A WOUND CARE PROTOCOL FOR AN EXTENDED HEALTH CARE FACILITY

By

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Chapter 1

Introduction

Wound Care Protocol for an Extended Health Care Facility

For years, health care providers considered exposure of wounds to the air essential for healing to occur (Skokan & Davis, 1993). It was felt that air exposure was beneficial and provided the proper environment. By keeping the wound dry, bacterial colonization was minimized and new skin grew in from the edges. It has since been shown that this process can decrease wound healing, and moisture in the wound is now encouraged (Skokan & Davis, 1993).

In spite of the new research available, appropriate management of the open wound continues to be controversial. The use of the newer wound management agents and techniques are not being used by some institutions which are still practicing dry wound management (Skokan & Davis, 1993). Implementation has not kept pace with the advances of products and interventions. Use of caustic agents and inappropriate dressings are still being utilized (Rodeheaver, 1989; Dyson, Young, Pendle, Webster, & Lang, 1988). This is particularly evident in the elderly and debilitated patient (International Committee on Wound Management, 1993).

In the elderly population, there are risk factors for delayed healing which are not present in younger persons. In the elder with an open wound, there is a decrease in

Langerhans cells and T-cell lymphocytes, which decrease cellular immunity (International Committee on Wound Management, 1993). A reduction in microvasculature causes a decreased blood flow, which results in a reduced defense against infection. Decreased pain perception, as well as significant and often debilitating co-morbid conditions, lower the elder's ability to heal and fight infection (International Committee on Wound Management, 1993). Increased skin dryness, eczema, and increased risk for secondary infection are also normal in the elderly (International Committee on Wound Management, 1993).

An extended care facility housing 96 elderly patients in Northern lower Michigan, has identified wound care as an area that needs updated for the facility. Most of the lesions that are treated are pressure ulcers. Several open surgical incisions are also treated. Few lesions develop in the facility and most occur prior to admission to the facility (personal communication, Cathy Cairns, assistant director of nursing, December 22, 1994). This facility continues to utilize treatment regimens that can potentially delay healing. This facility has not identified a delay in healing time or an increase in infection, but realizes the need for updating its knowledge and treatment of wounds. It is receptive to updating its wound care protocol (personal communication, Cathy Cairns, assistant director of nursing, December 22, 1994). Following approval by the director of

nursing and administrator, the protocol will be implemented. This student does plan to inservice the staff on implementation and utilization of this protocol, and to be available on a periodic basis for consultation on the implementation of this protocol.

Project

As an outcome of this project, a wound care protocol will be developed which will serve as a guide for practice at a health care facility in the Northern Lower Peninsula of Michigan. This is an extended care facility, at which 95 percent of the population is over age 70. Most of the wounds are pressure ulcers, that have developed outside of the facility. Other wounds seen at this facility include open surgical wounds, wounds resulting from trauma, and peripheral vascular disease. The protocol will be implemented at this facility when completed, and used as a guideline for practice.

Current research relative to wound care will be used as the basis for developing the protocol. The primary emphasis will be to maintain an appropriate wound environment, as well as decreasing or eliminating the use of caustic agents, which can cause tissue damage and delay healing. The protocol's goal will be to decrease wound care interventions that are deleterious to wounds. A method to evaluate the effectiveness of the protocol including monthly evaluations of the incidence, stage, treatment program of pressure

ulcers, and clinical evidence of infection.

Conceptual Definitions. A conceptual definition is used to define words or terms that can have multiple meanings for different readers. Therefore, significant terms or words used in this project will be specifically defined.

For this project the process of wound care will be defined as the treatment provided to the patient in an effort to improve or heal compromised tissue. Compromised tissue is defined as tissue that has lost integrity of the dermis. This compromise can extend to underlying tissue. Reasons for the compromised state may including surgery, pressure ulcers, abrasions, or peripheral vascular ulcerations. Treatment refers to any intervention designed to heal compromised tissue. The protocol will be defined as treatment guidelines that outline options for treatment of wounds. This protocol is not intended to usurp the primary provider's role in wound care, but to increase awareness of alternative treatment options and decrease the risk for untoward effects.

This project will identify appropriate wound care strategies and treatment options. Discussion will focus on current treatments, deleterious effects of inappropriate treatment, and guidelines for changes in wound care management. This protocol will identify treatment for pressure ulcers, closed clean surgical wounds, open surgical

wounds, and leg ulcers due to peripheral vascular disease.

Sister Callista Roy's theory of nursing will be used for this project. Roy's model is suited to assessment, implementation and evaluation of wound care interventions. Her theory is particularly important in evaluation of environmental factors that have an impact on wounds.

Chapter 2

Theoretical Framework

Introduction: For this project, the theory of Sister Callista Roy will be utilized as a conceptual model. A conceptual model is a framework that is used as an aid to understand observed phenomenon. It includes ideas, values and beliefs. This model attempts to define concepts, observations, and interrelationships that are used by practitioners and researchers to direct inquiries and interventions. The framework for Roy's theory centers around the person as an adaptive system who interacts with the environment. As such, the person is more than the sum of its parts; he or she can adjust to the environment and affect the environment, as well (Roy & Andrews, 1991).

Person: The person is identified as the recipient of nursing care. Person is an adaptive system with four adaptive modes, which include physiologic function, self concept, role function, and interdependence (Roy & McLeod, 1981). Person is further defined as an adaptive system with cognator and regulator subsystems acting to maintain the four adaptive modes. These are coping mechanisms (Roy & McLeod, 1981). Further, person is defined as a whole comprised of parts that function as a unit for some purpose (Roy & Andrews, 1991). Nurses typically care for individuals. The recipient of nursing care may be the individual, but may also be a family, group, community or society as a whole (Roy &

Andrews, 1991).

Regulator and Cognator Subsystems. Roy defines these concepts as mechanisms of adapting or coping with a changing environment (see Figure 1). They are viewed as biological, social and psychological in origin. These coping mechanisms are both innate and acquired. The regulator subsystem is a biological response mediated through neural, chemical and endocrine channels. The cognator subsystem is viewed as responding through cognitive-emotive channels. An adaptive response that is not effective is termed an ineffective adaptive response (Roy & Andrews, 1991).

Environment. The environment, defined by Roy, is composed of internal and external stimuli that act as stressors. It is also defined as conditions, circumstances, or influences that surround and affect the behavior of persons or groups(Roy & Andrews, 1991). The environment is the world in and around the person. According to the Roy Adaptation Model, changes in the environment stimulate the person to make adaptive changes. For humans life is never the same and requires the person to constantly change and adapt to the changing conditions.

Internal and External Stimuli. There are three categories of stimuli. Focal stimuli is the provoking situation or event immediately confronting the person that demands attention and prompts the person to seek relief(Roy & Andrews, 1991). Contextual stimuli are all other stimuli present affecting

the individual which contribute to the focal stimuli. Residual stimuli are vague general stimuli which are present and may affect the person, but their presence or importance cannot be validated or immediately ascertained (Roy & McLeod, 1981). Most wound care or wound care issues can be evaluated and intervened utilizing focal and contextual stimuli. Residual stimuli is a factor in wound care, but may not be immediately apparent and may require further investigation. This could include previous experience, personal or family history as well as cultural beliefs.

Health. Roy defines health as a state and a process of being and becoming an integrated and whole person. Lack of integration represents lack of health. Health as a state reflects the adaptation process and utilizes the adaptive process in the four adaptive modes, which are physiologic, role function, self concept and interdependence. Health is a process whereby the individual is striving to reach his maximum potential. This definition is valid throughout the life span (Roy & Andrews, 1991).

This definition of health is applicable to wound care as well. Health is defined as an adaptive process and wound care is also an adaptive process. Providers need to understand this process and assist the person to adjust and adapt to the altered state so that healing can occur.

Nursing. Roy identifies nursing activities as the nursing process (Andrews & Roy, 1986). The nursing process consists

of six steps: assessment of behavior, assessment of stimuli, nursing diagnosis, goal setting, intervention and evaluation (Andrews & Roy, 1986).

