

Softform Premier Active Mattress: a novel step-up/step-down approach

Geoff Thompson

Abstract

In the UK it is estimated that as many as 412000 patients who are already ill will develop pressure ulcers (Bennett et al, 2004) which are an unnecessary and expensive complication to treat in already ill patients (Hitch, 1995). One way to try and reduce these risks is by investing in suitable mattresses. The author's investigations into existing mattress stock in the years 1996–97 illustrated the inadequacy of the NHS standard mattress (Santy, 1995; Fox, 1997). Investigators (e.g. Rithalia, 1996) were recognizing the inadequacy of the pink marbled standard NHS foam mattress for pressure reduction (Medical Device Directorate, 1993; Dunford, 1994) which included reports necessary to help develop guidelines in pressure ulcer prevention and management (Coull, 2004) as well as make value-for-money recommendations about product purchases (Fletcher et al, 1994; Value For Money Update, 1994; Cullum et al 1995).

Key words: Pressure sores ■ Patient positioning ■ Care plans

The European Pressure Ulcer Advisory Panel (EPUAP, 1998) has defined pressure ulcers as: '...an area of localized damage to the skin and underlying tissue caused by pressure, shear, friction and or a combination of these'.

Pressure is a vertical loading force, such as the buttocks, pressing into the mattress or seat. Shear is a tangential, or parallel, loading force, for example when the patient gradually slides down the bed, but his skin sticks to the sheet or mattress which then stretches and distorts the immediate tissues (Bliss, 1993). Friction describes two surfaces in contact moving in opposite directions, as when the patient slips down the bed without the skin sticking to the surface or rubs one part of the body against another part, e.g. the heel down the tibial crest. Several intrinsic factors also contribute to an increased risk of pressure ulcers (Box 1).

Nursing strategies to prevent and treat pressure ulcers include a holistic plan of care which should include attention to off-loading pressure from the bony prominences by redistributing pressure achieved by repositioning the patient combined with a clinical decision to opt for a particular type of surface support (Maylor, 2004; NICE, 2005).

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To maintain healthy tissues the cells need a regular supply of nutrients, oxygen and the removal of metabolic waste products (Hubbard and Mehan, 1997). When any one part of the body is under compression these requirements are compromised and pain signals are generated, which in the normal uncompromised individual result in off-loading the pressure by self-repositioning while awake or asleep to relieve the pain or discomfort and restore the normal flow of blood (Rutishauser, 1997). When a patient cannot self-reposition this is traditionally done by attendant carers. To reduce the risk of tissue damage, the care institute should have access to one or more types of mattress support which have been evaluated as suitable for their local needs. There are two principal types of mattress support surfaces that can be used as part of a programme of pressure ulcer management and treatment.

Background

Following a literature review, a product performance specification was written and various foam mattresses were evaluated within the author's Trust. The 'MSS Softform Original' was purchased from Medical Support Systems (MSS) (now called Invacare-MSS), as the Trust's standard static mattress for all patients in all specialities; all NHS standard mattresses were collected and destroyed over a 14-month period.

This replacement stock is subject to continuous audit and a rolling replacement programme has been established substituting the Invacare-MSS Softform 'Original' for the more recent Invacare-MSS Softform 'Premier' static version.

The placement of all patients on Softform Original mattresses by 1998 pre-empted the NICE (2005) guidelines which state:

'all vulnerable patients, including those with a grade 1-2 pressure ulcer, should receive, as a minimum provision, a high specification foam mattress'.

From time to time the evaluation of other Invacare-MSS mattresses and competitor static mattress systems is conducted including variant models of the Softform mattress range. This article reports on the Invacare-MSS Softform 'Premier Active', a recent development on the static version.

