Clinical Guidelines And Primary Care

Alfred O. Berg, MD, MPH, Series Editor

Guidelines For The Prediction And Prevention Of Pressure Ulcers

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Editor's Note: The Agency for Health Care Policy and Research (AHCPR) is one of the most important players in the business of clinical guideline development. Its process is arguably the most complete and rigorous in the field. Dr. George Xakellis, author of the following guideline review, was one of the first family physicians appointed to an AHCPR guideline panel, and the pressure ulcer guideline he reviews was one of the first three guidelines released by AHCPR. Dr. Xakellis not only reviews the guideline but outlines the history of guideline development and current practice within AHCPR.

Ideally, the critical review of a guideline should be performed by individuals not directly involved in the process of developing the guideline to minimize bias in the commentary. The circumstances here are, however, unusual if not unique. Because of his membership on the guideline panel and because this panel was one of the very first, Dr. Xakellis is able to offer insight into AHCPR and into the conduct of the pressure ulcer guideline panel that would scarcely be possible from an outsider. In the spirit of full disclosure, however, readers are here reminded that the following review is written by an individual intimately involved in producing the guideline itself and should draw their conclusions accordingly. As the *Journal of the American Board of Family Practice* continues its series of clinical guideline reviews, readers can expect to see a variety of approaches to authorship and commentary, reflecting the changing nature of this new and constantly evolving area of clinical practice.

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Submitted, revised, 19 January 1993.

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The Agency for Health Care Policy and Research (AHCPR) was created by Congress in December 1989 as the eighth agency in the Public Health Service at the same organizational level as the Centers for Disease Control (CDC), the Food and Drug Administration (FDA), and the National Institutes of Health (NIH). The mission of the AHCPR focuses on information development and dissemination, rather than on policy making, and it is intended to serve as the focal point for medical effectiveness and health services research. Within the AHCPR, the Office of the Forum for Quality and Effectiveness in Health Care is charged with promoting the quality, appropriateness, and effectiveness of health care by facilitating the development of clinical guidelines.

Congress has recognized the need for clinical practice guidelines, according to David Schulke, Chief of Oversight for the US Senate Special Committee on Aging.[1] The interest of Congress in medical practice patterns was triggered a number of years ago, when medical studies showed that a great deal of unnecessary surgery was being performed. Initial reactions of outrage resulted in the passing of stronger laws to protect against fraud and abuse. Mr. Schulke further remarked that unexplained regional variation in medical practice has raised Congressional speculation that unnecessary surgery results not from fraud and abuse but from lack of clinical research in medical practice.[1] Congress has thus embraced the idea that wide acceptance of the AHCPR clinical practice guidelines will improve medical practices, and it views physician and consumer education as a means to provide maximum assimilation of these guidelines into health care.[1]

The Institute of Medicine has provided the working definition of practice guidelines: systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific circumstances. The AHCPR guideline development efforts have been focused

on quality (i.e., what is best for the patient given available technology, financial resources, and patient preferences).[2] AHCPR has mandated that guidelines be explicit, based on science, developed by practitioners, and continuously revised. Guidelines are to focus on the care of the patient rather than who should provide it.[2] AHCPR has also stated that guidelines are not intended to serve as regulations.[3]

History of Guideline Development

At a peer-review session for the guidelines, methodological consultant Steven Woolf, MD, MPH, presented a history of guideline development.[4] Clinical practice guidelines that represent "informal consensus building" by groups of experts who meet to develop treatment modalities for a certain problem have been published for many years. These guidelines usually contain a general statement regarding their scientific basis. They are not necessarily founded upon comprehensive literature reviews, however, nor do these guidelines indicate the extent to which they are based on scientific evidence.

The growing science of guideline development emphasizes systematic methods and explicit examination of evidence.[4] Great care is devoted to how topics and panel members are chosen, how evidence is selected and reviewed, how good studies are selected, and how personal opinions can influence process. The more rigorous and explicit format provides guideline users with sufficient information to judge the quality of guideline recommendations.

The process has become more complicated because of the increasing importance of clinical practice guidelines. Dr. Woolf illustrated the importance of improvements in the process through an example.[4] He reported that a national organization of gastroenterologists recently issued practice guidelines recommending that sigmoidoscopy be performed more frequently. The organization did not indicate, however, whether the recommendation was based on documented improvements in health outcomes. As a consequence, users of the guideline are unable to respond to critics who claim that the recommendation represents a conflict of interest.

