the ability to contain the new products in one location without being lost/misplaced in other wards and departments.

The objectives of all the evaluations were multiple:

- To replace previously failed stock
- To prove that the new designs were robust and practical enough to withstand rigorous cleaning and inspection regimens

- To show that the new mattresses were as clinically-effective as the well tried and tested older products.

Following staff training on the use of the mattresses, the evaluations began. Outcomes were reported to sales staff at weekly visits. Mattresses were inspected regularly for a minimum of one month, which was underpinned by a strict inspection regimen post patient discharge, as well as the quarterly Health Board audit (*Figure 1*).

The units involved in the study were the New Stobhill Hospital wards B and C, and the Southern General Hospital wards 51, 54, 55, 56 and 57. Ward B in Stobhill is an orthopaedic rehabilitation ward containing mostly short-stay yet vulnerable patients. Ward C is a general elective surgical ward, with patients in for longer periods of care. At the Southern General Hospital, the wards are predominantly care of the elderly settings, with ward 51 being orthopaedic rehabilitation, ward 56 stroke rehabilitation and ward 57 a care of the elderly acute admissions unit.

Methodology

Meetings were held between Invacare and health board personnel. Discussions were also held between tissue viability and infection control, with the involvement of the senior procurement officer. Ethical approval was confirmed, the audit protocols were agreed and the forms were designed to capture the relevant datasets:

- Clinical impact on pressure care, infection control
- Impact with regards to the risk of cross-infection due to product failure
- Financial impact in terms of management time and resources (including the cost of replacing non-warranty products).

Schedules were agreed to coordinate the removal of the current stock and the installation of new mattresses.

Figure 1.
The Invacare audit team at work.

It is beyond the remit of this paper to prove the improvement in patient care or wound healing rates through the use of these products. However, there was no deficit in patient care through the adoption of the new mattresses. This was shown from accessing the weekly monitoring records of incidence and prevalence documented by each ward and unit, and comparing them with the identical period from the previous year as a simple comparison. The impact from an infection prevention point of view relates closely to the recorded number of failures due to fluid ingress into the foam core of the mattresses.

The rigorous inspection regimens, coupled with the demanding cleaning regimens in place could quickly identify and highlight any product failures, thus allowing the failure rates to indicate potential hazard levels.

Alongside this, mattress failure rates serve as a valuable indicator of management intervention costs — data that the audit forms were designed to capture.

Pre-trial findings

As part of the implementation process, the equipment already in place was audited with a view to being redistributed across the Health Board. Of the 200 mattresses inspected, 134 were instantly sent for disposal due to cover failure. A further 38 were put into storage for inspection as possible warranty failures, and the remaining 28 were transported to the bed stores for use in other departments. This represented a failure rate of 86%. The 38 products to be evaluated for possible warranty replacement were from four different mattress manufacturers.

New Stobhill Hospital: mid-stage results

After the first six months *in situ*, it was reported that no mattress with SRT fabric failed the audit. All products over the period were subjected to the agreed protocols, which went beyond the existing current inspection regimen. Staff feedback was captured by the charge nurses on the units and the results were recorded and collated.

A 100% pass rate was achieved on all the products in all categories with one exception. It was noted on one product that the zip weld had come away from the cover. Upon investigation, it was found to be a manufacturing fault as the wrong size zip had been fitted. The cover failed within the first month and was immediately replaced. No other problems were reported. The product had not failed in any other way, and no ingress of fluid was noted.

When questioned, patients did not have any negative comments about the equipment and no negative clinical impact was observed. The only issue reported by staff was the position of the product labels in relation to the zip, which caused them to catch occasionally. This issue has since been rectified.

Southern General Hospital: mid-stage results

The audit data revealed that some staff reported issues with ease of movement, compatibility to the bed frame and patient comfort. Twenty two Avant-garde bed frames were not compatible with the size and shape of the Softform Premier supplied. However, despite the pinching effect and extra stress on the mattress, no product failures occurred while they were *in situ*. Staff on two wards said that only having handles on one side of the product was a disadvantage. After six months *in situ* there were no performance failures. All the issues raised were with regards to product design. Importantly, no product failed the audit in terms of cover failure or ingress of fluid.

Later visual inspections showed no wear and tear on the new cover. Three per cent of patients complained that the mattress was uncomfortable, making them feel hot at night. There were no product failures with 127 units in constant daily use in the Southern General Hospital and 50 units in use in Stobhill Hospital.

