

# Two clinical evaluations of the Repose system

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## Abstract

**Background:** Pressure ulcer prevention is expensive and at times difficult to achieve within budget. **Objectives:** Two evaluations of the Repose pressure ulcer prevention system were carried out concurrently in two centres across a wide range of acute clinical settings to establish cost-effectiveness, product durability and clinical efficacy. **Methods:** In one centre, patients in a 24-bed orthopaedic ward were recruited over a three-month period to evaluate the clinical effectiveness of the Repose heel protector (measured by a reduction in heel pressure ulcer incidence) and its ease of use (as assessed by an evaluation form). In the other centre, the Repose mattress overlay was evaluated throughout a hospital to establish its clinical efficacy (measured by reduction in pressure ulcer prevalence), its performance and cost benefits compared to the existing bed lease scheme. **Results:** Use of the Repose heel protector reduced the incidence of heel pressure ulceration from 17% to 0%, while the use of the mattress overlay reduced prevalence from 7% to 2–3%. The majority of staff found both products easy to use, with the main criticism levelled at its repackaging once used. Use of the products conferred significant cost benefits. **Conclusions:** Both hospitals involved in the evaluation now have Repose included in their best practice guidelines. **Conflict of interest:** None.

## KEY WORDS

Pressure ulceration  
Repose  
Cost benefits  
Dynamic support surfaces  
Tissue viability

The treatment and prevention of pressure ulcers makes huge demands on human and financial resources (Bale et al, 2001). The need to use clinically effective and economical support surfaces is beyond dispute in the ongoing fight against pressure ulcer damage.

The development of hospital-acquired pressure ulcers on the heel has been an increasingly acknowledged problem (Donnelly, 2001). Patients with limited mobility due to sensory

or motor impairment, lower limb fractures, heavy sedation and other intrinsic problems are particularly at risk (Wheeler, 1997). It is widely accepted that orthopaedic patients are at high risk of developing pressure ulceration, as the above factors are often compounded by surgical procedures and post-operative immobility (Wilson, 2002).

Pressure ulceration is a conspicuous blight on the health and wellbeing of both the patient and their carers (Franks et al, 2002), affecting up to 10% of all inpatients in acute settings. The situation in the community and primary care settings may be worse, with exact numbers impossible to measure (Cullum et al, 2001). Some studies suggest that in hospital settings prevalence ranges from 5% to 32% (Kaltenthaler et al, 2001).

In 1994 it was estimated that the cost of treating one patient with a grade 4 pressure ulcer was approximately £40,000 (Cullum et al, 2001). The accepted cost of treatment and prevention of pressure ulcers in a 600-bed hospital is anywhere

between £600,000 and £3m per year. Much of this spend is on preventive measures such as pressure-relieving surfaces (Cullum et al, 2001). So much so that the National Institute for Clinical Excellence (NICE) in its document, *The Use of Pressure-Relieving Devices (Beds, Mattresses and Overlays) for the Prevention of Pressure Ulcers in Primary and Secondary Care* calls for 'robust economic evaluations to aid rational use' of such equipment. This incorporates an analysis of their potential cost-effectiveness (NICE, 2004) in terms of financial investment against clinical impact. Thus, any real reduction in pressure ulcer prevalence or incidence represents a significant human and economic benefit, given the previous estimated cost of treating each ulcer.

The use of high-tech equipment, such as alternating pressure mattresses (that use alternating support surfaces where inflatable cells alternately inflate and deflate so that the period of pressure is reduced), require maintenance which is bound to have a financial and staffing impact and add to the growing burden of pressure ulcer management in the NHS (Price

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et al, 1999). Pressure ulcer prevention is expensive and at times difficult to achieve (Hampton, 2000) due to finite financial resources. Many companies attempt to alleviate these financial constraints by offering bed leasing schemes, including maintenance and cleaning costs. However, leasing is still an expensive solution, and one of the evaluations reported in this paper found the Repose mattress overlay to be a cheaper alternative.