The AHCPR guideline process attempts to limit potential conflicts of interest by implementing several safeguards. The first is to ensure that panels are multidisciplinary. The second is to require potential panel members to disclose possible conflicts of interest before being seated. The third is an AHCPR mandate that guidelines be grounded in science. Finally, it is stipulated that there is to be full disclosure of the guideline development process. Even so, Dr. Woolf cautioned the group to remember that the new science of guideline development is still in its infancy and that each physician is responsible for evaluating the usefulness of any new guideline he or she might encounter.[4]

Pressure Ulcers: Importance of the Problem

The prevention and management of pressure ulcers was one of seven clinical problems chosen by AHCPR for guideline development based on the following criteria proposed by the Institute of Medicine: potential to improve individual patient outcomes, potential to affect large populations, potential to reduce unit or aggregate cost, and potential to reduce unexplained variation in clinical practice. The final report from the pressure ulcer guideline panel was published in May 1992 as an AHCPR document, publication no. 92-0047, available free directly from AHCPR.*

The guideline report states that the exact incidence and prevalence of pressure ulcers has been difficult to determine because of methodological obstacles that complicate generalizations based on existing data.[5] Nonetheless, the panel was able to review 38 articles to estimate the incidence and prevalence of pressure ulcers. The guideline document reports that the incidence of pressure ulcers in hospital settings ranged from 2.7 percent to 29.5 percent,[6,7] and the prevalence of pressure ulcers in hospitalized patients ranged from 3 percent to 30 percent.[8,9] In the most extensive study of acute care settings, Meehan[10] surveyed 148 hospitals and found a prevalence of 9.2 percent. Those most susceptible to pressure ulcers were quadriplegic patients (60 percent prevalence) and elderly patients with femoral fractures (66 percent incidence).[11,12] The panel also reported that in the long-term care setting, findings of incidence and prevalence rates for pressure ulcers ranged from 2.4 percent to 23 percent.[13-15] The incidence and prevalence rates in the home care setting are not known.

*Call the AHCPR Clearinghouse toll-free at 1-800-358-9295 or write to: AHCPR Publications Clearinghouse, P.O. Box 8547, Silver Spring, MD 20907.

Purpose of the Panel and Scope of the Guidelines

During its initial meeting, the panel decided that the topic of prevention and management of pressure ulcers was too large for a single guideline document. Consequently, the topic was separated into two guidelines: the first on prediction and prevention of pressure ulcers, and the second on treatment of pressure ulcers. This report covers the first guideline, *Pressure Ulcers in Adults: Prediction and Prevention*, released in May 1992. Because the Congressional legislation mandated that guidelines be developed for three different audiences — practitioners, consumers, and educators — several slightly different presentations of the guideline have been released. The purpose of this guideline and the condition it targeted were defined by the panel as follows:

> This guideline's purpose is to help identify adults at risk of pressure ulcers, to define early interventions for prevention, and to describe treatment for Stage I pressure ulcers [nonblanchable erythema of *intact* skin].[5 p 7]

Interventions considered by the panel were early detection maneuvers (staff education, risk assessment, skin inspection), pressure-reducing techniques, and skin treatments designed to increase tissue tolerance to pressure.

A pressure ulcer was defined as "any lesion caused by unrelieved pressure resulting in damage of underlying tissues. Pressure ulcers usually occur over bony prominences and are graded or staged to classify the degree of tissue damage observed."[5 p 1] The panel believed that the staging system suggested by the National Pressure Advisory Panel and based on previous staging and grading systems provided a good framework for defining pressure ulceration.[16 p 25]

Stage I: Nonblanchable erythema of intact skin

Stage II: Partial-thickness skin loss involving epidermis and/or dermis

Stage III: Full-thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia

Stage IV: Full-thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures (for example, tendon or joint capsule)

Methodology for Guideline Development

Panel Selection

Panel members were appointed by AHCPR, and each member was endorsed by at least one professional organization.[5] The panel included 3 physicians (1 family physician, 1 internist, and 1 dermatologist), 1 basic scientist, 1 biomedical engineer, 5 nurses, 1 occupational therapist, and 1 consumer advocate. Nancy Bergstrom, RN, PhD, a professor of nursing at the University of Nebraska and a nationally known researcher in pressure ulcer prevention, served as panel chair. Steven Woolf, MD, MPH, a family physician and expert in clinical guideline development, provided methodological consultation and advice to the panel.