Staff feedback was favourable, although some minor product improvements were suggested, such as handles on both sides of the mattress and moving the product label slightly. Otherwise, the product ratings were either very good or excellent.

Clinical results

The tissue viability specialists at the New Stobhill Hospital and the Southern General Hospital in Greater Glasgow and Clyde monitor pressure ulcer levels using the Safety Cross System. This marks on a chart the daily ulcer prevalence and incidence using a simple colour coded system:

- Green = no new pressure ulceration recorded
- Orange = a new ulcer detected due to patient transferring into the unit
- Red = a patient has developed an ulcer while in the unit/ward.

The clinical impact of the new mattresses was subject to detailed continuous scrutiny.

No reported adverse outcomes associated with the use of the new mattresses were

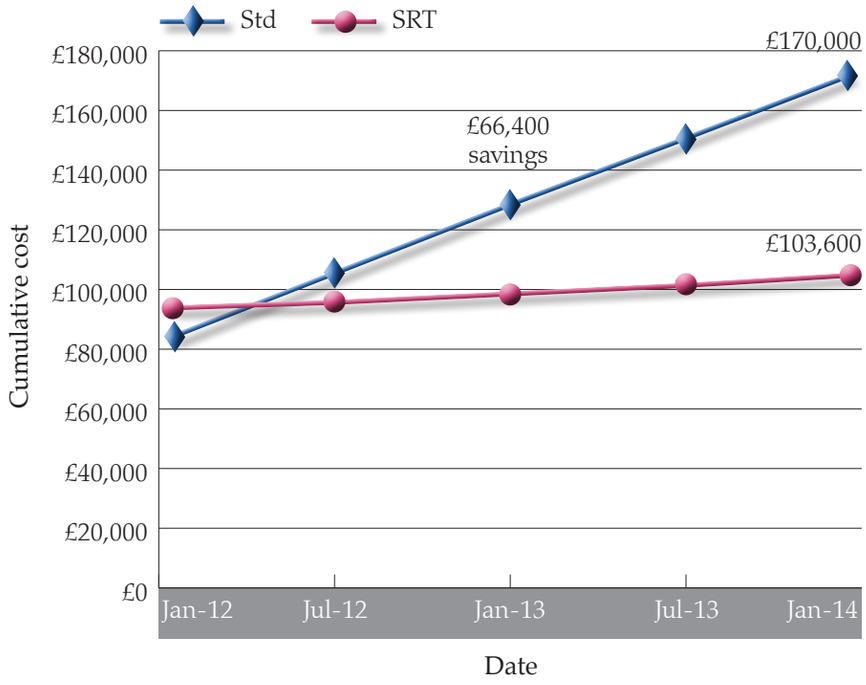

Figure 2.
Cost profile: new installation of 500 mattresses: SRT vs standard mattresses.

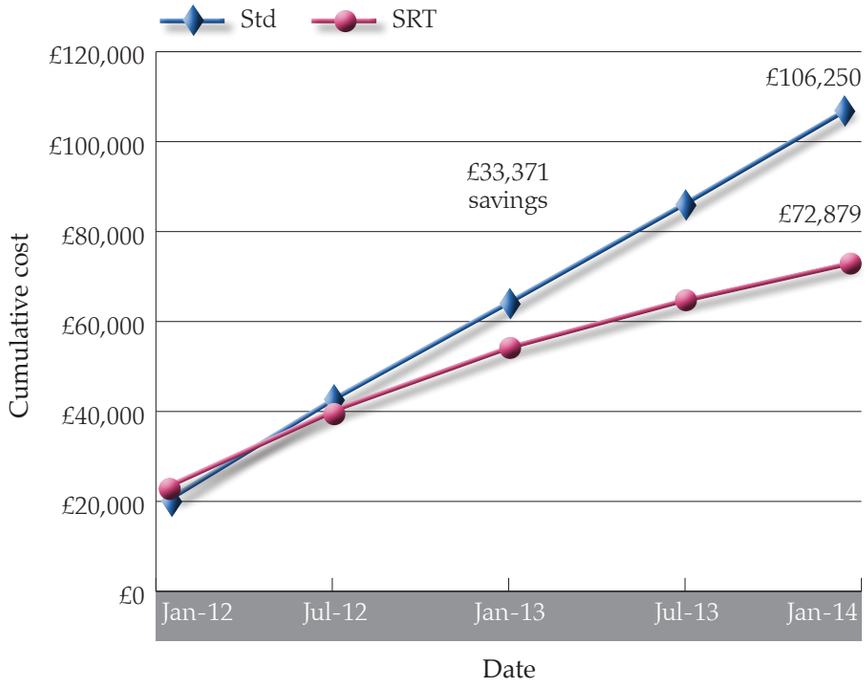

Figure 3.
Cost of replacing failures: SRT vs standard mattresses in a 500-bed hospital.

reported throughout the clinical areas. Anecdotally, staff indicated low levels of pressure damage on the units involved in the evaluations.