The basics of mattresses

Some of the problems with the standard pink foam NHS mattress were that the cover was not vapour permeable

which increased the risks to skin integrity as the patient sweated. The standard NHS mattresses did not stretch to conform to the patient's body surface, which could result in a hammocking effect leading to interface pressure measurements over 150 mmHg (Medical Device Directorate, 1995). Mattresses are pressure redistributive support surface devices that can be divided into two groups:

- Group 1 – Pressure Reducing Support Surfaces: This type attempt to reduce interface pressure over the bony prominences by increasing the contact body mass ratio. These types of mattresses are made in two basic forms:
 - Static non-powered systems of foam, viscoelastic, gel or liquid type, fibre or inert air cells
 - Dynamic-powered systems, low air loss, or some form of viscoelastic (Sareo Airform™) or foam (Softform Premier Active), with additional embedded alternating air cells.
- Group 2 – Pressure Relieving Support Surfaces: These are alternating pressure air mattresses (APAM) by which pressure is removed from the interface between the mattress surface and the patient's body by a preset programme of alternatively inflating and deflating a set of air cells that interface between the mattress and skin contact point.

APAM systems are available as overlay mattresses (APAM-Ov) that are directly placed onto a foam mattress, or as replacement mattress (APAM-Rm) that sits directly onto the bed base.

As all APAMs are electrically powered, they can be noisy, which is disturbing, especially at night. If these are replacement systems, they have the disadvantage of being expensive. When the patient is in a sitting position in bed, APAMs can cause the patient to move or slide down the bed as each cell alternately deflates and refills over its cycle of action (Collins and Hampton, 2000). Further, some patients complain of motion sickness and many patients complain about hard lumps pressing into them as the cells re-inflate. In the author's experience this latter complaint is more likely to be made about APAM overlay mattresses than APAM replacement mattresses, a feature also noted by Nixon et al (2006).

Box 1. Intrinsic and extrinsic risk factors

Intrinsic risk factors

- Acute illness/pyrexia/medication
- Extremes of age
- Reduced mobility/immobility
- Sensory impairment
- Conscious level
- Vascular disease
- Severe chronic/terminal illness
- Previous pressure ulcer history
- Malnutrition/dehydration
- Moisture to the skin especially
- Incontinence

Extrinsic factors

- Pressure
- Shear
- Friction

Adapted from Collier M (2004)

Stepping up and stepping down

These terms describe the nurse's response to increased risk of tissue damage by conducting a risk assessment. When a patient is at high risk, the nurse steps-up a patient to a higher performing mattress, such as from a static foam to an APAM; and vice-versa when a patient's risk status decreases.

In an attempt to overcome some of the discomfort, patients sliding down the bed and motion sickness from the APAM mattress, Sareo Healthcare Ltd introduced the Airform viscoelastic mattress with built-in powered dynamic air cells. This mattress provides a modulating pressure-reducing surface.

This is not considered a true APAM system, as the patient remains in complete contact with the mattress like any other pressure-reducing surface. However, the author has found that the mattress produces positive clinical results for patients who object to traditional APAMs. The Airform, however, can only be used in a dynamic-powered mode which limits its flexibility and application when considering a risk-based step approach to care.

Upon becoming aware that the Invacare-MSS Softform Premier mattress could be used either in static mode or in dynamic-active mode with minimal disturbance to patients and staff, the author immediately saw the potential of a single product being used in a step-approach to pressure ulcer management (Thompson, 2006).

Invacare-MSS Softform Premier Active

The Invacare-MSS Softform Premier static pressure-reducing mattress was introduced by Invacare-MSS several years ago to address numerous pressure care issues. This is a no-turn product which reduces manual handling risks, has a thicker base cover to reduce the risk of cross-infection from bed frame-generated rips and tears, and is more resistant to delamination damage while being able to support the heavier patient (up to 248 Kg).

The Softform Premier Active system is a further development from Invacare-MSS providing an optional modulating surface to support a patient of up to 248 Kg and is intended for patients whose risk assessment indicates the need to consider the use of a dynamic mattress. The Softform Premier static mattress is composed of a foam 'U-shaped' base unit into which a softer foam insert is placed and enclosed in a waterproof, vapour-permeable cover.

The Softform Premier Active contains an additional set of 10 alternating air cells operating on a 2-cell cycle over 10 minutes. These cells are permanently inserted between the foam insert and the foam base unit (See *Figures 1 and 2*). When clinical assessment warrants 'stepping-up' to a dynamic system the nurse attaches a small pump unit to an air-insert assembly (*Figure 3*).

