Cost Effectiveness of an Air-inflated Static Overlay for Pressure Ulcer Prevention: A Randomized, Controlled Trial

Sophie Vermette, RN, BSc; Isabelle Reeves, RN, PhD; Jacques Lemaire, PhD

Abstract: Numerous pressure-relieving surfaces of varying costs are available for the prevention of pressure ulcers. There is insufficient evidence to draw conclusions regarding the efficacy or merits of using more expensive technologies. The purpose of this unblinded, randomized, prospective study was to compare the clinical and the cost effectiveness of an inflated overlay with rented, pressure-relieving surfaces for the prevention of pressure ulcers. Methods. Patients in a 257-bed acute care facility were included if they had a Braden score of ≤ 14, had no skin lesion(s), were ≥ 18 years, weighed <300 lb, and submitted signed consent. One hundred, ten patients (110) were randomized into a control group using either a microfluid static overlay (MSO) or a low-air-loss dynamic mattress (LALDM) with pulsation (n = 55) or into an experimental group using an inflated static overlay (ISO) (n = 55). Both groups had identical positioning protocols. No statistically significant differences were noted between the 2 groups with regard to age, gender, weight, or Braden scale score. Head-to-toe assessments were performed 3 times a week for a maximum of 14 days to determine presence of pressure ulcers and comfort; Fisher’s exact and chi-squared tests were used to assess categorical data, and unpaired t-test and Mann-Whitney statistic tests were used to compare continuous variables. Comparative cost of support surface use was determined at the end of the study. Results. In the control group, 50 patients used an MSO and 5 patients used an LALDM; in the experimental group, 55 patients used an ISO. No significant difference in pressure ulcer incidence was found between the control (n = 6) and experimental groups (n = 2) (11% versus 4%, respectively; \( P = 0.2706 \)), and there was no significant difference in comfort (90% versus 85%; \( P = 0.7129 \)). However, a significant difference was noted in total cost ($13,606 CAD versus $3,364 CAD, \( P \leq 0.001 \)); the ISO was less expensive. Conclusion. The use of an ISO offers a cost-effective option for the prevention of pressure ulcers in a moderate to very high-risk population.

Pressure ulcers represent a serious condition that can increase morbidity and mortality, reduce quality of life, and constitute a substantial financial burden for any health care system. A pressure ulcer is defined as localized damage to the skin and/or underlying tissue, usually over a bony promi-
nence, that results from prolonged pressure on the skin or pressure in combination with shear and/or friction.2

According to Woodbury’s study, pressure ulcer prevalence is estimated at 25.1% for acute care facilities, 29.9% in long-term care, 22.1% for mixed institutions, and 15.1% in home and community care. Average pressure ulcer prevalence for all health institutions is 26%.3 Most pressure ulcers occur in the hospital setting, and 58% to 92% develop within 14 days.4 Many factors are associated with increasing pressure ulcer risk, including intensity and duration of the pressure.5 The incidence of pressure ulcers can be reduced by identifying people at risk of developing a pressure ulcer and by using prevention strategies. Providing patients with a pressure-relieving device is a documented prevention measure.6,7

Evidence that high-tech pressure-relieving mattresses and overlays are more effective than low-tech mattresses and overlays is insufficient.6,8 Due to important costs associated with pressure-relieving surfaces, rigorous research comparing different support surfaces is needed. In 2001, Pompeo used the severity of pressure ulcers to determine that the cost of treatment for wound care varied from $20,000 USD to $55,000 USD per pressure ulcer. The cost attributed to caring for a patient with a wound is very much influenced by the wound burden.9

Keypoints

- Evidence that high-tech pressure-relieving mattresses and overlays are more effective than low-tech mattresses and overlays is insufficient.6,8
- In 2001, Pompeo used the severity of pressure ulcers to determine that the cost of treatment for wound care varied from $20,000 USD to $55,000 USD per pressure ulcer.9

Purpose

The aims of this study are: 1) to compare the efficacy of different surfaces in the prevention of pressure ulcers; 2) to compare costs associated with the use of an inflated static overlay (ISO) with the standard treatment, which in the first author’s facility consists of renting a microfluid static overlay (MSO) or a low-air-loss dynamic mattress (LALDM) with pulsation for moderate to very high-risk patients; 3) to evaluate the profile of the at-risk population that requires preventive measures in the chosen setting; and 4) to evaluate patient comfort.

