Introducing the pressure support surfaces from Kaymed

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Abstract

The range of support surfaces available is quite varied. It is important that both the purchaser and the users are satisfied with the quality, comfort and the pressure-reducing properties of the mattress. The mattress needs to be versatile, in that it can be used both in a patient's home or in a hospital or nursing home and also on profiling beds. The Kaymed range of mattresses offers increased comfort with low interface pressures for patients up to and including high risk. This product focus examines the Kaymed mattress and looks at the design and results of tests performed on the visco-elastic foam used in the manufacturing of the mattresses.

The majority of pressure damage begins during the initial days following admission to hospital with an acute episode of illness or enforced immobility (Torrance and Maylor, 1999).

In the document *The Health of the Nation* (Department of Health (DoH), 1992) it was stated that pressure ulcer incidence should decrease by 5–10% each year. Reed et al (2001) indicate that there continues to be a national increase. It is impossible to identify which patients are most at risk of developing pressure ulcers. This is because methods used to collect and record data differ (e.g. incidence as opposed to prevalence, classification of pressure damage and so forth). However, there is enough evidence to deduce that patients who are immobile or acutely ill (Cullum et al, 1995; Clark, 1998) and patients who have experienced major surgery (Armstrong, 2001) are most at risk to the effects of unrelieved pressure.

Pressure ulcers can be described as an ulceration of the skin as a result of the effects of prolonged pressure in combination with a number of other variables (European Pressure Ulcer Advisory Panel (EUPAP), 1997). These variables can be either intrinsic physiological factors such as ischaemia, malnutrition, and age, or extrinsic factors such as pressure, shear, friction and moisture, combining with primary or secondary factors, including mobility and sensory perception, which increases the person's risk of developing pressure ulcers (Braden and Bergstrom, 1987).

Tissue lies over a rigid structure of bone and is mainly incompressible, unlike most support surfaces which are compacted or condensed under weight. Under pressure or shear forces, tissue tends to move away from the affected areas. Continued distortion of soft tissue on bony prominences can lead to occlusion of the blood supply and damage to the capillaries and the lymphatic system, finally resulting in tissue breakdown (Dealey, 1997). In bedridden patients the majority of ulcers develop on five classical sites: the sacrum; ischium; trochanter; heel; and ankle.

The Audit Commission (1995) stated that:

> **Pressure sores...cause pain and discomfort, require special equipment and intensive nursing care, and lead to longer hospital stays costing an estimated £320 million in 1993. Most pressure ulcers are preventable (*Audit Commission, 1995*).**

The majority of pressure ulcers can be avoided with minimal or no financial expense (Tingle, 1997), and pressure ulcers have been used as key indicators for measuring the quality of patient care (DoH, 1993). Furthermore, reports of litigation relating to pressure ulcer development, and in some cases leading to death, have been recorded, resulting in compensation being awarded (Tingle, 1997).

SUPPORT SURFACES

The prevention and treatment of pressure ulcers can only be achieved by a better understanding of the support surfaces used (Smith et al, 1991). There are over 200 support products available in the UK, varying in cost, design, reliability and maintenance; therefore, selecting the most effective support surface for specific patient needs is difficult and what is appropriate in a hospital may be inappropriate in the community, e.g. availability of electrical sockets for dynamic mattresses (Clark, 1998).

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An accurate assessment, using a risk assessment chart, must be made for each patient when choosing which support surface to use (Dealey, 1997). However, the assessment of the patient should be an holistic one and not totally based on risk assessment charts (Royal College of Nursing (RCN), 2000).

Support surfaces can be described as either pressure reducing or pressure relieving. Pressure-relieving systems relieve pressure on specific areas of the body, either statically or cyclically, using alternating pressure air mattresses. Pressure-reducing equipment reduces pressure by redistribution over a greater surface area and is usually static (*Figure 1*) (Rithalia and Kenney, 2000). Whichever surface is used, the two main functions of such mattresses are to redistribute pressure over a large area to avoid the development of pressure ulcers, and to provide patient comfort; however, it is the design of the mattress and the patient's response to it that determines the effectiveness of the mattress (Rithalia and Kenney, 2000).

The physical variables associated with comfort include skin temperature, weight distribution and vapour exchange between the patient's skin and the mattress. Discomfort is associated with pain, which can be related to physical measures, e.g. interface pressure.

