The Impact of an Educational Program Implemented in Home Health Nurses to Reduce Foot Ulcers Rates in Patients with Diabetes Mellitus Type 2

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Contents

Abstract

This Doctor of Nursing Practice (DNP) proposal aims to reduce infection rates in patients with diabetes mellitus within a South Florida Home Health Agency through an educational program for nurses. Grounded in well-established theories and real-world processes, the project upholds scientific integrity and ethical foundations. Research questions and hypotheses contribute to existing knowledge and open avenues for further studies, with a specific focus on educating nurses about foot ulcers in diabetic patients due to the high infection risk.

The study's objectives include assessing the effectiveness of a nursing training program on patients' foot self-care, evaluating the impact of the program on nurses' ability to estimate the risk of foot ulcers, and comparing outcomes using pre and post evaluations. The quasi-experimental design involved an intervention group of nurses receiving the training program. Statistical analysis, employing Chi-Square tests, aimed to determine significant changes in participants' knowledge following the intervention. The study's variables included an 18-question questionnaire addressing demographic data and specific knowledge about Diabetes Foot Ulcer. Demographic results revealed the age distribution, gender, and educational background of participants. Pre-test findings highlighted varied knowledge and beliefs, exposing misconceptions and gaps. Post-test results indicated significant improvements in key areas, with participants showing higher agreement with accurate statements. Consistency checks validated response reliability. Significant changes in participants' beliefs post-intervention were identified. The selected significance level was .05. This comprehensive approach in assessing, intervening, and analyzing results contributes to the project's scientific rigor and lays the foundation for potential advancements in diabetic patient care, emphasizing the pivotal role of education in improving health outcomes.

Introduction

As the prevalence of type 2 diabetes has increased worldwide, it has led to the development of several delivery models aimed at preventing this condition from occurring and developing. There is a problem when trying to conduct these programs at primary healthcare levels or at settings which are community based because they are not feasible and much less practical when a research study is conducted. The reason behind this statement is because these delivery programs are generally resource intensive. At a global level, more professionals admit one or more long-term conditions (LTCs), and this increases the demand for complex medical care services. In the case of general practice, it has been suggested that gathering healthcare professionals (HCPs) of other perspectives, training, wisdom, and better skills expands patients' experience of care and improves HCPs working lifetime (Sørensen, et al., 2020).

It is interesting to observe that the global prevalence of diabetes in adults rose from 4.7% in 1980 to 8.4% in 2017. Diabetic foot ulceration (DFU) is a serious complication of the condition for being one of the main causes of disability and mortality and a common reason for the admission of these patients in hospitals. It is thus estimated that DFU lifetime incidence is in the range of 15% and 25% among individuals with diabetes, and the estimation of re-ulceration rates at 65% after five years. Further complication DFU management is thought to be caused by poor wound healing and re-ulceration, secondary to concomitant peripheral arterial disease, infection, and neuropathy. Unfortunately if an injury is not healing or gets infected can end in limb amputation. Amputations caused by diabetes usually show a seven-year mortality rate of over 50% in those diabetes sufferers who do not have any chronic kidney disease and over 70% in those with co-existing chronic kidney disease. Also, the poor quality of life of those individuals with DFU-relevant amputations and undoubtedly can also suffer from psychological

distress. Not only is the life quality of life negatively affected in individuals with DFU, but also that of their caregivers. (Sørensen, et al., 2020).

“Nurses have a significant opportunity to positively influence individuals with diabetes outcomes and quality of life by promoting the maintenance of healthy feet, identifying emerging problems, and supporting evidence-based self-care practice. To facilitate the healing process of DFU, advanced knowledge is required from nurses professional. Such as saline-soaked gauze s, film , foam , non-adherent s, hydrogels, hydrocolloids, and alginates. This is the essential aspect to 'stop amputation by doing prevention” (Heimro et al., 2021).

Undoubtedly, nurses can prevent and manage DFU, by modifying DFU risk factors in the follow-up sessions, by detecting loss of protective sensation, by palpation and auscultation of those patients with DM feet, by observing places where the lesions are present. Usually, those nurses who have been well trained and have positive attitudes toward patients are more willing to participate in ulcer prevention and cure. This is a huge contribution to prevent limb amputation. Some strategies include Diabetes foot care, related screenings, and educating patients on their health problems (Abate et al., 2020).

This research is aimed at evaluating the possibility to lower infection rated in those patients with diabetes mellitus in a South Florida Home Health Agency using an educational.

The practice change project is related to the education of nurses that works in a home health care system to increase their knowledge about the risk of foot ulcer in Diabetes Mellitus patients; concerning that scenario, typically, the first step in scientific research is formulating evidence-based research questions, which are then explicitly reformulated as hypotheses. The study's guidelines, as well as solutions, explanations, and anticipated outcomes, are provided by the hypotheses. The fundamental formulation of research questions and hypotheses is based on conventional theories and actual processes, enabling the creation of novel studies and the ethical testing of ideas. Understanding qualitative and quantitative research is essential because both require formulating research questions and hypotheses.

Before defining a research question, it is needed first identify the primary and secondary objectives of the study, as well as any potential effect modifiers. It is easier to develop a focused or broad search strategy and conduct a systematic review if a research question focuses on, defines, and summarizes the project's objective in greater detail. A literature review to identify gaps in the field is required to create a good research question and define the study's purpose (Muka et al., 2019).

Muka (2019) thinks that if a new analysis will fill in gaps and add value, previous systematic reviews on similar research questions are not a barrier to conducting one. Some areas of research move quickly; A new and more up-to-date systematic review of the evidence or automated maintenance of living network meta-analyses may be recommended if numerous new publications are published. Some tools can assist with defining and analyzing a valuable research question, and a valuable research question must necessarily arise from existing knowledge (Muka et al., 2019).

However, these essential aspects of research are frequently overlooked; They are framed without the necessary forethought and careful consideration if they are remembered. Planning and reflection are crucial when conducting quantitative or qualitative research, particularly when conceiving research questions and hypotheses (Barroga & Matanguihan, 2022).

A research question is a question that a study or research project is supposed to answer. Through data analysis and interpretation, this question frequently addresses an issue or problem that is addressed in the study's conclusion. Most studies have their research questions written so that they outline various aspects of the study, like the population and variables to be studied and the issue the study aims to solve (Bouchrika, 2021).

Frequently relies on research, as the name suggests. As a result, these inquiries are ever-changing; The research question can be modified or refined by researchers as they conduct a literature review and construct a study framework. More extensive studies frequently employ multiple research questions, whereas many research projects concentrate on a single question (Bouchrika, 2021).

A hypothesis is a tentative assertion regarding the connection between two or more variables (Cherry, 2022).

. It is a precise, measurable prediction of what you anticipate will occur in a study. Cherry (2022) states that the following steps must be taken to develop a hypothesis:

- Collect as many observations as possible regarding a particular issue or subject.
- Look at these observations to see if they could be the problem's root cause.
- Compile a list of possible explanations for the researcher to consider.

Therefore, after some hypotheses have been developed, experimentation can either support or refute each one (Cherry, 2022).

According to Allen (2017), a hypothesis is used in research to predict a relationship or explain a phenomenon. This author noted that a hypothesis must satisfy four evaluation criteria. The expected relationship between the variables needs to be stated first. Second, it needs to be testable and falsifiable so that researchers can figure out if a hypothesis is true or false. Thirdly, it needs to be in line with what we already know. Finally, it should be stated in the most straightforward and evident possible manner (Allen, 2017).

When developing a hypothesis, a researcher must also consider the requirement that it be a precise, testable, and predictable statement based on theoretical guidance and/or prior evidence. Numerous research designs can be used to express a hypothesis. To investigate differences in research outcomes, researchers compare two or more groups of participants in experimental settings (Allen, 2017).

Blankart (2022) recommended that the researcher investigate the subject of interest before formulating a hypothesis. This will give you enough information to narrow down the question that the research will ask. After that, it's time to come up with a hypothesis, which is a statement of expectations for the results of the research question. It could, for instance, be testing the relationship between two critical variables. As a result, the data at hand should enable a hypothesis to be tested. Hypotheses fall into two categories: alternative or antagonistic The term "null" means that there is no effect, asserts that there is an effect. (Blankart et al., 2022).

Purpose

The purpose of this study is to assess the impact of a nursing health education program on the risk of diabetic foot ulcers among patients in a South Florida home health agency regarding foot self-care.

Research question

Will the implementation of a nursing education program associate with a lower rate of diabetic foot ulcers in home health care?

Objectives

1. To plan, implement, and assess the nursing education program's efficacy.

2. To determine the level of diabetes patients' nursing knowledge of foot self-care.

3. To determine how well-versed nurses are in estimating diabetic patient's risk of developing foot ulcers and the nursing education program's efficacy.

PICOT question

In nurses from a Home Health providers (P) what is the effect of a nursing training program about the patient’s foot self-care, and the nurse's ability to estimate risk of foot ulcers compared to standard care (I), before and after the intervention program (C) in terms of program efficacy and patient outcomes (Outcome) over a six-month period (Time)?

Population: Home Health Nurses, the demand for home health care services is growing globally as the elderly population continues to grow rapidly and patients are discharged from hospitals to their homes with complex care earlier.

