# AN ALGORITHM FOR THE ASSESSMENT AND MANAGEMENT OF RISK FACTORS RELATED TO PRESSURE ULCER DEVELOPMENT

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LINDA E. WARREN

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# AN ALGORITHM FOR THE ASSESSMENT AND MANAGEMENT OF RISK FACTORS RELATED TO PRESSURE ULCER DEVELOPMENT

By

Linda E. Warren

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Abstract

This scholarly project describes risk factors related to pressure ulcer development and an algorithm which can be used to assess and treat those risk factors. The literature review validates the need for prevention of pressure ulcers as reflected through morbidity and mortality statistics. Approximately 2 million Americans suffer from pressure ulcers at any given time, while 60,000 deaths per year are directly related to pressure ulcers (Brody, 1986; Staas & Cioschi, 1991). It is estimated that in the United States, home health nurses spend 50-75% of their time on wound care (Harding, 1995). Scientific and theoretical implications for advanced nursing practice are explored. Health care problems associated with pressure ulcer risk, as identified by the Calhoun County Health Improvement Project (1993), are also examined. The Health Promotion Model (Pender, 1996), a key component in the assessment process of the proposed algorithm, is described. Conceptual and operational definitions related to pressure ulcer prevention are addressed. Barriers to and possibilities for research are offered.

Three risk assessment scales which evaluate a person's potential for pressure ulcer development are described. Based on the review of the literature, the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) was selected as the assessment tool of choice. For this project, a multi-step algorithm was created which includes the following components: (a) History and physical assessment; (b) selected information based on the history and physical directly related to pressure ulcers is presented through the Adaptation of the Revised Health Promotion Model; (c) a risk assessment scale, i.e., Braden Scale for Predicting Pressure Sore Risk, (Braden & Bergstrom, 1987); (d) nursing interventions based on Wound Ostomy and Continence Nurses Society Standards (1992) and the Agency for Health Care Policy and Research Guidelines (1992); (e) the schematic algorithm and (f) an intervention protocol.

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# Chapter 1

## Background

The skin is the largest organ of the human body and has a multitude of functions (Maklebust & Sieggreen, 1996). It is the body's first defense against infection. Any disruption in the skin leads to a higher risk of infection (Gosnell, 1987).

The pressure ulcer, an injury to the skin's integrity, has been an ongoing health problem over many centuries. Those identified in Egyptian mummies dating as far back as the twenty-first dynasty (Krasner, 1990) were treated with concoctions such as crocodile dung, human urine and burned frog in oil (Magner, 1992).

In 1866, the English surgeon Hunter regarded the understanding of pressure ulcers as an essential part of the practice of surgery. Hunter's tutelage led to the requirement of knowledge and treatment of pressure ulcers as part of the medical degree in the practice of surgery at St. Bartholomew's Hospital and the Royal College of Surgeons in London (Bliss, 1992).

In 1989, the Agency for Health Care Policy and Research (AHCPR) selected prediction, prevention and early treatment of pressure ulcers as one of the seven predominant diagnoses for guideline development and published those guidelines in 1992. The AHCPR has encouraged health professionals to use a risk assessment scale to identify those persons prone to pressure ulcer development (Ramundo, 1995). According to the AHCPR (1992), the occurrence of pressure ulcers warrants concern, especially in high-risk groups.

It is estimated that all persons over the age of 65 have a 60% to 90% chance for pressure ulcer development, while quadriplegics have a 60% risk for pressure ulcers (Cooper, 1991). In general the elderly have little or no knowledge of the risk factors for skin breakdown. As part of their rehabilitation, quadriplegics are educated regarding skin care and pressure ulcer prevention. It is this author's opinion that the lower percentage of

pressure ulcers among quadriplegics is directly related to education.

Young adults, children and neonates are also at risk for pressure ulcer development and require risk assessment. Disease processes, oxygen saturation and medications must be kept in mind for this population. Common causes of pressure ulcers in children include incontinence, friction, and shortgut syndrome (Hagelgans, 1993).

Cooper (1991) reports that between 1.5 and 3 million persons in the United States have a pressure ulcer at any point in time. Staas and Cioschi (1991) provide the following statistics: (a) In 1987 more than 532,000 Medicare hospital days were used by patients with pressure ulcers as a primary diagnosis, (b) one million, seven hundred and fifty nine thousand Medicare hospital days were used by patients with pressure ulcers as a second diagnosis, and (c) left untreated or in advanced stages, pressure ulcers result in approximately 60,000 deaths per year in the United States.

In 1995 the national cost of wound care was $8,730,000.00 (Harding, 1995). The combined cost of pressure ulcer treatment in acute care, extended care and home health care settings may be well exceed ten billion dollars according to a Bristol-Myers Squibb Company survey (Marwick, 1992).

Incidence and prevalence studies of pressure ulcer development remain ambiguous across all health care settings due to methodological barriers in data collection (AHCPR, 1992). Data related to pressure ulcer incidence and prevalence in the extended care and acute care settings are more easily obtainable than data from the home health care setting. Therefore, prevalence and incidence of pressure ulcers in the home health care setting is the least understood. Studies suggest that prevalence of pressure ulcer development in the home health care setting ranges from 8.7% to 20%, while incidence is estimated to be between 17% and 20% (AHCPR, 1992: Ramundo, 1995).

## Statement of the Problem

Virtually any pressure ulcer may be attributed to negligence (Hogue, 1992). Most

pressure ulcers can be prevented (Kresevic & Naylor, 1995). Prevention is the treatment of choice (Gosnell, 1987). Many pressure ulcers can be prevented by identifying those persons at risk (Thomas-Hess, 1992). When determining how a risk assessment plan is to be instituted, clinicians select one or more of the following three options: (a) Assume all persons are at risk, (b) use their clinical judgment and intuitive sense to identify those at risk, and (c) utilize a risk assessment scale (Bryant, Shannon, Pieper, Braden, & Morris, 1992).

With the advent of prospective payment and the growth of managed care, home-health care agencies must provide prevention as well as active intervention of disease states. For this project a Medicare certified southern Michigan home health care agency provides current background data. This agency has a large percentage of patients that have the potential for or currently have pressure ulcers. It is estimated that 30% of the approximately 90,000 visits made per year by this organization's representatives are for treatment of pressure ulcers (Personal communication with D. Morgan, RN, CETN, Wound Care Program Coordinator, 1996). Currently the agency does not have a comprehensive pressure ulcer prevention program in place, however the agency management has indicated it is eager to implement the proposed algorithm.

In Calhoun County, Michigan, where this home health care agency is located, the proportion of seniors is larger than in other counties in the state of Michigan. One in seven residents of Calhoun County is age 65 or older (Calhoun County Profile, 1993). This senior population presents its own health care problems and concerns. A large proportion of these seniors are living in poverty; the per capita income in Calhoun county is $12,729 as compared to $14,154 for the State of Michigan. The number of persons in poverty in 1990 was 18,832 or an increase of 28.8% over the last decade. Nine and one-half percent of persons over the age of 65 lives below the poverty level (Calhoun County Profile, 1993). Persons in poverty often experience poor nutrition, poor housing, poor education,

lack of adequate transportation and lack of access to health care. These persons often become recipients of home health care services.

In addition to the high proportion of seniors, Calhoun County has the highest chronic disease rate of all Michigan counties (Calhoun County Profile, 1993). The county ranks highest among all of the counties in the state in leading causes of death by diseases of the heart, malignant neoplasms, cerebrovascular diseases, accidents and adverse effects, chronic obstructive pulmonary diseases and allied conditions, diabetes mellitus and atherosclerosis (Calhoun County Profile, 1993). One of the major sequelae to such debilitating disease processes is the development of pressure ulcers.

## Purpose and Significance of the Scholarly Project

This scholarly project documents a need for a comprehensive pressure ulcer prevention program, examines current approaches to pressure ulcer prevention in home health care and presents an algorithm which can be implemented by home health care agencies. The algorithm incorporates a risk assessment scale which predicts the potential for pressure ulcer development. The Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987, Appendix B), the risk assessment scale of choice, is used as an indicator of the potential for pressure ulcer development for individual clients. Permission for use of the scale was obtained from its' authors prior to its use in this scholarly project (See Appendix A).

A standardized, comprehensive pressure ulcer prevention program is essential to effectively prevent the occurrence of pressure ulcers (Bryant, et al., 1992). Knowledge of the risk factors is imperative for the nurse to conduct a comprehensive assessment (Gosnell, 1987). Research-based instruments have been developed that augment identification of those persons at risk for pressure ulcer development (Gosnell, 1987).