Summary

In both hospitals, neither the Crib 5 or Crib 7 products had any failures due to fluid ingress or cover deterioration/trauma due to inappropriate use. Therefore, there was no adverse impact on management time or activity. The financial impact was positive (funding was released for elsewhere, and products earmarked for use as replacements in the units have been reallocated), and there was no increased risk of cross-infection or disruption to patient care in the ward environment.

This was all achieved under the most rigorous inspection and cleaning regimen, while also delivering an increased level of security against fire.

In practical terms, given the failure rate of previous equipment over as short a period as three months, the indications are encouraging that the new Invacare product meets the needs of the 21st century nursing environment.

The Softform Premier with SRT performed beyond expectations under constant cleaning, handling and daily use in busy ward and clinical environments. These new products promise to solve the problems raised by previous product shortcomings, particularly in terms of fluid ingress and cover failure.

Both products, the Crib 5 (150 units in the Southern General Hospital) and the Crib 7 (50 in the New Stobhill Hospital) continue to perform well, with no product failures at the time of writing. In fact, in the area of robustness and being fit for 21st century practice, they are performing at a class leading level.

Salisbury District Hospital

The staff at Salisbury District Hospital share the concerns of other trusts that current mattresses fail to withstand the rigours of day-to-day life in a hospital environment. Since January 2010, the average failure rate for standard mattresses within the hospital has been close to 27%.

As part of the effort to reduce the spread of infection, mattresses are audited every six months, inspecting both the outer cover and inner foam core for signs of strikethrough and replacing the mattresses if any damage is found.

In practical terms, given the failure rate of previous equipment over as short a period as three months, the indications are encouraging that the new Invacare product meets the needs of the 21st century nursing environment.

With significant cost attached to each replacement, a solution was sought to bring the failure rate down. In January 2012, 100 mattresses with SRT were trialled alongside existing mattresses in the hospital.

With a standard failure rate of around 27% in mattresses used in hospitals across the NHS, in January 2012 Salisbury accepted Invacare's offer to trial 100 of their new SRT mattresses. The manufacturer made it quite clear that no special consideration was to be given to these mattresses, on the contrary they were to be treated like any other mattress in the hospital.

Our standard mattresses continue to fail at an average of 27%, however, we have been impressed with the way the SRT mattresses have performed, with an average failure rate of 3%, it demonstrates a significant reduction in cost and risk.

Our last hospital-wide audit in July 2013 showed an overall failure rate of 18.5% and we are confident that as more and more standard covers are replaced with SRT the failure rate will continue to drop further, providing capital savings and reducing the risk of infection.

Professor Ian Swain, Director of Clinical Science and Engineering, Salisbury NHS Foundation Trust

COST-EFFECTIVENESS OF SRT

Based on the findings from Salisbury District Hospital, that Softform Premier mattresses with SRT have a 3% failure rate compared with 27% for standard mattresses, cost-efficacy can be determined.

Using evidence-based criteria established over the last two years at both Glasgow and Salisbury, it is possible to illustrate the capital spend over a two-year period.

Figure 2 demonstrates a saving of £67,000 in choosing to install SRT mattresses instead of the current standard mattress in a 500-bed hospital.

Figure 3 demonstrates a saving of over £33,000 when choosing to replace such failures with complete SRT mattresses instead of current standard mattresses in an existing 500-bed hospital.

CONCLUSIONS

The demands of today's environment have stretched the capacity of existing mattresses beyond their limits. Alongside a coordinated educational effort designed to reduce damage caused by the mishandling of products, poor storage conditions and differing cleaning techniques, Invacare has developed a new cover providing increased protection from infection and with greater durability, making it possible for organisations to invest with confidence.

In the case of Crib 7, a whole new level of fire safety is achieved which meets the day-to-day demands of a clinical environment without compromising clinical efficacy.

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