Transfoam Visco: evaluation of a viscoelastic foam mattress

Abstract

It is both a massive financial commitment and a huge financial decision to standardise mattresses in a large trust. It should only be undertaken after evaluation of the evidence of efficacy supplied by relevant companies, together with independent research and reports by healthcare professionals. In addition, evaluation of the equipment should be made by back care advisers, from a user-safety viewpoint and physiotherapists, occupational therapists concerning rehabilitation. Ward-based nurses and patients need to assess equipment for comfort, ease of repositioning individuals, and ability to relieve pressure. This article outlines the process by which a static mattress was evaluated for ease of movement, pressure relief and comfort by patients and healthcare professionals. The possible longevity of the mattress was considered as secondary relevance; however, cost-effectiveness and quality of product are essential in today's acute healthcare setting.

The cost of pressure damage in terms of physical and psychological suffering for a patient is immeasurable. Pressure ulcers are frequently painful, malodorous, may become infected and difficult to heal, and may even cause the death of a patient. The financial cost of treating pressure ulcers are also considerable; Collier (1995) estimated the cost of one pressure ulcer treatment to be £40,000, including cost of specialist pressure-relieving equipment, wound management products and nursing time. In addition, legal costs may range from between £100,000 and £250,000 per patient in compensation and legal fees incurred by a hospital (Department of Health (DoH), 1993).

CAUSES OF PRESSURE DAMAGE

A pressure ulcer is described as an area of the body which has sustained damage owing to impairment of the vascular and lymphatic supply to that area of tissue as a result of pressure, friction or shearing forces. Oxygen and nutrients are unable to reach tissue and metabolic waste is not removed (Collins and Hampton 2000). This leads to ischaemia of skin, subcutaneous tissue and muscle, resulting in localised necrosis and the formation of a pressure ulcer.

A combination of intrinsic and extrinsic factors leads to pressure damage (Morison, 1997). Intrinsic factors include poor nutritional status, underlying disease, incontinence, poor vascular supply, immobility and lack of sensation. Extrinsic factors include pressure, friction, and shear. Pressure ulcers may develop over and area of the body, but especially those areas over bony prominences, e.g. heels, sacrum and ischial tuberosities (Callum et al. 1995).

PREVENTION OF PRESSURE DAMAGE

Prevention should begin by assessment of the patient, using a recognised pressure risk assessment tool, of which there are many (Table 1). Which tool is used depends very often on its appropriateness for the client in question. Assessment of patients' provisional information which

directs the management of their needs, whether nutritional, continence or mobility. The main preventive measures are:

- An adequate support surface which optimises contact between the patient's body area and the mattress without increasing interface pressure at bony prominences (Rithalia, 1996)
- Reduction of friction / shearing forces which may cause distortion and tearing of dermal capillaries (Bennett and Lee, 1985; Young and Roper, 1996)
- Repositioning of the patient at regular intervals (Exton-Smith and Sherwin, 1961; Springer et al, 1999).

In addition, optimizing the patient's nutritional status and ensuring the skin is kept warm and dry will contribute significantly, reducing any potential friction/shearing because of skin adhering to bedclothes and reducing the risk of maceration (Cooper, 1999).

The standard hospital mattress comprises a uniformly dense foam, which has a snugly fitting cover. These two factors alone conspire to contribute towards pressure damage. The tightly fitting cover allows a 'hammock' effect which prevents close contact of the patient with the mattress. Increased interface pressures at bony prominences have been shown to be as great as 50-150mmHg. Such mattresses are therefore unsuitable for nursing a vulnerable patient (Barbenel and Feguson – Pell, 1981).

The ideal mattress would afford complete pressure relief: however, this is impossible to achieve since gravitational forces are always present. Alternating pressure air mattresses (APAMs), which inflate and deflate air cushions at intervals, are frequently used for relief of pressure for the vulnerable individual. However, these require regular maintenance, may be prone to damage during patient transportation, require vigilance by nursing staff to ensure settings are correct, and are expensive.