## Nursing's Role

A large amount of literature exists for nurses attempting to reduce the incidence of

pressure ulcers (Makelbust & Sieggreen, 1996). Advanced knowledge of pressure ulcer etiology has improved the ability to identify those persons at risk for developing skin breakdown (Braden & Bryant, 1990). Nurses have long appreciated the need for a credible way to assess patients at risk for pressure ulcer development (Braden & Bryant, 1990) and have become specially trained in the area of wound care. Conscientious nursing practice requires methodical assessment of pressure ulcer risk factors (Buhrer & Mitchell, 1996). Assessment and evaluation are imperative nursing responsibilities to maintain skin integrity and promote health (Gosnell, 1987).

Advance practice nurses (APN's), because of the diversity of practice settings and advanced knowledge, are in a position to offer expertise in the prevention of pressure ulcers and wound care. By virtue of the educational process, and required oral and written communication skills, the APN is in a key position to articulate health care needs to the public (Yoder, 1991). Maraldo and Solomon (1987) state, "The current environment provides fertile ground for nursing to cultivate and nourish the vision of becoming primary care providers in a health care system that emphasizes preventing illness and optimizing the health of individuals through the encouragement of healthy behaviors" (p. 87). Risk assessment for the prevention of pressure ulcers is clearly appropriate for the role of the advanced practice nurse.

Risk Assessment Scales

Risk assessment scales are a relatively new concept. Three instruments designed to predict the risk of pressure ulcers have been identified in the literature. The Norton Risk Assessment Scale (Norton, 1962) consists of five categories including physical condition, mental state, activity, mobility and incontinence. The Gosnell Scale (Gosnell, 1973) is an adaptation of the Norton Risk Assessment Scale; it identifies five parameters consisting of mental status, incontinence, mobility, activity and nutrition. The Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) is composed of six subscales

including sensory perception, skin moisture, physical activity, nutritional intake, friction and shear, and ability to change and/or control body position. Only registered nurses have been found to reliably use any of the three scales (Bryant, et al., 1992). The scale is used only as a predictor of potential pressure ulcer development, and must be used in conjunction with sound clinical judgment to assess the potential of pressure ulcer development on all clients admitted to a southern Michigan home care agency. The scale does not suggest treatment of existing pressure ulcers. It is used strictly for prevention.

Contributing Factors

Cognitive Abilities

One's cognitive abilities impact the capability to be active, to sense pain or to recognize incontinence. An example of changes in cognitive function that would impact one's capabilities is the Alzheimer's patient who can ambulate and change position but does not do so without assistance. Decreased sensory perception may limit one's response to stimuli, i.e., the patient with multiple sclerosis that does not feel the coiled catheter tubing beneath his buttocks that is causing an area of pressure.

Incontinence

Incontinence increases the risk of pressure ulcer formation by excessive tissue moisture and by chemical irritation. It has been suggested that fecal incontinence is more detrimental to the skin than urinary incontinence. Feces contains bacteria and toxins that increase the pH of the skin and make the skin more permeable to caustic substances (Maklebust & Sieggreen, 1996).

Nutrition

Nutrition is one factor that plays a key role in the development of pressure ulcers. Serum albumin is a better predictor of pressure ulcer formation than weight (Hanan & Scheele, 1990). Protein deficiency renders soft tissue more vulnerable to breakdown when exposed to pressure. Low protein levels also promote decreased resistance to infection

because of the effect on the immune system (Bryant, et al. 1992).

Activity

Activity refers to a person's ability to remove pressure from skin areas through standing or walking. Mobility, on the other hand, is one's ability to change maintain position (Bergstrom, Braden, Laguzza, & Holman, 1987). Both activity and mobility have to do with position change, thus decreasing and/or eliminating pressure to the skin.

Friction and Shear

Friction and shear lead to mechanical destruction of soft tissue. Shear is most likely to occur when patients are dragged over sheets during repositioning or with elevation of the head of a hospital bed. The body skeleton slides downward as the soft tissue is being propelled upward. A high level of shearing force may reduce by one-half the amount of pressure needed to cause vascular occlusion and pressure ulcer development. Friction commonly occurs when patients are unable to lift themselves and the outer layer of skin is pulled away with repositioning (Maklebust & Sieggreen, 1996). Friction leads to tissue damage and susceptibility to pressure ulcer development.

Consideration

Multiple factors must be considered when doing a risk assessment, and the evaluator must incorporate the risk assessment scale into a total evaluation. The total evaluation must consider underlying disease processes, which may precipitate the development of pressure ulcers and slowed healing. Medications must be thoroughly assessed. Medications such as steroids may impede wound healing. The presence or absence of a capable and willing caregiver must be determined. A holistic nursing assessment is an imperative component of any risk assessment program.

## Operational Definitions

For a clearer understanding of the underlying assumptions and the terms used in this project the following operational definitions are provided.

Algorithm is a schematic representation of a process leading to a goal, the process of calculating a means to an end.

Pressure ulcer, also referred to as pressure sore, bed sore, or decubitus ulcer, is defined by the National Pressure Ulcer Advisory Panel (1989) as "localized areas of tissue necrosis that tend to develop when soft tissue is compressed between a bony prominence and an external surface for a prolonged period of time."

Health has multiple definitions; however, Greifinger's definition will be applied. Health is "...a process of becoming; a dynamic movement toward full realization of latent possibilities, not only in the human body, but in human feeling, minds, and spirits." (Leddy & Pepper, 1985, p. 155). This definition has been selected because it is applicable to the nursing process, which is an essential component of risk assessment. Providers must understand the concept of health to assist the patient to move in the direction of optimum well-being.

Patient is any individual in his/her home being served by the home health care agency.

Caregiver is the professional or non-professional person or persons participating in or providing self-care activities for the patient.

Home care is nursing services to persons in the home setting under a physician's care who exhibit the need of intermittent skilled care and are, for whatever reason, unable to regularly leave their home to seek health care (Health Care Financing Administration, 1989).

Skilled care are those services that require the intervention of a professional nurse, i.e., education, assessment of specific health care needs, and/or implementation, management and evaluation of an overall plan of treatment.

Pressure ulcer risk assessment refers to the evaluation of those factors that predispose individuals to pressure ulcers.

The Braden Scale of Predicting Pressure Sore Risk is defined by the following concepts:

Sensory Perception is the ability to meaningfully respond to pressure-related discomfort.

Activity is the degree of physical activity the person usually performs.

Mobility is the ability to change and control body position.

Nutrition is a person's usual food intake, including enteral, intravenous, and oral intake.

Moisture is the degree to which skin is exposed to wetness.

Friction is surface damage caused by skin rubbing against another surface.

Shear is trauma caused by tissue layers sliding against each other in opposing directions, which results in the disruption or angulation of blood vessels (Braden & Bergstrom, 1987).

Prevention is a means of deterring skin breakdown.

Sensitivity is the number of patients predicted to be at risk that do actually develop pressure ulcers (Ramundo, 1995).

Specificity is the number of patients who are not predicted to be at risk that do not develop pressure ulcers (Ramundo, 1995).

Interventions are measures taken in response to defined criteria.

Significant change in health status is the improvement or deterioration in the patient's overall physical and/or mental condition.

## Conclusions

Pressure ulcers have been in existence for many centuries and remain a major health care problem in 1996. The development of instruments for assessing the risk of pressure ulcer development offers health care providers an opportunity to decrease both the incidence and prevalence of pressure ulcers. Once risk has been established, the implementation of appropriate interventions to prevent pressure ulcer development is imperative. The algorithm proposed in this scholarly project offers a step-by-step plan for pressure ulcer prevention.

## Chapter 2

### Conceptual Model

The Health Belief Model was developed in the 1950's by Rosenstock, Hochbaum, and Kegeles (Pender, 1987). The model provides a paradigm for exploring actions taken to prevent illness. It views perceived consequences, subjective estimates of outcomes and decision making (Pender, 1982). The Revised Health Promotion Model [RHPM] (Pender, 1996; see Figure 1) is an adaptation of the Health Belief Model (HPM) and will be operationalized for this project. Pender (1982), creator of the RHPM theorizes, "Perceived benefits and perceived value of early detection are important considerations early in the decision-making phase" (Pender, 1982, p. 54). The Adaptation of the Revised Health Promotion Model (see Figure 2) is well suited to this project because it applies the RHPM to the patient at risk for pressure ulcer development. .

Prevention is a fundamental element of the risk assessment scale. Though not recognized as a part of the model, the concept of prevention provides an underlying framework of the RHPM. Prevention, according to Pender (1982), is a set of actions to ward off disease or sequelae and may be described as health-protecting behavior because of its emphasis on defending the body from illness. Primary prevention provides specific protection against disease; at this level preventive measures include counseling, education, implementation of health practices or lifestyle changes (Pender, 1982). Secondary prevention consists of early diagnosis and immediate intervention. Early interventions are provided by organized screening and education (Pender, 1982).

Tertiary prevention begins early in the period of recovery to prevent complications. Those activities that decrease the potential for complications and maximizing patient abilities are emphasized (Pender, 1982).

