

Running head: NUTRITION SCREENING AND VENOUS LEG ULCERS

Impact of Nutrition Screening of Venous Leg Ulcer Patients on an Outpatient Wound Center

Fran Valle

University of Maryland Baltimore

Dedication

This Capstone Project is dedicated to:

My husband, Dan, who selflessly supported me throughout my education never growing weary of my trials and tribulations. He not only kept me well hydrated and nourished during the long nights at my computer but provided a soft shoulder on which to cry and a warm heart and soul on which I could rest.

My children, Anna and Ben, who understood my many times away from family moments and always encouraged me to do my best. They inspired me through their love by understanding my goals and supporting my dreams. I am in awe of the individuals they have become.

My father who passed away during my first semester as a doctoral student only after graciously teaching me love and compassion for others, and

My mother who has always selflessly given me her love and guidance.

Acknowledgements

The author of this paper would like to acknowledge the nurses and staff of the Johns Hopkins Wound Healing Center for their tireless hard work and dedication to the welfare of their patients. They embody the true meaning of nursing by providing compassionate care to the many patients that cross the threshold of the Wound Healing Center.

Additionally, the author would like to acknowledge the capstone committee members: Dr. Marisa Wilson, Chairperson, Dr. Joseph Pellegrini, and Dr. Maria Koszalka for their guidance, patience, and encouragement throughout this process.

TABLE OF CONTENTS

Abstract.....1

Title Page.....2

Dedication.....3

Acknowledgements.....4

Section 1.....7

 Background7

 Problem, Setting, and Target Population.....11

 Significance.....13

 Purpose and Objectives.....14

 Theoretical Framework.....15

Section 2.....23

 Review of the Literature.....23

 Adoption of Clinical Change.....23

 Venous Leg Ulcers and Malnutrition26

 Nutrition Screening Tool: MUST.....32

Section 3: Methodology.....34

Section 4.....39

 Results.....39

 Discussion and Recommendations.....47

 Personal Leadership Goals.....53

References.....55

Appendix A: MUST.....58

Appendix B: Validity and Reliability of MUST.....	59
Appendix C: Nursing Pre/Post Test.....	61
Appendix D: Letter of Explanation to Patients.....	63
Appendix E: MUST Source Documentation.....	64
Appendix F: Focus Group Questions.....	65
Appendix G: Nurses' List of Priorities.....	66
Appendix H: Focus Group Themes.....	67

IMPACT OF NUTRITION SCREENING OF VENOUS LEG ULCER PATIENTS ON AN OUTPATIENT WOUND CENTER

Section One

Background

Malnutrition and wound healing

Malnutrition is a pervasive issue in patients with chronic diseases such as chronic wounds. Malnutrition may prolong the inflammatory phase of wound healing, leading to decreased fibroblast proliferation which, in turn, leads to decreased collagen synthesis (Langemo et al. 2006) Additionally, neoangiogenesis which occurs during the proliferative phase of wound healing may be delayed which could further inhibit the necessary formation of granulation tissue (Langemo et al.). Furthermore, protein-calorie malnutrition impairs humoral and cell-mediated immunological responses, lowering the host's resistance and increasing morbidity and mortality associated with impaired wound healing (Wipke-Tevis & Stotts, 1996).

Unfortunately, there is no universally accepted definition of malnutrition. Herein lays the problem: What is the most appropriate way to measure nutritional status? Historically, clinicians have linked the serum hepatic proteins of albumin, prealbumin, and transferrin to nutritional status (Fuhrman, Charney, & Mueller, 2004). While alterations in these proteins are indicators of morbidity and mortality, it is the inflammatory process of acute and chronic illnesses that adversely affects hepatic protein metabolism as opposed to nutritional status or protein intake (Fuhrman et al.). Also, the severity of illness, including trauma, infection, and inflammation, can significantly impact gastrointestinal motility, appetite, and hemodynamic status, thus negatively impacting nutritional status (Fuhrman et al.). Furthermore, it is recovery from these conditions and not exogenous supplementation of protein and energy that increases the serum levels of

albumin, prealbumin, and transferrin (Fuhrman et al.). Therefore, because these serum proteins are negatively affected by inflammation, infection, and trauma (typical manifestations of chronic wounds), another method of measuring nutritional status must be utilized: nutrition risk screening.

Nutrition risk screening can be performed quickly and non-invasively. The results are obtained immediately and a treatment plan, if necessary, can be devised during the same clinic visit. This decreases expense, eliminates the need for an invasive test, and spares the patient any further inconvenience of an unnecessary office visit to discuss lab results.

Nutrition screening

It has been demonstrated that early nutrition risk screening can reduce the deleterious effects of malnutrition and the health care costs related to it (Norman, Pichard, Lochs, & Perlich, 2007). The Joint Commission mandates that nutrition screening be completed on all patients within 24 hours of hospital admission (Joint Commission, 2005). Consequent to this screening process, an alarming 32% to 59% of hospitalized patients in the United States have been found to be malnourished (Brown, Turek, & Maillet, 2006). Additionally, malnutrition was not identified in 57% of elderly patients and 88% of young patients in hospital outpatient settings in the United States (Elia, Zellipour, & Stratton, 2005). Also, a recent United Kingdom survey of 11,655 patients revealed that one in four adult patients admitted to hospitals and care homes were at risk of malnutrition (British Association of Parenteral and Enteral Nutrition (BAPEN), 2007).

According to the nutrition assessment guideline published by the Agency for Healthcare Quality and Research (AHRQ, 2002), nutrition screening of all patients should occur during the initial evaluation, whether it be in ambulatory, hospital, home or long term care facilities. Since the majority of chronic wound patients receive their wound care in an outpatient wound clinic, it

is essential that these clinics routinely conduct nutrition screening. However, the high rate of malnutrition discovered among inpatients and outpatients clearly implies that nutrition screening is not occurring as it should in the outpatient or community setting (BAPEN, 2007). Despite there being an obvious gap in the evidence related to nutrition screening of chronic wound patients in an outpatient setting specifically, one can surmise from the literature that the prevalence of such a program is low.

A nutrition screening program begins with the implementation of a valid nutrition screening tool. The M.U.S.T. (Malnutrition Universal Screening Tool) was developed by the British Association of Parenteral and Enteral Nutrition and, through rigorous testing, has been verified to be reliable and valid (BAPEN, 2003). This tool is straightforward and appropriate for use on all age groups and in all clinical settings, making it suitable for the VLU patient in an outpatient wound clinic setting. The MUST will be discussed in more detail later.

Venous leg ulcers

VLU's account for approximately 80%-90% of all lower extremity ulcers treated in an outpatient wound clinic, and it has been noted that approximately 2% of the population suffers from VLU's (Valencia, Falabella, Kirsner, & Eaglstein, 2001; Olin et al., 1999). It has been reported that the average cost per month of treatment of VLU's in the United States in 1999 was approximately \$2400, with an average duration of follow-up care for a VLU patient of 119 days (Olin et al., 1999). Healthcare expenditures for VLU's in the United States are estimated to be between \$1.9 billion and \$2.5 billion (Valencia et al.).

The peak prevalence of VLU's occurs between the ages of 60 to 80 (Valencia et al., 2001). However, it has been noted that 72% of the VLU patients experience their first ulcer before the age of 60, 22% before the age of 40, and 13% before the age of 30 (Valencia et al.).

Therefore, the strain on work force productivity due to missed work days as well as the impact of the growing population of elderly people potentiates the economic burden that VLU's place on society. The typical VLU patient is likely to be older, male, and obese (Tobon, Whitney, & Jarrett, 2008). Another aspect to consider with VLU's is their impact on quality of life. As many as 75% of patients with VLU's report significant pain (Valencia, Falabella, Kirsner, & Eaglstein, 2001). Furthermore, weekly visits to an outpatient wound center causes interference with daily routines and schedules. Because of the economic, physical, and social impact of VLU's on individuals and society as a whole, it is important to discern optimal treatment of such a disease, including the screening, assessment, and treatment of malnutrition.

While there are a variety of chronic wounds that require outpatient nursing care, this project focused on the venous leg ulcer (VLU) patient. Though the specific pathogenesis of VLU development is unclear, venous hypertension that leads to capillary bed distention and subsequent edema is considered the most common contributing factor (Tobon, Whitney, & Jarrett). Therefore, the mainstay of treatment for VLU's in the outpatient setting is the application of moist wound healing products coupled with compression therapy to the lower legs to control edema. However, because of the deleterious effects of malnutrition on the wound healing process, optimal treatment of VLU's should include the identification of patients at risk of malnutrition through a nutrition screening program. Unfortunately, outpatient settings continue to be deficient in conducting nutrition screening despite the AHRQ (2002) recommending that it occur in all patient care settings.

Problem, Setting, and Target Population

Poor wound healing is a consequence of malnutrition. Since the traditional methods of analyzing serum hepatic proteins have proven to be an inadequate assessment of nutritional status, another strategy must be employed to identify this risk factor of poor wound healing. The implementation of a nutrition screening program utilizing an appropriate nutrition screening tool can guide the wound clinician to the early identification and treatment of those patients at risk of malnutrition. This Capstone project focused on the nutrition screening of VLU patients in The Johns Hopkins Wound Healing Center. Specifically, three issues were addressed: 1. The identification of VLU patients at risk of malnutrition; 2. The Wound Healing Center nurses' perception of a nutrition screening program, including the evaluation of the nutrition screening tool, and; 3. The effect that a nutrition screening program has on the work flow of a busy outpatient wound clinic.

The setting for this project, the Johns Hopkins Wound Healing Center, is a busy, hospital based outpatient wound center located in the Johns Hopkins Bayview Medical Center and is part of the Johns Hopkins Health System in Baltimore, Maryland. The administrative team of the Wound Healing Center includes a dermatologist as the medical director, a plastic/reconstructive surgeon as the surgical director and a nurse manager. Clinical practice decisions are discussed and agreed upon in staff meetings among the directors, the manager, and the six wound nurses. The nursing staff of the Johns Hopkins Wound Healing Center is experienced wound nurses, four of whom are certified in wound, ostomy, and continence. They are dedicated professionals who apply evidenced based practice to the wound patients whom they treat. Ancillary staff of the Wound Healing Center includes two registrars who occasionally assist patients back to the exam rooms and one nursing assistant who assists with obtaining vital signs and removing wound dressing.

Patient scheduling at the Johns Hopkins Wound Healing Center utilizes templates and each clinic runs about four hours with a one hour break for lunch. During nursing clinics, the nurses are the providers of care. Each nurse has her own template and has patients scheduled approximately every 30 to 60 minutes. During physician or nurse practitioner run clinics, the patients are scheduled on the provider's templates only and the nurses see patients in conjunction with the providers. Typically, these clinics are much faster paced, as the provider is seeing as many as 3 patients or more each hour. This scheduling pattern of the Wound Healing Center necessitates the use of a nutrition screening tool that is fast and easy.

The Johns Hopkins Wound Healing Center accommodates approximately 450 patient visits per month. Included in this patient population is the VLU patient who accounts for about 35% of the Wound Healing Center's appointments, or 1900 patient visits per year. Each of the six nurses at the Wound Healing Center has their own patient template listing their appointments for the day. On average, the nurses at the Wound Healing Center spend approximately 30 minutes with each VLU patient. The standard of care for the VLU patient at the Johns Hopkins Wound Healing Center consists of a vascular evaluation, compression wraps, advanced wound care products, weekly clinic visits, lower extremity elevation and, in some instances, sequential compression devices. However, a formal nutrition screening program, which is recommended by the AHRQ guidelines (2002) to occur in all care settings upon a patient's first visit, had not been implemented at the Johns Hopkins Wound Healing Center.