Assessment of behavior involves determining how the person is behaving as an adaptive system. Assessment of stimuli is the evaluation of stimuli that affect behavior. The third step is determining a nursing diagnosis. The fourth step is goal setting to promote the patients adaptation. Determining interventions is the fifth step. This involves managing the patients stimuli to promote adaptation. The final step is evaluating whether the interventions were successful (Andrews & Roy, 1986).

The objective of nursing is to enhance the interaction of the person with the environment in the four adaptive modes: physiological, self concept, role function and interdependence.Nursing activities promote adaptation that contribute to the patient's health, quality of life, and dying with dignity. Roy identifies two levels of the assessment. The first level of assessment evaluates the person in the four adaptive modes; physiological function, self concept, role function, and interdependence. By altering the environment, wound incidence will decrease and by altering the local wound environment the wound will have a positive adaptive response.

In the second level of assessment, the nurse evaluates focal, contextual, and residual factors that may impact the

first level of assessment. Nursing interventions are carried out that involve managing or manipulating the focal, contextual, and residual stimuli (Roy & Andrews, 1991). This would involve altering perceptions such as cultural, or educational beliefs that can affect wound care. The historical nature of current wound care practices may be difficult to alter, and may require several years to appreciate changes in practice. Specifically the practice of maintaining a dry wound bed is pervasive in the health care industry and it may be difficult to change this practice.

Interrelationships. Roy's theory of adaptation uses the concepts of health, nursing, environment, and person in a way where one aspect or concept cannot be evaluated without affecting the other concepts. Person affects environment as it affects health as it affects nursing. Therefore, management of the wound must be done in the context of the individual. Understanding social and environmental factors, as well as the person, are important according to Roy (Roy & Andrews, 1991).

The cognator and regulator subsystems are methods of coping with a changing environment. The regulator subsystem is viewed as the biological response, such as the three phases of wound healing. Nurses would intervene by providing conditions to maintain the appropriate environment.

The cognator subsystem is the aspect that learning plays in determining a response to a stressor. Utilizing

research is viewed as a cognator response to a stressor, such as providing treatment to a wound. By using research nursing can implement interventions that are safe and effective in providing wound care, and, therefore, impact the individual adaptation response.

The cognator subsystem also plays a role in learning what constitutes an ineffective response, and subsequently avoiding that response to a stimulus. An example of this would be discontinuing treatments that have not been effective or resulted in an untoward response. Alternative measures are then tried until an effective adaptive response is found. Through expert assistance and advice, the nurse in advanced practice can eliminate treatments that have been found to be ineffective.

Feedback follows to determine if the response is effective or ineffective. If the response is ineffective, alterations occur, such as with the wound care program. If the response is effective, as determined by the regulator and cognator, no alteration in the treatment will occur. Discussion: The adaptive mode of physiologic function fits this student's perception of the importance of maintaining an appropriate environment for healing. By utilizing research that indicates improved treatment options for wounds, the provider is actively implementing Roy's perception of adaption in the physiologic mode. Self concept, role function and interdependence are other areas

the provider can impact specific to wound care. This can be done by realizing the importance of individuality, as well as the interrelationships that are present.

The use of Roy's adaptation model is suited to the implementation of wound care interventions and treatments. Specifically the nurse in advanced practice can impact the cognator, effector aspects in Roys model. The Cognator deals with internal and external demands. This is where appropriate decision making and choosing the appropriate dressing is determined. The effector is the actual wound treatment as determined by this protocol.

The process of altering the focal and contextual stimuli are interventions that nurses in advanced practice can also significantly impact. This would be the input on the Roy model (see Figure 1). The nurse can also impact the cognator response to the wound by assisting with problem solving and decision making. Altering regulator response can occur through manipulating the internal environment, such as with nutritional support.

As previously discussed, wound environment is important in the healing of the wound. Caregivers therefore, must provide an environment that allows the greatest opportunity for healing to occur. Stressors to the wound can be decreased by altering the focal and contextual stimuli to create the proper environment. These stimuli affect the development and behavior of the person and are central to

the interaction with the environment (see Figure 2).

Roy's adaptation theory is suited to the evaluation and treatment of wounds because providing the best environment for adaptation to stressors is an area that nursing can impact. This can occur by altering the patient's position, nutrition factors and hygiene. Similarly, maintaining an environment that is optimal for tissue repair can significantly decrease healing time and improve outcomes, and is part of the adaptation process. Altering the patient's environment and, on a smaller scale, the environment of the wound will provide the greatest opportunity for healing to occur. Discussion of physiology, and micro environment of wound repair will further clarify the importance of adaptation in wound repair.

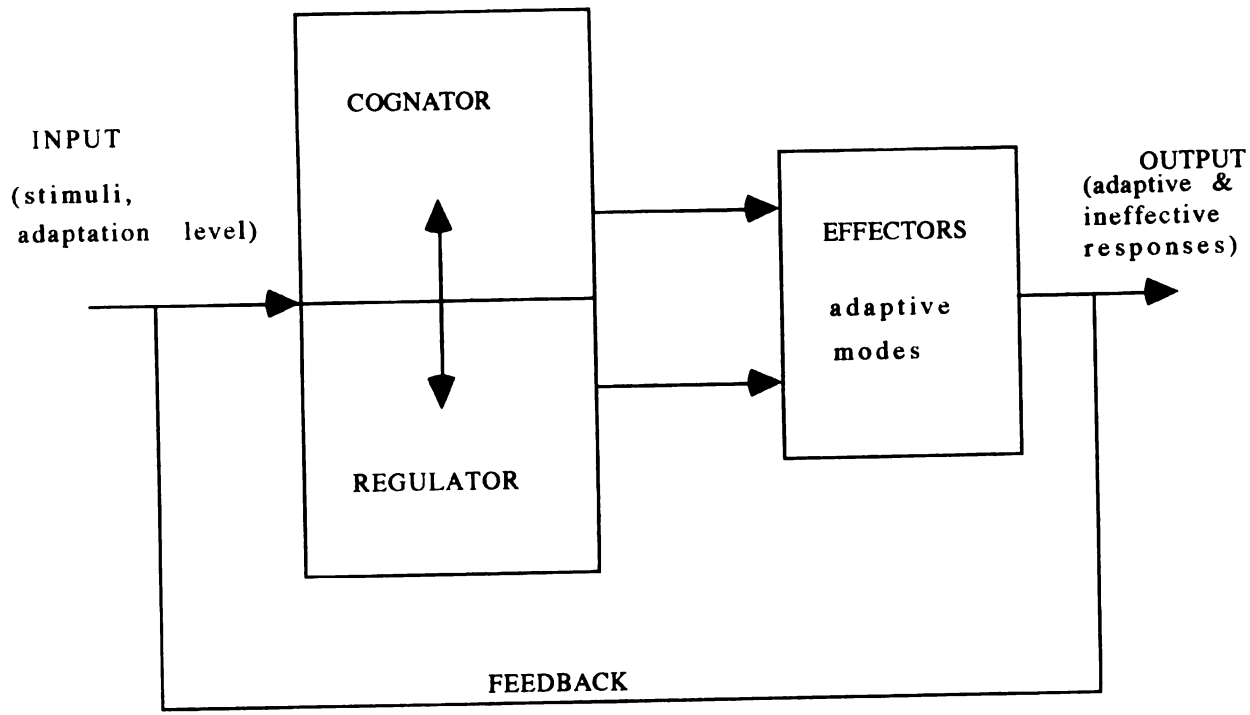

Figure 1: The person as an adaptive person (Roy and Mcleod 1981).