### The Repose pressure ulcer prevention system

The Repose pressure ulcer prevention system (Frontier Therapeutics, Blackwood, South Wales) consists of a range of low-cost, low-maintenance, inflatable pressure ulcer prevention products that includes mattress overlay, cushion, foot protector, vascular wedges and paediatric equipment.

All the Repose products, except the heel protector, are made using a configuration of two high-tech polyurethane membranes. All items are supplied wrapped within a cylindrical pump (Figure 1), reducing transportation and storage problems. Each product is inflated by hand to a pre-set pressure setting.

The system has been tested in the UK and Europe as both a treatment for pressure ulcers and as a device for their prevention (Price et al, 1999).

#### Mattress overlay

The mattress overlay (Figure 1) is a low-tech device that works by moulding around the patient to distribute their weight over a large area. It is used on top of an existing mattress in patients at risk of developing pressure ulcers.

#### Foot protector

The foot protector is a derivative of the mattress overlay and cushion and is designed to reduce the risk of pressure damage to the heel (Figure 2). It comes in the form of a boot made of plaiton, a polyurethane material with unique stretch, thermal and vapour-permeable properties (Wilson, 2002).



Figure 1. Repose mattress overlay.



Figure 2. Repose foot protectors.

Repose foot protectors are most effective when the patient is recumbent, semi-recumbent or upright while on bed rest, as their heels are supported above a void and, therefore, close to zero pressure, while the malleoli are protected by the air compartments.

#### The evaluations

In this paper, the findings of two independent, concurrent evaluations will be presented. The evaluations were undertaken in two geographically distinct areas of Scotland to look at the effect of the widespread use of Repose products across different clinical settings on

pressure ulcer incidence, ease of use and cost effectiveness.

#### Evaluation 1: Hairmyres Hospital, East Kilbride

The first evaluation was carried out in Hairmyres Hospital, Lanarkshire Acute Hospitals NHS Trust. An evaluation of Repose heel protectors was undertaken in the 24-bed orthopaedic ward where there was concern over the raised incidence of heel ulcers.

The recorded clinical incidence (defined as the calculated amount of pressure ulcer damage occurring in the hospital unit, as opposed to prevalence of the total amount of all tissue damage in a unit on a given day) before the study was 17% of patients (Hill-Rom Audit, 2001–2).

Before the study began, patients at risk of pressure damage to the heel were treated using foam foot troughs, or their heels were padded using bandages to reduce friction and shearing. A regular inspection and monitoring regimen was in place as standard practice.

The aim of the evaluation was to determine the impact of the use of Repose heel protectors on pressure ulcer incidence. Ten pairs of foot protectors were purchased and the study was undertaken in the 24-bed unit over a period of three months.

Patients included in the evaluation were those who were at the most risk of developing pressure ulceration. This included all patients admitted to the ward who would be on bed rest for 24 hours or more. Those who could not comply with the use of equipment, e.g. confused patients, or those who were unwilling to participate, were excluded from the study.

Staff were given introductory training in how to use the heel protectors and the evaluation form before the study began. The evaluation form was divided into sections relating to pressure area problems, Waterlow risk assessment, skin condition, product evaluation, and nurse review of the evaluation.

Over a three-month period, Repose heel protectors were allocated to patients on admission to the ward and their details and skin assessments recorded on the evaluation form. The skin was checked daily for any signs of pressure ulcer damage, according to local policy, and any tissue damage graded according to the Stirling scale (Reid and Morrison, 1994). The heel protectors were used at all times while on bed rest or until the patient was discharged from the ward.

#### Results

During the three-month period, 44 patients were included in the evaluation and their progress was recorded throughout their stay in the unit (range of stay = 5–21 days). Of the 10 pairs of foot protectors purchased for the study, all were still in use at the end of the evaluation period. None of the patients using Repose heel protectors developed a heel ulcer in the unit, resulting in a fall in clinical incidence from 17% to 0%.

Staff feedback recorded on the evaluation form on the ease of use and simplicity of the product, as well as the clinical impact on patient care, was very positive.