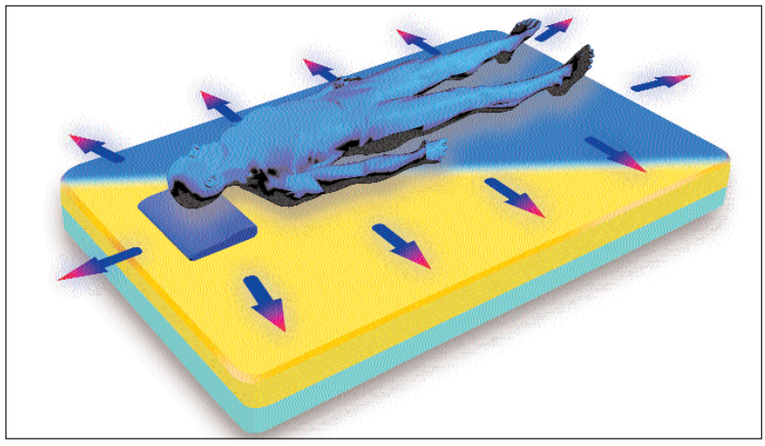
Bennett and Lee (1986) described pressure as a perpendicular load or force exerted on a unit of area. This pressure is measured by using various pressure-sensitive equipment. One method most commonly used to evaluate support surfaces is interface pressure (Fletcher, 1996). Interface pressure is the sum of pressure produced between the support surface and the patient's skin. It is not always recorded accurately as results will depend upon the patient's weight, posture and the size and nature of the recording equipment, and thus the recent RCN guidelines (RCN, 2000) imply that interface pressure measurements alone should not be used to make decisions about pressure-redistributing devices.

However, pressure measurements at the interface of skin and the support surface are widely employed by investigators for comparing various beds and mattresses. The optimum interface pressure, i.e. the level of pressure that prevents occlusion of the underlying blood supply, is still debated, but a consensus exists among researchers, manufacturers and users alike that application of external body loads below capillary threshold pressures do not cause tissue damage. A realistic figure for capillary closing pressure should be between 45 mmHg and 50 mmHg, and any pressure greater than this will cause tissue damage (Collier, 1996).

The limitations of the standard hospital mattress have been well recorded (Rithalia, 1996). During their lifetime, standard hospital mattresses undergo various amounts of wear and tear (Simpson and Livesley, 1989). They are usually made up of polyurethane low-density foam with a non-stretch cover of polyurethane-proofed and woven nylon (Dunford, 1994). The foam has a short life expectancy, and is often used beyond its effective life, and the replacement of these mattresses is often overlooked (Benbow, 1992). Santy (1995) implies that the foam can become contaminated from body fluids within 6 months after first being used.

The intentionally made smaller cover produces a wrinkle-free, tight-fitting surface over a somewhat hard foam block. This creates a detrimental weight distribution pattern ranging from 50–150 mmHg, owing to the 'hammock effect'. Hammocking produces very high pressures, particularly over the bony prominences of the body such as the

Figure 1. Pressure redistribution.



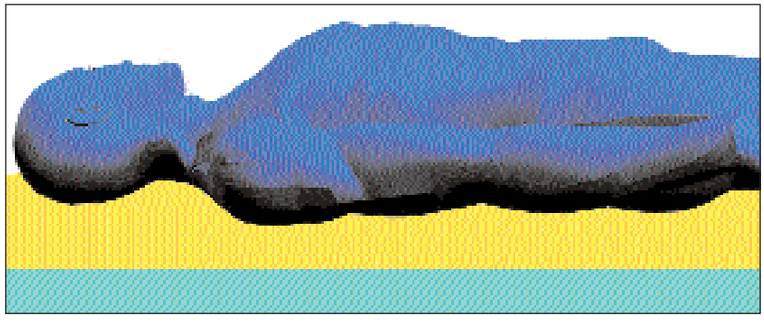


Figure 2. Contouring properties of Kaymed visco-elastic.

trochanters and heals (Shaw and Snowdon, 1979). If a uniformed support of the body is to be maintained it is necessary to minimize the effect of 'hammocking' by using a vapour-permeable elastic two-way stretch cover (Rithalia, 1996). Therefore, the standard hospital mattress is less effective at preventing ulcers than some low-pressure foam mattresses (*Effective Health Care*, 1995).

To prevent pressure ulcers, the patient's weight should be distributed as uniformly as possible on the supporting surface (Shaw and Snowdon, 1979). This is achieved by making certain that there is more contact between the mattress and the patient's skin. To achieve this, pressure-reducing foam mattresses allow the patient to be somewhat immersed into the foam. To maintain greater conformability, good quality foam with a higher density should be used. This type of foam has the ability to return to its original shape once the body weight has been removed, and the mattress should be made up of two or more foams with a firm base (Rithalia, 1996).