Home health agencies in the United States provide temporary, intermittent skilled care to homebound patients who require the services of skilled healthcare professionals such as registered nurses, physical, occupational, and speech language therapists, and social workers. Home health nurses are viewed as independent clinicians who receive remote support from a central office. They are in charge of assisting patients in restoring, maintaining, or slowing the decline of their functional capacity while allowing them to remain in the community for as long as possible (Irani et al., 2018). However, nurses are the primary point of contact for patients and are seen as a source of information by patients. In order for nurses to fulfill this role, they must have knowledge regarding diabetic foot care management and convey this knowledge to the patient (Iversen et al., 2020).

Intervention

The intervention for this PICOT study is specialized training. Adequate training provides home health nursing with essential education and experiences imperative in impacting them with necessary home health skills, knowledge, and professional behavior and attitudes to replicate their knowledge and teach the patients the essential of self-care in DFUs. All health professionals play a role in diabetic foot treatment, but nurses play a significant role because they are in communication with patients for 24 hours (Kaya & Karaca, 2018).

Comparison

The study will utilize a compare design, before and after the training (CDC, 2020). They will receive quality training in-home health, about DFUs. The participants knowledge about FU will be evaluated at the beginning of the training program, and al the end, where is suppose that the group shall be assessed for knowledge and skills proficiencies against the initial condition before training.

Outcomes

It is expected that the training nurses shall develop more home health care knowledge and skills proficiencies, and confidence to operate alone in-home health care Health nursing care scenarios measured through qualitative analysis about their patients with FU. The quality of engagement of home healthcare workers (HHWs) who work with diabetic patients is the cornerstone of preventing this DFU. The foot care prevention and awareness appears to be done only after the initial DFU has developed. Patients some time have their first contact with HCWs in home healthcare, which is the most important level of care because it shapes the foundation of care that the patient with diabetes will receive (Ranuve & Mohammadnezhad, 2022).

Timing

The PICOT study is anticipated to occur within ten weeks, including conducting the training program, subjecting the participant's in-home health care scenarios, and finalizing the qualitative analysis.

Hypothesis/Null Hypothesis

The nursing education programs will reduce the number of patients with diabetes who develop food ulcers over extended periods (up to 10 weeks).

Alternative Hypothesis

The nursing education programs will not reduce the number of patients with diabetes who develop food ulcers over extended periods (up to six months).

Risks and Discomforts

At the moment, there are minimum risks you may be experiencing if you decide to participate in the investigation. These risks could be tiredness or boringness. However, you should not worry, because we have an action plan to meet your needs in case of an unexpected event. These include rest periods after each activity.

Potential benefits

You may receive benefits when participating in the investigation, including gaining valuable knowledge and skills related to foot ulcer prevention and care in patients with Diabetes Mellitus type 2. In Addition, empowering you with evidence-based information, practical strategies, and specialized training provided by experienced home health nurses. This knowledge can help you identify and mitigate potential risks, allowing for proactive measures in foot care management.

Incentives

There are no incentives in this project.

Theoretical Framework

Different phenomena occur and have connections to create a theoretical framework that in an abstract way reveals a theory. Various concepts form a logical system along with several propositions which have descriptions of some topics which at the end becomes a theory. This structure has been traditionally the way theories are formed, and the statements which have been

made give rise to hypotheses. In the case of qualitative research, descriptive theory is used to describe the topic under study. Inductive reasoning is used on descriptive theories because they are formed when the researchers are aimed at observing and recapitulating common characteristics found in persons, groups of persons, and/or situations that have occurred during their life spans. Descriptive theories are considered in their broader terms because they predict and explain (Themes, 2017).

Researchers resort to theories because they help to interpret the findings of their research answering crucial questions as why this happened and how did it happen in natural phenomena. Generality in theories can differ because of the different aspects of a given research. For example, researchers can find an extensive universe of nursing theories that involve the very practice of this noble profession, disregarding other fields. In the case of a Grand Theory as Peirce's Human Paradigm, this theory is more abstract than other type of theories where concepts are mostly used by researchers. However, in the case of Intermediate Theories, more specific topics are addressed: Health promotions, stress, comfort among others. It is then apparent that larger concepts are not so accurate and logically more difficult to test empirically compared to mid-range nursing theories because they deal with specific areas of nursing (Themes, 2017).

According to Themes (2017), there is a logical difference between a theory and a conceptual model also named model which is based on a common theme around which abstract concepts joined. However, in theories, a conceptual model depicts the ways events link together and are not based on connecting ideas through a framework using the logical behind the phenomena and a deductive way of thinking.

It should be stated that this DPN research study abides by various models created for the nursing practice and for other relevant contexts and fields. In this regard, it is important to underline that Pender's HPM depicts three main areas which are very useful for nurses when assessing health promotion behavior:

1) Personal experience gained and characteristics

2) Effects and specific perceptions of the behavior

3) Results of the action

In the case of Type 2 Diabetes Mellitus (TIIDM), it is crucial to use Pender's Model to lower the risk of infection. This Model is indispensable in promoting health in those cases with chronic diseases. Healthcare providers can use it as a guide to motivate patients in behaviors that can reduce the negative effects of the disease. This Model can assist healthcare providers to persuade patients with well-informed interventions toward better outcomes and their much needed well-being (Themes, 2017).

Patients with type 2 diabetes mellitus are at a high risk of infection and they live a life of restrictions in food, and sometimes feel desperate to continue following the established rules for their survival, these situations prove that promotional health strategies are much needed to help patients with risky behaviors. Therefore, counseling to them should be done appropriately, and the tenets of this Model can highly contribute to that (Chahardah-Cherik et al., 2018).

According to Hidayati et al. (2019), the management of diabetes responds better when patients are educated. The role of nursing is to set up optimal conditions for patients, families, and communities and jointly work to deliver support. Advocacy programs can raise patients' education and better health behaviors.

Health can be described as attaining human potential via goal-directed behavior, self-care, and relationships with others. It is also indispensable to perform requried adjustments to keep the proper and needed environment. Illness can be defined as a discrete event in life which can harm or expand patient's quest for health (Hidayati et al., 2019).

The Health Belief Model (HBM), another model similar to the Health Promotion Model, this Model depicts the situations where people fail to apply disease prevention strategies to screening tests for early detection of disease. This is also a theoretical model which serves a guide for intervention programs for disease prevention. Likewise, it is a major model that has been extensively used to promote useful health behavior and for the prevention of diseases (Sun et al., 2022).

This Model dedicates an important part of its tenets to raise awareness on individuals on their health conditions and beliefs. This can predict individual health-related behaviors. Key factors are also found in this model as perceived vulnerability, severity, barriers, benefits, behavioral cues, and self-efficacy (Sun et al. 2022).

The Model features five actionable vital points ruling crucial decisions which influence health behavior:

Informed by conducting a health needs analysis to identify at-risk persons, communicate risk sensitivity and severity of risk, share benefits of behavior, eliminate barriers to behavior, promote self-efficacy, and incentivize behavior. These actions are the key elements of the health belief model as important parts aimed at implementing programs centered on health promotion and disease prevention. This Model can be used alone or with other theories and models. It is indispensable to identify "behavioral directives' to finally ensure the success of this model always considering the specificities of the target population (Mirzaei-Alavijeh et al., 2019).

These theoretical frameworks are important references to take in high considerations for the development of research, they are guidance for formulating research questions and attain the research objectives pursued.

The Theorist and Her History

Nola Pender was an American nursing theorist who developed the "Health Promotion Model" (HPM) was created by Nola Pender. Born in 1941 in Lansing, Michigan, United States. This nursing theorist attained the Bachelor of Science in nursing degree in the University of her state. Attained a Master of Science in Nursing also in the abovementioned university, but it was the Pennsylvania State University which granted her PhD in Human Development and Family Studies (Themes, 2017).

Her Model is a conceptual framework depicting how people can behave differently in their health behavior attending a multidimensional nature. This theorist underlines that the perceptions patients might have of their health is a crucial aspect to be taken into consideration their own health status. Three main components make up her model: Patient's individual characteristics and experiences lived, behavior-specific cognitions and affect, and behavioral outcomes. Nola Pender was also aware of the significance that environmental factors have and the ways these factors influence the health behavior of everyone. Those environmental factors are mainly: Family, friends, public policy, and community (Themes, 2017).

This theorist was awarded with several prizes and honored in different occasions for her outstanding work in nursing. There are many articles published in different nurse journals and in chapters of books. Her contribution to nursing with her health promotion model has been largely praised. Nola Pender held important academic and leadership positions in the field of nursing, as professor and dean of the University Of Michigan School Of Nursing, and also participated in

various committees at national and international levels on the fields of nursing and health (Themes, 2017).

The Health Promotion Model (HPM) is a theoretical framework developed by Nola Pender, a professor of nursing, in 1980s. HPM is based on the premise that people can act to promote their health and well-being. It emphasizes the importance of personal factors, behavioral perceptions and influences, and environmental factors in determining health behavior (Themes, 2017).

The Model created by this theorist, who was also a professor of nursing, is based on her assumption and beliefs that people can be the protagonist of their well-being and health. The theoretical framework Pender created, strongly considers that health behavior is determined by personal factors which include as stated above the environment, influences of different types, behavioral perceptions, and personal factors based on the life experience of a person

Explanations of the factors considered in the HPM:

 Personal factors:

Demographics, biological, and psychological factors of each individual.

 Behavior perception and impact:

Health promotion individual perceptions in terms of benefits and barriers, self-efficacy, and the emotional responses to health behaviors. This last aspect is important because bad news on health can lead to negative or exaggerating behaviors.

 Action result:

Individual current actions on health behaviors: Regular check-ups attendance, physical exercises, healthy diets.

