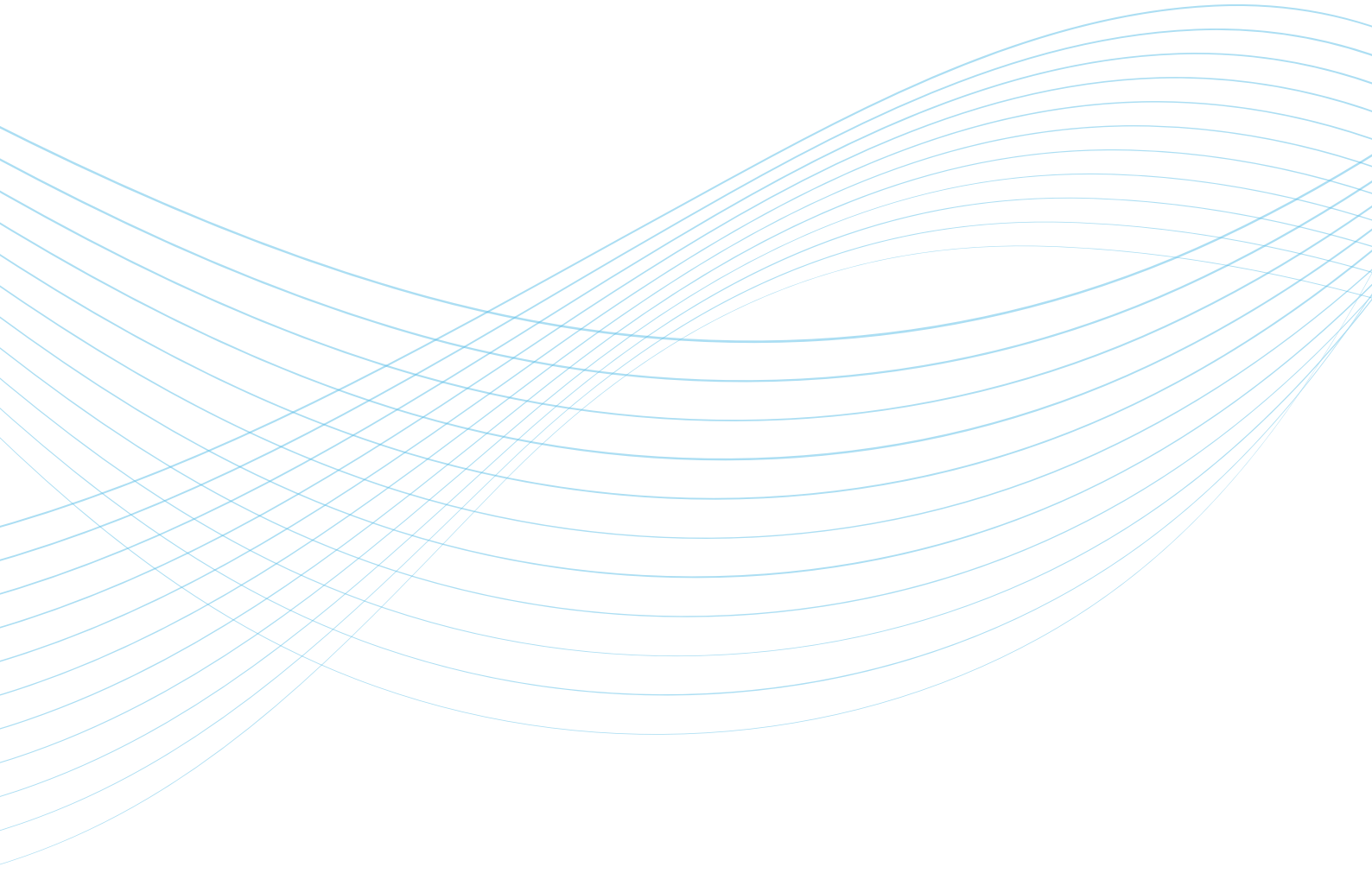
Clinical Guide

Pressure Injury Prevention & Hybrid Support Surfaces



INVACARE®

Yes, you can.®

Selecting the correct support surface impacts the patient, clinician and facility

Contents

Introduction

- The aim of this booklet is to provide an overview of pressure care with guidance on selecting support surfaces including the application of hybrid support surfaces based upon best practice statements and guidelines.

For ease of reference, this document has been split into three sections:

1. Pressure care

- Going back to basics, the booklet starts by identifying pressure injuries and their classifications. By ascertaining the causes and the impact pressure injuries have, both on the individual and the care facility, it is clear just how important selecting the right support surface is.

2. Support surfaces

- There is an array of support surface options available, often making selection difficult and posing challenges. To make an informed choice, it is important for prescribers and individuals to fully understand the therapy provided by the support surface and how it affects the human body.

3. Invacare hybrid support surfaces

- Hybrid support support surfaces combine foam and air to maximise the benefits offered by both technologies. This type of surface brings with it many benefits, which can be affirmed in the array of supporting clinical evidence and patient case studies.

Selecting the appropriate support surface can be a complex process. It should always start with the needs of the individual.

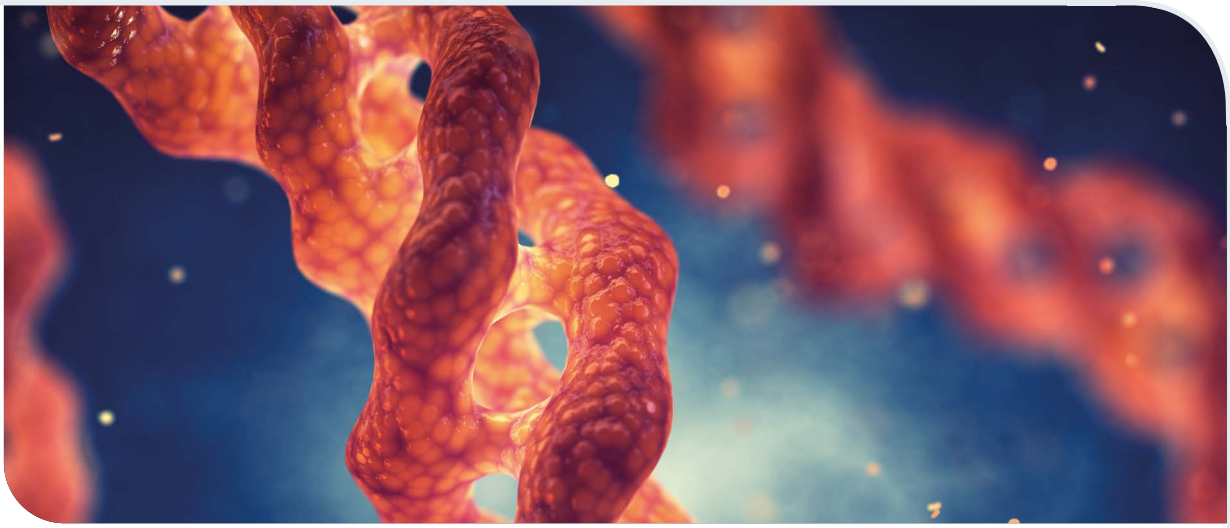
What is a pressure injury?

- **A pressure injury is a localised damage to the skin and/or underlying tissue** as a result of pressure, or in combination with shear. Pressure injuries usually occur over a bony prominence, but may also be related to a medical device or other object.
'A number of contributing or confounding factors are also associated with pressure injuries; the primary of which is impaired mobility.' (EPUAP, NPIAP, PPPIA, 2019)

  - All patients are potentially at risk of developing a pressure injury, however, they are more likely to occur in people who are seriously ill, have a neurological condition, impaired mobility, impaired nutrition, poor posture or a deformity (NICE, 2014).

Causes of pressure injuries

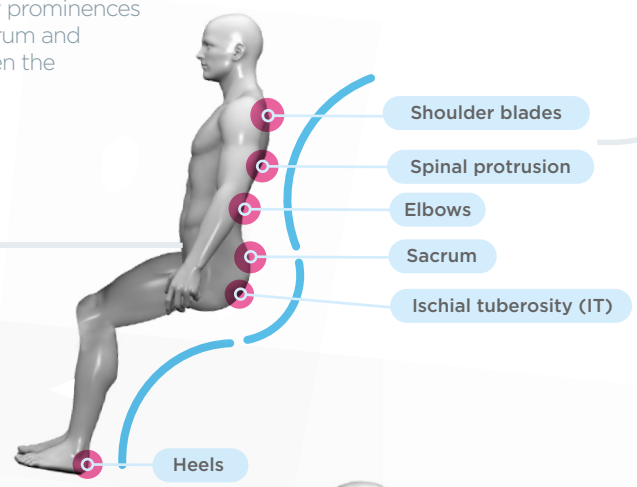
- Pressure injuries occur when an area of skin, and the tissues beneath, become damaged as a result of being placed under pressure, and/or experiencing shear forces sufficient to impair its blood supply.
- The skin and underlying tissue are compressed for a period of time, blood cannot circulate, causing a lack of oxygen and nutrients, and blocking the removal of waste products. Deprivation of nutrients and a change of pH, owing to waste products, will eventually lead to tissue damage.
- Other pathways, such as tissue deformation and inflammatory responses in the tissues combined with the tolerance and susceptibility to pressure injuries, are becoming more of interest to researchers with the growing body of scientific evidence in this field and the impact these pathways have.



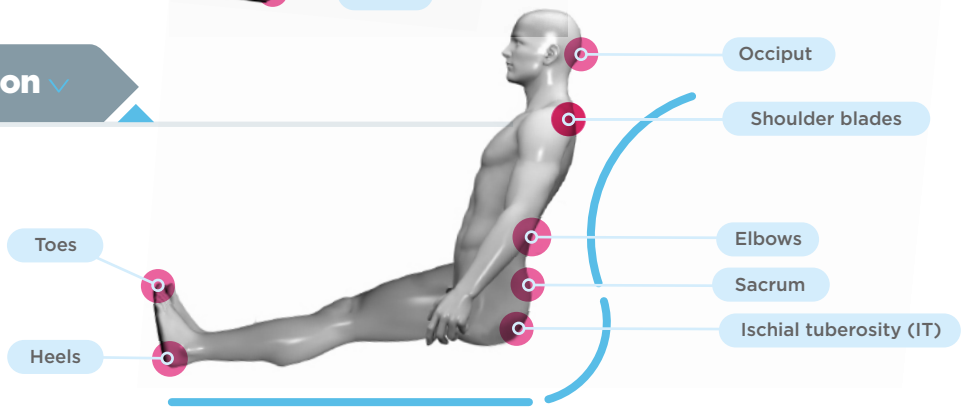
The areas at risk from pressure damage

- Pressure injuries are more likely to develop over a bony prominence owing to heightened pressure in these areas. All bony prominences are at risk, although the highest risk areas are the sacrum and heels as they are the areas that take the pressure when the individual is either lying or sitting.

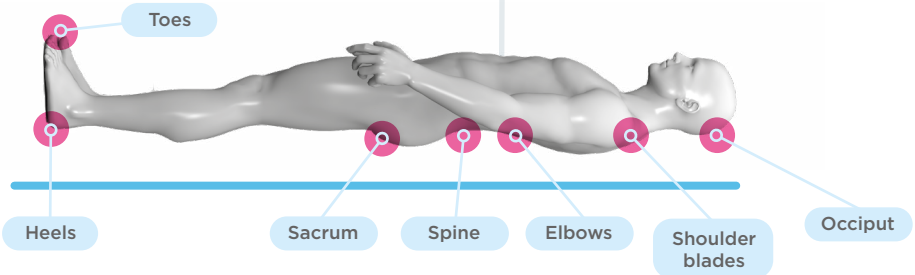
Seated position



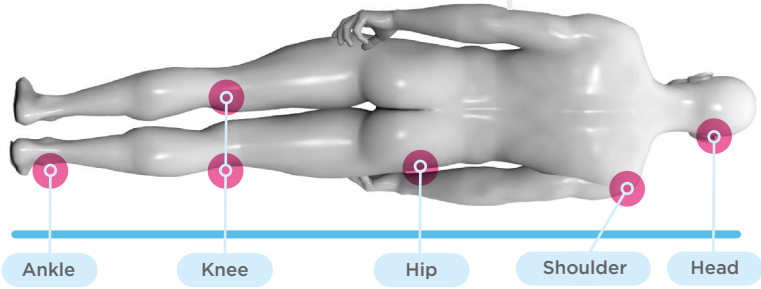
Semi-recumbent position



Supine position



Lateral position



Pressure injury classification

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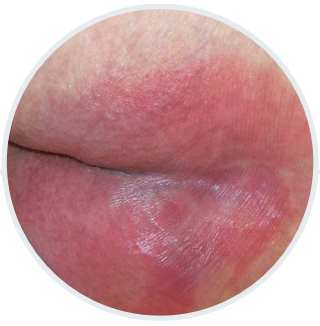
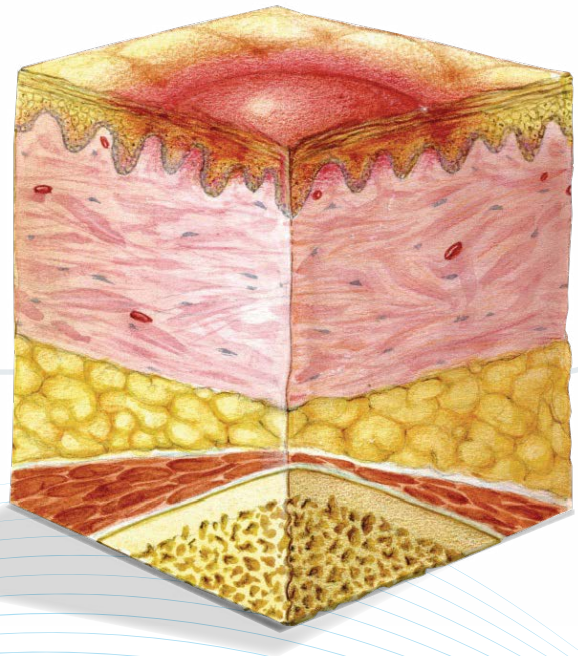
- The terms used to define the level of damage to the skin by a pressure injury are ‘stage’, ‘grade’ or ‘category’. The European and National Pressure Injury Advisory Panels developed an international definition and classification system for pressure injuries, which can be seen as follows:

Category/Stage I:

Non-blanchable Erythema

- 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.





