

Reducing the incidence and risk of pressure sores, manual handling loading and carer costs using 'in-bed' systems.

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Abstract

Preventing or alleviating pressure sores, reducing physical loading tasks and saving costs are challenges for all health and social care organisations. In the county of Norfolk, a preliminary assessment of 'in-bed' systems had identified the System RoMedic WendyLett system¹ as having the potential for making significant inroads into these problems. During this six-months monitoring trial, 110 clients, all of whom were using tissue viability mattresses, were assessed for skin integrity and pressure ulcer incidence. Results indicated positive cost-benefits for the use of the WendyLett system in that: clients without pressure ulcers at the start of the trial did not develop them; the incidence of pressure ulcers of all grades was reduced; and the number of carers required for moving and handling procedures, even for bariatric clients, was significantly reduced. There was a projected reduction of annual tissue viability management costs of 87.7%, and a projected saving ranging from 33-45% in terms of patient care costs was indicated for the effective use of an approved and flexible 'in-bed' system.

Introduction

Pressure ulcers

In the United Kingdom, pressure sores affect 20% of people in acute hospitals, 30% of people receiving care in the community and 20% of people who reside in nursing and residential homes². A pressure area is defined as pressure sores or bed sores caused by an area of the skin that breaks down. Usually the causation is either from pressure, where the weight of the body is pressing down on the skin, from shear, where layers of the skin are forced to slide, for example, when pulling a person up the bed without using appropriate equipment, or from friction, where the skin rubs together. On average, managing severe cases of pressure sores can cost £11,000-£40,000 per person. The National Health Service spends up to four billion pounds treating pressure ulcers and related conditions each year. Pressure sores can become ulcerated and infected and in addition to financial costs the individual can

suffer both pain and systemic infection with consequent increases in mortality and morbidity. Table 1 lists the pressure sore categories used within the United Kingdom.

Table 1. Pressure ulcer classification in the United Kingdom.³

Classification	Severity
Grade 1	Non-blanchable erythema of intact skin. Discolouration of the skin, warmth, oedema, induration or hardness may also be used as indicators, particularly on individuals with darker skin.
Grade 2	Partial thickness skin loss involving epidermis, dermis, or both. The ulcer is superficial and presents clinically as an abrasion or blister.
Grade 3	Full thickness skin loss involving damage to or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia.
Grade 4	Extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures with or without full thickness skin loss.

Care Costs

In the United Kingdom there is a huge move towards meeting the needs of both patients and carers whilst at the same time reducing the costs of health and social care⁴. Organisations must explore ways to reduce care costs whilst maintaining health and safety of employees and comfort of the patient. One approach to reducing care costs is firstly to invest in appropriate equipment and training of care staff. With the changes towards personalisation, self-directed support and personal budgets⁵, correct equipment solutions can improve productivity, enhance comfort, reduce costs and increase patient independence.

Manual Handling injuries

Back injuries among NHS staff cost taxpayers over £400 million annually⁶. The charity Backcare found that around 80,000 nurses sustain back injuries as a result of moving and handling activities at work each year⁷. The HSE⁸ identify twisting, bending, static postures, repositioning patients and repetitive handling as risk factors

for injury. Mansfield⁹ identified workload and an increase in the number of obese patients as risk factors for back pain and injuries. The related staff sicknesses and absences amount to a huge £400 million annual cost, which is enough to employ 16,000 nurses for a year. In addition to nurses, 3,600 healthcare workers are forced to retire early as a result of back problems and, across the entire care sector, moving and handling injuries account for over a quarter of all reported staff injuries. Manual handling compensation continues to rise and can be preventable through systems of management, equipment and training¹⁰.

WendyLett Systems

Wendy Lett systems are based on a satin- finished woven textile that can be left in place as bed linen under bed-bound individuals. The system is intended to be used for people who have difficulties turning and positioning independently in bed. The system can be used singly as a base sheet or with a compatible draw sheet/sliding draw sheet.

WendyLett 2 way system

The Wendy Lett 2-way drawsheet is placed on top of the Wendy Lett base sheet. The combination of the base sheet and the Wendy Lett drawsheet enables handlers to turn the user laterally, in the direction of the stripes.