#### Evaluation 2: Western General Hospital, Lothian

The second evaluation was undertaken in Western General Hospital, Lothian Acute NHS Trust; a large hospital with 460 beds which provide mostly specialist care.

Previously, a series of much smaller and less formal trials of the Repose mattress overlay had been held at the hospital; first, in a single ward environment, then in the oncology, neurosciences and infectious diseases departments. All three areas were heavy users of alternating mattresses. Within these settings, the Repose mattress overlay proved to be both clinically effective and durable over a period of years. The outcome of the trials suggested that major cost benefits should accrue while using the Repose mattress overlays, while a growing body of evidence also suggested positive clinical outcomes (Price et al, 1999).

Following these findings, and in an effort to reduce their rental costs, but without wanting to compromise their clinical outcomes, the hospital decided to introduce and evaluate Repose overlays as an alternative low-cost system to alternating pressure mattresses, throughout the premises.

The aims of the evaluation were to make a cost comparison against a leasing agreement (total bed contract, which included cleaning and maintenance costs) which was in place at the participating hospital at the time of the evaluation, to establish clinical efficacy through a reduced prevalence of pressure ulcers, and to assess equipment performance.

#### Methods

Repose was used in the acute admissions, intensive care, infectious disease, oncology, rheumatology, respiratory, surgical, gastrointestinal and high dependency units. In total, 136 Repose mattress overlays were used throughout the hospital.

#### Clinical efficacy

Before the eight-month evaluation, local policy within the hospital meant that all patients were nursed on a foam mattress, and those at high risk of pressure damage were transferred to an alternating pressure mattress. During the evaluation, however, Repose was introduced as an intermediate step between the foam mattress and alternating surface for patients at risk of pressure ulceration.

Patients with pre-existing pressure damage were excluded from using the new equipment. Although the evaluation aimed to determine the effect of repose in pressure ulcer prevention, as it progressed, staff became confident with the equipment and they began to use it on patients with pre-existing ulceration and found it to be effective. These findings are also included in the results.

The patients' wound/skin condition was monitored and recorded on an evaluation form as part of routine skin monitoring. The Waterlow

**Please tick the box on each row, which indicates how you rate the performance of the product.**

	Excellent	Good	Satisfactory	Unacceptable	N/A
a. Level of wound healing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Maintenance of skin integrity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Ease of cleaning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Ease of patient care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Patient comfort	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Ease of patient transfer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Has independent patient movement been compromised?			Yes <input type="checkbox"/>	No <input type="checkbox"/>	N/A <input type="checkbox"/>
h. Can position be maintained by the patient following re-positioning?			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Was the associated noise of the system disturbing to the patient?			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j. Did the product generate heat?			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>If yes, did this result in moisture build up for the patient?</i>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k. Was effective inflation maintained?			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i. Was the system easy to use?			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other comments					

**Figure 3. Product evaluation section of the evaluation form.**

assessment scoring system was used as an assessment tool pre- and post-evaluation.

As part of the clinical evaluation, staff were also asked to comment on the use of the product using the evaluation form (Figure 3).

Upon the final collection of evaluation forms in the wards, the

tissue viability nurse (TVN) asked staff and patients about their experience of using Repose and how useful it had been using an open questionnaire.

The prevalence of pressure ulcers was compared pre- and post-purchase of the repose overlays. Reduced prevalence was noted as a positive measure of the mattress overlay's performance (Table 1). Although less significant than that of clinical incidence, the prevalence level was the only measurement available on the equipment used before the study began.

#### Overlay evaluation and performance

The life expectancy of the Repose mattress overlays were monitored over an 18-month period by ward clerks reporting weekly to the TVN. This report included the amount of equipment in use and the frequency of use measured in bed days.

#### Cost benefits

A six-month costing comparison of dynamic mattress replacement systems *versus* Repose mattress overlays was carried out. Cost benefits were determined by simply assessing how many alternating beds were used throughout the hospital before Repose was introduced, and how many were required after the purchase of the overlays.

