Pressure redistributing surfaces: getting to the core of the subject

Healthcare professionals continually strive to minimise the risk of pressure sores for their patients, not only because of the discomfort they cause, but also because of the inherent infection control risks they carry. Key aids come in the form of Continuous Low Pressure (CLP) support surfaces such as mattresses – which are a familiar feature of operating tables, hospital beds, patient trolleys and stretchers.

Defined as 'low-tech' or 'non-powered', these surfaces consist of a core of material, or combination of materials, plus a breathable cover, but they are 'passive', in other words, there is no powered ripple/undulating movement to counteract the effects of the patient's immobility.

While these devices are grouped together as a category – their effectiveness varies greatly depending on their composition and construction.

Options available on the market today

The two main types of CLP devices found in healthcare facilities are:

Standard Foam Mattress (SFM)

An SFM is generally regarded as a support surface produced using a single piece of plain cut, low density/low hardness grade, open cell foam.

It will offer pressure care suited to patients who weigh circa 180kg and present a low to medium pressure care risk.

Alternative Foam Mattress (AFM)

An alternative foam mattress (AFM) is generally regarded as a support surface produced using a combination of foam specifications which may vary in density, hardness and construction (the so called 'cutting methods'). The foam may be elastic or viscoelastic, open or closed cell, or a combination of these.

It will offer pressure care suited to patients who weigh circa 250kg and present a medium to high pressure care risk.

When to use an Alternative Foam Mattress

Within the **NICE clinical guidance**[1] issued in April 2014, under sections 1.1.13 to 1.1.17, it states the requirement for the higher specification AFM, is when the patient is:

- **admitted to secondary care**
- **undergoing surgery**

However, at present, there are no government standards in place that stipulate criteria for healthcare facilities to follow in selecting appropriate AFMs – and limited evidence-based data available to support product claims. Selection is therefore very much based on perception.

Key aspects of this tend to be **depth** and **softness** – where the surface conforms to the contours of the patient's body, enveloping / immersing bony prominences such as heels, which helps to mitigate the concentrated pressure and contributes to greater patient comfort. Looking at this in more detail:

- **Depth and softness**

Mattress depth is not always as important as might first appear: the perception that a mattress which immerses/envelops the patient offers better pressure care can be erroneous as it may simply mean that a lower (less dense) specification of foam and material cover have been selected.

However, a shallower depth of an appropriate foam core specification and material cover may offer equal, if not greater, pressure redistribution over its surface than products of greater depth and will still offer a comfortable surface for the patient, even over extended periods of time.

In other words, softness may offer an initial impression of comfort and increased pressure care, but over a period of hours, the foam core may 'bottom out' under the weight of the patient – reducing its Safe Working Load (SWL) pressure care properties and leading to patient discomfort.

- **Rigidity**

In emergency departments, an important item of equipment requiring an AFM is a patient trolley or stretcher. An additional factor for consideration in this environment is the suitability of the equipment for CPR procedures, where a level of surface rigidity is essential.

A mattress that is too soft may reduce the effectiveness of the CPR being delivered, introduce unnecessary manual handling should the patient need to be transferred, and result in a delay in treatment.

Cost benefit analysis – materials and their properties vs manufacturing requirements

With budget pressures always a consideration, procurement has to balance effectiveness and cost for any purchase, and AFM is no different. These are some of the pros and cons:

- **A single core material**

The least expensive option: if only one material is to be used, viscoelastic (memory/temperature sensitive) foam has been proven to offer increased pressure care properties over standard foam. However, it relies on the body's heat to conform to its contours, which if not dispersed, can lead to the patient perspiring which is counter-productive to pressure care. Also, while less dense, hard foams are generally cheaper and they have a reduced life expectancy.

- **Core material combinations**

The other core option is a combination of foam types (perhaps different grades, hardness or density), and some may even incorporate other elements such as air, gel, viscous fluid, water or fibre, to offer a 'superior' product.

Combining the correct specification of elastic foam with an appropriate amount of viscoelastic foam will offer equal if not greater pressure redistribution over its surface.