Materials and Methods

Surfaces. The standard of care in the first author’s facility to prevent pressure ulcers includes renting surfaces for moderate to very high-risk patients. The rented surfaces used in the study (RIK® and Therakair®, KCI Medical, San Antonio, TX) represent the mattresses the hospital would typically allocate to certain patients. The RIK® overlay is used for patients weighing < 200 lb who are at moderate to very high risk of developing pressure ulcers (Braden score of ≤ 14). It consists of an MSO that has no memory foam and allows for reduction of pressure over bony prominences. It was rented for $28 CAD per day from September 2009 to March 2010. The Therakair® Visio is an LALDM with pulsation. A Gore-Tex® cover helps control shearing forces and humidity.10 The LALDM is rented for patients at moderate to very high risk of developing pressure ulcers who require edematous management, weigh 200 lb to 300 lb, or are bottoming out the MSO. It is rented for $40 CAD per day. The Waffle® overlay (EHOB, Indianapolis, IN) is a plastic ISO that reduces pressure and requires proper inflation (air between the mattress and skin) to optimize prevention of pressure ulcers.11 To control infection, the institution considered the overlay a single-patient use surface, each costing $58 CAD, and it would be offered to the patient at time of discharge. Surfaces used were 2009–2010 models.

Recruitment. This prospective, randomized controlled trial (RCT) was conducted in a 257-bed acute care facility. Eligible participants were recruited from September 2009 to the end of March 2010. Recruited patients were hospitalized on a medical, surgical, active geriatric, or an intensive care unit (ICU) ward. Follow-up lasted until mid-April 2010. Recruitment had to be put on hold for 2 months during the A-H1N1 pandemic from November 2009 to January 2010. Actual recruitment was conducted over an 18-week period.

Subjects were enrolled Monday to Friday by the research nurse. Any new patient admitted onto a participating ward or ICU was considered for inclusion and, if eligible, met with the assistant head nurse of the unit who explained the study. The research nurse then met with the patient to obtain a written, informed consent.

Inclusion and exclusion criteria. Eligible participants were adults ages 18 or older, without skin lesion(s) per visual inspection, weighing < 300 pounds, and able to give informed consent (if needed, consent could be obtained from the mandator or tutor). In addition, all participants had to be considered at moderate to very high risk of developing a pressure ulcer, scoring 14 or less on the Braden scale. The Braden scale defines whether a patient is at risk of developing a pressure ulcer. The scale
examines 6 risks factors: sensory perception, moisture, activity, mobility, nutrition, and friction shear. Total score ranges from 6 to 23. The validity and specificity of the scale have been documented by many authors. There were no specific exclusion criteria other than the reverse inclusion criteria.

**Sample size.** The sample size was calculated *a priori.* To detect a clinically accepted difference of 10% in the incidence proportion of pressure ulcers, a one-sided equivalence test of a difference was used (alpha of 0.05, minimum power of 80%) between the control and experimental groups. A sample of 110 subjects was needed to obtain significant statistical results, with 55 subjects in the control group and 55 in the experimental group.

**Randomization and blinding.** Participants were randomly assigned a rented surface (MSO or LALDM) or an ISO. Once subject consent was obtained and signed, the allocation sequence for mattress type was done by draw by the research nurse using an opaque envelope and the subject witnessing the draw. In the control group, an MSO was assigned for subjects < 200 lb, and the LALDM was assigned to subjects who required edematous management, weighed > 200 lb to 300 lb, or were bottoming out the MSO. The allocation sequence was concealed from the research nurse enrolling and assessing the participants. Blinding was not obtained for the patient, the clinical staff, or the research evaluator because the surfaces were visible.