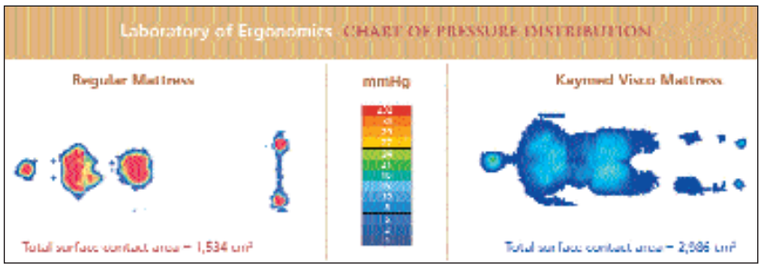


Figure 3. Pressure area map.

Table 1. Products available in the Kaymed range

Anti-infection pillows
Positional devices, including heel and leg supports
Kombat Cushion
Replacement seat cushion
Ultra Cushion
Pressure Care Performance Mattress
Kombat Mattress
Visco Ultra Mattress
Kombat Visco Pad, suitable for trolleys in accident and emergency and theatre
Visco-elastic Overlay

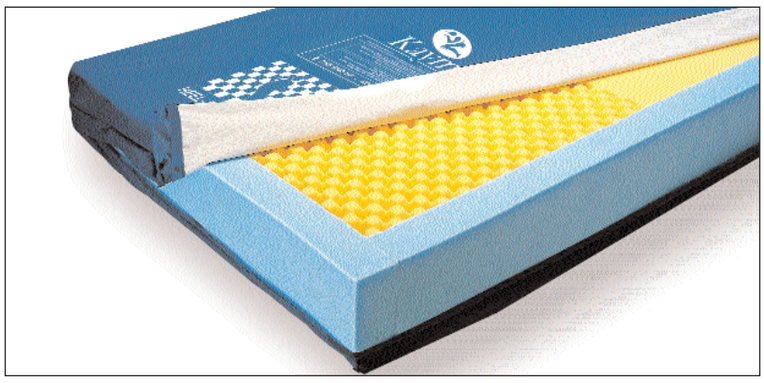


Figure 4. Details of the Kaymed Kombat mattress.

KAYMED SUPPORT SURFACES

The range of visco-elastic mattresses developed by Kaymed includes mattresses, overlay and trolley mattresses, cushions for wheelchairs and seats, all of which are designed to reduce interface pressures.

Kaymed's visco-elastic slowfoam has a gel-like feel, which is sensitive to temperature. When warm pressure is applied to the surface, it recognizes the shape and pressure of the occupant's body and adjusts to distribute the patient's weight as evenly as possible. Kaymed visco is formulated to soften the most the closer it gets to body temperature. The points of highest interface pressure are also the points of warmest contact; therefore, the support surface will deform the most beneath the points of highest interface pressure, redistributing the pressure to the surrounding contact area. This redistribution of pressure has been described by Kaymed as simulating a flotation effect (*Figure 2*).

The Kaymed mattresses were evaluated at the Centre for Disability Research and Innovation, Stanmore, at various scientific test houses in the UK, Salisbury NHS Trust, and in Europe at TNO, Netherlands (an independent contract research organization), CTBA, Paris (an independent technical test centre) and in the USA at Stork Laboratories, Twin Cities, using pressure mapping techniques (Bain, 2000).

This method measures the pressures between two surfaces (patient's body and mattress) and is displayed on a computer screen. A sheet with sensors (transducers) is placed on the mattress or cushion and the patient sits or lies on the product. The results are supplied in colour format (*Figure 3*). The pressure is measured in mmHg. The lower the mmHg the more suitable the product is for at-risk patients. The higher

the pressure, the greater the risk of capillary occlusion, leading to tissue death (pressure ulcer). The results on Kaymed visco-elastic mattresses showed significantly lower peak pressures, offering better pressure reduction than not only the standard hospital mattress but also other leading pressure-reducing mattresses, especially on the heels, sacrum, and the trochanter (Bain, 2000).

The fast action of the visco-elastic in re-adjusting to the patient's body contours reduces shearing forces. Skin maceration is prevented as the visco-elastic slowfoam aids the dissipation of moisture and perspiration away from the patient's body. As the cover is breathable it facilitates the above process. Other equipment available is listed in *Table 1*.

Each piece of equipment has its own verifications. The Kombat/K2 mattress (*Figure 4*) is suitable for patients up to high risk. Its construction consists of a superior density visco-elastic, which not only gives better pressure reduction, but also increases the product's lifespan. This mattress has the advantage of having side-rails to ease patient transfer, and a heel pressure net which gives additional pressure reduction in the heel area.

The Pressure Care Performance Mattress is suitable for patients up to and including medium risk. It consists of an inner and external firm core for support, with inner soft cushioning foam. The trolley pads are made up of three layers: the top layer is constructed using high density visco-elastic for pressure reduction and comfort, the middle layer is Kaymed's visco-elastic foam offering pressure reduction and support; and the base layer is a high density support foam.