However, foam cannot be produced in one piece from different grades or types (such as open or closed cell, elastic, viscoelastic, solid cut, shaped cut, etc.), so each different element is cut separately and then bonded together. This is more expensive from a material purchasing, material stock holding and production point of view, which generally leads to a higher cost price. This is compounded if additional elements are also incorporated. The result can offer superior pressure care, but evaluation of the whole structure is essential.

- **Core material cutting / shape**

Core material cutting/shape (the way the foam and other elements are formed within its structure) can contribute to the surface's pressure care effectiveness. Options include castellations, open cells / voids and 'egg box' surfaces.

Any of these options work by minimising the contact points between the patient's body and the AFM, while the surface area maximises the opportunity for air to circulate within the mattress, which in turn minimises heat retention, and therefore perspiration.

But cutting methods and shapes are only effective to a certain depth, as beyond this, they will collapse partially or fully under the patient's weight, nullifying the benefits they offer.

Material cutting/shaping is therefore a potential benefit, although it comes at an added cost, but again the full mattress structure must be evaluated in order to make an accurate assessment of the benefits of an individual product.

National Center for Biotechnology Information (NCBI)

While there may be no actual standards, there is some useful research from the **US NCBI**[2].

Summary

It is clear that a full evaluation of material and construction elements together with cost must be taken into account when purchasing any AFM product, which is important not just from the pressure care point of view, but for patient comfort, something which impacts both their physical and mental wellbeing.

References

Ref 1: https://www.nice.org.uk/guidance/cg179/chapter/1-Recommendations#prevention-adults
Ref 2: https://www.ncbi.nlm.nih.gov/books/NBK333135/

Checklist

- ☐ 1 Seek evidence-based data when purchasing an AFM, or a medical device that carries one, from a new supplier.
- ☐ 2 Be aware that depth and softness can be misleading – avoid excessive core material combinations and / or cutting / shapes unless evidence-based data can be offered to support their benefits.
- ☐ 3 Take product life expectancy into account.

K8 TECHNOLOGY

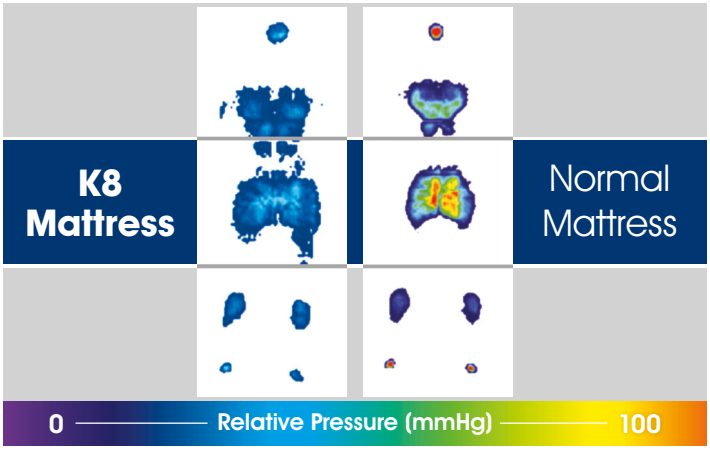
Combining pressure care and infection control

Pressure care and infection control are top priorities in a patient mattress – even low tech Continuous Low Pressure (CLP) versions used on patient trolleys, stretchers and operating tables.

The key is finding the most effective combination of materials and construction at a reasonable cost: such as Anetic Aid's independently tested K8 pressure care mattress

Evidence suggests any patient undergoing surgery for more than three hours faces a risk of developing pressure sores, due to immobility during the operation and use of anaesthesia. Our research and experience suggests:

- *A significant proportion of the overall depth of the foam core should be a minimum density of 48kg/m³ and 210 N hardness high quality elastic foam*
- *Only a small proportion of the overall depth of the foam core should be given to viscoelastic foam which should be a minimum density of 58kg/m³ and 70 N hardness*



FEATURES

- High risk pressure care mattress
- Independently tested
- Latex free
- Antibacterial / vapour permeable
- Welded seams
- X-ray translucent

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