Conduct of the Panel

Panel members met six times from August 1990 to September 1991. The panel was given its charge by representatives of AHCPR at the first meeting, and it approved the completed guideline at the sixth meeting. Before the first meeting, the AHCPR provided the group with several large bibliographies of article abstracts that had been created by the National Library of Medicine (NLM). Members performed literature reviews between meetings and used the general meetings to report their progress and recommendations.

During the first meeting, the panel defined the scope of its task and divided into subgroups. The second meeting was used to refine and narrow the panel's scope to prediction, prevention, and treatment of Stage I pressure ulcers only. Treatment of Stage II through IV pressure ulcers was delegated to the treatment guideline panel. The panel met a third time in December 1990 for an open forum. At the fourth meeting, in February 1991, the guidelines were drafted and prepared for peer review, and panel members rated the strength of the evidence supporting each recommendation.

The fifth meeting in March 1991 was jointly sponsored with the National Pressure Ulcer Advisory Panel, a private not-for-profit group dedicated to reducing the occurrence of pressure ulcers, the Association of Rehabilitation Nurses, and the International Association for Enterostomal Therapy. This meeting served as the first peer-review session for the guidelines. Nine peer reviewers spoke on the impact of the guidelines in ethical, fiscal, legal, clinical, and administrative arenas.

After this feedback the guidelines were modified and distributed to 27 additional peer reviewers who had professional backgrounds in medicine, nursing, bioengineering, occupational therapy, health care administration, education, nutrition, and statistics. In addition, five professional health provider organizations selected members to serve as peer reviewers. Peer reviewers were asked to evaluate the comprehensiveness of the literature review, the validity of the conclusions based on the literature review, and the practicality of implementing the guidelines in the clinical practice setting. The panel members analyzed the reviewers' comments and modified the guidelines accordingly.

Pilot testing of the guidelines occurred at 20 sites across the country. These sites included acute care hospitals, long-term care facilities, and home health agencies. Participants in the pilot tests were asked to review each guideline, test it informally on a small number of patients, and provide feedback to the panel on the practicality of its implementation. The feedback from the peer reviewers and pilot test sites was reviewed by the panel at its sixth meeting in September 1991. The guidelines were revised, finalized, published in booklet form, and released in May 1992.

Review of the Evidence

The National Library of Medicine has been designated as the information center for AHCPR and its projects. Before the first meeting, a computerized literature search for articles on pressure (decubitus) ulcers was performed using MEDLINE and 20 other data bases. The panel reviewed a bibliography with abstracts at the first meeting. NLM also provided each panel member with a complete copy of abstracts. Product manufacturers were contacted and asked to supply any published or unpublished literature relevant to the panel's deliberations. Finally, personal files of individual panel members were reviewed and made available to the entire group.

Approximately 12,000 abstracts were selected and reviewed through this process. Initially, only research studies on pressure ulcers were accepted for review. Some subgroups needed additional information, however, to draw conclusions. As a consequence, the panel accepted for review papers expressing expert opinion or research reports on related skin conditions. For example, there is a large body of literature on the assessment of skin hydration, but most of it relates to tests of cosmetics on skin hydration. The extent to which information about other skin conditions was extrapolated to pressure ulcers was determined by individual subcommittees. Guidelines resulting from this type of evidence were listed as based on expert opinion only. From the 12,000 abstracts reviewed, approximately 800 articles were chosen for possible inclusion in the evidence tables. Of these, 27 percent were research-based reports and 73 percent were nonresearch articles.[17] Approximately 130 of these articles are presented in the bibliography of the published guideline.

The panel tended to focus more on potential benefits than on potential harms of the various interventions. Because most interventions were thought to be safe (e.g., the use of skin moisturizers), the group focused on separating useful interventions from useless ones. The panel recommended avoiding interventions believed to be potentially harmful. Evaluation of cost was performed by a consulting health care economist, but unfortunately, there was insufficient information to reach a definitive judgment on cost.