Wendy Lett 4 way system

The Wendy Lett 4-way multi-directional sliding drawsheet combined with a Wendy Lett base sheet enables multi-directional positioning within the bed. Procedures such as lateral positioning, moving up/lower in the bed or re-adjusting a user's position while lying.

If the scenario requires further support, for instance for heavier users resistant to movement or static loading on handlers from supporting the user laterally the Romedic Top sheet can be added.

Tissue viability and equipment myths

There is a myth with some healthcare professionals that moving and handling equipment should not be left under people when they are on bed care because of the risk of tissue viability problems. Many care staff and some healthcare professionals also believe once a tissue viability mattress has been provided that the client does not require regular repositioning within the bed.

Prior to this trial, the author expressed concerns that there should be a balance of risks, focusing on the risks to handlers possibly sustaining back injuries as a result of moving and handling and the possible risks of skin integrity to patients from lying on moving and handling equipment. Gaining support from the tissue viability nurses enabled a trial with the Wendy Lett systems. We agreed to trial Wendy Lett systems

on the complete range of tissue viability mattresses available within the county of Norfolk, United Kingdom.

Tools used for data collection.

1. The Borg category rating scale ¹¹.

The Borg rating scale is used to measure the perceived exertion rate a person feels when undertaking specific tasks. The scale runs from scale 6, least effort, to 20 for maximum effort. Users are asked to rate their perceived exertion on completion of each task.

Least effort

6	Very, very light.
7	
8	
9	Very light
10	
11	Fairly light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Very, very hard.
20	

Most effort

2. Pressure Ulcer Productivity Calculator (Department of Health 2010).

The Pressure Ulcer Productivity Calculator was designed by the Department of Health¹², following research undertaken by the Personal Social Services Research Unit in 2009¹³. The aim of the tool is to assist National Health organisations and

commissioners understand the productivity and cost elements associated in treating patients with pressure ulcers. The tool estimates the cost of pressure ulcer treatment and is based on the following costs:

Treatment costs per annum.

Grade of ulcer	Estimated treatment cost
1	£1000
2	£6000
3	£10,000
4	£14,000

Nursing workforce time; capital costs, salary on-costs at 20% include (travel, training, annual leave, staff cover) and bed occupancy costs. These are the examples used within the tool.

Staffing costs per annum and hourly rate.

Nursing grade	Salary and on costs (20%).	Hourly rate
Band 8b	£60,595.00	£31.07
Band 8a	£51,208.60	£26.26
Band 7	£42,228.80	£21.66
Band 6	£35,479.86	£18.19
Band 4	£23,904.00	£12.26

Completion of the tool is through a spreadsheet available from the Department of Health website. There are three stages:

1. Section A; Recording entire number of pressure ulcer incidence within the organisation.
2. Section B; Recording the number of pressure ulcers for grades 1-4.
3. Section C; calculates the **estimated** cost of treating the pressure ulcers.

Methodology

The study followed an action research methodology collating information from clients and users who required use of tissue viability products and regular repositioning

within a bed. The project was completed between January 2010 and May 2011. For ease of reading, the methodology has been broken down into numbered components.

1. The author initiated contact with the Tissue Viability Nurse, explained the proposed project and the need to balance the risk of injury to patient handlers with a reduction in the risk of pressure ulcer incidence.
2. The first part of the project identified the types of tissue viability mattresses provided by the Primary Care Trust and Social Care organisations within the county of Norfolk, United Kingdom. The Tissue Viability Nurse was able to provide a list of mattresses provided by the Primary Care Trust. Social Services Procurement were able to supply a list of the mattresses provided by Social Care. The mattresses used are listed in table 2.

Table 2. Types of tissue viability mattresses used within Norfolk, United Kingdom.