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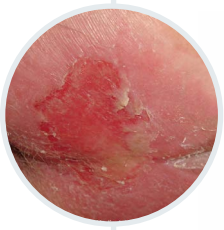
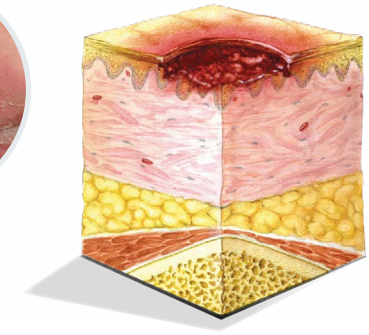
Category/Stage II:
Partial Thickness Skin Loss

- 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 blister. Presents as a shiny or dry shallow ulcer without slough or bruising.





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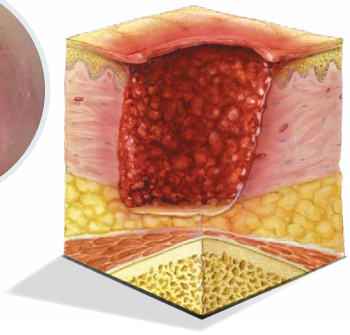
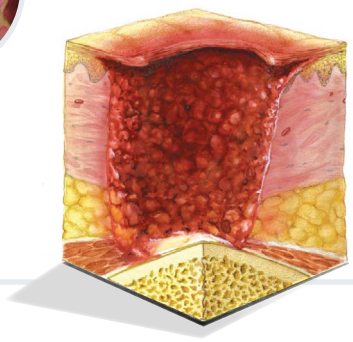
Category/Stage III:
Full Thickness Skin Loss

- 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. Bone/tendon is not visible or directly palpable.



Category/Stage IV:
Full Thickness Tissue Loss

- Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed. Often includes undermining and tunnelling. Exposed bone/tendon is visible or directly palpable.



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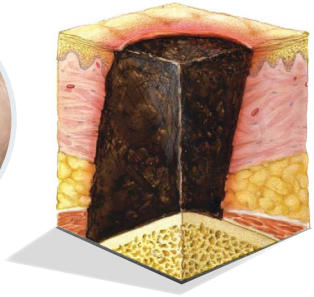
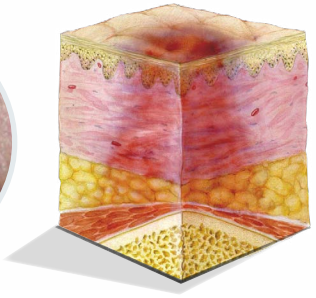
Unstageable:
Depth Unknown

- Full thickness tissue loss, in which the base of the ulcer is covered by slough (yellow, tan, grey, green or brown) and/or eschar (tan, brown or black) in the wound bed.



Suspected Deep Tissue Injury:
Depth Unknown

- Purple or maroon localised area of discoloured intact skin or blood-filled blister owing to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler, as compared to adjacent tissue.



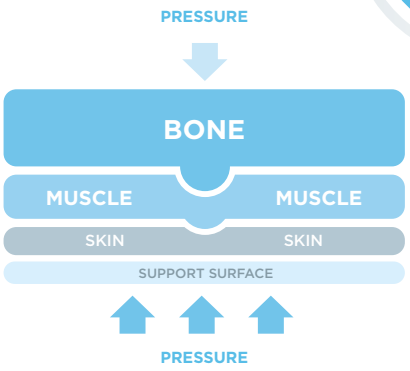
Pressure injury risk factors

- **The factors associated with pressure injury development are divided into two groups:**
- **EXTRINSIC** – Pressure, shear, friction and moisture & temperature (microclimate)
- **INTRINSIC** – Reduced mobility, advancing age, cognitive deficit, chronic illness, medication, poor nutrition, dehydration, incontinence and skin condition
- The development of pressure ulceration is dependent upon both extrinsic and intrinsic factors, which affect tissue tolerance and potential skin breakdown (Braden and Bergstorm, 1987).

Pressure

1

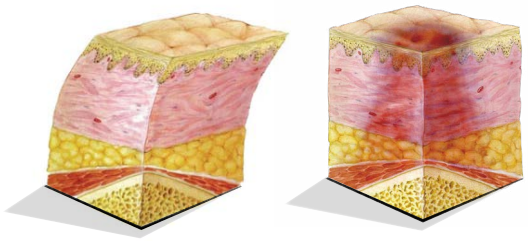
- **Pressure is a direct (vertical) force that occurs when our skin makes contact with a surface e.g. when sitting on a chair or lying on a mattress. Pressure causes the skin to compress or squash, restricting blood flow.**
- Oxygen and nutrients are carried via the blood to our skin, thus when pressure squashes the tissues, which make up our skin, the blood cannot transport the oxygen and nutrients and the tissues become damaged.



Shear

- **Shear works in a different direction to pressure.** Shear is a parallel or horizontal force which causes the skin and underlying tissues to stretch. Shear can occur when an individual slides down a bed or chair.

  The skin adheres to the mattress or cushion, distorting the underlying tissues. Blood flow may be reduced or impeded as dermal capillary beds are stretched and narrowed.



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Deep Tissue Injury (DTI)

Moisture and temperature

4

- **Moisture and temperature in the context of pressure injuries, also known as microclimate, usually refers to skin temperature and moisture conditions at the skin–support surface interface.**

Changes in microclimate at the skin/support surface interface can affect the body's ability to withstand the effects of external factors, such as pressure. As a result, tissue tolerance levels may alter, which could result in pressure injury development.

Friction

3

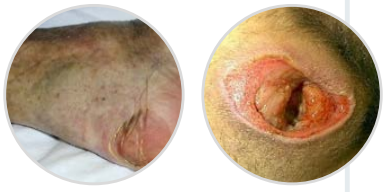
- **Friction forces are applied to an area of skin which is rubbed against the support surface as a result of gravity, poor repositioning technique or agitation.**

The results of which can be almost instantaneous, as the epidermal skin layer is sheared away from the underlying tissue.

Moisture lesions can be misclassified as **pressure injuries**, although the prevention and treatment of the skin damage is significantly different.

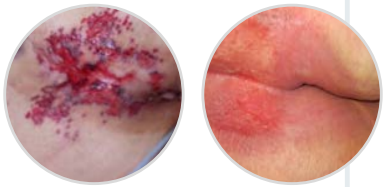
Pressure injuries

- **Regular**
- **Defined**
- **Localised**
- **Usually over a bony prominence**



Moisture lesions

- **Irregular,**
- **Scattered**
- **Diffuse**
- **Moisture present**



Impact of pressure injuries

- **Pressure injuries are a significant cause of morbidity and mortality (Posnett et al, 2009) and can be a standard of care measurement for a healthcare environment, as they are considered to be largely avoidable.** The number of avoidable pressure injuries is estimated at between 80 and 95% (NPSA, 2010).

With this in mind, the NHS Safety Thermometer reported that from April 2014 to the end of March 2015, just under 25,000 patients were reported to have developed a new pressure injury, and on average 2,000 pressure injuries are newly acquired each month within the NHS in England (NHS Safety Thermometer Report, 2015).

Cost

Pressure injuries can have a significant impact on an individual's quality of life. They cause longer hospital stays, medication and dressings. With over 4m people* affected in Europe, it costs €70,000* per year to treat a pressure injury (EPUAP, 2021).

- **The cost of pressure injuries in the Netherlands is between USD 362 million (low estimate) and USD 2.8 billion (high estimate) (Severens et al, 2002)**
- **The most conservative estimate is 1% of the Dutch healthcare budget (Severens et al, 2002)**
- **The cost of wound care in the UK is around 3% of the NHS expenditure - an estimated £2.4 billion-£3.1 billion per year (Drew et al, 2015). One NHS Trust reported a cost estimated at as much as £9.89 million (Vowden et al, 2009)**

The cost of treating a pressure injury varies from £1,214 to £14,108. Costs increase with severity, as the time to heal is longer and the likelihood of complications are higher in severe cases. Nursing time makes up most of the cost. Other associated costs, estimated at 3.3% of expenditure, include wound dressings, medication and equipment (Dealey et al, 2012).

Quality of life

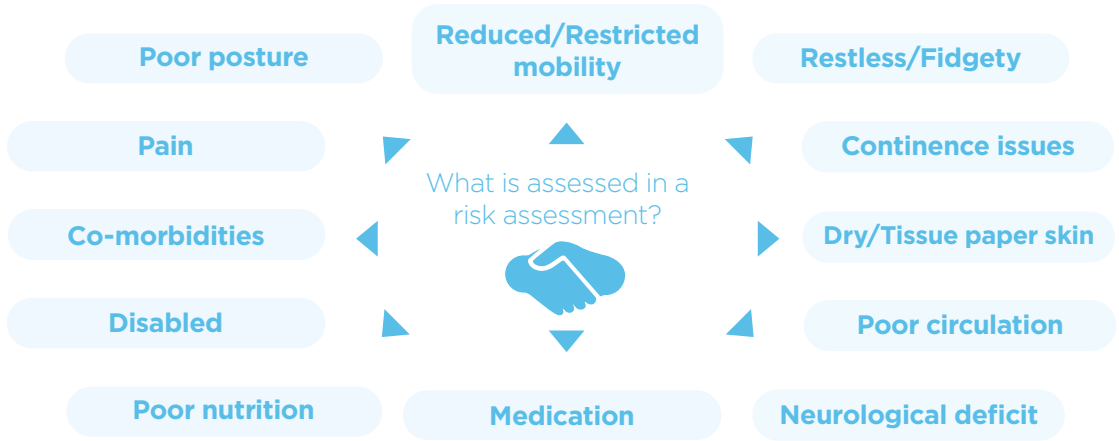
The impact of quality of life for the individual living with a pressure injury can be great, with changes in mobility, general functioning, control of pain and odour being important considerations. (Bradbury et al, 2008).

Severity and location of skin damage can have varying effects on the individual and their care plan, treatment strategies and clinical outcome. Much can depend on the individual's general health, nutritional status, mobility, continence status, prognosis, and standard of care.

Risk Assessment

▸ Owing to the burden and impact of pressure injury development on both the individual and the health service, it is accepted practice that a risk assessment should be undertaken on individuals, with the aim of identifying those who are at potential risk, in order that individualised preventive interventions can be planned and initiated (EPUAP, 2019). Harding et al (2016) highlight the importance of carrying out a risk assessment as soon as a patient is admitted to hospital in order to identify susceptibility and allow implementation of preventative interventions for the duration of the hospital stay, with awareness of evidence-based practices being instilled through staff education.

This image highlights some of the risk factors included in a risk assessment:



Risk assessment tools

▸ There is a plethora of risk assessment tools available; some designed for generic use and others for specific populations such as those in critical care/intensive care units or paediatrics. A combination of risk assessment, information collected from other tools and clinical judgement, should be encouraged to develop a more focused assessment that leads to a good plan of care (Fletcher, 2017). Examples of risk assessment tools are: Waterlow, Norton, Braden, Braden Q and PURPOSE T.

The impact of quality of life for the individual living with a pressure injury can be great

Skin & tissue assessment

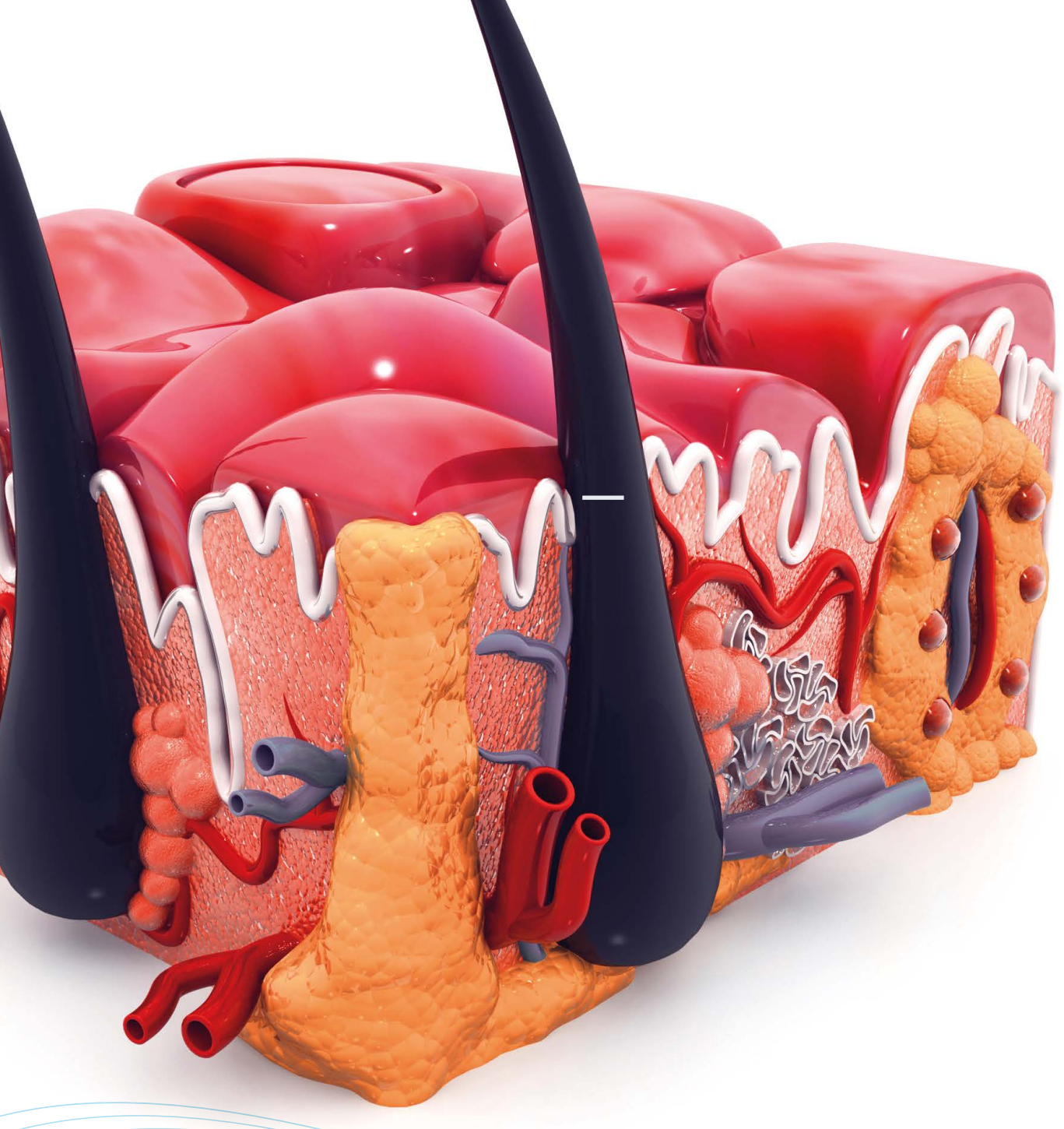
A skin and tissue assessment is important in pressure injury prevention, classification, diagnosis and treatment (EPUAP, 2019). A comprehensive skin assessment should be carried out on individuals who are considered to be at risk of developing a pressure injury, in order to detect the early signs of skin damage as a result of pressure and/or shear forces. Tissue tolerance, or the way the skin responds to external forces, can determine an effective repositioning schedule and assess for an appropriate support surface, depending on individual need.