When the patient's risk status reduces the nurse 'steps-down' the surface support by removing the pump unit – a process not available when using a mix of traditional mattresses. This pump reduces the disturbance to the patient as there is no need to relocate the patient onto a different mattress; it reduces manual handling risk to the staff as no patient bed-to-bed transfer or bed-to-chair transfer is involved; the handling of an additional bulky mattress is removed; it has the potential

Figure 1. Softform Premier Active mattress showing the inner set of aircells.



to shorten the time delay between recognizing the need for a dynamic surface and implementing this surface.

Methodology

The author's Trust has a mattress selection algorithm which is used as a guideline, based on the existing stock mix, with product literature on each item available to ward staff. Knowledge of product characteristics aids the clinician in making an informed choice for patient management (Collins, 2004).

The assessment involves the use of the Waterlow Risk Assessment Tool (Waterlow, 1995) to identify tissue damage (EPUAP, 1998). Overall clinical judgement as to mattress choice rests with the nurse, the author (if involved) and patient preferences.

It was within this framework that four Softform Premier Active mattresses were obtained and intended to be used instead of the Trust's standard APAM dynamic overlay mattress for selected patients.

Patient enrolment process

Staff routinely assessed patients and those with a Waterlow score between 18–30, with or without grade 1–2 pressure damage, would log a call to the author's department requesting an APAM dynamic–overlay mattress.

If Softform Premier Active mattresses remained in stock, the author spoke with the ward staff by phone to verify



Figure 2. Softform Premier Active mattress complete and inflated.

Figure 3. Softform Premier Active mattress showing air inlet hose.



clinical details and to ensure that the patient was likely to remain in bed for at least 5 days. This assessment was to reduce confusion in interpretation of results on product performance, because if the Softform Premier Active was used for patients sitting out of bed, it would be difficult or impossible to distinguish any new tissue damage acquired by patients as a result of lying on the mattress (Gebhardt, 2004).

Prior to the actual installation of the mattress, the patients were visited by the author to check the clinical details and confirm that the patient would clinically need to remain in bed for several days and to discuss with the patient the potential benefits of the Premier Active system.

Written and verbal permission was obtained for photographs to be taken by the author of key pressure areas for some of the patients. They patients were also given the option to refuse the mattress in favour of a standard APAM or static mattress.

It should be noted that several patients were placed on the Softform Premier Active mattresses by ward staff particularly over the weekends when previously allocated Softform Actives already on the ward were reallocated as they became free. The author recruited these patients to the evaluation and to date, 40 patients have been nursed on the Softform Premier Active (See Box 3).

Case 1: Patient with cystic fibrosis

Lucy, aged 30, has been coming to hospital all her life to get treatment for her cystic fibrosis. She has several admissions per year, mainly for respiratory complications which need aggressive antibiotic therapy but also for intense physiotherapy and weight loss support for which she is supervised almost daily by the dietician.

Lucy has had several episodes of grade 2 pressure ulcer formation (EPUAP, 1998) and readily marks if left in one position for as little as 30 minutes.

Over the years she has been nursed on several different types of dynamic overlay or replacement mattress systems

but has always found them uncomfortable. On this particular admission (February 2006) she weighed 35 Kg with a body mass index (BMI) of 14.5; she was emaciated with pronounced bony prominences (See Figure 4).

Her Waterlow Risk Assessment Score was 22 with numerous areas of small patches of blanching erythema over the sacrum, trochanters and scapulae – many of them were linear from simple creases in her pyjamas. There was at least one small discreet scar of approximately 6 mm in diameter over the coccyx which she said was from an old pressure ulcer of about 3 years ago.

She was confined to bed due to fatigue and was unable to walk, even with assistance, for more than a few metres and had needed continuous oxygen for about 2 weeks prior to admission. She required assistance to go to the toilet. Though Lucy sat out of bed it was for no more than 10 minutes while the staff re-made it; she dozed or went into a deep sleep most of the time. Additionally, she needed intensive respiratory physiotherapy, intravenous (IV) antibiotics and dietetic support.