Mattress type	Risk category	Company
Repose Overlay	Low to medium risk	Repose
Contour Memory Foam	Moderate to high risk	Sidhil
Casaflex Core Foam	Medium to high risk	Days Healthcare
VE soft rest foam	Medium to high risk	Sidhil
Casflex Base Foam	High risk	Days Healthcare
Aclaim VE Foam mattress	High risk	Sidhil
Quatro Plus replacement mattress	High risk and for users with limited mobility	Talley Group
Aclaim bariatric foam	Bariatric (320kgs) with medium to high risk	Sidhil
Bariatric Dynamic System	Bariatric (285kgs) with high risk	Sidhil

3. The author identified clients who required or were currently prescribed a tissue viability mattress and the Wendy Lett systems.
4. The author identified whether any of the clients had pressure ulcer incidence at the start of the project. Clients with pressure ulcer incidence had their pressure ulcer graded, according to table 1 criteria. .
5. Clients were issued with either the Wendy Lett base sheet, Wendy Lett 2-way system or Wendy Lett 4-way system.
6. The Moving and Handling Advisor and Occupational Therapists provided training on how to use the Wendy Lett systems to all handlers . Occupational Therapists had their training provided by the Moving and Handling Advisor to

ensure the same techniques were applied.

7. After two weeks of the trial the number of handlers for the six bariatric cases was reviewed.
8. After 6 weeks of the trial clients were assessed for changes in skin integrity and graded according to table 1.
9. After 12 weeks and 6 months of the trial clients had their skin integrity assessed again and graded according to table 1.
10. During the 6 months all clients were reviewed to see if the number of handlers remained the same or was reduced.
11. During the 6 months when clients were reviewed handlers were asked to describe their rate of perceived exertion, using Borg Rating Scale, (Borg 1998).
12. At the end of the trial the estimated cost of pressure ulcer treatment at the start and end of the trial was calculated using the Pressure Ulcer Productivity Calculator (Department of Health 2010).

Results

During January 2010 to May 2011, 110 (N=110) clients were identified with moving and handling needs and who required a 'leave in bed' system for positioning within the bed. To meet the study eligibility all of the clients also had tissue viability mattresses.

Table 3 documents the number of clients using each mattress type (listed in table 2).

Table 3. Clients and type of mattresses used.

Mattress type	Number of clients
Repose Overlay	0
Contour Memory Foam	11
Casaflex Core Foam	13
VE soft rest foam	23
Aclaim VE Foam mattress	21
Quatro Plus replacement	31
Aclaim bariatric foam	5

Bariatric Dynamic System	6
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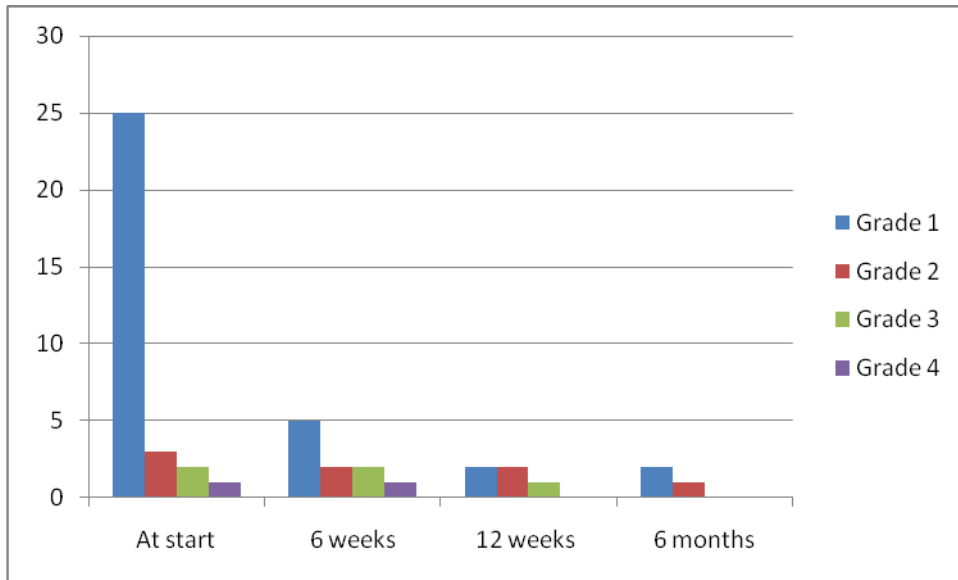
Every client had an assessment of skin integrity before introduction of the Wendy Lett systems. The tissue integrity was recorded and pressure ulcer incidence graded according to table 1. Results of skin integrity are recorded in table 4.