The RHPM has three major concepts: (a) Individual characteristics and experiences; (b) behavior-specific cognitions and affect, and (c) behavioral outcome. Each

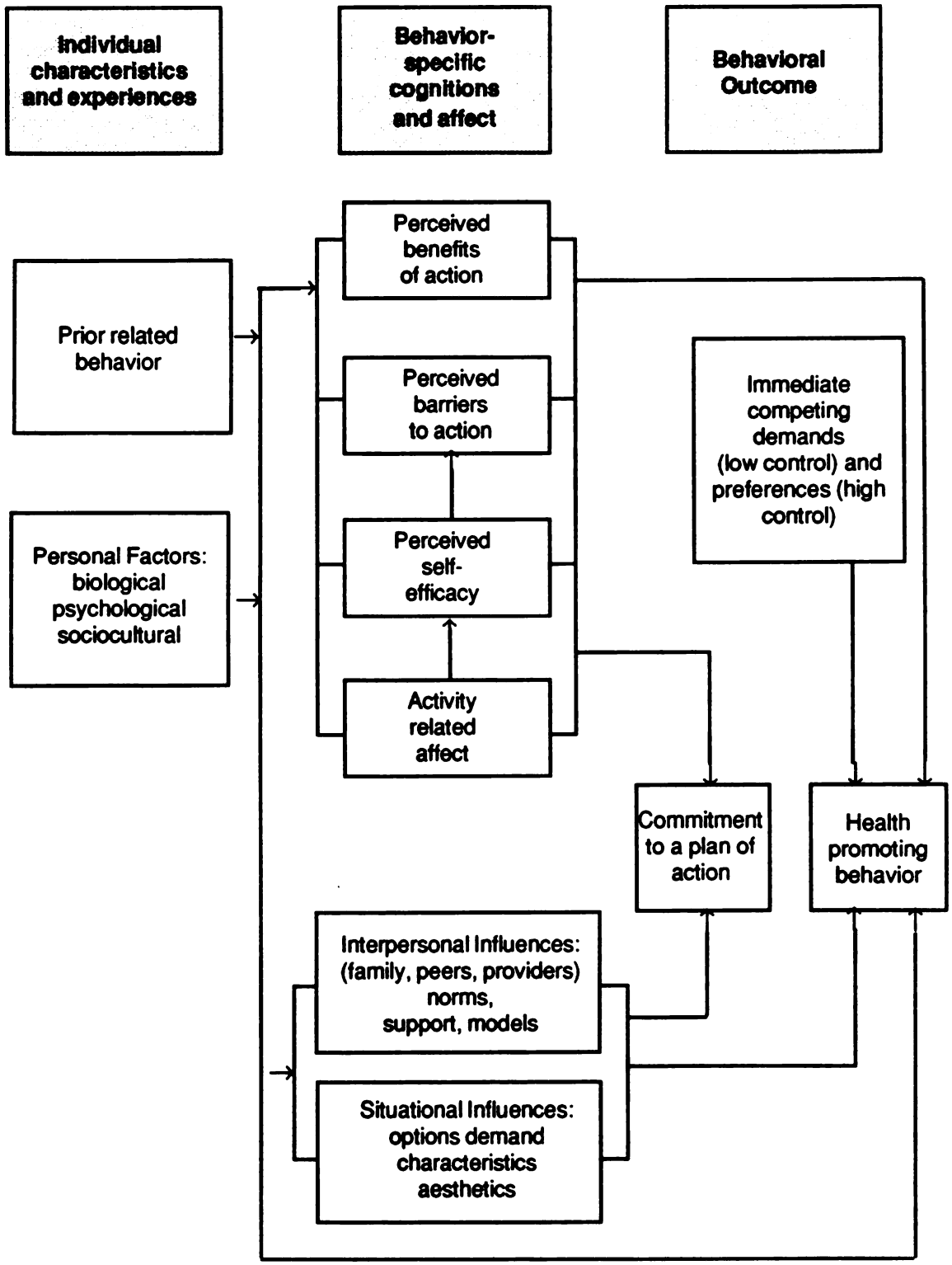


**Figure 1: Revised Health Promotion Model (Pender, 1996)**

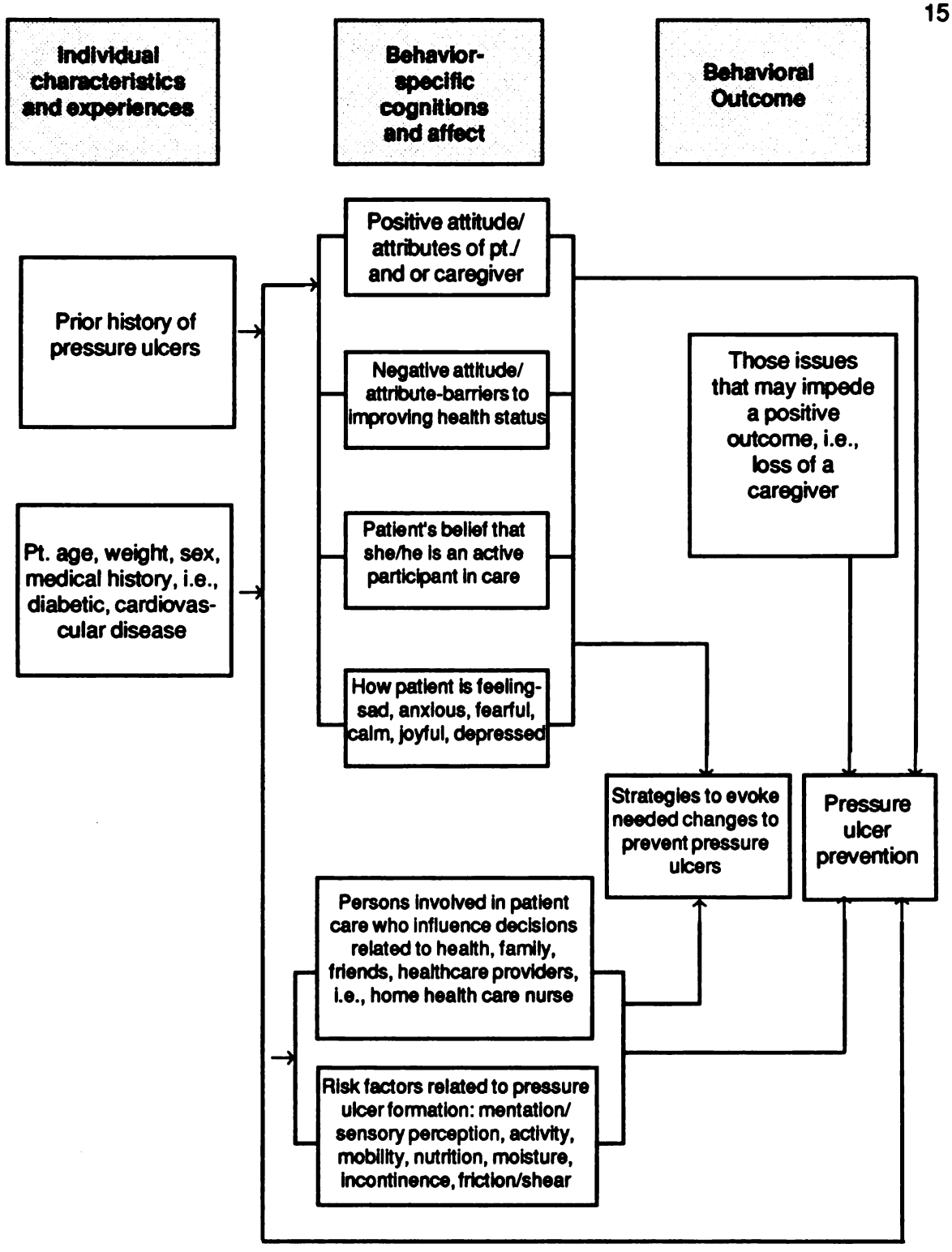


**Figure 2: Adaptation of the Revised Health Promotion Model**

concept contains variables that directly impact the concept and influence the outcome. The variables in the model are described below.

Individual Characteristics and Experiences

Prior related behaviors have both direct/automatic and indirect/influences that affect the likelihood of engaging in health promotion (Pender, 1996).

Personal factors include biological, psychological, and sociocultural aspects of the person (Pender, 1996).

Behavior-Specific Cognitions and Affect

Perceived benefits of action are intrinsic and extrinsic beliefs about the effectiveness of recommended preventive actions and affect the individual's perceived value of early detection (Pender, 1996).

Perceived barriers to action are parallel to perceived benefits, exercising a direct influence on the inclination to engage in health-promoting behavior (Pender, 1996).

Perceived self-efficacy is an individual's accountability for his or her own health (Pender, 1996).

Activity-related affect refers to the subjective states that occur before, during and after a behavior (Pender, 1996).

Interpersonal influences are defined as norms, or expectations of significant others, social support or instrumental and emotional encouragement, and modeling learned through observations (Pender, 1987).