There are essentially two populations on which this project focused: the VLU patients and the six nurses of the Johns Hopkins Wound Healing Center. The VLU patients included in this project must have had a chronic venous ulceration for longer than three months duration and been willing to be nutritionally screened during their clinic appointment. The six nurses applied

and evaluated the screening tool. Their perceptions of the tool and the nutrition screening program, as well as its effect on the clinic were discussed during a focus group following the program implementation.

Significance

The treatment for VLU's is time consuming, expensive, and negatively impacts the quality of life for both patient and family. The average length of treatment for VLU's is approximately four months, many times requiring weekly trips to a wound center for dressing changes and pain management and a leave of absence from work for the patient (Olin et al., 1999; Valencia et al.). The mainstay treatment for VLU's is compression therapy and moist wound healing. However, for a patient in a malnourished state, healing of a chronic wound is impaired despite progressive medical management of the ulcer. Malnutrition tends to prolong the inflammatory phase of wound healing leading to a reduction in collagen synthesis, delaying neoangiogenesis, thereby inhibiting the formation of granulation tissue (Langamo et al., 2006). Also, malnutrition impairs the immune system, resulting in an increase in morbidity and mortality of the chronic wound patient (Wipke-Tevis & Stotts, 1996).

Currently, there is a gap in the literature concerning the nutritional screening of chronic VLU patients. However, this Capstone project brings the issue of nutrition screening among chronic VLU patients this wound population to the forefront. At present, Medicare coverage allows for outpatient nutrition assessments and interventions by a nutritionist on only diabetic and end stage renal disease (ESRD) patients. However, the data gained from this Capstone project justifies the need for nutrition screening programs for patients other than those currently covered.

Additionally, outpatient nutrition screening leading to the identification and treatment malnutrition with subsequent improved healing rates can significantly impact the financial burden that VLU's place on families and society as a whole and have a positive effect on the quality of life of the VLU patient. The knowledge gained from this project can facilitate the development and implementation of a sustainable nutrition screening program in not just the Wound Healing Center but in other outpatient clinics within the hospital. Lastly, the results of this project can be used to design quantitative studies measuring wound healing outcomes of a nutrition intervention program based on the implementation of a nutrition screening program in outpatient wound centers.

Purpose and Objectives

Early nutrition risk screening can reduce the detrimental effects of malnutrition on the healing of chronic wounds thereby reducing the health care costs related to their treatment and improving the quality of life for both patient and family (Norman, Pichard, Lochs, & Perlich, 2007). The Nutrition Assessment Guideline published by AHRQ (2002) recommends that nutrition screening be implemented upon a patient's initial encounter to any healthcare setting to include ambulatory clinics, home care, primary care providers' offices, hospitals, and long term care facilities. However, a formal nutrition screening program did not exist at the Johns Hopkins Wound Healing Center.

The purpose of this project was to explore the answers to the project's objectives in an outpatient wound center whose staff and certified wound nurses are experienced and knowledgeable in the care and treatment of the VLU patient. The objectives of this project were:

1. To identify prevalence of VLU patients who are at risk of malnutrition at the Johns Hopkins Wound Healing Center

2. To obtain The Wound Healing Center nurses' perception of a nutrition screening program, including the evaluation of the nutrition screening tool
3. To understand the effect that a nutrition screening program has on the work flow of a busy outpatient wound clinic.

Theoretical Framework: Diffusion of Innovations (Rogers, 2003)

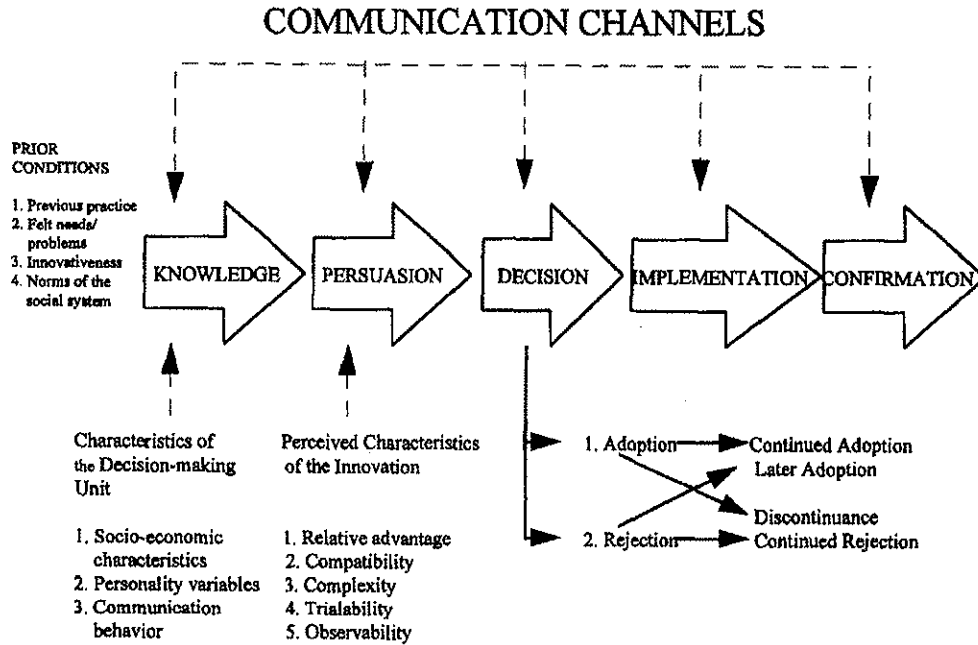
Everett Rogers' theory of Diffusion of Innovations provides an appropriate theoretical framework for the implementation of a nutrition screening program in an outpatient wound clinic. Diffusion of Innovations is beneficial in determining the adoption of clinical change (Sanson-Fisher, 2004). Rogers' theory clarifies and stresses the importance of communication and the social system on the adoption of innovations. The use of Rogers' theory affects the way in which the introduction of a nutrition screening program to the wound center staff is accomplished.

Rogers (2003, p. 5) defines diffusion as "...the process in which an innovation is communicated through certain channels over time among the members of a social system." Diffusion is considered a type of communication that disseminates the message of a new idea. Perceived risk and uncertainty of the new idea occurs during the diffusion process. The communication process that occurs among participants of a social system through the creation and sharing of information helps to diminish the level of uncertainty of the new idea. The main concepts in the diffusion of new ideas include the (1) innovation that is (2) communicated over (3) time to the members of a (4) social system. This implies that a decision is not an instantaneous occurrence; rather is it something that occurs over time through a series of stages: knowledge, persuasion, decision, implementation, and confirmation.

An innovation is conceptually defined as an idea, practice, or object that is perceived as new to an individual who is seeking its adoption. Although a nutrition screening program is not a “new” idea, it is perceived as new by the Johns Hopkins Wound Healing Center. Since a nutrition screening program had not been implemented and is one with which the staff was not familiar it was, therefore, considered an innovation. Communication is a process in which individuals share information among themselves to reach a mutual understanding. Time is the frame of reference over which the innovation diffusion occurs. Lastly, the social system is considered a group that engages in joint problem solving toward the endpoint of a common goal.

Additional concepts pertinent to the adoption of a nutrition screening program are uncertainty, information, need, social change, and change agent. Uncertainty motivates individuals to seek out information. A need occurs out of a state of dissatisfaction or frustration when an individual does not have something that he or she desires (Rogers, 2003). A need can be an antecedent of or consequence to an innovation. Social change, which is a consequence of the innovation diffusion, occurs when new ideas are adopted or rejected. Lastly, a change agent is an individual who intentionally promotes of the adoption of a new idea. Uncertainty and need can be generated through the interventions of the change agent who promotes social change through the adoption of an innovation.

Roger's Theory of Diffusion of Innovations Model (Rogers, 2003, p. 170).



The innovation-decision process is conceptualized into five stages (see figure):

Knowledge, Persuasion, Decision, implementation, and Confirmation. It is important to understand that prior conditions such as previous practice, felt needs/problems, innovativeness, and norms of the social system affect the process. Knowledge, the first stage of the innovation-decision process, begins when an individual becomes aware of the innovation's existence and begins to understand its purpose. Awareness knowledge can be passive, obtained by chance, or not passive and obtained through one's own initiation based on needs, interests, or existing attitudes. A need relates to a feeling of dissatisfaction or frustration with what is actually occurring. A change agent creates a need by revealing the existence of new ideas to address the dissatisfaction of the individual's current actuality. However, it is not clear whether a need precedes awareness knowledge or if knowledge of the idea creates the need. It is through awareness knowledge that one begins the process of obtaining how-to knowledge (information needed to understand the use of an innovation) and principles-knowledge (information needed to understand the how the innovation works). It is important to take into account the characteristics

of the individuals, such as their educational background, socioeconomic background, exposure to mass media, interpersonal communication, and their social participation. These characteristics generally help to predict the rate of knowing.

The second phase of the innovation-decision process is persuasion. In this stage, the individual forms an attitude (favorable or unfavorable) about the innovation. Attitude, an individual's conviction about something, influences the individual's actions. Thinking in the persuasion stage encompasses feelings. It is here that the individual becomes involved in actively seeking information about the innovation to decide on its credibility and how to interpret the information received: selective perception. Selective perception which molds the individual's behavior and the perceived attributes of the innovation (relative advantage, compatibility, complexity) play an important role in the persuasion stage.

Perceived attributes of an innovation help to explain rate of adoption. Relative advantage occurs in the adoption process when the innovation is perceived as better than its preceding idea and compatibility concerns the perception of whether the innovation is consistent with the values, past experiences, and needs of those who may potentially adopt it. The nurses at the Johns Hopkins Wound Healing Center are compassionate nurses whose ultimate goal is perpetuating the healing process to help patients regain a higher quality of life without the pain and burden of a chronic wound. The Wound Center's nurses are open to new, evidence based measures that can support the process of healing.

Trialability occurs in the adoption process when individuals are able to experiment with the innovation, and observability is the visibility of the results of the innovation. Complexity deals with whether the innovation is perceived as being difficult to use. Generally, innovations that have greater relative advantage, compatibility, trialability, and observability with less

complexity are more easily adopted. The nutrition screening tool, MUST, has been found to be easy to administer as well as valid and reliable. Performing a trial of a nutrition screening program over six weeks helped the nurses observe the impact of this innovation and “re-invent” it according to their needs.

Peer relations provide social reinforcement about the uncertainty of an innovation and help to confirm or refute the individual’s beliefs about the innovation. It is here that an individual seeks to know the innovation’s advantages, disadvantages, and consequences. Thus, the outcome of the persuasion stage is the formation of a favorable or unfavorable attitude about the innovation.

Decision, the third stage of the innovation-decision process, occurs when an individual has received enough information about the innovation to form an opinion to reach the point of adopting or rejecting the innovation. Adoption means that a decision was made to make full use of the innovation whereas rejection entails the decision not to adopt at all. Usually, individuals do not adopt an innovation without first trialing it. Therefore, piloting the innovation for a period of time will help with the intrinsic uncertainty.

The fourth stage of the innovation-decision process is the implementation stage. An individual progresses to this stage only if he or she has developed a favorable decision to use the innovation. An overt behavior change is necessary to actually implement the innovation. However, even though an individual chooses to adopt an innovation, structural, process, or psychological barriers may obstruct its implementation. In general, it is easier for an individual to adopt an innovation than it is for an organization. The implementation stage can be lengthy. It is concluded once the innovation is no longer thought of as new; instead it is considered a regular aspect of ongoing operations.