Skin integrity of all clients was recorded at 6 weeks, 12 weeks and 6 months after introduction of the Wendy Lett sheets. All of the pressure ulcers were graded according to the classifications set out in table 1. All of the results are recorded in table 4. Figure 5 shows how the pressure ulcer incidence has declined during the six months of Wendy Lett use for each ulcer grade.

Table 4, number of clients with tissue viability incidence before and after implementation of Wendy Lett systems.

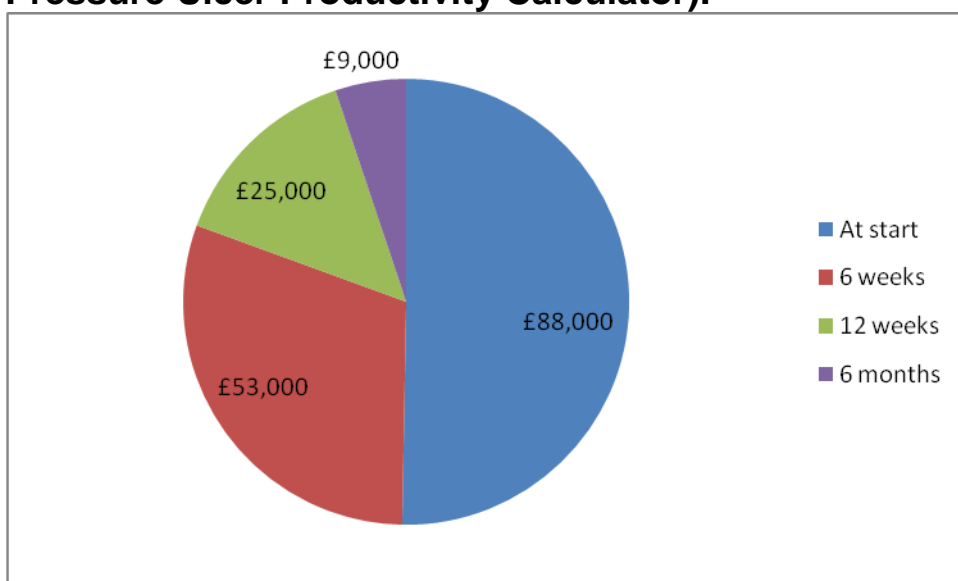
Number of clients with no pressure ulcers at start of trial	Ulcer Grades	Number of clients with pressure ulcers at start of trial.	Number of clients with pressure ulcers at 6 weeks	Number of clients with pressure ulcers at 12 weeks	Number of clients with pressure ulcers at 6 months.
79					
	1	25	5	2	2
	2	3	2	2	1
	3	2	2	1	0
	4	1	1	0	0

Figure 5, Histogram showing the reduction of pressure ulcers over 6 months.



At the end of the trial the author thought it would be prudent to calculate the anticipated cost of pressure ulcers at the start and the end of the project. These figures are outlined in figure 6.

Figure 6, Anticipated costs in £ per annum of treating and managing the pressure ulcers at start of trial compared to anticipated costs at the end of the 6 month trial, (based on Pressure Ulcer Productivity Calculator).



Reducing carer costs

In Norfolk unit costs for double up visits are £15.51, that is £7.75 per carer visiting client.

Single carer unit costs are £8.51.

a) Bariatric clients

6 bariatric clients required 4 handlers for each visit at the start of the trial. The anticipated costs would be as follows:

Cost of 4 carers per client .

$£15.51 \times 2 = £31.02$ for each visit.

Number of visits per day = 4 visits a day. Daily cost $£31.02 \times 4 = £124.08$

Weekly costs = $£124.08 \times 7 = £868.56$

Annual cost = $£868.14 \times 52 = £45,165.12$

Annual cost for 6 clients = $£45,165.12 \times 6 = £270,990.72$

After implementation of the Wendy Lett systems 4 of the clients required 2 carers, instead of 4 carers to safely assist the client.

Cost per client with two carers instead of four carers.

Cost of package is now £15.51 for each visit.

