

# The Braden Q + P: A Pediatric Perioperative Pressure Ulcer Risk Assessment and Intervention Tool

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## ABSTRACT

Pressure ulcers continue to be a personally and financially expensive complication of surgery and hospitalization. The effects of anesthesia, immobilization during surgery, and use of multiple medical devices all place the surgical patient at high risk for pressure-related skin injury. As part of a comprehensive pressure ulcer prevention initiative, nurses in the cardiac and main ORs at Children's Hospital Boston, Massachusetts, became concerned that current pressure ulcer risk assessment tools did not adequately capture the intense but short-term risk posed in the operating and procedural suites. A team, formed to investigate this matter, developed a tool to guide nursing assessment of patient risk and to plan nursing interventions to prevent pressure ulcers. Results after implementation of the Braden Q+P tool appear to show improvement in preventing pressure ulcers. Increased awareness of pressure ulcer prevention, a hospital focus on skin care, and nursing education about pressure ulcers supported this improvement. *AORN J* 96 (September 2012) 261-270. © AORN, Inc, 2012. <http://dx.doi.org/10.1016/j.aorn.2012.05.010>

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**P**ressure ulcers are a significant and expensive postoperative complication that increases hospital length of stay, patient morbidity, readmission rates, and health care costs. The Institute for Healthcare Improvement estimates that nearly 2.5 million people develop pressure ulcers each year.<sup>1,2</sup> Breaks in skin integrity increase a patient's risk for infection and can lead to pain management challenges and psychological distress. Increased length of stay and readmission for treatment increase health care costs. Nationally, the cost to treat pressure ulcers is nearly \$11 billion annually.<sup>3</sup> As of October 2008, Medicare no longer compensates costs associated with treatment

of health care—associated pressure ulcers.<sup>4</sup> More importantly, pressure ulcers are considered preventable events.<sup>5</sup>

Preventing pressure-related injuries is a core concern for nurses. The first step in prevention is identifying a patient's risk so that an individualized plan of care can be developed.<sup>6</sup> Surgery presents unique challenges in the prevention of pressure ulcers. The effects of anesthesia and immobilization, and the use of multiple devices place the surgical patient at high risk for tissue injury. In addition, surgical drapes covering the patient limit the nurse's ability to visually assess the patient's skin.

The incidence and prevalence of pressure ulcers for inpatient units has been reported,<sup>7</sup> but the effect of surgical procedures on pressure ulcer prevalence and development during admission has not been recognized—current pressure ulcer risk assessment tools do not address the patient who comes in for surgery, is admitted to the hospital after surgery, and then develops a pressure ulcer.<sup>7</sup> Research and reporting related to pressure ulcer prevention primarily focus on adult patients, and current risk assessment scales focus on hospitalized or long-term care patients.<sup>8</sup> Of the many validated risk assessment tools available, few focus on either the pediatric patient or pressure-related skin injuries acquired in the OR or procedure areas. The aim of this quality improvement project was to develop a pediatric-specific, conceptually based risk assessment and prevention tool for pressure-related skin injuries as part of a comprehensive pressure ulcer prevention plan.

### THE PROBLEM

Reducing pressure ulcer development in the pediatric population is a clinical challenge. In 2009, an increase in the number of postoperative cardiac patients with pressure ulcers was noted by nurse managers and intensive care unit (ICU) nurse specialists through the Serious Event Reporting System (SERS) at Children's Hospital Boston (CHB), Massachusetts. A total of 21 patients were reported to have a pressure ulcer related to a bony prominence. Nine of these pressure ulcers were classified as level II, III, or IV. The locations of the injuries included the coccyx, sacrum, and occiput. Patient ages ranged from newborn to 31 years. Patient weights ranged from 2 kg to 69 kg. All patients had an admitting diagnosis of congenital heart disease, and all had undergone cardiac surgery during their hospitalization.

