Reducing Pressure Ulcer Incidence through Braden Scale Risk Assessment and Support Surface Use

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ABSTRACT

OBJECTIVE: To collect available evidence showing that some hospitals have been able to markedly reduce pressure ulcer incidence despite broad surveys in previous recent years that demonstrated little or no progress and to provide guidance to hospitals through analysis of the evidence showing incidence reduction to be expected by taking the measures indicated.

APPROACH: At the time of the article’s writing, a review of the literature was conducted using PubMed. References were sought that cited hospitals using the Braden Scale to identify at-risk patients and providing pressure-reducing surfaces to those found to be at risk. Nine hospitals were so identified. Each hospital had reduced pressure ulcer incidence through risk assessment followed by intervention that included support surface provision. Statistical measures were used to establish confidence limits for the noted improvements.

INTERVENTIONS: Each of the hospitals reviewed had implemented a policy of risk assessment of all admitted patients using the Braden Scale followed by implementation of best practices, generally including assignment of patients judged to be at risk to a pressure-reducing support surface.

MAIN OUTCOME MEASURES: Each hospital reported in the literature a rate of nosocomial prevalence, both before and after program implementation. All hospitals demonstrated improvement, although the amount of improvement varied widely.

MAIN RESULTS: Realizing that each of the hospitals reviewed started from different baselines, used different at-risk criteria, did not utilize the same support surface, and may have implemented a variety of additional interventions, it is perhaps not surprising that the 95% confidence interval for incidence odds ratio is broad, from 0.220 to 0.508 (meta-analysis), yet clearly significant. Cost savings due to reduced need for rental of expensive low-air-loss- or fluidized-bed therapy were reported.

CONCLUSIONS: Risk assessment of all admitted patients followed by provision of specialized support surfaces to all deemed to be at risk offers real hope of reducing the present very high rate of hospital-caused pressure ulcers. With the growing understanding that some pressure ulcers have their origin in deep tissue, it no longer makes sense to wait for the appearance of Stage I or II ulcers before taking action.

INTRODUCTION

Pressure ulcers are a significant cause of death in hospitals, although the recorded cause of death often disguises this fact. Redelings et al1 conclude, “pressure ulcers are associated with fatal septic infections and are reported as a cause of thousands of deaths each year in the United States.” However, these figures are likely to be very low because, even in those cases where pressure ulcers were an important contributing factor, they are often unlikely to be listed as a cause of death.1

Despite the efforts of many people and organizations, the prevalence of pressure ulcers in hospitals remained unchanged at about 16% over a 6-year period from 1999 through 2004.2 The incidence of pressure ulcers in acute care facilities has varied between 7% and 9% over the same period.2 During that 6-year period, about 70% of individuals older than 65 years with pressure ulcers also developed new pressure ulcers.2

The Braden Scale3 was developed in 1988 as a means of assessing the degree of risk of pressure ulcer development any individual patient faces. Six factors are considered: sensory...
perception, moisture, activity, mobility, nutrition, and friction/shear. A score is assigned for each factor; factor scores can be added to arrive at a total score.

The US Department of Health and Human Services published the first edition of the Agency for Healthcare Research and Quality (AHRQ [formerly the Agency for Health Care Policy and Research, AHCPR]) Clinical Practice Guideline Number 3 in 1992. This guideline, developed by the Panel for the Prediction and Prevention of Pressure Ulcers in Adults, states that “individuals should be assessed on admission to acute care…using a validated risk assessment tool such as the Braden Scale.” The guideline further states, “Anyone assessed to be at risk should be placed on a pressure-reducing device when lying in bed.” Although relatively few hospitals have fully implemented these guidelines, this article describes the results obtained by those hospitals that have done so and have reported their results in the literature.

In addition to reducing pressure ulcer incidence, many facilities in the study were able to reduce costs because the support surfaces capable of preventing ulcers are far less expensive than those required to facilitate healing once a Stage IV pressure ulcer has been allowed to develop. Prevention is always the best approach.