Re-invention, a modification of the innovation by the user during the process of innovation-decision, can occur during the implementation phase. It is believed that the degree to which an innovation can be re-invented relates to its sustainability. Re-invention is not regarded negatively. Frequently, innovations require re-invention so the adopter can make the appropriate changes necessary for his or her situation.

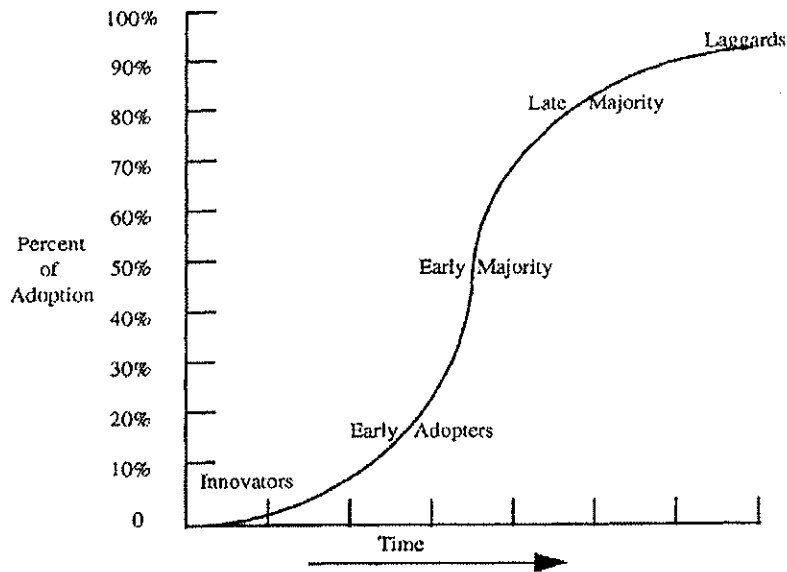
The final stage of the innovation-decision process is that of confirmation. In this stage, the individual seeks corroboration about the innovation decision that was made. The decision may be reversed if this corroboration is not achieved. It is important that those involved in adopting the innovation receive validation of its impact. This ensures confirmation and sustainability. However, during the confirmation stage, dissonance can occur. This is evident if discontinuance, a decision to reject the innovation after it was adopted, transpires. Discontinuance can occur because of dissatisfaction with the innovation or because another innovation is being adopted that will take its place. Also, when an individual is re-exposed to pro-innovation reports, adoption can occur even after an individual has chosen to reject a new idea.

In addition to the stages of the innovation-decision process, it is necessary to discuss the rate of innovation adoption as influenced by adopter categories. Since each individual's rate of adoption is dependent upon personal characteristics, a successful innovation adoption distribution follows a bell-shaped (frequency) curve plotted over time. This is a spin-off of the S-curve which plots the cumulative number of adopters (see figure). It is through the activation of interpersonal networks that the rate of adoption is accelerated.

The adopter categories include the innovators (2.5%), early adopters (13.5%), early majority (34%), late majority (34%), and laggards (16%). The innovator is considered venturesome, always seeking information about innovations. Many times, the innovator launches

the idea through information gained from outside the system. The early adopter is respected by peers, is successful, and discrete about the incorporation of new ideas. Uncertainty about an innovation is decreased when the early adopter adopts the new idea. The early majority can be described as deliberate. Through frequent peer interactions, this group provides interconnections with the very early and relatively late adopters making them an important link in the innovation-decision process. The early majority takes more time to make a decision. The late majority, on the other hand, is considered skeptical. Their adoption of an innovation may be based upon the economics of a given situation or by peer pressure. Most of the idea's uncertainty must be eliminated before the late majority adopts it. Lastly, the laggards are labeled conventional. They hold no leadership opinion and generally interact with those of the same traditional beliefs. The laggard's decisions are based upon what has been done previously. They are suspicious of new ideas, are deficient in awareness knowledge and, consequently, require a lengthy innovation-decision process. Typically, successful adoption of an innovation occurs after approximately 10-25% of the social system members adopt it. This is rapidly followed by the remaining members and, finally, the laggards.

Adopter Categories of Innovation Adoption S-curve (Landrum, 1998)



Rogers' theory of Diffusion of Innovations is a suitable theoretical framework for the implementation of a nutrition screening program in an outpatient wound center. Diffusion of the innovation of this program goes beyond the limits of introduction and education of nutrition screening. It involves an understanding of the social system that includes individual networks of communication which affect adoption. A realization of the uncertainty and needs of the wound center is required prior to the introduction of an innovation. Also, prior to developing the nutrition screening program, one needs to anticipate the perceived attributes of the innovation and make any necessary modifications to the program based on them. It is also important to appreciate the characteristics of each stage of the innovation-decision process to predict the types of interventions needed along the way.

Section Two

Review of the Literature

A search of the literature pertaining to wound healing and nutrition as well as adoption of clinical change was performed through December 2009. PubMedMEDLINE search words included “varicose ulcer” *and* “malnutrition,” “wound healing” *and* “malnutrition,” “wound healing” *and* “nutrition assessment,” and “organizational innovation.” Search strategy on CINAHL included search words of “malnutrition,” “nutrition assessment,” “nutrition screening tools,” “wound healing” *and* “malnutrition,” “wound healing” *and* “nutrition,” “venous leg ulcers” *and* “nutrition”, and “diffusion of innovation.”

Implementing a nutrition screening program in a busy outpatient wound clinic is a process of adoption of clinical change. This requires a change agent to propagate uncertainty among the staff leading them to seek more information about malnutrition among their patient population. This, in turn, creates a need among the staff, opening them to the innovation and adoption of nutrition screening to better address the needs of their patients.

Adoption of clinical change

The adoption of a new clinical program or idea by a clinician in a healthcare setting is multi-factorial and typically independent of the advantages it provides (Swanson-Fisher, 2004; Rogers, 2003). The implementation of clinical change can significantly impact organizational workflow. Therefore, successful implementation must be built upon a system’s strengths and resources and hinges on the discovery and management of barriers to change (Horner, Abel, Taylor, & Sands, 2004). An understanding of the adoption process is essential.

Roger’s theory of Diffusion of Innovations has been used to guide change among many disciplines and venues, including nursing. Horner, Abel, Taylor, and Sands (2004) utilized this theory as the framework for integrating genetic content into nursing curricula. The authors concluded that significant impacts on successful adoption include administrative support, faculty

ownership and participation in the change process, faculty perception of the program pertaining to the philosophy of the school, persuasion of faculty by early adopters of the program, and piloting the program through the inception of a singular genetics course. It was essential that the key stakeholders, students, faculty, administration, and the broader community, were in support of the program.

In another case study, Barr (2002) utilized Roger's theory of Diffusion of Innovations as the theoretical framework when examining social change in a perioperative department of an acute care facility during the inception of a computer information system. Barr postulated that no matter the sophistication of the computer system, adoption of it into nursing practice would not occur if the end user, the nurse, is not motivated to learn the system. Adaptation, support, and acceptance on the part of the nurses would be necessary for this change. The author perceived that successful implementation is based on commitment and preparedness. Preparedness pertained to changes made by nursing administration to assign authority, accountability, and creativity to those charged with the dissemination of information.

The change agent for this project was a perioperative nursing leader who realized that trust, along with communication, availability, accessibility, confidentiality and the willingness to build the staffs' knowledge base and development, was essential to the adoption of the computer system. Furthermore, communication among individuals of the perioperative staff and the change agent were seen as vital. Finally, Barr stressed that future outcomes studies that include computerized charting will solidify the confirmation of the adoption. Barr concluded by indicating that a motivation to learn is far more important than the attributes of a computer system as are positive attitudes toward computer acceptance. Allowing staff to participate in the

development and design of the computerized record thereby adapting the system to meet their needs promoted adoption of the system.

Day and Boynton (2008) promoted change in wound care practices within a rural healthcare system. The authors elucidated that the creation of new healthcare programs depends on the support of administrators and the commitment by the entire healthcare team. They also advocated a change agent as facilitator of this process. Buy-in from key stakeholders, the healthcare system's board of directors, was essential to move forward in the adoption of change.

Day and Boynton (2008) utilized the theory of Diffusion of Innovations when creating this wound program. Communication channels, through the use of focus groups, education, and circulation of a newsletter assisted in the acquisition of knowledge among the adopters. Additionally, persuasion of the new idea was facilitated through collaboration among the stakeholders. The authors related that confirmation and continued success of the program depends on preserving communication and educational development, staff retention, implementation of new evidence, and outcomes evaluation.

Change within a healthcare organization is multidimensional. As evidenced from the aforementioned case studies, communication and education seem to be the most important factor in facilitating change through the use of a change agent. Stakeholder buy-in, support, and acknowledgement of the benefits of the change are essential in the adoption of new ideas and programs. The adopters, however, also need to accept ownership of the problem and support the adaptation to the change. It has been shown that piloting new programs assists with acceptance and facilitates the adoption-decision process. After confirmation of a new program, ongoing evaluation is necessary to guide continuance, discontinuance, or revision of the adoption. Lastly, the final step is that of performing outcomes measures of the program for future growth and

development. It is evident that Roger's theory of Diffusion of Innovations provides a solid framework for the implementation of new ideas, including a nutrition screening program for VLU patients in an outpatient wound center.

Venous leg ulcers and malnutrition

There have been only a handful of research studies that have examined nutritional risk of the VLU patient. A recent study by Szewczyk et al. (2008) compared the nutritional status of older adults with and without venous leg ulcers. The control group consisted of inpatients with vascular disease and the experimental group consisted of a convenience sample selected among outpatients with VLU's. Patients were eligible for the control group if they were hospitalized, had never had a venous ulcer, and were diagnosed with a chronic vascular disease (Szewczyk et al., 2008). Patients were eligible for the experimental group if they were older than 18, had a VLU with diagnosed venous disease by ultrasound, and normal ankle-brachial indexes. Patients were excluded if they had ulcers related to diabetes, a mixed etiology of vascular disease, hypertension, or atherosclerosis, or chronic diseases such as cancer, AIDS, or anything that may compromise nutrition (Szewczyk et al., 2008).

The Mini-Nutritional Assessment (MNA) by Nestle was used for nutrition screening of the study patients. Mean age of outpatients was 70.4 years and mean ages of inpatients was 77.1 years. Patients with ulcers were found to have significantly lower screening scores and lower BMI's. Forty-six percent of patients with ulcers and 32% of patients without ulcers were found to be at risk of malnutrition ($p < 0.05$) and 19% with ulcers were found to be malnourished ($p < 0.05$).

While the outpatient sample revealed a significant amount of subjects who were at risk of malnutrition or were malnourished, a lesser but still significant number of patients at risk for

malnutrition was found among hospital inpatients as well. This is consistent with the findings that Brown, Turek, & Maillet (2006) concerning the rate of malnutrition found among hospital inpatients, supporting the consideration that patients are not being nutritionally screened in outpatient clinics.

In a pilot study by Wipke-Tevis and Stotts (1996) the nutritional risk and intake of seven VLU patients was explored. The authors evaluated the subjects' nutrition with a screening tool, a three day diet recall, serum parameters of hemoglobin and hematocrit (H+H), white blood cell count (WBC), albumin, transferrin, vitamin C and Zinc, as well as obtaining anthropometric measurements of height, weight, triceps skin fold, wrist circumference, and mid-arm circumference. The average duration of ulcer presence was 5.4 months.

