

INTRODUCING A RANGE OF INNOVATIVE COMMUNITY MATTRESS DESIGNS

Independent living is a goal that those with physical impairment strive to achieve. However, for many, the threat of pressure-related tissue damage can be a disabling limitation. A number of devices have been marketed for use in the community but many of these retain their 'medicalised' features, making them less attractive for clients living independently in the community and resulting in non-concordance with pressure-relieving interventions. In this article, the author will look at two pressure-relieving devices for use in the home environment and when travelling, which have been developed by one UK manufacturer through interaction with service users. This user involvement identified that although the medical benefits of any pressure-relieving device are important, of equal importance are design features that make products easy to operate and which enhance product aesthetics.

Pressure damage results from the interruption of blood flow to the tissues for prolonged periods of time. This leads to local tissue hypoxia — the build-up of metabolic waste and inflammation — the net result of which is tissue damage and cell death.

The mechanisms of tissue damage, namely pressure, shear and friction along with reduced tissue tolerance to pressure-related tissue stress, are well documented (National Institute for Clinical Excellence [NICE], 2005; European Pressure Ulcer Advisory Panel [EPUAP], 2009). Similarly, the factors both intrinsic and extrinsic that make an individual at increased risk of pressure damage have been well researched and are generally understood. However, pressure damage remains a problem for many individuals with reduced movement or pain perception.

Current guidance on pressure ulcer prevention concentrates on the care of individuals in environments such as hospitals and care homes (NICE, 2005; EPUAP, 2009). The guidelines stress

the importance of risk assessment and the provision of care, which is aimed at reducing this risk. However, in general, these guidelines are targeted at highly regulated care environments where the key care-providers are professionally trained or medically led. For many individuals with physical disabilities this is not reflective of their own care environment.

A recent, but not exhaustive search of published research and literature on pressure ulcer prevention by the author revealed that while intense debate has raged about how pressure prevention care has, or should be, delivered, little emphasis has been placed on why such interventions can fail from the perspective of the sufferer.

Anecdotally, it would seem that many individuals are aware of the risks of prolonged immobility and yet do not initiate effective self-care practices or refuse conventional pressure-relieving equipment. The reasons for this failure are unknown, however, discussions with a number of physically impaired



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Dream Flow beds are designed to remove the stigma from pressure care. The pump is concealed in a sound-proofed drawer and the dynamic mattress is concealed within a choice of interchangeable top covers.



The bedroom and the bed itself are more than simply somewhere to rest and sleep.



The Dream Flow provides a refreshing alternative to the institutionalised look and feel of the traditional dynamic mattress. It is non-discriminatory in that it can be used by everyone and can be designed to suit all tastes and social/physical requirements.

individuals have highlighted that often, the equipment provided for them is perceived as too 'medically orientated' or does not meet their personal needs.

Despite the threat of tissue breakdown, many impaired individuals do not consider themselves to be 'patients' and so do not want to use 'patient equipment', particularly in their own homes. In addition, this equipment may not be able to fulfil the social or intimate needs they regard as important.

WHO REQUIRES CARE IN THE COMMUNITY?

A significant number of disabled or physically impaired people live within their own homes and many will be at risk of pressure ulcer formation. It is impossible to give an all-encompassing classification of all those at risk of pressure damage. However, groups might include:

- ▶ Those at short-term increased risk following an acute illness or medical event who require healthcare support during this phase of their recovery
- ▶ Those with a long-term condition that places them at high risk of pressure damage, who have ongoing healthcare needs and require continued support
- ▶ Those with a long-term condition that places them at high risk, but who require little or no ongoing healthcare supervision, support or intervention
- ▶ Those at lower levels of pressure ulcer risk but who experience discomfort

from prolonged periods of sitting or lying.

These people may face different challenges in maintaining health and wellbeing than those in formal care environments. Consequently, the methods used to prevent pressure ulcer formation must also differ. A number of approaches to reducing pressure ulcer risk have been suggested, including the 30° tilt method of positioning (Preston, 1984; Maylor, 2001b); the use of foam, particularly visco-elastic foam toppers (Benbow, 2008); static air overlay mattress devices (Price et al, 1999); and dynamic alternating air mattresses (Benbow, 2008).

While these may be successful for some, many will require equipment that is specifically designed for their environment and their own personal preference (Maylor, 2001a). Not all individuals with a physical impairment want to take a 'patient' approach.