The ward staff requested a dynamic overlay as standard precaution for Lucy, but when the Softform Premier Active was explained she accepted the opportunity to try the mattress as a result of her many experiences of discomfort with dynamic systems.

During a 4-week stay in hospital she gradually gained weight, became less reliant on oxygen and slowly began to walk further along the ward corridors with the physiotherapist. By the third week, she began to sit out. However, sitting periods were never more than 30 minutes.

She was always fully satisfied with the mattress and said: 'It's the best mattress I've been on.' Her skin did not deteriorate (See Figure 5). She was discharged home with her normal

Figure 4. Lucy (sacral area). Day one on Softform Premier Active.



medical support services and the ward staff arranged for her to receive the Softform Premier Active as initial base-line support for future admissions.

Case 2: Patient with end-stage renal failure

Peggy, age 58 has had end-stage renal failure for more than 10 years secondary to insulin-dependent diabetes. When at home she remains on a community-supplied APAM and attends the haemodialysis centre three times per week when she is supported on a dialysis treatment 'chair' and her own Simcair viscoelastic mattress overlay (Hampton, 2005). When an inpatient she remains on her own bed and an APAM during dialysis.

Peggy has numerous medical complications which include: diabetic neuropathy, left eye diabetes-induced blindness, diabetic paresis with recurrent episodes of vomiting, chronic cerebrovascular disease, chronic chest wall pain, chronic constipation with frequent episodes of faecal overflow, and over the years, many episodes of grades 1-4 pressure ulcers (EPUAP, 1998) to the buttocks, sacrum



Figure 5. Lucy (sacral area). Day 26 on Softform Premier Active.

Box 3. Data collected

Patient details

- Clinical profile
- Pressure risk status
- Skin/ulcer status
- Photography (selected)
- Skin deterioration if any
- Wound changes if present
- Basal Metabolic Rate (selected)
- Comfort (Smiley-face)
- Motion sickness
- Worming down bed
- Pump noise (patient subjectivity)

Clinical conditions nursed (n=40):

- Age related general deterioration
- Cancer- terminal care
- Cystic fibrosis
- Bariatric-medical
- Bariatric-surgical
- End-stage renal failure inc. death
- End-stage cardiac failure inc. death
- Diabetes conditions
- Post-operative recovery(various)

and heels. Her medical records run to nine volumes and note several life-threatening acute medical crises, including cardiac arrest.

Her husband is her registered carer who devotes most of his time to her nursing care. He has acquired a basic understanding of pressure ulcer risks and is always very careful to check the performance characteristics of any new type of mattress.

When her dependency deteriorates or medical complications become too difficult to manage at home Peggy is admitted to a medical ward (3–4 times per year) for medical stabilization and is usually an inpatient for 4–8 weeks or longer.

Peggy is well known to the author, who has been providing her with a variety of mattress types, and pressure ulcer prevention and treatment strategies for at least 3 years. She is husband/nurse dependent and always complains in a labile fashion when dressings are removed from sensitive sacral or buttock pressure ulcers. Peggy was admitted in February 2006 but did not require the author's involvement until 30 June 2006 when she had developed sacral and buttock pressure ulcers.

The buttock/sacral area showed scar tissue from healed grade 3 and 4 ulcers, and on this occasion, displayed a broad mix of blanching erythema and grade 1 and 2 damage with some bleeding points (See *Figure 6*). Her Waterlow Score was 28. Peggy had poor anal sphincter control and the perineum and sacrum were frequently exposed to a thin watery faecal flow. Immediate treatment of the sacral areas was 3M™ Cavilon™ No-sting Barrier spray and application of the smallest possible adhesive dressing from the Mepilex® Border range to the bleeding points (Mölnlycke Health Care). Concurrently there was a 3-month old grade 3 pressure ulcer to the right heel, covered in tenacious slough which was cleared with maggot therapy. A turning regime was well established and maintained by her husband and staff in or out of hospital. Nutritional status was attended to by the dietician. The reason for the more recent preceding onset of grades 1 and 2 pressure ulcer damage is unknown as no other factors had changed over the months.