 Environmental factors:

Surrounding ambiances at home and at work can impact individual responses in social, cultural, and physical realms where they live and work. It is important to bear in mind these factors for developing guides on health promotion and interventions. Logically, these factors contribute to raise our awareness and understanding of individual health behaviors (Themes, 2017).

It is understandable that if the health provider also considers the individual's factors at home, work, behavioral perceptions, these are important data for understanding the specific needs and characteristics of the individual, and this is what the HPM is about. This Model is an effective way to promote healthy behavior at the time of tailoring an intervention with informed decisions (Themes, 2017).

Literature Review Part I

Nather et al. (2018), report that diabetic foot wound management relies heavily on prevention. Diabetes foot ulcers (DFU) have a lifetime risk of 15%(5), and the incidence of developing an ulcer in diabetics may be as high as 25%. There is a high probability that an ulcer will result in amputation below the knee. Amputation of limbs is the most expensive and dreaded outcome of foot ulcers. 84% of diabetics' non-traumatic limb amputations are the result of DFUs. This group is 25 times more likely to have a limb amputated than people without diabetes (Nather et al., 2018).

Educational strategies are one crucial factor in reducing diabetes complications, in particular DFUs. The best way to avoid issues with diabetic feet is through education. Professionals must first be educated on the nature of patient education, even though this is primarily intended for patients and caregivers. After receiving training and education, they can effectively educate patients and caregivers (Nather et al., 2018).

Monteiro-Soares et al. (2020), reported that patients, limbs, or ulcers might be at risk for developing a DFU, and these conditions may result in hospitalization, lower extremity amputation, and mortality. DFU results will be affected differently by various individual factors in multiple groups and nations. Notably, according to Monteiro-Soares et al. (2020), 80 percent of people with diabetes live in low- and middle-income countries, where it is difficult to access numerous diagnostic tools, and this situation is not expected to change soon.

Interactions between foot-related behaviors and biological risk factors like peripheral neuropathy typically bring on DFU. At least 75% of all cases could be avoided with high-quality preventive care, according to estimates. For successful prevention, patients need to participate in foot care actively. Avoidance of activities that put the foot at risk (such as walking barefoot), consistent use of appropriate footwear, and attendance at annual foot screenings are vital behaviors that reduce the risk of developing DFU. Other key behaviors include daily foot inspection and immediate reporting of irregularities to a health professional. However, many diabetes patients do not participate in these activities. For instance, nearly two-thirds only check their feet occasionally, and only a tiny percentage adhere to footwear recommendations (Coffey et al., 2018).

A report about the findings of 35 qualitative studies in a qualitative meta-synthesis published in 2018 found that health professionals' communication with participants regarding DFU and foot care needed to be more comprehensive. Diabetes-related amputation patients, in particular, frequently lamented the consultants' lack of sensitivity when they were told they needed this procedure. Often, appointments were rushed or consisted only of administering medication without discussion. Many medical professionals lacked empathy for their patients and appeared to lack a comprehensive understanding of them (Coffey et al., 2018).

According to Schaper et al. (2020) in their most recent review, the International Working Group on the Diabetic Foot (IWGDF) identified five major components that support efforts to prevent foot ulcers:

Determining which foot is at risk.

Regular inspection and examination of the foot at risk.

Educating the patient, the patient's family, and medical professionals.

Make sure that the right shoes are worn frequently.

Ad risk factors for ulcers.

The IWGDF (2019) also says that a well-trained team of healthcare professionals should address these five aspects as part of integrated care for people at high risk of ulceration. Regarding education, the group believes that a member of the health care team must provide it in a structured manner, either individually or in small groups, over several sessions, with periodic reinforcement, and preferably by utilizing various approaches. The elements of education should be according to culture, gender, patient’s health literacy, and personal circumstances (Schaper et al.,2020.

Martinez-Garcia et al. (2021) explained that in diabetic foot patients, vitamin D, C, A, and E, magnesium, zinc, omega-3 fatty acids, and probiotics supplementation reduce ulcer size and improve glycemic control; However, wound healing can be observed with arginine, glutamine, and -hydroxy—methyl butyrate supplementation, but more research is needed to confirm these findings (Martinez Garcia et al., 2021).

Preventing foot issues necessitates therapeutic education, as previously stated. Miranda et al. (2021) say that therapeutic education's objective is to "improve patients' knowledge of foot care, awareness, and self-management, and improve motivation and skills to facilitate adherence to appropriate behaviors" (p.3). Additionally, Miranda et al. (2021) recommended that healthcare providers receive regular training to enhance their abilities in caring for patients at high risk for foot ulceration.

An examination of the DFU risk factor considers that diabetic neuropathy is the most common complication of diabetes, affecting nearly 50% of people with both types. Reardon et al.'s research on diabetic neuropathy asserted that people with diabetes with a grade of sensory loss are seven times more likely than people with diabetes without neuropathy to develop a first-foot ulcer. Poor balance due to loss of proprioception, decreased sweating, dry skin that can build skin cracks and fissures, and an increased risk of diabetic foot ulceration are some of the effects of neuropathy (Reardon et al., 2020).

The number of people with diabetes is expected to rise by 25% by 2030, according to Chang and Nguyen (2021). Additionally, neuropathy is caused by nerve damage in the legs and feet caused by persistently high blood glucose levels; After an unnoticed foot injury, diabetic foot ulcers (DFUs) are the result of decreased sensation in the legs and feet caused by neuropathy or peripheral arterial disease.

It has been estimated that 30% of diabetic patients will develop DFUs in their lifetime. DFUs are persistent wounds that do not heal. In 2016 it was reported 130, 000 amputations of lower limbs in the United States 2016. The dysregulated and abnormal wound repair process is related to the mechanism of DFUs. Inflammation, angiogenesis, the formation of new blood vessels, and ECM remodeling, which repairs the dermal skin layer, are all components of routine wound healing. For wound debridement (removing dead, necrotic, or infected tissue to aid in wound healing) and to cleave damaged collagen type I, neutrophils—a type of white blood cell essential for the immune system's response—come to the wound and secrete matrix metalloproteinase (MMP)-8 (Chang & Nguyen, 2021).

Diabetes patients frequently develop DFUs, and even a tiny cut in the skin on the foot can become infected if it does not heal immediately. The high rate of ulcerations, infections, and gangrene is the most common reason for DM patients to be admitted to the hospital. To successfully treat DFUs, a clinical setting should have the tools necessary to identify risk factors, and prompt and proper management is also essential. For people with diabetes, exercise should be encouraged, and a suitable activity monitor should be used to promote daily routine and physical activity. The DM patient's care team should encourage them to use a fitness tracker and share their exercise and blood sugar logs. Utilizing vascular and plantar soft tissue examinations will enable the care team to better prevent DFUs, even in individuals at the highest risk (Lung et al., 2020).

Diabetes ulceration is the most common cause of amputation of the lower limbs. Early intervention and care are essential due to the high mortality rate following an amputation. The development of diabetic foot ulcers is influenced by underlying neuropathy, peripheral vascular disease, and structural abnormalities that put more pressure on the affected areas of the foot.

Diabetes mellitus affects the functions of the autonomic, motor, and sensory nerves simultaneously. A lack of awareness of recurring injuries and pain, dry, dehydrated skin, and foot anatomical anomalies are the outcomes of the combination of these effects. Diabetes also increases the likelihood of developing atherosclerotic disease. According to Bowers & Franco (2020), the typical locations for diabetic ulcers are the plantar surface of the metatarsal heads or the toes.

Wound care nurses at all levels must work together to get the best results and reduce DFU risk factors. A multidisciplinary team that includes vascular surgeons, family doctors, podiatrists, some diabetes consultants, and diabetes educators is one of the primary requirements. According to Subrata & Phuphaibul (2019), collaboration in nursing is an interprofessional process in which nurses pool their resources and expertise to form a team to solve a patient's or healthcare issue.

All nursing interventions must be based on clinical assessment results, current patient conditions, and pertinent research for optimal treatment. Therapy goals must include immediate wound closure, infection control, reduced risk of recurrence, appropriate wound maintenance for a chronic wound (also known as DFU), and improved health status. The development of the comprehensive diabetic foot examination tool and its implementation have resulted in promising outcomes. The nursing literature also lists a variety of DFU interventions to reduce complexity, such as history and physical examinations, foot care instruction, and, when necessary, referrals to wound care specialists (Subrata & Phuphaibul, 2019).

Netten et al. (2020) published a systematic review with 30 controlled studies and 44 non-controlled studies. They discovered several connections between diabetes foot ulcers and the review. According to the review by the authors, there is virtually no evidence to support the use

of interventions designed to prevent the first foot ulcer in diabetic patients at risk. Because foot ulcers almost always occur outside of a therapeutic setting, self-management is essential for their prevention. Individual or group sessions, weekly meetings, one-on-one sessions, and a variety of educators and treatments are all options for patient education. More information is available regarding preventing recurrent foot ulcers, with solid evidence supporting therapeutic footwear with a demonstrated stress-relieving effect that the patient consistently wears and the home monitoring of foot skin temperatures with subsequent preventative measures. In addition, some evidence suggests that integrated foot care can effectively prevent recurrent foot ulcers (Netten et al., 2020).

Flattau et al. (2021) say that a qualitative study looked at the experiences of sixteen adults in a low-income urban area in the United States who had foot ulcers and were trying to prevent them or get care for them. Participants discussed the lack of knowledge about diabetic foot conditions; Many did not seek treatment until they had severe symptoms. They found that social and health system-related factors impede quick access to care. Some participants talked about how, after getting an ulcer, they realized how bad their illness was and could take better care of themselves. According to Flattau et al. (2021), it is necessary to enhance self-management capabilities, provide timely access, and pay attention to social determinants.