Number of visits per day = 4 visits a day. Daily cost $£15.51 \times 4 = £62.04$

Weekly cost = $£62.04 \times 7 = £434.28$

Annual cost per client $£434.28 \times 52 = £22,582.56$

Annual cost for 4 clients = $£22,582.56 \times 4 = £90,330.24$

Annual cost for 4 clients with double up visits (£90,330.24) and 2 clients requiring 4 carers, 4 times a day is $(90,330.24 + 90,330.24) = £180,660.48$.

Estimated savings would be £270,990.72 - £180,660.48 = £90,330.24, representing a reduction in staff costs of 33.34%.

b) Cost of other care packages.

There were 110 clients included in the research that required assistance with daily tasks and positioning within the bed. Six of the clients had bariatric needs and the cost savings following implementation of the Wendy Lett systems have been calculated (see a) above). A further 22 clients had a reduction of carer costs

because the Wendy Lett system enabled the informal carer, (client's spouse/partner/family member) to work alongside the formal, (home care assistant), carer. Cost savings calculated as follows:

Twelve clients requiring four double up visits a day.

Cost of double up visits four times a day is £15.51 for each visit. (Unit cost of £7.75 per carer or £15.51 for 2 carers).

Daily cost = £15.51 X 4 = £62.04

Weekly cost = £62.04 x 7 = £434.28

Annual cost = £434.28 x 52 = £22,582.56

Annual cost for twelve clients is £22,582.56 X 12 = £270,990.72

Cost reducing each visit to one carer per client.

£8.51 x 1 = £8.51. The unit cost of one carer is slightly higher than the cost of halving the unit costs for 2 carers, (double up carer unit costs). Unit cost of one carer is £8.51.

Daily cost = £8.51 X 4 = £34.04

Weekly cost = £34.04 x 7 = £238.28

Annual cost = £238.28 X 52 = £12,390.56

Cost for twelve clients = £12,390.56 X 12 = £148,686.72

Estimated cost savings reducing visits from two carers to one carer, for twelve clients is £270,990.72 - £148,686.72 = £122,304.00, representing a reduction in staff costs of 45%.

Ten clients requiring 3 double up visits a day.

£15.51 for each visit.

Daily cost = £15.51 X 3 = £46.53

Weekly cost = £46.53 x 7 = £325.71

Annual cost = £325.71 x 52 = £16,936.92 per client.

Annual cost for ten clients is £16,936.92 X 10 = £169,369.20

Cost reducing each visit to one carer.

£8.51 x 1 = £8.51, higher unit price for one carer.

Daily cost = £8.51 X 3 = £25.53

Weekly cost = £25.53 x 7 = £178.71

Annual cost per client = £9,292.92.

Annual cost for ten clients = £9,292.92 X 10 = £92,929.20.

Estimated cost savings reducing visits from two carers to one carer, for ten clients is £169,369.20 - £92,929.20 = £76,440.00, representing a reduction in staff costs of 45%.

Carer perception of exertion when using the Wendy Lett systems.

At the review stage all of the formal carers were asked for their perceived rate of exertion when using the WendyLett systems. In total 232 carers were asked for their responses.

Figure 7 Rate of Perceived Exertion of handlers.

Exertion rate	Number of handlers
6	30
7	45
8	40
9	50
10	50
11	10
12	2
13	2
14	3
15	0
16	0
17	0
18	0
19	0
20	0

Discussion

Pressure Ulcer incidence

Frequent positioning and removal of slide sheets can potentially increase the risk of shearing onto the skin. One of the concerns from care staff has been fear of disturbing pressure ulcer dressings when they are trying to introduce or remove slide sheets. Introducing an “in bed” system takes away any anxiety of dressing

disturbance and reduces any shear or friction to the skin.

At the beginning of the trial 110 clients were assessed for pressure ulcer incidence. 79 clients had no pressure ulcer incidence at the beginning of the trial. These clients remained without pressure ulcer incidence throughout the trial indicating that leaving “in bed” systems in place does not increase the risk of pressure ulcer incidence.

