

PRODUCT FOCUS

Transair® Paediatric Mattress replacement system evaluation

Jaki Law

Pressure ulcers can be described as an ulceration of the skin as a result of the effects of prolonged pressure in combination with a number of other variables, e.g. ill health, the ageing process or excess moisture (European Pressure Ulcer Advisory Panel (EPUAP), 1999). Pressure ulcers have been associated with prolonged lying or sitting in the same position without adequate provision of a pressure-reducing or pressure-relieving surface (Hibbs, 1988). It is accepted that the use of alternating therapy is an effective way of reducing pressure and that this can reduce the risk of pressure ulcer development (Royal College of Nursing (RCN), 2001).

Research has been ongoing for more than a decade, often with an emphasis on the prevention and treatment of pressure ulcers occurring in the acutely ill adult. This is because of the increased risk of pressure ulcer development associated with advanced age (Harding et al, 1993). As a result, there is an ever-increasing choice of designs and systems to choose from to meet the needs of the adult patient. In comparison, little has been developed to meet the very different requirements that the child can demand because of smaller body weight, skin surface and limb size.

PAEDIATRIC PRESSURE RELIEF

Researchers investigating the development of new alternating therapy devices have concentrated on the adult subject. As a result, when alternating therapy is required for children who normally sleep in an adult-sized bed, an adult-sized mattress replacement is most commonly used. Observation in clinical practice showed that this is often inappropriate and fails to meet the needs of a child.

The large cells of a mattress replacement system have been designed to provide pressure relief to adult-sized bodies and are disproportionately large for the smaller frame and limbs of a child. Consequently, a child's

Abstract

While a plethora of pressure-relieving and reducing equipment is available to nurses for the prevention and treatment of pressure ulcers, very little of it is specifically designed or appropriate for paediatric patients. The limited choice that does exist concentrates on neonates or babies, which is problematic for the nurse dealing with the older child. Children may be at increased risk of developing pressure injury as a result of the forces of friction, shearing and pressure that result from being nursed on a support system designed for the adult patient. This gap in service provision may cause dilemmas for the nurse who has a duty to 'cause no harm' (UKCC, 1992) in his/her attempt to protect and treat a child. This article introduces a new product available from Karomed (a division of the Verna Group) that has been specifically designed with the child in mind.

leg, for example, would be supported by two or three cells of a mattress instead of the five or six cells that usually support a similar limb in an adult.

It has further been noted that the joints of a child's limbs can become lodged in the space between the cells and that the buttocks and sacral area of small children are able to sink between the cells when the mattress is used in a sitting position. The risks of this occurring include:

- Pressure ulcer development as a result of direct pressure from the bed base
- Increased risk of damage from shear and friction because of the need to lift repetitively the child's buttocks from between the cells.

This combination of mechanical forces has been identified as the most common cause of pressure ulcers (Young, 1997; Dealey, 1999), and as such it may be considered as negligent to ignore the risks of shear and friction produced when using a system which is overly large for a child's frame. The logical suggestion then was to find a mattress replacement system that incorporates smaller cells designed to provide adequate pressure relief to child-sized bodies and limbs.

Jaki Law is Clinical Nurse Specialist in Tissue Viability, Manager of the Tissue Viability Service, Sandwell Healthcare NHS Trust, West Midlands

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TRANSAIR® PAEDIATRIC MATTRESS

The Transair® Paediatric Mattress (*Figure 1*) is an alternating mattress replacement system designed specifically for paediatric patients. It was suggested that the lower weight of the child might cause lower pressures to be required within the cells. Testing was carried out by the manufacturer Karomed (a division of the Verna Group) to identify the correct pressures required within the 29 cells, which would ensure adequate support was achieved while ensuring interface pressures remained below 32 mmHg. This figure is widely accepted as the blood pressure at the end of the arteriole loop and is based primarily on the work of Landis (1930), who suggested that pressure above 32 mmHg would cause occlusion of the vessel leading to tissue ischaemia and tissue damage.

Fletcher (2001) examined the acceptance of a pressure below 32 mmHg as therapeutic and considers the variables which question this assumption. Fletcher critically appraised the equipment used to measure pressure, the type of sensors used and the positioning of the sensors, in addition to the patient's physical differences, including body mass and temperature. The final product contains cells that exert 28 mmHg at the highest level during the inflation stage of alternating therapy. Surprisingly,

this is not dissimilar to the 30 mmHg commonly used as a therapeutic level for an adult. However, it should be considered that such values were measured using a healthy subject and may differ for sick children who may exhibit variables such as those previously considered by Fletcher (2001).

The pump, used to regulate the amount of pressure within the cell, and the rate at which these pressures change, is lightweight and easy to use. The pressure range within the cell is pre-set by the manufacturer to avoid accidental change during use or by inquisitive friends and siblings. For unusually heavy children, the settings can be changed to meet their individual requirements but this work must be carried out by a suitably qualified engineer. High to low settings on the pump enable the user to choose a firmer or softer surface to ensure comfort or to assist in moving and handling the patient, while ensuring pressures remain within a therapeutic range.

In the event of a power failure, the system could be placed in transport mode for up to 24 hours. The system would no longer alternate but would offer a reduced level of pressure relief.

The 5 cm cells within the mattress are small enough to provide an effective alternating system, allowing reduced pressures to be exerted on the skin while adequately supporting the child. By providing adequate support the child would be prevented from slipping between the cells and becoming at risk of damage from the underlying hard support surface.