Squirrel Medical, a medical devices manufacturer based in the UK, carried out interviews with a variety of individuals with a physical impairment. These revealed that although equipment is generally provided in primary care by community nurses and community loan stores for those at risk of pressure damage, this equipment is often seen as highly 'medical' and poorly suited to integration into the home environment.

'Feedback from users of the mattress via post-marketing surveillance has been extremely positive'

Key features: Dream Flow Bed

- ▶▶ Integrated (very high risk) clinically proven dynamic hybrid mattress (see *Wounds Essentials* Product Focus [www.wounds-uk.com/pdf/content_10461.pdf])
- ▶▶ Attractive contemporary design
- ▶▶ Various size options
- ▶▶ Height adjustment options
- ▶▶ Hidden (silent) pump
- ▶▶ Remote handset option

While this is less of an issue in the short-term and during acute illness, those with longer-term needs and who prefer to manage their own health requirements can find this a barrier. Many of these devices are designed for use on single-sized beds, particularly in combination with hospital-type bed frames. These devices do not adequately support the concept of self-care and make sleeping arrangements with partners difficult if not impossible. Not all individuals with a physical impairment want to take a 'patient' approach — they want to maintain their independence and view their impairment as a challenge rather than a disability.

From these findings, Squirrel Medical developed a new range of medical devices aimed at fulfilling these individuals' needs and expectations.

THE DREAM FLOW DYNAMIC DIVAN BED

The Dream Flow is a new concept in bed and mattress design. It is aimed at individuals who require the benefit of proven clinical technology to assist in the prevention of pressure-related skin and tissue damage, but want to retain the look, feel and benefits of a domestic divan bed.

The Dream Flow enables the user and their partner to decide what features are included within the bed and how their personal needs can best be met. In the Dream Flow the health-related components of the system are unobtrusively integrated within the mattress and the base of the bedframe. If needed, the characteristics, appearance and functions of the bed can be updated over time by changes to its modular construction, enabling the bed and mattress to be adapted to the changing needs of the individual.

Functions

Tissue damage occurs when unrelieved high pressure occludes the blood supply to the skin and soft tissues, thus starving them of oxygen and allowing the accumulation of metabolic waste. The provision of a soft and yielding support surface reduces this pressure by spreading load over a large area. When this is combined with further periodic pressure reduction, tissue damage can be avoided. Dynamic alternating air mattresses use soft conforming air-filled cells to support

the individual, redistributing pressure as the cells periodically inflate and deflate over a designated time frame. These mattresses have been used extensively in healthcare settings for many years to help eliminate the risk of pressure damage in vulnerable patients (NICE, 2005).

The Dream Flow system is constructed around the dynamic alternating air mattress technology provided in the Squirrel Medical Diamond mattress. This system is used within the NHS and has been shown to effectively prevent ulcer formation in patients with a very high risk of pressure damage and to assist in the healing of existing pressure-related tissue trauma (Baker, 2012).

The Squirrel Diamond mattress comprises 58 transverse air cells formed into two independent layers. When connected to its digital pump, the lower tier provides a continuous level of support at a nominated pressure range of 30-60mmHg. This cell layer conforms to the load applied through the upper tier by the user's body mass, but also prevents the transmission of high points of pressure, which sometimes occurs with other systems if they 'bottom out'. The upper tier of air cells provides direct support to the user.

In all but the five head-end cells, air is delivered to the upper tier in a staggered A:B alternating sequence — each cell deflating and then reinflating before the next cell deflates. This sequence is continually repeated, redistributing pressure and mimicking the micro-movement seen in healthy, sensate and mobile individuals. The Dream Flow incorporates this technology to prevent damage in individuals in their own homes.

Features

The manufacturers recognise the importance of ensuring the specific needs of each user are met. It is, therefore, possible with the Dream Flow system to tailor the design of each mattress and bed combination to suit the users' requirements. The system is available as a single-occupant 90cm (3ft) or 120cm (4ft) bed width. It is also possible to have 4ft 6", 5ft and 6ft double-bed units. The double-occupancy beds have the option of dynamic alternating action on either

side, or alternatively full-width alternating technology is available if required. In such cases, an optional second handset is available to control the dynamic function of each side of the mattress independently.