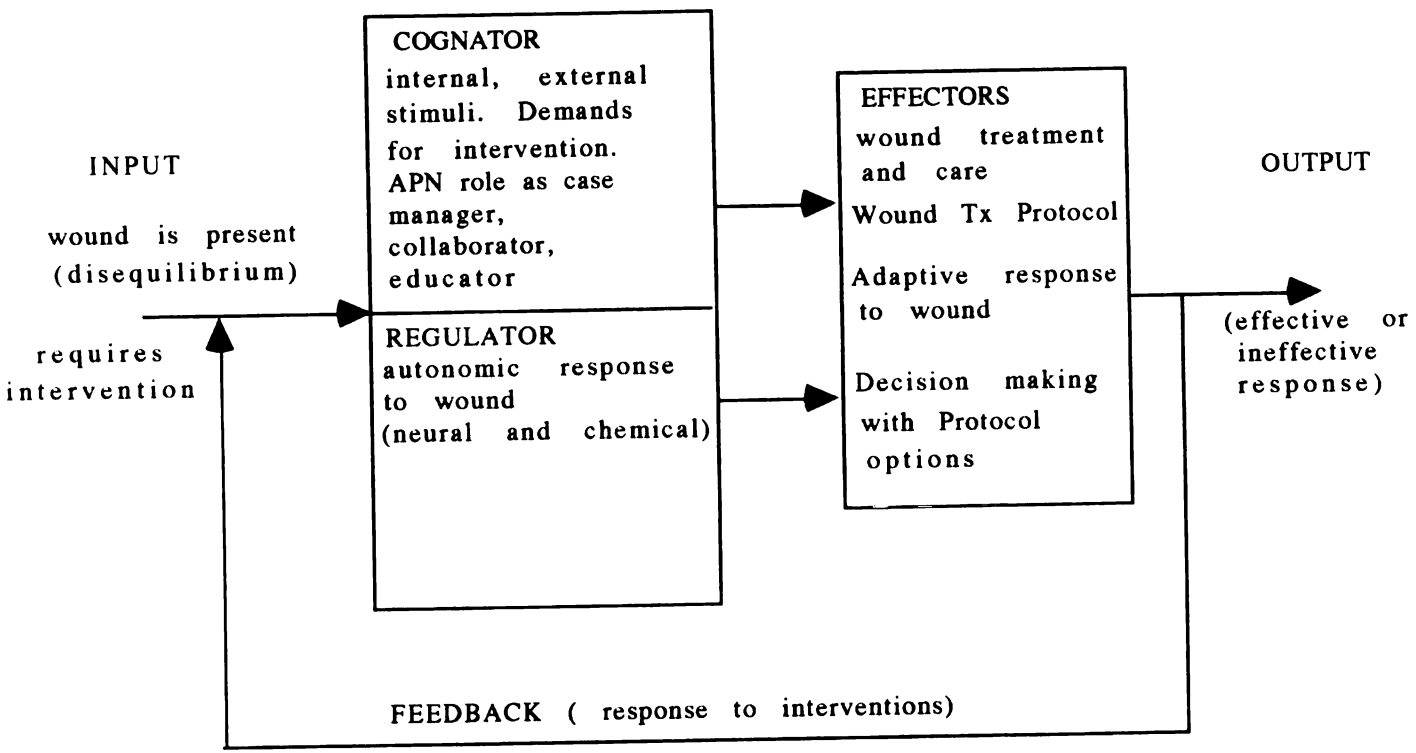

Figure 2: Gertiser's perception of Roy's adaptation model as applied to wound care.

Chapter 3

Review of the Literature

Introduction: Wound injury and repair is a complex process. There are multiple factors involved in injury and repair of tissue. Age of the patient, the cause of the injury, any nutritional compromise, as well as co-morbid factors all play a significant role in wounding and healing. Following will be a general discussion of tissue injury and repair. The process and time frame outlined here can be significantly altered by age, co-morbid disease or other factors that can delay healing.

Following the section on physiology of wound repair, a discussion of the effects of a moist environment and use of caustic agents in wound repair will be offered that will aid in understanding current and past wound treatments. The importance of the wound environment on healing and current treatment options will also be discussed in each of these sections.

Physiology of Wound Repair

Normal repair of injured tissue follows an ordered sequence. Disruption of capillaries causes hemorrhage, platelet aggregation, and coagulation of blood. Disruption of this tissue activates the compliment and kinin cascade, with migration of inflammatory cells into the wound space. Compliment is a group of proteins in the blood that influence the inflammatory process and serve as the primary

mediator in the antigen-antibody reaction. Kinins are a group of polypeptides that influence smooth muscle contraction, increases blood flow, and permeability of capillaries (Knighton, Hunt, Thakral, & Goodson, 1982).

Angiogenesis (the development of blood vessels), fibroplasia (the development of fibrous tissue), and collagen synthesis are integral components of the host's response to injury and wounding. These responses are what eventually heals the injury (Knighton et al, 1982).

Fibroblasts (precursors of connective tissue) that align at the wound edges are stimulated to divide, migrate, and lay down new collagen (Hunt, Knighton, Thakral, Goodson, & Andrews, 1984). Within a few hours the wound surface becomes dry due to clotting of blood and evaporation of moisture from the wound surface (Pollack, 1979). The dermis continues to dry for about 18 hours following wounding. At this point, the most superficial layer that is able to support cellular life lies about 0.3 mm below the desiccated region (Pollack, 1979).

There are three phases of wound repair: the inflammatory phase, the laying down of granulation tissue, and the remodeling phase (Skokan & Davis, 1993). Each of these phases will be discussed.

In the inflammatory phase, an increase in neutrophils and monocytes is evident in the wound fluid. Both types of white blood cells are attracted to the wound by chemotaxis

factors that are released immediately due to blood vessel disruption. Chemotaxis is the movement of additional white blood cells to an area of inflammation in response to chemical mediators, such as neutrophils, monocytes and injured tissue. The neutrophils are the first to the site and are responsible for removal of bacteria (Skokan & Davis, 1993).

Later, in the inflammatory phase, monocytes migrate to the site and undergo a transformation into a macrophage. The macrophage has two roles: to continue removal of bacteria and to release growth factors to stimulate granulation tissue formation (Ekersley & Dudley, 1988). Fibroplasia and collagen synthesis begin within 24 hours after wounding. Platelets, activated by the coagulation cascade and thrombin, release a mitogen that stimulates fibroblasts and smooth muscle cells in vitro (Knighton et al, 1982).

The second phase of wound repair is granulation tissue formation. This consists of new blood vessel formation, fibroplasia, and re-epithelialization. Growth factors and chemotactic factors released from macrophages attract endothelial cells and fibroblasts to the wound site (Ekersley & Dudley, 1988). The formation of new capillary buds and deposition of extracellular matrix also occur in this phase. Extracellular matrix consists of loosely organized collagen, hyaluronic acid, and any one of a group of proteins present in blood plasma and extracellular matrix

called fibronectin. Once the fibrinomatrix is in place, cells begin to adhere to each other and to the matrix. This process causes increased tension across the wound and contraction (Skokan & Davis, 1993).

Once a suitable granular bed is in place, re-epithelialization, or the lying down of new epithelial cells, can occur. The process of re-epithelialization requires that cells move over each other in order to lay down each succeeding layer of new tissue (Skokan & Davis, 1993).

The third phase of repair involves the extracellular matrix maturation and remodeling (Ekersley & Dudley, 1988). There is a constant alteration in the matrix with degradation of fibronectin and laying down of new collagen. This process of remodeling continues for weeks to months. Subsequent accumulation of new collagen increases the strength of the scar. Over time the tissue integrity will be restored (Skokan & Davis, 1993).

Effects of a Moist Wound Environment

Many of the current wound care practices are detrimental to the open wound (International Committee on Wound Management, 1993). Following is a discussion and rationale for keeping the wound moist. The importance of maintaining and promoting an environment that is without trauma or caustic chemicals is also offered.

If any of the complex biochemical and physical processes are inhibited following wounding, healing will not occur (Skokan & Davis, 1993). Vascularization around the wound, rearrangement of smaller vessels, and bud development must occur for nourishment to be supplied for wound repair (Skokan & Davis, 1993). If delivery of oxygen to the wound is decreased, healing is impaired (Skokan & Davis, 1993). If fibroblasts or macrophages are prevented access to the wound, the repair process stops (Skokan & Davis, 1993).