Situational influences are perceptions of available options, demand characteristics, and aesthetic features of the environment (Pender, 1996).

Behavioral Outcomes

Immediate competing demands and preferences are behaviors that consciously intrude on the course of action and may affect the health-promotion activity (Pender, 1996).

Commitment to a plan of action refers to a decision to carry out specific actions and

identification of specific strategies to succeed with the plan (Pender, 1996).

Health-promoting behavior is the outcome or result of health promotion activities.

## Adaptation of the Revised Health Promotion Model

In the Adaptation of the Revised Health Promotion Model (ARHPM; see Figure 2), the major concepts are identical to the original model. However, the variables within each concept have been altered.

### Individual Characteristics and Experiences

Within the concept of Individual Characteristics and Experiences, the variable of a prior history of pressure ulcers has replaced prior related behavior. A history of pressure ulcers is important because the person's potential for breakdown as well as compliance with a wound treatment regime may be affected based on previous experiences.

Within the variable related to personal factors, medical history, age, height, weight and sex have replaced the original factors. These factors can aid in the assessment of the potential for pressure ulcer development. Underlying disease processes have been added since they can significantly affect the potential for pressure ulcer development.

### Behavior-Specific Cognitions and Affect

Within Behavior-Specific Cognitions and Affect, the area of perceived benefits is replaced with positive attitude or attributes of the patient and/or caregiver. Perceived barriers become negative attitudes or attributes of the patient and/or caregiver to improving health status. The patient's belief that she/he is an active participant in her/his health care replaces perceived self-efficacy. Activity-related affect now refers to feelings that are being emitted by the patient.

Interpersonal influences now refers to those persons who influence decisions related to health including health care providers. Situational influences reflect the subscales of the Braden Scale for Predicting Pressure Sore Risk. Knowledge of the subscales directly influences implementation of health promoting behaviors through interventions

directly related to results of the risk assessment. The risk factors are mentation, sensory perception, activity, mobility, nutrition, moisture, incontinence, friction and shear.

Behavioral Outcome Concepts

Within the Behavioral Outcome Concepts, the commitment to a plan of action can be influenced by the health care provider's ability to trigger appropriate reactions. Consequently, this variable is renamed as "strategies to evoke changes to prevent pressure ulcers". The intensity of the strategy will be dependent upon the individual's level of readiness to engage in health-promoting behaviors.

The nurse performing the risk assessment must be cognizant of the subconcept of immediate competing demands or those issues that may impede a positive outcome. The information obtained from individual characteristics and experiences along with cognitions and affect will facilitate understanding of competing demands. This variable does not differ from the original model. Health promoting behavior is renamed pressure ulcer prevention and is the ultimate outcome.

## Discussion

The RHPM (Pender, 1996) fits well with the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) because both address health promotion and illness prevention. The professional home health care nurse will have access to demographic information prior to visiting the patient in his or her home. The nurse will complete a total physical assessment of all patients admitted to the home health care agency. After meeting the patient and caregiver, the home care nurse can begin to assess interpersonal relationships and develop a positive nurse-patient relationship. The patient support system can be evaluated by the nurse and incorporated into the risk assessment plan.

## Conclusions

By utilizing the concepts in the Adaptation of the Revised Health Promotion Model incorporated in the proposed algorithm on all patients admitted to the specified home health

care agency, the nurse will be able to obtain information directly related to potential pressure ulcer development. Providing information in the non-threatening home environment should enhance patient/caregiver receptivity, increase the possibility of positive health promoting behaviors and consequently achieve the ultimate goal of pressure ulcer prevention.

# Chapter 3

## Review of the Literature

Despite an increasing body of knowledge related to the etiology of pressure ulcers, they remain a major health care problem (Colburn, 1990). According to the Agency for Health Care Policy and Research (1992), the incidence and prevalence of pressure ulcers are high enough to warrant concern among persons in all health care settings. The agency also asserts that prevention of pressure ulcers is much less costly than pressure ulcer treatment in terms of human suffering and financial cost.

In reviewing how the art and science of pressure ulcer prevention has changed in the last ten years, one is struck by the lack of change paralleling radical differences (Braden & Bryant, 1990). Misconceptions about pressure ulcer development continue to exist. Examples include: (a) Pressure ulcers are due to poor nursing care, (b) all pressure ulcers can be prevented, (c) massaging a reddened area will help prevent pressure ulcer formation, and (d) only the elderly debilitated patient is prone to pressure ulcer formation (Makelbust & Sieggreen, 1996). According to Stotts (1987) there are no statistically meaningful age-specific characteristics for pressure ulcer development.

## Anatomy and Physiology of the Skin

The surface area of the skin covers approximately six to eight feet; the skin is composed of two layers, the epidermis and the dermis (Alterescu & Alterescu, 1988). The outermost layer is the epidermis which is 75 microns to 0.6 mm thick and consists of five sub-layers, each of which has a specific function. The stratum corneum is the outermost layer and is sometimes referred to as the "horny layer". Because of its constant exposure to the environment and daily use, this layer is lost and replaced everyday (Alterescu & Alterescu, 1988). This layer has an acid mantle that maintains the ecology of the skin retarding certain fungal and bacterial growth and provides a water repellent covering.

Beneath the stratum corneum is the stratum lucidum, a packed translucent line of

flat cells located only on the palms of the hands and soles of the feet. The stratum granulosum is beneath the stratum lucidum when it is present; otherwise, it is beneath the stratum corneum (Wysocki & Bryant, 1992). This layer contains Langerhans cells which play a primary role in immune reactions and effect the inflammatory phase of allergic dermatitis (Maklebust & Sieggreen, 1996).

The next layer is the stratum spinosum. This layer does not have the ability to regenerate but is repaired through scar formation. The base of the epidermis is made up of the stratum germinativum referred to as the basal layer, which comes in contact with the second layer of the skin, the dermis or corneum (Maklebust & Sieggreen, 1996).

The dermis produces re-epithelialization through three phases: (a) Defensive phase, (b) proliferative phase, and (c) maturation phase. Within the dermis are blood vessels, lymphatic vessels, nerves, cellular components, i.e., fibroblasts, mast cells, leukocytes, and macrophages. Capillary occlusion initiates the healing cascade through the process of homeostasis (Alterescu & Alterescu, 1988). Tissue injury launches the clotting process activating coagulation (mast cells) leading to platelet aggregation, resulting in fibrin clot formation. Leukocytes are the first white blood cells to enter a wound and provide initial protection against bacteria. Macrophages then enter the wound "directing" the healing process and acting as defenders, phagocytizing bacteria and breaking down necrotic tissue. Fibroblasts play an essential role in the synthesis of collagen and production of connective tissue, enhancing wound repair (Doughty, 1992).

Pathophysiology of Pressure Ulcer Formation

Body tissues have different tolerances for pressure. The normal response to pressure is a position change before tissue ischemia occurs. Pressure ulcers can develop over any bony prominence or any area of soft tissue when exposed to prolonged, unrelieved pressure. (See Appendix C for Stages of Pressure Ulcers).

There are two schools of thought related to the formation of pressure ulcers. One

opinion is that pressure ulcers begin at the skin surface. The other speculation is that they begin at the bone soft tissue interface (Maklebust & Siegreen, 1996). Both theories remain under investigation.

There are multiple factors that contribute to pressure ulcer formation including inactivity, immobility, incontinence, excessive moisture, poor nutrition, altered cognition and/or sensation and the presence of friction/shear forces. Pressure remains the major cause of pressure ulcer formation leading to tissue ischemia and necrosis (Bryant, et al., 1992).

Pressure Ulcer Risk Assessment

Risk assessment can be accomplished through the use of a reliable risk assessment scale. Thomas-Hess (1992) asserts that the goal of a pressure ulcer risk assessment scale is to assess each person for potential or actual pressure ulcers and to implement appropriate and timely preventive and treatment modalities. The most effective plan is one that documents assessment of skin integrity on all patients (Gosnell, 1987).

Many dressing manufacturers have developed risk assessment scales. These scales lack reliability and validity measures; consequently, they were not considered for this algorithm (Gosnell, 1987).

Of the three published risk assessment scales available—the Norton Risk Assessment Scale (Norton, 1962), Gosnell Scale (Gosnell, 1973) and Braden Scale for Predicting Pressure Sore Risk (1987)—the Braden scale has had the most rigorous testing for reliability and validity (Ramundo, 1995). The first study (1987) produced a sensitivity of 100% and specificity of 90% with a cut-off scale of 16. The second and third studies demonstrated sensitivity of 100% and 83% respectively and specificity of 64% in both studies. The creators of the scale concluded that the instrument was reliable when used by registered nurses and that the scale was sensitive with some overprediction of risk. Limitations to the studies included difficulty defining Stage I pressure ulcers. The

originators of the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) contend that though prevention is important, it is also important not to overtreat because unnecessary prevention is costly (Ramundo, 1995). To ensure cost effective interventions an assessment scale should be reliable in predicting who will and will not develop pressure ulcers; the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) has proved accurate in identifying those persons who will/will not develop pressure ulcers (Braden & Bryant, 1990).

