Pressure Ulcer Management in Home Health Care: Efficacy and Cost Effectiveness of Moisture Vapor Permeable Dressing

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This prospective randomized study was conducted in the home care setting to compare healing rates and costs of two different dressings for pressure ulcers: the gauze and tape dressing and the transparent moisture vapor permeable dressing (MVP). Demographic variables, healing rates, and cost of treatment were statistically analyzed for 77 pressure ulcers (48 patients). Each wound was randomly assigned to either a gauze dressing or a MVP dressing. Initial ulcer grade (Shea criteria) and measurements were determined at the start of treatment and weekly for an eight-week period. Photographs of the wound were taken at the beginning and end of treatment. The same protocol for irrigating the wound and relieving pressure was followed for both dressing groups. The median improvement for the grade II group was 100% for the MVP (n = 22) and 52% for gauze (n = 12), p < 0.05 (Wilcoxon rank sum test). The healing rates for grade III ulcers were not significantly different in the two dressing groups. The mean (eight-week) labor and supply cost per ulcer using the MVP was $845, while that for gauze treatments was $1359, p < 0.05 (Wilcoxon rank sum test). The cost difference for grade III ulcers was not significant in the two dressing groups. The MVP improved the healing rate and was more cost effective for grade II ulcers. Both gauze and MVP dressings proved effective for the treatment of grade III ulcers.

KEY WORDS: Bandages; Community health nursing; Decubitus ulcers; Nursing care

Today, because of the economics of health care and the necessity of early discharge, home management of complications in persons with physical disabilities has become an attractive alternative to hospital care. However, the cost and efficacy of providing treatments in the home is not well understood. For example, there are hundreds of different treatments for pressure ulcers, but there is little research on the safety, efficacy, and cost effectiveness of these treatments in the home setting.

Contrary to popular opinion, not all pressure ulcers are preventable. They are caused by a variety of intrinsic and extrinsic factors. The primary intrinsic factor causing skin breakdown is tissue necrosis from ischemia. Relieving pressure and promoting nutrition are two cornerstones of care, but there are changing trends in local wound management. This study was designed to test the efficacy and cost of treating pressure ulcers with one brand of transparent moisture vapor permeable (MVP) dressings in a home care population served by a metropolitan Visiting Nurse Association (VNA).

This prospective randomized study was designed to investigate differences between wet to dry gauze dressings and MVP dressings. Areas of interest were healing rates, cost of nursing visits and supplies, incidence of wound infection and comfort.

METHODS AND MATERIALS

Any patient having a grade II or grade III pressure ulcer who was receiving VNA service was invited to participate in the study, but subjects were excluded if their wound contained eschar, the pressure ulcer was a grade I or grade IV, the patient was terminal, the patient’s white count was below 4,000, or the patient had more than three existing ulcers.

The Shea criteria were used to grade the wounds. Shea defines four categories for grading the severity of the pressure ulcer in increasing severity from grade I through grade IV as described in figure 1.

After informed consent was obtained from the patient, the pressure ulcer was randomly assigned to either a MVP dressing or a wet to dry gauze dressing. A sequential list of 100 random numbers, 50 in the control (gauze) group and 50 in the experiment (MVP) group, was used to assign the treatment. The random assignment was followed even if a subject with two ulcers had the same treatment for both. By chance, six subjects with two ulcers were treated with both dressings.

Twenty-three of the 100 assigned treatments were disqualified because the subject dropped out of the study in less than three weeks. The most frequent causes of dropout were death, hospitalization and inability to comply with the study protocol for pressure relief. That protocol included a turning schedule and wheelchair pushups. Wheelchair-dependent subjects were given a silicone gel pad or dense foam cushion. If the subject was dependent in bed mobility, an alternating pressure pad...
was adhering to epithelial tissue. All the wounds were irrigated at each dressing change with half strength hydrogen peroxide and were rinsed with physiologic saline. If the wound was contaminated with urine or stool, povidone iodine was applied for two minutes and then rinsed away with physiologic saline.