**Procedure.** The research nurse performed head-to-toe skin assessments 3 times a week every Monday, Wednesday, and Friday to rate their comfort level on a scale of 1 to 5, 1 indicating very comfortable and 5 indicating not comfortable.

**Outcomes and other variables.** The primary outcome measure was the development of a pressure ulcer within the maximum 2-week period of participation in the study. Secondary outcomes were the costs associated with the surfaces and patient comfort. Trial completion was defined as discharge from hospital, death, improved total Braden score above 14, removal of the surface due to discomfort, a total of 14 days of participation free of pressure ulcer, or development of a pressure ulcer.

**Ethical consideration.** Ethical approval for this study was obtained by 2 ethics committees. Risks for participating in this study were limited. Patient discomfort, warmth, or increased humidity might have been experienced as a result of support surfaces. The risk of appearance of a pressure ulcer is present regardless of the surface in use. Written informed consent had to be obtained. For subjects unable to provide their own consent, the mandator or tutor could provide consent. The study was a project toward a Master's Degree. No public or private funds supported the research. The surfaces utilized were either rented or purchased by the facility involved in the research.

**Key Points**

- The Braden scale defines whether or not a patient is at risk of developing a pressure ulcer. The scale examines 6 risks factors: sensory perception; moisture; activity; mobility; nutrition; and friction and shear.
- In the control group, an MSO was assigned for subjects < 200 lb, and the LALDM was assigned to subjects who required edematous management, weighed > 200 to 300 lb, or were bottoming out the MSO.

**Data Collection**

Medical record review was performed to extract data from the participant’s chart. In addition to demographic data, related pressure ulcer risk factors separate from the Braden scale were considered, such as albumin levels and surgeries during participation of the study, incontinence, pain, and comorbidities (ie, cancer and renal insufficiency).

**Statistical analysis**

Analyses were performed in intention-to-treat involving all 110 randomly assigned patients. The data were re-
corded in Microsoft® Excel files with codes assigned by the research nurse used to identify patients, and analyses were carried out using SAS version 9.1 (SAS Institute Inc, Cary, NC). Fisher’s exact test and the $\chi^2$ test were used for categorical variables, and unpaired t-test and Mann-Whitney statistic tests were used to compare continuous variables.

The effect on the incidence of pressure ulcers was evaluated using a logistic regression analysis; to account for confounding variables on the incidence of pressure ulcers during the study period, 6 variables were adjusted separately: body mass index (BMI), weight, hemoglobin, hematocrit, diabetes, and surgery during the study period (Table 4).

### Results

Demographic characteristics and factors affecting pressure ulcer risk were analyzed and are reported in Table 1. Each group (control and experiment) included 55 people, with 21 men in the control group and 23 men in the experimental group. The participants’ ages averaged 77.8 years (range 20 years to 99 years, median 80.5; Q1 72.0; Q3 86.0 years). The most common admitting diagnoses were cerebral vascular accident (CVA) (n = 18, 16%), decrease in general status (n = 15, 14%), hip fracture (n = 14, 15%), and pneumonia (n = 8, 7%).

The research nurse followed participants for a maximum of 14 days. There was no significant difference in length of participation between the control group (9.9 days ± 4.3) and the experimental group (9.2 days ± 4.8).