Checking the skin and tissue

Every time the individual is repositioned, an opportunity arises to conduct a brief skin assessment. This provides guidance for selecting a support surface and confirms what repositioning techniques and schedules are required. Following a period of pressure on a bony prominence, the skin naturally presents as a reddened area. If there are any reddened areas, it is important to ascertain if it is a natural tissue response (reactive hyperaemia) or showing the early signs of skin damage. This can be determined by light finger pressure over the reddened area to check if the tissues are responsive (blanchable or non-blanchable).

To detect the early signs of skin damage, skin should be observed for the following:

- **Red patches on light skinned people**
- **Purplish bluish patches on dark skinned people**
- **Swelling**
- **Blisters**
- **Shiny areas**
- **Dry patches**
- **Cracks, calluses, wrinkles**
- **Feel for warm areas and swollen skin over bony prominences**



▸ As it is not always possible to identify erythema on darkly pigmented skin; localised heat, oedema and change in tissue consistency in relation to surrounding tissue (e.g. induration/hardness) are important indicators of early pressure damage. If an individual is able to respond reliably, ask them to identify any areas of discomfort or pain that may be attributed to pressure damage (EPUAP, 2019).

Individualised care planning

Develop and document an individualised care plan for neonates, infants, children, young people and adults, who have been assessed as being at high risk of developing a pressure injury. It should take into account the following:

- **The outcome of risk and skin assessment**
- **The need for additional pressure relief at specific at-risk sites**
- **Their mobility and ability to reposition**
- **Other co-morbidities**
- **Patient preference**

(NICE, 2014)

Repositioning

- **'Repositioning involves a change in position of the lying or seated individual undertaken at regular intervals,** with the purpose of relieving or redistributing pressure and enhancing comfort.' (EPUAP, NPIAP, PPPIA 2019)

There is also a need to reposition individuals to:

- **Aid nutrition, hydration**
- **Perform a skin inspection**
- **Prevent the risks of bed rest i.e.: DVT, constipation, isolation, reduced muscle tone and reduced bone density**

'A pressure injury can occur within one hour! Two hour turning of patients has been a regime for 50 years. This is a good example of ritualistic practice which has no medical basis'

(Waterlow, 2005).

Considerations

As we age, there is a tendency to want to move less, joints can become stiff and less mobile, risk of complications are increased and skin is thinner and more susceptible to damage.

Careful and considerate repositioning techniques are essential. It is important to determine repositioning frequency taking into consideration the individual's:

- **Tissue tolerance**
- **Level of activity and mobility**
- **General medical condition**
- **Overall treatment objectives**
- **Skin condition**
- **Comfort**

Repositioning guidelines

a. There has been much research and debate on recommended frequency of repositioning. There are no general recommendations on which frequency should be used for individuals at risk for developing pressure injuries. There are, however general recommendations to what a frequency for the individual should be based on.

b. Reposition all individuals with or at risk of pressure injuries on an individualised schedule, unless contra-indicated.

c. Determine repositioning frequency based on: Skin and tissue tolerance; General medical condition; Overall treatment objective; Comfort and pain.

d. Implement repositioning reminder strategies to promote adherence to repositioning regimens.
(EPUAP, NPIAP, PPPIA, 2019)

Support surfaces

Support surfaces are specialised devices for pressure redistribution, designed for management of tissue loads, microclimate, and/or other therapeutic functions (EPUAP, NPIAP, PPPIA, 2019). The meaning of the term 'pressure redistribution' is the ability of a support surface to distribute load over the contact areas of the body.

Support surfaces also include mattresses, overlays, cushions and seating, with an aim to reduce or redistribute pressure, friction or shearing forces. Pressure redistributing support surfaces are widely accepted methods of trying to prevent the development of skin damage for people assessed as being at risk of developing pressure injuries.

With this is mind, there is, however, limited evidence on whether different at-risk sites of the body benefit from using different pressure redistributing devices. Further research is needed to identify what devices are beneficial for specific at-risk sites for all age groups' (NICE, 2014).

Support surfaces are designed to either increase the body surface area that comes into contact with the support surface (to reduce interface pressure), or to sequentially alter the parts of the body that bear load, thus reducing the duration of loading at any given anatomical site (EPUAP, 2019).

Historically, clinicians have considered static support surfaces to be 'pressure redistributing' and active support surfaces (dynamic/alternating) to be 'pressure relief' in their categorisation. However, these terms have been superseded by the term 'pressure redistribution' as an individual is not weightless and, therefore, cannot be completely free of pressure (NPIAP, 2007).

Types of support surfaces

Support surface	Type	Definition
Active	• Alternating pressure air/ dynamic • Powered air-foam hybrid	A powered support surface with the capability to change its load distribution properties, with or without applied load.
Reactive	• Castellated foam • Memory foam • Static air • Fibre • Gel • Air fluidised • Non-powered air-foam hybrid	A powered or non-powered support surface with the capability to change its load distribution properties in response to applied load.
Integrated bed system	Bed and mattress	A bed frame and support surface that are combined into a single unit whereby the surface is unable to function separately.

(Support surface definition source: NPIAP, 2007)

Active support surfaces

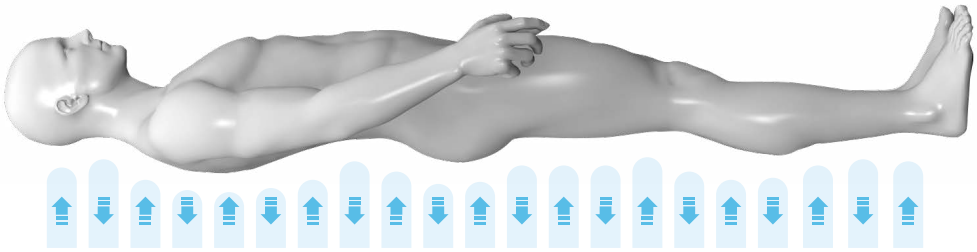
1

- Active support surfaces are alternating air systems (also known as dynamic systems) that redistribute pressure by cyclically inflating and deflating zones of the surface.

- The surface incorporates a sequence of air sacs that inflate and deflate. Changing the pressure at the support surface interface in a sequence controlled by the motorised control unit. The cells actively redistribute pressure by altering the parts of the body that bear load. Active surfaces tend to be prescribed for the treatment of pressure injuries as part of a holistic approach and are generally more expensive than reactive support surfaces due to their complexity.

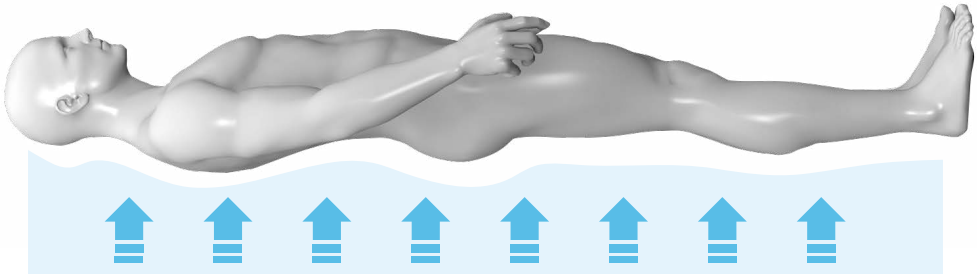
The performance of the surface is dependent on the frequency, duration, amplitude and rate, however, there is currently no clear evidence to yet suggest the ideal frequency, duration, amplitude and rate of inflation and deflation.

Active support surface



- **For example,** alternating pressure air mattress.

Reactive support surface



- **For example,** cut, layered or formed foam, static air, gel, fibre, low air-loss, or air fluidised.

Reactive support surfaces

2

- Reactive surfaces redistribute pressure over a large surface area by contouring to the anatomical shape of the body.

- They are generally considered to be the first line of defence for pressure injury prevention and, in some cases, used effectively as part of a holistic approach for the treatment of superficial ulcers. They also offer a high level of immersion and envelopment.

- **Immersion** refers to the ability of a support surface to allow a patient to sink into it. As the body sinks in, more of the body comes into contact with the support surface, redistributing the patient's weight over a larger area and reducing pressure. Immersion is greater on softer surfaces and also has the potential to be higher on thicker surfaces. However, if the material is too soft, the patient may 'bottom out' (i.e. end up sitting or lying on the underlying structure of the bed or chair) because the support surface has become too compressed.

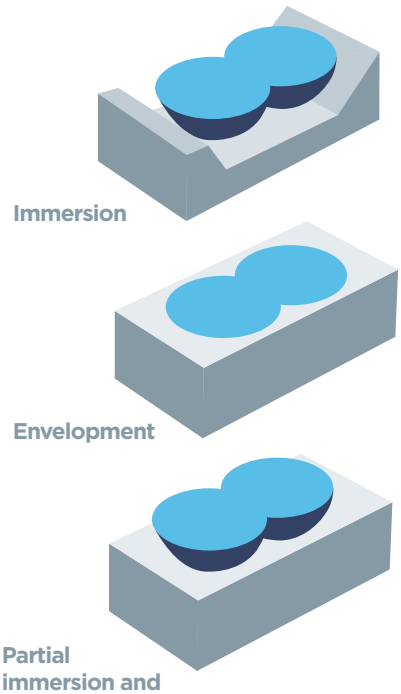
(Wounds International, 2010)

- **Envelopment** refers to how well a support surface moulds to body contours and accommodates irregular areas (such as folds in clothing or bedding). Recent research has indicated that the degree of immersion and envelopment of a support surface can be impaired by increasing tension at the surface of the support, especially when combined with sagging of the support surface itself. For example, a tight cover over a mattress or seat cushion can create a hammock effect that prevents the support surface moulding to the body's contours and this could produce high pressures over a small area.

(Wounds International, 2010)

- Immersion and envelopment have important implications for patient mobility and independence. For example, it requires relatively little effort to stand from sitting or lying on wood (which has no immersion or envelopment), but the same manoeuvre from water requires more effort because of the high degree of immersion and envelopment.

(Wounds International, 2010)



Active and reactive support surfaces

- **A surface that can be used in both active and reactive** mode usually has a powered control unit that can be connected to the mattress when active support is needed. Reactive support in these surfaces usually doesn't have the necessity of a powered control unit. The products are constructed of both foam and aircells. **This is referred to as a powered hybrid mattress by many clinicians.**

- There are generally two types of hybrid support surfaces:
  - Non powered hybrid support surfaces
  - Powered hybrid support surfaces

a

Non-powered hybrid support surfaces

- **Non-powered hybrid support surfaces work on the principle of air displacement and there are different underlying mechanisms of action depending on the valve technology being used:**

1. The first group of hybrid surfaces make use of a form of cut off valve. Over a period of time, the air cells will naturally diffuse and the cells will deflate when a patient is lying on the mattress so the surface requires regular opportunities to recalibrate the air cells.

2. The second group uses a specialised air valve to regulate internal air pressure by continuously reaching an equilibrium between the atmospheric pressure and the air inside the cells. It will inflate or deflate based on the patient's weight and movements.

3. The third group has a closed system that maintains a fixed pressure/volume relationship within the air cylinders/reservoir.

b

Powered hybrid support surfaces

- A powered hybrid support surface allows the option of a control unit to be connected to a mattress to action the movement of cells beneath the individual, thus altering the parts of the body bearing load at any given time. The automated cyclical action generally provides enhanced benefits for those with existing pressure injuries. This set-up prevents air diffusing from the support surface and provides a form of alternating pressure support as a step-up therapy.

Clinical efficacy

C

- **The clinical efficacy of a support surface does not rely solely on the internal construction.**

There are other considerations that have varying influences on clinical outcomes and, just as no two alternating air support surfaces are the same, no two hybrid mattresses with a high specification foam interface are the same either.

Factors that may influence clinical efficacy:

- Shape, construction and density of the base foam and side formers
- Density and specific cut of high specification foam
- Shape and format of individual castellation's of foam
- Size and depth of individual foam components
- Profiling mechanism of independent layers
- Cover material qualities, structure and composition
- Power unit specification and features
- Weight limits
- Patient dependant clinical aspects and clinical evolution

Support surface selection

Support surfaces should be chosen on an individual basis depending on the needs of the individual. It is important to review the effectiveness of the support surface for prevention and treatment of pressure injuries, and consider other aspects, such as comfort and transfer abilities. 'Stepping-up' and 'stepping down' the therapy delivered by the support surface is also important for the best clinical and financial outcomes.

Factors to be considered

Existing pressure damage

Consider the location of pressure damage and the treatment objectives, including the cause of the pressure damage and the effectiveness of the support surface. For example, a pressure injury to the ear caused by oxygen tubing. Take into account anatomical location of pressure damage and consider the effectiveness of a support surface.