Nurse leaders and wound care nurse specialists met to assess the scope of the problem, evaluate current practice standards, and make recommendations for improvements. At the same time, an increase in pressure-related injuries was noted by

OR risk management personnel, primarily involving orthopedic patients undergoing surgical procedures lasting more than two hours. Although the Braden Q Scale had been adopted by CHB for pressure ulcer risk assessment, use of the tool and training was primarily done in the inpatient units. Surgical patients arriving at the hospital on the same day as their surgeries did not have their pressure ulcer risk assessments completed until after surgery, so staff members could not assess the role of the events in the OR on pressure ulcer development. Perioperative nurses relied on their clinical judgment to assess patients and develop a plan of care to prevent intraoperative-related tissue injury and breaks in skin integrity.

### OUR GOAL

Nurses from the cardiac OR and main OR met to review perioperative nursing practice and procedures related to pressure ulcer prevention. The clinical goal was to improve patient outcomes by decreasing the number of skin-related events in surgical patients. We identified preoperative pressure ulcer risk assessment, preprocedure and postprocedure skin assessments, positioning, and clinical interventions to reduce pressure-related tissue injury in all surgical patients as the scope of the quality improvement project. The nurses consulted hospital wound care experts about current nursing practice in the OR and in the ICU. Potential improvements were recommended as the project moved forward.

Current OR practices for maintaining skin and tissue integrity and preventing injury were evaluated by a task force of nurses from the cardiac and main ORs. The task force conducted a comprehensive review of pressure-related skin injuries reported in the SERS to identify common themes and patterns across the 24 operating suites. To reduce skin events, the task force developed a comprehensive pressure ulcer prevention plan that included risk assessment, positioning guidelines, algorithms to direct nursing interventions, staff education, and event

reporting. The next step was to address the gap in pressure ulcer risk assessment for pediatric surgical patients by developing a risk assessment tool.

### Literature Review

The task force conducted a comprehensive literature review to identify valid and reliable risk assessment tools and a second literature review to identify intraoperative pressure ulcer prevention strategies for pediatric

patients. We conducted a search of MEDLINE®, the Cumulative Index of Nursing and Allied Health Literature (CINAHL®), and the Cochrane Library by using the search terms

- *prediction of pressure ulcers,*
- *prediction of pressure ulcers in pediatric patient,*
- *prediction of pressure ulcers in the OR, and*
- *pressure ulcer prevention in the OR.*

Articles related to pressure ulcer prediction acknowledge that the OR is a high-risk environment, but no specific risk assessment tools were described that focused on patients undergoing surgery. Prevention strategies primarily focused on positioning.

### Risk Assessment Tools

We reviewed two articles that compared assessment scales.<sup>8,9</sup> A systematic review of risk assessment scales provided background information on pressure ulcer risk assessment.<sup>8,9</sup> Pancorbo-Hidalgo et al<sup>8</sup> reviewed 33 research studies that compared the validity and reliability of pressure ulcer risk assessment scales. The Braden Scale was validated in 22 of these studies and was considered to have the highest validity and reliability. The Braden Scale also was noted to be a better predictor than nurses' clinical judgment. Pancorbo-Hidalgo et al<sup>8</sup> concluded, however, that the use of a risk

assessment scale does not guarantee a reduction in pressure ulcers.

Two pediatric-specific risk assessment tools are described in the literature: the Braden Q Scale<sup>10</sup> and the Glamorgan Scale.<sup>11</sup> The Braden Q Scale was developed by using Braden and Bergstrom's conceptual framework, which is constructed on physiological factors that are population independent. The framework identifies two critical deter-

minants of ulceration: tissue tolerance and the intensity and duration of pressure. The unique characteristics of pediatric patients were considered in subscale development of the

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Braden Q Scale. The recommendation for a pressure ulcer prevention program requires early identification of at-risk patients and includes conducting a head-to-toe skin assessment and obtaining a Braden Q Scale score within 24 hours of patient admission.<sup>10</sup> The Braden Q Scale specifically predicts immobility-related pressure ulcers, and its dimensions include mobility, activity, sensory perception, moisture, friction, shear, nutrition, and tissue perfusion.