The wound healing process is greatly influenced by the extracellular environment of the wound (Dyson, Young, Pendle, Webster, & Lang, 1988). A moist wound bed promotes re-epithelialization more rapidly than a dry wound bed (Dyson et al, 1988). The elimination of caustic chemicals from the wound bed diminishes the risk and incidence of infection (Rodeheaver, 1989). Mechanical trauma to the wound bed and surrounding tissue, such as cleansing, scrubbing and shear forces, are other elements of wound care that require careful consideration (Rodeheaver, 1989). The moist conditions that develop under occlusion are conducive to bacterial growth and provide an environment that allows for the efficient function of the host defenses (Hutchinson, 1989). Temperature increases the rate of collagen cross-linking, speeding the repair process (Skokan & Davis, 1993).

In spite of this information, methods are used that do not promote a moist environment; treatments that use caustic

materials for cleaning and disinfecting wounds are continuing (Rodeheaver, 1989). This may occur because a major fear is that infection increases under an occlusive dressing. This has not been borne out by clinical experience (Hutchinson, 1989). Most wounds are colonized by aerobic and anaerobic bacteria. However, infection is not necessarily present (Hutchinson, 1989).

Providing a moist environment aids in the repair process. This environment provides increased oxygen, macrophages, fibroblasts, and a slightly higher temperature. Increased mitotic and metabolic activity of fibroblast occurs with a moist wound environment and the increased temperature (Skokan & Davis, 1993).

Due to ethical and practical considerations, it is not possible to always have well-controlled studies using human subjects. This is particularly true when evaluating the effectiveness of different treatments on artificially induced wounds. Consequently, the use of animals are used to evaluate different environments on wound healing. For example, two Yucatan miniature pigs were wounded with 40 wounds each to evaluate a moist environment on healing. They were then subjected to moist or dry-wound treatment (Turner-Beatty, Grotewiel, Fosha-Dolezal, Hill, Ashley, Drees, & Counts, 1990). An evaluation of this type is ethically not possible with human subjects. Yet this information is important in the understanding of wound

repair and, until a suitable alternative is possible, the use of animals is necessary.

Referring back to the Yucatan pig study, the dry wound was covered with a telfa dressing. The moist wound was treated with an unspecified oil and water solution. For those wounds kept moist, there was a 15% greater reduction in the wound area by day 10. There was an 85% increase in DNA content and alkaline phosphatase was elevated 138%, suggesting greater amounts of granulation tissue (Turner-Beatty et al, 1990). These results indicate the beneficial effects of moisture on wound healing and suggest that the enhanced healing may be attributed to increased granulation tissue (Turner-Beatty et al, 1990).

Another study evaluating the effects of moist and dry environments on porcine dermal repair, compared adhesive polyurethane dressings to dry gauze dressings. Changes in the populations of neutrophil, macrophage, fibroblast, and endothelial cells in porcine skin were evaluated (Dyson, Young, Pendle, Webster, & Lang, 1988). The number of inflammatory cells decreased more rapidly under the moist dressing than the dry. There was also a rapid increase in the proliferative phase of wound repair under the moist dressing (Dyson et al, 1988). This is evidenced by evaluation of the granulation tissue present. Under the moist dressing by day 5, 66% of the cells in the granulation tissue were fibroblasts and endothelial cells, compared to

48% under the dry dressing. By day 21, the number of fibroblasts and endothelial cells fell below that of the dry dressing, suggesting that progress from the proliferative to the remodeling phase was more rapid under the moist dressing (Dyson et al, 1988).

Further support of a moist environment is found in evaluation of chemotaxis. Platelet derived growth factor is released from platelets following wounding. The mitogenic activity of platelet derived growth factor may then cause a rapid proliferation of fibroblasts. Subsequently these cells produce collagen and other materials necessary to repair the wound (Seppa, Grotendorst, Seppa, Schiffmann, & Martin, 1982). Dermal fibroblasts and arterial smooth muscle cells fail to proliferate in a culture of platelet poor plasma (Rutherford & Ross, 1976).

The maintenance of a moist environment is central to maintaining the integrity and health of the wound (Hutchinson & Lawrence, 1991). With moist dressings, migration of epithelial cells is improved and healing is faster (Hutchinson & Lawrence, 1991.

Bacterial counts may be large under both occluded and non-occluded dressings (Hutchinson, 1989). Occluded wounds may have higher counts of normal resident flora than non-occluded wounds. However, the mere presence of aerobic or anaerobic bacteria does not influence leg ulcer healing (Hutchinson, 1989). Occlusion is generally contraindicated

in infected wounds. Pseudomonas aeruginosa was found to disappear under hydrocolloid and polyurethane film treated wounds (Hutchinson, 1989).

Occlusive dressings are a group of dressings that cover the wound and are a barrier to outside contaminants. They also can hold wound exudate at the wound site and be left in place for several days. Polyurethane film and hydrocolloid are two of the most common and widely used varieties. The polyurethane film dressings allow gas and water vapor transport, provide a mechanical barrier against contamination, are comfortable and conformable. Polyurethane dressings cannot absorb drainage. The hydrocolloids have little moisture vapor transport capability and can absorb a moderate amount of exudate. These dressings are also comfortable and conformable and provide a barrier against bacterial contamination (Szycher & Lee, 1992).

A prospective study by Gorse and Messner (1987) was undertaken to evaluate response to moist dressings and wet-to-dry dressings on 52 patients with a total of 128 pressure sores. Along with faster healing times in the hydrocolloid treated (moist dressing) group, the cost was significantly less. For the wet-to-dry group, the cost was estimated at $52.50 per week. The cost of the hydrocolloid dressing, including nursing time, was estimated at only $6.20 per week. This compared a dressing that is changed every 8 hours with a dressing that is changed twice a week (Gorse &

Messner, 1987).

Saline moistened gauze is a standard, non-occlusive dressing treatment of open wounds. To compare the effectiveness of a hydrocolloid and saline, 50 patients with a total of 56 pressure ulcers were evaluated (Alm, Hornmark, Fall, Linder, Bergstrand, Ehrnebo, Munk, Madsen, & Setterberg, 1990). Ulcer size was comparable in both groups. Ulcer depth was less in the hydrocolloid group, though not statistically significant (Alm et al, 1990). The saline gauze treated ulcers were changed twice a day, the hydrocolloid only when necessary. In the hydrocolloid treated group, the dressings were more comfortable and took less time to change. Dressings were changed twice a day for the saline-treated group throughout the study. This is compared to the hydrocolloid-treated group that required dressing changes every three to four days in the early weeks of the study and every seven days in the latter weeks of the study (Alm et al, 1990). The ulcers had similar healing times. Presence of infection was not discussed (Alm et al, 1990).

Although bacterial counts are large under both occlusive and non-occlusive dressings, it's important to address the issue of the fear of infection. This is frequently cited as a reason for not using occlusive dressings. However, there is a growing body of research that indicates occlusive dressings may actually decrease

bacterial counts by providing an environment that is less conducive to bacterial growth (Hutchinson, 1989). To evaluate this, the exudate under polyurethane film and hydrocolloid dressings was examined. Hydrocolloid dressings were found to have a lower pH *in vivo* and *in vitro*. The lower pH was found to have possibly inhibited the growth of *S. Aureus*. The lower pH was not evident under polyurethane film, but a higher neutrophils count was found. The authors suggest further studies are needed to quantify these preliminary observations (Varghese, Balin, Carter, & Caldwell, 1986).

As a clinician, it's important to differentiate colonization from infection (Hutchinson & Lawrence, 1991). Evaluation for infection needs to be based on clinical evidence of infection, such as erythema, heat, edema, or purulent exudate (Hutchinson & Lawrence, 1991). The importance of microbiological findings in diagnosing infection must be evaluated in conjunction with the clinical signs of infection (Hutchinson & Lawrence, 1991).

Chronically infected wounds are an ongoing management problem for the patient and provider. Use of sugar paste has been successful in treating infected wounds. Sugar is thought to exert an antimicrobial effect by lowering water activity, and perhaps osmotic effect, on necrotic tissue (Tanner, Owen, & Seal, 1988). Sugar paste, consisting of caster sugar, icing sugar, polyethylene glycol, and hydrogen

peroxide was used to treat 20 patients, most of whom failed with prior treatment. Nineteen of the 20 completely healed using the sugar paste treatment. Thin sugar paste was found to be a good alternative to packing an abscess cavity with gauze, and it is painless and easy to apply (Tanner et al, 1988).