Patient's needs

Consider the individual's need for pressure redistribution based on the following factors:

- **Level of immobility and inactivity**
- **Need for microclimate control and shear reduction**
- **Size and weight**
- **Risk of developing a new pressure injuries**
- **Diagnosis/prognosis/ pre-existing condition/pain**
- **Compliance with the support surface**
- **Level of independence and how to optimise it**
- **Level of comfort and rest**

(EPUAP, NPIAP, PPPIA, 2019)

Care setting

Consider the choice of support surfaces based on the following factors:

- **Weight of the bed**
- **The structure of the building**
- **The width of doorways**
- **The availability of uninterrupted electrical power** – Contingency plans should be in place for power failures
- **Safe location for the pump/motor, including its ventilation**

(EPUAP, NPIAP, PPPIA, 2019)

Repositioning

- **Repositioning is required for all individuals, irrespective of the type of support surface in use,** although the type of support surface may have an effect on the repositioning frequency (EPUAP, NPIAP, PPPIA 2019) for the prevention and treatment of pressure injuries. However the individuals' response to pressure should always guide turning frequency.

Pre-exisiting issues

- **It is important to take into account the individuals diagnosis,** prognosis, pre-existing conditions, pain, activity and compliance when prescribing a support surface, and where possible, optimise their independence and enhance comfort and rest.

Equipment compatibility

- **The size of a support surface should be compatible with the bed base,** ensuring the gaps do not cause entrapment and there is no risk of injury owing to an incorrect fit.
- **The height of the side rails on the bed, if used, should be considered, especially when overlay support surfaces are used as they can increase the height of the patient platform** - A risk assessment is advised in all cases.
- **Many alternating air systems have straps to secure the support surface to the bed base in order to reduce movement, particularly during transfer** - Check the integrity of the straps and ensure the chosen bed base is suitable for their use to reduce the risk of falls. Always refer to the manufacturer's recommendations for the use and maintenance of specialised devices.

What do the current guidelines recommend?

The European Pressure Injury Advisory Panel recommend the prescription of support surfaces as follows:

- **Use a high specification** reactive single layer foam mattress or overlay inpreference to a foam mattress without high specification qualities for individuals at risk of developing pressure injuries.
- **Assess the relative benefits of using an alternating pressure air mattress or overlay for individuals at risk of pressure injuries.**
- **Consider using a reactive air mattress** or overlay for individuals at risk of developing pressure injuries.
- **Select a support surface** that meets the individuals needs for pressure redistribution based on the following factors
  - Levels of immobility and inactivity
  - Need to influence microclimate control and shear reduction
  - Size and weight of the individual
  - Number, severity and location of existing pressure injuries
  - Risk for developing new pressure injuries
- **Wherever possible,** do not position an individual on an existing pressure injury

Benefits of non-powered hybrid support surfaces

The main advantage of a non-powered hybrid system is the individualised reactive air support, providing continuity of intended support without the need for a power supply essentially offering ease of use.

Practical

a

- **Its enhanced reactive pressure redistribution** means the air cells will respond to the movement, body shape and position of the patient, providing individualised support without the need for a control unit.
- **The need for periodically servicing control units is greatly reduced** within healthcare settings and alleviates the risk of having prolonged downtimes of systems and the need to have more systems than are actually being used.
- **Cleaning and decontamination processes can be reduced** with the use of a hybrid support surface. Non powered hybrid support surfaces are just as easily cleaned and decontaminated as static foam mattresses.
- **Hybrid support surfaces may be supplied with a similarly constructed cushion for 24-hour support surface provision,** for individuals who spend time sitting in a chair.
- **By reducing the need for alternating mattresses,** it may be possible to release nursing time back to care with a hybrid system, helping to improve safety and the patient experience.

Financial

- **A hybrid support surface provides savings on initial purchase,** replacement of parts and maintenance costs, compared with many traditional alternating or other powered air systems. Many of the parts can also be replaced at the bedside if required.
- **Cost savings related to reduced outlay for decontamination and mattress rental expenditure.**
- **There is less likelihood of damage or punctures to air cells** owing to the protection of the foam, this reduces the need for replacement, incurring additional cost and patient disturbance. It also negates the need to ensure a replacement surface is available during the repair period.

b

Clinical

c

- **Non-powered hybrids work on the principle of air displacement.** When a person repositions their weight, air moves within the mattress to surrounding cells for optimum pressure redistribution. This allows the mattress to conform to the person's body shape as they move. This increased surface area that is in contact with the mattress reduces the patient/support surface interface pressures; minimising the potential for cell and tissue breakdown[1].
- **As there would be no interruption in power supply with a non-powered hybrid,** there will be no issues with experiencing discomfort or associated pressure injury risks with lying directly on the bed base as a result of a deflated powered mattress.
- **As hybrid support surfaces have firm foam bases to secure to the bed base.** This offers more stability for the individual and reduces the risk of falls.
- **A non-powered hybrid support surface can be more comfortable than an alternating air-cell surface.** The tolerance rate is, therefore, likely to be increased and a broader range of co-morbidities catered for.
- **Transferring to and from a hybrid system is easier as it is generally smoother and offers more stability than an alternating powered surface.** This can be advantageous for an individual's confidence as well as their independence. An alternating interface may impede the independence of obese individuals owing to the possible difficulties with moving independently upon this type of surface (Tickle, 2015).
- **Body spasm may be reduced by a hybrid support surface with a foam interface** (Stephen-Haynes, 2015). It has been noted that at times an individual's body spasm may be aggravated by direct alternating pressure against the skin.
- **The introduction of a hybrid system also brings several patient benefits with reports of improved comfort levels and the ability to sleep better** (the system is quieter than a powered system). Improved comfort and tolerability has also been associated with improved quality of life and better patient outcomes.

1 Levy A, Kopplin K, Gefen A. An air-cell-based cushion for pressure injury protection remarkably reduces tissue stresses in the seated buttocks with respect to foams: finite element studies. J Tissue Viability 2014; 23(1): 13–23

Benefits of powered hybrid support surfaces

The main advantage of a hybrid system is alleviating the need for two support surfaces when therapy needs to be stepped-up or stepped-down.

There are often delays associated with changing support surfaces, which could in itself lead to exposing the individual to the risk of pressure ulceration. Plus, when the surface does arrive, the individual has to be assisted out of bed, the bed linen needs to be removed and the new surface needs to be put in place, causing a lot of disruption to the individual.

By simply adding a power unit to a non-powered surface (and vice versa), the process of changing therapy is both quick and simple.

Practical

- **By activating the air cell cycle on a powered hybrid system,** a higher level of therapy can be delivered, without the need to assist the patient out of bed, remove bed linen or replace the support surface.
- **The need for storing several or different mattresses is greatly reduced** within healthcare settings and alleviates the risk of damage during transfer and while the support surface is not in use.
- **Its enhanced reactive pressure redistribution means the air cells will respond to the movement,** body shape and position of the patient, providing individualised support without the need for a control unit.
- **Cleaning and decontamination processes can be reduced with the use of a hybrid support surface.** Valuable nursing time and resources can be saved in the process of 'step-up' and step-down' therapy.
- **Hybrid support surfaces may be supplied with a similarly constructed cushion for 24-hour support surface provision,** for individuals who spend time sitting in a chair.
- **The cyclical movement of an alternating air cell interface can often enhance the individual's propulsion along the bed surface (Thompson, 2006).** The foam interface on a powered hybrid system contributes greatly to reducing this effect, diminishing the risk of shear and friction forces and alleviating the need for patient disturbance due to unnecessary repositioning.

Financial

b

- **A hybrid support surface provides savings on initial purchase,** replacement of component parts and maintenance costs, compared with many traditional alternating air systems. Many of the component parts can also be replaced at the bedside if required**.**
- **Adams (2014)** demonstrated that installing the Softform Premier Active hybrid system throughout a 600-bed acute NHS Trust led to cost savings in excess of £1.85 million over a seven-year period. These costs related to reduced outlay for decontamination and mattress rental expenditure.
- There is less likelihood of damage or punctures to air cells owing to the protection of the foam, this reduces the need for replacement, incurring additional cost and patient disturbance. It also negates the need to ensure a replacement surface is available during the repair period.

Clinical

c

- **The alternating air cell cycle can be interrupted for changing circumstances,** such as during periods of clinical intervention, i.e. a dressing change.
- **Should there be an interruption in power supply, the individual would be adequately supported on a foam mattress,** rather than experience the discomfort and pressure injury risk associated with lying directly upon the bed base.
- As hybrid support surfaces have firm foam bases, this negates the need to secure them to the bed base, **therefore, there is generally more stability** for the individual and reduced risk of falls.
- **The foam interface offers comfort and rest advantages over an alternating air cell surface.** The peak pressures against the skin, and particularly over bony prominences, are diffused by the foam. The compliance rate for a foam interface is, therefore, likely to be increased and a broader range of co-morbidities catered for.
- **Transfer abilities of the individual may be increased on a hybrid system with a foam interface as it is generally smoother and offers more stability than an alternating surface.** This can be advantageous for an individual's confidence as well as their independence. An alternating interface may impede the independence of obese individuals owing to the possible difficulties with moving independently upon this type of surface (Tickle, 2015).
- **The sensation of movement beneath an individual can often create a feeling of motion sickness.** At times, this may be so severe that it inhibits the use of an alternating interface support surface. The foam interface next to the skin can alleviate the sensation of movement, often resulting in increased compliance and negating the need for unnecessary transfer.
- **Body spasm may be reduced by a hybrid support surface with a foam interface (Stephen-Haynes, 2015).** It has been noted that at times an individual's body spasm may be aggravated by direct alternating pressure against the skin. The foam interface may alleviate agitation from the alternating cells beneath.

Introducing

InvaSoft™ Hybrid
Non-powered support surface

Explore the Advanced Hybrid Technology by Invacare with the InvaSoft™ Hybrid. This non-powered support surface combines management of pressure, shear and microclimate in individuals at high risk of developing pressure injuries.

a

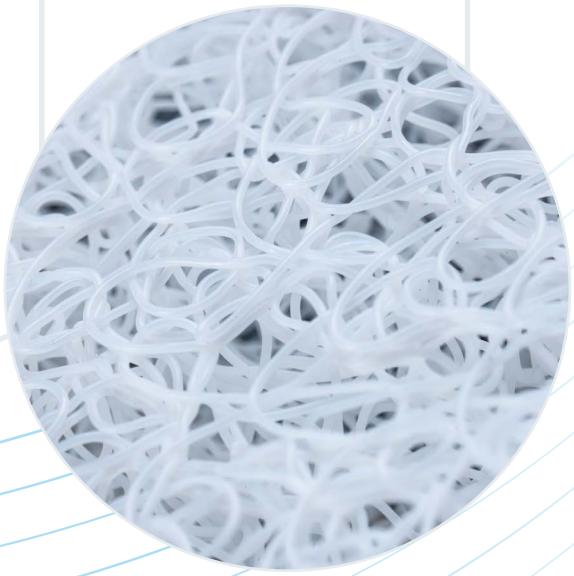
The Principle

Non-powered hybrid support surfaces work on the principle of air displacement. When a person repositions his or her weight, air moves within the mattress to surrounding cells for optimum pressure redistribution. This allows the mattress to conform to the shape of the person's body as they move. This ultimately increases the person's surface area in contact with the mattress, thus reducing the surface interface pressures and minimising the potential for tissue and cell breakdown.

b

InvaSoft™ as a 'Reactive' surface

▶ A uniquely developed spacer material ensures the air cells give optimised support: InvaSoft™ makes use of reactive non-powered Auto-Adjust Technology to adjust to weight placed upon the air cells. They open to allow air in and out to automatically regulate internal pressure to provide constant pressure redistribution to adapt to the patient needs and reduce the risk of skin breakdown.



c

InvaSoft™ for Microclimate management

▶ Hybrid provides continuous microclimate management

Construction of the InvaSoft™ Hybrid

InvaSoft™ Hybrid offers an advanced and high-quality construction that provides enhanced comfort and stability, whilst fully supporting body contours to redistribute pressure effectively. As a result, the InvaSoft™ Hybrid is suitable for patients at high risk of developing pressure injuries.