The Glamorgan Scale was developed by using the opinions of experts and is based on factors believed to be relevant in the development of pressure ulcers in children. The Glamorgan Scale predicts both immobility-related and device-related pressure ulcers. Scoring is complex, using 10 variables with different weightings. Mobility issues and the presence of pressure related to equipment carry higher scores than the pyrexia, peripheral perfusion, nutrition, serum albumin level, anemia, weight percentile, and incontinence subscores.

Anthony et al<sup>11</sup> noted that mobility is the most important predictor for both the Glamorgan and Braden Q Scales. The uniqueness of the surgical environment, including devices used for positioning

or as part of the surgical procedure, is not addressed in these scales. In addition, preoperative risk assessment scores may be very different from the postoperative scores when using the Braden Q and Glamorgan Scales. No risk assessment tool exists that is focused on preventing tissue injury in any patient population in the surgical environment.

### Pressure Ulcer Prevention Strategies

We reviewed articles that addressed intraoperative patient positioning and pressure ulcer prevention and intervention strategies. Several articles highlighted the use of appropriate support surfaces and principles of positioning techniques as intraoperative pressure ulcer prevention strategies.<sup>12-17</sup> Scott and Buckland<sup>17</sup> stated that the beginning of prevention is assessment. They added “it has been suggested that formal risk assessment scores should only be used as an *aide-mémoire* and should not replace clinical judgment.”<sup>17(p78)</sup> Guidelines and assessment tools provide a framework to support nursing assessment and nursing judgment.

Bales and Podwojski<sup>3</sup> reported that a program that used a validated tool implemented with a comprehensive risk-based prevention plan reduced pressure ulcer prevalence from 9.5% to 0%. Pasek et al<sup>6</sup> used a comprehensive skin care team approach to reduce incidence and prevalence to below national benchmarks. Elliot et al<sup>1</sup> adopted comprehensive prevention strategies as part of a quality improvement project with successful reduction in prevalence and incidence of pressure ulcers. Samaniego<sup>18</sup> described the benefit of a skin care pathway for pediatric patients as increasing awareness and reporting as well as standardizing care. The common theme in these reports was the use of a risk assessment scale, staff education, and clinical experts to reduce the prevalence and incidence of pressure ulcer development.<sup>1,3,6,8,18</sup>

Pressure ulcer risk factors in the pediatric population are similar to those identified in adults. The role of individual health status and tissue tolerance for pressure is acknowledged in each of the risk assessment scales reviewed. Patients with

preexisting pressure ulcers and comorbidities, such as diabetes, are identified as being at higher risk.<sup>17</sup> Patients undergoing cardiac surgery often have periods of decreased tissue perfusion and decreased systolic blood pressure while on cardiopulmonary bypass. Pediatric patients with congenital heart disease are likely to have lower oxygen saturation and altered nutritional status, so they may be at higher risk for experiencing skin breakdown. Patients undergoing orthopedic surgery have the additional risk of shearing related to the forces exerted with orthopedic procedures. All surgical patients are at risk for pressure ulcer development related to immobility.

The OR bed mattress is a mainstay in pressure ulcer prevention.<sup>17</sup> Gel overlays and gel positioning devices may be more effective in reducing pressure ulcer development than a standard OR mattress alone. Alternating air mattresses were demonstrated to be more effective than gel overlays in a general surgery population.<sup>13</sup>

### PRESSURE ULCER PREVENTION BUNDLE

Consistent with the Braden Q Scale, we used Braden and Bergstrom’s conceptual framework on the etiology of pressure ulcers to organize our pressure ulcer prevention bundle, which is outlined in [Figure 1](#). The conceptual framework identifies two critical determinants of ulceration: the intensity and duration of pressure and tissue tolerance. Factors that contribute to prolonged and intense pressure include mobility (ie, ability to change and control body position), activity (ie, degree of physical activity), and sensory perception (ie, ability to respond in a developmentally appropriate way to pressure-related discomfort). Tissue tolerance includes both intrinsic (eg, nutrition, arterial pressure) and extrinsic (eg, moisture, friction, shear) factors that affect the ability of the skin and its supporting structures to endure the effects of pressure without adverse sequelae.