#### Table 1. Baseline demographic and clinical characteristics (data are means [±SD] or numbers).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control (n=55)</th>
<th>Experimental (n=55)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Braden at enrollment</td>
<td>11.8 ± 1.6</td>
<td>12.3 ± 1.3</td>
<td>0.0914&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Age (years)</td>
<td>77.7 ± 10.6</td>
<td>77.9 ± 14.6</td>
<td>0.5260&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Gender (male)</td>
<td>21</td>
<td>23</td>
<td>0.6971&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 18</td>
<td>6</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>26</td>
<td>35</td>
<td>0.0241&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>&gt; 25</td>
<td>23</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Diabetic</td>
<td>6</td>
<td>16</td>
<td>0.0304&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Unable to consent</td>
<td>31</td>
<td>31</td>
<td>1&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Bed rest</td>
<td>27</td>
<td>22</td>
<td>0.8752&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Days in study (days)</td>
<td>9.9 ± 4.4</td>
<td>9.2 ± 4.8</td>
<td>0.5373&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> = Fisher exact test, <sup>b</sup> = Wilcoxon two sample test, <sup>c</sup> = $\chi^2$ test

#### Table 2. Comparing use a of microfluid static overlay (MSO) or a low-air- loss dynamic mattress (LALDM) (control surfaces) to an inflated static overlay (ISO) (experimental surface).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control MSO and LALM (n = 55)</th>
<th>Experimental ISO (n = 55)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary outcome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure ulcer incidence</td>
<td>11% (6/55)</td>
<td>4% (2/55)</td>
<td>0.2706&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Secondary outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comfort</td>
<td>90% (27/30)</td>
<td>85% (29/34)</td>
<td>0.7129&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Total costs</td>
<td>$16,086 (n = 55)</td>
<td>$3,364 (n = 55)</td>
<td>&lt;0.0001&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> = Fisher exact test, <sup>b</sup> = Wilcoxon two sample test

#### Table 3. Comparison of microfluid static overlay (MSO) to an inflated static overlay (ISO).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control MSO and LALM (n = 50)</th>
<th>Experimental ISO (n = 55)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary outcome</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure ulcer incidence</td>
<td>12% (6/50)</td>
<td>4% (2/55)</td>
<td>0.1269&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Secondary outcomes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comfort</td>
<td>89% (24/27)</td>
<td>85% (29/34)</td>
<td>1.000&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Total costs</td>
<td>$13,086 (n = 50)</td>
<td>$3,364 (n = 55)</td>
<td>&lt;0.0001&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> = Fisher exact test, <sup>b</sup> = Wilcoxon two sample test
The reasons for ending the study were similar in both groups and included discharge (10 control, 14 experimental, 22%), death (7 control, 4 experimental, 10%), improvement in their general status resulting in a Braden score of 15 or more (11 control, 9 experimental, 18%), request for support surface change due to discomfort (0 control, 4 experimental, 4%), reached the maximum study period set at 14 days (21 control, 22 experimental, 39%), and developed a pressure ulcer (6 control, 2 experimental, 7%).

The number of subjects considered bedridden was similar between the control (n = 27) and experimental (n = 22) groups (49% versus 40%, P = 0.8752). The participants allocated to the experimental equipment (ISO) tended to have a lower BMI, while the participants allocated to the control equipment (MSO or LALDM) tended to have a higher BMI (P = 0.0241). Low and high BMI are contributing factors in pressure ulcer development.19 Although more participants with diabetes were found in the experimental group, the difference was not significant (P = 0.1276).

One of the objectives of this study was to document the at-risk patient profile. Obesity was not a characteristic of the participants. The rented surfaces for the subjects in the control group were allocated according to the subject's weight (MSO if ≤ 200 lb) or need for edema management (LALDM with a Gore-Tex® cover to control humidity). That allocation consisted of the normal distribution method in the institution; ultimately, 50 subjects were assigned the MSO and 5 subjects were assigned the LALDM. It reflected the reality that obesity and edema cannot be considered issues in the study population. The results presented in Table 2 compare the control (MSO and LALDM, n = 55) and the experimental group (n = 55) outcomes. In light of the fact that the authors used 50 MSO and only 5 LALDM in the control group, results comparing the ISO group (n = 55) only to the MSO group (n = 50) highlight the efficacy in pressure ulcer prevention as it relates to comfort and costs and also reflects the author's practice (Table 3).

