In 1992, the Agency for Health Care Policy & Research (AHCPR) presented clinical guidelines for the prediction, prevention, and early treatment of pressure ulcers (PU) in adults [1]. Since these landmark recommendations were issued, many educational programs, protocols, scales, and medical devices have been developed and trialed in an effort to reduce PU rates in the hospitalized patient. While some advances have been made, most notably in the ability to identify at-risk patients, PU incidences remain at unacceptable levels in the acute care hospital setting. A 2006 investigative review of the evidence surrounding PU prediction and prevention yielded 83 articles and abstracts, of which 18 were selected as relevant, and covered a variety of topics, settings, and patient populations. The operative patient experience was evaluated in particular detail.

An updated integrative review on PU prevention was conducted in 2008, with a focus on pressure ulcers in the critical care environment. This updated review yielded 282 articles, of which 14 were reviewed in detail, and 8 selected as relevant for inclusion. The strength of the research evidence ranged from insufficient to good, with a final grade of fair. 4 articles from the 2006 review were eliminated, as they were now included in current systematic reviews, meta-analyses, or have been replaced by stronger evidence. In addition, two Wound/Ostomy Nurses were interviewed regarding pressure ulcer prevention in the critical care setting. Much of their clinical judgment and expert opinion is validated by the evidence captured in this review.

- Pressure Ulcer Management [3, 6, 8, 10, 11, 12, 13, 15, 18]
  - Change in Nursing Practice [8, 10, 11]
    - Organizations tend to underestimate the time it takes to adopt the use of evidence to change nursing practice in complex environments, particularly with large groups.
    - Implementation of knowledge is positively influenced by organizational commitment & feelings of support.
    - Sustained commitment by leaders is necessary to make a change in philosophy stick and become embedded.
    - PU prevention may require more of a management focus, rather than a staff nurse focus, in order to sustain results.
    - A system may be needed to monitor both PU Prevalence and PU Incidence in order to determine PU problems and associated root causes (20).
  - Cost-Effectiveness [4, 8, 11]
    - Substantial resources, both physical and human, are required to attain goals.
    - In a 3 year study in a long-term care facility examining the effects of the institution of guideline-based PU prevention protocol:
      - Initial gains in improved PU treatment were not lost.
      - Reduction in cost of PU treatment was dramatic.
      - PU healed more rapidly.
      - Less costly supplies were used for shorter periods of time.
      - Treatment supply fell 90%.
      - Labor costs for treatment fell 75%.
    - A nonscientific relationship was noted between declining C.N.A. hours (2.2 hrs per patient day to 1.9 hours per patient day) & increased incidence of PU.
Pressure Ulcers – An Integrative Review

A Topic Summary of the Evidence

- Previous research in long-term care facilities suggests maintaining 2.2 hours per patient day of C.N.A. time is associated with maintenance of research-based skin care protocols and low PU incidence.
- Costs may be an important determination factor for support surface choice.

  o Education [7, 8, 10, 12, 15]
    - Presence of knowledge does not guarantee changes in traditional behavior.
    - Intensive staff PU education can *initially* reduce PU incidence; however, these gains are often lost over time.
    - Educational programs & materials for caregivers & patients are needed in order to involve them in, and take responsibility for, PU prevention.
    - Nurses need checklists, guidelines, & risk assessment scales as weapons for PU prevention.
    - Photos and diagrams are important in training nurses to recognize PU stages.
    - 2005 survey of hospital nurses suggests more education may be needed regarding risk assessment tool use.
    - More training may be needed in the subscales of moisture & sensory perception.

  o Guidelines, Protocols, & Strategies [3, 4, 5, 7, 8, 13, 21]
    - Insufficient evidence to recommend specific turning regimes
      - Origin of 2 hr turning schedule is anecdotally linked to the time Florence Nightingale took to reposition every injured soldier on a ward during the Crimean war.
      - Also attributed to a 2 hr turning schedule in a 1961 study by Koziak.
      - More frequent repositioning on a pressure-reducing mattress does not necessarily lead to fewer PU and cannot be considered as a more effective preventive measure.
      - For patients for whom turning protocols are not effective in preventing PU, more intensive measures are needed.
    - Appropriate strategies to prevent PU include:
      - Use static or dynamic support surfaces, rather than standard surfaces.
      - Reposition the patient, optimize nutritional status, moisturize sacral skin
      - Start prevention earlier in patients who are at risk of developing PU.
    - Initial reductions in PU incidence after implementation of guideline-based protocols are often lost over time.
    - One study noted that the conceptual framework from AHCPR guidelines was not helpful in predicting patients at risk for PU formation.
      - Are the guidelines better at predicting *those not at risk than those at risk*?
    - Special guidelines are needed for padding & positioning at risk OR patients.
    - Patients who develop PU after admission often have multiple medical diagnoses.
      - Do current guidelines capture these high-risk patients?