As part of the task force’s quality improvement initiative to reduce incidence of pressure ulcer development, we developed a one-page tool to guide

<b>Comprehensive Pressure Ulcer Risk Assessment</b>			
<p><b>Assessment components</b>                      Length of procedure &gt; 2 hours                      Braden Q score &lt; 16 (if available)</p> <p><b>If a Braden Q score is not available, use OR risk assessment tool to identify</b>                      Underlying conditions                      Surgical position other than supine                      Device utilization                      Potential for friction and shear                      Nutritional status assessment                      Poor tissue perfusion - capillary refill &gt; 2 seconds or O<sub>2</sub> saturation &lt; 95%</p> <p><b>Predetermined as high risk:</b>                      Neonates or pre-term infants                      Adolescents or adults with congenital heart disease                      Patients with a history of pressure ulcers</p>			
<p><b>If patient is determined to be at high risk for pressure ulcer development</b>                      Complete a comprehensive skin assessment both preoperatively and postoperatively                      Document interventions to prevent tissue injury</p>			
<b>Interventions</b>			
<b>Positioning and protection from medical device pressure</b>	<b>Moisture protection</b>	<b>Surface pressure reduction</b>	<b>Communication</b>
Ensure no wires or tubes are in contact with patient's skin  Use gel padding and rolls for support  Position heels off the bed  Protect all areas of skin-to-skin contact	Use drip towels for skin prep, irrigation  Insert a bladder catheter	Place transparent film dressings over reddened bony prominences  Avoid restrictive devices  Use an alternating pressure redistribution air mattress on the bed for patients > 15 kg, or use a gel mattress pads  Discuss the potential for heel and occipital pressure relief every 2 hours during the procedure  Place an air mattress on the postoperative bed	Document: <ul style="list-style-type: none"> <li>• Risk assessment</li> <li>• Preoperative skin assessment</li> <li>• Interventions implemented</li> <li>• Postoperative skin assessment</li> <li>• Nurse-to-nurse report</li> </ul>

**Figure 1. OR pressure ulcer prevention bundle.**

nursing assessment of patient risk and to plan nursing interventions to prevent pressure ulcers. We wanted a simple tool that did not add an extra burden to the current preoperative workflow. The

first iteration was a modification of the Braden Q Scale. Six of the seven subscales were modified to reflect the characteristics of ORs. For example, we eliminated the subscale “mobility” and translated

it into surgical time to determine the effect of long procedures on pressure ulcer development. The “activity” subscale was eliminated because all surgical patients are under anesthesia.

Each work group member pilot tested the tool in different surgical suites to determine its relevance to practice. We found the first draft to be awkward and unreliable. In the second draft, we used a yes/no scoring system for each subscale. Although this format was easier to use, the essence of the assessment and planned intervention seemed to be missing. We then modified the tool to separately address each source of pressure and identified surgical time as a separate and important factor that could not be modified. We also included the number and type of medical devices used intraoperatively, the American Society of Anesthesiologists physical status classification,

and a section to describe interventions that direct practice. We named this final tool the Braden Q+P (Figure 2). The name acknowledges that the tool was adapted from the pediatric Braden Q Scale with the addition of the letter P to represent our recommendation for using the tool for procedures—this can mean surgical procedures but also includes procedures in other areas, such as the cardiac catheterization laboratory or radiology suites.