Interestingly, the authors found that the average BMI of the study subjects was 32.1, indicating obesity. All subjects demonstrated at least one nutritional abnormality. Two patients were considered to be low malnutrition risk, two patients medium risk, and three patients were considered high risk of malnutrition. According to the diet recall, nutritional intake was adequate in one subject only. Four subjects had inadequate protein intake according to AHRQ guidelines which recommends increased intake of protein and calories to facilitate wound healing (Snyder, 2006). Serum albumin and transferrin were found to be low in three of the subjects. Lastly, three subjects took in inadequate amounts of vitamins A and C, zinc, and iron.

Many times, healthcare providers draw inappropriate conclusions about adequate nutrition intake based on the presence of obesity. However, Wipke-Tevis' and Stotts' study revealed that malnutrition risk was present in all of their obese subjects. Therefore, providers must be diligent to screen for malnutrition among this population, especially because obese patients are more prone to venous ulcerations (Tobon et al., 2008). Of course, a major weakness

in the study by Wipke-Tevis and Stott is their sample size. Because this was a pilot study, future research needs to focus on the long term significance of malnutrition on VLU's as well as the effects of nutrition interventions. Additionally, subjects were observed at one point in time only, thereby limiting the conclusions that can be drawn about wound healing and nutrition.

In yet another study by Wipke-Tevis and Stotts (1998), the authors investigated the effects of nutrition and tissue oxygenation on the healing of VLU's. The study occurred over a four week period and required two clinic visits and a telephone call to review a three day diet recall of a convenience sample of 20 VLU patients. Additionally, a valid and reliable nutritional assessment tool was used to categorize subjects' nutritional risks into low, moderate, or high classifications. Biochemical nutritional serum parameters of albumin, hemoglobin, hematocrit, fasting glucose, glycoylated hemoglobin zinc, and vitamin C were evaluated. Wound surface area and rates of healing were obtained by wound tracings via image analysis software. Lastly, a transcutaneous oxygenation tool was used to measure tissue perfusion at the wound site during the first study visit. Exclusion criteria included the use of greater than 5 mg of prednisone per day, beta blockade therapy, an autoimmune disorder, a positive HIV history, ankle brachial index showing significant peripheral vascular disease, or that the patient was participating in another wound healing investigational protocol. The mean age of subjects was 59.8 years (SD = 15.3).

Wipke-Tevis and Stott (1998) found that 84 percent of the subjects included in the trial were considered to be at moderate to high nutritional risk. This is greater than the percentage of the elderly population as a whole in the United States found to be at nutritional risk. Interestingly, the authors found that mean serum albumin level obtained from the study sample was 4.12 g/dL (SD = 0.25 g/dL), indicating normal serum protein. However, the anthropometric measurements of triceps skin fold, mid-arm circumference, and mid-arm muscle circumference

obtained at the first study visit and the daily protein intake were low in many of the subjects, indicating that muscle wasting may be maintaining visceral protein levels. Out of 20 subjects, 17 had inadequate caloric intake and 15 had low protein intake. Still, 50 percent of the subjects were considered obese based on BMI.

Because of the small sample size of Wipke-Tevis and Stott's study (1998), it was difficult to draw any conclusions about statistically significant relationships between biochemical parameters, tissue oxygenation, and healing rates of VLU's. However, the rate of poor caloric and protein intake in the presence of obesity in the VLU patient indicates a need for further research to investigate the possibility of a significant relationship between nutrition and VLU development and or healing rates.

To explore the relationship between nutritional status and VLU severity, Tobon, Whitney, and Jarrett (2008) investigated the relationship between nutritional status of overweight and obese patients and the severity of VLU's. In their convenience sample of eight subjects who were older than age 50 with BMI's of at least 25, the investigators checked the biochemical parameters of serum albumin, vitamins A and C, and zinc, performed anthropometric measurements and analyzed a three day nutritional intake log. Also, arterial perfusion studies were performed to rule out peripheral vascular disease. VLU severity was evaluated using the Leg Ulcer Measurement Tool (LUMT) which takes into account 14 clinician-rated VLU assessment parameters including exudates, size and necrotic tissue among others.

Tobon et al. (2008) discovered no significant relationship between serum zinc, albumin and LUMT scores, a finding consistent with the work done by Fuhrman et al. (2004) emphasizing that serum hepatic proteins are not good indicators of nutritional status. However, all subjects' caloric intake was below their calculated caloric need. Although this pilot study by

Tobon et al. utilized a small sample, their findings support those of Wipke-Tevis and Stotts (1998) and further emphasize the need of diligent nutritional screening in the VLU patient.

Taking into account the necessity of adequate nutrition for wound healing, Wissing, Lennernas, Ek, and Unosson (2000) evaluated food-related factors, meal patterns and quality to assess the nutritional status of elderly out-patients with lower extremity ulcers. The study sample included 70 elderly people (age greater than 65 years) with ulcers that lived in their own homes with ulcers to their leg or foot. A valid and reliable nutrition screening tool for the elderly (the Mini Nutritional Assessment or MNA) was used to evaluate nutritional status.

As with the previous studies, Wissing et al. (2000) found a relationship between high BMI (greater than 30) and malnutrition. Those subjects who lived alone (N = 45) had fewer meals in total. Rosenbloom and Whittington (1993) in their study of elderly, widowed persons determined that widowhood resulted in less meal preparation. This may explain why such a large number of elderly patients are malnourished when admitted to the hospital. Forty-nine percent of the subjects were at malnutrition risk or were considered malnourished as demonstrated by the MNA screening tool results. Most of these patients were dependent upon others to do their shopping. There was an 80 percent return rate of dietary logs and some of these were incomplete. Incomplete meals accounted for 36 percent of those diaries returned while 19 percent of those returned yielded complete meals. The results showed that the well-nourished patients had a higher mean frequency of prepared complete meals than those at risk of malnutrition.

An obvious weakness of this study by Wissing et al. (2000) was the poor return and incompleteness of dietary logs. However, elderly patients' meal quality and patterns significantly affect their nutritional status. This is a relevant finding for the VLU patient, as a majority of

these patients are elderly and may not be receiving the appropriate nutrition necessary for wound healing.

Wissing, Unosson, Lennarnas, and Ek (1997) conducted another study on leg ulcer patients that assessed nutritional intake and physical activity. This again evaluated intake of energy and nutrients, meal patterns but also included physical activity, specifically focusing on nine women living in their own homes. The mean age was 79.7 years (SD 4.9). Only two were married and seven lived on their own. Interviews were conducted in subjects' homes to ascertain meal quality and patterns. Physical activity was assessed by interview at the same time.

Five out of nine subjects were found to have low caloric intake as well as low intake of protein (mean protein intake of 0.86 g/kg), vitamin C and zinc. The average BMI was 26.6 (range 19-35.8). Five women purchased their own food while four needed help. The majority of subjects cooked their own meals. The average number of meals per day was 4.8 (SD = 0.96). Most subjects were relatively inactive and did not go outside, reporting that most of their activity came from light housework. All but one subject required some kind of walking aid such as cane or walker.

Again, Wissing, Unosson, Lennarnas, and Ek (1997) reveal that the majority leg ulcer subjects in their study did not receive appropriate amounts of calorie or protein intake. An additional finding is that of inactivity. Exercises that utilize the calf muscles help to improve venous circulation to this area, which may counteract the development of edema in conjunction with compression stockings. Perhaps pain related to the ulcerations prevented subjects from exercising. This would have been a helpful parameter to evaluate. Additionally, it is unclear if the subjects were taught the effects of nutrition and exercise on the development and healing of the ulcerations.

As indicated in the aforementioned studies, protein –calorie malnutrition is a significant factor in VLU patients. The elderly population, who are at greater risk of malnutrition, accounts for a substantial amount of the VLU population. Additionally, many of these patients can be categorized as obese which can be a misleading indicator of nutritional status.

Nutrition Screening Tool: M.U.S.T.

In order for the nutritional status of VLU patients to be appropriately evaluated, a screening tool must be incorporated into the physical assessment of the patient during his or her outpatient wound clinic visit. This tool needs to be quick, valid, and reliable. However, in the absence of a universally accepted definition of malnutrition, it is difficult to establish the face and content validity of a malnutrition screening tool. Therefore, after analysis of in-depth physiological and clinical literature on malnutrition, the Malnutrition Advisory Group, a standing committee of the British Association of Parenteral and Enteral Nutrition (2003), developed the following definition: “Malnutrition is a state of nutrition in which a deficiency, excess or imbalance of energy, protein, and other nutrients causes measurable adverse effects on tissue/body form (body shape, size and composition) and function, and clinical outcome.” Specifically, the term, malnutrition, is referring to a state of under-nutrition and poor protein-energy status (British Association of Parenteral and Enteral Nutrition).

The tool developed by the Malnutrition Advisory Group (2003) used for the malnutrition screening is ‘M.U.S.T.:’ Malnutrition Universal Screening Tool (Appendix A). ‘MUST’ is a malnutrition screening tool proven valid and reliable for different care settings (inpatient, outpatient and home care) that can be applied to different age groups for the detection of malnutrition due to a variety of causes (psychosocial and physical) (British Association of Parenteral and Enteral Nutrition, 2003). Furthermore, ‘MUST’ has excellent inter-rater reliability

when applied by different types of health care workers (physicians, nurses, dieticians, technicians, students) and appropriately identifies disturbances in protein-energy status (British Association of Parenteral and Enteral Nutrition). The 'MUST' Report (2003) details the validity and reliability testing of the 'MUST' tool (Appendix B).

MUST, the Malnutrition Universal Screening Tool, is a straightforward screening tool consisting of five steps used to evaluate adults who are malnourished, at risk of malnutrition, and/or obese (Waters, 2007). MUST can be used on patients who are unable to be weighed, as it takes into account subjective data, mid-arm circumference to estimate BMI, and observations by the administrator of the tool (Waters, 2007). Lastly, 'MUST' can be completed within 5 minutes, making it ideal for use during an outpatient wound clinic visit (British Association of Parenteral and Enteral Nutrition).

MUST was evaluated in a prospective study by Stratton, King, Stroud, Jackson, and Elia (2006) among acutely ill elderly patients. The central aims of this study were to assess if MUST was an appropriate tool to evaluate malnutrition in elderly hospitalized patients, including those unable to be weighed, to ascertain if there was a predictive value of MUST on patient outcomes of the group as a whole and of the subgroup of patients unable to be weighed, and to see if malnutrition strongly correlates with poor clinical outcomes in the elderly patient who is not able to be weighed. The sample included 150 consecutively admitted hospitalized, elderly patients. Fifty six percent of patients could be weighed and 58% of patients were considered at malnutrition risk. Mortality and increased hospital length of stay significantly correlated with malnutrition risk. For patients who were unable to be weighed and had no subjective weight recall, investigators used their subjective assessment data (thin, very thin) in combination with arm circumference for BMI estimates. These patients had increased risk of malnutrition and a

worse clinical outcome compared to those who could be weighed. Overall, clinical outcome was the worst among patients deemed at malnutrition risk. Therefore, the authors concluded that MUST had good predictive value.

A limitation of the MUST tool, as described above, is the inclusion of the administrator's subjective assessment of weight and recent weight loss in addition to the anthropometric measurement of mid-arm circumference. It is not clear how to incorporate the subjective analysis into the results of the assessment. This can lead to measurement bias. The authors also concluded that the patients who were unable to recall their weight had the highest prevalence of malnutrition and the worst clinical outcome. Lastly, to evaluate the validity of the MUST tool, it would have been appropriate for the authors to compare it with another valid nutrition screening tool with their study sample.