**METHODS**

An online literature search was conducted on PubMed, using keywords such as “Braden” and “support surface.” Those studies describing trials at acute care facilities that included factors of risk assessment and support surface assignment were selected. The outcomes achieved by the facilities identified during the literature search were reviewed. The summaries of results that follow do not, of course, include detailed data, analysis, or costs for each reported trial; cited references should be consulted for further information. Although some facilities presented results both including and excluding Stage I pressure ulcers, the data inclusive of all pressure ulcers have been used here. Each of the studies included here reported on the effect of actions taken on the occurrence of hospital-caused pressure ulcers. Terminology differed among institutions, but the most common nomenclature used was nosocomial prevalence, referring to the number of ulcers found upon survey at a point in time that had not been present at admission. Nosocomial prevalence rate (incidence) refers to nosocomial ulcers divided by beds surveyed.

A 500-bed acute care facility in California placed all admitted patients in its 44-bed AIDS/oncology unit on the ZoneAire support surface (Hill-Rom Inc, Batesville, IN) during a 6-month trial in 1995. This was an initial trial to confirm the efficacy of the support surface. Monthly surveys on 9 occasions before the trial showed a total of 12 nosocomial ulcers. The incidence of ulcers during the trial period, which consisted of 7 monthly surveys from April 1995 through November 1995, and another unannounced survey in May 1996, was zero. Risk assessment tools were not used during the period of the study, but since mid-1996, the Braden Scale evaluation has been used in the 500-bed hospital to determine which admitted patients are placed on the new beds. Purchase of the ZoneAire beds allowed an 83% reduction in rental costs for low-air-loss therapy.

A major university medical center replaced its hospital beds at the end of 1995 and in early 1996. A newly available interface pressure-reducing support surface was chosen. In September 1996, after all of the new beds were in place, a survey of 262 patients found the rate of nosocomial ulcers to be 6%. This compares with rates of 19% and 21% in 2 preprotocol surveys (February 1992 and February 1995). Another university hospital conducted 1-day surveys of its 750-bed hospital in 1993, 1995, and 1997. The prevalence rate of nosocomial ulcers was 14% in 1993, 8% in 1995, and 6% (3% excluding Stage I) in 1997. Risk assessment based on the Braden Scale was introduced during the 1997 study for every hospitalized patient. Improved survey results were thought to be, at least in part, because “support surface selection criteria were developed and consistently applied, and the hospital purchased several pressure-relieving beds in order to reduce cost and “waiting times for rental beds.”

An acute care hospital in Hawaii implemented a program of risk assessment followed by support surface assignment in 1996. The nosocomial pressure ulcer prevalence rate in this 159-bed acute care facility was found to be 31.4% (25.7% excluding Stage I) during a 1995 survey. During the first quarter of 1996, the Braden Scale was implemented as the risk assessment tool of choice at the hospital. New ZoneAire pressure-reducing support surfaces were purchased. Those admitted patients who were judged to be at risk were placed on the beds. The nosocomial prevalence rate was reduced to 14.9% (5.9% excluding Stage I) in October 1996 and to 4.7% (1.5% excluding Stage I) in September 1997.

A Texas hospital conducted the first in an annual series of pressure ulcer–prevalence surveys during 1996. This survey found the prevalence rate of hospital-acquired ulcers to be 18%, or 158 patients. Nosocomial prevalence rates dropped to 10%, or 183 patients, in 1997 and to 9%, or 157 patients, in 1998. Although the authors stated that risk assessment using the Braden Scale and a “specialty mattress/bed protocol” were in place before the 1996 survey, they speculated in this article that the designation of unit skin care resource nurses following that survey led to greater care and emphasis in the implementation of these practices.
A 500-bed hospital in Illinois implemented the AHCPR Guidelines in 1998. Risk assessment through use of the Braden Scale was instituted. A measure of incidence was chosen as the preferred indicator of the effectiveness of prevention strategies to reduce nosocomial pressure ulcers. Data collection was initiated through participation in the 1998 KCI/Novation National Prevalence and Incidence Study. Because the average length of stay at this hospital was 4.8 days, a second survey was taken after 5 days to obtain the data needed to calculate incidence. After 1 year, pressure ulcer incidence decreased from 14% to 9%.