High specification foam

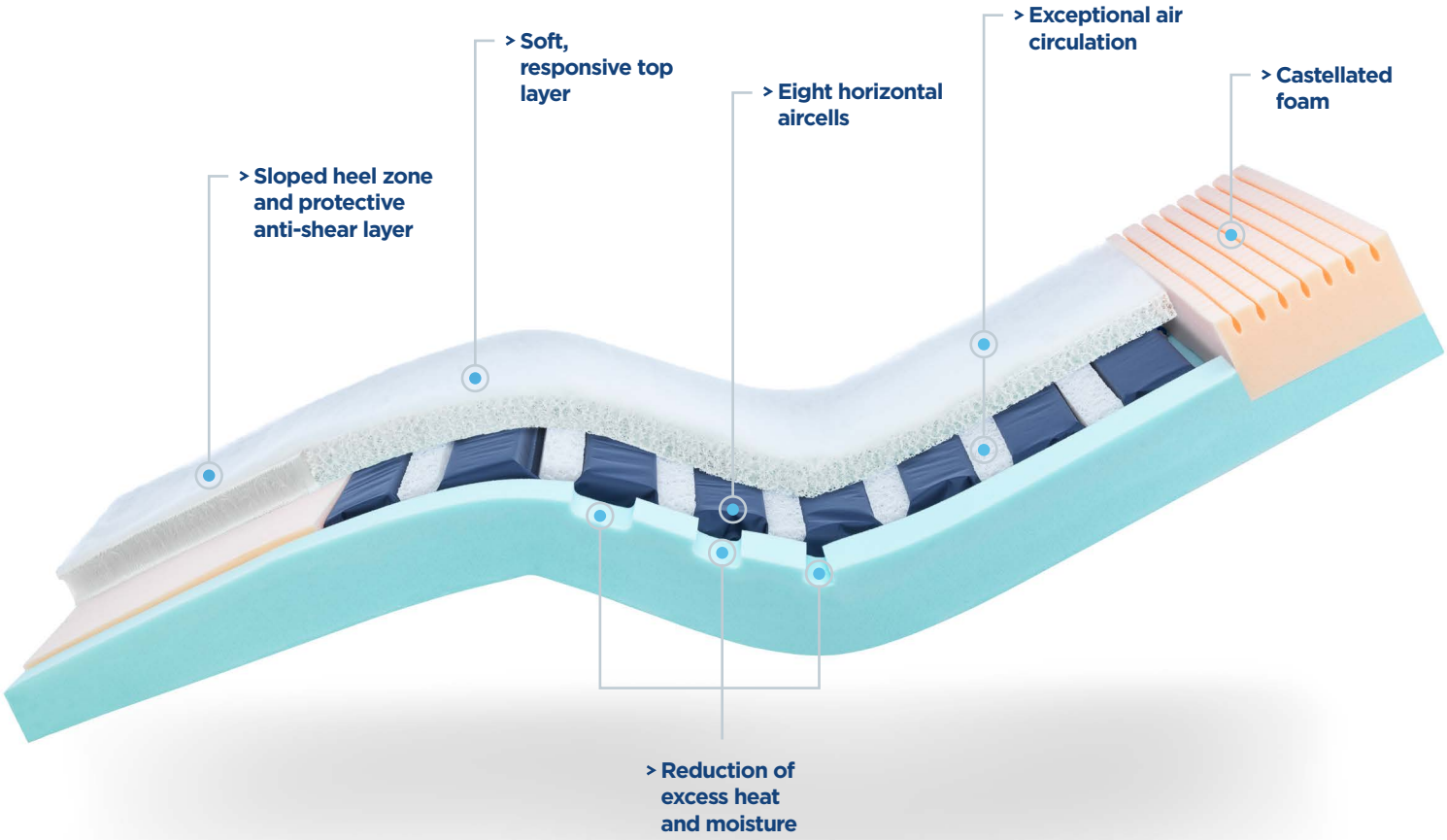
The various foam layers are of a high specification, meeting the criteria laid out in the EPUAP, NPIAP, PPPIA 2019 guidelines. Each foam layer which helps builds this advanced design, works together to ultimately provide comfortable body support whilst allowing for optimum immersion and envelopment in order to redistribute pressure most effectively.

Noodle material

This latest and advanced developed material ensures the air cells provide optimal support whilst allowing air to flow. It's a synthetic three-dimensional polymer with a top layer of a non-woven spacer material that maximises comfort.

Results from Berlin Cert testing mattress performance, confirms InvaSoft™ offers an equal to superior performance to three other leading hybrid mattresses.

See pages 36 - 39 for details.



Integrated heel protection

▶ **The 5-degree sloped heel zone** will help to reduce interface pressures and reduce the risk of skin breakdown on the vulnerable heel area.

Foam U Core

▶ **The high-density foam of the single cut U-core base** adds strength and conformity for profiling, as well as support and protection for individuals due to its maximum user weight of 230 kg while facilitating the Venturi effect by specifically designed cutouts. It also has integrated high-density foam side that provide the most stable edges for egress, enhancing an individuals' confidence and stability during transfer and the rehabilitation process.

Non-powered Technologies

Non-powered Airflow Technology (N.P.A.T.) can help manage the skin's microclimate effectively without the need for additional or specialist equipment whilst also offering reduced maintenance and ease of use. **Auto-adjust technology** redistributes air according to patient size, weight, position and body shape. The air cells in InvaSoft™ offers the benefit of enhanced immersion and envelopment in a non-powered hybrid support system.

Top cover

The multi-stretch high breathable cover further enhances the InvaSoft™ Hybrid microclimate management feature. The absence of seams along the upper edges also ensure prevents ingress of body fluids.

Base cover

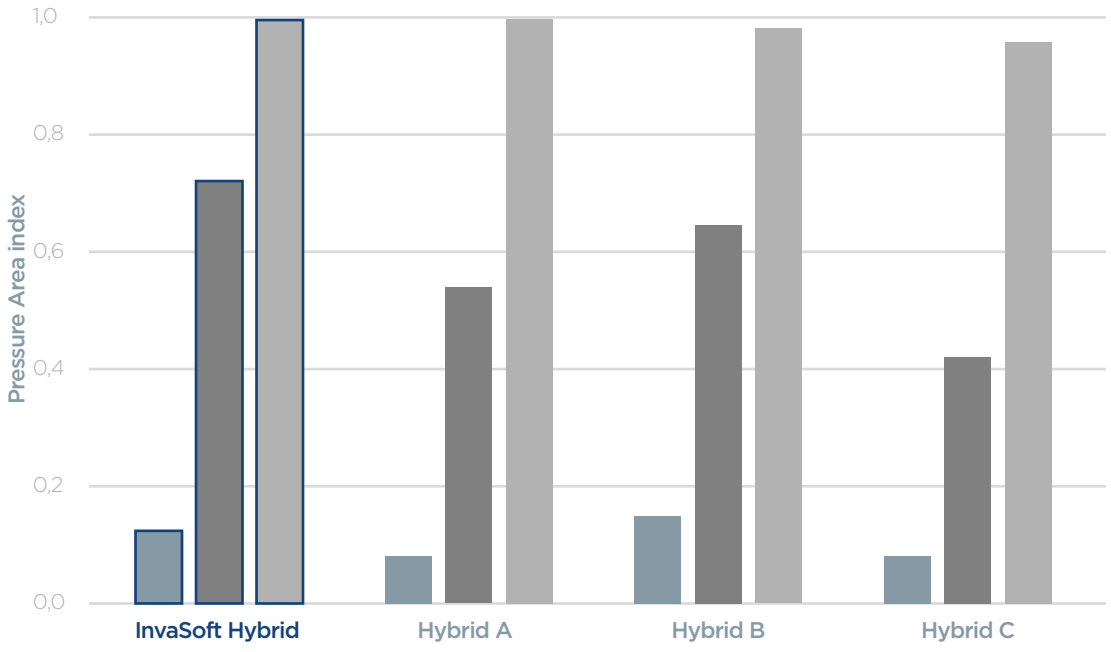
A toughened polyurethane base cover ensures longevity when used continuously on an electric profiling bed, giving internal components added protection. The addition of rivetted toughened polyurethane handles to the edge of the base cover, offers further durability whilst also visually promoting their use for moving and handling and reducing damage to the support surface during transfer.


INVACARE

Clinical effectiveness of the InvaSoft™ Hybrid

InvaSoft™ Hybrid is suitable for those at high risk of developing pressure injuries. Performance has been measured by Berlin Cert - a well-established independent test facility with specific experience in different types of support surfaces and tested against three leading hybrid support surfaces undergoing the same test protocols.

Measuring PRESSURE DISTRIBUTION using the 1600 sensor XSENSOR system:



The percentage of skin contact area, using an 80kg model where interface pressure is below pre-defined thresholds of:

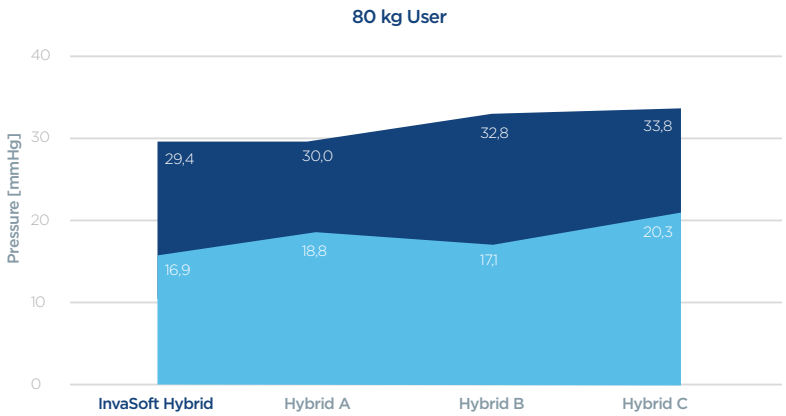
10 mmHg 20 mmHg 30 mmHg

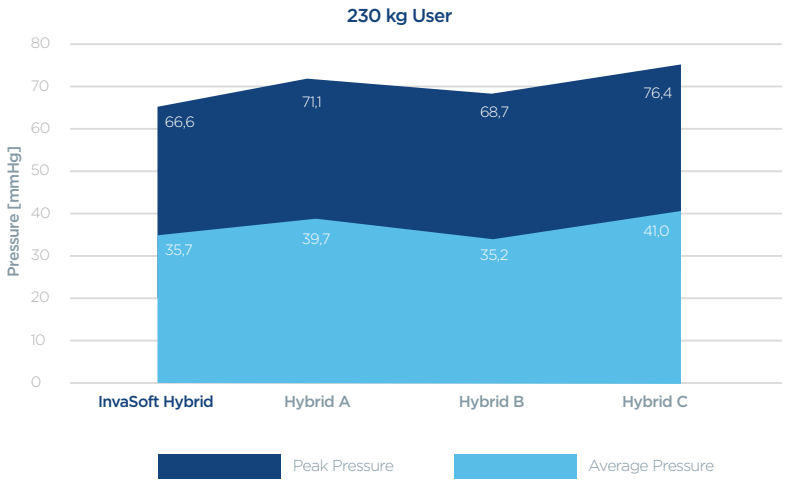
Pressure area index

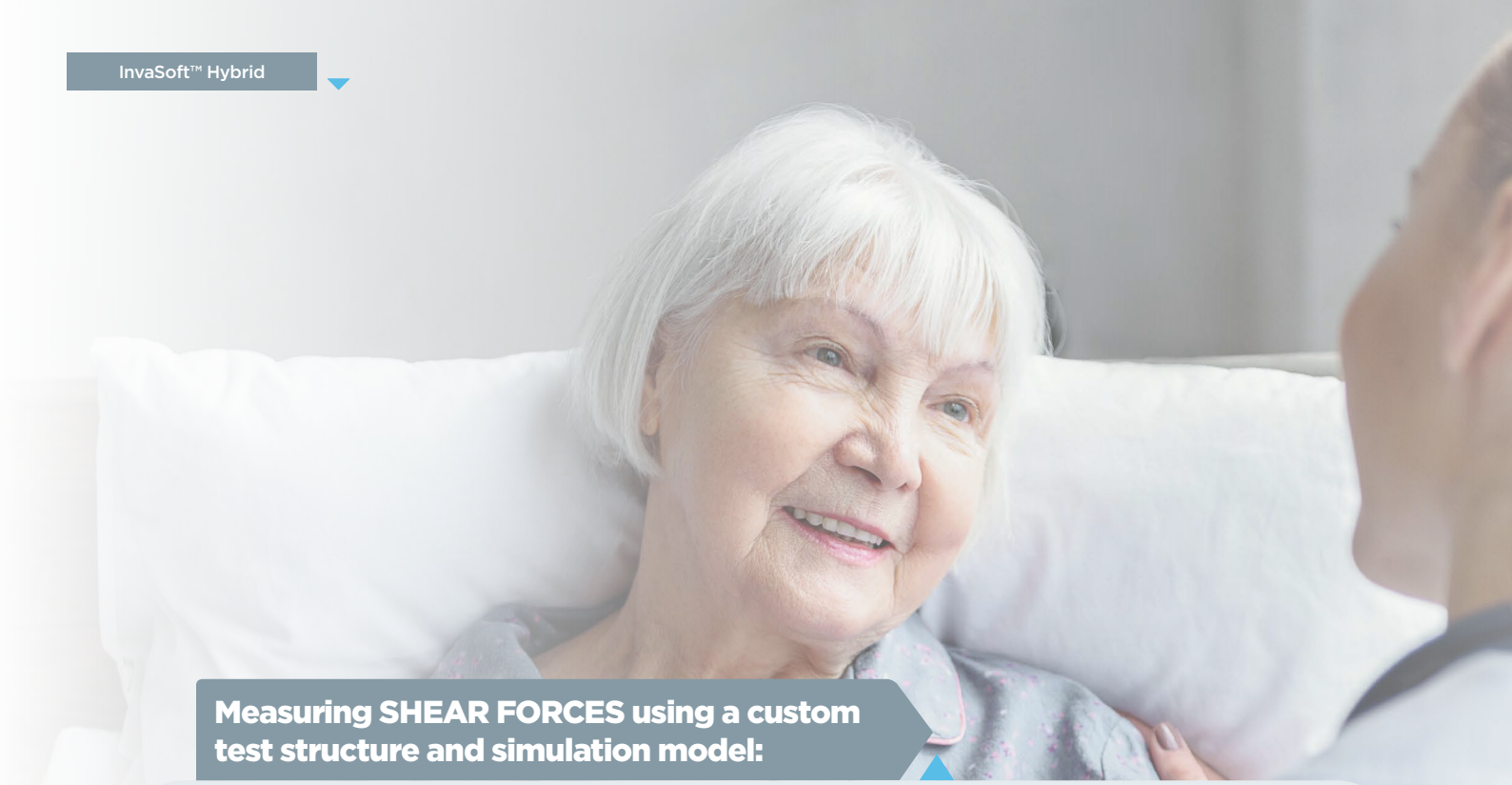
Pressure Area Index (PAI) indicates the ability of a surface to spread pressure across the available contact area. The higher the PAI, the better the performance. PAI is calculated from interface pressure data acquired using large sensor arrays known as pressure maps. PAI refers to the percentage of skin contact area where interface pressure is below pre-defined thresholds.

Peak Pressure and Average Pressure

▶ Reactive support surfaces in general, like e.g. hybrid support surfaces, need a certain time to adjust themselves to the load that is being applied by the patient. During that time, the immersion and envelopment properties of the surface are being utilized so the tissue interface pressure is the lowest that is achievable for the given situation.