Content of the Report

The guideline is divided into four overall sections covering four groups of goals. The first section focuses on assessment of a patient's risk for developing a pressure ulcer. The goal is to describe at-risk individuals and the specific factors that place those individuals at risk. The second section discusses care for unbroken skin. The goal of this section is to prevent injury by improving tissue tolerance to pressure. The third section discusses recommendations for support surfaces and pressure-reduction methods for prevention of pressure ulcers. Its goal is to protect against the adverse effects of external mechanical forces: pressure, friction, and shear. The fourth section presents recommendations for education in the prevention of pressure ulcers. The goal of the fourth section is to reduce the occurrence of pressure ulcers through educational programs.

The strength of evidence in support of each guideline statement was rated by the panel on a three-point scale adapted from the US Preventive Services Task Force.[18]

1. Level A: There is good research-based evidence to support the recommendation
2. Level B: There is fair research-based evidence to support the recommendation
3. Level C: The recommendation is based on expert opinion and panel consensus

Overall, 26 recommendations were presented as part of the clinical practice guideline. Two of the recommendations were based on level A evidence, 4 were based on level B evidence, and 20 were based on level C evidence. The guideline recommendations that were research based are presented in the tables and commented upon briefly below. All recommendations based on expert opinion (level C) are presented in the tables without comment, because their rationale tends to be fairly obvious.

Risk Assessment Tools and Risk Factors

This section addresses the assessment of a patient's risk for developing a pressure ulcer. Table 1 presents the panel's recommendations. The goal of the recommendations is to "identify at-risk individuals needing prevention and the specific factors placing them at risk."[5 p 13] The subgroup selected 184 articles for review and inclusion in the bibliography of the guideline. Of these, 94 met the criteria to be included in one of the two summary evidence tables on risk assessment.[17] Articles included in the summary evidence table on risk assessment tools had to be published research studies on the predictive validity of the risk assessment tool, unpublished papers available for peer review, or a submission by a panel member of information that was expected to be published. Twenty-nine articles on risk assessment tools were included in the evidence table.

Table 1. Guideline for Risk for Developing Pressure Ulcers.

Recommendation (Strength of Evidence)	Text*
1 (Level A)	Bed- and chair-bound individuals or those with impaired ability to reposition should be asssessed for additional factors that increase risk for developing pressure ulcers. These factors include immobility, incontinence, nutritional factors such as inadequate dietary intake and impaired nutritional status, and altered level of consciousness. Individuals should be assessed on admission to acute care and rehabilitation hospitals, nursing homes, home care programs, and other health care facilities. A systematic risk assessment can be accomplished by using a validated risk assessment tool such as the Braden scale or Norton scale. Pressure ulcer risk should be reassessed at periodic intervals.
(Level C)	All assessment or risk should be documented.

*Panel for the Prediction and Prevention of Pressure Ulcers in Adults.[5]

Articles included in the summary evidence table on individual risk factors needed to be written in English and be reports of original research involving human subjects. These articles were required to be prospective studies with cases and controls, retrospective studies with cases and controls, or clinical trials that explored a relation between a risk factor and pressure ulcer development. Sixty-five articles on individual risk factors were included in the summary evidence table.

Comment: Recommendation 1

Immobility is the risk factor most consistently associated with pressure ulcer development, a conclusion based on four cohort trials involving 850 subjects.[19-22] These trials indicated that decreased mobility is associated with an increased pressure ulcer incidence. Numerous risk assessment scales have been developed and recommended for predicting risk of pressure ulcer development in immobile patients. The Norton scale[23] and the Braden scale[24] are the most extensively tested. In a study of 250 elderly subjects, a low score on the Norton scale correlated with a high rate of pressure ulcer development.[23] The Norton scale was shown to have low specificity, however, because even the highest risk group had only a 50 percent chance of developing a pressure ulcer. The Braden scale has been tested in numerous settings including the acute care hospital, the intensive care unit, and the long-term care facility. Its sensitivity and specificity in a general hospital setting were 100 percent and 90 percent, respectively.[24] While it appears that the use of the Norton scale may overpredict pressure ulcer development more than the Braden scale does, the differences were not dramatic enough to favor one scale clearly more than the other. The panel recommended that risk assessment be performed

at the time of admission to an acute-care or long-term care facility and at an unspecified interval after that. The most appropriate interval at which to reassess a patient's risk is not known and represents an area for future research.