A teaching hospital in Georgia reported the success of its wound care program in 1999. Prevention protocols, including the use of the ZoneAire support surfaces throughout the hospital, resulted in the reduction of the nosocomial prevalence rate from 16.5% to 3.5%. The reduction was from 9.5% to 1.2% excluding Stage I ulcers.

Young et al described a successful attempt to reduce nosocomial pressure ulcer incidence at an 877-bed tertiary teaching hospital in Florida. The prevention program was initiated in January 2000. ‘‘The first and primary responsibility was to identify high-risk patients without pressure ulcers. At-risk individuals were identified by the Braden Score.” During the 2000–2001 period, 97% of patients received an initial skin assessment within 24 hours of admission. This project was successful in reducing the incidence of nosocomial ulcers between 1999 and 2001 by 55% including Stage I ulcers and by 50% when Stage I ulcers were excluded.

A 243-bed acute care medical center in Pennsylvania replaced traditional foam mattresses throughout the hospital with a new support surface, Isolof (Gaymar Industries Inc, Orchard Park, NY), designed to reduce pressure and shear. The hospital has a policy of assessing patient risk of developing pressure ulcers using the Braden Scale upon admission. In 1999, an audit of 108 patients found the prevalence rate of nosocomial ulcers to be 5.5%. A similar audit of 128 patients in October 2000, 3 months after implementing the new support surfaces, found the prevalence rate of hospital-acquired pressure ulcers to be 3.1%. The number of ulcers Stage II and above decreased dramatically from 8% to 2%.

RESULTS
Each of the aforementioned hospitals undertook a program of risk assessment followed by action directed at all admitted patients as of a definite time. Although the key action undertaken was not exactly the same in all cases, for the most part, provision of a specialized support surface was involved. Table 1 illustrates the nosocomial prevalence rate reported at each hospital before and after instituting such a program.

Each of the studies identified by the initial literature review reported on a procedure whereby risk assessment of all admitted patients based on the Braden Scale was implemented at a point in time. Analysis of these results involves combining studies with much in common, but involving a wide range of patient populations. Meta-analysis is the statistical procedure that allows conclusions to be drawn by combining several similar studies. A weighted procedure gives more importance to the results of large studies than to small ones.

Table 2 presents the results of meta-analysis of the 9 studies considered in this investigation. Columns designated “control” present survey results at each hospital before implementing risk assessment, whereas “treated” columns show nosocomial prevalence after risk assessment was in place. The key statistic presented is the odds ratio. The odds are the number of patients developing pressure ulcers divided by the number who did not. The odds ratio is then the odds “after” (treated) divided by the odds “before” (control). If the procedure being tested made no difference, the odds ratio would be 1.

The analysis was performed using the random-effects model, rather than the fixed-effects model, thus avoiding the restrictive assumption that if all studies considered were sufficiently large, then they would give the same results. The upper and lower limits on the odds ratio are presented at a confidence level of 95%. These limits do include the null value of 1 for 2 of the included studies, but the combined results give the odds ratio as falling between 0.220 and 0.508. Because these limits do not include the null value of 1, the procedure being tested is statistically significant at the 95% confidence level.

The programs put in place by the hospitals discussed above were not precisely the same. Some placed more emphasis on providing specialized support surfaces to at-risk patients than

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Table 1.