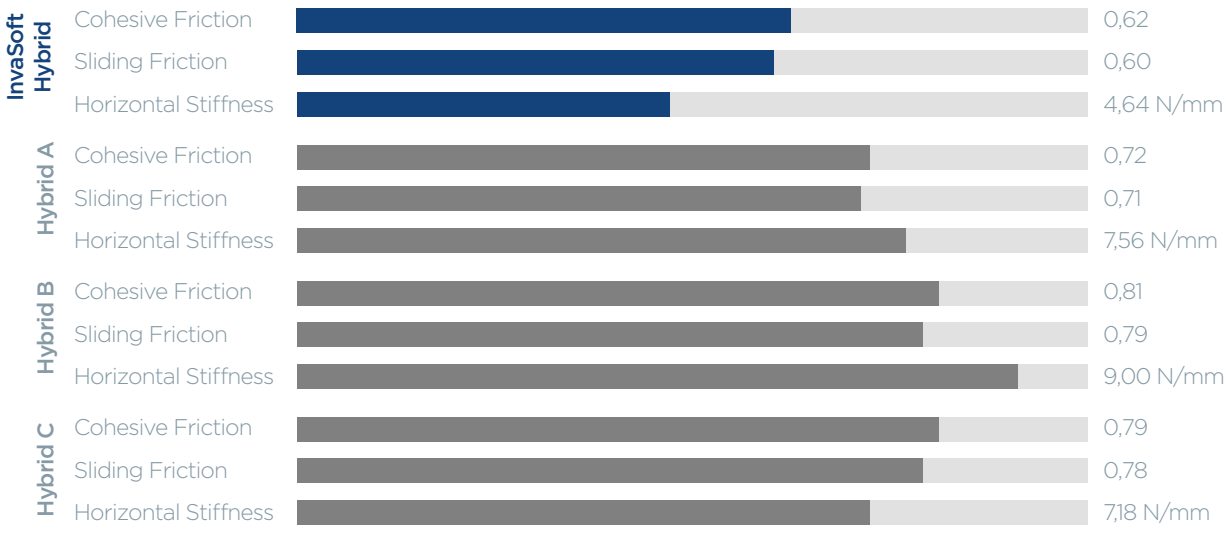
Measuring SHEAR FORCES using a custom test structure and simulation model:

Cohesive & sliding friction

▶ InvaSoft™ demonstrates at least 10% superior performance in cohesive and sliding friction in comparison to three other leading hybrid mattresses in the market

Horizontal stiffness

▶ InvaSoft™ outperformed all competitive products by at least 55% which indicates that there is a significantly lower risk of skin breakdown due to shear and friction forces.



▶ Based on patient weight of 80 kg with a sacrum model total weight of 35 kg.

Measuring MICROCLIMATE using a transpiration model:

Elevated temperature and humidity can affect the structure and function of the skin and reduce the tolerance of the skin and tissues to the damaging effects of pressure, shear and friction. It has been suggested that an elevated skin temperature increases the metabolic demand of local tissues, increases the tissues' requirement for oxygen, and increases the susceptibility of the tissues, to the ischemic effects of pressure and shear whilst also weakening the stratum Stratum Corneum.

Excessive moisture against the skin causes maceration which reduces stiffness, and connective tissue strength and increases the susceptibility to shear forces. Friction at the skin interface with the support surface is also increased promoting adhesion to the sheet or bedclothes and increasing the risk of mechanical damage and superficial pressure injuries.

Any surface in contact with the skin has the potential to affect the microclimate. The overall effect is dependent on the nature of the support surface and the cover.

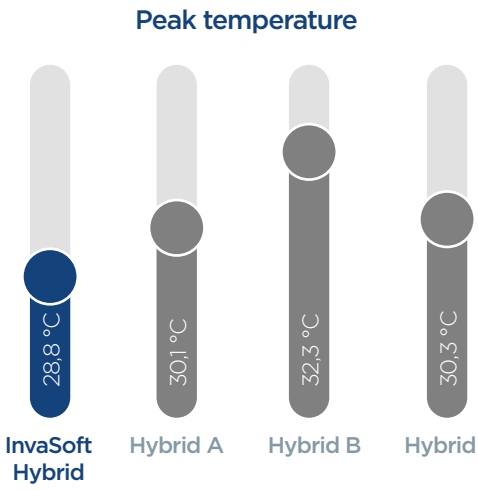
There are numerous ways to normalize the local skin microclimate, the simplest being to reposition the patient. However, this is not always possible and many patients may require additional interventions. The International Guidelines discuss how managing microclimate can provide an environment conducive to injury prevention and tissue repair. As such, the guidelines recommend the need for additional features such as the ability to control moisture and temperature when selecting a support surface.

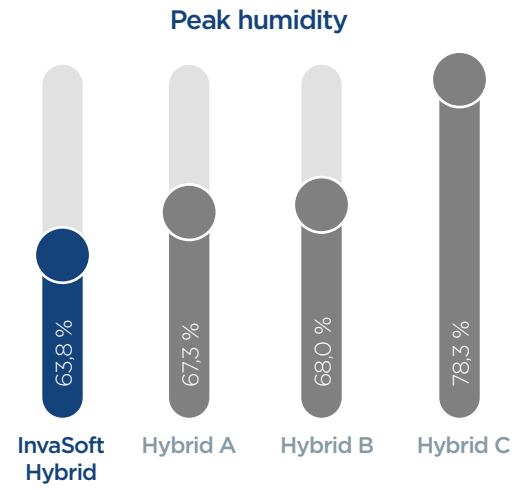
Peak temperature

- InvaSoft™ outperformed all competitive products by at least 3.5° C regardless of the technology employed to help the management of humidity.

Peak humidity

- InvaSoft™ demonstrated superior performance in humidity management in comparison to three other leading hybrid mattresses in the market.





- Loaded with a body model with a total weight of 35 kg.

Introducing

SoftForm Premier Active 2 powered hybrid mattress with Active 2 RX control unit

- The Softform Premier Active mattress combines the clinically proven Softform Premier high specification foam mattress with a layer of air cells.
- The system can be both a 'non-powered' and 'powered' hybrid mattress and, similarly, both 'reactive' and 'active' in its classification within the support surface categories.

a

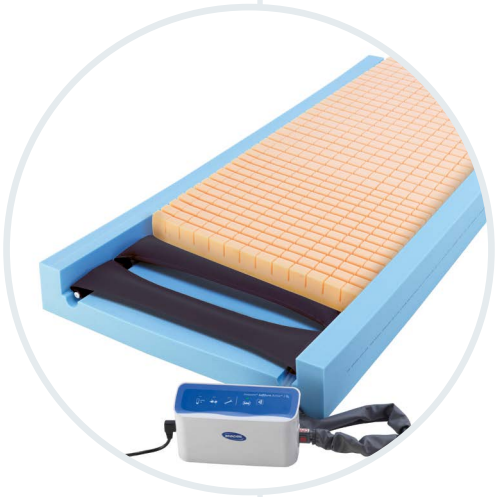
Softform Premier Active 2 as a 'Reactive' surface

- In its 'non-powered' state, it provides an effective pressure redistributing 'reactive' support surface, for individuals at risk of pressure damage and may be used for the treatment of superficial pressure injuries, as part of a holistic approach.

b

Softform Premier Active 2 as an 'Active' surface

▶ By simply connecting the Active 2 RX control unit to the mattress, the support surface is enhanced and it falls into the category of being an 'active' support surface, thus altering the parts of the body that bear load. The cyclical action of the alternating air cells beneath the high specification foam interface enhances the pressure redistribution therapy delivered at the patient interface.



Construction of the Softform Premier Active 2

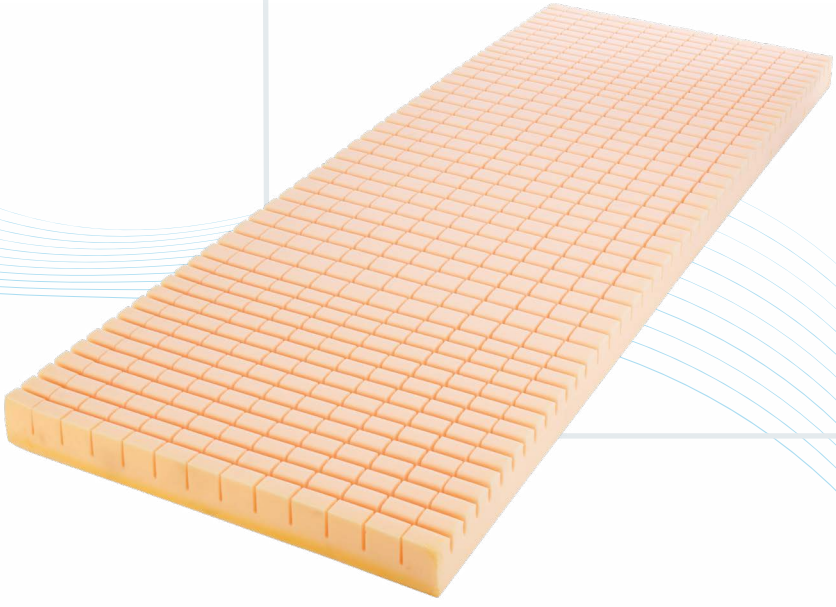
The construction of the system is a unique design providing enhanced comfort and stability, whilst supporting the skeletal structure and effectively redistributing pressure. Support and comfort are apparent both in 'reactive' and 'active' therapy modes.

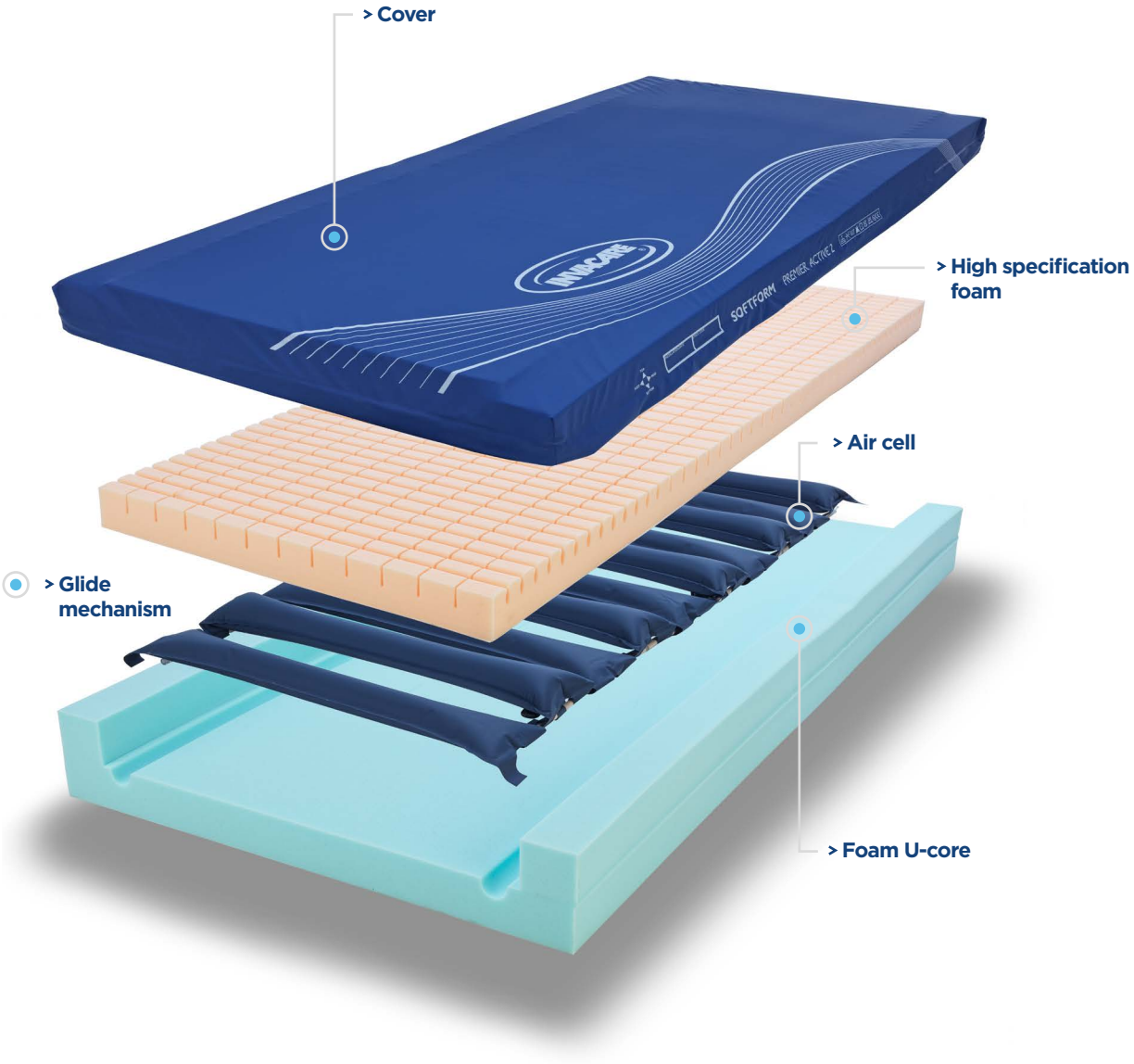
High specification foam

The top layer of foam consists of individual castellations within three zoned areas that effectively conform to the body contours, redistributing peak pressure from the bony prominences. The pivotal movement of the specifically cut 'teardrop' shaped castellations reduce shear forces to vulnerable tissue during independent or assisted movement. When the bedframe platform is profiled, contouring of the interface is enhanced, with both smooth areas to redistribute pressure and heighten comfort, and individual castellation separation to further enhance the pressure, shear and microclimate qualities of the interface.

Glide mechanism

The innovative glide mechanism allows the interface foam and base foam to separate within the cover to enhance the specific qualities of the Softform Premier Active 2 system for shear reduction.





Air Cell

The clinical benefits of the high specification interface are enhanced when the internal air cell structure is activated by the powered motorised control unit. A 10-cell layer of concave air sacs is positioned beneath the high specification top foam layer. When activated, the cells alternate in a two cell 10-minute cycle to alter the parts of the body bearing load at the interface, enhancing the therapy from 'reactive' to 'active'. Using clinically proven pressure set at 60 MmHg beneath a high specification foam layer, the Softform Premier Active 2 system can be prescribed as an effective therapy support surface for both prevention of pressure injuries and for the treatment of the most severe (Stephen-Haynes et al 2015). Indeed, research conducted by Gray et al (2008) concluded that the Softform Premier Active mattress was as effective in reducing pressure injury incidence as a standard alternating air mattress, for a population at very high risk of pressure injury development.