#### Results

In the eight months from July 2001 to March 2002, named nurses recorded the performance of the Repose mattress overlay in the ward environment using the evaluation forms; 69 forms were completed and returned. The use of the equipment was spread throughout the available patient population and the results were from a good cross-section of patients (n=69: m=49%, f=51%; 44% emaciated; 41% normal bodyweight; 15% obese; 39% of

**Table 1.**

Prevalence of pressure ulcers at Western General Hospital July 2000 (TVN audit)

Total patient population:	448
Total pressure ulcers:	78
Grade 1 blanching hyperaemia:	46 (10%)
Grade 2:	25 (6%)
Grade 3/4:	7 (2%)

\*Grades measured using the Stirling scale

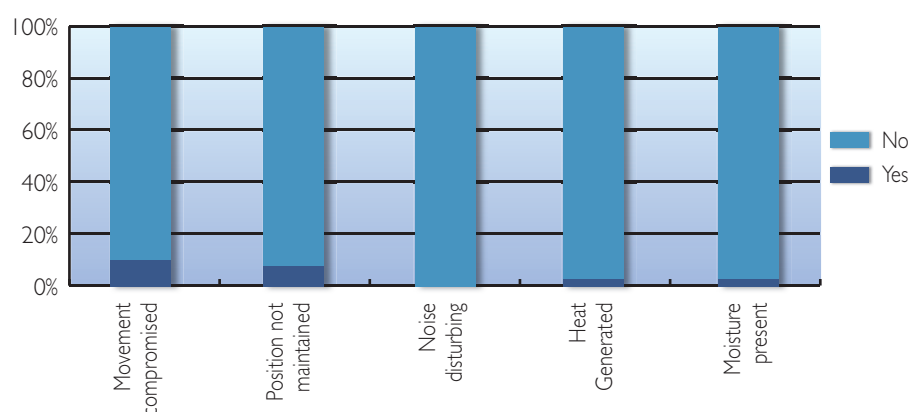


Figure 4. Repose mattress overlay evaluation by nurses at Western General Hospital.

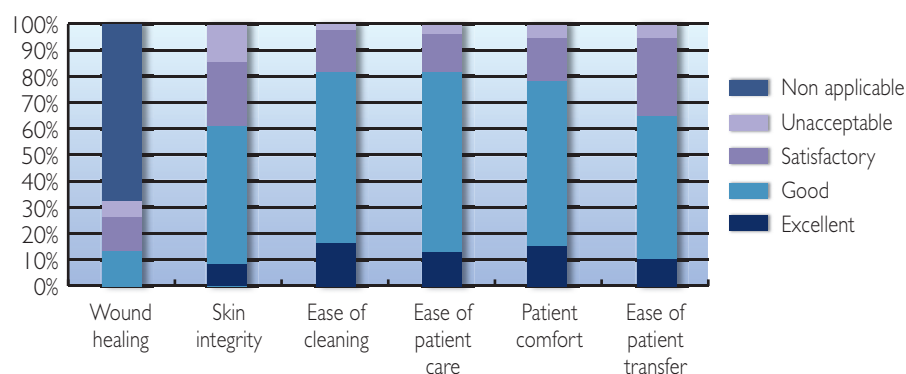


Figure 5. An evaluation of the Repose overlay mattress' key performance criteria.

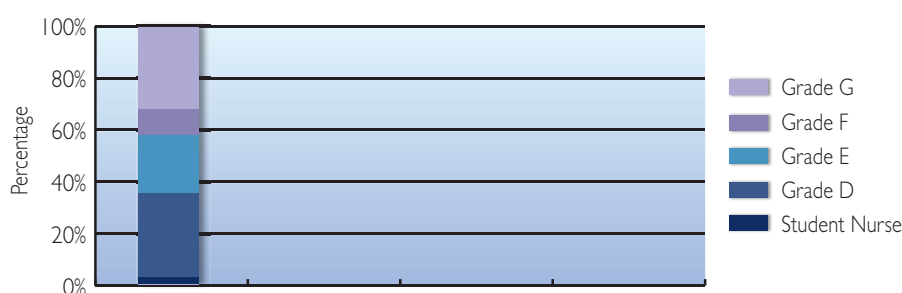


Figure 6. Percentages of grade of staff who completed the Repose mattress overlay evaluation forms.

patients suffered from faecal or urinary incontinence). Of the study group, 3% used Repose post-operatively with between 30–50% suffering from peripheral circulatory problems and immobility in bed and chairs. The diverse population of patients had Waterlow scores ranging from 9 to 30+ (demonstrating low to high risk) pre- and post-evaluation.