Clinical guidelines for prevention recommend the use of risk assessment scales for all patients regardless of the setting (Ramundo, 1995). Research emphasizes the need for valid and reliable risk assessment scales for use in both the acute care and extended care settings; however, a conspicuous shortage of such a scale in the home health care setting is evident.

The Braden Scale for Predicting Pressure Sore Risk

Three small non-experimental studies evaluating the validity and reliability of the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) and one study of the Norton Risk Assessment Scale in the home health care arena were discovered by this author. The sample sizes ranged from 30 to 103 and were convenience samples. The risk assessment scales and assessment variables were evaluated. The recurrent theme that was unearthed was that in the home health care domain, the presence or absence of a caregiver had a significant impact on the potential for pressure ulcer development. Ramundo (1995) reports that an able and willing caregiver is a significant variable in the risk of developing pressure ulcers in the home care setting. None of the current risk assessment scales include the presence or absence of a caregiver in its subscales. This may be due to the fact that the home care arena has not been the focus of research conducted on risk assessment scales.

The study conducted by Ramundo (1995) concluded that the Braden Scale for

Predicting Pressure Ulcer Risk (Braden & Bergstrom, 1987) is useful for evaluating patients at risk of developing pressure ulcers. However, a lack of specificity was identified as a limitation in the home health care setting. Ramundo collected data on 48 patients, seven of which developed pressure ulcers, an incidence rate of 17%. The mean score on the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) at which pressure ulcers developed was 17. Specificity was determined by the percentage of patients who did not develop pressure ulcers. At a score of 11 or below, the specificity was 98%; scores of 12 to 13 yielded 95% specificity; a range of 80% to 90% specificity was obtained at scores between 14 and 16; a score of 17 produced 63% and; scores above 18 led to 34% - 0% specificity.

The six subscales of the Braden Scale for Predicting Pressure Sore Risk (1988) have undergone much scrutiny and were adopted from the original risk assessment scales developed by Norton (1962) and Gosnell (1973). The subscales identify two crucial components of pressure ulcer formation, including the intensity and duration of pressure and the tolerance of the skin and supporting structures for pressure. The intensity and duration of pressure are associated with the subscales of mobility, activity and sensory perception. Tissue tolerance for pressure is influenced by both internal and external factors. External factors include moisture, friction and shear, while internal factors include nutrition, age and arteriolar pressure (Bergstrom, et al., 1987).

The subscales are rated from 1 (least favorable) to 3 or 4 (most favorable). There is a maximum score of 23 points. Each subscale is mutually exclusive with no overlap to another subscale (Bergstrom, Demuth, & Braden, 1987).

Patients in acute or extended care settings are deemed to be at risk for pressure ulcer formation at a score of 16 or less. At a score of 16, studies have found that the Braden scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) has a sensitivity of 83% and a specificity of 64% (Bergstrom, et al., 1987). Ramundo (1995) found in the

home health care setting that at a cut off score of 16, the tool was 29% sensitive; at 17, 43% sensitive; and at 18, 100% sensitive. However, at a score of 18, the tool had a low specificity and was thought to have led to costly overtreatment.

The authors of the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) encourage orientation to the scale (by the use of a video) followed by interater evaluations to ensure that each member of the nursing staff is using the instrument properly (Personal communication with N. Bergstrom, 1994).

Treatment of Identified Risk Factors

Risk assessment involves more than merely determining the patient's score on an assessment scale. It involves synthesizing risk factors with knowledge of additional contributing factors as well as sound nursing judgment (Bryant, et al., 1992). Several approaches have been suggested for pressure ulcer prevention guidelines. Fowler (1982) recommends that a pressure ulcer prevention program include pressure relief, nutrition, skin care, patient movement and patient/family education. Lidowski (1988) implemented the Nutrition, Assessment, Management and Prevention (NAMP) program which evaluates nutritional support, assessment and accountability, management by moist wound healing, and protocols for prevention/protection.

The Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) subscales can easily be incorporated into the program recommendations. In the clinical guidelines for pressure ulcer prevention, the interventions will be directly related to the scores from the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) for the individual patient. Based on results of the assessment, the nurse must determine which risk factors are present. The risk of pressure ulcer development is directly correlated with the number of risk factors that are present (Wound Ostomy and Continence Nurses Society, 1992).

Since unrelieved pressure greater than capillary closing pressure (32 mm Hg, on

average) is a predominant cause of pressure ulcers, it is important to provide effective pressure relief for those at risk (Colburn, 1990). Patients who have decreased sensory perception may not feel discomfort from pressure; this may result in unrelieved pressure over bony prominences, which significantly increases the risk of pressure ulcer development (Maklebust & Sieggreen, 1996).

Immobility and inactivity may or may not be related to sensory perception deficit. Immobility and inactivity are the greatest risks for pressure ulcer development. AHCPR guidelines (1992) advise evaluation of all bedridden and chairbound patients (Maklebust & Sieggreen, 1996). Patient mobility includes evaluation of reflexive body movements in bed or chair, active bed mobility, active chair/wheelchair mobility, activity, transfers, ambulation, distance and endurance (Feedar, 1994).

Once it has been established that pressure may be attributed to either a sensory deficit or immobility/inactivity, specific interventions related to these factors should be initiated. There are numerous pressure reducing devices available for both bed and chair. The Wound Ostomy and Continence Nurses Society (WOCN, 1992) cautions that pressure reducing devices should not be used alone. A pressure reduction device does not negate the need for position changes (Colburn, 1990). Frequent turning, repositioning, and mobility are essential elements of a prevention program (AHCPR, 1992). Those patients who cannot independently reposition themselves require passive repositioning on a regular schedule and pillow bridging (Maklebust & Sieggreen, 1996).

Historically, massage over bony prominences has been used to stimulate circulation and help prevent pressure ulcer formation. There is now scientific evidence to suggest that massage over bony prominences may be harmful and may, in fact, lead to tissue destruction (AHCPR, 1992). Education regarding avoiding massage over bony prominences must be part of any pressure ulcer prevention program.

Relief/reduction devices used include air, gel and water filled pads for chair and

bed; alternating pressure pads and mattress replacements, low air-loss and high air-loss mattress replacements and beds. There is no scientific proof that one support surface works better than another. Choice of pressure relief/reduction devices must be based on the individual patient's needs, clinical effectiveness, financial cost, ease of use, patient comfort, caregiver availability, durable medical equipment services and product availability (Maklebust & Sieggreen, 1996).

Exposure to irritating substances such as incontinent material and perspiration have long been implicated with pressure ulcer formation (Colburn, 1990). Skin cleansing should occur at the time of soiling and as needed to prevent pressure ulcer formation (AHCPR, 1992). Barrier cremes may be helpful in providing protection from excessive moisture (Colburn, 1990). Excessive cleansing with harsh soaps should be avoided since drying, flaking, and scaly skin is predisposed to pressure ulcer development (AHCPR, 1992).

Nutritional status is a critical predictor of the potential for pressure ulcer development. Aggressive nutritional support is a vital component of a pressure ulcer prevention program (Colburn, 1990). The intent of nutritional support is a diet containing appropriate nutrients to maintain tissue integrity (Makelbust & Sieggreen, 1996).

Friction and shear contribute to the mechanical destruction of tissue. Elevating the head of the bed increases shear, while pulling a patient across bed linens increases friction (Makelbust & Sieggreen, 1996). Correct positioning and the use of devices to assist with positioning may decrease the potential of breakdown from both friction and shear.

## Conclusions

After reviewing the current research literature related to pressure ulcer development, prevention of pressure ulcers, risk assessment, and treatment of risk factors, several conclusions can be drawn. Pressure ulcers remain a major health care issue in terms of illness and financial costs. Preventive protocols must be developed and implemented into

health promotion and illness prevention programs. APNs are in the forefront of health care reform and must be willing and able to take an active role in the implementation of preventive programs. In the home health care setting, research of risk assessment scales is lacking. Risk assessment is needed in the home health care setting as more patients are being cared for in their homes.

Research regarding those interventions that prevent pressure ulcer occurrence and their efficacy needs to be undertaken. At the present time there are no studies that could be found by this author that deal specifically with interventions to be initiated for patients at low, moderate or high risk for pressure ulcer development.

Testing of the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) has begun in the home health care setting. The scale has undergone significant testing in the acute and extended care settings and has been proven to be valid and reliable. Because of the scale's proven efficacy in acute and extended care, it is the most credible current choice for assessing pressure ulcer risk of patients of the selected home health care agency in Calhoun County, Michigan.