Control unit

The motorised control unit (Active 2 Rx) is both small and quiet in operation. It is simple to operate and practical to use and requires limited space to be suspended from the foot board of most hospital and community beds. Audible and visual alarms alert the attendant to any interruptions caused by an interference in power supply, connection or mechanical issue. If the alarm sounds, whilst waiting for the issue to be rectified, the patient will be safe and fully supported on a high specification foam mattress.

Cover

Clinical benefits are enhanced further by the optional multi-stretch, vapour-permeable Strikethrough Resistant Technology (SRT) cover fabric and composition. SRT fabric was a necessary attribute to the Softform Premier Active 2 to meet the demands of the 21st century healthcare environment. An increase in cleaning processes and procedures (BHTA, 2011), coupled with the introduction of an extensive number of cleaning agents used in care settings, led to the development of a fabric that has a high resistance to chemical and mechanical damage. SRT fabric has excellent strength, recovery qualities and moisture vapour transfer properties, whilst also creating a waterproof environment for the internal components. The absence of seams along the upper edges ensure there are no risks of ingress of bodily fluid because of weld or stitching failures, and the double welded corners create a smooth and linear transfer surface.

Base cover

A toughened polyurethane base cover ensures longevity when used continuously on an electric profiling bed, to give added protection of the internal components from potentially damaging friction forces. The addition of rivetted toughened polyurethane handles to the edge of the base cover further enhance longevity, by visually prompting their use for moving and handling. Purposes, thus reducing damage to the support surface during transfer.

Cable management

Specifically positioned cable management clips are located along the outer edge of the base cover to secure the power cable in position when the motorised control unit is in use. This negates the need for a trailing lead to pose a trip hazard or falls risk for both the individual and attendants at the bedside. It also protects the cable from damage and debris.

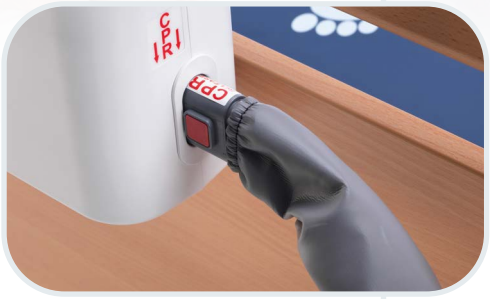
SRT reduces mattress failure rates

Early data reported mattress audit failure rates reduced from as high as 87% to less than 4%. Thus, reducing the expenditure allocated to replacing component parts (Stevens, 2013). However, subsequent analysis has suggested a failure rate of 3% per year, against a previous average of 27%, the Crib 7 cover having a failure rate as low as 0.7% (Laidlaw et al, 2015).

White underside fabric and the presence of a 360-degree zip ensure early detection and subsequent replacement of the top cover, should mechanical damage and resulting strike-through of bodily fluids occur.

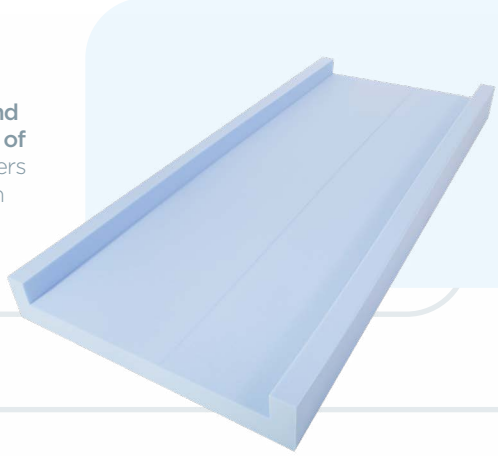
Covered connecting hose

Located on the outer aspect at the foot end of the mattress base, the polyurethane covered connecting hose can be attached to the motorised control unit without disturbing the individual. Cells automatically activate when the control unit is connected to the electricity supply and switched on. Cells inflate and alternate without the need to transfer the individual from the support surface. Similarly, when the support is 'stepped-down' and the control unit is no longer required, the covered hose can be disconnected quickly and simply and secured safely at the foot of the bed, thus posing no infection control risk or hazard.



Foam U-core

The high-density foam of the single cut U-core base adds strength and conformity for profiling, and support and protection for individuals due to its maximum user weight of 247.6 kg. It also has integrated high density foam side formers that provide the most stable edges for egress, enhancing an individuals' confidence and stability during transfer and the rehabilitation process.



Clinical effectiveness of the Softform Premier Active 2

a

Clinical Paper 1

- **Thompson** reviewed the use of the Softform Premier Active system for 40 patients with Waterlow scores ranging from 18-30 with a number of medical conditions, including age-related general deterioration, cancer, bariatric medical and surgical conditions, end stage renal failure, end stage cardiac failure, diabetes and post-operative recovery.

  Pressure damage ranged from intact skin to grade 2 for all patients included within the study, with the exception of one terminal care patient with a grade 4 pressure injury.

Results

Skin damage either improved or did not develop an extension to existing damage, nor develop new tissue damage, revealing that the **Softform Premier Active mattress can be used for the acutely ill and those who have chronic medical conditions.** It may also be used for the prevention and treatment of pressure injuries as part of a pressure injury prevention strategy. Thompson believed the Softform Premier Active system has the potential to reduce reliance on traditional dynamic mattress systems without compromising skin integrity, by using the step-up step-down approach to manage changing levels of dependency.

Source: Thompson, G. Softform Premier Active Mattress: a novel step up/step-down approach. British Journal of Nursing, 2006.

b

Clinical Paper 2

- A study over a six-month period was undertaken to compare the effects of using the Softform Premier to a standard air mattress on pressure injury incidence in two acute care of the elderly wards.

Patients

- 50 patients were included in the study with a mean age of 82.4 and Waterlow scores ranging from 17-29 and mean number of chronic condition of 3.2. All patients on the wards were emergency admissions with a variety of causes, the most common being acute infection.

Product

Each ward was provided with Softform Premier Active mattresses and cushions. Patients considered to be at high risk of pressure injury development were randomly allocated either a Softform Premier Active system or a standard air mattress.

Results

Results revealed a pressure injury incidence of 8% in both groups, which was considered to be 'unexpectedly low in such a vulnerable, high risk population'. **The study concluded that for this population, the Softform Premier Active system was as effective in reducing pressure injury incidence as the standard alternating pressure air system.**

Source: Gray, D., Cooper, P., Bertram, M., Duguid, K. & Pirie, G. A clinical audit of the Softform Premier Active mattress in two acute care of the elderly wards. Wounds UK, 2008.

Clinical Paper 3

- A 20-patient survey was undertaken to monitor the effectiveness of the Softform Premier Active within a Community Trust.

Patients

- Ages of patients included in the study ranged from 45-99, with a mean age of 71.3 years. Waterlow risk assessment scores ranged from 11-25 with weight recorded as 51–159kgs. Medical conditions included motor neurone disease (MND), multiple sclerosis (MS), cardiac failure, paraplegia, cancer and osteoarthritis. Eight patients had intact skin, one had category 1, nine had category 2 and two had category 3 pressure injuries.

Source: Stephen-Haynes, J. Achieving effective outcomes: monitoring the effectiveness of the Softform Premier Active mattress. Wounds Care, 2010.

Results

Of the twenty patients included in the study, **ten showed signs of skin improvement within two weeks** and none of the patients' skin deteriorated.

Fourteen patients found the Softform Premier Active system to be **more comfortable than previous equipment**, four found it to be as comfortable and two did not comment. Eight patients found the system **quieter than their previous equipment.**

Two patients found **an improvement relating to motion sickness,** one found it **decreased body spasm** and one found their **sleep pattern improved.**

The audit indicates that despite significant age, chronic illness and palliative care needs, the Softform Premier Active system offers clinical, practical and financial benefits.

Clinical Paper 4

- **Strapp** evaluated the use of the Softform Premier Active system on a busy medical ward within a 625-bed university teaching hospital.

60% of the patients on the ward required total nursing care.

The objective of the trial was to evaluate the suitability of the system in providing an effective solution for reducing the incidence of pressure injuries, to have a positive impact upon patient outcomes.

Staff feedback for ease of use was also an important consideration.

All mattresses on the ward were replaced with the Softform Premier Active over a two-day period and an evaluation form completed privately by all of the healthcare staff, to ensure an unbiased opinion, and submitted to the author for review.

The Softform Premier Active system alleviated the need for storage and the use of the system had a positive impact on manual handling for patients and healthcare staff.

The author concluded that the **patients found the system very comfortable and skin integrity was excellent**. The improvement in manual handling reducing the time to upgrade a mattress by 20 minutes, thus improving patient outcomes.

Source: Strapp, H. Invacare Softform Premier Active 2 Evaluation in a Hospital Setting, The Adelaide and Meath Hospital Dublin, 2015.

Results

Nursing staff feedback was very positive

- **The ability to maintain skin integrity**
  65% Excellent/35% Good
- **The ability to improve skin integrity**
  60% Excellent/40% Good
- **Patient comfort**
  70% Excellent
- **Ease of repositioning**
  100% Excellent
- **CRP function**
  100% Excellent
- **Ease of use**
  100% easy to install and use
- **Quiet**
  75% Excellent
- **Ease of use**
  100% easy to install and use
- **Step up/Step down**
  95% Excellent
- **Infection control**
  100% Excellent

100%

of the prescribers stated they would use the Softform Premier Active system again

Clinical Paper 5

- A seven-week online survey was conducted to determine the selection, application and effectiveness of the Softform Premier Active system followed by a retrospective evaluation of its use over a 12-month period.

- The objective of the research was to review its effectiveness for patients with grade 3 and 4 pressure injuries.

- Twenty-two surveys were completed by prescribers, including district and community nurses, and community hospital nurses.

Results

- 75% of the respondents stated they had selected the support surface to improve patient comfort and 67% to improve skin integrity.

- 73% selected the support surface to prevent pressure injury development.

- There were six cases in which the system was selected for the treatment of a pressure injury, three recorded as grade 2 and three as grade 3. Four located on the sacrum and two on the hips.

95% indicated the system was **easy to use**

91% rated the system as **easy to clean**

95% reported good/very good for **ease of patient transfer**

91% would **recommend to a friend**

82% stated they **would use again**

Prescribers reported they had seen an **improvement in patients' skin within two weeks of using the system**.

100% of those that stated they would use the Softform Premier Active system again did so because of the following reasons:

- **quiet system**
- **positive effect on pressure injuries**

73% prescribed the support surface for the prevention of pressure injuries, indicating an over-prescription based upon the Trust's equipment selection algorithm. The Softform Premier mattress being the recommended surface of choice for this purpose.

12-month audit

- The retrospective audit over a 12-month period indicated that 411 patients were prescribed the Softform Premier Active system within the Community Trust.

- Included were 73 patients with Grade 1, 95 with grade 2, 21 with grade 3 and six with grade 4 pressure damage, with various clinical conditions including motor/sensory, orthopaedic, peripheral vascular disease, tetraplegia, single/multiple organ failure and terminal cachexia.

12-month audit results

- Of the 21 patients with grade 3 pressure damage, of which six were end of life care, use of the system resulted in the healing of eight patients.

- **Of the six patients with grade 4 pressure damage, use of the system had resulted in the healing of all six patients.**

- Data showed that patients were often allocated the Softform Premier Active as they were unable to tolerate alternating air systems.

- Reduction in body spasm, improvements in transfer, increase in independence, enhanced comfort, improved sleep and reduction in movement along the bed surface were noted as additional clinical benefits gained from using the Softform Premier Active system.

- The algorithm has now been amended to include its use for patients with grade 4 pressure damage for patients unable to tolerate alternating pressure systems.

Stephen-Haynes, J., Callaghan, R. & Allsopp, A. A retrospective analysis of the use of the Softform Premier Active 2 in an NHS Trust. Wounds UK, 2015.

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Clinical Paper 6

▶ **Pressure redistributing** equipment prescribing patterns were reviewed with evaluations across two centres..

• Worcester Health and Care Trust has an estimated population of 600,000, covers approximately 560sq miles and six community hospitals, and have been purchasing Softform Premier Active systems for seven years.

• Medway Maritime Hospital is a 600-bed acute hospital which introduced the Softform Premier Active system throughout the hospital as a result of a project by Adams (2014), projecting cost savings in excess of £1.85 million over a seven-year period.

Following results obtained from Worcester Health and Care Trust, highlighting the over-prescription of the Softform Premier Active system (Stephen-Haynes 2010), a similar study was conducted within Medway Maritime Hospital to review prescription patterns.

Results

A 12-month audit revealed that the Softform Premier Active had been prescribed for three patients with grade 4 pressure injuries which had healed and positive results were seen for patients with grade 3 pressure damage. **Of the 19 patients, 12 were transferred, four healed and two were healing.**

These results prompted the Trust to question the need for the rental supply of low air loss systems included within the equipment selection algorithm.

Within a one-month period, there was a 76% over-prescription based upon the criteria set out in the algorithm, with 65% of patient having intact skin.

52 staff questionnaires revealed the rationale for prescribing low air loss therapy did not correlate with the use of these support surfaces.

Conclusion

The authors concluded that over-prescription of pressure redistributing equipment is a problem for Health Trusts, which could have a dramatic effect on both clinical and financial outcomes.

The 73% over-prescription of Softform Premier Active systems within Worcester Health and Care Trust suggested an estimated £41k per annum saving, if the correct piece of equipment had been prescribed according to the algorithm.

Correction of the 76% over-prescription of Low Air Loss therapy within **Medway Maritime Hospital saved an estimated £91k per annum.**

The authors conclude that, in order to address over-prescription of pressure redistributing equipment, healthcare professionals must understand why it is important to prescribe appropriate equipment and how to make the right choice, with algorithms supporting sound decision making for effective outcomes.

Source: Stephen-Haynes, J., Allsopp, A. & Jones, H. Evaluating the effectiveness of pressure-redistributing equipment for the best clinical and financial outcomes. Wounds UK, 2017.

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Clinical Paper 7

▶ **An evaluation** was conducted within a neuro-rehabilitation unit to evaluate the effectiveness of the Softform Premier Active system for this patient group.