The population of patients in an acute hospital are often elderly progressively or terminally ill, with limited mobility, poor nutrition and/or continence difficulties, thus rendering them vulnerable to pressure damage. However, in an NHS trust of almost 1000 beds it is impossible to supply APAMs to all patients.

Visco elastic foam mattress

In the last 5 years, the advent of viscoelastic form has caused a small revolution in the mattress market for those seeking a high-quality static mattress which provides close contact with the patient. These mattresses spread the load of their weight and reduce interface pressures at critical areas. They are made of a heat-sensitive foam which is able to contour the patient's body shape, thus reducing friction and / or shearing forces.

THE EVALUATION OF EQUIPMENT

Clinical randomised trials of pressure relieving equipment are few and must have methodological faults (Cullum et al, 2000). It is imperative that clinical trials are critically analysed to avoid expensive

errors. Young (1992) urged that the evaluation of equipment should be based on organised trials as well as clinical effectiveness, and selection should not depend on:

- Anecdotal evidence
- Traditional practice
- Company persuasion
- Advertising
- Personal preference
- Cost

It could be argued that while none of the above factors should be considered in isolation, such as anecdotal evidence from one individual, there is some merit in considering all the above, provided the observer remains both critical and open to suggestion.

Anecdotal evidence given by patients using equipment must be considered as they are the main users. The opinions of nursing colleagues are also valuable; chance remarks may provoke closer investigation and reveal unnoticed faults of merits of mattresses.

Traditional practices do occasionally remain valuable and may serve as a comparison. For example, the traditional practice of repositioning patients regularly has several merits; it provides the opportunity for communication and to offer fluids; allows observation of the skin; detection of incontinence; lung expansion; and ensures regular relief to specific tissue areas over bony prominences. Methods of repositioning should be dictated by local manual handling policy and in consultation with physiotherapists.

A comparison of different companies' advertisement strategies may serve to highlight deficiencies or excellence, while personal preference must always be justified. Cost is always a huge issue and one which may influence decision making. If a tight budget is to be accommodated there may be compromise.

INTERFACE PRESSURES

The interface or contact pressure between a body and the support surface is a measurement often quoted by companies producing pressure relieving equipment. The validity of this information should be questioned: were the pressures measured under healthy volunteers or patients: were a broad or narrow range of patients weight recorded?: how many volunteers were recorded? (Rithalia, 1996).

It has been quoted that capillary pressures exceeding 30-35 mmHg should be avoided as being the external pressure required to occlude a capillary (Franek and Zweifach, 1975). However, Bennet et al (1981) found that pressures as low as 22 mmHg were sufficient to prevent blood flow in a number of ill elderly patients. Obviously, interface pressure measurements are relevant. Localized pressure on soft tissue trapped between an internal bony surface and an external support surface will reduce capillary flow (Burman and O'Dea, 1994). When reading interface pressure values, healthcare professionals need to question their validity in relation to the client group for which they are considering the equipment.

CLINICAL EVALUATION OF A VISCOELASTIC FOAM MATTRESS: TRANSFOAM VISCO™ (KAROMED)