# Chapter 4

## An Algorithm for Use of The Braden Risk Assessment Tool in the Home Health Care Setting

This algorithm is designed for staff nurses in the home health care setting as a guide to determining the potential for pressure ulcer development. It provides a comprehensive step-by-step plan based on the following factors that are identified in the ARHPM (Figure 2): (a) Complete history and physical assessment, (b) prior history of pressure ulcers, (c) demographic information (age, weight, sex, medical history), (d) positive attitudes or attributes, (e) negative attitudes or attributes, (f) patient's belief that she/he is an active participant in her/his care, (g) patient feelings, (h) persons who influence patient health care decisions, (i) the score resulting from Braden Scale of Predicting Pressure Sore Risk (Braden & Bergstrom, 1987), (j) issues that may hamper a positive outcome and (k) strategies to evoke needed changes to prevent pressure ulcers. Interventions for patients considered prone to pressure ulcer development are based on AHCPR guidelines (1992) and WOCN Patient Care Standards (1992). The interventions are intended to be used for persons across the life span who are subject to developing pressure ulcers. The proposed schematic algorithm (see Figure 3) and the proposed intervention protocol (see Figure 4) are designed to be combined with sound clinical nursing judgment, and patient/caregiver and primary health care provider collaboration.

### Goals Related to Algorithm Development

The first goal of this algorithm is the identification of those patients at risk for pressure ulcer development. The second goal is early intervention to prevent pressure ulcers, consequently minimizing the cost of health care in terms of patient health and financial costs.

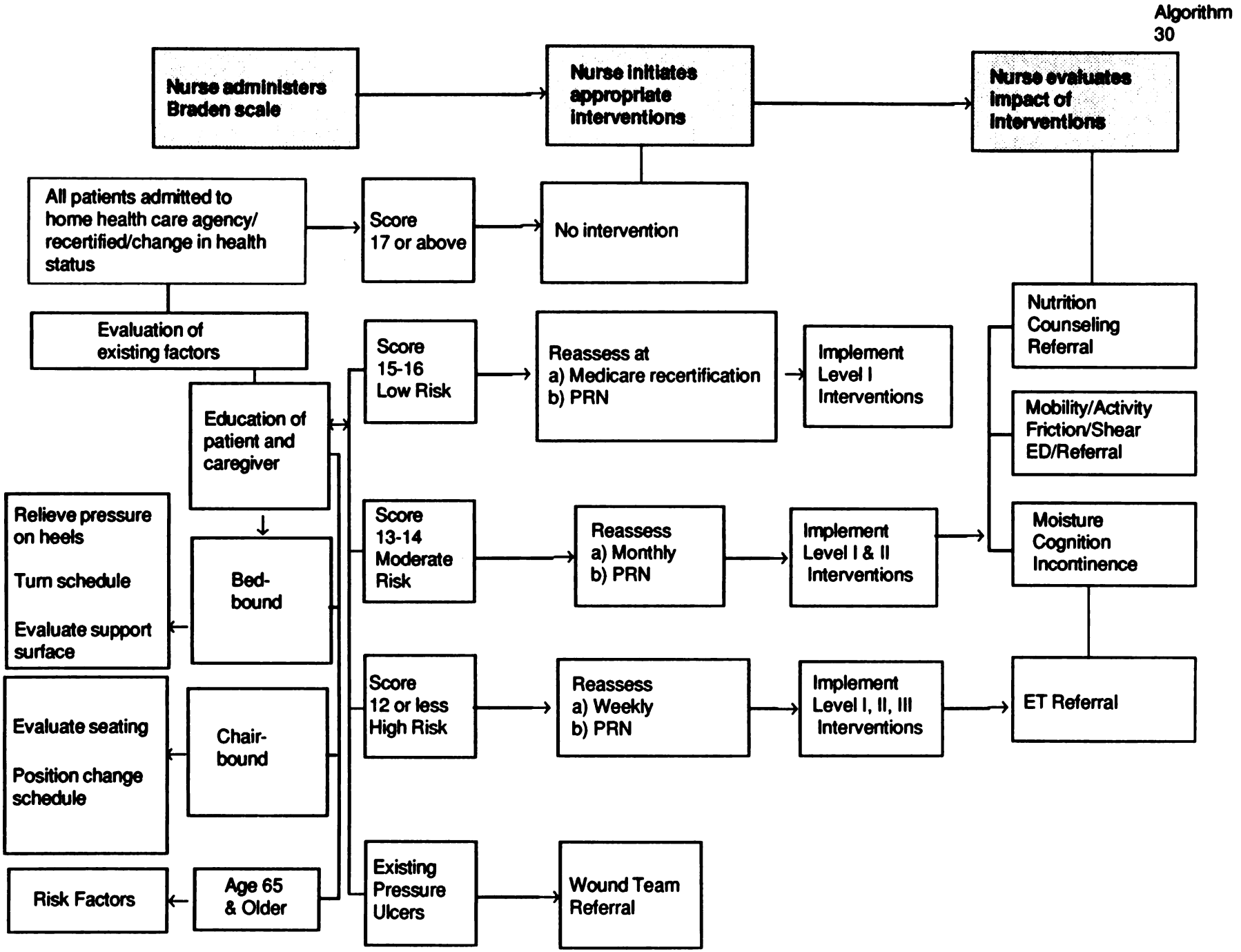


Figure 3: Proposed Schematic Algorithm

| | 17<br>No Risk at Present Time | 15-16<br>Low Risk<br>*Primary Prevention* | 13-14<br>Moderate Risk<br>*Secondary Prevention* | ≤12<br>High Risk<br>*Secondary Prevention* | Existing Pressure Ulcers<br>*Tertiary Prevention* |
|---|---|---|---|---|---|
| Step One<br>+ | No intervention | **Level I Interventions**<br>**Education**<br>Cleanse skin after it is soiled<br>Avoid factors that will dry skin<br>Do not massage bony prominences<br>Avoid excessive moisture<br>Avoid friction and shear<br>Adequate nutrition<br>Maintain mobility/activity<br>Bedbound Patients<br>Pressure off heels<br>Turn schedule<br>Evaluate support surface<br>Chairbound Patients<br>Evaluate seating<br>Position change schedule<br>Patients 65 and older<br>Evaluate risk factors | **Level I Interventions**<br>**Education (see left)** | **Level I Interventions**<br>**Education (see left)** | Wound Team Referral |
| Step Two<br>+ | | | **Evaluation**<br>3-day food diary<br>Assistive devices (turn sheets, Hoyer lift)<br>Bowel and bladder schedules | **Evaluation (see left)** | |
| Step Three<br>+ | | | **Level II Interventions**<br>(based on the individual patient)<br>Nutrition<br>Dietary counseling with or without dietary supplement<br>R.D. referral<br>S.T. referral<br>Dental referral<br>Blood work<br>Mobility<br>Devices (walker, trapeze, turn sheet, etc.)<br>Turn schedule<br>P.T. referral<br>Moisture/Cognition<br>Pads<br>Bowel or bladder program<br>Peri-care products | **Level II Interventions**<br>**(see left)** | |
| Step Four | | | | **Level III Interventions**<br>E.T. referral | |

**Figure 4: Proposed Intervention Protocol**

Implementation

The algorithm which incorporates the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987), AHCPR Treatment Guidelines (1992) and WOCN Patient Care Standards (1992) will be presented to the home health care agency for approval and implementation. The wound team, made up of registered nurses (RNs), has been eagerly awaiting this algorithm and will act as the pilot group. Inservice education including instructions related to use of the algorithm, and appropriate interventions will be presented to the wound care team. The inservice includes a video on the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987) developed by the authors of the scale, lasting approximately 30 minutes which provides specific instructions for use of the scale as well as education to promote interater reliability. The wound team will utilize the algorithm for a trial period of three months. Initially, two wound nurses will assess each patient to evaluate interater reliability. At the end of a three month period, the team will meet to discuss needed revisions, agency wide inservicing for RN staff and plans for implementation.

The time required to execute the algorithm should decrease as familiarity with the instruments increases. The wound care team will work together to improve their proficiency with the tools. The team will develop a uniform approach to use of the algorithm as well as a method for introducing the algorithm to patients.

Application of the Algorithm

1. A patient referral i.e., (start of care) is received by the RN.
2. A home care visit is scheduled.
3. A complete history and physical exam are performed according to agency protocol.
4. Education regarding pressure ulcer prevention is presented to ALL bedbound and chairbound patients, as well as patients age 65 or older.
5. An assessment of the potential for pressure ulcer development is completed by using

the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987).

6. The assessment is scored.
7. Interventions are implemented based on the assessment score.
8. Re-evaluation time frames are set up based on the assessment score.
9. Re-evaluation will include steps 5 through 8 along with a review of the patient's history and physical information.