### IMPLEMENTATION

The Braden Q+P tool was implemented for patients undergoing cardiac surgery. This patient population was selected because of the consistency in nursing practice, small number of staff members to be trained, length of procedures, and ability for several days of postoperative follow-up. All cardiac

Braden Q+P Pressure Ulcer Risk Assessment Tool		Circle one:		Main OR	Cardiac OR	Cardiac Cath Lab
<b>Intensity and duration of pressure</b>	<b>Risk factors</b>		Y	N	Date: Height and weight: American Society of Anesthesiologists score: Length of procedure: Procedure:	
<i>Immobility and decreased sensory perception</i>	Procedure is scheduled > 2 hours					
<b>Tolerance of skin and support structures</b>	<b>Risk factors</b>		Y	N	<b>Interventions: (check if implemented)</b> Head-to-toe skin assessment - preprocedure Head-to-toe skin assessment - postprocedure Documentation and nurse-to-nurse report	
<i>Underlying conditions</i>	One or more of the following: • Contractures • Neonates or pre-term infants < 42 weeks • History of pressure ulcers • Skin breakdown noted on preprocedure skin assessment					
<i>Position other than supine</i>	Alternative tables and positioning devices will be used for positioning the patient				Use gel pads and appropriate positioning devices Protect areas of skin-to-skin contact	
<i>Devices</i>	Potential for device related injury				Protect skin from pressure related to devices	
<b>Any other device attached to or that transverses the skin (Circle all that apply)</b> Endotracheal tube, face mask, blood pressure cuff, peripheral IV line, central venous line, pulse oximetry probe, electrocardiogram electrodes, electrosurgical unit dispersive pad, external defibrillation pad, medically necessary restraints, near infrared spectroscopy monitoring, spinal fusion frame, pneumatic tourniquet, stirrups, other:						
<i>Moisture</i>	Skin at risk for constant moisture or exposure related to skin prep, irrigation, and urine leakage				Consider these interventions: Place side towels for prep Use clear, plastic, adhesive incision drapes to isolate surgical area Place an indwelling urinary catheter before surgery Use draw sheet or roller used to lift/transfer patient Place side extensions for patients who are obese Avoid massaging red areas or bony prominences Use forced air warming mattress if possible	
<i>Friction and shear</i>	Potential for sliding during the procedure					
<i>Nutrition</i>	The patient weight for age is either less than 10th or greater than 90th percentile					
<i>Tissue perfusion</i>	Baseline oxygen saturation < 95% or capillary refill > 2 seconds Risk or plan for intraoperative hypothermia					
		<b>Total number of “yes” and “no” responses</b>			There is no need to total intervention responses here	
<b>Postprocedure concerns</b>	<b>Intubation or too unstable to move &gt; 20 kg</b>		Y	N	<b>If yes, consider pressure redistribution mattress</b>	
<b>Postprocedure assessment</b>	<b>Were there any areas of redness noted on the postprocedure assessment?</b> Circle one: Yes No				<b>Did the red area resolve before the patient was transferred from the procedure room?</b> Circle one: Yes No If no, please complete a SERS report	

Figure 2. Braden Q+P pressure ulcer risk assessment tool. Adapted and printed with permission from Dr Martha A. Q. Curley.

OR and main OR nurses attended education sessions on pressure ulcer development, patient risk factors, and pressure ulcer prevention strategies. Additionally, all cardiac OR nurses were trained on the significance and completion of the risk assessment tool. A review of events reported in SERS was part of the nursing education. Frequent evaluation of the tool's effect on workflow allowed us to modify it during the implementation process. We used rapid plan-do-study-act cycles to test the feasibility of incorporating this risk assessment tool into practice. Using a rapid cycle change approach shapes and improves changes during the process as they happen.<sup>19</sup>

Ongoing updates from the cardiac OR nurses regarding skin events continued during implementation. These events were discussed as part of the cardiac OR daily nursing report as educational opportunities around risk assessment, skin assessment, documentation, and SERS reporting. At the same time, the hospital launched the "Skin is In" initiative to increase awareness of skin breakdown and pressure ulcer development across all nursing units. This initiative was launched by the hospital as an educational initiative. Its events happened at the same time as the task force's activities and supported the task force's goals. One nurse from our task force was involved in development of "Skin is In."