An audit was carried out by the author in an acute hospital setting to determine the current status of 900 static mattresses regarding provision of pressure relief. Of these, 420 were recognized as requiring replacement owing to moisture within the mattress or because the foam had collapsed, causing the mattress to 'bottom out'. The audit highlighted areas of concern such as care and maintenance of equipment. Staff in some areas were cleansing mattresses with a variety of disinfectants, including diluted clear phenolic solution which may make mattresses permeable and should be avoided (Ayliffe et al, 2000). Training was required to change this practice in line with the local infection control policy, which states that all such equipment should be cleaned using a soapy detergent (DoH, 1991), the exception being in the event of a large blood spillage (Larcombe, 1988). Following audit, a list of desirable specifications were prepared that took into careful consideration the requirements of patients and nursing staff (Table 2). Viscoelastic foam was chosen for its thermocontouring ability. It should be able to mould around an individual body, yet recover quickly in response to a change in position (Collins and Hampton, 2000). This enables close contact of the patient with the mattress, thus reducing friction/shearing forces (Bennet and Lee, 1985; Young and Roper, 1996). In the viscoelastic foam mattress there is a base layer of robust polyurethane, which also provides a firm edge to enable ease of patient transfer. The heel section of the mattress constitutes a high-quality cut foam which supports the feet while allowing them to sink into the mattress, allowing contouring. The mattress cover is a knitted nylon which is coated both internally and externally with a film of polyurethane, and is manufactured by Teasdale Ltd. The cover is washable at 70ºC but the mattress cannot be washed without damaging its thermocontouring ability. Ten Transfoam Visco™ mattresses were introduced into a medical ward with designated beds caring for stroke patients and specific beds for haematology patients. The stroke unit was chosen to ensure that both physiotherapists and occupational therapists could evaluate the mattresses from a rehabilitation perspective, since this client group would have problems specifically with mobility. Haematology patients are usually debilitated, having poor haemoglobin levels, neutropenia, and so are extremely vulnerable to infection and pressure damage. The period of evaluation was 4 months during which time 38 patients were nursed on the trial mattresses. Each patient had a pressure risk assessment recorded:

- Skin examined for existing pressure damage
- Nutritional status estimated
- Continence/perspiration problems assessed
- Ability to reposition themselves independently and participate in their care.

Patients were randomly allocated mattresses: Transfoam Visco™ (Karomed) or Softform (Medical Support Systems). The only patients excluded were those with existing cavity pressure ulcers. Patients with erythematous areas, blistering and partial-thickness breaks in the skin were included. Any patient whose medical condition deteriorated was removed from the evaluation if they or their family requested. Patients and/or relatives were aware the mattresses were under

evaluation and were informed they could be nursed on an alternative if desired. All patients and/or relatives were happy to be nursed on the mattresses and were delighted that their views were being taken into consideration. Patients were nursed on the assigned mattress during the whole of their admission period. In addition to regular inspection of patients' skin, the patients were asked their opinion of the mattresses in relation to comfort and ability to move, sleep and any other characteristics. Nursing staff were asked to comment about ease of repositioning patients, how quickly the mattress recovered, and whether any patients commented favourably or unfavourably. The physiotherapists' and occupational therapists' views were considered in relation to rehabilitation and ease of transfer.

RESULTS

Of the 34 patients (age range 46–92 years), all had at least one predisposing factor towards pressure damage (Table 3). Three patients were admitted with pre-existing pressure damage: partial-thickness skin damage to the sacrum because of friction/shearing forces. None of the patients or relatives asked to be removed from the mattress. Everyone found them comfortable and were able to sleep well and move normally (Table 4). No patients developed pressure damage. Of the three patients who were admitted with pre-existing ulcers, one died, and in the other two patients the ulcers healed. Their nutritional and hygienic needs were considered and met, in addition to regular repositioning, so it is difficult to determine the significance of the mattress. The patients did report sleeping well, feeling comfortable and were nursed predominantly on the mattress, rather than spending long periods in a chair and they did not develop further pressure damage. Physiotherapists and occupational therapists were very enthusiastic. A problem they often raised was the difficulty in enabling patients to transfer when an alternating pressure air mattress moves under them; this is especially difficult when the patient has spatial disturbances secondary to stroke. They reported that the static mattress enabled greater ease of transfer from bed to chair. Nursing staff commented favourably, observing that it was 'normal' for a patient to be nursed on a static mattress. There was also reduced skin 'marking' on patients when repositioning, which faded after only a few minutes. They also appreciated not having to turn the mattresses to maintain them. However, perhaps the most important observation is that of reduction in pressure ulcer incidence. In the evaluation area, incidence had previously been recorded at 3.5–4% for the previous year. During the evaluation period this fell to less than 1%. Certainly less partial- or full-thickness dermal damage was reported, and this could be because of contouring ability of the mattress and a reduction in friction/shearing forces. It might also be commented that because of the mattress evaluation nursing staff were more acutely aware of the vulnerability of patients and adhered more closely to manual handling procedures. However, since the evaluation ended, the incidence of pressure ulcers has remained less than 1%. In addition, the use of APAMs has greatly reduced which has saved considerably on the budget.