Another safety feature of the Transair® Paediatric Mattress is the introduction of a layer of pressure-reducing foam to the base of each cell. This was considered an important addition to a system designed for use in a community setting. Should the cell deflate as a result of prolonged power failure or puncture, the foam layer will prevent the child's body from being supported by the bed base alone, thus providing valuable extra time to allow a replacement or repair to be carried out.

EVALUATION OF THE TRANSAIR® PAEDIATRIC MATTRESS

Four children who were at high risk of developing pressure injury and who had been nursed in both the acute and community sectors evaluated the Transair® Paediatric Mattress. At the commencement of the

Figure 1. The Transair® Paediatric Mattress.



TRANSAIR® PAEDIATRIC MATTRESS REPLACEMENT SYSTEM EVALUATION

evaluation no child was suffering any pressure damage, and each had previously been nursed using an adult alternating mattress replacement, together with a four-section profiling bed. They had expressed issues involving lack of comfort and/or slippage between the cells and they were failing to have their needs met fully.

Each child required management in bed for more than 15 hours in a 24-hour period, and had an able carer who repositioned the child at intervals not exceeding 4 hours. They were each nursed on the Transair® Paediatric Mattress for a period ranging between 4 and 10 weeks (with an average period of use being 6.16 weeks). The ages ranged from 6 years to 13 years (an average of 9 years) and weights varied between 24 kg and 42.2 kg (an average of 33.7 kg).

Each child also had in common the fact that they suffered with long periods of pain, which made comfort one of their highest priorities. The children experienced use of the mattress both while lying and sitting in the bed and it was noted that when a child sat at an angle of 45° or more, the extra weight exerted upon the cells supporting the buttocks and sacrum did not cause the cells to lose significant pressure, which would have placed the child at an increased risk of developing pressure damage.

In the event that any child should exhibit signs of deterioration while using the Transair® Paediatric Mattress, the system they had been using previously would be re-installed immediately. Each of the children had experienced difficulties associated with falling between the mattress cells and/or discomfort when using alternating mattress replacement therapy designed for adults. Therefore, the prevention of these problems, while still providing a support system that prevented pressure damage, was the focus when evaluating the Transair® Paediatric Mattress.

RESULTS

The children and their carers were visited by a member of the evaluation team on a daily basis for the first week, and weekly thereafter to ensure the safety and wellbeing of the children. Each child used the Transair® Paediatric Mattress until the need for high-risk therapy was no longer needed. This would be indicated by the return of the child to mobility

without experiencing pressure damage, or in one instance by the death of the child.

The responses received in each case were entirely positive. Comments from children and carers had similar themes and the easy to use features of the pump and heightened comfort factors were commonly expressed:

'This is great, I do not get my elbow stuck when I turn over'
(Patient).

'When my mum sat me up, my bottom got stuck before, but now it does not'
(Patient).

'My smallest son could alter the weight setting on the old pump, he can turn this one, but it will not harm [him]'
(Parent).

'The last pump was confusing, so many dials to remember. This one is much easier, even I cannot get it wrong'
(Parent).

Skin damage was considered to have occurred if blanching erythema took longer than 20 minutes to resolve after repositioning to relieve pressure, or any sign of damage was noted using the Torrance (1983) pressure ulcer grading tool grade 2–5. Of the four children who used this system, no child experienced skin damage while being nursed on the Transair® Paediatric Mattress, which included one child whose general condition deteriorated rapidly and thus required 24-hour nursing care in bed.

DISCUSSION

The RCN (2001) has issued guidelines on pressure ulcer management and has stated that comfort should be a factor for consideration when choosing a pressure-relieving therapy for a patient. Bliss (1992) has also stated that comfort is the most valued asset to pressure-relieving/reducing aids. All users of the Transair® Paediatric Mattress commented on the high comfort value delivered by the system.

Rithalia and Kenney (2000) stated that it is the patient's response, together with the design of a mattress, which determine the effectiveness of the mattress. The responses of both patients and carers were positive and no child experienced any insult to skin

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integrity or its underlying structures. It may be suggested, therefore, that the Transair® Paediatric Mattress provides a comfortable support surface which is effective in preventing pressure ulcers in children. However, a large-scale study is recommended to validate these preliminary findings.

CONCLUSION

The tissue viability nurse has a responsibility to ensure that each patient receives high quality care, and that includes the selection and use of pressure-relieving aids that are most appropriate and meet the needs of the patient. The RCN (2001) guidelines with regard to pressure ulcer management clearly state the need to take the comfort factor into account when choosing devices designed to redistribute pressure. This document further states that alternating therapy or other high-technology pressure-redistributing systems should be used wherever a patient is considered to be at a very high risk of developing pressure ulcers.

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this system is appropriate for both primary and secondary care settings.

Following the positive outcomes from the evaluation, the trust has begun purchasing the Transair® Paediatric Mattress for use in both hospital and community settings. This is in line with the commitment of the trust to provide safe, appropriate and effective care for all its patients. **BJN**

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KEY POINTS

- The Transair® Paediatric Mattress has 5 cm cells designed to provide effective alternating therapy for a child-sized frame.
- The provision of a comfortable system is identified as an essential component by both clinicians and users.
- Using adult alternating therapy systems in children can potentially increase the risks of damage because of shear and friction.
- The Transair® Paediatric Mattress is designed for use with profiling beds or mattress elevators without loss of therapeutic value.
- The component cells of the system have an insert of pressure-reducing foam as a precaution against damage as a result of loss of power or damage to the cells.
- Clinicians have a professional and moral duty to ensure their patients receive a high standard of care which is appropriate to their needs.