Evaluation

Initial evaluation of the algorithm will be based on feedback from the wound care nurses. Evaluation will be based on ease of use, outcomes and cost savings. Ease of use will be evaluated by the time needed to complete the algorithm and the clarity of the instruments.

Evaluation of outcomes will be done quarterly. Numbers of wounds are currently tracked on a wound-flow-sheet. The flow sheet will expedite counting numbers of pressure ulcers. Evidence of decreasing numbers of pressure ulcers (based on 90,000 visits, 1996) will be one indication of positive outcomes. Chart reviews will offer further information necessary to evaluate effectiveness of the algorithm. A quality improvement (QI) tool specific to skin and wounds that is currently used within the home health care agency will be utilized in the chart review procedure. Some of the information within the QI tool can be obtained through utilization of the ARHPM. Information that can be gleaned from the tool includes the following: (a) SOC date, (b) diagnosis, (c) age, (d) sex, (e) weight, (f) presence or absence of caregiver, (g) presence or absence of pressure ulcers, (h) date of pressure ulcer appearance, (i) numbers of pressure ulcers, (j) stages of pressure ulcers, [refer to Appendix C], (k) preventive treatments and (l) pressure ulcer treatment.

Cost savings will be evaluated through a review of monies spent on dressing supplies in the quarter prior to implementation of the algorithm. Cost of preventive equipment will also be compared to cost of dressing supplies.

Guidelines

The algorithm will become part of the Start of Care (SOC) Packets for each new patient admitted to the home health care agency. A complete assessment will be completed by a registered nurse with each SOC. A risk assessment will be done based on the score obtained from The Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987; see Figure 3) and as necessary with significant changes in a patient's health status as determined by the nurse caring for the patient. The assessment and interventions are merely guidelines and do not take the place of sound clinical judgment.

Assessment

Complete history and physical assessment will be done at SOC and yearly according to agency protocol. Risk assessment will systematically follow the subscales of the Braden Scale for Predicting Pressure Sore Risk and be done with each SOC, as indicated by the patient's risk assessment score and as necessary for significant changes in health status. The parameters defined by the scale's authors will be used as determinants for interventions. These parameters will be used unless they are determined to be ineffective in predicting the risk of pressure ulcer development for patients in this home health care agency.

Clinical Guidelines

Interventions will be based on the score obtained after assessment with the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstrom, 1987). As the score decreases the potential for pressure ulcer development increases. The scores are divided into four separate ranks. According to the scales' authors, a total score of 16 or less is considered to be at risk for pressure ulcer development. A score of 15 or 16 is at low risk for pressure ulcer development; a score of 13 or 14 is at moderate risk; and a score of 12 or less is at high risk for the development of pressure ulcers. As the risk score decreases the number of interventions increases. As the score decreases the interventions from the

previous rank are employed and new interventions added.

A score of 17 or above would signify a patient with "no risk" factors for pressure ulcer development. Interventions would be considered only when the patient had a significant change in health status, at which time a second risk assessment would be completed and indicated interventions initiated.

A score of 15-16 is indicative of low risk for pressure ulcer development. Reassessment is advised with every Medicare recertification (every 62 days) period and as necessary with significant change in health status. Intervention at this level is primarily education (primary prevention) about factors that lead to pressure ulcers. Education would include the following recommendations based on AHCPR (1992) guidelines.

Proposed Interventions

Level I Interventions

1. Cleanse any soiled skin.

   Rationale: Exposure to chemical irritants such as urine and feces can potentiate the chances for pressure ulcer development.

2. Avoid environmental factors that lead to skin drying such as harsh soaps and dry air.

   Rationale: Dry, flaking, scaly skin has increased possibility of breakdown.

3. Refrain from massaging bony prominences.

   Rationale: Massage may cause further tissue damage to jeopardized skin.

4. Avoid skin exposure to moisture.

   Rationale: Moisture can make the skin more susceptible to injury.

5. Minimize injury due to friction or shear.

   Rationale: Shear injury occurs when the skin remains fixed and the underlying tissue shifts. Friction occurs when the skin moves against a coarse surface.

6. Maintain adequate nutrition to promote skin integrity.

Rationale: Nutrition is an important component in maintaining skin integrity.

7. Maintain activity and mobility levels.

Rationale: Frequent turning, repositioning and mobility are essential in reducing the risk of pressure ulcers.

A score of 13-14 indicates that the patient is at moderate risk for pressure ulcer development. Reassessment of risk factors should occur monthly and as necessary with any significant changes in health status. Education regarding those factors that lead to pressure ulcer development would be initiated as with a score of 15-16. Additional interventions (secondary prevention) based on WOCN (1992) standards of practice and AHCPR (1992) guidelines follow:

1. Evaluation of nutritional status by obtaining a three day food diary.

Rationale: Aggressive nutritional support is an essential component of a preventative program (Colburn, 1990).

2. Evaluate mobility/activity and use of assistive devices such as a walker, trapeze, turn sheets etc.

Rationale: Increasing the frequency and safety of position shifts will decrease the possibility of friction or shear injury to tissue. Increased mobility decreases the potential for prolonged pressure leading to pressure ulcer formation.

3. Evaluate bowel and bladder schedules.

Rationale: Feces and urine are chemical irritants that potentiate the possibility of pressure ulcer development.

4. Provide necessary interventions based on patient needs. Secondary Prevention Level II Interventions:

Nutrition-

-Dietary counseling with or without dietary supplement.

-Referral to registered dietitian.

-Referral to speech pathologist if a swallowing disorder is identified.

-Dental referral if a dental problem that is limiting nutritional intake is identified.

-Evaluation of blood chemistry to determine which nutrients may be missing or deficit.

Mobility/Activity/Friction/Shear

-Procurement of needed devices.

-Develop a turn schedule.

-Referral to physical therapy and/or occupational therapy.

Moisture/Incontinence (cognition)

-Establish bowel or bladder program as appropriate.

-Procurement of needed absorptive pads, barrier cremes etc.

If a score of 12 or less is obtained the patient is considered at high risk for the development of pressure ulcers; a weekly risk assessment will be performed. Interventions from the low and moderate risk categories will be initiated followed by additional interventions based on WOCN (1992) and AHCPR (1992) guidelines.

Level III Interventions

1. Refer to Enterostomal Therapy nurse.

If the patient presents with existing pressure ulcers, the nurse will complete the algorithm as with any patient admitted to the home health care agency. The nurse will follow the interventions for the patient's specific score and consult with the Enterostomal Therapy nurse regarding pressure ulcer treatment. A wound care team referral will be initiated.

## Conclusions

The importance of risk assessment should not be underestimated. Persons at risk must be identified so that risk factors can be reduced through appropriate interventions (AHCPR, 1992). Education is an essential component of a pressure ulcer prevention program. Patient and family acceptance of and readiness for education can be understood

through the operationalization of the ARHPM. Treatment options are based on scientific research, risk assessment results and sound clinical judgment. Though all pressure ulcers cannot be prevented, a pressure ulcer prevention program should reduce the occurrence of pressure ulcers, promote health and prevent illness.

# Chapter 5

## Implications for Advanced Practice and Further Research

An algorithm for the identification of those persons at risk for pressure ulcer development is proposed to assist advance practice nurses (APNs) in primary care. The APN as a primary health care provider is in an excellent position to educate other health care providers, RNs, allied health care workers, patients and their families about the risk for and prevention of pressure ulcers. Early detection and prevention of pressure ulcers reduces health care costs and lessens individual suffering. Currently primary health care places little or no emphasis on prevention of pressure ulcers. A risk assessment program should be initiated in the primary health care setting allowing the various providers to collaborate regarding pressure ulcer prevention.

The APN's knowledge of research-based preventive interventions facilitates successful patient outcomes. As a researcher, the APN can evaluate patient outcomes. The following is an example of a patient outcome evaluation. Consider two groups of paraplegic wheelchair patients. Group A is educated about pressure ulcer prevention at three intervals: upon discharge from rehabilitation, six weeks after discharge and three months later. Group B was educated about pressure ulcer prevention only upon discharge from rehabilitation. At six and twelve months, an evaluation of the number of pressure ulcers including stage, location and treatments for each group will be administered.

The APN has an obligation to promote the profession of nursing. Publications and oral presentations are ideal ways to educate the public about risk assessment and the APN's role. At the conclusion of the three month trial of this algorithm by the wound care team n the identified home health care agency, this author proposes to write a paper for publication about the effectiveness of the algorithm. Through mass media, television, radio or newspaper, the APN has the opportunity to act as an educator while at the same time articulating nursing's domain. Involvement in interest groups related to skin care, such as

the Wound Ostomy and Continence Nurses Society, can create opportunities for the promotion of advanced practice.

As a leader and change agent the APN must be involved in health care policy. According to Murphy (1992), as nurses take part in decision making by developing and using networks of professional relationships, they encourage decision makers to consider solutions guided by the principles of primary health care practice (p. 161). The APN must articulate the need for governmental financing of health care prevention and health promotion activities. The APN utilizes knowledge to persuade payors that preventive services rather than treatment of potentially life-threatening pressure ulcers is a cost effective means of providing health care.