The MVP dressing was changed daily to three times a week, depending on adherence of the dressing. The MVP dressing is a polyurethane adhesive dressing, coated with an acrylate adhesive. It is sterile, transparent, impervious to water and bacteria, but permeable to moisture vapor and oxygen. Some of the MVP dressings were pug dressings. The MVP pouche dressing is made of the same material, but is perforated to allow fluid to pass through it into a film pouch. Once in the pouch, fluid may readily evaporate through the film.

All patients were assessed using the PULSES functional assessment profile modified by Granger and associates. PULSES stands for physical condition, upper limb function, lower limb function, sensory, excretory, and support factors. Each category is given a score between 1 and 4, 1 indicating intact function and 4 indicating total dependence. The best possible score is 6 and the worst possible score is 24. A score of 16 or more was chosen by Granger to delineate the very severely disabled. Although nutrition and disease were not controlled, through randomization of subjects the groups were similar in age, height, weight and PULSES score. The means of the PULSES score fell in the range of the very severely disabled (table 2).

RESULTS

Healing status. The healing status and the final grade of the wound were analyzed with the chi square test. Healing status was divided into four categories: healed, progress toward healing, no change, and discontinued or deteriorated. None of the grade II ulcers using gauze healed in eight weeks. Sixty-four percent of the grade II ulcers using the MVP healed in eight weeks (table 3). The healing status for the grade III ulcers was not significantly different in the two dressing groups.
Table 4: Final Grade of Grade II Ulcers*

<table>
<thead>
<tr>
<th>Final grade</th>
<th>Gauze (n = 12)</th>
<th>MVP (n = 22)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 (0%)</td>
<td>14 (64%)</td>
</tr>
<tr>
<td>1</td>
<td>0 (0%)</td>
<td>2 (9%)</td>
</tr>
<tr>
<td>II</td>
<td>7 (58%)</td>
<td>5 (23%)</td>
</tr>
<tr>
<td>III</td>
<td>5 (42%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>IV</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

*Chi-square test \( p < 0.01 \).

**Final grade.** The grade II ulcers using the MVP dressings had a significantly lower final grade, which indicates healing, than those using the gauze dressings (\( p < 0.01 \), chi-square). These results are shown in table 4. The final grade for the grade III pressure ulcers was not significantly different in the two dressing groups.

**Median decrease.** In addition to improved healing status, a greater median percent decrease in wound area was found for grade II ulcers using the MVP dressing (fig 2). Grade II ulcers in the control group had a 52% median decrease in area, whereas those in the experimental group had a 100% median decrease. The overall significance using Wilcoxon rank sum was \( p < 0.01 \).

The median percent decrease in area for grade III ulcers was not significant, but there was a trend for a greater decrease in area when the MVP dressing was used. The median percent decrease was 44% for the control group (\( n = 28 \)) and 67% for the experimental group (\( n = 15 \)) (fig 2).

**Cost of treatment.** Cost of treatment was separated into cost of nursing visits for an eight-week period, and cost of treatment supplies (asepto syringe, physiologic saline, hydrogen peroxide, povidone iodine, sterile gloves and dressings). The mean supply cost for the grade II ulcers was $99 in the control group and $97 in the experimental group. The mean supply cost for the grade III ulcers was $140 for the gauze group and $179 for the MVP treatment. There was no significant difference using the Wilcoxon rank sum test between the cost of supplies for the groups.

A significant difference was found between the total cost of nursing visits and supplies for the grade II ulcers. The mean (eight-week) cost of treatment per ulcer using gauze dressings was $1359, but for the MVP dressing it was $845, \( p < 0.05 \) (Wilcoxon rank sum), as shown in figure 3. The cost of treatment was not significantly different for grade III ulcers in the two dressing groups. The eight-week cost of labor and supplies for grade III ulcers was $1412 for gauze and $1470 for MVP.