Ensuring that appropriate skin assessments are performed before the patient's surgery is a key component of prevention. A thorough head-to-toe skin assessment either in the preoperative clinic or in the same-day admitting area may not be possible. We determined that the best time to perform these assessments was after the induction of anesthesia in the OR. The circulating nurse in the OR completed preoperative and postoperative skin assessments and compared them to identify any pressure-related injuries that may have occurred during the intraoperative phase of care.

Interventions to prevent skin injury were implemented as outlined on the Braden Q+P tool. Staff nurses developed a guideline for positioning

cardiac patients to promote consistency and decrease unnecessary variability in practice. Delayed manifestations of pressure-related injury in postoperative patients are not uncommon.<sup>17</sup> Any unresolved skin alteration or redness before transfer was documented in the hospital's existing SERS reports to ensure follow-up across the cardiac inpatient care units. Transfer reports from the OR to the ICU included skin assessment results.

## BARRIERS TO IMPLEMENTATION

Braden Q+P tool completion initially was perceived as adding to the nursing workload but there were no changes to workflows, and this perception decreased as familiarity with the tool increased. Three cardiac OR nurses from the original quality improvement task force were available to answer questions and provide assistance as needed. Initially, staff compliance with the prevention bundle was poor, but more education about the importance of the bundle increased compliance. Various interpretations of the characteristics in the tool and personal preferences with positioning and head-to-toe and anterior-to-posterior skin assessments presented the most challenges. Task force members discussed variations in positioning practice and the importance of following the standard guideline. The importance of the initial skin assessment on admission was reinforced with nursing staff. The Deficit Reduction Act of 2005 states that a skin assessment must be completed on admission, with the skin assessment results documented in the medical record.<sup>20</sup> By having staff members visually audit procedures and by educating staff nurses on the importance of positioning guidelines, staff members at CHB were able to successfully implement skin assessments and positioning guidelines.

A second barrier to implementation was the cooperation of the entire multidisciplinary team with skin assessments and standard positioning. The importance of skin assessments before and after the procedure and standardizing of positioning practices were discussed informally with the

anesthesia and cardiac OR nursing teams. The task force helped CHB incorporate a simple guide for head-to-toe skin assessment into the facility's OR nursing education.

This guide includes turning the patient for direct visualization of the occiput, shoulder blades, coccyx, and heels. Some nurses found it challenging to enlist the help of anesthesia staff members to perform the posterior skin assessments when the patient entered the room because the anesthesiologists were focused on the airway and placing lines. One of our physician colleagues was identified as a champion in pressure ulcer prevention and was enlisted to help accomplish the preoperative and postoperative turning for assessment. This sharing of information between disciplines about quality improvement is important to facilitate open communication and increase engagement. By making it clear to all members of the surgical team that all team members, not just the nurses, are responsible for pressure ulcer prevention, our workgroup's education efforts made progress in implementing the tool. The practice of turning patients safely and at the appropriate time before and after surgery is now a team effort.

## METHODS

Consistent with national standards that define quality improvement projects as those designed to improve clinical care to better conform to established or accepted standards, we monitored our practice during 356 procedures. The surgical times ranged from 20 minutes to 11 hours, with a median of 4.5 hours. Because all patients were under anesthesia and positioned for surgery, the intensity and duration of pressure could be considered constant for the entire surgical time. The American Society of Anesthesiologists physical status classification scores were 3 or higher in 96% of patients, indicating systemic disease in the majority of patients. Most patients were exposed to moisture (78%) and were at risk for friction and shearing forces (79%). Tissue perfusion, described as oxygen saturation less than 95%, was noted in 59% of

patients. The nutrition guideline of weight less than the 10th or greater than the 90th percentile was identified as a risk factor in 44% of patients.