Advanced practice nurses are involved in multiple health care settings. While this algorithm was specifically intended for use in a home health care setting, it could easily fit into primary, extended and acute care settings; this would create numerous implications for the advanced practice nurse. As a consultant, the APN with knowledge of pressure ulcer prevention, should be available to advise other providers about assessment and intervention strategies as stated in the proposed algorithm for this scholarly project.

As a clinician and counselor the APN provides direct patient care to clients and their families. The APN, possessing theoretical and clinical knowledge, is able to provide comprehensive evaluation of risk assessment interventions. Along with the clinical interventions, the APN educates and counsels the family about the concepts of health and wellness.

Providing quality, cost effective care is a primary goal of the advanced practice nurse. As educator to both patients and other health care providers, the APN applies learning theories and methods to identify and meet health educational needs. Patient needs become readily apparent with the use of a systematic approach that assists in decision making and facilitates prevention of illness. The APN as a leader and change agent impacts

health care policy and governmental reform. Prevention must be one of the principal aims of health care reform and APNs are in the forefront of health policy improvement and revision. The roles of collaborator and consultant allow the APN to exchange information and offer advice to other health care professionals and consumers about health care, risk assessment and prevention of pressure ulcers. The clinician provides direct patient care that is based on sound theory and clinical judgment. Clinical judgment is based on research and guided by tools described in this project. The counselor utilizes theories such as the health promotion model to facilitate individual coping and change behaviors. As a researcher the APN seeks to gain a new body of knowledge to advance health care beyond what is it today. APNs serving in these roles continue to advance and improve primary health care.

Implications for Research

As health care continues to change, there will be a stronger emphasis on prevention. As consumers and payors become more focused on clinically proven cost effective care, interventions will require scientific basis for implementation and payment. Much research needs to be done on pressure ulcer prevention and effective preventive interventions.

With the increased use of pressure ulcer risk assessment scales, research of their efficacy will be required in all health care settings. Research studies about the scales' sensitivity and specificity need to be done. The effectiveness of the algorithm proposed in this scholarly project needs to be researched.

Capillary closing pressure, which is the soft tissue support surface interface, is frequently documented as a criteria for use of specialty mattresses and chair cushions. Research regarding the bone, soft tissue interface needs exploration. The bone, soft tissue interface may well have a greater impact on pressure ulcer development than does the soft tissue, support surface interface. Directly relating to the Braden Scale for Predicting Pressure Sore Risk (Braden & Bergstom, 1987), research needs to be undertaken in other home health care arenas and this is not without its difficulties. Methodological barriers of

data collection in the home health care setting include the ability to accurately collect data indicative of incidence and prevalence of pressure ulcers, the logistics of homes serviced by home health care agencies as well as time and financial constraints. Multiple variables that effect research in the home; these include the numbers of persons residing in the home, the presence of a willing and able caregiver, finances, cultural background and compliance with the plan of treatment.

The presence or absence of a caregiver is thought to be a factor in the development of pressure ulcers in the home health care setting. Caregiver involvement in patient care needs to be researched in the home setting in spite of the multiple variables that may be encountered.

Conclusions

According to Makelbust and Sieggreen (1992) pressure ulcers continue to be a major cause of patient morbidity and mortality in the 1990s. At the present time pressure ulcer prevention and treatment are receiving considerable recognition from the health care community. Significant advances in cost effective, scientifically proven methods of prevention and treatment are being made. As a health care provider the advanced practice nurse is in an excellent position to develop, implement and evaluate new approaches to prevention and treatment of pressure ulcers. Health care practice must be grounded in science (Maklebust & Sieggreen, 1996); the questions generated by the APN will help expand research and provide improved health care for generations to come.

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# Appendix A

## Permission to Use the Braden Scale

CREIGHTON UNIVERSITY
Graduate School

Office of the Dean

Date: April 8, 1996

To: Linda Warren, RN, CRRN, CETN, CWCN

From: Barbara Braden, Ph.D., R.N. & Nancy Bergstrom, Ph.D., R.N.

Re: Permission to use the Braden Scale

As holders of the official copyright for the Braden Scale for Predicting Pressure Sore Risk, we hereby grant permission for the use of the Braden Scale in * Research

Barbara J. Braden, Ph.D., R.N., F.A.A.N.
Associate Professor
Creighton University
School of Nursing
Omaha, NE 68178

Nancy Bergstrom, Ph.D., R.N.
Professor
University of Nebraska
Medical Center
College of Nursing
Omaha, NE 68105

*We request that the name of the instrument and the indication that the copyright belongs to Braden and Bergstrom remain on any copies and that you do not make any substantial changes to the wording or the order, etc., of this tool.

Appendix B

Braden Risk Assessment Scale

# Braden Risk Assessment Scale*

NOTE: Bed- and chairbound individuals or those with impaired ability to reposition should be assessed upon admission for their risk of developing pressure ulcers. Patients with established pressure ulcers should be reassessed periodically.

Patient name _____

Room number _____ Date _____

| | | | | | (Indicate appropriate numbers below) |
|---|---|---|---|---|---|
| **SENSORY PERCEPTION** ability to respond meaningfully to pressure-related discomfort | **1. Completely Limited:** Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation. OR limited ability to feel pain over most of body surface. | **2. Very Limited:** Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness. OR has a sensory impairment which limits the ability to feel pain or discomfort over 1/2 of body. | **3. Slightly Limited:** Responds to verbal commands, but cannot always communicate discomfort or need to be turned. OR has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities. | **4. No Impairment:** Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort. | |
| **MOISTURE** degree to which skin is exposed to moisture | **1. Constantly Moist:** Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned. | **2. Very Moist:** Skin is often, but not always, moist. Linen must be changed at least once a shift. | **3. Occasionally Moist:** Skin is occasionally moist, requiring an extra linen change approximately once a day. | **4. Rarely Moist:** Skin is usually dry; linen only requires changing at routine intervals. | |
| **ACTIVITY** degree of physical activity | **1. Bedfast:** Confined to bed. | **2. Chairfast:** Ability to walk severely limited or non-existent. Cannot bear own weight and/or must be assisted into chair or wheelchair. | **3. Walks Occasionally:** Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair. | **4. Walks Frequently:** Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours. | |
| **MOBILITY** ability to change and control body position | **1. Completely Immobile:** Does not make even slight changes in body or extremity position without assistance. | **2. Very Limited:** Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently. | **3. Slightly Limited:** Makes frequent though slight changes in body or extremity position independently. | **4. No Limitations:** Makes major and frequent changes in position without assistance. | |
| **NUTRITION** *usual* food intake pattern | **1. Very Poor:** Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement. OR is NPO and/or maintained on clear liquids or IV's for more than 5 days. | **2. Probably Inadequate:** Rarely eats a complete meal and generally eats only about 1/2 of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement. OR receives less than optimum amount of liquid diet or tube feeding. | **3. Adequate:** Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally will refuse a meal, but will usually take a supplement if offered. OR is on a tube feeding or TPN regimen which probably meets most of nutritional needs. | **4. Excellent:** Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation. | |
| **FRICTION AND SHEAR** | **1. Problem:** Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures or agitation lead to almost constant friction. | **2. Potential Problem:** Moves feebly or requires minimum assistance. During a move skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down. | **3. No Apparent Problem:** Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times. | | |

NOTE: Patients with a total score of 16 or less are considered to be at risk of developing pressure ulcers. (15 or 16 = low risk, 13 or 14 = moderate risk, 12 or less = high risk)

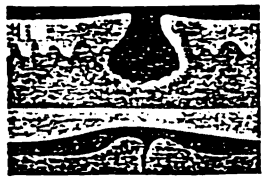
**TOTAL SCORE:** _____



**Pressure Ulcer Staging** (Source: National Pressure Ulcer Advisory Panel)

**Stage I**

Nonblanchable erythema of intact skin, the heralding lesion of skin ulceration



**Stage II**

Partial-thickness skin loss involving epidermis and/or dermis. The ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater.

**Stage III**

Full-thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia. The ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.

**Stage IV**

Full-thickness skin loss with extensive destruction, tissue necrosis, or damage to muscle, bone, or supporting structures (e.g., tendon, joint capsule).

# Appendix C

Stages of Pressure Ulcers

Stage I pressure ulcer, is non-blanchable erythema of intact skin.

Stage II pressure ulcer, is partial thickness skin loss involving epidermis and/or dermis.

Stage III pressure ulcer, is full thickness skin loss involving damage or necrosis of subcutaneous tissue which may extend down to, but not through, underlying fascia.

Stage IV pressure ulcer, is full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle bone or supporting structures (Wound Ostomy and Continence Nurses Society, 1992).