In another prospective study by Stratton et al. (2004), the authors' aim was to compare MUST and seven other tools to evaluate the prevalence of malnutrition in inpatient and outpatient settings, to evaluate concurrent validity of MUST with the other tools, and to compare ease of use of MUST with the other malnutrition screening tools. The malnutrition screening tools used in comparison were MEREK Bulletin Tool (MEREK), Hickson and Hill tool (HH), the nutrition risk score (NRS), the malnutrition screening tool (MST), the short form mini nutritional assessment screening tool (MNA-tool), the subjective global assessment (SGA), and the undernutrition risk score (URS). This study is actually a combination of several sub studies. The authors performed comparisons with each different tool, in the appropriate setting with consecutive patients. Each comparison had its own sample size, which ranged from 50-86 subjects.

All of the investigators found MUST to be 'very easy' to 'easy' to use. MST was rated 'very easy' to use by one investigator and the MNA was rated 'easy' to use by two investigators. All of the other tools were rated as 'difficult.' Also, MUST has 'excellent' inter-rater reliability, whereas, some of the other tools, such as NRS and HH do not (Stratton et al., 2004).

The aforementioned attributes of MUST make it an ideal tool to use in an outpatient wound clinic nutrition screening program. It has been found to be easy, quick, valid, and reliable. Additionally, Stratton et al. (2004) found that the MUST tool could be appropriately utilized in all adult patients and in all care settings: inpatient, outpatient, long term care and home.

Section Three

Methodology

It has been well documented in the evidence that nutrition plays a pivotal role in the healing of chronic wounds. Because the traditional methods of evaluating serum protein levels as a way of assessing one's nutritional status has proven not to be a good indicator, the AHRQ has recommended that nutrition screening occur during a patient's first encounter visit in all outpatient, community, and long term care settings. The Johns Hopkins Wound Healing Center is an outpatient wound center that treats a large population of VLU patients. Prior to this protocol implementation, routine nutrition screening was not occurring in this wound center.

The purpose of this project was to evaluate the effect that a nutrition screening program for patients with chronic venous leg ulcers has on the identification of patients at risk for malnutrition, the nurses' perceptions of a nutrition screening program, and the work flow of a busy outpatient wound clinic. This required two arms to the proposal: 1. the investigation into a correlation between patients at risk of malnutrition (as evidenced by their score on a nutrition

screening tool) and non-healing venous leg ulcers and, 2. the evaluation of nurses' perceptions of a nutrition screening program and its impact on workflow of an outpatient wound clinic.

First, the researcher met with and received support for this project from the medical and surgical directors of the Wound Healing Center, the Vice President of Patient Care Services of Johns Hopkins Bayview Medical Center, as well as the nurse manager. Then, the researcher submitted the proposal to the Internal Review Boards (IRB) of Johns Hopkins University and the University of Maryland. Following the approval of both IRB's, the researcher met with the registered dietitians assigned to the outpatient clinics to review the protocol. At that time, the dietitians committed to offer nutritional counseling to any patients found to be at high risk of malnutrition by the MUST tool. Next, the researcher scheduled a meeting with the nurses of the Johns Hopkins Wound Healing Center to explain the purpose of the protocol. Informed consent for participation in the protocol was explained to and acquired from the nurses. The nurses were told that they could elect not to participate or to withdraw from participation at any time during the protocol.

Then, the researcher ascertained the nurse's current priorities of treatments for VLU patients by asking them to rank the priorities in descending order (Appendix G). A pretest evaluating the nurses' knowledge base of malnutrition, nutrition screening, and wound healing of the VLU patient was given (Appendix C). Following the pre-test, the researcher conducted an educational program to review current statistics and the impact of nutrition on VLU patients. Also, the staff was educated about the inadequacy of monitoring hepatic proteins when assessing nutritional status. Additionally, the nurses were taught about the development of MUST and the appropriate way to conduct nutrition screening with MUST in the outpatient clinic.

A convenience sample of chronic VLU patients was utilized to ascertain if there was a relationship between chronic venous leg ulcers and the scoring on a nutrition screening tool.

Since this proposal did not evaluate healing rates, it was not necessary to control for co-morbidities, compliance issues, or treatment modalities. The researcher reviewed the patient appointment lists on a weekly basis for the inclusion criterion: chronic venous leg ulcer for a period of time greater than 3 months. The MUST screening tools were placed on the charts of those patients who had VLU's for greater than 3 months duration. A letter of explanation about the study was given to the patients upon their arrival to the Wound Center (Appendix D). The nurses of the wound center applied MUST at the beginning of each patient visit. A body weight scale was used to weigh the patients. After obtaining the patients' height, the BMI was acquired by plugging the values in on the BMI chart in the MUST tool. The same scale was zeroed daily and used at each screening. To obtain an objective assessment of time required to apply the MUST, the nurses wrote down start and stop times of the screening procedure on the MUST source documentation sheet (Appendix E).

VLU patients were screened one time only. To avoid the re-screening of patients, a red sticker was placed on the patient medication form in the medical record, a section that is viewed and updated at every visit. The results of the MUST were recorded on source documentation sheets (Appendix E). Once completed, the sheets were placed in a collection bin at the nurses' station. No patient demographic or medical record information was utilized for the purpose of this study.

The researcher was present every morning before the start of clinic to answer nurses' questions and to collect the completed documentation sheets the following day. Data collection continued for six weeks. At the conclusion of the six weeks of data collection, the post-test (Appendix C) was given and a focus group was conducted with the nursing staff of the wound center. The moderator of the focus group was a research assistant who was not employed through the Wound Healing Center. The focus group took place after clinic hours over the course of

approximately 60 minutes in a room that was secluded, quiet, and away from the Wound Healing Center. The session was audio-taped to assist with data collection and evaluation. The purpose of this focus group was to determine the nurses' perceptions of the nutrition screening program. Appendix F lists the questions that were asked during the focus group.

The prevalence of VLU patients at risk of malnutrition was calculated utilizing the results of the nutrition screening of VLU patients with MUST. The time study results objectively evaluated the average time needed to conduct the MUST screening per patient. This quantified the impact of on the workflow of the clinic. Lastly, a qualitative content evaluation and interpretation of the results of the focus group was completed by the researcher to ascertain the nurses' perception of the screening program and the affect of the screening program on the outpatient clinic.

Section Four

Results

Objective #1: To identify the prevalence of VLU patients who are at risk of malnutrition at the Johns Hopkins Wound Healing Center

M.U.S.T. Scoring: Assessing patients' risk of malnutrition.

A total of 81 venous leg ulcer patients over a six week time period were nutritionally screened with the MUST at the Johns Hopkins Wound Healing Center. Of the 81 subjects, 25.9% (n=21) were found to be at medium risk of malnutrition and 2.5% (n=2) were found to be at high malnutrition risk. Subjects' BMI ranged from 19 (n=9) to 59 (n=1) with a mean BMI of 29.11. Twenty-eight point four percent (n=23) were categorized as overweight with a BMI of 25-29 and 32.1% (n=26) were categorized as obese with a BMI of 30 or more (see Table 1).

Table 1

BMI classification of participants

BMI	Class	N
<24.9		32
25-29.9	Overweight	23
30-34.9	Class I Obesity	10
35-39.9	Class II Obesity	5
40 or greater	Class III Obesity	11

Adapted from Kress, Haartzel, & Peterson, 2005

Fourteen of the 21 subjects found to be at medium risk of malnutrition were classified as such based on a low BMI (less than or equal to 20). The remaining 7 subjects had lost greater than 5-10% of their body weight over a 3-6 month period of time. The two subjects found to be at high malnutrition risk were classified as such due to an acute disease effect score (n=1) and a

combination of a BMI of less than or equal to 20 and an unintentional weight loss of 5-10% over 3-6 months (n=1).

The nurses documented the amount of time required to complete the MUST on 70.4% of the subjects (n=59). Timing of the screening started as patients were called from the waiting room, on their way to the exam rooms, where they were weighed and height was measured by the nursing assistant. The nurses completed the remainder of the screening in the exam room. The time needed to screen subjects ranged from 2 minutes (n=12) to 36 minutes (n=1) with a mean time of 5.76 minutes.

Objective #2: The Wound Healing Center nurses' perception of a nutrition screening program, including the evaluation of the nutrition screening tool

Ranking of priorities.

Prior to the nurses' educational session about nutrition and VLU's, the nurses were asked to state in descending order (1 is highest and 5 is lowest) their top five priorities in the treatments of VLU's. The results in Table 2 represent the nurses' priority ranking of nutrition in the treatment of VLU's both pre and post the nutrition screening program implementation. Nurse #6 did not rank nutrition in her top 5 priorities pre-intervention.

Priority ranking of nutrition among nurses

Nurse #	Priority Ranking Pre-Intervention	Priority Ranking Post-Intervention
1	3	3
2	1	3
3	5	4
4	3	3
5	5	3
6	Did not rank in top 5	3

During the focus group following the six week nutrition screening program implementation, the nurses were again asked how they would rank nutrition among the priorities in treating VLU's. As a group, the nurses agreed upon a priority ranking for nutrition as 3 out of 5, except for nurse #3 who ranked the importance of nutrition as 4 out of 5. For two nurses, this ranking did not change pre to post implementation. For nurse #2, the ranking of nutrition importance decreased from 1 to 3. However, for three of the six nurses (including nurse #6), the priority ranking of nutrition in the treatment of VLU's increased (see table). Overall, compression therapy and ruling out infection were seen as the most important initial therapy in the care of the VLU patient.

Focus group results.

The focus group took place approximately one week after the conclusion of the six week nutrition screening program implementation in a closed conference room that was separate from the Wound Healing Center. The participants of the focus group included the nurses (n=6) of the Johns Hopkins Wound Healing Center who partook in the screening program, the focus group facilitator, and another researcher who functioned as the observer to note non-verbal communication among the participants. The focus group participants were seated around an oblong conference table where four digital voice recorders captured the data over approximately 60 minutes. The focus group recordings were then transcribed into narrative data and checked against the audio recordings by the researcher. Specific categories and patterns in the transcription were identified through qualitative content analysis of the narrative data. Emergent themes were discussed and agreed upon by the primary researcher and the researcher observing the focus group for consistency. Finally, descriptive statistical analysis was achieved through data entry of theme codes using SPSS computer software. The main themes are summarized in Appendix H. Verbatim illustrative quotes are reported to support the discussion.

Frustration.

The nurses had an overwhelming feeling of frustration related to the financial constraints of their patient population and lack of insurance coverage for nutrition counseling. The nurses voiced concern that the patients would not change their dietary patterns because they choose foods based on affordability and not nutritional value. Greater than 55% of the patient population of the Wound Healing Center is insured through Medicare and/or Medicaid. Nutrition counseling is not a covered service under these payers unless diabetes mellitus or end stage renal disease is part of a patient's diagnostic codes. Other third party payers have health maintenance programs for a fee in addition to insurance premiums. The nurses believed that their patients would not be able to afford an additional fee.

Focus Group Results

1. Lack of Resources: 66.7% (n=4)
 2. Inability to Refer: 50% (n=3)
 3. Patients Will Not Change: 33.3% (n=2)
 4. Patients' Food Choices Based on Affordability : 66.7% (n=4)
-

“...the inability to refer a patient out. There's no resources if you don't have the appropriate diagnosis, there's no reimbursement if they're Medicare patients. So, even if we screen the patients, I didn't have any where to send her unless they have some kind of out of pocket resources which many of our patients don't.”