Incidences of pressure ulcers. No significant difference in pressure ulcer incidence was noted between the control (n = 6) and experimental groups (n = 2) (11% versus 4%, P = 0.2706) (Table 2). Those results are similar when comparing the MSO (n = 6) with the ISO (n = 2) (12% versus 4%, P = 0.1269) (Table 3). No confounding variables could be accounted for (Table 4). Odds ratios and confidence intervals were not affected by confounders.

Cost comparison. The ISO in the present study was significantly less expensive (P ≤ 0.001) to use than the other surfaces. To calculate cost of the rented surfaces in the control group (n = 55), the total number of days of participation in the study were summed and multiplied by the daily rental cost of $28 CAD per day for the MSO (484 rental days × $28 = $13,552) and $40 CAD per day for the LALDM (62 rental days × $40 = $2,480), for a total of $16,032. Regardless of whether the ISO in the experimental group (n = 55) could be disinfected, it was used as a single-patient surface, and costs were calculated according to the single purchase cost of $58 CAD. Three participants used 2 surfaces during their participation if the surface was damaged (58 surfaces purchased × $58 = $3,364). Using the total cost of the ISO for 505 days of use during the study period only, the average cost was calculated to be $6.66 per day in comparison with renting fees of $28.

### Table 4. Logistic regression analysis to account for confounding variables (OR: odds ratio form treatment, CI 95% and significance of the χ² test [P value] for treatment after taking into account the confounding variable).

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR of ulcer when on experimental surface versus control</th>
<th>CI 95%</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure ulcer development (with no confounder)</td>
<td>0.308</td>
<td>[0.059 – 1.600]</td>
<td>0.1613</td>
</tr>
<tr>
<td>BMI</td>
<td>0.263</td>
<td>[0.050 – 1.400]</td>
<td>0.1176</td>
</tr>
<tr>
<td>Weight</td>
<td>0.268</td>
<td>[0.051 – 1.422]</td>
<td>0.1221</td>
</tr>
<tr>
<td>Hemoglobin (Hb)</td>
<td>0.373</td>
<td>[0.070 – 1.981]</td>
<td>0.2468</td>
</tr>
<tr>
<td>Hematocrit (Ht)</td>
<td>0.375</td>
<td>[0.070 – 2.005]</td>
<td>0.2514</td>
</tr>
<tr>
<td>Diabetic</td>
<td>0.263</td>
<td>[0.047 – 1.466]</td>
<td>0.1276</td>
</tr>
<tr>
<td>Surgery during study</td>
<td>0.399</td>
<td>[0.072 – 2.230]</td>
<td>0.2956</td>
</tr>
</tbody>
</table>
or $40 per day for the MSO and LALDM, respectively. The ISO is guaranteed for a 30-day period, costing $1.93 per day and even less if it is used for more than the 1-month guarantee period.

A $12,668 difference was noted between the costs of the rented surfaces (MSO and LALDM) and the cost of buying the ISO used as a single-patient surface. If ISO use (n = 55) is compared to use of MSO alone (n = 50), total savings are still considerable ($10,188). These savings represent an average stay of 10 days for 55 patients, which could represent savings of more than $100,000 for 500 patients at risk of developing a pressure ulcer over a 1-year period. The use of the ISO for a total of 500 patients per year would cost less than $60,000 annually. The findings of this study suggest that the ISO is cost-effective for the prevention of pressure ulcers (Table 2 and 3).