The bed is available as a standard fixed height unit. However, adjustable height variants are available on request. Alternatively, bed-height adjustment can be incorporated at a later time if required.

The look and feel of a bed is as important as its pressure-relieving function. All Dream Flow systems (patent applied for) are constructed as a divan bed with an attached domestic headboard. The alternating air cells are manufactured as an insert, which is incorporated into the dedicated composite mattress. The edges of the mattress are constructed of dense foam to prevent lateral movement of the air cell insert and provide additional stability when transferring in and out of bed. Beneath the air cell insert is a series of integral low-profile pocket springs. These give the mattress the look and feel of a traditional divan bed and work in harmony with the dynamic components.

Air tubes from the air cell insert thread through the mattress base and into the base of the bed. Here, they connect to the digital compressor pump, which is located in a built-in drawer, which is lined with acoustic foam to reduce noise and possible vibration. The pumps power cord threads through the bed-base to headboard (reducing the risk of trip hazards) and connects via a standard three-pin plug into the domestic electrical outlet.

The dynamic action of the bed can be adjusted using the remote handset. Air cell pressure can be increased and decreased between 30mmHg and 60mmHg for comfort purposes. The handset also controls the cycle time of air cell inflation to 5, 10, 15 or 25 minutes. The full-width double version of the bed has the option of two hand control sets. This enables each occupant to alter the dynamic characteristics in each half of the bed to their own preference.

The Dream Flow is available with a choice of mattress covers. Cover design is important in providing a barrier, preventing the ingress of moisture and

debris into the mattress. Traditionally, dynamic mattresses are all equipped with stretch polyurethane (PU) covers, which enable the mattress to conform to body contours and prevents internal mattress soiling in case of incontinence.

The Dream Flow has a PU mattress cover option if this is required. This soft top cover does not absorb perspiration and does not hold dust. It can be wiped down with a damp cloth using warm soapy water. Alternatively, the user can select either a Squirrel Medical MF cover, (which includes a layer of foam contained within a waterproofed inner zip) or a cream colour-coordinated towelling cover. For those at reduced risk of pressure damage, an optional interface layer of thin memory foam is also available which can be positioned between the cover and the air cells. This is held in place with straps and is used purely to enhance user comfort.

Safety

It is important to ensure that the dynamic air cells are in operation whenever the mattress is in use. If the electrical supply is interrupted through a power cut or by accidentally unplugging, an alarm will activate on the pump unit of the Dream Flow mattress. Similarly, damage to the air cells or air hose connections will result in an audible warning that air pressure is low. This alarm can be cancelled by activating the alert button on the pump or handset control.

In summary, the Dream Flow provides an innovative solution to those that seek the benefits of a clinically proven dynamic support surface, while maintaining a normal look and feel to their bedroom.

TRAVEL FLOW — COMMUNITY AND TRAVEL DYNAMIC MATTRESS

The physically impaired often face issues when travelling away from their usual residence. These problems were highlighted to the company when a disabled external consultant visited their offices. Christopher Mason is a young active paraplegic who uses a wheelchair to maintain mobility and independence. Mr Mason travelled from the north of England to the company's offices in Plymouth to discuss issues regarding bed design and manufacture. The discussions

‘A significant number of disabled or physically impaired people live within their own homes and many will be at risk of pressure ulcer formation’



The Travel Flow has been designed to facilitate greater independence, safety and comfort.

Key Features: Travel Flow Community Dynamic Mattress

- ▶▶ Clinically proven design
- ▶▶ Portable (the mattress and pump fits comfortably into a standard flight bag)
- ▶▶ Discreet low profile design
- ▶▶ Fits single and double divan beds
- ▶▶ Twenty-nine soft form cells
- ▶▶ Zipped water proof or dry towelling

‘Despite changes in the law regarding disability discrimination, the physically impaired still face problems in preventing pressure damage when they travel away from home’

were planned to take place over several days and so Mr Mason booked into a good local hotel with disabled accommodation. This included the usual divan bed.

Unfortunately, after only two nights stay, Mr Mason developed a category 1 (EPUAP, 2009) pressure ulcer. The company wanted to provide Mr Mason with an existing dynamic air mattress to use. This was found to be too cumbersome to carry on his wheelchair and took up too much space in his car.

Having discussed the issues faced by the physically impaired traveller, the company set about developing a product which would not only be of use to Mr Mason, but could also offer assistance to other disabled individuals. With Mr Mason's input, Squirrel Medical created the Travel Flow™ travel and community dynamic air mattress.