Twenty-five clients at the beginning of the trial were assessed as having grade 1 pressure ulcer incidence. At the six week review the ulcer incidence for 20 clients had been eradicated. At 12 weeks only two clients were assessed as having pressure ulcer incidence of grade 1. At the six month review 2 clients had pressure ulcer incidence, grade level 1. These clients had pressure ulcer incidence of 3 at the start of the trial.

At the beginning of the trial three clients were assessed as having pressure ulcer incidence grade 2. At the six week review one client’s pressure ulcer incidence improved and was downgraded to grade 1. At the end of the six months only one client had pressure ulcer incidence, grade 2. This client had a grade 4 classification at the beginning of the trial.

Two clients were classified as having grade 3 pressure ulcer incidence at the start of the trial. At the six week review both clients were re- classified as grade 2. By 12 weeks one client was downgraded to grade 1 and the other client remained graded at level 2.

One client was classified as having pressure ulcer incidence grade 4 at the start of the trial. By 12 weeks the client was downgraded to level 3 and at the end of six months they were downgraded to level 1.

With the exception of one client the WendyLett systems appeared not to increase pressure ulcer incidence. One client, who was using the WendyLett and TopSheet system initially did develop grade 1 pressure ulcer incidence. The tissue viability mattress was changed from medium to high risk and turning within the bed increased to hourly rather than 2 hourly. After 2 weeks normal repositioning was resumed because the pressure ulcer incidence improved and normal skin integrity had returned.

Leaving systems on the bed enabled handlers to frequently reposition their clients with the minimum of disruption. The combination of appropriate tissue viability mattresses and frequent positioning improved client skin integrity and did not put clients without skin problems at the start of the trial at risk.

Using the Pressure Ulcer Productivity Calculator the estimated annual cost for treating pressure ulcers before implementing the “in bed” system was £88,000 per annum. Reducing the pressure ulcer severity and the number of clients with pressure ulcer incidence from thirty-one clients to three clients reduced the

estimated costs to £9,000 representing a cost saving of £79,000 per annum, with estimated reduction in costs of 87.7%.

Bariatric clients.

Within the research study six clients were identified as bariatric. Within the United Kingdom a person defined as bariatric is a person who either exceeds the safe working load or width of standard equipment. The clients' weight ranged from 114.5kgs to 203kgs. Their body mass index ranged from 30-43.

Reducing manual handling injuries and improving handler comfort.

232 handlers were asked to rate their perceived rate of exertion during repositioning of their clients within the bed. Repositioning tasks included micro movements for turning within the bed and micro movements for positioning up the bed. Using Borg (1998) 12.9% of the handlers found using the Wendy Lett systems required virtually no effort. 19.4% of the handlers found their rate of perceived exertion for the task required very little effort. 38.7% required some effort but again this was rated as low effort required when undertaking the tasks. 26.7% also rated their rate of perceived exertion as light but rated 10 and 11 on the Borg scale, indicative that some effort was required compared to those scoring 6-9. Only 2.1% found using the Wendy Lett systems hard and this was attributable to them working with the heavier bariatric clients.

Traditionally, handlers were used to using a large, weight transference movement to move clients further up the bed. This technique was used when clients had slid down the bed. Handlers would complete either of the following techniques:

1. Two or four handlers would stand on either side of the bed and stand facing the other two or four handlers. The handlers would grip the drawsheet, level with the clients' hip and shoulders. The movement would start with weight on the leg, nearest the foot end of the bed and then during the transfer weight would be transferred onto the other leg. At the same time the client would move up the bed.
2. Two handlers would stand on opposite side of the beds, with their hips facing the opposite corner at the bottom of the bed. The handlers would bring their furthest arm across their body and grasp the drawsheet at nearest the clients shoulder. Their inner arm would cross over the outer arm to hold the drawsheet nearest the clients' elbow or upper arm. Weight would be transferred from the front leg to the back leg to facilitate a slide up the bed.

Handlers were retrained and reminded wherever possible to elevate the foot end of the bed slightly to minimise sliding down the bed. Handlers were also advised to tuck in the drawsheet system because it acts as a brake and further reduces sliding.