DISCUSSION

This prospective study has design faults. There were no comparisons made with mattresses without pressure-relieving qualities, which would have provided further information regarding the efficacy or otherwise in provision of pressure relief by the Transfoam Visco™. The point of

the evaluation was to highlight the need to include opinions from the main groups of equipment users, patients, nursing and therapeutic staff and to determine the usefulness of the mattress with regard to rehabilitation from a therapist's viewpoint. Perhaps pressure-relieving equipment has come full circle, and returned to static equipment which has a proven efficacy in pressure relief. There will always be those patients for whom APAMs are a necessity; however, with the advent of viscoelastic foam it may be possible to nurse many patients on a 'normal' support surface. Many elderly patients do not like the movement of APAMs and complained of 'seasickness', and that such equipment can be noisy, especially at night. Static equipment is obviously more cost-effective than dynamic, and does not need regular servicing and maintenance. It also is less prone to inadvertent damage by healthcare professionals. Since completing the evaluation this trust has purchased 450 Transfoam Visco™ mattresses. The pressure ulcer incidence statistics will be examined with interest in the future. It is hoped that a similar reduction to that of the evaluative ward will be produced in other areas.

KEY POINTS

- Pressure, friction and shear are vital elements in pressure ulcer development.
- Quality of mattresses should be the main consideration.
- Involvement of all relevant members of the multidisciplinary team is essential in the decision-making process.
- Static pressure-relieving mattresses may prove a 'normal' substitute for patients than dynamic airflow equipment.
- The patient should be the focus of equipment evaluation as the main user.

Table 1. Tools for the assessment of pressure damage	
Tool	**Features**
Norton Score, first recognized for pressure ulcer risk assessment	Based on the most commonly recognized risk factors of mobility, general physical condition, mental condition and incontinence (Norton et al, 1962)
Gosnell Score, based upon Norton's work	Developed in the care of elderly people (Gosnell, 1973)
Knoll Decubitus Score	A combination of Norton and Gosnell's work (Abruzzese, 1982)
Waterlow Score, devised after a pressure ulcer audit in 1985	More comprehensive than a simple risk-assessment tool, the Waterlow Score included guidelines on use of equipment, an ulcer classification system and management for wound care (Waterlow, 1985)
Braden Score	Acknowledges the possible role of nutrition in pressure ulcer development (Braden and Bergstrom, 1988)

Table 2. Desirable mattress specifications
The mattress should not require turning to ensure longevity
The mattress should have a warranty of a minimum of 5 years
The mattress cover warranty should be a minimum of 5 years
The mattress cover should comply with safety action bulletin SAB76
The mattress should consist of viscoelastic foam central section
The mattress should be appropriate for a profiling bed frame
The providing company would aid in training for use of mattresses

Table 3. Predisposing factors contributing to pressure ulceration	
Predisposing factor	Number of patients
Pre-existing pressure damage	3
Poor nutritional status/taking nothing orally/ nasogastric feeding	16
Incontinent of urine/faeces	10
Unable to move independently	13
Unable to participate in care	4
Sensory loss	12
Acute illness affecting blood pressure, dermal perfusion	5

Table 4. Patients' comments of the mattresses
'Much better than an air mattress — they make me feel sick'
'I'm able to move myself more easily, I find the air mattress moves against me'
'Really comfortable, best night's rest I've ever had in a hospital'
'Feels firm to touch, but lying down it gives under you'

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