“...the problem is if they can't afford the consult...it just kills it right there.”

An additional feeling of frustration related to the nurses' perception of a lack of influence over their patients. Essentially, they believed that even with the appropriate counseling that the patients would not change their diet due to, again, financial constraints, a lack of understanding, and a feeling of apathy.

“Our population has a tendency to be middle to lower income...they have poor food choices and they have minimal amounts of money to spend on food. So, their idea of importance is not based on what's an appropriate food choice to make. It's what kind of food can I eat...that I can afford...”

“...I intellectually know how important nutrition is to the healing of any ulcer and how extremely important it is. Is it a high priority when I go into the room? Uh-uh (no). Why? Because I don't feel like I can do anything about it. I don't feel like I can refer 75% of my patients. I don't feel like even if they have a nutrition consult they would either heed the words of the nutritionist or have the means or ability to buy fresh or nutritious foods.”

“I had one patient...that said, 'I'm not interested.'” He didn't equate the weight to being the issue with his wounds. ...his wife emailed me a couple of days later saying, 'Do you think we need to look at his nutrition?' and I said, 'Yeah, I suggested that a couple of days ago,' but he still wouldn't even budge with his wife encouraging him.”

Lastly, the MUST tool itself was a source of nurses' frustration. Aside from the limitations of the tool itself being too small to read, having a cut off weight of 100 kg, or requiring standard to metric measurement conversions, the nurses did not understand why the tool did not identify any obese patient as being at risk of malnutrition. Also, some nurses found

the tool to be vague and time consuming. Some patients chose not to participate because of lack of interest or they refused to be weighed.

Focus Group Results

-
1. Obese Patients Not Found Nutritionally Deficient: 50% (n=3)
 2. Tool is Vague: 33.3% (n=2)
 3. Tool is Time Consuming: 50% (n=3)
 4. Patients Refused: 83.3% (n=5)
-

“...the ones I really worried about were the ones that you know are nutritionally deficient but they’re just tipping the scales at 3-400 pounds...it doesn’t do anything for the obese patients.”

“...I probably did 20-30 patients and they were always “0” (no nutritional risk on MUST) no matter how big...”

“...the tool was so vague; I think we would need a more specific tool...”

“...my patients did want to do the study like they just weren’t interested...”

“...it was mostly the weight, because they just didn’t want to use the scale...or they just didn’t want to take the time.”

Awareness

Patients and nurses reported an increased awareness of the importance of nutrition on wound healing as a result of the screening program. According to the nurses, many patients expressed interest and increased awareness of their height and weight and became more aware of available resources, including nutritional supplements and nutritionists.

Focus Group Results: Patients (per nurse report)

-
1. Patients Interested and Surprised: 50% (n=3)
 2. Patients Unaware of Issues: 50% (n=3)
 3. Patients Enjoyed/Excited: 33.3% (n=2)
-

“...I did have one patient who was considered moderate risk who was very interested. So, I think a pro would be that some people really are very interested and I don’t even think they know that they have that resource (nutritionist). So, that was good for the patient...the patients I screened that needed it (nutrition counseling) were actually kind of excited about that.”

“...the patients I screened actually were interested. They thought it was interesting and the wanted to know about it...”

“...when they got on the scale, they’ll even say, ‘Oh my gosh, that’s 20 pounds higher than it was 2 months ago.’ At least it gives them the opportunity...”

Focus Group Results: Nurses

-
1. Easier Conversations About Weight: 66.7% (n=4)
 2. Increased Nurse Awareness and Sensitivity: 83.3% (n=5)
 3. Increased Nutrition Discussions: 33.3% (n=2)
-

As a result of the screening program, recurring themes that resonated from the nurses were not only an increased awareness of the need for nutritional teaching, but also an increased likelihood that the nurses would talk about nutrition to their patients. The screening program opened conversations about different aspects of nutrition important to the VLU patient specifically such as sodium content of foods and medications. Also, the nurses found that having a screening program increased their sensitivity to the obese patient and allowed conversations about weight and nutrition to be less confrontational.

“...I used it (the screening program) to bring nutrition awareness to venous leg ulcers (patients).”

“...my focus in terms of their (VLU patients) nutrition is...generally sodium control...what are you eating at home are you snacking on pickles and chips and canned foods?”

“...if you’re going to heal and, you know, it’s get rid of the fluid, take your lasix...”

“It (the program) increased my awareness of the importance of nutrition, so then you’re more likely to talk about it.”

“...it (screening program) definitely jump started a conversation.”

“...it (screening program) made me more aware of it (nutrition). And, I didn’t realize...how many of our population were obese either before we did this.”

“It (screening program) increased the likelihood that you would talk about weight when they got on the scale...”

Objective #3: To understand the effect that a nutrition screening program has on the work flow of a busy outpatient wound clinic

Affect on clinic flow.

The Wound Healing Center nurses modified the screening program by allowing the nursing assistant to weigh and measure patients because they found that having to do this themselves slowed down the flow of the clinic. They agreed that it added to the many tasks they perform during their day. The nurses inferred that having the patients report their weight and height without actually having to measure them in the clinic would be accurate enough and save time. Additionally, the font on the screening tool and the calculations the nurses had to make were causing them to get behind in their paperwork.

Focus Group Results

1. Slows Down Clinic: 33.3% (n=2)
2. Just One More Thing to Do: 50% (n=3)

“...it (screening program) probably would have slowed down the clinic if _____ (nursing assistant) wasn’t there.”

“...the specific height and weight were really slowing down the clinic. I think this particular tool, because it was so vague, even just asking the patient a self-report of weight and height would be sufficient because it’s screening.”

“It’s just another step,” “just one more thing...”

Nurse recommendations.

Overwhelmingly, the nurses’ recommended and interdisciplinary approach to nutrition with the addition of a nutritionist to the staff of the Wound Healing Center who would screen all patients during their initial clinic visit. This would facilitate consistency and follow-up for patients who are regularly seen in the clinic. The nutritionist would be able to counsel patients according to their income and food availability. Having a nutritionist on staff would also relieve

the nurses of additional work. Supplementary teaching would occur mostly through flyers, posters, and “nutritious recipes” in the waiting room.

Focus Group Results

-
1. Screen All Patients: 50% (n=3)
 2. Have Nutritionist of Staff/Interdisciplinary Approach: 83.3% (n=5)
 3. Have Nutrition Information in the Waiting Room: 33.3% (n=2)
-

“...every patient needs to be screened when they come in.”

“...when they (a new patient) is booked into the system, it automatically goes to the nutritionist...and they (the patients) come in and the first 20 minutes is done with the nutritionist and then the medical visit starts...”

Further recommendations revolved around the obese patient. The nurses agreed that the obese patient needs to be seen by the nutritionist; therefore, it was recommended that all obese patients be referred. Another recommendation included performing a “metabolic work up” to evaluate the protein status of the obese patients. Lastly, the nurses believed it would be important to find a screening tool that evaluates the nutritional statuses of the obese patient, as this was considered a major flaw with the MUST.

Discussion and Recommendations

A nutrition screening program was implemented at the Johns Hopkins Wound Healing Center and occurred over a six week period of time to evaluate three issues: 1. The identification of venous leg ulcer patients at risk of malnutrition, 2. The nurses’ perception of a nutrition screening program, and 3. The effect that a nutrition screening program has on the work flow of a busy outpatient wound clinic.

Essential to organizational change is buy-in and acceptance of the change by key stakeholders. The researcher proposed the nutrition screening program to the Wound Healing Center’s medical director and manager as well as the Vice President of Patient Care Services

who were all in support of the program. Additionally, the researcher achieved buy-in from the six nurses in the Wound Healing Center.

Adoption or discontinuance of an innovation

Adoption of an innovation, as described in Roger's Diffusion of Innovations Theory, is complex and requires the facilitation of transformation via the impact of a change agent. The Knowledge phase of the adoption process includes awareness of the innovation, the MUST screening tool, and the identification of a need, nutrition screening. This was accomplished through communication and education about the innovation by the researcher who was the change agent for this proposal. The researcher provided an educational session to the wound nurses about nutrition and wound healing, the MUST screening tool, and an explanation of steps involved in the screening program. Prior to the educational session, the nurses took a pre-test of the knowledge. Interestingly, all but one nurse thought that checking serum protein levels was an appropriate evaluation of nutritional status. Most were quite surprised at the high level of malnutrition found among patients admitted to the hospital as well as the annual impact that VLU's have on the United State's economy.

One nurse expressed a concern of feeling powerless over her patients' food choices and believed that it would be difficult to effectively influence a change in their nutritional status. However, the remaining nurses formed an immediate positive attitude about the MUST tool in general, agreed that it was not complex, and decided that implementing this proposal would function as a trial of the tool and the screening program. This represents the formation of a favorable attitude toward the screening program, thus signifying an immergence in the Persuasion phase of the adoption process.

During the Implementation phase of the adoption process, the researcher was present in the Wound Healing Center every morning prior to the beginning of clinic to identify which

patients were to be screened that day, to answer any questions that the nurses may have had, and to pick up the previous day's screening tools. "Re-invention" of the screening program occurred during the Implementation phase when the nurses discovered that obtaining patients' weight and height was too time consuming, and, therefore, was delegated to the nursing assistant. The nurses made this adaptation to the work based on their situation which kept the flow of the clinic intact.

Although the researcher frequently re-exposed the nursing staff to the importance of nutrition screening during her daily visits, this repeated validation did not alleviate the nurses' feelings of dissatisfaction of the screening tool itself. Although the nurses agreed that nutrition screening is important, they were not confident in the MUST's ability to properly identify malnutrition, as only one of the obese patients was classified as malnourished. Also, frustration surrounded the nurses' inability to refer patients for formal nutritional assessments due lack of insurance coverage and inadequate patient funds. This added to the nurses' frustrations and feelings of apathy about their impact on patients' nutritional status leading to their lack ownership of the issue of nutrition screening and, therefore, opposition to the adaptation of change. Thus, "discontinuance" of the MUST and, therefore the screening program, occurred. The nurses did, however, provide positive recommendations to "re-invent" a screening program in the Wound Healing Center.

Clinical practice

Although 132 venous leg ulcer patients at the Johns Hopkins Wound Healing Center were approached to participate in nutrition screening, only 81 agreed to take part. This, according to the nurses, was generally due to patients' refusal to be weighed for reasons unknown. Unfortunately, this limits the population from which the sample was derived possibly leading to measurement error of the project. Additionally, the small sample size can threaten external validity making it difficult to generalize the findings to the VLU population as a whole.

Twenty-three of the 81 patients screened over a 6 week period of time (28.4%) were found to be at risk of malnutrition. While this finding is significant, the number is quite low when evaluating the limited evidence found in the literature which revealed a significant relationship between obesity and malnutrition. However, many of the studies cited in this paper's literature review gleaned a clearer picture of the subjects' nutritional states by exploring beyond nutritional screening through the application of full nutritional assessments, many times including 3 day diet recalls.

During the program implementation at the Johns Hopkins Wound Healing Center, 32.1% of the VLU patients (n=26) were categorized as at least class I obesity with a BMI of 30 or more. However, only one was found to be at risk of malnutrition related to an acute disease effect score and not BMI. This potential lack of identification of malnutrition risk of the obese patient is due to the low sensitivity of the MUST screening tool: a BMI of 30 or more scores a zero which indicates no risk of malnutrition based on BMI.