  o Pressure-Relieving and Other Devices [4, 5, 6, 13, 18, 21, 22]
    - Pressure-relieving overlays on the OR table and in the post-op period can reduce post-op PU.
      - Static air overlays best reduce tissue interface pressure.
Pressure Ulcers – An Integrative Review

A Topic Summary of the Evidence

- Gel pads or dry visco-elastic polymer pad skin surfaces better than foam overlays & standard OR mattresses, but not as efficient as static air overlays.
- Multilayer surface significantly reduce incidence of PU as compared to standard OR pad.
  - Foam alternatives to standard hospital form mattresses can reduce PU.
  - Relative merits of alternating & constant low-pressure devices, as well as different alternating pressure devices, are unclear.
  - Australian standard medical sheepskins prevented PU in one trial.
  - There are tentative indications that foot waffle heel elevators are harmful.
  - The term “standard” in these studies is poorly described.
  - Rotational beds do not reduce PU, as compared to standard hospital or ICU beds.
  - Higher-specification foam mattresses are preferred to standard hospital foam mattresses.
  - Cushioned surface facemasks may prevent facial PU in patients receiving non-invasive ventilation.
  - Use of a 30 degree position cushion may be an option to achieve a more stable and comfortable lateral position.
  - A Bowel Management System, with an aggressive PU prevention program, may reduce the moisture to which an incontinent patient's skin is exposed, with a decrease in PU risk.

- Nurses Perceptions, Beliefs, and Attitudes [9, 10, 11, 12, 13, 19]
  - Behaviors related to PU prevention can be erratic, despite positive attitudes towards PU prevention.
  - Documentation practices demonstrate an inconsistent approach.
  - Nurses are willing to change their practice as long as the change is not difficult, time-consuming, or add to the workload [9, 10, 11, 19]
    - However, nurses may not be interested in changing their routines!
    - PU prevention is often not viewed by the nurse as a great issue in daily work.
    - Nurses admit being less interested in PU prevention than other aspects of nursing care; not a high priority
    - Nurses will not use assessment tools seen as burdensome.
    - Practice changes can occur if respected colleagues change their practice and encourage other nurses to change their behavior.
      - Influence of social norms/peer pressure was highlighted by some nurses.
  - Positive attitudes may not be enough to ensure practice change takes place.

- PU Knowledge [10]
  - Nursing acting & thinking are largely based on traditional knowledge.
  - Traditional knowledge is more valued than recent knowledge.
  - Nurses will continue traditional practices if they have had positive experiences with that practice.
Nurses are not restricted by the fact that some traditional knowledge is outdated.

- **PU Protocol Acceptance [10]**
  - Acceptance is based on experience, tradition, basic education, and information coming from colleagues.
  - Depends on a nurse’s conviction re: effectiveness of intervention.
  - Nurses may transpose the "problem" outside their responsibility, re: "they came in with the PU; it's not our fault."
  - Nurses may consider PU protocols unnecessary and redundant.
  - Some nurses demonstrate decreased personal involvement, as seen in decreased concerns about PU prevention.

- **Miscellaneous Observations [12, 13, 19]**
  - "Wound care is a specialty that has evolved like many other nursing specialties. The average nurse may not possess this specialized knowledge and instead relies on the specialist. This specialist isn't always available and/or is overloaded with work."
  - Staff shortages may pressure nurses to prioritize tasks, with PU prevention becoming less of a priority
  - Nurses with less than 1 year of experience seem especially conscientious about skin assessment.
    - However, do they know “the next step?”
  - Nurses may have moved patients more if they perceived a particular mattress was less effective.
    - Can the reverse be implied - do nurses move patients less if they perceive a particular mattress is effective?
  - Implementation strategies to introduce change must acknowledge the complexities practice change and introduce ways in which key staff can be empowered to manage barriers to change.

- **Pressure Ulcer Risk Assessment Scales (RAS) & Tools [1, 3, 9, 12, 14, 15, 17]**
  - No evidence that the use of RAS decreases PU incidence.
  - RAS are more accurate than nurses’ clinical judgment in predicting PU risk.
  - RAS are a useful tool for improving the effectiveness of providing pressure-reducing surfaces and improving preventive interventions.
  - Braden Scale [1, 3, 12, 17]
    - Braden Scale offers the best balance between sensitivity, specificity, and best risk estimate.
    - May be better at identifying those not at risk than those at risk.
    - Despite limitations of the Braden Scales, its use ensures a systematic evaluation of PU risk factors.
    - The more experienced the nurse, the more likely he/she is to consistently assess skin condition, identify PU stages, and use the Braden Scale correctly.
  - Modified Tools & Scales [9, 15]
    - A shortened or modified version of any scale on a hospital form does not ensure correct use of the scale.
Abbreviated tools may lead to inaccurate results. Thus, the entire scale with subscale definitions should be available.