Skin Care and Early Treatment

This section discusses care of unbroken skin, its goal being to maintain and improve tissue tolerance to pressure to prevent injury. Table 2 presents the panel's recommendations. They are based on information gathered from 50 research articles and 277 other articles.[17] Information in the research articles was extracted and summarized in evidence tables. The panel numbers reviewed all documents that specifically addressed the care of intact human skin for the purpose of preventing pressure ulcers. Unfortunately, most of the research articles dealt with general skin care and did not address the effects of interventions on pressure ulcer prevention. Seven of the eight recommendations in this section are based on this indirect evidence and were judged to be supported by level C evidence only. The 4th recommendation is supported by a fair level of research-based evidence (level B).

Comment: Recommendation 4

Massage has been used to stimulate circulation for decades. Dyson[25] and Ek, et al.[26] have reported, however, that massage over bony prominences can cause skin damage and should be avoided. Dyson[25] studied 200 elderly patients in a geriatric hospital. One-half of the patients received massage over the sacrum and one-half did not. The nonmassaged group had a 38 percent reduction in pressure ulcer incidence. In addition, on biopsy the massaged tissue showed tearing

Table 2. Guideline for Care of Unbroken Skin.

Recommendation (Strength of Evidence)	Text*
1 (Level C)	All individuals at risk should have a systematic skin inspection at least once a day, paying particular attention to the bony prominences. Results of skin inspection should be documented.
2 (Level C)	Skin cleansing should occur at the time of soiling and at routine intervals. The frequency of skin cleansing should be individualized according to need and/or patient preference. Avoid hot water, and use a mild cleansing agent that minimizes irritation and dryness of the skin. During the cleansing process, care should be utilized to minimize the force and friction applied to the skin.
3 (Level C)	Minimize environmental factors leading to skin drying, such as low humidity (less than 40 percent) and exposure to cold. Dry skin should be treated with moisturizers.
4 (Level B)	Avoid massage over bony prominences.
5 (Level C)	Minimize skin exposure to moisture due to incontinence, perspiration, or wound drainage. When these sources of moisture cannot be controlled, underpads or briefs can be used that are made of materials that absorb moisture and present a quick-drying surface to the skin. For information about assessing and managing urinary incontinence, refer to Urinary Incontinence in Adults: Clinical Practice Guideline (available from AHCPR). Topical agents that act as barriers to moisture can also be used.
6 (Level C)	Skin injury due to friction and shear forces should be minimized through proper positioning, transferring, and turning techniques. In addition, friction injuries may be reduced by the use of lubricants (such as corn starch and creams), protective films (such as transparent film dressings and skin sealants), protective dressings (such as hydrocolloids), and protective padding.
7 (Level C)	When apparently well-nourished individuals develop an inadequate dietary intake of protein or calories, caregivers should first attempt to discover the factors compromising intake and offer support with eating. Other nutritional supplements or support may be needed. If dietary intake remains inadequate and if consistent with overall goals of therapy, more aggressive nutritional intervention such as enteral or parenteral feeds should be considered. For nutritionally compromised individuals, a plan of nutritional support and/or supplementation should be implemented that meets individual needs and is consistent with the overall goals of therapy.
8 (Level C)	If potential for improving mobility and activity status exists, rehabilitation efforts should be instituted if consistent with the overall goals of therapy. Maintaining current activity level, mobility, and range of motion is an appropriate goal for most individuals.
9 (Level C)	Interventions and outcomes should be monitored and documented.

*Panel for the Prediction and Prevention of Pressure Ulcers in Adults.[5]

whereas the nonmassaged tissue did not. Ek, et al.[26] demonstrated in 15 patients who had skin discoloration over a bony prominence that massage resulted in a decrease in skin temperature rather than the expected increase. Based on these two studies, it appears prudent to avoid massage over bony prominence.

Mechanical Loading and Support Services

This section presents guideline recommendations concerning mechanical loading of the skin and support surfaces (Table 3). The goal is to protect against the adverse effects of external mechanical forces: pressure, friction, and shear. Forty research-based articles and 107 other articles were selected for review.[17] The evidence table on support surfaces included only research articles that had the following characteristics: they were written in English, they were investigations of clinical outcomes of pressure-reducing devices used for at-risk patients, and they focused on prevention rather than on treatment of pressure ulcers. Thirteen articles on support surfaces fit these criteria.