All patients had monitoring devices present for the duration of the procedure. Endotracheal tubes (95%), blood pressure cuffs (96%), IV lines (97%), pulse oximeter (97%), and electrocardiogram leads (94%), electrosurgical unit dispersive pads (84%), defibrillator pads (56%), and near infrared spectroscopy leads (39%) were reported. Patients undergoing surgery in our ORs have an average of seven devices in place.

In accordance with CHB policy, standard OR positioning guidelines are used for all surgery patients, and these guidelines were modified as a result of our project. Specific guidelines addressing the unique needs of complex surgical patients also were developed as part of our project. Most patients had surgery while in the supine position (64%). Gel rolls are used under the shoulders to maximize exposure in the mediastinal cavity. Gel is also the product of choice at CHB to elevate heels and cushion the occiput and elbows. Patients who weigh more than 15 kg and who are undergoing cardiac surgery are placed on an alternating air pressure—redistribution OR mattress system with a gel overlay. Patients who weigh less than 15 kg are placed on a 3-inch pressure-reducing OR mattress pad with a gel overlay.

Areas of redness were noted at the end of the procedure in only 12% of patients; 67% of areas resolved before patient transfer. At the same time, all SERS reports related to skin or tissue were reviewed. Skin-related events were divided into two categories, positioning related or device related, based on a brief factual description.

## WHAT WE LEARNED

In 2009, 21 pressure ulcers not related to devices were reported in cardiac surgical patients, nine of which were stage II, III or IV. All of these were skin breakdowns around bony prominences. The facility first used the new pressure ulcer prevention tool in clinical practice in January 2010. End of year data

for 2010 showed that only 14 pressure ulcers, including stage I ulcers, were reported. In 2011, 18 pressure ulcers not related to devices, including stage I ulcers, were reported. In each of these two years, one patient was reported to have a pressure ulcer progress to stage III, a reportable event. In each of these cases, the pressure ulcer was determined to have been unpreventable. It should be noted that average surgical procedure times during this period increased by 31 minutes. Intensive care unit admissions and length of stay also increased. These indicators point to an increase in patient complexity. We believe that our results show improvement in preventing pressure ulcers after the implementation of the Braden Q+P tool. Increased awareness of pressure ulcer prevention, a hospital focus on skin care, and nursing education about pressure ulcers supported this improvement.

## CONCLUSION

The greatest number of pressure ulcers occur in the first 12 to 24 hours of a patient admission. Nurses caring for patients undergoing procedures must identify the hazards that patients are exposed to during prolonged procedures and patient positioning. The use of a risk assessment tool may not decrease overall pressure ulcer incidence, but putting an increased focus on skin assessment and pressure ulcer prevention strategies complements nursing judgment and improves outcomes. Risks related to a short but intense period of immobility and device use have not been previously described for either pediatric or adult patients. The incidence of positioning and device-related skin and tissue injury associated with prolonged surgical procedures has not been reported.

Engagement of the interdisciplinary team across the continuum of care will help ensure successful outcomes. We believe that surgical patients identified as at risk and managed with consistent nursing practices will have a decreased incidence of pressure-related injury. Using the Braden Q Scale as the framework for the Braden Q+P tool allows for consistency in risk assessment across clinical

settings. To our knowledge, this is the first attempt to incorporate pressure ulcer risk assessment into perioperative nursing care. Our next steps will include additional education and implementation of the Braden Q+P tool in all surgical services and procedure areas. The paper tool will be converted to be part of our electronic medical record.