Based on the relationship of malnutrition and obesity found in the literature and the results of this screening program, one could surmise that the 31% (n=25) of VLU patients at the Johns Hopkins Wound Healing Center who were found to be obese due to their BMI's may be at risk of malnutrition. Therefore, adding this to the 28.4% of the VLU population found to be at risk of malnutrition during this screening program, 59.4% of the VLU population at the Johns Hopkins Wound Healing Center may be at risk of malnutrition. This percentage is more in line with the rate of malnutrition found among obese VLU patients in the literature (Tobon, Whitney, & Jarrett, 2008; Wipke-Tevis & Stotts, 1996, 1998; Wissing, Lenneras, Ek & Unosson, 1997, 2000).

The nurses recognized the lack of identification of malnutrition risk among the obese patients by the MUST and overwhelmingly recommended to refer not only all obese patients to a

nutritionist but to have all patients nutritionally screened during their first visit to the Wound Healing Center. Unfortunately, Medicare and many insurance payers do not reimburse for nutrition counseling unless the patient is diabetic or has end stage renal disease (ESRD). Therefore, in the short term, it would behoove the Wound Healing Center to review the medical records of all patients to identify those that are diabetic and refer them to a nutritionist for counseling that would be covered under their insurance. Additionally, monitoring fasting blood sugars on all obese patients at least yearly may help in early identification and treatment of diabetes, including nutrition counseling that would be covered by insurance due to their new diagnostic code. In the long term, lobbying legislators to include preventative services as reimbursable under Medicare and other third party payers is essential to not only addressing the obese population but in alleviating the burden of preventable diseases on the socioeconomic and health care climate in the United States.

The majority of the nurses at the Johns Hopkins Wound Healing Center ranked nutrition as the third most important aspect in the treatment of VLU's behind compression and ruling out infection. The nurses believed that their patients' food choices were based on socioeconomic influences and were skeptical that their patients would change dietary habits because of nutritional counseling. However, they agreed that every patient should undergo nutritional screening during their first appointment at the Wound Healing Center, as recommended by AHRQ guidelines. This could be accomplished by having a nutritionist on staff. Not only would this take the onus of nutrition screening off of the nurses and minimally impact clinic flow, it would help with patient follow-up and establish continuity. The nutritionist's ability to teach patients appropriate and healthy food choices based on their income, culture, and available foods would encourage patient adherence to dietary changes.

Of course, a cost benefit analysis needs to be completed to understand the financial feasibility of adding a nutritionist to the Wound Healing Center's staff. Included in the financial numbers would be the hourly cost of the nutritionist multiplied by the number of hours in clinic. A pilot study would need to occur to determine a difference in healing rates of the diabetic patients undergoing nutritional counseling as well as investigating the potential financial impact this service would have on the Wound Healing Center.

In the interim, perhaps the first step in restoring a nutrition screening program in which the nurses are supportive would be to research other nutrition screening tools to ascertain their effectiveness in malnutrition risk identification of all wound patients, including the obese patient. In 2005, Green and Watson conducted a literature review of 71 nutrition screening and assessment tools evaluating validity, reliability, sensitivity, specificity, acceptability, ease of use of the tools, and the population for which the tool was appropriate. Of the 71 tools, two were identified as appropriate for use among the adult outpatient population but neither tool had strong validity and reliability testing. Both tools were designed to be applied by nurses only.

Not included in the review was the Mini Nutritional Assessment tool (MNA) created by the Nestle Corporation in 2006 and the MUST, created by the British Association of Parenteral and Enteral Nutrition. The MNA is a popular screening tool with strong validity and reliability testing; however, it is specific for the elderly population only. Interestingly, as with the MUST, the MNA also assigns the highest number in their screening for a BMI of >23 proving the screening tool's sensitivity to be low and creating the potential issue of under-recognition of malnutrition risk among the obese population. The MUST is the only tool this researcher found to be appropriate for the adult population in any health care setting and does not need to be applied by a licensed professional. Therefore, the Wound Healing Center may need to resort to

piloting a variety of screening tools and choose more than one tool to appropriately screen the adult patient of diverse ages.

Personal Leadership Goals

The ultimate goal of this Capstone project was to improve patient care through a change in clinical practice utilizing the theoretical framework of Roger's Diffusion of Innovation Theory. To successfully facilitate change, a leader must have insight into the dynamics of a system, the interpersonal relationships within a system, the characteristics of the potential adopters of change, effective communication, and sensitivity to the innovation-decision process.

The planning, implementation, and evaluation of this Capstone project has led to a deepened realization of organizational theory through the processes of attaining key stakeholder buy-in and understanding the needs at the point of service: the nurses. The decisions made at the point of service must be congruent with the mission and values of the larger system, as what occurs at the point of service ultimately affects what is delivered to the community, one patient at a time. Success of this Capstone project was not hinged on the Wound Healing Center's acceptance of a specific nutrition screening program. Rather, this researcher believes, success was achieved through the piloting process leading to the nurses' heightened sensitivity to the nutritional status of their patients and the realization of the importance of nutritionally screening all wound patients.

Although this part of the Capstone is complete, it is the researcher's view that the Johns Hopkins Wound Healing Center's process of adopting a nutrition screening program remains in the Decision phase of the innovation-decision process. This means that though the Center has rejected the screening program utilizing the MUST tool, the nurses are now open to the possibility of piloting other screening tools and investigating the feasibility of adding a nutritionist to the Center's staff. The clinical change generated from this re-invention of the

innovation of nutrition screening, as previously discussed, would entail financial and clinical analyses leading to the next phase of this Capstone project.

References

- British Association of Enteral and Parenteral Nutrition (2007). BAPEN study reveals that 1 in 4 of all adults across all age groups admitted to hospital and care homes in the UK are at risk of malnutrition. Retrieved April 6, 2008 from http://www.bapen.org.uk/res_press_rel37.html.
- Brown, B., Turek, J., & Maillet, J. (2006). Comparison of an institutional nutrition screen with 4 validated screening tools. *Topics in Clinical Nutrition, 21*(2), 122-138.
- Elia, M, Zellipour, L., & Stratton, R. J. (2005). To screen or not to screen for adult malnutrition. *Clinical Nutrition, 24*, 867-884.
- http://www.bapen.org.uk/res_press_rel37.html.
- Fuhrman, P., Charney, P., & Mueller, C. (2004). Hepatic proteins and nutrition assessment. *Journal of the American Dietetic Association, 104*(8), 1258-1264.
- Green, S.M. & Watson, R. (2005). Nutritional screening and assessment tools for use by nurses: literature review. *Journal of Advanced Nursing, 50*(1), 69-83.
- Joint Commission for the Accreditation of Hospital Organizations. *Comprehensive Manual for Hospitals: the Official Handbook. Elements of Performance for PC.2.120. Oakbrook, Ill: Joint Commission Resources Inc: 2005.*
- Langemo, D., Anderon, J., Hanson, D., Hunter, S., Thompson, P., & Posthauer, M. E. (2006). Nutritional considerations in wound care. *Advances in Skin and Wound Care, 19*(6), 297-303.
- Malnutrition Advisory Group, a Standing Committee of BAPEN. (2003). *The 'MUST' Report. Nutritional Screening of Adults: A Multidisciplinary Responsibility.* Redditch, Worcs: BAPEN.

- Norman, K., Pichard, C., Lochs, H., & Perlich, M. (2007). Prognostic impact of disease related malnutrition. *Clinical Nutrition*, doi:10.1016/j.clnu.2007.10.007.
- Nutrition Assessment- Adults. American Society for Parenteral and Enteral Nutrition – Professional Association. 2002 Jan-Feb. 4 pages. NGC: 002851 Retrieved April 6, 2008 from http://guidelines.gov/summary/summary.aspx?doc_id=3625&nbr=002851&string=nutrition+AND+assessment.
- Olin, J. W., Beusterien, K. M., Childs, M. B., Seavey, C., McHugh, L., & Griffiths, R. I. (1999). Medical costs of treating venous stasis ulcers: evidence from a retrospective cohort study. *Vascular Medicine*, 4, 1-7.
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed., Rev.). New York: Free Press.
- Rosenbloom, C. A., & Whittington, F. J. (1993). The effects of bereavement on eating behaviors and nutrient intakes in elderly widowed persons. *Journal of Gerontology*, 48, 223-229.
- Sanson-Fisher, R. W. (2004). Diffusion of Innovation Theory for clinical change. In *MJA Books*. Retrieved November 28, 2008, from The Medical Journal of Australia: http://www.mja.com.au/public/issues/180_06_150304/san10748_fm.html
- Snyder, R.J. (2006). Nutrition and its role in wound healing. *Podiatry Management* 25(6), 175-176.
- Szewczyk, M. T., Jawien, A., Kornatowska, K., Moscicka, P., Cwajda, J., Cierzniaowska, K., et al. (2008). The nutritional status of older adults with and without venous ulcers: A comparative, descriptive study. *Ostomy Wound Management*, 54(9), .

- Tobon, J., Whitney, J. D., & Jarrett, M. (2008). Nutritional status and wound severity of overweight and obese patients with venous leg ulcers: A pilot study. *Journal of Vascular Nursing, 26*(2), 43-52.
- Tevis, D. D., & Stotts, N. A. (1998). Nutrition, tissue oxygenation, and healing of venous leg ulcers. *Journal of Vascular Nursing, 16*(3), 48-56.
- Valencia, I. C., Falabella, A., Kirsner, R., & Eaglstein, W. H. (2001). Chronic venous insufficiency and venous leg ulceration. *Journal of the American Academy of Dermatology, 44*, 401-421.
- Wissing, U., Lennernas, M., Ek, A. C., & Unosson, M. (2000). Meal patterns and meal quality in patients with leg ulcers. *Journal of Human Nutrition and Dietetics, 13*(1), 3-12.
- Wissing, U., Unosson, M., Lennernas, M. A., & Ek, A. C. (1997). Nutritional intake and physical activity in leg ulcer patients. *Journal of Advanced Nursing, 25*, 571-578.

Appendix A



Advancing Clinical Nutrition

'Malnutrition Universal Screening Tool' ('MUST')



Malnutrition Advisory Group
A Standing Committee of BAPEN

BSF 1 is a registered charity number 5053927 www.bapen.org.uk

Step 1 BMI score

BMI kg/m ²	Score
>20(>30 Obese)	= 0
18.5-20	= 1
<18.5	= 2

+ Step 2 Weight loss score

Unplanned weight loss in past 3-6 months	
%	Score
<5	= 0
5-10	= 1
>10	= 2

+ Step 3 Acute disease effect score

If patient is acutely ill and there has been or is likely to be no nutritional intake for >5 days
Score 2

If unable to obtain height and weight, see reverse for alternative measurements and use of subjective criteria

Step 4

Overall risk of malnutrition

Add Scores together to calculate overall risk of malnutrition
Score 0 Low Risk Score 1 Medium Risk Score 2 or more High Risk

Step 5

Management guidelines

0 Low Risk
Routine clinical care

- Repeat screening
Hospital – weekly
Care Homes – monthly
Community – annually for special groups e.g. those >75 yrs

1 Medium Risk
Observe

- Document dietary intake for 3 days if subject in hospital or care home
- If improved or adequate intake – little clinical concern; if no improvement – clinical concern - follow local policy
- Repeat screening
Hospital – weekly
Care Home – at least monthly
Community – at least every 2-3 months

2 or more High Risk
Treat*

- Refer to dietitian. Nutritional Support Team or implement local policy
- Improve and increase overall nutritional intake
- Monitor and review care plan
Hospital – weekly
Care Home – monthly
Community – monthly

* Unless detrimental or no benefit is expected from nutritional support e.g. imminent death.