Travel Flow travel and community dynamic mattress

This product is designed as an ultra-portable dynamic alternating air overlay mattress, which can be fitted on top of a standard single or double mattress below a fitted sheet. The mattress is constructed of 29 air cells, which inflate in an A:B sequence over a 10-minute cycle. Pressure within the cells can be adjusted for comfort between 30–60mmHg. Air cells within the thoracic, sacral and heel areas are fitted with micro-low air loss vents. These enable cells to deform faster load, ensuring the cell contours to the individuals' body shape and helps in enabling reduction of body moisture.

As well as redistributing pressure, the alternating cell action provides a subtle stimulation to the capillaries improving blood flow, removing waste toxins and helping sensitive skin tissue recover from the stresses that travel and wheelchair use can cause.

When in use, the mattress inflates to a height of 7.5cm making it discreet and generally enables the use of standard bed linen. This means that despite providing much-needed pressure relief the system does not distract from the natural ambience of the bedroom. When no longer required the system can be folded-up and returned to its supplied sports-type carry case ready for transport or

storage. When travelling abroad, the unit can be powered by an optional 110-volt compressor.

Squirrel Medical developed the first prototype unit in February 2010. Since then, the product has been refined further and was launched via two international distributors, Bakare Beds and Nottingham Rehab Supplies. It has since been used by Carnival Cruises, several hotel groups and, with the optional 110-volt compressor unit, has been used by a number of clients in the Disney Resort, Florida, USA.

Feedback from users of the mattress via post-marketing surveillance has been extremely positive. The product has been found to be easy to operate, unobtrusive and comfortable — removing the constant worry of pressure ulcer development. One user stated: 'To be frank, it is life changing. I can now travel anywhere in the world, and recently stayed at a nice country farmhouse for four days without pressure sores, neurological pain or any form of discomfort.'

Use of the Travel Flow in care establishments

Since the product's launch, the mattress has also become popular with care staff working in formal care environments and in the community. Here, its ease of storage, light weight and transportability makes it ideal for occasional use for high to very high-risk patients.

This may be beneficial as a first-step product to manage risk until a definitive system becomes available or for short-term use for individuals whose risk of pressure ulcer development has increased through transient ill health. In such circumstances the Travel Flow has been used to successfully treat existing category 1 and 2 (EPUAP, 2009) pressure ulcers.

Some users have also used the Travel Flow regularly on their standard divan beds with good effect. As with all pressure-relieving products, the Travel Flow must be used as an adjunct to holistic nursing care and in conjunction with sound clinical judgment, recognising the unique needs and wishes of the individual.

Case study — using Travel Flow in a nursing home

A female client of 92 years of age, suffering



The Travel Flow Portable Dynamic Mattress facilitates safe independent travel.



from diabetes and who was immobile was transferred into a nursing home for ongoing care. On admission, she was found to have a small category 2 pressure ulcer on her sacrum and signs of persistent, but blanching, redness to both her heels.

Following initial assessment she was transferred onto a Squirrel Travel flow community and travel alternating air mattress to assist in her pressure ulcer care and prevention. A careful turning regimen was implemented and in conjunction with good nursing care and particular attention to nutritional status, the ulcer improved. By day nine, this was significant and by day 34, the ulcer had healed entirely.

The redness on the heels had also resolved completely. The client, who was categorised as being at very high risk throughout this period, used the mattress for the duration of her stay and the vulnerable skin areas remained intact.

Staff at the care home found the product easy to use and adaptable for their client needs. The home has now integrated the Travel Flow into the care regimens offered to all residents. In particular, the mattress is used on all on clients admitted from hospital with superficial pressure ulcers, clients with short-term illness and during the care

of terminally ill residents where patient comfort is considered a high priority.

CONCLUSION

There is a high risk of pressure ulceration for many individuals with a physical impairment. However, it is important that these same people are offered the same opportunities for self-fulfilment and independence. Strategies utilised in a sheltered care environment, such as a hospital or care home, may not be suited to situations in wider society, particularly in the non-medical world.

Users and carers need to be aware that products are now available which have been specifically designed to help them maintain normality, even in the face of a disabling environment. For the clinician, it should be remembered that these products may also have benefits that can cross over into more organised care environments. **WUK**

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