According to Bennett (2020), appropriate knowledge of people with diabetes and their care providers plays a crucial role in managing and preventing diabetes complications. Additionally, reasonable glycemic control, regular foot assessments, appropriate footwear, patient education, and early referral for pre-ulcerative lesions all contribute to the prevention of DFU. According to the authors, providing diabetes care providers with training can significantly reduce complications like foot amputation. The study included primary and secondary care

nurses and physicians with diabetes and diabetic foot care experience. In the end, 396 registered nurses and physicians participated in 19 workshops as part of a training program that covered DFU definitions and types, etiology, epidemiology, prevention, screening, assessment, and management and rehabilitation principles. Based on the findings of this study, it is possible to conclude that educational movies, teamwork, and continuing professional education with actual patients all significantly impacted the development of essential competencies that healthcare providers need to care for DFU patients (Bennett, 2020).

Hinckley et al. (2020) reviewed the "Guidelines on diagnosis, prognosis, and therapy of peripheral artery disease in patients with foot ulcers and diabetes" various diabetes-related topics and foot ulcers were discussed. Peripheral artery disease affects up to 50% of diabetics and people with foot ulcers in the middle- and high-income countries. However, neuropathic ulcers may be more prevalent in low-income countries. Patients with diabetes AND artery disease risk being misdiagnosed until they experience tissue loss because many of them exhibit the typical clinical symptoms such as claudication or rest pain (Hinchliffe et al., 2020).

Even though it is likely that many of the included patients have diabetes, the majority of studies that report on PAD outcomes do not include a diabetes subgroup. Additionally, many studies on PAD and diabetes only include patients whose feet are unaffected or fail to adequately describe the presence of neuropathy, ulcer, infection or other factors that contribute to poor outcomes (Hinchliffe et al., 2020).

Sanz-Corbalán et al. (2018) in a review, found that diabetic symmetric polyneuropathy (DSPN), which is also a predictor of mortality, is the most significant contributor to foot ulceration and increases the likelihood of amputation. DSPN is the most common cause of ulceration in 90% of DFU patients. Distal nerve fiber destruction that is length-dependent,

symmetrical, and persistent in DSPN is a chronic form of diabetes. The patient may be able to walk on an unresponsive foot and lose their protective sense when large fibers are involved. The author says that it's essential that diabetic foot clinics catch neuropathy early, and new diagnostic techniques are needed to find the disease as early as possible. They explained in the article that Sudomotor dysfunction plays a significant role in the etiopathogenesis of foot ulceration and can manifest as dry skin and anhidrosis (Sanz-Corbalán et al., 2018).

Luo et al. (2022) published the findings of a meta-analysis and systematic review regarding the effectiveness of therapeutic footwear in preventing DUF. Using the search strategy, eight RCTs with 1,587 participants were found. The authors conclude that special therapeutic footwear with offloading capabilities reduces DFU incidence.

In an editorial published in a specialized journal in 2018, Sibbald and Ayello summed up the five Ss that can be used to prevent diabetic foot amputation:

1. Screening: The Simplified 60-Second Diabetic Foot Screening Tool is a validated screening tool that healthcare providers and systems should use.

2. Quitting smoking: Tobacco use is a known risk factor for diabetes-related lower limb amputations. Provide patients with the appropriate treatments.

3. Shoes: Shoes, socks, and offloading devices are all critical components of diabetic foot ulcer treatment and prevention. Both the accessibility of these devices and their affordability are crucial.

4. Control of blood sugar and blood pressure throughout the body: The diabetes pandemic could be solved by lowering hemoglobin A1c, controlling blood pressure, and screening diabetic feet. A critical factor in avoiding diabetic foot amputations is expanding access to insulin and other essential medications.

5. Temperature readings of the skin: For clinicians, infrared thermometry is a straightforward, inexpensive, and efficient method for assessing infection, even in low- and middle-income populations (p. 389)

Qin et al. (2022) published an enthralling article on foot skin temperature monitoring as a self-management technique that effectively prevents DFUs by identifying inflammation. The timely identification and treatment of signs of pre-ulceration may be made possible by interim foot self-management between regular podiatry care sessions. Identifying inflammation through foot skin temperature monitoring has proven to be an effective self-management tool for preventing DFUs. The medial arch pattern was the most common hot area when the authors looked at plantar thermal ways in home settings. This is consistent with previous findings from well-controlled clinical settings. Smartphone-based thermography could be used as a self-assessment tool in the home to use the device they recommended (Qin et al., 2022).

Jeffcoate et al. (2018) consider that despite significant advancements over the past 25 years, DFUs continue to strain the healthcare system significantly. DFUs are common, have a 12-week average healing time without surgery, and are linked to a significant risk of limb loss and amputation. After a new DFU presentation, the 5-year survival rate is only 50–60%, which is lower than the rate for many common cancers (Jeffcoate et al., 2018).

The most recent data showed that 1-, 2-, and 5-year survival rates were only 81, 69, and 29 percent, respectively. DFU mortality was more strongly associated with mortality than any other macrovascular disease. However, there is evidence that mortality decreases as a cardiovascular risk reduction is used more frequently. In addition to providing appropriate footwear for individuals with (especially plantar ulcers), targeted education is considered an essential component of secondary prevention. Despite this, little solid evidence exists for its

effectiveness at this time. On the other hand, another group has reported some additional studies that demonstrate the value of daily foot skin temperature monitoring (Jeffcoate et al., 2018).

Literature review Part II

The article that evaluates the efficacy of 3STEPFUN, the acronyms of an educational program which is based on a theory relevant to foot care aimed at lowering the foot ulcers usually common in patients with Type 2 diabetes. This program deals with risk factors associated with this disease and self-care behaviors (Nguyen et al., 2019). The article abovementioned depicts the use of a controlled, pre-test/ post-test quasi-experimental design where 119 patients were involved, out of this figure, 60 belonged to the control group who experienced usual care and were given a foot care brochure. The other 59 participant patients belonged to the intervention group who attended intensive education sessions along with regular phone calls as follow-up monitoring and also received a kit for foot care during six months.

The findings showed that the group that largely improved self-care behaviors of their feet were the intervention group along with a reduction on the incidence of foot risk factors for ulceration compared to the control group. The study suggests those programs which were involved in foot care education could be successful in the prevention of minor foot problems. It was then recommended other research studies using a formal randomized controlled trial design and more follow-up periods to assess the effects on lowering the incidence of foot ulcers.

The article highlighted the global threat and challenge of foot ulcers in patients with diabetes and the significance of primary prevention level for foot ulcer primary, specifically for those patients with low risk of having painful lesions on their feet (Nguyen et al., 2019). Lipsky et al. (2020) reviewed the update for the guideline on the diagnosis and treatment for diabetic

patients with foot infections. The International Working Group on the Diabetic Foot (IWGDF) updated their guidelines relevant to those persons with diabetes and the ways to do the diagnosis and treatment of foot infections in 2019. Here are the key points:

Diagnosis:

First, signs of infections should be examined in diabetic patients who developed foot lesions. It is indispensable that at least two signs of inflammations like pain, purulent discharge, warmth, induration, and erythema are present to make the diagnosis of foot infection. Blood tests and imaging may be helpful in determining the extent and severity of the infection.

Treatment:

Immediate therapy with antibiotics must begin in patients with infected foot ulcers. While waiting for the results of the culture labs, a therapy with empirical broad-spectrum antibiotic must start. When the results finally are available, then the selection of the type of antibiotic should be decided on the following: Allergies, renal functions, local resistant patterns, and infection severity level. Surgical intervention, such as debridement and drainage, may be necessary in more severe cases of infection. Patients should be monitored closely for signs of clinical improvement or deterioration during treatment.

Prevention:

Regular foot exams in diabetic persons and education on proper foot care are crucial in preventing foot infections. Footwear/foot orthotics should be properly fitted to prevent trauma and pressure points. Regarding control and monitoring of other risk factors as glycemic control, lowering of hypertension and hyperlipidemia, can also contribute to lower the foot infection risks (Lipsky et al., 2020).

Chatwin et al. (2019), examine how high plantar pressure that builds up as a result of several risk factors, affects DFU prognosis and prevention. The authors evaluate the various techniques for measuring plantar pressure both barefoot and while wearing shoes, as well as the pressure characteristics examined in earlier work. Research measuring plantar pressure often reveals that those with diabetes have greater pressure while those with ulcers have even higher pressure. Nonetheless, prospective investigations have found that still just a vertical plantar pressure is a weak predictor of DFU. The study addresses the comparative strengths and weaknesses of earlier research, which may have led to their lack of predictive power, as well as how closely these earlier approaches may have been related to the stresses encountered in real-life everyday activities (Chatwin et al., 2019).

It is very sad to know that foot ulcers in diabetic persons can lead to amputation and this is a serious health danger and unfortunately have an elevated rate of recurrence. It is crucial to underline that it is common to see that high plantar pressure is fund on diabetic foot ulcers, and individuals who have had these type of ulcers have a tendency of more plantar pressures than other patients who are not diabetic. It is important to stress the fact that though vertical plantar pressure is usually more evaluated, shear pressures are also important but more challenging to measure. Currently, shear pressure is often only assessed when the patient is barefoot, whereas vertical pressure can be measured both barefoot and in shoes. However, the assessment of pressure in shoes has limitations, and pressure assessments have mainly been conducted in laboratory settings, which may not reflect real-life situations (Chatwin et al., 2019).