Due to the widespread patient population within the hospital and their differing needs, 6% of patients using the overlay showed signs of patient deterioration; 10% of patients improved (meaning that pre-existing ulcers were healing or healed) and 56% of patients were recorded as having no change or no deterioration. A clearer indication of performance

was gained by referring to the concluding staff assessment on the evaluation form regarding the success or failure of the mattress overlay, according to whether its use was allocated for prevention, treatment, or palliation.

#### Clinical efficacy

No patient developed a pressure ulcer while using the Repose mattress overlay. Three-quarters of all evaluation forms indicated no deterioration in skin assessment during the evaluation, while 12% were noted as a partial fulfilment due to early discharge from units. In 12% of cases, the patient required a stepping up from Repose to alternating systems. The further progress of these patients once this had taken place is unknown, therefore it is impossible to know if the patient continued to deteriorate or improve. There were some cases of patients with grade 2 and 3 pressure ulcers (Stirling scale) who were treated successfully using Repose as their support surface, resulting in a reduction in the patient's pressure ulcer rating.

In an in-house audit in July 2000 before the purchase of Repose, pressure ulcer prevalence was 7% excluding stage one blanching hyperaemia. The prevalence following the widespread use of the Repose overlay was 2% in February 2002 and 3% in September 2002, both excluding cases of stage one blanching hyperaemia.

#### Equipment performance and evaluation

The named nurses responsible for patient care completed a questionnaire rating the performance of the product against key criteria. Staff rated performance as either Excellent, Good, Satisfactory, Unacceptable or Not applicable. Figures 4 and 5 show that most of the staff who completed the questionnaire rated Repose very highly, and only 2% found its performance unacceptable (Figure 5). The evaluation forms were completed by a good mix of nurses from different grades (Figure 6).



By looking at key performance criteria, staff commented on the impact of the Repose system on patient care. These questions covered the practical outcomes of Repose in terms of their experience of other bed systems.

In response to the final question on the evaluation form: 'Would you like to have this product on your ward?' 96% of nurses indicated clearly that they wanted to continue using the product and 4% did not.

The responses of staff and patients gathered via the simple open question questionnaire were also positive, with clinical performance and ease of use highlighted by staff with comments such as: 'The mattresses are readily available and easy to use'. Patients underlined the comfort of the mattress: 'It's the most comfortable mattress I have ever been on.' The main criticism levelled by staff involved difficulties in repacking the overlay into the tube/pump package.

#### Cost benefits of the Repose system

The difference in the use of dynamic mattress replacement systems and Repose mattresses over a period of six months demonstrated a saving of £34,603. This is a conservative figure and the real figure must be considerably higher. This figure includes the cost of the 136 sets of Repose equipment, but has made no provision for maintenance, electricity or special cleaning costs associated with dynamic/alternating equipment. Furthermore, the costs saved by the equipment enabling a quick — almost instant — intervention, saving nursing time and reductions in dressings and other associated wound care costs, are not taken into account.

A year after the evaluation, 81% of the mattress overlays (n=112) remained *in situ* (including 23 trial overlays from the initial evaluation); 18 months after purchase, 74% of the mattresses remained in use, with an average monthly use of 2,431 bed days per month. However, this is an underestimate as there was erratic

reporting from the units using the Repose equipment and the figures thus remain conservative.

The reduction in the number of overlays available with time was due to a combination of factors; damage to the product, patients being discharged with the equipment, and staff thinking it was a disposable product. Some were also discarded because they had become contaminated.

There was still an increased availability when compared with the previous system. As well as being clinically effective, the increased availability in pressure-relieving surfaces meant that there was no delay in supply and, thus, treatment of patients.