<table>
<thead>
<tr>
<th>Study Name</th>
<th>Year</th>
<th>Action Taken</th>
<th>Before</th>
<th>After</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa Clara</td>
<td>1996</td>
<td>Support Surface</td>
<td>3.6</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
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<td>1996</td>
<td>Support Surface</td>
<td>20</td>
<td>7</td>
<td>65</td>
</tr>
<tr>
<td>Allegheny</td>
<td>1997</td>
<td>Various, incl. Bed</td>
<td>8</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Straub</td>
<td>1996</td>
<td>Support Surface</td>
<td>31.4</td>
<td>4.7</td>
<td>85</td>
</tr>
<tr>
<td>Scott &amp; White</td>
<td>1997</td>
<td>Support Surface</td>
<td>18</td>
<td>9</td>
<td>50</td>
</tr>
<tr>
<td>Trinity</td>
<td>1998</td>
<td>Guideline No. 3</td>
<td>14</td>
<td>9</td>
<td>36</td>
</tr>
<tr>
<td>Robert Packer</td>
<td>1999</td>
<td>Support Surface</td>
<td>5.5</td>
<td>3.1</td>
<td>44</td>
</tr>
<tr>
<td>Augusta</td>
<td>1998</td>
<td>Support Surface</td>
<td>16.5</td>
<td>3.5</td>
<td>79</td>
</tr>
<tr>
<td>Tampa</td>
<td>2000</td>
<td>Best Practices</td>
<td>*</td>
<td>*</td>
<td>55</td>
</tr>
</tbody>
</table>

*Data not provided.*
did others, and some had more elements of a risk assessment program already in place when they conducted the “before” surveys than did others. These results indicate that hospitals that put in place a similar program can expect to reduce the odds that a patient will develop a pressure ulcer by somewhere between a factor of 2 and 5.

DISCUSSION

Clearly, all hospitals should be performing risk assessment on all admitted patients at the time of admission, and all patients found to be at risk should be immediately placed on a support surface that has been demonstrated to significantly reduce pressure ulcer incidence when an ulcer is not already present (eg, ZoneAire). However, on an even more fundamental level, the results of such a risk assessment must be shared with the patient and the patient’s family. The risk of pressure ulcer development in hospitals is very high, especially for older adults.

The federal Centers for Medicare and Medicaid Services announced in August 2007 that as of October 2008 it will no longer reimburse hospitals for treating 8 “reasonably preventable” conditions if absent at admission. Pressure ulcers are among the most prevalent on the list. Hospitals therefore have significant financial incentive to take every possible step to prevent pressure ulcers.

At-risk patients and their families must be advised of the importance of frequent repositioning, good nutrition, and avoidance of friction and shear before any sign of a pressure ulcer develops. The support surface may not need to be an expensive high-technology design to achieve promising results. Xakellis et al, 17 working at a 77-bed long-term care facility to implement the AHRQ guidelines, 4 provided inexpensive 2- and 4-in foam overlays to those patients determined to be at risk based on Braden Scale assessment. They used a staged approach providing overlay alone, turning schedule alone (none had been in place before protocol implementation), or both turning schedule and overlay, depending on the level of risk identified. This approach was successful in reducing the 6-month incidence rate from 23% preprotocol (16 of 69) to 5% postprotocol (3 of 63).

The National Pressure Ulcer Advisory Panel (NPUAP) convened a consensus conference in 2005 to deal with the issue of deep tissue injury. 18 One stated conclusion was that “deep tissue injury due to pressure exists as a form of pressure ulcer and is not well captured by current staging.” Following this conference, in February 2007 the NPUAP added 2 stages to the original 4. One of these is labeled, “Suspected Deep Tissue Injury.”

An engineering text, 19 based on analysis of stress distribution in the vicinity of a bony prominence, concludes, “Therefore, pressure sores likely begin in the deep tissue.”

CONCLUSION

Realization that most, if not all, pressure wounds have their origin in deep tissue explains why the practice followed by most hospitals of providing a specialty support surface only after the appearance of Stage I or II indicators has so often met with failure. Clearly, the only policy with any hope for success must include the provision of pressure-reducing support surfaces to all at-risk patients at admission, before the appearance of any pressure wound indicator. This article has demonstrated that such a policy significantly reduces pressure ulcer incidence in hospitals. 6

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