Excellent skin care demonstrates quality nursing. The Braden Q+P tool holds promise as a valid and reliable tool to assess patient risk and to delineate interventions to prevent pressure-related skin injuries in the surgical and procedural suites. Although a pressure ulcer plan alone will not ensure successful outcomes, introducing pressure ulcer risk assessment in the OR and other procedure areas will support nurses' efforts to prevent tissue injury and reduce pressure ulcer development. **AORN**

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## References

1. Elliot R, McKinley S, Fox V. Quality improvement program to reduce the prevalence of pressure ulcers in an intensive care unit. *Am J Crit Care*. 2008;17(4):328-334.
2. Relieve the pressure and reduce harm. Institute for Healthcare Improvement. <http://www.ihl.org/knowledge/Pages/ImprovementStories/RelievethethePressureandReduceHarm.aspx>. Accessed May 18, 2012.
3. Bales I, Podwojski A. Reaching for the moon: achieving zero pressure ulcer prevalence. *J Wound Care*. 2009;18(4):137-144.
4. Hospital Acquired Conditions. Centers for Medicare and Medicaid Services. [http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/Hospital-Acquired\\_Conditions.html](http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/Hospital-Acquired_Conditions.html). Accessed May 18, 2012.
5. Butler CT. Pediatric skin care: guidelines for assessment, prevention and treatment. *Dermatol Nurs*. 2007;19(5):471-485.
6. Pasek TA, Geysler A, Sidoni M, et al. Skin care team in the pediatric intensive care unit: a model for excellence. *Crit Care Nurse*. 2008;28(2):125-135.

7. Curley MA, Quigley SM, Lin M. Pressure ulcers in pediatric intensive care: incidence and associated factors. *Pediatr Crit Care Med*. 2003;4(3):284-290.
8. Pancorbo-Hidalgo PL, Garcia-Fernandez FP, Lopez-Medina IM, Alvarez-Nieto C. Risk assessment scales for pressure ulcer prevention: a systematic review. *J Adv Nurs*. 2006;54(1):94-110.
9. Willock J, Baharestani MM, Anthony D. The development of the Glamorgan paediatric pressure ulcer risk assessment scale. *J Wound Care*. 2009;18(1):17-21.
10. Quigley SM, Curley MA. Skin integrity in the pediatric population: preventing and managing pressure ulcers. *J Soc Pediatr Nurs*. 1996;1(1):7-18.
11. Anthony D, Willock J, Baharestani M. A comparison of Braden Q, Garvin and Glamorgan risk assessment scales in paediatrics. *J Tissue Viability*. 2010;19(3):98-105.
12. McEwen DR. Intraoperative positioning of surgical patients. *AORN J*. 1996;63(6):1059-1079.
13. Schultz A. Predicting and preventing pressure ulcers in surgical patients. *AORN J*. 1999;81(5):986-1006.
14. Schouchoff B. Pressure ulcer development in the operating room. *Crit Care Nurs Q*. 2002;25(1):76-82.
15. Schindler CA, Mikhailov TA, Fischer K, Lukasiewicz G, Kuhn EM, Duncan L. Skin integrity in critically ill and injured children. *Am J Crit Care*. 2007;16(6):568-574.
16. St-Arnaud D, Paquin MJ. Safe positioning for neurosurgical patients. *AORN J*. 2008;87(6):1156-1168.
17. Scott EM, Buckland R. Pressure ulcer risk in the perioperative environment. *Nurs Stand*. 2005;20(7):74-86.
18. Samaniego IA. A sore spot in pediatrics: risk factors for pressure ulcers. *Dermatology Nursing*. 2004;16(2):153-159.
19. Warburton RN. Improving patient safety: an economic perspective on the role of nurses. *J Nurs Manag*. 2009;17(2):223-229.
20. Ayello EA, Capitulo KL, Fife CE, et al. Legal issues in the care of pressure ulcer patients: key concepts for health care providers: a consensus paper from the International Expert Wound Care Advisory Panel. *J Palliat Med*. 2009;12(11):995-1008.

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