**Comfort.** The majority of patients in this study had central or peripheral nerve damage. The subjects who had intact sensory input from their ulcer reported less pain when the MVP or MVP pouch dressings were used.

**DISCUSSION**

The MVP dressing improved the rate of healing and was more cost effective in the treatment of grade II ulcers, but there was no significant difference in the healing rates or cost for the grade III ulcers.

**Advantages of MVP.** The MVP was easier to apply and to teach the family to use. Most of the grade III wounds were small, the median size for the gauze was 4.5 cm² and for the MVP 6.1 cm². The moist 2-by-2-inch gauze dressing was too large for the ulcer’s surface, and would either fall off the ulcer or overlap the intact periumlcer area. Because the MVP only adheres to dry areas and not to moist areas, it easily conforms to the moist wound surface. If the grade III pressure ulcer produced a significant amount of exudate the MVP pouch dressing was used (figs 4 and 5). Cost savings resulted when nursing visits could be reduced because MVP pouch dressing changes were required every two days instead of daily.

Other advantages in using the MVP dressing rather than gauze on grade II and grade III ulcers were: the dressing acts as a barrier to urine and stool, it is more comfortable than gauze, it is transparent so the wound can be assessed without removing the dressing, and it has a low surface profile making it less likely to be sheared off in transfers.

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*Fig 2—Median % decrease in area for grade II and grade III pressure ulcers.*

*Fig 3—Total 8-week cost for grade II pressure ulcers.*

*Fig 4—Grade III pressure ulcer less than 4.5 square centimeters.*
Fig 5—Grade III pressure ulcer (same as figure 4) covered with MVP pouch dressing.

**Disadvantages.** It was clinically observed that the MVP was nonadherent in less than 24 hours on grade III pressure ulcers larger than 30 cm². Also in wounds that tunneled 4 cm and more, the MVP did not contain the wound exudate and would fall off. When there were problems with management of exudate, gauze dressings were used.

**Common problems.** Skin maceration was clinically observed in both treatment groups, but was more common when the MVP dressing was used (table 5). As long as healing of the wound was evident the MVP treatment was continued in the presence of maceration. Skin barrier wipes were used on the macerated periwound area. If the maceration caused erosion of the epidermis, the MVP was discontinued.

Sepsis from a pressure ulcer did not occur in either of the treatment groups. Eleven ulcers developed eschar and necrosis after being randomly assigned to a treatment. In a few subjects the necrosis was a result of inability to follow the study protocol for relieving pressure, but more commonly the sloughing and necrotic tissue developed after the study protocol was implemented. Some of the subjects had two ulcers, one clean and another covered with eschar. The ulcers covered by eschar were not included in the study but liquefaction of eschar was clinically observed when a debriding ointment and the MVP dressing were used.

In cases in which there was a large area of sloughing tissue, surgical debridement was performed either in the home or outpatient department. Wet to dry dressings were used after surgical debridement until the drainage decreased and the wound was free of necrotic tissue. Most of the subjects were not good surgical candidates because they were in the end stages of chronic illness with severe functional limitations. Many were in poor nutritional states. Three of the subjects with grade III ulcers who were surgical candidates had their ulcers debrided and grafted in the hospital.

It is frequently necessary to teach a family member to do the wound care because insurance limits the number of skilled nursing visits that will be reimbursed. Teaching the family how to prevent and manage pressure ulcers needs to begin early in the rehabilitation process.

Since home health care agencies will be caring for an increasing number of disabled persons it is important that they have protocols for the prevention and early treatment of pressure ulcers. PULSES scores correlated with the level of functional impairment assessed in this home-care population. Using the PULSES profile may be one way to identify the severely disabled population at risk. Research that demonstrates the cost effectiveness of preventive programs will be essential for reimbursement of this service.

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**References**

**Supplier**
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