Research has shown that individuals with diabetic peripheral neuropathy walk less, but remain standing or sitting more time, this suggests that cumulative pressure during more time is more significant as a measure than peak pressure. It is then assumed that footwear and insoles

made customized for each patient may help offload high plantar pressures; however, more research should be made to establish standard protocols for designing and modifying such footwear. While footwear interventions can be effective, their success depends on regular use, and there are individual variations in outcomes. Providing plantar pressure feedback is a promising alternative approach, but more research is needed to evaluate its long-term effects and to consider all fields relevant to diabetic foot. The use of state-of-the-art technology for continual monitoring and feedback shows promise and has yielded successful outcomes in a trial where concepts are proven (Chatwin et al., 2019).

However, the low prediction scores for ulceration using previous methods of pressure assessment suggest that other studies are required to better assess plantar pressures that predispose to ulceration. This requires the assessment of both vertical and shear components of pressure in activities which are done on a daily basis and all weight-bearing exercises. It is apparent that more research studies are required to state if giving feedback would render long-term beneficial effects and lower in fact plantar pressure and the incidence of diabetic foot ulcers (Chatwin et al., 2019).

Diabetic foot ulcers occurred when there is a mixed situations of peripheral neuropathy, vascular problems, and repetitive injury. About half of the people with these ulcers will develop an infection, and 20% of those experiencing an infection will have a bone infection called osteomyelitis. The authors of this article discuss the ways to diagnose and treat foot infections in diabetic patients, including osteomyelitis, and the challenges involved (Mponponsuo et al., 2021).

To diagnose skin and soft tissue infection, doctors rely on clinical criteria, such as examining the affected area. A bone biopsy is the best way to diagnose osteomyelitis, but it is not

always possible, so a sequence of findings in the clinical, biochemical, and radiographic fields may be used. X-rays are the preferred initial imaging test, but more advanced imaging may be needed if the suspicion of infection remains despite a negative test result (Mponponsuo et al., 2021).

Staphylococcus aureus and other Gram-positive cocci are the bacteria that cause skin and soft tissue infections and osteomyelitis, the major pathogens identified. To determine the specific bacteria causing the infection, doctors will perform deep cultures, which help identify the best antibiotics to use for treatment. Management of these infections requires a team approach, with surgical debridement and bone resection often necessary in severe cases. Wound care is also important, along with ad those conditions that raise the risk of developing these infections: Peripheral neuropathy, arterial disorder, fungal infections, and edema (Mponponsuo et al., 2021).

Another author (Grennan, 2019) presented a basic review of some aspect of foot diabetic that can cause foot and lower leg ulcers due to damaged blood vessels throughout the body, leading to reduced pain sensation and slow healing. Calluses, blisters, cuts, burns, and ingrown toenails responsible agents of diabetic foot ulcers, which may become infected and lead to amputations. Peripheral neuropathy can cause a patient to be unaware of minor injuries, allowing ulcers to develop and enlarge unnoticed. Daily foot inspection is crucial for diabetes management to prevent foot ulcers. Infected ulcers can be identified by pus drainage and warm, red skin, and treated with oral antibiotics or tissue sample testing to identify the bacteria causing the infection. Osteomyelitis, a bone infection, can lead to amputation if the bone is dead, but a long course of antibiotics may be prescribed if removal is not possible (Grennan, 2019).

A review of DFD published by Tekale et al. (2022) remarks that Diabetic foot disease (DFD) is a significant worldwide problem among the elderly population, with a high percentage

of diabetic patients expected to develop this condition in future years. DFD can take the lead to cause serious complicated issues as infections and limb amputation, affecting life expectancy and causing disabilities worldwide. Recurrence rates are high, making prevention of remission and serious effects crucial in managing this chronic disease. Proper footwear can help manage DFD and avoid the development of new ulcers, particularly for those with diabetic peripheral neuropathy. Reversible risk factors, including higher pressure on plantar surfaces, an unsteady gait, hyperglycemia, hypertension, high cholesterol, and triglycerides levels, can be lowered if treatments and advice are followed as proper foot hygiene, footwear usage, and medical monitoring. Remote monitoring through sensors and wearables, associated with these patients' management through telemedicine may lower the danger of patients and staff getting infected and suffer from respiratory illnesses and severe infections (Tekale et al., 2022).

Diabetic foot disease (DFD) is a significant global problem among the elderly population, with a high percentage of diabetic patients expected to develop this condition during their lifetime. DFD can lead to severe complications such as infections and limb amputation, affecting life expectancy and causing disabilities worldwide. Recurrence rates are high, making prevention of remission and serious effects crucial in managing this chronic disease. Proper footwear can help manage DFD and avoid the appearance of other ulcers, particularly for those with diabetic peripheral neuropathy. Reversible risk factors, including more pressure on plantar surfaces, an unsteady gait, hyperglycemia, hypertension, high cholesterol, and triglycerides levels, can be lowered when patients follow the treatment, wear the convenient shoes and practice good foot hygiene (Tekale et al., 2022).

According to Armstrong et al. (2020), one of the worst complications of people with diabetes is foot ulcers (DFUs). Around one-third of patients with diabetes develop foot ulcers in

life. Unfortunately, over half of the DFUs get infected, and 17% of infected DFUs need amputation. The prospect of amputation is so terrifying for people with diabetes that they would prefer death over losing a limb. Even for those who manage to heal their ulcer, the likelihood of recurrence is high, with 40% of patients having and incidence in the term of one year and more than 90% within ten years. The risk of developing a DFU is also increased if the patient has previously healed from one (Armstrong et al., 2020).

DFUs are a leading cause of disability worldwide, yet research funding for this condition lags other diabetes research and is even further behind cancer research. It is alarming the high rate of mortality of those who had lower extremity amputation due to a DFU with over half of patients dying within five years. This is even worse for those with other comorbidities, such as chronic kidney disease, and reduced mobility leading to cardiovascular and renal disease. Despite this, DFUs are not always recognized as a direct cause of death because those patients with DFUs live five years less than age and disease-matched controls, with ischemic heart disease as the primary cause of death. DFUs have a significant economic impact, with direct costs in the USA reaching $237 billion in 2017, with one-third of this cost attributable to DFU care. This cost is expected to rise if diabetes sufferers grow, unless serious measures are taken to provide preventive education and care (Armstrong et al., 2020).

While patient education is important in managing DFUs, the emergence of new tools thanks to the technological progress, healing times could be faster, lower ulcer severity, and general costs. It is crucial to allocate more research funding for DFUs, as this condition has a significant impact on the lives of people with diabetes, both physically and financially (Armstrong et al., 2020).

Higher morbidity can be expected because around 40% of patients suffering from diabetes-related foot ulcers acquire foot infections. In this regard, health providers should consider those patients who are under risk experiencing large foot ulcers, uncontrolled diabetes, poor blood flow, and other comorbidities when assessing for foot infections or osteomyelitis. Symptoms such as redness, swelling, tenderness, warmth, and discharge are true indicators that an infection has occurred. It is imperative to prevent superficial wound cultures from occurring because of elevated contamination rates. Instead, it is indispensable to guide treatment using deep cultures taken from aseptic procedures such as incision and drainage or bone culture. Initial imaging with plain radiography is used to detect osteomyelitis, but magnetic resonance imaging or computed tomography may be required for inconclusive radiography or to determine the extent of the infection for surgical planning purposes (Matheson et al., 2021).

Staphylococcus aureus and Streptococcus agalactiae are the most commonly isolated pathogens though polymicrobial infections are equally common. It is important to tailor which antibiotic therapy to the most isolated organisms, local resistance patterns, the preferences of patients, and the foot infection severity. If the infection range is from mild to moderate, oral antibiotics should be used, but for severe infections, treatment should require intravenous antibiotics. From one to two weeks is the lapse of time that the treatment usually requires. However, it may be longer if the case treated has slow-healing infections or osteomyelitis. In some cases, surgery and specialized wound care may be necessary for severe or persistent infections. While primary prevention strategies are widely recommended, their effectiveness is not well-established. Systematic evaluation, counseling, and management of comorbidities are essential for a successful secondary prevention for foot infections relevant to diabetes (Matheson et al., 2021).

Crocker et al. (2022) use a qualitative study with semi-structured interviews grounded in a phenomenological framework aimed at exploring the ways patients recognize and identify their foot problems. With a variety sample of 15 Hispanic, Native American, and White patients, the authors apply the qualitative interview. The results of the analysis were split into two main categories: (1) The ways patients see foot ulceration, with topics relevant to poor knowledge of foot ulceration, local sensory opinions of foot problems, and barriers to ulcer observation; and (2) The ways patients see the timing of foot ulceration, with topics relating to how time observations changed as foot problems turns to be more severe, which was closely related to the ways in which patients replied to their foot problems. The conclusion of the study suggests that people with diabetes confront a variety of obstacles that might prevent them from grasping the significance of diabetic foot ulceration despite the careful sensory inspection of their feet. This can postpone obtaining medical attention. A crucial role can be played by nurses in patient education by expanding their knowledge on foot ulcer self-management (Crocker et al., 2022).