The heel care device serves as a leg elevator with an incorporated bed cradle, and it also offers visco heel cushioning. Kaymed has developed the Sensoflex™ cover to provide lasting benefits and to optimize the performance of Kaymed visco-elastic interiors, which are antibacterial, fungistatic, waterproof, vapour-permeable, easy to clean, flame retardant and warranted. It is a multistretch cover facilitating the contouring properties of the visco-elastic.

CONCLUSION

The versatility of any equipment is an important feature for the purchaser. The Kaymed range appears to offer this versatility for both the hospital and community setting and appears to meet the criteria set out by Jay (1995). In meeting these requirements for low-pressure support surfaces, Kaymed products meet the needs of both the patient and the clinician by being both comfortable and durable. BJN

Kaymed is distributed throughout the UK by Pegasus Limited.

Armstrong D (2001) An integrative review of pressure relief in surgical patients. *AORN J* **73**(3): 645–8

Audit Commission (1995) *United They Stand: Coordinating Care for Elderly Patients with Hip Fracture*. HMSO, London

Bain D (2000) Evaluation report: Kaymed visco-elastic foam mattress. Data on file, Kaymed, Dublin

Benbow M (1992) Bed programme. *Nurs Times* **88**(39): 66

Bennett L, Lee B (1986) Shear versus pressure as causative factors in skin blood flow occlusion. *Arch Phys Med Rehabil* **60**: 309–14

Braden B, Bergstrom N (1987) A conceptual schema for the study of the etiology of pressure ulcers. *Rehabil Nurs* **12**(1): 8–12

Clark M (1998) Repositioning to prevent pressure ulcers — what is the evidence? *Nurs Stand* **13**(3): 310–16

Collier M (1996) Pressure-reducing mattresses. *J Wound Care* **5**(5): 207–11

Cullum N, Deeks J, Fletcher A et al (1995) The prevention and treatment of pressure ulcers: how effective are pressure-relieving interventions and risk assessment for the prevention and treatment of pressure ulcers? In: *Effective Health Care Bulletin*. NHS Centre for Reviews and Dissemination, University of York

Dealey C (1997) *Managing Pressure Sore Prevention*. Quay Books, Mark Allen Publishing, Dinton

DoH (1992) *The Health of the Nation*. HMSO, London

DoH (1993) *Pressure Ulcers. A Key Quality Indicator*. HMSO, London

Dunford C (1994) Choosing a mattress: research findings. *Nurs Stand* **8**(20): 58–60

Effective Health Care (1995) The prevention and treatment of pressure ulcers: how effective are pressure-relieving interventions and risk assessment for the prevention and treatment of pressure ulcers? *Effective Health Care* **2**(1): 1–16

EUPAP (1997) *Pressure Ulcer Treatment Guidelines*. EUPAP, Churchill Hospital, Headington

Fletcher J (1996) Types of pressure-relieving equipment available: 2. *Br J Nurs* **5**(13): 810–16

Jay E (1995) How different constant low pressure support surface address pressure and shear forces. *J Tissue Viabil* **5**(4): 118–22

RCN (2000) *Pressure Ulcer Risk Assessment and Prevention. Clinical Practice Guidelines*. RCN, London

Reed S, Hanbridge K, Land L (2001) Implementing best practice in pressure ulcer prevention. *Nurs Times Plus* **97**(24): 118–22

Rithalia S (1996) Pressure ulcers: which foam mattress and why? *J Tissue Viabil* **6**(3): 115–19

Rithalia S, Kenney L (2000) Mattresses and beds: reducing and relieving pressure. *Nurs Times Plus* **96**(36): 9–10

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

Shaw BAH, Snowdon D (1979) *The Mechanics of Mattessess*. Biomedial Research and Development Unit Report, Roehampton. Department of Health and Social Security Report, London: 123–32

Simpson G, Livesley B (1989) *The Prevention and Management of Pressure Ulcers Within Hospital and Community Settings*. The Research of Ageing Trust, London

Smith DM, Winsemins DK, Besdine RW (1991) Pressure ulcers in the elderly — can this outcome be improved. *J Gen Intern Med* **6**: 81–93

Tingle J (1997) Pressure ulcers: counting the legal cost of neglect. *Br J Nurs* **6**(13): 757–8

Torrance C, Maylor M (1999) Pressure ulcer survey: part one. *J Wound Care* **8**(1): 27–30

KEY POINTS

- The versatility of the mattress allows it to be used both in a patient's home or in a hospital/nursing home and also on profiling beds.
- Visco-elastic slowfoam is sensitive to temperature and is thus able to adjust to a patient's body shape and pressure, redistributing weight as evenly as possible. This fast action of the foam in readjusting reduces shearing forces.
- Skin maceration is prevented owing to the breathable cover of the mattress, and the foam which dissipates moisture and perspiration away from the patient's body.