Comment: Recommendation 1

Two clinical studies provided support for this guideline statement. In 1961, Exton-Smith and Sherwin[21] studied nocturnal movements in 50 elderly subjects. They measured nocturnal movements by placing sensors on the subjects' mattresses and found that those who developed pressure ulcers had the fewest nocturnal movements. In 1962, Norton and colleagues[23] developed a clinical risk assessment scale that predicted those patients who would have few nocturnal movements and were most likely to develop pressure ulcers. Norton, et al.[23] conducted a second study of 248 nursing home patients, which found that 9 percent of at-risk patients who were turned by the nursing staff every 2 to 3 hours developed pressure ulcers compared with 26 percent who were placed flat on their backs, the standard method of care at the time of the study.

Table 3. Guideline for Mechanical Loading of the Skin and Support Surfaces.

Recommendation (Strength of Evidence)	Text*
1 (Level B)	Any individual in bed who is assessed to be at risk for developing pressure ulcers should be repositioned at least every 2 hours if consistent with overall patient treatment goals. A written schedule for systematic turning and repositioning the individual should be used.
2 (Level C)	For individuals in bed, positioning devices such as pillows or foam wedges should be used to keep bony prominences from direct contact with one another, according to a written plan.
3 (Level C)	Individuals in bed who are completely immobile should have a care plan that includes the use of devices that totally relieve pressure on the heels, most commonly by raising the heels off the bed. Do not use donut-type devices.
4 (Level C)	When the side-lying position is used in bed, avoid positioning directly on the trochanter.
5 (Level C)	Maintain the head of the bed at the lowest degree of elevation consistent with medical conditions and other restrictions. Limit the amount of time the head of the bed is elevated.
6 (Level C)	Use lifting devices such as a trapeze or bed linen to move (rather than drag) individuals in bed who cannot assist during transfers or position changes.
7 (Level B)	Any individual assessed to be at risk for developing pressure ulcers should be placed when lying in bed on a pressure-reducing device such as foam, static air, alternating air, gel, or water mattress.
8 (Level C)	Any person at risk for developing a pressure ulcer should avoid uninterrupted sitting in a chair or wheelchair. The individual should be repositioned, shifting the points under pressure at least every hour or be put back to bed if consistent with overall patient management goals. Individuals who are able should be taught to shift weight every 15 minutes.
9 (Level C)	For chair-bound individuals, the use of a pressure-reducing device such as those made of foam, gel, air, or a combination is indicated. Do not use donut-type devices.
10 (Level C)	Positioning of chair-bound individuals in chairs or wheelchairs should include consideration of postural alignment, distribution of weight, balance and stability, and pressure relief.
11 (Level C)	A written plan for the use of positioning devices and schedules may be helpful for chair-bound individuals.

*Panel for the Prediction and Prevention of Pressure Ulcers in Adults.[5]

Comment: Recommendation 7

The studies that compared various types of mattresses and wheelchair cushions had two variable outcomes. The first was interface pressures. Studies of interface pressures assessed the amount of compressive pressure present at the interface between the support surface and the patient's skin. Note that because a safe level of interface pressure cannot be precisely defined, interface pressure can be considered only an intermediate outcome variable. For many years, 32 mm of interface pressure has been reported to represent capillary closing pressure and thus be the pressure above which tissue ischemia and pressure ulcers occur. This measure, however, represents the mean capillary closing pressure in the fingernail beds of healthy volunteers, and it is questionable whether the skin of elderly patients who are at risk for pressure ulcers responds in the same way. The interface pressure readings for various mattresses can be used to compare performance characteristics of the mattresses but should not be used to determine whether a mattress is safe for a particular patient.