Another author's review (Lavery et al., 2019) explained that Diabetic foot syndrome is a condition that is caused or made worse by diabetes and affects multiple organ systems, like metastatic cancer. It is interesting to state that patients not always see diabetes as a complicated disease as cancer, despite its negative impact on various systems. This leaves them exceptionally vulnerable to conditions such as peripheral arterial disease, peripheral neuropathies, postural instability, osteopenia, osteoporosis, fractures, Charcot neuroarthropathy, ulcers, infections, and amputations. Sensory neuropathy and PAD are prevalent in adults with diabetes. It is sad to see that patients living with an amputation is likely to raise, and they do not have preventive services nor vigilant care. It is probable that next year around 50% to 80% of patients will endure a new

or recurrent ulcer. Unfortunately, DFUs are one of the main factors causing infection and limb loss (Lavery et al., 2019).

DFUs develop in patients with peripheral sensory neuropathy, biomechanical abnormalities of the foot and ankle, external trauma, and macro and microvascular disease. They generally take place when there is a light or high foot pressure and shear forces that receive a repetitive trauma. Sometimes, patients do not detect a foot ulcer because of sensory neuropathy. Where the foot ulcer appears, infection risks are higher. Unfortunately, low pain is not detected by patients with diabetes because of sensory neuropathy, deficits in humoral and cellular immunity, and macro- and micro-peripheral vascular disease that may impair tissue penetration with antibiotics and impede healing, and these patients have a higher risk of infection (Lavery et al., 2019).

For the past thirty years, the role played by a multidisciplinary team in the treatment and prevention of diabetic foot complications has been instrumental. The impact of the authors' reviews in the 19 studies was a team approach to diabetic limb salvage. The outcomes linked to a multidisciplinary team are very variable; however, common outcomes found are lower amputations, improved wound healing, less length of stay, and lower re-ulceration. It is indispensable that diabetic foot teams work for the same success attained in centers that deal with specializations in stroke, heart disorders and trauma. The success has been the team-based approach to care, the protocols which are evidence-based, good hospital leadership, and the work of healthcare providers with expertise completely devoted to measuring quality and improving patient care (Lavery et al., 2019).

Araújo et al. (2022) analyzed thermometry on the diabetic foot ulcers prevention. The systematic review and metanalysis included five articles out of the 670 records that were

admissible. The meta-analysis was computed with moderate confidence using effect summary (RR 0.53; 95%CI 0.29-0.96; p=0.02), and the outcome was the prevention of the occurrence of diabetic foot ulcers. In the results, the authors suggest that it has been proven that using infrared thermometers to check the temperature of the plantar surface can help diabetics avoid developing foot ulcers. As diabetic foot ulcers place a significant drain on the world's public health. Therefore, there is hope on the findings of this systematic review with meta-analysis that managers, public health services, health professionals, and patients/family members/caregivers raise their awareness on these regards and implement this preventive technique in the context of clinical setting and at home. By incorporating this innovative preventive approach, the health team may be better able to make clinical decisions in accordance with patient preferences, improve patients' conditions, and benefit the general population and managers. The preventive approach can count with the possibility to advance interdisciplinary and interprofessional care (Araújo et al., 2022).

Other authors published an interesting report about “information communication technology (ICT) tools in Diabetic Foot Ulcer Prevention Programs” (Obilor et al., 2021, p.1). The first objective of diabetes foot care interventions is to attain that the incidence of diabetic foot ulcers can lower and preventive (DFUs). However, research supporting this goal is restricted, solely three studies reported the incidence of DFUs as a first outcome. These studies showed lowered recurrence of DFUs among high-risk individuals by using pressure-sensitive insole systems and multidimensional foot health interventions that encompassed patient education. While some studies found patient education interventions to be significant in preventing DFUs, others yielded mixed results. None of the studies utilized information and communication technology (ICT) tools (Obilor et al., 2021).

Various factors cause DFUs occurrence such as peripheral neuropathy, vascular disease, foot deformities, trauma, ill-fitting footwear, and retinopathy. Interventions that raise DFU awareness and promote self-care could reduce risk factors the incidence of DFUs, and amputations. Four studies in the review indicated the positive effects of preventive interventions on DFU risk factors. Three of the four studies reported a significant reversal of peripheral neuropathy and vasculopathy, lowered foot skin and toenail issues, and better results when wearing well-fitting footwear and socks. Unfortunately, the studies did not show evidence of the positive results on the use of education and support interventions on DFU risk factors, but maintaining optimum blood glucose management and engaging in healthy practices like exercise, smoking cessation, and foot elevation could help reduce risk factors (Obilor et al., 2021).

Patient behavior, information, and self-efficacy are secondary outcomes measured to evaluate the success of DFU prevention programs. Foot self-care behavior and information were the greatest outcomes stated in most studies on patient education, with a significant improvement observed in 75% of the studies. Patient education programs registered positive changes in foot self-care behavior, education, and self-efficacy for four months. Our review suggests that ICT tools like PowerPoint presentations, videos, CD-ROMs, phones, and web portals could further improve foot self-care behavior and self-efficacy, but the impact on the prevention of DFUs needs further investigation (Obilor et al., 2021).

The review's success is the extensive range of ICT tools identified, with important results stated in 59% of the studies reported (Obilor et al., 2021). Unfortunately, the list of the identified ICT tools did not include the following:

E-mails, interactive voice response systems, and social media, which at present are prevalent in day-to-day human activities and interactions. More investigation is required to

determine the reasons behind that explain why these ICT tools were not used in DFU prevention programs or why their positive impact on foot care results were not been empirically researched. It has been agreed on that the use of these other ICT tools could further improve outcomes in DFU prevention programs for their support to ongoing patient engagement in diabetes foot self-care, despite of geographic limitations (Obilor et al., 2021).

Tan et al. (2022) performed a qualitative study to comprehend patients' individual experiences with DFUs in a safety net health system, including how they used the healthcare system and the challenges they encountered. The reasons for the observed differences in diabetes-related amputation are unclear. However, they may be linked to the availability of therapy for diabetic foot ulcers (DFU). Fifteen semi-structured interviews were conducted over the phone. The goal of a qualitative study was to comprehend how patients personally experienced the healthcare system and the challenges they encountered. Weakly understood processes underlie these reported differences in DFU incidence and development. There is evidence; however, that differences in amputation rates are significantly influenced by the availability to preventative treatments, limb salvage surgery, and cheap, high-quality medical care. The themes that emerged from the study's examination of several obstacles at various levels of the healthcare system will aid in enhancing the delivery of healthcare to a population that faces increased risks of diabetes-related ulceration and amputation (Tan et al., 2022)

According to Yavuz et al. (2020), a new type of preventative device that combines multiple modes of action may help to lower the rates of ulceration and amputation. Research has shown that cooler tissue is less likely to break down, so the technology being evaluated in this study aims to prevent foot ulcers. The study tests a Temperature and Pressure Monitoring and Regulating Insole (TAPMARI) in both diabetic neuropathic and healthy individuals. The

TAPMARI includes a cooling unit, mini-water pump, battery pack, and a microcontroller which regulates the temperature to 28°C, placed inside a box attached to the subject's calf, providing cooling inside the shoe (Yavuz et al., 2020).

Eight subjects, including three with diabetic neuropathy, participated in the study. They wore the TAPMARI shoe on their right foot and a control shoe on their left foot while walking on a treadmill for 5 minutes at their own speed. Baseline and post-walking thermographs were taken with a thermal camera, and plantar pressure distributions were also measured. At the midpoint, the subjects walked on the treadmill again for another 5 minutes. Second baseline and post-walking thermographs were taken. The TAPMARI successfully regulated the foot temperatures at or below the target temperature (Yavuz et al., 2020).

The study showed that the TAPMARI was effective in regulating the foot temperature to below the target temperature. The mean baseline temperature of the right (regulated) and left (control) feet was 28.1 ± 1.9°C for all subjects. The mean temperature at the end of the study was 25.9 ± 2.5°C (right) and 31.7 ± 1.6°C (left) for all subjects. In the diabetic neuropathy group, the final mean temperatures were 27.5 ± 2.4°C (right) and 31.6 ± 0.8°C (left), indicating that the temperature goal was met inside the TAPMARI shoe. By regulating the temperature, the TAPMARI may reduce the metabolic demands on the foot and prevent cell breakdown by maintaining oxygen supply and demand balance. The study suggests that further research is needed to investigate the clinical effectiveness of TAPMARI in preventing diabetic foot ulcers (Yavuz et al., 2020). The publication of Rayman et al. (2020) reviews the updates of the Guidelines on the use of interventions to enhance the healing of chronic foot ulcers in diabetes (Rayman et al., 2020)

The International Working Group on the Diabetic Foot (IWGDF) has been issuing guidelines on the prevention and management of diabetic foot disease since 1999, which are based on evidence from systematic reviews of the literature. The latest update of the guidelines, which includes 13 recommendations, was developed with input from internal and external reviewers and expert consultants and used a framework known as the Population, Intervention, Comparator, and Outcomes (PICO) model, the SIGN guideline/Cochrane review system, and a 21-point scoring system advocated by IWGDF/EWMA. While some recommendations on topics such as sharp debridement and the selection of s remained unchanged from the last update in 2016, there were also new recommendations, including consideration of sucrose-octa sulfate impregnated s and autologous combined leucocyte, platelet, and fibrin patch in difficult to heal neuro-ischemic ulcers, and topical placental derived products when used in addition to the best standard of care. The guidelines continue to recommend against the use of certain interventions, such as growth factors, autologous platelet gels, bioengineered skin products, ozone, topical carbon dioxide, nitric oxide or interventions reporting improvement of ulcer healing through an alteration of the physical environment or through other systemic medical or nutritional means (Rayman et al., 2020).