#### Discussion

Hairmyres Hospital continues to use the Repose heel protector and the heel pressure ulcer incidence on the orthopaedic ward in the 12 months following the evaluation was recorded as peaking at 1%. This increase was due to the admission of patients with pre-existing pressure ulcer damage who were subsequently transferred from the unit before active intervention was possible. Within the ward, the ongoing clinical outcomes are regularly updated and subject to regular audits and the current incidence of heel ulceration in January 2006 was 0%.

The initial three unit trial of the Repose overlay mattress in the Western General Hospital indicated cost savings. In fact, the Repose mattress overlay had paid for itself within two weeks of purchase (this was based on leasing/rental costs of the dynamic overlays it replaced). The savings determined by the second evaluation presented here, while basic, clearly indicate the significant clinical and financial benefits of using the Repose mattress overlay in a variety of different acute units and wards for the treatment of a wide spectrum of patients. The full economical implications of this use of

the Repose system requires further investigation.

It is interesting to note that as time passed, the use of the Repose equipment changed from the prevention of ulcers to healing, when it was used successfully with patients who had pre-existing pressure ulceration. The use of Repose in the treatment of pressure ulceration would therefore be an interesting area of investigation.

Similar clinical evaluation and research should be carried out using other Repose products, looking in particular at clinical incidence of pressure ulcers when using the equipment. The authors would also be interested to see the findings of an assessment of the use of heel protectors across an entire hospital, including its systematic use from A&E to operating theatres to ward locations. The full financial impact both within a contract period and the full impact on patient comfort and pain relief should also be investigated.

#### Key Points

- ▶▶ The treatment and prevention of pressure ulcers makes huge demands on humans and financial resources (Bale et al, 2001).
- ▶▶ Pressure ulcer prevention is expensive and at times difficult to achieve (Hampton, 2000).
- ▶▶ The Repose system is a clinically and cost effective intervention for patients at risk of developing pressure ulcers.
- ▶▶ In the studies presented here, the use of the Repose heel protector eradicated the incidence of pressure ulcers in an orthopaedic ward, while the use of the mattress overlay reduced PU prevalence by more than half throughout the participating hospital.

## Conclusions

The purpose of the two evaluations outlined in this paper was to assess the use of a low-cost, clinically effective and simple pressure ulcer prevention system across a wide range of acute clinical areas.

In Western General Hospital, the use of Repose mattress overlays resulted in a dramatic reduction in costs, while the prevalence of pressure ulcers and hospital-acquired pressure ulcers dropped by 4–5%. In Hairmyres Hospital, the use of Repose heel protectors totally eradicated the incidence of pressure ulcers to the heel on the orthopaedic ward. Satisfaction surveys carried out during the trial periods indicated that these products required low maintenance and were easy to use, making them popular with nurses, patients and procurement staff.

Both of the hospitals who trialled Repose have now adopted the two products and have included them in their best practice guidelines

for pressure ulcer prevention and management. **WUK**

*This study was originally an oral presentation titled 'The Shared experiences of two Scottish hospitals in the evaluation and resultant implementation of Repose mattresses and heel protectors as part of their hospitals protocol in the prevention and treatment of pressure ulcers.' It was presented by Ann McFarlane and Sue Sayer at the European Pressure Ulcer Advisory Panel International Conference 2003 at Tampere, Finland.*

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## An effective aid in the prevention and treatment of pressure ulcers

Clinically effective<sup>1, 2, 3</sup>

Cost effective<sup>4, 5, 6</sup>

Easy to use

No maintenance

Portable



- **Repose** has contributed to the successful treatment of more than **1 million patients**
- **Repose** “appears to offer a similar level of benefit in preventing pressure ulcers, with the potential for major cost reduction.”  
Clinical trial; pressure ulcers; RCT; Repose v Nimbus™.<sup>7</sup>
- The **Repose** mattress is reactive, it reduces contact pressure by immersion
- More patients are currently treated on Repose than any other pressure redistribution mattress in the UK

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