The second type of study used skin damage as an outcome variable. The evidence table consisted of 13 clinical studies of the effects of a variety of pressure-reducing devices on prevention of pressure ulcers in at-risk patients. Overall, compared with the standard hospital bed, the pressure-reducing mattresses resulted in a lower occurrence of pressure ulcers. In the largest of the studies, Anderson, et al.[27] found that among 600 at-risk hospitalized patients, those who received a water or an air mattress were less likely to develop pressure ulcers than those who received a standard hospital mattress. There was no difference in the rate of pressure ulcer development between the air mattress and water mattress groups. The panel found no specific pressure-reducing mattress or cushion to be clearly superior to the others.[27-29] It seems that any pressure-reducing device discourages development of pressure ulcers, but selecting among them is more a matter of personal preference than a matter of quality of care.

Education

The goal of recommendations presented in this section is the reduction of the incidence of pressure ulcers through educational programs (Table 4). The subgroup on education located 83 articles that specifically addressed educational programs for the prevention and management of pressure ulcers.[17] Forty-three of the 83 articles were summarized in the evidence table. Of these 43 articles, 12 were research articles with a described educational program, 11 were research articles without a described educational program, 14 were descriptions of educational programs that were not formally tested, 4 were guides or manuals, 1 was both a program description and guide, and 1 was a research article with a guide. Recommendations in this section are based on these 43 articles. There is 1 level A recommendation, 1 level B recommendation, and 2 level C recommendations.

Table 4. Guideline for Educational Programs to Prevent Pressure Ulcers.

Recommendation (Strength of Evidence)	Text*
1 (Level A)	Educational programs for the prevention of pressure ulcers should be structured, organized, and comprehensive and directed at all levels of health care providers, patients, and families or caregivers.
2 (Level B)	The educational program for prevention of pressure ulcers should include information on the following items: etiology and risk factors for pressure ulcers, risk assessment tools and their application, skin assessment, selection and/or use of support surfaces, development and implementation of an individualized program of skin care, demonstration of positioning to decrease risk of tissue breakdown, instruction on accurate documentation of pertinent data.
3 (Level C)	The educational program should identify those responsible for pressure ulcer prevention, describe each person's role, and be appropriate to the audience in terms of level of information presented and expected participation. The educational program should be updated on a regular basis to incorporate new and existing techniques or technologies.
4 (Level C)	Educational programs should be developed, implemented, and evaluated using principles of adult learning.

*Panel for the Prediction and Prevention of Pressure Ulcers in Adults.[5]

Comment: Recommendation 1

In 1988 Moody, et al.[30] showed that formal introduction of a hospital-wide educational program on the prevention and treatment of pressure ulcers reduced their occurrence without introduction of any other preventive or treatment intervention. Several other studies have suggested that a multidisciplinary team approach with a major educational component can decrease the rate and recurrence of pressure ulcers.[9,31-33] These educational programs are particularly well-developed in the rehabilitative setting and in units that specialize in the treatment of spinal-cord–injured patients. Teams developed around these prevention programs are known as pressure management teams, tissue teams, skin care teams, skin care task forces, and pressure ulcer committees.

Comment: Recommendation 2

The seven items listed in the recommendation make up the core of the pressure ulcer prevention programs presented in recommendation 1.[31-33] In one study, Moody, et al.[30] showed that an intensive course for nurses and physicians, which covered pathogenesis, staging, prevention, and treatment of ulcers, led to an important decrease in pressure ulcer rate in one acute care hospital.

Summary

Of the 26 recommendations made by the panel, only six (23 percent) have sufficient research data to warrant a level A or B strength of evidence rating. Thus expert opinion, while traditionally valuable for filling the gaps where research-based information is missing, is used more extensively than data to support the recommendations of this guideline. The literature on pressure ulcers is voluminous but of variable quality. After reviewing this literature, I am not surprised at the confusion and frustration that physicians feel when trying to prevent pressure ulcers. More research is needed to confirm or refute expert opinion on prevention of pressure ulcers. The guideline does, however, provide physicians five specific steps that can be used to prevent pressure ulcers in their patients: (1) perform a risk assessment on all bed- and chair-bound patients, (2) keep the pressure off the bony prominences of at-risk patients by using a turning schedule, (3) use a pressure-reducing mattress in the treatment of all at-risk patients, (4) avoid massage of bony prominences, and (5) encourage the development of institutional educational programs or skin care teams for the prevention and treatment of pressure ulcers. The remaining 20 recommendations are reasonable and can be applied selectively, but they are based on expert opinion and have not been shown to reduce the rate of pressure ulcers in well-designed research studies.

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