- Braden Scales have been successfully modified for specific patient populations, such as the Braden Q Scale for PICU.

**Assessment Tool Cut Scores** [3, 15]
- Nurses are able to identify “no risk” patients and “high risk” patients. However, they seem to have difficulty in identifying patients at “mild risk” and “moderate risk”.
  - One study revealed the greatest number of PU occurred in the “mild risk” category.
  - A “magic” cut score number predicting PU risk does not exist for any of the discussed risk assessment tools, even the Braden Scale.
  - Predictive values of cut scores demonstrate variability according to patient population, hospital setting, diagnosis, operative experience, and LOS.
    - These scores can actually change on a day-to-day basis!
    - As cutoff points change, so does any scale’s specificity & sensitivity.
- PU risk prediction can only be accomplished with reassessment and determination of Braden scales reflecting a patient’s changing clinical condition.

**Assessment Tool Subscales** [3, 9, 14, 18, 22]
- Studies seem to differ concerning the subscale risk factors most predictive for PU development. While some studies eliminated risk factors as poor PU predictors, other studies included them as excellent PU predictors. These subscale factors include:
  - Nutrition
  - Friction & Shear
  - Moisture & Sensory Perception
  - Activity & Mobility
- Braden subscale item of "Moisture" does not differentiate between urine, sweat, diarrhea, or other types of moisture.
- Two studies determined that altered/abnormal body type/mass for height and the condition/type of skin were strong predictors for PU development.
  - This has important implications in obese and thin patients, as well as patients with thin subcutaneous layers and frail skin.
- A Modified Braden Q Scale eliminated 4 subscales and kept 3 subscales felt to be more predictive of PU in the PICU setting.
- Nutritional and mobility subscales of the Braden Scale may be most predictive of OR-acquired PU

**Critical Care Environment** [20, 21, 22]
- Research data specific to PU in the ICU is difficult to find.
- Staff nurses need further education on the use of the Braden Scale from the time the patient is admitted through the entire length of hospital stay.
- No single risk factor for PU development that is valid or discriminatory in a general or specific critically ill population can be identified.
Pressure Ulcers – An Integrative Review

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- Implementation of appropriate PU prevention interventions targeted to specific Braden subscales, such as mobility and nutrition, needs to be emphasized to the staff.
- Patients most at risk for PU were those on sedatives, either alone or in combination with other vasopressor medications.
- One study demonstrated that 55% of patients with PUs developed them within 2 weeks of admission.
- PU Prevention in Critical Care:
  - Most critically ill patients are not routinely repositioned.
  - Higher-specification foam mattresses are preferred to standard hospital foam mattresses.
  - Using facemasks with large cushioned surface in patients receiving non-invasive ventilation may prevent facial PU.
  - No studies on a superior device in the prevention of PU in critically ill patients.

- The Operative Experience [2, 4, 6, 13, 16, 18]
  - All surgical patients should be considered to be at risk of PU development because of uncontrollable factors (OR time, hemodynamic state, use of vasoactive meds, etc.) (6).
  - Pressure ulcers originating in the OR may be incorrectly blamed on postoperative areas of care resulting from delay of PU demarcation.
    - PU formation varies from as little as hours to as much as 5 days.
  - Delayed PU development in surgical patients may add to high PU rates seen in M/S areas.
  - A risk assessment scale could be useful to identify surgical patients at risk for PU development.
  - Pre-operative Braden Scale scores may be a predictor of PU formation, although other studies have found the Braden scale not to be a significant variable.
  - Increased education is needed for perioperative staff nurses regarding risk factors, body alignment, pressure reduction strategies, shear & friction, warming blankets, and skin assessment.
  - Best practice supports the use of small foam pads & plump firm pillows for body support.
  - There is conflicting evidence regarding PU significant risk factors for surgical patients.
    - Uncontrollable risk factors: Age, ethnicity, gender, body size, OR time, hemodynamic state, use of vasoactive meds, comorbid conditions, nutritional status, pre-operative hypotension, ASA scores, and albumin levels.
    - Controllable OR risk factors include pooled prep solutions, shearing, friction, use of warming blankets beneath patients, surgical position, and the OR surface.
      - OR patients placed on warming blankets are at higher risk for PU.
### Pressure Ulcers – An Integrative Review

**A Topic Summary of the Evidence**

*Appendix A - Quality Of The Evidence*

#### Key Web Search Terms (1992 – 2006)

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2006 articles eliminated from 2008 review (included in Systematic Reviews, Abstracts only, Replaced by stronger evidence): 4

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**Total Articles** 22

(* 10 = qualitative study; *12, *19 = survey questionnaire)

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Appendix B – 2008 Bibliography


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Appendix C – 2006 Deleted Articles


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