**Comfort.** Although patients may have expressed a preference for a soft or firm surface, no significant difference in comfort were noted between the MSO/LALDM and ISO. Of the 110 participants, 68 expressed opinions regarding comfort. Participants expressing no opinion were either confused or too ill. Participants were asked to rate their comfort level on a scale of 1 to 5, with 1 indicating very comfortable, 2 indicating comfortable, 3 indicating reasonably comfortable, 4 indicating slightly comfortable, and 5 indicating not comfortable. Ratings of 1, 2, or 3 were combined (patients were comfortable). No significant differences in comfort assessment were found comparing MSO and LALDM versus ISO (90% versus 85%, statistically significant when comparing the surfaces (P = 0.0170). In this study, the overlay was compared in majority to a static MSO (n = 50), whereas Cobb compared the ISO to an LALDM (n = 61 for the ISO and n = 62 for the LALDM).

In this study, the overall pressure ulcer incidence was low (7%) due to the effective pressure-relieving devices. Another possible explanation might be that the use of a visual reminder at each subject’s bedside and in each care plan to ensure turning and positioning reinforced the use of preventative measures. It is also a fact that subjects are better positioned during studies than in ordinary circumstances.8 However, given the small number of subjects that developed pressure ulcers (n = 8), no significant conclusions were drawn.

The sample size in this study was calculated, accepting a satisfying clinical difference of 10% in the incidence of pressure ulcers for a total of 110 participants. Decreasing that percent of difference would have considerably increased the author’s sample, as was noted with Vanderwee,22 who accepted a difference of 7% for a total of 447 participants. An estimated number of 260 participants would have been necessary to accept a difference of 7%. That number would have risen to 778, accepting a difference of only 5%.

McInnes et al8 indicated that foam alternatives were shown to reduce the incidence of pressure ulcers in people at risk in comparison with the standard hospital foam mattress. They also cited lack of evidence regarding the merits of higher technologies — i.e., constant low pressure and alternating pressure. They concluded that well-designed RCTs are needed to compare the clinical cost-effectiveness of different types of pressure-relieving devices for patients at different levels of risk.8 Their suggestions were taken into account in this study.

**Keypoints**

- A $12,668 difference was noted between the costs of the rented surfaces (MSO and LALDM) and the cost of buying the ISO used as a single-patient surface.
- No significant difference in pressure ulcer incidence was noted between the control (n = 6) and experimental groups (n = 2) (11% versus 4%, P = 0.2706) (Table 2).

**Discussion**

In an exploratory context, this study population at risk for pressure ulcers led the authors to recognize that the choice of surfaces resulted in the rental of more MSO (n = 50) for prevention than LALDM (n = 5).

In 2008, 24% of the Canadian adult population was considered overweight.20 In the present study, 11% of the 110 participants had BMI ≥ 30, which classified them as obese, and 30% were considered overweight with a BMI ≥ 25 and < 30. Although the statistics are alarming, the authors realized the obese population was not the main clientele, as reflected in the use of MSO (n = 50) as opposed to LALDM (n = 5). LALDM was assigned to subjects who required edematous management (n = 1), weighed > 200 lb (n = 4), or were bottoming out the MSO (n = 0).

The present study revealed no significant difference between the MSO or LALDM and the ISO in terms of pressure ulcer incidence. These findings are similar to Cobb et al,20 who found no significant difference between the 2 surfaces in the reduction of pressure ulcers, although the differences in costs for pressure ulcer prevention were statistically significant when comparing the surfaces (P = 0.7129) (Table 2) or comparing MSO alone versus ISO (89% versus 85%, P = 1.0000) (Table 3).
evaluating patients’ risk, clearly describing interventions under evaluation, follow-up, sample size, and emphasis on economics.

One concern in this study is that skin integrity was assessed 3 times a week and the proper use of the mattress was verified at the same time by the research nurse. Knowing that proper inflation of the ISO is essential for optimal performance, the researcher could not rule out the fact that inflation might not have been carried out properly by the clinical staff every other day. There is also the possibility that skin changes that occurred on days the research nurse was not performing a skin assessment were not detected as promptly. The possibility of an increase in the Braden score on those days also cannot be eliminated. These changes might have influenced the number of days of participation in the study for some subjects.