Peggy found the Soffform Premier Active most comfortable scoring a 'smiley' face on the pain scale and over the next

30 days showed a gradual improvement in skin condition to her buttocks (See *Figure 7*).

Discussion

This novel mattress has shown, over a period of several months, that a wide range of patients with varying diagnoses and dependencies can be successfully nursed – providing nursing interventions are holistically tailored to suit the individual patient needs.

The author has found that the Soffform Premier Active mattress can be used with the acutely ill and with those who have chronic multiple conditions. In a few cases, the mattress provided a level of appreciated comfort to death. Waterlow Risk Scores ranged from 18–30 while pressure ulcer grades 1–4 either improved or did not develop an extension to existing damage nor develop new tissue damage.

Only one patient claimed the mattress made her grade 2 damage more painful (the author later discovered the patient was sitting out of bed on a hard chair with an inappropriate dressing to the ulcer). One medical bariatric patient said, after 24 hours on the mattress, that she felt she would roll out of bed and requested a traditional APAM. No other patients reported any negative aspects about the mattress. Indeed, all patients chose the maximum satisfaction rating of the 'smiley' face on the Trust's scale when asked about their mattress. No creeping down the bed from cell activity nor motion sickness was reported, nor complaints about feeling hard ridges under the sacrum – a feature of some APAMs when the patient is sitting up in bed.

The most verbally appreciative patients were those with previous experience of APAMs who either requested the Soffform Premier Active for future admissions or said it was the most comfortable hospital mattress they had experienced.

Practical implications

The author believes this mattress has the potential to reduce reliance on traditional dynamic APAM systems without compromising patient tissue viability integrity. The Soffform Premier Active can be used to step-up and step-down the level of mattress support as a patient's risk status alters and



Figure 6. Peggy (sacral area). Day 10 on alternating pressure air mattress and day 1 on Soffform Premier Active.



Figure 7. Peggy (sacral area). Day 30 on Soffform Premier Active.

has been used for a wide range of dependencies, including terminal care, which included a grade 4 pressure ulcer.

Manual handling risks to staff and patients are reduced as there is no need to transfer a patient from one surface to another to facilitate APAM installation and the mattresses are no-turn. As the Softform Premier Active is of normal depth and can be used instead of an APAM overlay, in the author's Trust there was no compromise on safety bed rail height.

A new-build hospital or a hospital with a total static mattress replacement programme could gain from provisioning all its beds with the proven benefits of the Softform Premier static mattress (non-Active version). Trusts have the potential to gain more flexibility if they were to purchase the Softform Premier Active version as it would then be able to share pump units across wards without the need to store displaced static mattresses or transport bulky APAMs around the hospital.

Those hospitals with existing Softform Premier static mattresses can also gain the benefits of the Active version by having their Premier stock retrofitted by the company to the Premier Active version.

Conclusion

The author has been evaluating static and dynamic mattresses for many years. During this time various negative aspects to APAMs have been noted: namely discomfort, motion sickness and patients sliding or moving down the bed by the alternating process of the dynamic mattress.

The Softform Premier Active mattress was evaluated on 40 patients with the majority of patients having no more direct involvement by the author (as a clinical nurse specialist for pressure ulcer prevention and management) than if they had been nursed on the Trust's regular APAM overlay product range.

Ten patients however received more attention, e.g. skin inspection, photographs, more in-depth interviews, of which the two case histories have been selected to illustrate the flexibility and benefits to the product. It is the author's belief that the Softform Premier Active will prove to be acceptable by tissue viability carers as a valuable addition to the prevention and treatment of high risk patients with the proviso that the mattress – like any other mattress – is used only as a tool in the overall holistic plan of care which must include a turning regimen and attention to skin condition. The mattresses are allocated to the acute stroke unit for long-term outcome evaluation. BJN

Bennett G, Dealey C, Posnett J (2004) The cost of pressure ulcers in the UK. *Age Ageing* **33**(3): 217–8

Bliss M (1993) Aetiology of pressure sores. *Rev Clin Gerontol* **3**: 379–97

Collier M (2004) Effective prevention requires accurate risk assessment. *J Wound Care/Therapy Weekly Supplement* **13**(5): 3