Otherwise, Karabanow et al. (2021) also comment on the guidelines and consider that based on reviews of the available research and expert opinion; several organizations have released guidelines for the prevention, diagnosis, and treatment of diabetic foot ulcers (DFUs). The authors looked over these suggestions to see if there was agreement (or not) about their nature, their strength, and the quality of the evidence. Karabanow (2021) concluded that using this study, we built a clinical checklist for busy practitioners, developed a multidisciplinary set of DFU recommendations stratified by the strength of suggestion and quality of evidence, and

pinpointed areas for further targeted research. Clinicians, organizations responsible for producing guidelines, and researchers should find this material useful (Karabanow et al., 2021).

Koonalinthip et al. (2021) assess the effects of the primary prevention and the healing of diabetic foot ulcers at the Diabetic Foot Clinic at a university hospital in Thailand; the authors review a total of 35 diabetic patients were included, 21 of whom had diabetic foot ulcers, and 28 of whom had pre-ulcerative lesions. The main results were the weekly decrease in wound radius was 1.1 1.1 (mean SD) mm/week. During four weeks, 57% of the ulcers underwent the surrogate 50% area reduction. At 12 and 16 weeks, the proportion of ulcers that had healed was 38.1% and 47.6%, respectively. The pre-ulcerative lesion had an improvement rate of 78.6%. Soft tissue infection was the most frequent consequence (19%), necessitating surgical debridement (14.2%) and mild amputation (4.8%). The authors remark that the percentage of healing within a certain period may not be as responsive to the healing rate as changes in the ulcer area measurement. Also to evaluate the primary prevention of diabetic foot ulcers, the healing of pre-ulcerative lesions was recommended (Koonalinthip et al., 2021).

The use of telehealth and telemedicine applications has the potential to improve the self-monitoring of foot health by diabetic patients for diagnostic, therapeutic, and educational purposes. This can lead to more efficient and effective care, as well as improved patient well-being and autonomy, especially in light of rapidly changing socioeconomic perspectives in healthcare. Several applications, such as dermal thermography, foot imaging tools, and mobile phone or online technology, have been developed for this purpose. However, only a few applications have been implemented in diabetic foot care, possibly due to issues with psychometric properties, feasibility, or lack of demonstrated effectiveness or cost-effectiveness (Hazenberg et al., 2019).

To provide guidance on the current state-of-the-art and inform future development and implementation in this area, a systematic review of peer-reviewed literature on telehealth and telemedicine applications for the assessment, monitoring, prevention, and treatment of diabetic foot disease was conducted. A total of 1311 references were identified in the database search, of which 96 were considered eligible for inclusion based on the assessment of the title and abstract. After a full-article review, 61 original peer-reviewed research articles were selected for final inclusion. According to the review's conclusions, there are several technologies that might be useful for diagnosing, monitoring, preventing, and/or treating diabetic foot disease. Nevertheless, before they can be extensively used in the patient's home as a telehealth or telemedicine tool, they need a stronger scientific basis of effectiveness and/or viability or are still in the early stages of research and require a technically and economically more efficient method (Hazenberg et al., 2019).

Oe et al. (2021) report a case of the use of technology to treat DFU. Detecting pre-ulcerative pathology in diabetic patients is crucial for preventing diabetic foot ulcers (DFU), but identifying signs of inflammation can be challenging, particularly in those with diabetic neuropathy who have reduced sensation in their feet. Infrared thermography offers a means of objectively identifying inflammation, and a device that allows patients to view thermograms of their feet could prove to be an effective method of preventing DFU. The objective was to assess the impact of a new self-monitoring tool, which incorporates a thermograph that attaches to a smartphone, on DFU prevention. As conclusion, this device might provide self-care incentives to prevent DFU, although some issues, such as the automatic detection of high-risk thermographic changes, need to be improved (Oe et al., 2021).

Ahmed et al., 2020) circulated a systematic review about “Footwear and insole design features that reduce neuropathic plantar forefoot ulcer risk in people with diabetes." The authors examined twenty-five studies that involved 2063 participants. Regarding the footwear recommendation, the authors reached at the conclusions that the studies examined failed to inform on the factors affecting adherence to therapy, this situation limits the generalizability of the findings. The literature is lacking in terms of considering the expectations of patients, their proper education on footwear, and activity-specific device designs. Additionally, geographical and socioeconomic factors were not taken into account. Most studies were conducted in developed countries with climates that are suitable for ankle-high boots, and the practicality of wearing these boots in countries with hotter weathers requires to be analyzed (Ahmed et al., 2020).

There is a need for a personalized approach to treatment that consider the individual needs and preferences of patients to raise adherence. Considering that footwear is a personal item, it is instrumental to obtain feedback from participants before the study to ensure adherence. The N-of-1 or single-patient-trial design may be useful in ad this gap in the literature. Furthermore, proper footwear designs that examine the needs of low-income countries and those with warmer weathers are not abundant in the literature, despite diabetes in these regions are also high (Ahmed et al., 2020).

Lucoveis et al. (2021) developed and validated a model which is like a prevention small guide to avoid foot ulceration. This model is named diabetes care management, aimed at helping healthcare professionals and societies engaged in scientific matters. The authors remark that most cases of ulcerations that could lead to amputation are caused by factors such as pre-ulcerative lesions, trauma from wearing inconvenient footwear, and minor injuries due to

walking barefoot. These are preventable situations using educative and preventive programs, as well as proper foot care and monitoring patients with these difficulties. The correct management of foot care involves following the orientations of a team which members belong to interdisciplinary departments and these steps may significantly lower amputations in 80% of cases (Lucoveis et al., 2021).

Lucoveis et al. (2021) consider that the Delphi technique is a useful tool for achieving group consensus on a particular topic by consulting with experts in the field. These experts, or judges, provide their opinions via questionnaires without having access to the responses given among them, thus minimizing those risks posed by the influences that their responses can cause. The responses are then filtered and analyzed for a consensus. The number of judges involved is determined by the subject matter and the extent of their knowledge in that area. Experts jointly with their sound knowledge on the topic, would like to also be involved in each stage within the process. It is indispensable to prevent delays from occurring, and judges should perform a timely review of the questionnaires and return them to the group's administrator. In general, two to three rounds of consultations are enough to achieve group consensus. If many rounds are done then expert participation may discourage overall involvement, and as a result delay the study's conclusion (Lucoveis et al., 2021).

The use of the Delphi method is important for validating the contents of an educational guide aimed at preventing the complications derived from foot ulcers in diabetic patients. Brazilian experts on diabetes and diabetic foot, collaborated in this guide, ensuring that it represents the opinions of multiple experts rather than just one. After the use of the Delphi

method with the experts, the conclusion arrived was that foot ulcers in individuals with diabetes can result in amputation and significant healthcare expenses. Conducting routine inspections and examinations of high-risk feet can avoid the usual problems that occur in diabetes. Providing education on the different health-related topics in diabetes is considered a major care component of this disease. Individuals with diabetes should wear appropriate footwear to meet their needs. Treating pre-ulcerative lesions on the feet can prevent severe complications in individuals with diabetes. A proven pocket guide is a valuable resource for healthcare professionals in avoiding and managing these type of ulcers (Lucoveis et al., 2021).

Petersen et al. (2022) define episodes-of-care as an essential aspect of modern healthcare economics that is constantly evolving. Two approaches have been traditionally used for specifying episodes involving foot care. The first approach examines care provided beyond a first event or procedure, including related aftercare in a time frame that was predefined. The second approach gathers information on care during some time for a specific chronic condition that a group of administrative codes identified. Even though these approaches are effective, they may not be sufficient for complex chronic conditions like diabetic foot ulcers (DFU), which require a more thorough approach to estimate episodes of care and evaluate the potential financial burden more appropriately (Petersen et al., 2022).

Although various methods were reviewed to assess the prevalence of DFU from administrative data, there is currently no validated method for calculating DFU incidence or episodes of care. Also, research conducted suggests that foot ulcers may complicate the acknowledgment of resources used and derived expenses and are linked to a considerable raise in the risk of all-cause mortality. The objective of the authors' investigation was twofold: (1) to

assess a claims-based episode-of-care model for DFU and (2) the use this model to see if major healthcare economic outcomes, such as all-cause mortality and all-cause inpatient admissions, are more than expected in the course of DFU episodes-of-care (Petersen et al., 2022).

The results showed that an unrecognized correlation exists between the prevalence of diabetic foot ulcers, all-cause mortality (IR = 1.5), and all-cause hospital admissions (IR = 2.8), according to a recently validated episode-of-care model for diabetic foot ulceration. Diabetes-related foot ulcers (DFU) can lead to an evil cascade of further acute-on-chronic problems, increasing the chance of hospital admission for health issues involving cardiovascular, renal, and pulmonary conditions. Petersen et al. (2022) concluded that an innovative focus on preventing diabetic foot problems might be needed and these initiatives could lead to a larger than anticipated influence on the results involving patient health (Petersen et al., 2022).

The article of Oni, (2020) is a systematic review with the purpose of identifying unexplained views that may be crucial for future treatments that encourage adherence to advised foot self-care routines and examine qualitative studies on patients with diabetes perceptions of these procedures. The research included nine articles that contained the complete text of information on 113 diabetes patients. Among them, 95 patients had diabetic foot ulcers (DFUs) or a history of DFUs, while 18 patients did not have any DFUs. The research had different study designs, including four qualitative descriptive designs, two descriptive phenomenology studies, one grounded theory design, one interpretive phenomenology, and one exploratory qualitative design. After reviewing the studies using the Standards for Reporting Qualitative Research (SRQR), it was found that four studies had low transparency scores of below 15, showing no clear views. Only two studies assessed the issue of trustworthiness, while the rest failed to report

on this issue. Therefore, the findings of these research conducted should be cautiously seen. (Oni, 2020).