All risk categories:

- Treat underlying condition and provide help and advice on food choices, eating and drinking when necessary.
- Record malnutrition risk category.
- Record need for special diets and follow local policy.

Obesity:

- Record presence of obesity. For those with underlying conditions, these are generally controlled before the treatment of obesity.

Re-assess subjects identified at risk as they move through care settings
See The 'MUST' Explanatory Booklet for further details and The 'MUST' Report for supporting evidence.

Appendix B

Validity and Reliability of 'MUST' as Reported by the 'MUST' Report

Concurrent validity: established by comparing 'MUST' to other nutrition screening tool in an outpatient setting.

- MUST' had ""substantial" to "almost perfect" strength of agreement of concurrent validity with two other outpatient tools (kappa = 0.711 to 0.893; N=100) (Landis & Koch, 1977)

Predictive validity of outpatients (using Pearson Chi squared and Univariate ANOVA):

- Hospital admissions: significantly greater in high risk groups (N=98, p<.001)
- Physician visits: More frequent in those with medium to high risk of malnutrition than low risk (N=213, p<.001)

Internal validity:

- Differences and relationships between measured and self-reported (recalled) values of height and BMI:
 - Self-reported height highly predictive of measured height (N=332, r =0.941, standard error of estimate (see)=3.0 cm)
 - Self-reported height allows excellent overall categorization of malnutrition risk (>95% agreement with malnutrition risk categorization using actual measurements of height; kappa values >0.9)
- Family informant estimates of weight and height:
 - informant estimates were highly predictive of measured heights (N=374, r =0.95) and weight (N=374, r =0.94)
- Recumbent height for bedridden patients:
 - recumbent heights found to be as precise as standing heights (N=108)
- Surrogate procedures: established equations for converting knee height and demispan to height showed an overall bias of < 0.5 cm when height was estimated from knee height and 2.7 cm when height was estimated from demispan (N=300).
 - when these conversions were used to categorize patients into malnutrition risk, using either measured or self-reported weight, the results agreed very well with malnutrition categorization based on measured weight and height (agreement > 95%; kappa > 0.9; sensitivities and specificities > 95%)

- When weight cannot be measured: self-reported weight was found to be an unbiased predictor of measured weight and BMI (N=338, $r=0.961$, see < 3kg).
- Self-reported weight to categorize patients into overall malnutrition risk: self-reported weight did not alter BMI categorization among outpatients
- When weight and height cannot be measured:

-self-reported height and weight: there was a discrepancy with measured BMI and a weak but significant relationship between the discrepancy and measured BMI (N=200, $r^2 = 0.066$)

-despite these findings, the final categorization of malnutrition risk was altered in less than 5% of cases (κ values = 0.833-0.929; sensitivity of 95%; specificity of 97%).

-surrogate measures (mid-upper arm circumference, MAUC) to establish BMI and cut-off of 23.5 cm for underweight/no underweight and malnutrition risk:

-in a group with ages 16-94 years, scores obtained using MAUC showed excellent agreement with using measured height and weight (N=300, agreement 95.8%, $\kappa=0.904$, sensitivity 92% and specificity 98%)

-surrogate measures (MUAC) to categorize obese/not obese

-in a group with ages < 65 years (N unknown) a cut-off point of 32 was associated with a sensitivity of 95% and specificity of 84%.

Inter-rater reliability: In an outpatient setting, “almost perfect” strength of agreement of inter-rater reliability ($\kappa = 0.809$ to 1.000, N= 364) (Landis & Koch, 1977).

- Agreement in malnutrition categories between two raters was > 95% in all studies

Appendix C

Nutrition and Venous Leg Ulcers

1. In the United States, what percent range identifies the rate of malnutrition found among hospital inpatients? (circle one best answer)

- A. 6%-15%
- B. 11% - 28%
- C. 24% - 41%
- D. 32% - 59%

2. AHRQ guidelines (2002) recommend that nutrition screening be completed on all patients during their first encounter visit in all settings: hospital, outpatient, community, long term care.

True False

3. What parameters appropriately evaluate and monitor nutrition status? (circle **all** that are appropriate)

- A. Albumin
- B. Prealbumin
- C. Transferrin
- D. Complete blood count
- E. All of the above
- F. None of the above

4. Nutrition screening, the process of identifying characteristics known to be associated with nutrition problems, allows the clinician to: (circle **all** that are appropriate)

- A. Target individuals for further assessment and treatment
- B. Streamline the referral process
- C. Prioritize services to those most in need
- D. All of the above

5. Nutrition screening must be done by a licensed dietician.

True False

6. Unintentional weight loss of greater than ____% of body weight in adults over a period of 3-6 months represents a cut-off for malnutrition. (circle correct answer)

- A. 5
- B. 8
- C. 10
- D. 12

7. In the United States, **1996** statistics estimated that the annual healthcare dollars spent on venous leg ulcer patients to be between. (circle correct answer)

- A. 250 – 625 million dollars
- B. 650 million – 1.2 billion dollars
- C. 1.9 – 2.5 billion dollars
- D. 2.6 – 3.2 billion dollars

8. Venous leg ulcers account for approximately 80-90% of all lower extremity ulcers.

True False

9. According to recent research, venous leg ulcer patients who are obese typically get adequate amounts of protein and are not considered malnourished.

True False

Appendix D

Dear venous leg ulcer patient:

Fran Valle, a nurse practitioner at Johns Hopkins Bayview Medical Center, is conducting a research study with the nurses of the Wound Center that looks at a patient's nutrition using a nutrition screening tool.

There are three purposes of this study:

1. To get the nurses' opinions about the usefulness of the nutrition screening tool
2. To find out how using a nutrition screening tool will impact the day to day running of the Wound Center
3. To get an understanding of how many patients with leg ulcers are at risk of poor nutrition

Malnutrition (poor nutrition) can cause wounds not to heal. It is hard to tell if someone is malnourished by looking at the person. In order to check to see if someone may be at risk of malnutrition, a nutrition screening test should be done. Certain government agencies want nutrition screening to be done at your first visit to your doctor and at least yearly after that.

The screening test that is being used at the Wound Center is made up of three parts:

1. Weighing you on a scale and measuring your height (if you cannot be weighed or cannot stand, the nurses can measure your arm to estimate your weight and height)
2. Asking if you have lost any weight in the past 3-6 months that you were not trying to lose
3. Asking if you have had or if you will have a period of time where you could not eat for 5 days or more (for any reason)

If you are found to be at a "medium" risk of malnutrition after being screened, the nurses will give you some information about diet and eating that will help you. The nurses will screen you again in 3 months to see if your change in eating has helped your nutrition.

If you are found at "high" risk of malnutrition, the nurses will call your medical doctor so that he or she can refer you to the health care provider who can help you.

It is important for you to know that your personal information, including your name, medical history, and any information from your visit today (other than the results of your screening test), will **not** be used for the purpose of this study. Also, you may choose not be screened today.

If you have any questions, please call Fran Valle at:

410-550-0315 (Wound Center) or 410-283-3105 (pager)

Appendix E

MUST Source Documentation

Date: _____

STEP 1: BMI Score

Height: _____ Ulna Length (if unable to obtain height): _____

Weight: _____ MUAC (if unable to obtain weight): _____

BMI: _____

BMI > 20 = 0

BMI 18.5-20 = 1

BMI < 18.5 = 2

Score: _____

STEP 2: Weight Loss Score (unplanned weight loss past 3-6 months)

< 5% = 0

5-10% = 1

> 10% = 2

Score: _____

Step 3: Acute Disease Effect

Score 2 is patient has had no nutritional intake or likelihood of no intake for more than 5 days. Otherwise, score 0.

Score: _____

Step 4: Add scores together to calculate overall risk

Step 1 score _____ + Step 2 score _____ + Step 3 score _____ = _____

Step 5: Risk Categories:

Total score 0 = low risk (re-screen annually)

Total score 1 = medium risk (re-screen in 1 month)

Total score 2 or more = high risk (inform PCP)

Appendix F

Focus Group Questions

1. Among your priorities for the venous leg ulcer patient, how important do you feel nutrition is in the healing of their wounds?
2. What do you see as some of the pros and cons of a nutrition screening program in an outpatient setting?
3. What is your perception of the MUST tool for nutrition screening?
4. How did the implementation of the nutrition screening program affect your interactions with your patients?
5. How did the patients react to the screening program?
6. How did the physicians react to the nutrition screening program?
7. How did the implementation of the nutrition screening program affect the clinic flow?
8. What other types of patients would benefit from a nutrition screening program?
9. What has happened as a result of the implementation of the nutrition screening program?
10. Is there anything else that you would like to say concerning the nutrition screening program implemented here?
11. If you had to design a program for nutrition screening, how would you do it?

Appendix G

Ranking of Priorities in Caring for the Venous Leg Ulcer Patient

Please list in descending (most important to least important) order your priority of treatments for the venous leg ulcer patient:

1.

2.

3.

4.

5.

Appendix H

Main themes emerging from focus group

Theme	Description
Frustration	
Inability to refer Lack of resources	<p>Patients cannot afford nutritious foods or supplements</p> <p>Patients make food choices based on affordability and not nutrition value</p> <p>No reimbursement for nutrition counseling through insurance companies or Medicare patients without DM or ENSRD</p> <p>Patients lack resources for out of pocket expenses</p>
Lack of influence	<p>Do not believe that patients will change diet even with nutrition counseling</p> <p>Wound Healing Center is “not good” at complementary and alternative medicine</p> <p>Patients do not understand what they are eating</p>
Limitations of MUST	<p>Did not identify any obese patient as being at risk of malnourishment</p> <p>Some patients were so obese that BMI’s were not on scale</p> <p>Tool does not indicate specific nutritional deficits</p> <p>Tool is too vague</p> <p>Charts in MUST are too small to read</p> <p>Difficult converting from standard measurement to metric</p> <p>Patients refused screening because they did not want to be weighed</p>
Awareness	
Patients (per nurse report)	<p>Increased patients’ awareness of their height and weight</p> <p>Increased patient interest in nutrition and wound healing</p> <p>Patients became more aware of available resources</p> <p>Moderate risk patient very interested in increasing nutrition awareness</p> <p>Patients unaware of nutritional supplements</p>
Nurses	<p>Increased nurses’ awareness of nutrition</p> <p>Screening program made it easier for nurses to talk to patients about nutrition/jump started conversations</p> <p>Made nurses aware of the number of obese patients in clinic</p> <p>Made it easier for the “skinny” nurses to speak to obese patients about weight loss and nutrition</p> <p>Facilitated non-confrontational discussion about weight</p>

Increased nurses' sensitivity to obesity
 Nurses unaware of nutritional supplements

Affect on clinic flow

Process would have been too slow if nurse assistant did not weigh/measure patients
 Nurses felt like it was "just one more thing to do"
 Nurses to ask patients for self-report of weight and height instead of patients being weighed and measured
 "Complicated equations" and looking up BMI's put nurses behind

Nurse recommendations

Nutritionist

Have nutritionist on staff in Wound Healing Center
 Nutritionist to screen all patients at first visit: this will help with follow-up
 Nutritionist to adjust counseling based on food availability and affordability

Teaching

Provide patients with information about the availability of nutrition counseling (flyers, posters)
 Have nutrition information and healthy recipes available in waiting room
 Teach about importance of sodium restriction and fluid management
 Give examples of healthier snacks
 Have patients do a self assessment of nutrition on ambulatory intake forms

General

Screen all patients
 Refer all obese patients to nutritionist
 Find another tool
 Perform full metabolic work-up on obese patients