At the start of the trial, handlers were using one large weight transference movement for repositioning the client up the bed. Handlers felt the task required great physical effort, and rated exertion around Borg 15-17. This, potentially, could make them susceptible to injury and some handlers found the task physically loading. The handlers were reminded to follow the same techniques but to use smaller movements. Analysing the results, the change in practice still facilitated client movement but reduced the perceived rate of exertion.

Similar problems occurred during assisting the client to turn within the bed. Handlers would try and turn the client in one large movement. Rating the task, the majority of handlers rated their perceived exertion turning with Wendy Lett system as 14 and 15. This potentially could make them susceptible to injury and some handlers found the task physically loading. Traditionally two handlers would stand on opposite sides of the bed. One handler would hold the drawsheet level with the clients' hip and shoulders. This handler would pull on the drawsheet and use weight transference, from front leg to back leg to turn the client. At the same time the second handler would support the clients' hip and shoulder to assist with moving the person onto their side. At the beginning of the trial one handler was found to be undertaking the majority of the physical work resulting in a higher perceived rate of exertion.

The technique was changed and handlers were taught to use the following technique.

Two handlers stand on the opposite sides of the bed. One handler would grasp the drawsheet level with the clients' hip and shoulders. Using micro movements the handler would gently slide the clients' shoulder, then hip and repeat several times. At the same time the second handler would push on the drawsheet to assist with the slide. Handlers using the new technique rated the task as Borg 7-11.

The introduction of the Wendy Lett systems and change of techniques did improve handler comfort and reduced the perceived rate of exertion during repositioning of clients within the bed.

Many of the clients requiring a "leave in" bed system expressed challenging behaviour. Often when clients express challenging behaviour, they attempt to hit, scratch or bite staff when staff are trying to position slide sheets. Sometimes positioning slide sheets can lead to client anxiety, particularly those with dementia, and the anxiety can increase the challenging behaviour. Introducing a "leave in" bed system can reduce client anxiety and subsequently their challenging behaviour improves.

Some palliative care clients may have increased pressure ulcer risks, problems with pain management and fragility found the positioning of traditional slide sheets,

increased their discomfort and friction. Implementing an in bed positioning system was found to alleviate pain and reduced friction and shearing. The systems also enabled the client to move much more freely within the bed.

Some of the handlers found positioning and removal of slide sheets with bariatric clients physically demanding. Sometimes due to the anthropometric shape of the client handlers find it difficult to position the slide sheets in the correct position. Using “leave in” systems reduced the amount of time required for the task as well as reducing physical effort required by the handlers. Clients also expressed they felt more comfortable using “leave in” systems.

Reducing handler costs

The results found after implementing the “leave in” bed systems that in many cases the number of handlers could be reduced without exposing either the client or handler to unnecessary health and safety risk.

At the beginning of the trial estimated annual handling costs for 28 clients who required 2-4 handlers were £711,349. After implementation of the “leave in” bed system the number of required handlers was reduced and the estimated annual costs were recalculated at £422,276. This provided a potential saving for the organisation of £289,074 (40%) in labour costs. Given a typical retail capital cost for a ‘standard’ WendyLett ‘in-bed’ system of some £450 per bed and assuming a typical usage life of two years for this equipment, excluding laundry charges a purchase cost equating to some 2% of the labour cost saving would be involved in the introduction of the ‘in-bed’ system.

One of the main complaints clients in social care expressed was the length of time they have to wait between visits. Some bedbound clients only had 2-4 visits a day which often resulted in long periods in bed, in the same position. Being in one position for long periods increases discomfort and pressure ulcer incidence. Some of the relatives were taught how to use the WendyLett sheets for positioning their partners in-between visits. The client’s pain levels improved and the relatives were satisfied that they were able to support their loved one.

Conclusions

Implementing the use of approved and flexible in bed positioning systems can provide three benefits for organisations. There is strong evidence the systems can reduce and improve pressure ulcer incidence. Organisations are under pressure to reduce staffing costs and the use of in bed systems for some clients can reduce the number of carers required for manual handling tasks. Clients also benefited from the systems because shearing and friction was reduced and they could be repositioned by their family in-between carer visits. Carers reported a reduction in physical exertion when using the in-bed systems and found the systems useful for clients who

were bariatric, frail, had tissue viability problems and clients who were expressing physically challenging behaviour.

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