Archer, Barnett, Irving, Middleton, & Seal (1990) found that wounds healed satisfactorily without need for sterilization. Colonization on the surface with bacteria did not impair the formation of collagen tissue or epidermal migration. The authors of this study felt that it is important to control bacteria if pus is present or with the presence of an abscess cavity, as well as clinical indications of infection (Archer et al, 1990). This study also found that the use of gauze to hold the dressings in place resulted in bundles of gauze being incorporated into the granulating tissue, causing a foreign body reaction (Archer et al, 1990).

Covering sutured, clean or clean contaminated wounds does not decrease the incidence of infection (Chrintz, Vibits, Cordtz, Harreby, Waaddegaard, & Larsen, 1989). Following surgery, 1,202 clean or clean contaminated wounds were evaluated to determine if a dressing affects the infection rate. After the first 24 hours, half the wounds were left without covering. Covered wounds experienced a 4.9% infection rate. Uncovered wounds experienced a 4.7%

infection rate (Chrintz et al, 1989). Routine covering of sutured surgical wounds with dressings is based on tradition and is not scientifically supported (Chrintz et al, 1989).

Wound disinfectants. It is generally accepted that clinical infection impairs wound healing, but there is not evidence that wounds colonized by bacteria are detrimental (Hutchinson & Lawrence, 1991). The use of wound cleansers for wound management has been a practice for many years (Leaper & Simpson, 1986). Cleansing agents such as sodium hypochlorite, Betadyne, hydrogen peroxide, and others are used industry wide in wound care. Until recently, few research studies had been done to evaluate their effectiveness, and toxicity (Brennan & Leaper, 1986).

In an in vivo study of the effects of antiseptics on the ear of a rabbit, several antiseptics were evaluated. Use of the rabbit ear chamber allowed for direct observation of the effect on granulation tissue by the antiseptics. Following application of hypochlorite solutions, Eusol and Chloramine T, blood flow in the capillaries of new granulation tissue ceased with subsequent delay in tissue repair. The closed vessels that were treated with the hypochlorite solutions were never reopened. Povidone iodine 5% caused cessation of blood flow with only the largest vessels remaining open. The tissue recovered in 72 hours. No changes were seen with the application of hydrogen peroxide.

Chlorhexidine (Hibiclens) caused a mild exudative reaction with a few capillaries closing down. Redirection of flow also occurred, though no overall change was observed (Brennan & Leaper, 1985).

Six adult beagles were used for an in vivo evaluation of the effect of Chlorhexidine diacetate and povidone iodine on wound healing in dogs. It was found that the chlorhexidine treated dogs had a greater bacteriocidal effect than the dogs treated with the saline control or the povidone iodine (Sanchez, Swaim, Nusbaum, Hale, Henderson, & McGuire, 1988). At concentrations of 0.05%, chlorhexidine diacetate resulted in significantly fewer contaminated wounds (Sanchez et al, 1988). The chlorhexidine treated dogs healed faster indicating this solution to be more beneficial than saline alone. This indicates that concentrations that are cytotoxic in vitro may not be detrimental in vivo. The authors attribute the healing to decreased bacterial counts (Sanchez et al, 1988).

Cultured neutrophils, fibroblasts, and endothelial cells were observed for effects on cell migration and injury when exposed to Dakin's solution (sodium hypochlorite) at concentrations of $2.5x10^{-2}$% or $2.5x10^{-3}$%. The study found that the cells, when viewed with electron microscopy, showed marked cell injury characterized by convoluted nuclei, cytoplasmic vacuolization, dilated endoplasmic reticulum, and swollen mitochondria. The authors of this study

recommended that Dakin's solution not be used in open wounds, and that there is no safe concentration of Dakin's solution (Kozol, Gillies, & Elgebaly, 1988).

To further assess the toxicity of materials used in wound cleaning, several agents were evaluated using cell cultures of skin fibroblasts in vitro. Povidone iodine, hydrogen peroxide, chlorhexidine, balsam of Peru (Granulex) and Carrington Dermal Wound Gel were used to evaluate cytotoxic effects (Johnson, White, & McAnalley, 1989). The cells were labeled with chromium to measure the release of radioactivity, which has been shown to be a reliable indicator of cell injury. By measuring the release of Cr, cell injury was quantified. Following addition of the antiseptic agents povidone iodine, Granulex and Hibiclens, rapid release of the Cr occurred. Between 55% and 62% of the Cr label was released within five minutes. The control solution was the cultured fibroblasts, which released 5% of the Cr within 5 minutes. Carrington Dermal Wound Gel at a 0.5% concentration released no more than the medium alone. Longer incubation for 10 to 15 minutes slightly increased the release of radioactivity (Johnson et al, 1989). In this study, hydrogen peroxide was not evaluated by the release of Cr, but rather by observation of the change in morphology following introduction of hydrogen peroxide. The researchers found that the hydrogen peroxide at a concentration of 0.01% significantly damaged the cells. The researches did not

quantify the damage caused by the hydrogen peroxide (Johnson et al, 1989). Concentrations of Carrington Dermal Wound Gel of greater than 0.5% was not used. There was not an explanation of why the gel was diluted by 50% (Johnson et al, 1989).

Hydrogen peroxide is the most commonly used antiseptic on wounds. However, the bacteriocidal activity is minimal (Brown & Zitelli, 1993). Hydrogen peroxide is often used for its effervescence and visual evidence of activity. This occurs by the reduction of hydrogen peroxide to hydrogen and water by tissue catalase present in wounds (Brown & Zitelli, 1993). Any benefit of mechanical debridement comes at the expense of tissue toxicity. Disruption of the epithelium occurs by formation of bullae that may form under the new tissue (Brown & Zitelli, 1993). Hydrogen peroxide is also toxic to fibroblasts even when diluted to 1:100. It has been shown to delay healing in animal and human wounds (Brown & Zitelli, 1993).

Aloe vera, the active ingredient in Carrington Dermal Wound Gel, is reported to help wounds heal and speed healing time. Carrington Dermal Wound Gel was evaluated by comparison of time interval to complete healing. This study evaluated twenty-one women who had wound complications following cesarean delivery or laparotomy for gynecologic surgery, and required healing by secondary intention (Schmidt & Greenspoon, 1991). Secondary intention is the

process of allowing the wound to heal without surgical closure. This often occurs when an incision opens, and closure is not possible. The wound is then allowed to granulate in and close (Ekersley & Dudley, 1988). Eleven patients were randomized to the standard management group and 10 to the Carrington Gel group. Sodium hypochlorite 0.025%, was used as the control, or standard wound treatment. Patients receiving the standard treatment healed in 53 days (sd 24 days). The Carrington Dermal Wound Gel group healed in 83 days (sd 35 days). The study was terminated early due to the obvious delay in healing in the Carrington Gel treatment group (Schmidt & Greenspoon, 1991).

Although this is a small sample, treated with sodium hypochlorite, a known cytotoxic agent (Brennan & Leaper, 1985), as the control, it still outperformed the aloe vera treated group. This indicates that in vivo and in vitro studies can give conflicting and contradicting results (Brennan & Leaper, 1985) and (Schmidt & Greenspoon, 1991). The use of potentially cytotoxic chemicals on wounds needs to be carefully evaluated (Brown & Zitelli, 1993). Even the use of seemingly benign agents such as aloe vera gel must be evaluated (Schmidt & Greenspoon, 1991).

Chronic non-healing wounds is an ongoing clinical problem. Utilizing treatments to improve the environment, as well as limiting or eliminating exposure to toxic chemicals may not be sufficient to heal the ulcer. Use of growth

factors to stimulate repair is being investigated (Knighton, Fiegel, Doucette, Fylling, & Cerra, 1989). Platelets and macrophages are identified as the main regulatory cells in wound repair. Platelets contain five, and perhaps more, growth factors (Knighton et al, 1989). Platelet derived growth factor [PDGF] is a mitogenic chemoattractant for fibroblasts and smooth muscle cells. A mitogenic chemoattractant is a substance that stimulates replication and movement of fibroblasts. At low concentrations it causes fibroblast migration, and at slightly higher concentrations it causes fibroblast mitosis (Knighton et al, 1989).