Collins F (2004) A guide to the selection of specialist beds and mattresses. *J Wound Care* **13**(5): 14–8

Collins F, Hampton S (2000) Use of Pressurease and Airform mattresses in pressure ulcer care. *Br J Nurs* **9**(19): 2104–08

Coull A (2004) Who is leading guideline development in tissue viability? *Br J Nurs* **13**(19): S3

Cullum N, Deeks JJ, Fletcher AW, Sheldon TA, Song F (1995) The prevention and treatment of pressure ulcers. *Effective Health Care* **2**: 1–16

Dunford C (1994) Choosing a mattress: research findings. *Nurs Stand* **8**(20): 58–61

European Pressure Ulcer Advisory Panel (EPUAP) (1998) *Pressure Ulcer Treatment Guidelines*. EPUAP, Oxford

Fox C (1997) The Softform pressure-reducing mattress for high-risk patients. *Br J Nurs* **6**(20): 1197–2000

Gebhardt KS (2004) Pressure ulcer research: where do we go from here? *Br J Nurs* **13**(19): S14–S18

Hampton S (2005) A simple mattress system to support pressure ulcer prevention. *Br J Nurs* **14**(7): 409–10, 12

Hitch S (1995) NHS executive nursing directorate-strategy for major clinical guidelines-prevention and management of pressure sores, a literature review. *Journal of Tissue Viability* **5**(1): 3–11

Hubbard J, Mechan J (1997) *The Physiology of Health and Illness with Related Anatomy*. Stanley Thornes Ltd, Cheltenham

Fletcher J, Grimshaw G, Stewart J, Szczepura A (1994) The Prevention and Treatment of Pressure Sores in Hospital. Infact Reports, No 1

Medical Devices Directorate (MDD) (1993) Foam mattresses. Evaluation PS1 August. HMSO, Norwich

Maylor M (2004) Manual Repositioning: Turning Patients and Reducing Risk. In: *Pressure Ulcers: Recent Advances in Tissue Viability*, Clark M, ed. Quay Books, London

National Institute for Health and Clinical Excellence (2005) *The Prevention and Treatment of Pressure Ulcers*. NICE, London

Nixon J, Cranny G, Iglesias C et al (2006) Randomised, controlled trial of alternating pressure mattresses compared with alternating pressure overlays for the prevention of pressure ulcers: PRESSURE (pressure relieving support surfaces) trial. *BMJ* **332**: 1413

Rithalia S (1996) Pressure sores: which foam mattress and why? *Journal of Tissue Viability* **6**(3): 115–19

Russell L (2003) *Trends in Wound Care, Vol II*. Quay Books, London

Rutishauser S (1997) *Physiology and Anatomy: Basis for Nursing and Healthcare*. Churchill Livingstone, London

Santy J (1995) Hospital mattresses and pressure sore prevention. *J Wound Care* **4**(7): 329–32

Thompson G (2006) Evaluating a novel dual purpose static-dynamic mattress system. Poster presentation. Tissue Viability Society Conference. April, Birmingham

Value For Money Update (VFM) (1994) Pressure Sores: A Preventable Problem. NHS Executive issue no 12 Nov. HMSO, Norwich

Waterlow J (1995) Waterlow Pressure Sore Prevention/Treatment Policy. Newtons, Curland, Taunton

KEY POINTS

- Nurses involved in assessing patients at risk of acquiring or extending existing pressure-related tissue damage should follow their trust's policy for prevention.
- The use of mattresses to prevent/treat pressure-related tissue damage should only be seen as a tool within a holistic framework of care which must, as a minimum, involve a defined period of re-assessment relevant to the patient's needs and include attention to overall skin care and treatment of any damage.
- A step-approach in the use of mattresses requires consideration of the patient's changing level of dependency, along with the amount of patient disturbance, staffing levels, storage and transport issues.
- A step-up/step-down approach to managing changing levels of patient dependency with the use of the Invacare-MSS Softform Premier Active mattress in static mode or dynamic/active mode should facilitate such an approach with reduced disturbance to the patient and a reduction in manual handling risks.