By using the inflated overlay for 55 patients in this study, at least $10,950 CAD in bed rental fees was saved (difference between using an MSO and the ISO for 505 days) — i.e., 50 patients for a total of 484 days — cost $13,552 as opposed to 55 patients for a total of 505 days costing $3,364. The total savings are estimated at $10,188. Essentially, if the authors were to use the MSO for 1 patient for a 10-day stay, it would cost $2,800 compared to $58 for the use of an ISO. These savings represent an important reduction in expenditures over a 1-year period that could be viewed favorably by administrators, considering there was no significant difference in pressure ulcer incidence.

Renting or purchasing surfaces is an option for most organizations. A strategy has to be in place to ensure replacement of the surface as soon as needed. Support surfaces usually last for an average of 8 years. Storing and managing the surfaces might cause issues. Renting allows for continuous updates of the surfaces and usage of new technologies. Additionally, the rental company often will offer in-services on proper and secure device use, as well as decontamination and maintenance services. Logistics have to be taken into account and are unique to each organization. Since the study, the ISO has been in use at the participating hospital and is easily placed on the stretcher so that as an at-risk patient enters the emergency department, providing a quick and efficient prevention strategy. Patients then are transferred to the unit on the ISO and they keep it when discharged for use at home, in convalescence, in rehabilitation, in a long-term care facility, or elsewhere.

No significant difference in pressure ulcer incidence or in comfort between the control and experimental groups was noted, but costs were significantly lower with the ISO. These results support that an inexpensive surface has no negative effect on patient comfort. Exploring the curative merits of the surface could bring valuable savings, knowing that the prevalence of pressure ulcers is 26% in Canada.8

Keypoints

- Support surfaces usually last for an average of 8 years. Storing and managing the surfaces might cause issues. Renting allows for continuous updates of the surfaces and usage of new technologies.

Study strengths and weaknesses

One of the major strengths of this study is the use of randomization of the subjects to control selection and confusion bias. In addition, the study’s simplicity, low cost, and the fact that different levels of patient risks were examined are noteworthy. Lastly, the ease of recruitment and time frame of this study are also positives. This study provides answers in the need for further well-designed RCTs looking at cost-effectiveness of different surfaces.

However, because the surfaces were visible, researchers were not blinded to the different options. The possibility of differences in the care received from the nursing staff regarding positioning and hygiene cannot be discarded. Although a reminder placed at the bedside of each subject required a signature by staff members following a position change every 2 hours, it is impossible to control the length of time spent sitting up in a chair versus lying in bed. Compliance with regard to positioning was also an issue. Some confused subjects were not following commands and even refused positioning from time to time. This in itself underscores the importance of having surfaces to prevent pressure ulcers.

The cost analysis is limited to the rental or the purchasing of surfaces, restricting comparisons because they were only performed on mattresses currently rented at the hospital where the study was conducted.

Further work is needed to determine whether the effect demonstrated in this study regarding pressure ulcer incidence results in a significant difference between prevention and wound healing. Due to the limited number of patients, the authors must be cautious when generalizing these findings. A larger sample might have given a broader sense of statistical differences.
Conclusion

This study helped improve knowledge regarding pressure ulcer prevention as it pertains to cost effectiveness. With budget cuts and restrictions, managers must be informed of more economic prevention choices.

Results of this study may give others the incentive to examine the curative properties of this cost-efficient surface with patients living with existing pressure ulcers. The challenge of finding a cost-effective curative approach for treating pressure ulcers is a valuable asset for the health care system. The fact that the inflated surface can be used as a single-patient use surface might help in providing valuable information with regard to infection prevention. Ease of use of the equipment and patient transfer also are important factors to consider and would be worthy aspects to explore in a future study.

Acknowledgments

The authors thank the directors, nursing staff, occupational therapists, and physiotherapists at the hospital for their collaboration in this project. The authors also thank Christine Dzurowka, Katherine Wadas, and Tarik Alam for their comments and revision of this article.

References