To evaluate the effects of PDGF, Knighton, Ciresi, Fiegel, Schumerth, Butler, & Cerra, (1990) studied 32 patients with a chronic wound; the type of chronic wound was not identified. Half were treated with autologously prepared PDGF. The control group was treated with an identical medium which did not contain PDGF. During the first eight weeks, 17 of 21 ulcers in the treatment group achieved epithelialization. In the control group 2 of 13 wounds achieved epithelialization. After crossover to the treatment protocol, all wounds achieved epithelialization in an average of 7.1 weeks (Knighton et al, 1990). The cost for the treatments was not stated in this study. Considering that each patient must have autologously prepared PDGF, the cost may be prohibitive for routine use. However, for wounds that fail with conventional therapy, PDGF could be

considered.

Trying to keep wounds free of contamination, may be both futile and contraindicated. Seven strains of staphylococcus aureus were inoculated along the length of dorsal skin incisions of rats. Accelerated healing and improved wound strength resulted. Contamination with pseudomonas and staphylococcus epidermidis, and staphylococcus hominis did not result in improved healing or strength. There was no evidence of local or systemic infection (Gruber, Gruber, Seifter, Molnar, & Levenson, 1985).

The process of accelerated healing occurs by increasing inflammatory response that is maintained within the host defense mechanisms (Laato, Lehtonen, & Niinikoski, 1985). Rats inoculated with S. aureus 10^3 or more organisms showed infection. Rats inoculated with 10^2 organisms had increased monocytes and macrophages in the wound fluid, and increased healing (Laato et al, 1985).

Lower Extremity Wounds. Significant mortality and morbidity is associated with wounds due to venous stasis, arterial insufficiency, and diabetes. Venous stasis ulcers are a significant management problem that require additional evaluation and treatment interventions (McCully, Halber, & Posner, 1994).

Chronic venous hypertension and venous insufficiency account for 70% of the leg ulcers. Arterial insufficiency

accounts for 8-10%; the rest is of mixed arterial and venous etiology (Cherry, Ryan, & Cameron, 1991). Peripheral vascular disease is the major cause of leg ulceration. Other causes include metabolic disease, infection, neoplasm, vascular disease, trauma, and hematologic disease (Cherry et al, 1991).

The treatment of venous and arterial ulcers is different. Therefore it is important that determination of the ulcer type is made (Cherry et al, 1991). Treatment of venous lesions include; elevation of the leg, compression bandage such as elastic stockings, paste bandage (Unna's boot), or elastic bandages. The authors recommend use of hydrocolloid dressing under the compression bandage (Cherry et al, 1991).

Venous insufficiency in the lower extremities results in venous hypertension, which leads to excessive accumulation of fluid and fibrinogen in the subcutaneous tissue. The result is swelling, dermatosclerosis, (an infiltration of the skin with fibrous material) and finally, ulceration (Christopoulos, Nicolaides, Cook, Irvine, Galloway, & Wilkinson, 1989). One hypothesis for ulceration that occurs in the lower extremities is the presence of edema. The edema causes a rise in tissue pressure, which causes the normally observed postural changes to be modified (Chant, 1990). Constantly high skin and tissue pressures cause compromised circulation which results in ulceration

(Chant, 1990).

Arterial ulcers are difficult to heal and require different treatment than venous ulceration. Treatment options should include evaluation for vascular surgery. Hydrocolloid dressings have been effective and comfortable for treatment of arterial lesions (Cherry et al, 1991).

Diabetic ulcers are a significant management concern. Diabetes accounts for more than half of the amputations of lower extremities in the United States (Miller, 1993) and ranks fifth in the cause of death in the United States (Morain & Colen, 1990).

There are two distinctive types of diabetic ulcers; ischemic and neuropathic. Ischemic ulcers are ulcers due to diminished arterial supply to the lower extremity. If the defect is not corrected, prognosis is poor and amputation is inevitable (Miller, 1993). Additionally, there is evidence of altered blood viscosity, affecting circulation, and ischemia that results in an alteration in microvascular flow patterns (Morain & Colen, 1990). Evidence of arterial origin includes; cool foot, dependent rubor, pallor on elevation, atrophic shiny skin, and diminished or absent dorsalis pedis, or posterior tibial pulses. Intermittent claudication or pain with elevation of the lower extremity, which is relieved by dependency, are additional signs (Miller, 1993).

The neuropathic ulcer is essentially a pressure ulcer that occurs due to absent or distorted foot sensation

(Miller, 1993). Neuropathy affects motor autonomic as well as sensory nerve functions. Vascular supply limitations may compound the problems with peripheral neuropathy (Miller, 1993). If an ulcer is present, debridement and relief from pressure are absolutely essential. If enzyme preparations and wet-to-dry debridement does not suffice, mechanical debridement is the best course of treatment (Miller, 1993). The basic principles of wound care are used in the treatment of a diabetic ulcer. This includes keeping the wound bed moist and avoiding cytotoxic agents such as povidone iodine and hydrogen peroxide (Miller, 1993). There is increased risk of infection due to diabetes. The lack of skin sensation results in failure to alert the patient of problems with skin breakdown, or pressure points (Morain & Colen, 1990).

Conclusions

After evaluating the current research relating to wound care and management, there are several conclusions which can be drawn. The health care providers need to evaluate very critically the need for caustic antiseptics which may be marginally effective. These antiseptics have a significant probability of causing cellular injury, or cell death. The benefit of trying to sterilize a wound is limited and the risk for harm is significant. This is particularly true when dealing with a chronic wound. In a chronic wound, bacterial contamination is virtually assured, and the futile attempts

to sterilize the wound are likely to cause further injury. Use of such chemicals as povidone iodine, hydrogen peroxide, and Dakin's solution needs to be discontinued.

Removing necrotic tissue is important in wound care. It is difficult for re-epithelialization to occur under intact eschar or necrotic tissue. Debridement, either mechanical or autologously, is needed to improve the wound bed. This can be done surgically, or with dressings that promote autolysis and a moist environment. This moist environment allows the host to remove the dead tissue, and assists in the repair process.

Finally, maintaining a moist wound environment aids in migration of new cells, speeds healing, and phagocytosis of offending bacteria. Hydrocolloid dressings are one of the dressings that are used to maintain this moist environment. This type of dressing is more comfortable for the patient, takes less time to apply than dry dressings, and is cost effective. The management of wounds requires the provider to be open to new interventions and a willingness to implement treatments that are research based and effective.

Chapter 4

Guidelines for Wound Care in an Extended Care Facility

Introduction: This protocol is designed as an aid for the practicing nurse in determining appropriate interventions for wound care. These interventions can be implemented across the life span and are particularly important in a compromised individual such as the elderly and persons with diabetes. It is intended to be used in conjunction with clinical judgement and independent evaluation of the individual circumstances. It is not designed to determine all interventions in all conditions. Determination of appropriate dressings, cleansing agents, and techniques for wound management will be outlined. Use of appropriate products, cleansing, and dressings will also be covered.

Goals of wound care: The goal of wound care is to eliminate factors that delay or impede the healing process and to correct the underlying pathology; identify what is causing the wound; implement interventions to help decrease the risk for reoccurrence; and utilize products that will not destroy tissue. The interventions should be cost-effective, comfortable, and easy to use.

Implementation: This protocol will be offered to the extended care facility for evaluation and upon approval its implementation. This protocol will be implemented in conjunction with an inservice on its use. This author will

arrange with the extended care facility (ECF) to provide an inservice to staff on current wound care interventions as outlined in this protocol. Following this inservice the protocol will than be implemented. At the discretion of the management of the ECF they may implemented the protocol in selected populations or for selected types of wounds that are encountered in the ECF.