On admission to the largest level 1 accredited facility available, which offers patient focused rehabilitation, patients would routinely be prescribed an alternating air mattress, unless contraindicated, following a risk assessment and skin inspection. However, there were occasions when patients were compromised on these systems and required an alternative support surface. Supported by sound clinical evidence for use with the most compromised patients with severe pressure injuries (Stephen-Haynes, 2015), the Softform Premier Active was evaluated. Staff feedback questionnaires were completed as part of the prescribing process.

Results

Results were positive for equipment set up, ease of use, cleaning, noise level, patient transfer, repositioning and bedmaking with respondents scoring easy/very easy or quiet/very quiet respectively.

Positive clinical outcomes were achieved and the 42-bed unit now have a full complement of Softform Premier Active systems to replace the existing alternating systems, as a successful alternative.

The author was ***"proud to announce that since using the hybrid system, they are now five years pressure injury free!"***

Wagstaff, K. Evaluating the effectiveness of a high specification foam interface hybrid mattress in a Neuro-rehabilitation unit. Poster. EPUAP, 2017

Case studies on the Softform Premier Active 2

Case Study 1

Patient history

A 30-year-old female with 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.

She has had several episodes of category 2 pressure injury 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 mattress, although found them all uncomfortable.

Patient on admission

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.

Her Waterlow Risk Assessment Score was 22, she was confined to bed owing to fatigue and was unable to walk, even with assistance, for more than a few metres and had needed continuous oxygen for about two weeks prior to admission.

Product prescription

She required assistance for toileting, only sat out of bed for 10 minute intervals and would sleep for long periods.

Additionally, she needed intensive respiratory physiotherapy, intravenous (IV) antibiotics and dietetic support.

She was prescribed a Softform Premier Active system during her four week hospital stay.

She gradually gained weight, became less reliant upon oxygen therapy and slowly began to mobilise along hospital corridors with the help of physiotherapists. Sitting periods were no more than 30 minutes at a time.

She was always fully satisfied with the mattress and said: **'It's the best mattress I've been on.'**

Her skin did not deteriorate and she was discharged home.

Source: Thompson, G. Softform Premier Active Mattress: a novel step up/step-down approach. British Journal of Nursing, 2006

Case Study 2

Patient history

▶ **A 58-year-old lady with end-stage renal failure for more than 10 years, secondary to insulin-dependent diabetes.** She has an alternating air mattress at home and attends the haemodialysis centre three times per week, where she is supported on a dialysis treatment 'chair' and her own visco overlay.

She has multiple co-morbidities including: diabetic neuropathy, left eye diabetes-induced blindness, diabetic paresis with recurrent episodes of vomiting, chronic cerebrovascular disease, chronic chest pain, chronic constipation with frequent episodes of faecal overflow.

Over the years she has had many episodes of categories 1-4 pressure injuries (EPUAP, 1998) to the buttocks 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. When her dependency deteriorates or medical complications become too difficult to manage at home she is admitted to a medical ward (3-4 times per year) for medical stabilisation and is usually an inpatient for 4-8 weeks, sometimes longer.

Patient on admission

She was admitted in February 2006 with a Waterlow score of 28, with an existing category 3 pressure injury to her right heel and subsequently developed category 1 & 2 sacral and buttock pressure injuries in June.

She had poor anal sphincter control and the perineum and sacrum were frequently exposed to a watery faecal flow.

Product prescription

She found the Softform Premier Active system 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 sacrum and buttocks.

Source: Thompson, G. Softform Premier Active Mattress: a novel step up/step-down approach. British Journal of Nursing, 2006

Case Study 3

Patient history

▶ **A 76-year-old man with multiple sclerosis who developed a category 4 pressure injury.** His contractures and poor nutrition caused by his swallowing problems were significant factors in the development of his pressure injury.

Product prescription

The clinical staff recommended the Softform Premier Active system, as he had experienced a loss of movement on the previous alternating pressure mattress. It was hoped the hybrid mattress would increase his mobility level. The lack of alternating pressure and movement of the cells within the Softform Premier Active mattress led to a reduction in the spasms he experienced.

In March 2015, he was transferred to a care home for palliative care.

He was determined to take his mattress with him as he found it comfortable and it did not aggravate his spasms.

The wound was healing and all his other pressure areas remained intact. His general health and multiple sclerosis were deteriorating, and owing to repeated chest infections he passed away.

Source: Stephen-Haynes, J., Callaghan, R. & Allsopp, A. A retrospective analysis of the use of the Softform Premier Active 2 in an NHS Trust. Wounds UK, 2015.

Case Study 4

Patient history

A 79-year-old male with acute renal failure was discharged from hospital in March 2015 with a category 4 pressure injury to his buttock, following a period of being very unwell and immobile.

Product prescription

He had expressed a need for greater mobility and on his return home the patient was nursed on a Softform Premier Active mattress, which enabled him to continue with his rehabilitation and increase his independence. He found the mattress easy to move on and get off, in comparison to the previous alternating-pressure mattress.

The category 4 pressure injury had healed by August and he stepped down to a Softform high-specification foam mattress.

Source: Stephen-Haynes, J., Callaghan, R. & Allsopp, A. A retrospective analysis of the use of the Softform Premier Active 2 in an NHS Trust. Wounds UK, 2015.

Case Study 5

Patient history

A 73-year-old lady who developed a category 4 pressure injury following problems with her seating and the change in posture owing to her multiple sclerosis. She had previously tried alternating pressure mattresses, although she had experienced an increase in her tone and found they caused lower back pain.

When the ulcer initially developed, the lady was very reluctant to utilise any pressure-reducing mattress owing to the problems she had experienced in the past.

Product prescription

She finds the Softform Premier Active mattress to be comfortable and no longer has the increased tone/spasms or lower back-ache. Her pressure injury is continuing to heal well and would currently be classified as category 2.

Source: Stephen-Haynes, J., Callaghan, R. & Allsopp, A. A retrospective analysis of the use of the Softform Premier Active 2 in an NHS Trust. Wounds UK, 2015.

Case Study 6

Patient history

An 84 year old lady with a category 4 sacral ulcer. She lived alone but was unwilling to accept support at home. She had been less mobile owing to heart failure and had several recent urinary infections. She developed the category 4 injury in April 2015, which is when the district nurse team became involved.

Product prescription

The Softform Premier Active mattress was selected as this would allow her to maintain her mobility and independence, enabling her to get in and out of bed unaided.

This ulcer is healing slowly, so she is still being nursed on the Softform Premier Active system.

Source: Stephen-Haynes, J., Callaghan, R. & Allsopp, A. A retrospective analysis of the use of the Softform Premier Active 2 in an NHS Trust. Wounds UK, 2015.

Case Study 7

Patient history

An 80-year-old lady with a diagnosis of dementia, who was very restless and had limited mobility, had a fall and fractured her hip. Following a hip replacement, she developed a category 4 ulcer to her heel.

Product prescription

The Softform Premier Active mattress was selected owing to her dementia, as patients with dementia are often unable to tolerate alternating pressure.

The pressure injury was healing with all other skin intact when the patient passed away suddenly.

Source: Stephen-Haynes, J., Callaghan, R. & Allsopp, A. A retrospective analysis of the use of the Softform Premier Active 2 in an NHS Trust. Wounds UK, 2015.

Case Study 8

Patient history

A 54-year-old gentleman with a complex past medical history, who has spastic quadriplegia, developed a category 4 PU to his sacrum(Figure 1). The constraints of his condition and lifestyle choices, including frequent rips away, made treatment challenging. Coupled with faecal incontinence and the position of the pressure injury, a positive clinical outcome was expected to be slow.

Despite provision of appropriate advice, dressings and an alternating air mattress, the wound deteriorated and an alternative mattress was requested to improve comfort and sleep.

Product prescription

The Softform Premier Active mattress was selected as this would allow her to maintain her mobility and independence, enabling her to get in and out of bed unaided. This ulcer is healing slowly, so she is still being nursed on the Softform Premier Active system.

The category 4 PU showed substantial signs of healing following prescription of the Softform Premier Active (Figure 2) and the patient's pressure areas continue to be managed successfully.

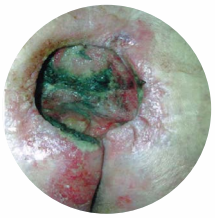

Figure 1: Sacral pressure injury prior to being nursed on the Softform Premier Active mattress

Figure 2: Sacral pressure injury showing signs of healing following prescription of the Softform Premier Active mattress

Source: Stephen-Haynes, J., Callaghan, R. & Allsopp, A. A retrospective analysis of the use of the Softform Premier Active 2 in an NHS Trust. Wounds UK, 2015.

Case Study 9

Patient history

An unresponsive 67-year-old female was admitted to hospital from a care home. She had been diagnosed with a cerebrovascular accident, was bedbound, PEG-fed, catheterised and had faecal incontinence. She also had type 2 diabetes, advanced frailty, likely aspiration pneumonia and hypernatremia.

She had a category 4 pressure injury to her sacrum, a category 2 pressure injury to the right foot, and a moisture lesion to the buttocks.

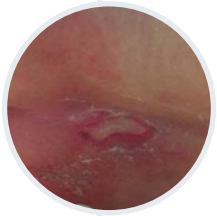

Figure 3: Healed sacral pressure injury following prescription of the Softform Premier Active mattress.

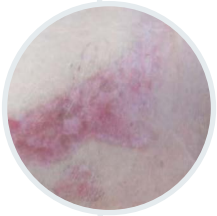

Figure 4: Healed hip pressure injury following prescription of the Softform Premier Active mattress.

Product prescription

On admission, she was prescribed an SPA2. Healing was achieved to the sacrum within one month (Figure 3), and she was discharged one week later with intact skin. Within the month, the patient was readmitted from the care home with multiple pressure injuries, including category 3 damage to the right hip and category 2 damage to the right foot. Again, she was prescribed a Softform Premier Active and catheterised to manage her urinary incontinence.

In less than two weeks, the patient was discharged with pressure areas intact (Figure 4). Approximately one month later, she was readmitted from the care home with a category 2 PU to the buttocks. The patient sadly passed away during this stay.

Source: Stephen-Haynes, J., Callaghan, R. & Allsopp, A. A retrospective analysis of the use of the Softform Premier Active 2 in an NHS Trust. Wounds UK, 2015.

The category 4 pressure injury healed following prescription of the Softform Premier Active

Case Study 10

Patient history

A 68-year-old swimming instructor who developed Guillain Barre syndrome in July 2016. He was admitted to Central England Rehabilitation Unit (CERU) in September for neurological rehabilitation. On admission, he was being peg fed and completely dependent upon staff for total care.

He disliked the air mattress as he felt quite frightened, owing to the movement on the cells causing instability.

Product prescription

A Softform Premier Active mattress was prescribed as an alternative support surface. He used a banana board transfer and felt much more stable and confident while in bed.

His skin remains intact.

Source: Wagstaff, K. No incidents of pressure ulcers in 4 years. Invacare Ltd document, 2017.

Pressure areas are managed successfully and skin remains intact

Case Study 11

Patient history

A 23-year-old photographer's assistant, who was setting up a photo shoot on top of a building in November 2016, when he fell down a ventilation shaft. His fall was broken by a flight of stairs and, as a result, he suffered multiple fractures including both legs, both arms, pelvic and spinal fractures, a ruptured spleen, a head injury and facial fractures.

He underwent a splenectomy, a cerebral pressure probe was inserted and then further surgery for fixation of his fractures. He was admitted to CERU in January 2017.

Product prescription

On admission, he was prescribed an alternating air mattress which he found uncomfortable.

The following day this was changed to a Softform Premier Active mattress, which greatly improved his comfort and aided transfer owing to the stability of the edges when he uses the rota stand with the assistance of two staff.

His pressure areas are managed successfully and his skin remains intact.

Source: Wagstaff, K. No incidents of pressure ulcers in 4 years. Invacare Ltd document, 2017.

Case Study 12

Patient history

A 16-year-old boy, with axonal diffuse brain injury after falling off his bicycle. He was admitted to the major trauma centre initially, where he was intubated and ventilated.

He was admitted to CERU in March 2016, in a state of prolonged disorder of consciousness, with a category 4 pressure injury to the back of his head from his cervical collar. Following neuro rehab assessment, where his awareness levels were improved, he commenced hydrotherapy which further aided his rehabilitation process.

By February 2017 he was considered to be at high risk of falls and the cells of the alternating air mattress initially prescribed, proved to be a means of egress for him, as he could grab individual air cells and drag himself to the edge of the bed. A Softform Premier Active was prescribed as an alternative support surface.

Product prescription

The Softform Premier Active system reduced his falls risk and alleviated the associated risk of shear damage and he remains on the system with his pressure areas intact.

Source: Wagstaff, K. No incidents of pressure ulcers in 4 years. Invacare Ltd document, 2017.

Reviews

We have used the Invacare Softform® Premier Active 2 hybrid mattress at the unit for approximately four years. It is our mattress of choice owing to the many benefits it brings to the rehabilitation environment".

Central England Rehabilitation Unit (CERU) is a 42-bedded neurorehabilitation unit, our patients have differing levels of brain injury, ranging from those who have a prolonged disorder of consciousness, to those patients who are able bodied but require psychological rehabilitation"

Really like this mattress and think we should use them"

Patient really liked the mattress and accepted it... Don't think she would have complied with an alternating pressure mattress"

It's the best mattress I've been on"

During the rehabilitation process, we have found that the Invacare Softform® Premier Active 2 allows our patients to practice transfers from bed to wheelchair with greater ease, this is owing to being able to deflate at the point of transfer and allowing the patient stability, with balance from a non-moving surface"

Very happy with the mattress"

I have found a big improvement in reported patient comfort"

Patients report that they are very comfortable, and the Invacare Softform® Premier Active 2 feels more like their own bed than other healthcare mattresses they have experienced. Because they are suitable for a wide range of patients and conditions, they are able to be used on patients who are at 'High Risk' of developing pressure injuries. Moreover, we haven't had an acquired pressure injury on the unit for four years!"

Family commented on how quiet the mattress was and how comfortable the patient found it"

Very convenient, if a patient needs to upgrade mattress, just attach a pump"

Patients stated that the mattress was very comfortable"

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Pressure care and mattress selection EU - 02/2021

Yes, you can.