Evaluation: Evaluation of the wound will be done on a weekly basis. This will include assessing and recording all wounds, current treatment, presence or absence of necrotic tissue, measurements, evidence of infection, frequency of dressing changes, and type of dressing used. This weekly evaluation will be used to assess the effectiveness of this protocol. A flow sheet will be developed for use at the facility outlining the outcome criteria to be evaluated. This sheet will identify the outcomes of the intervention, the time involved with using this protocol, identified complications and the wound response. This chart will provide the basis for easy reference and evaluation of the protocol.

Guidelines:

There are three basic wound care guidelines that must be observed. First, necrotic or dead tissue must be removed if possible. Dead tissue allows bacteria to grow, thus increasing the risk of infection (Hutchinson, 1989).

The dead tissue can be removed surgically or with

several of the dressings currently available, such as hydrocolloid (Duoderm) and polyurethane film (Tegaderm). These dressings allow the body to break down and soften the dead tissue, allowing easy removal with forceps, scissors or saline irrigation (Szycher & Lee, 1992).

Secondly, maintain a moist wound environment. This allows the new cells to move in and fill the wound, which subsequently heals the wound faster than if left dry. A moist wound is generally more comfortable and is at less risk for infection (Szycher & Lee, 1992). The wound healing process is greatly influenced by the extracellular environment of the wound (Dyson, Young, Pendle, Webster, & Lang, 1988). A moist wound bed promotes re-epithelization more rapidly than a dry wound bed (Dyson et al, 1988).

Thirdly, eliminate or decrease the use of chemicals that can delay healing. Many routinely used chemicals have been shown to actually hinder healing (Leaper & Simpson, 1986), (Brennan & Leaper, 1985). These chemicals include povidone iodine, hydrogen peroxide, granulex, Dakins solution (a dilute bleach solution) and Hibiclens (Brennan & Leaper, 1985),(Kozol, et al, 1988), (Johnson, et al, 1989). The elimination of caustic chemicals from the wound bed diminishes the risk and incidence of infection (Rodeheaver, 1989). Mechanical trauma to the wound bed and surrounding tissue, such as cleansing, scrubbing and shear forces, are other elements of wound care that require careful

consideration (Rodeheaver, 1989).

The rationale for use of these chemicals is to decrease the bacteria in the wound. This is now generally considered futile since removing all the bacteria is not possible (Rodeheaver, 1989). If the wound is infected (red surrounding tissue, red streaks, warm tissue, painful, foul odor, and elevated temperature), antibiotics by mouth or by injection may be needed (Rodeheaver, 1989).

Wound Cleansing

Removal of dead tissue is important in the healing wound (Rodeheaver, 1989). Dead tissue helps to support the growth of bacteria and should be removed whenever possible. Another reason for its removal is that the foul odor of dead tissue is mistaken for infection and antibiotics are started prematurely. Other evidence of infection, such as elevated temperature, red area surrounding the wound, and pain need to be used to determine infection.

Several methods can be used to clean the wound and remove dead tissue. The least traumatic for the patient is a process called autolysis. This is the process of allowing the body to break down the dead tissue. The tissue becomes soft, and than can be easily removed with saline irrigation, or carefully with gauze. Autolysis is best accomplished under a dressing that keeps the wound bed moist, such as Duoderm or Tegaderm type dressings. Autolysis occurs very slowly if the wound is dry, or covered with an eschar

(scab), that is dry.

Irrigation is done with a 30 Ml syringe equipped with a 18-20 gauge plastic catheter or needle. The plastic catheter should be at the wound surface to 2 centimeters away from the skin (Chisholm, 1992). A flush volume of two hundred milliliters is needed for a low bacterial load or wound that is minimally contaminated. Use more irrigant for infected wounds that have a higher bacterial load (Chisholm, 1992). A drawback of irrigation is the spray produced. Use a gauze or commercially available shield designed to minimize the spray and contain it (Chisholm, 1992). Normal Saline or Lactated Ringers are recommended irrigation solutions (Perez, 1993). Irrigation with saline is safe, nontoxic and minimally traumatic to new cells that are forming in the wound bed. Irrigate the wound with each dressing change (Rodeheaver, 1989).

Dead tissue can also be removed with scissors, knife and forceps; this is often called "sharp debridement". This requires a skilled practitioner, often a nurse or physician who has experience and instruction doing this type of debridement. Only devitalized tissue should be removed. This can often be facilitated by using one of the polyurethane film dressings, which can soften the dead tissue making removal easier (Barnes, 1993).

Barrier Dressings

Occlusive dressings are a group of dressings that cover

the wound and are a barrier to outside contaminants. They also can hold wound exudate at the wound site promoting a moist wound environment. They can be left in place for several days to soften dead tissue, thus aiding in removal (Barnes, 1993).

Polyurethane film and hydrocolloid are two of the most common and widely used varieties. The polyurethane film dressings allow gas and water vapor transport, provide a mechanical barrier against contamination, and are comfortable and conformable. Polyurethane dressings cannot absorb drainage and because they are clear, the wound can be evaluated before the dressing is removed. These dressing are effective in softening eschar (the hard surface covering the wound) increase moisture in the wound, and support the white cells in breaking down the dead tissue (Barnes, 1993).

The hydrocolloids have little moisture vapor transport capability and can absorb a minimal to a moderate amount of exudate. If the dressing leaks and needs to be changed more than once a day due to drainage, this is too much drainage for hydrocolloids to effectively contain and is not cost effective (Barnes, 1993). These dressings are also comfortable and conformable and provide a barrier against bacterial contamination (Szycher & Lee, 1992). Hydrocolloids are generally more comfortable than gauze dressings, and take less time to change. They can be left on for one week (Barnes, 1993).

Their are several disadvantages and contraindications to Hydrocolloids. The inability to see the wound unless the dressing is removed is a significant disadvantage to using hydrocolloid dressings. They can cause maceration, or over hydrating of the skin around the wound, therefore a skin protectant such as Bard Skin Prep should be used.

The risk for a systemic (whole body) infection increases if hydrocolloids are used in an infected wound. The breakdown of dead tissue is often mistaken for infection, causing premature discontinuation of the dressing. Use other indications of infection such as redness, streaking, elevated temperature, and increased pain, instead of odor to determine infection.

The moist conditions that develop under occlusive dressings are conducive to bacterial growth. This also provides an environment that allows for the efficient function of the host defenses (Hutchinson, 1989).

Topical Antibiotics

Topical antibiotics are safe and effective in preventing wound infections. These are the topical agents of choice for wound antisepsis (instead of antiseptics). They are applied to the wound surface and held in place with secondary dressing such as gauze. Many of the agents will accelerate healing, including mupirocin, silvadene and bacitracin ointment (Brown & Zitelli, 1993). These substances are effective if the bacterial load is high. The beneficial

effect may not all be related to the antimicrobial effect. Rather some of the benefits could be from the vehicle (the antibiotic base) present in the ointment or cream (Brown & Zitelli, 1993). Topical antibiotics are not usually toxic to tissue though a systemic allergic response is possible. Overgrowth of non-susceptible bacteria may occur, and resistant strains of bacteria can proliferate (Brown & Zitelli, 1993). Topical antibiotics are applied 2-4 times a day, or with each dressing change. A small thin covering is usually adequate.

Gauze Dressings

Gauze is used to fill a large wound bed and wick exudate from the wound surface. To maintain a moist environment the dressing should be applied moist and changed or moistened often enough to prevent the wound tissue from drying out. The dressing is usually changed two to four times daily, or as needed according to the amount of exudate present (Szycher & Lee, 1992),(Alm et al, 1990).

A Wet-to-dry dressing is where the exudate is allowed to dry into the gauze, this causes non selective removal of viable and dead tissue(Alm et al, 1990). This is often painful to remove (Szycher & Lee, 1992).

Gauze is inexpensive, but takes more time to change. Gauze may also be used with an ointment that prevents the wound from drying out (Szycher & Lee, 1992).

Wound Gel

Used to keep the wound bed moist, and will create a moist environment in a dry wound bed. A secondary dressing must be used, such as gauze or another good absorbing dressing. Gel is comfortable to use and will hydrate eschar and slough, easing removal. It promotes migration of new cells and can be used in infected wounds. Requires dressing changes daily or more often in highly exudative wounds where the dressing is unable to contain the drainage (Schmidt & Greenspoon, 1991)

Some contain aloe vera, which may slow healing. Requires a secondary dressing such as gauze or polyurethane film (Schmidt & Greenspoon, 1991).

Wound Care Protocol Summary

Moist Environment:

- A moist wound is more comfortable than a dry wound and should be maintained
- It aids in the migration and survival of new cells that fill in the wound bed.
- It helps the body fight infection by bathing the wound in exudate that is rich in white blood cells.
- Softening and removal of dead tissue is easier in a moist wound.

Debridement:

- Removal of dead tissue is important to reduce infection, odor, and the bacterial load in the wound.
- Wet to moist gauze dressing that is lightly packed into the wound is effective in non-selective removal of tissue. Because this can harm new cells when removed, this type of dressing should be discontinued when dead tissue is not a management problem.
- Surgical removal of dead tissue is also effective and safe when there is a large amount of tissue to remove and conservative measures are not effective.
- Cut and remove only dead tissue. This requires a skilled practitioner instructed in debridement.

Wound Cleaning:

- Irrigate with saline or Lactated Ringers solution. A 19-20 gauge catheter with a 30 ml syringe provides

enough force to remove bacteria without damaging new tissue.

- A volume of 200 ml is usually adequate for wounds with a low bacterial load. Use more solution if infected or excessive dead tissue is present.
- Collect the drainage in a basin or absorbent padding.
- Avoid caustic materials such as povidone iodine (Betadyne) hydrogen peroxide, sodium hypochlorite (Dakins solution) balsam of Peru (Granulex), which can kill cells and slow healing

Hydrocolloid: ex; Duoderm

- Apply to moderately exudating wounds.
- Use skin protectant.
- Tape edges to help them stay flat.
- Change daily or when exudate leaks.
- Leave on for a maximum of one week.
- Cannot be used in infected (elevated temperature, redness, purulent material, pain) wounds.

Polyurethane film: ex; Tegaderm

- Use for minimally exudating wounds.
- Apply daily, change when leakage occurs, or at least weekly.
- Use skin prep to decrease over hydrating intact skin (maceration).
- Cannot be used if the wound is infected.

Gauze:

- Useful for moderately to heavily draining wounds.
- Often applied wet to dry or wet to moist to help remove dead tissue.
- Change once to several times a day as needed to control drainage.
- Hold in place with tape or other securing method.
- Paper tape is least reactive to intact skin.
- Can be used in infected wounds.
- Wound gel or a topical antibiotic may be used with gauze to help maintain a moist wound environment

Topical Antibiotics:

- Useful to help keep the wound moist.
- They can help to decrease the bacterial load.
- Apply a thin layer to the wound with each dressing change. Usually applied two to four times a day.
- If the wound is infected, oral antibiotics may be needed, because topical therapy alone is usually not effective.
- Can cause an allergic response.
- Cover with a secondary dressing such as gauze.

Chapter 5

Implications For Advanced Practice

The previous protocol is intended to aid the advanced practice nurses in developing and implementing a treatment program for wound care. As stated previously individual assessment of each wound should be used in conjunction with this protocol to determine a program that is effective and well tolerated. Multiple factors must be considered before implementing any treatment program. These include previous treatments, concomitant disease, mobility, nutrition, caregiver support and the wound's condition. The nurse in advanced practice is in a position to impact this area of practice by accurately assessing and educating patients and other providers on appropriate treatment options.

Inappropriate treatment of wounds in both home and institutional settings is continuing. Education of patients and other providers on appropriate treatments is generally needed in multiple settings, including private practices and nursing homes.

With increased knowledge about appropriate treatments, patients and providers will hopefully question or offer suggestions of alternative treatment options. Wounds will heal faster, and generally with less discomfort by using methods outlined in this protocol.

The current environment of health care reform and managed care is demanding less costly and more effective treatment of wounds. As providers of care and educators of patients and

associates, nurses in advanced practice can provide cost-effective care with positive outcomes in the area of wound care. Possible changes in patient outcomes would be: decreased infections, decreased pain, decreased morbidity and possibly decreased mortality. There may also be decreased amputations of lower extremities due to diabetic wound complications and fewer hospitalizations. In addition, with this protocol there may be increased compliance by the provider and patient with the wound care treatment. There may also be less risk of inappropriate antibiotic use with correct identification and treatment of infected wounds.

The role of the nurse in advanced practice with wound care expertise is threefold. As a consultant, the nurse in advanced practice with wound care expertise should be available to advise other providers on problematic wounds. This should occur in such settings as an extended care facility, private practice, or even skilled home care.

As an educator, the nurse in advanced practice can provide inservice sessions to other professionals who provide wound care. This can be done on a contractual basis, such as providing an inservice to the facility or as a consultant on specific cases. Assisting care providers and patients in defining educational interventions that results in a positive adaptation for the client creates a successful environment for all individuals involved. This facilitates the adaptation of the care providers learning new skills as well.

As a collaborator, the nurse in advanced practice can assist others in the primary care setting with management of wounds by providing expertise and leadership in innovative and proven treatment options. This may include serving as a case manager, communicating with the members of the health care team to ensure the continuity of the client's care and successful adaptation.

Providing comprehensive care that is cost effective, acting as an educational resource to staff and patients, and being available for consultation to peers, are positive roles identified for the advanced practice nurse. Serving in these roles the nurse in advanced practice can improve primary care.

Implications for research

Wound care is continuing to evolve. The treatments and interventions have changed markedly over the last fifteen years and will likely continue as new treatments and interventions are proven. The health care industry is also changing with payers requiring treatments that are safe cost effective and provide maximum long term benefit. Researchers must continue to develop new treatments and evaluate the current interventions to assess safety and effectiveness. This clinician has identified several areas that require further research.

Further research utilizing platelet derived growth factors (PDGF) is needed. PDGF shows promise as a superior aid in healing chronic wounds as compared to other less expensive treatments which are currently available. Yet, its use at this time is

limited to specialty wound care clinics and the cost of treatment is significant.

There is continued controversy about the effects of aloe vera. Further in vivo research defining the effects of this substance is indicated. The conflicting research currently available precludes the use of products that contain aloe vera.

Research focusing on the indications, application, and efficacy of the multiple dressings currently available would be helpful. For example, a study is needed that evaluates several of the hydrocolloid dressings to determine if one is better than another, lasts longer, controls drainage better, or is more comfortable. This study could also evaluate reasons for discontinuation of hydrocolloid dressings and the effects of inservice sessions on correct use of hydrocolloid dressings. Much of the research available is conducted by the manufacturer. This may indicate the possibility of bias in the research findings. Independent evaluations of the effectiveness of these products are needed.

Utilization of inexpensive treatment options such as sugar paste needs further exploration. Because the cost of dressings can be a significant deterrent to use, an effective and low-cost product that is readily available, safe, and comfortable would be a welcome addition to the wound care product line. Comparison of a hydrocolloid to sugar paste would be a possible research study.

Further research investigating the use of compression in venous peripheral vascular disease is indicated. Comparison of

compression with a hydrocolloid versus a hydrocolloid alone would be one question that needs to be addressed.

Further research is indicated to evaluate the effects of a self-management wound program as compared to a provider-supervised program. This would help to answer the question of effectiveness of a nurse-supervised versus nurse-implemented wound care program.

Wound care is field of nursing that is changing continuously. At this point, there have been great advances in our treatment of wounds, and this trend is likely to continue over the next fifteen years. Health care reform and prospective payment may provide the catalyst needed to push health care providers into identifying and utilizing treatments that are identified as less expensive, more practical, and effective. As information and alternative treatments become available, the provider must be willing to implement new treatments, evaluate the effectiveness, and generate new questions. The advanced practice nurse is in an excellent position to be instrumental in implementing current research, and answering the questions that will come.

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