This study has revealed that the way patients with diabetes perceive their health much depends on their ability to practice foot self-care. The study found that many patients with diabetes, whether they have diabetic foot ulcers (DFUs) or not, ignore or do not quite understand the importance of observing convenient foot self-care. Despite the availability of guidelines for foot care, some patients choose self-management practices which are risky and lead to more chances of enduring these ulcers. This is a difficult topic that raises concerns because there is a significant difference between what patients and healthcare providers perceive and expect about foot self-care. There are also major gaps and barriers relevant to the ways that these patients are informed and educated to care for their feet in the healthcare centers (Oni, 2020).

To promote that these diabetic patients adhere to the recommendations given for their foot self-care, it is indispensable that clinical interventions are done aimed at identifying the barriers found that worsen the communication between patients and healthcare staff to address and remove them. It is important to stress the fact that interventions should be individualized and given at the literacy level for each patient to be understood. The focus should be on changing the patient's perceptions and behaviors toward foot self-care practices. Rather than just teaching patients, healthcare providers need to identify which could be approaches that can be used to implement the clinical interventions for each patient that will remove barriers, change perceptions, and expand behavioral response to the recommendations given for foot self-care Overall, this study highlights the importance of effective communication between healthcare providers and patients in promoting foot self-care practices among patients with diabetes. By understanding the barriers and gaps in communication, healthcare providers can identify and

address the specific needs of each patient, ultimately improving their ability to practice foot self-care and reducing the risk of developing foot ulcers (Oni, 2020).

Oyibo et al., 2002, inform that around 20% of diabetic patients experience foot issues according to a recent large-scale population survey. Diabetes patients alone account for two-thirds of lower extremity amputations, and most of them are preceded by foot ulcers. Foot pressure and pain-protective feelings are lost because of diabetic peripheral neuropathy. This raises the risk of foot ulcers brought on by unnoticed small damage from shoes and other physical traumas, along with dry skin and decreased joint mobility. The likelihood that a foot ulcer may result in the amputation of a lower leg is increased by peripheral vascular disease and infection. Another consequence of diabetic neuropathy is Charcot's neuroarthropathy, which is characterized by the combined occurrence of bone deterioration, disintegration, and remodeling in the foot (Oyibo et al., 2002).

The purpose of the study conducted by Oyibo et al. (2022) was to examine the clinical characteristics of patients with diabetic foot ulcers and determine whether there have been any changes in these characteristics over the years. The researchers analyzed the case notes of 298 patients who visited the Manchester Diabetic Foot Clinic between 1990 and 1996. They recorded patient information on the following aspects: Demographics, referral source and reasons, previous amputations, as well as time and occurrence of diabetes complications. Most patients (73.3%) had type 2 diabetes and had suffered this condition around 14.9 years. Most patients (86.7%) were referred to the clinic because of foot ulceration, which was predominantly neuro ischemic (52.3%) and located on the forefoot (76.7%). The researchers found that 80% of patients showed peripheral neuropathy, 60% experienced a peripheral arterial disease, and 70% lived with several diabetic complications. The prevalence of high blood pressure and previous

amputations was greater in men, while women experienced higher prevalence of various foot ulcers (Oyibo et al., 2002).

The study concludes that diabetic patients with foot ulcers have several diabetic complications, and mostly neuro ischemic ulcers, which are likely to have a major impact on treatment expenses and mortality. The findings suggest that managing diabetes-related complications and providing appropriate foot care are crucial in preventing foot ulcers and reducing the burden of diabetes-related morbidity and mortality (Oyibo et al., 2002).

Kaminski et al. (2022) published the Australian evidence-based guidelines for diabetes-related foot disease, and a panel of experts identified a number of twelve research priorities for the prevention of diabetic foot ulcers (DFUs). The first priority is to study the efficiency of screening for DFU prevention, involving which should be screened, screening tools and techniques validated, and the ideal duration in line to the patient's physical, psychological, and social presence. The assessment intervals should also be studied. The second priority is to conduct trials for preventative surgical procedures which should be well-designed and show longer follow-up periods. The third priority is to study if foot and mobility-related exercises can lower DFU incidence and change risk factors, such as plantar pressure, and the combined types of exercising which could be more convenient (Kaminski et al., 2022).

The fourth priority is to develop methods which could have the conveniences of being cost-effective, user-friendly, accessible, accurate, and reliable, to check foot temperatures at home and to know the preferences or values patients are willing to follow. The fifth priority is to study which are the prevention interventions at individual and societal level in contrast with usual care in terms of costs and cost-effectiveness. The sixth priority is to develop a comprehensive foot care approach that combines those recommendations given in the DFU

preventing guideline. The seventh priority is to research DFU prevention in the islander population of the Aboriginal and Torres Strait (Kaminski et al., 2022).

The eighth priority is to develop for the Aboriginal and Torres Strait Islander population a convenient approach for their education and for those living in rural and remote areas. Rendering telehealth services are also included in this priority. The ninth priority is to study potential interventions from a psychological standpoint aimed at gaining adherence and psychosocial management for DFU prevention. The tenth priority is to study ways to attain a good management of medication DFU prevention. The eleventh priority is to ways and interventions that can be more efficient for care prevention. Finally, the twelfth priority is to study the risk and benefits of programs of exercises tailored to develop better cardiovascular health in those patients who are at risk of DFU and to verify if performing some specific modalities may lower the risk of ulceration, such as walking, biking, rowing, or swimming (Kaminski et al., 2022).

According to the authors, it is a widespread truth that it is crucial to prevent DFU from occurring because of the severe and costly health problem derived from the disease. These new Australian guidelines feature DFU prevention recommendation which are evidence-based developed to meet the needs of consumers and health professionals within distinctive geography, diversity, cultures, and healthcare settings in Australia. The guidelines include factors and brief clinical pathways for Australian health professionals to follow, which may contribute better ways to implement these recommendations in clinical practice for prevention purposes. Following these recommendations, undoubtedly better DFU prevention outcomes can be attained and would contribute to lower the enormous burden of DFU in Australia (Kaminski et al., 2022).

The report from Nigi et al. (2018) analyzed the value of multidisciplinary teams in treating DFU. If the team can see the consequences of the first stage of a foot ulcer and takes the necessary actions then, the complication of diabetic foot ulcers does not reach to traumatic limb amputations. The primary causes of foot ulcers are diabetic neuropathy and peripheral arterial disease, often with bone abnormalities, and are frequently complicated by invasive infections. Effective care of this condition involves identifying at-risk feet, treating the ulcerated foot, and preventing other worse outcomes. Undoubtedly, the good services rendered by multidisciplinary teams composed of a diabetologist, podiatrist, orthoptist, educator, and plaster technician, jointly with the important assistance of a vascular surgeon, orthopedic/podiatric surgeon, and dermatologist, lower considerably the incidence of ulcers, infections, and amputations. A diabetologist should lead the team, as chronic hyperglycemia is the major cause of diabetic foot ulcers. The formation of diabetic foot care teams is supported by all National and International Diabetes Scientific Societies and Associations (Nigi et al., 2018).

Diabetes mellitus is a prevalent chronic disease that is a significant global health emergency. The prevalence of both type 1 and type 2 diabetes is raising in the entire world. Around 415 million adults were diagnosed with diabetes mellitus in 2015. Foot ulcers is a major contributor of the increasing numbers of premature deaths worldwide. Foot ulcers, localized wounds of the skin and/or underlying tissue below the ankle in people with diabetes, affect up to 6.3% of people diagnosed with diabetes globally. Unfortunately, an amputation is performed every 30 seconds worldwide due to diabetes. Logically, amputation risks are over 25 times higher in patients with diabetes than in those who are not diabetic sufferers (Nigi et al., 2018).

The primary causes of foot ulcers are diabetic neuropathy and peripheral arterial disease, often with bone abnormalities. These factors can cause a callous and abnormal foot, resulting in

irregular loading and eventually ulceration, which can be complicated by invasive infections. Multidisciplinary teams that include diabetologists, podiatrists, orthoptists, educators, and plaster technicians, in collaboration with vascular surgeons, orthopedic/podiatric surgeons, and dermatologists, can significantly reduce the incidence of diabetic foot ulcers, infections, and amputations. These teams should be led by diabetologists, as chronic hyperglycemia is the main cause of diabetic foot ulcers. All national and international diabetes scientific societies and associations seek to support of teams engaged in diabetic foot care (Nigi et al., 2018).

Akhtar et al. (2022) studied the foot ulcers in diabetic patients in Punjab, Pakistan. The prevalence of this disease in Pakistan was studied using a cross-sectional analysis in the Punjab state. A multistage cluster random sampling procedure was used to investigate the prevalence and factors linked to foot ulcers in diabetic patients. The study included 1,503 individuals with diabetes, consisting of 504 men and 999 women, chosen from various clusters between December 18, 2018, and June 30, 2019, and aged 18 years or older. The use of a binary multiple logistic regression analysis identified the factors linked to diabetic foot ulcers (Akhtar et al., 2022).

The study found that the overall prevalence of foot ulcers in diabetic patients was 16.83%, with a higher prevalence among females (17.52%) than males (15.48%). The prevalence was higher in urban areas (17.96%) than in rural areas (13.91%). The prevalence was highest among individuals aged 75 years or older (66.67%). Subjects with an income higher than Rs. 61,000 per month, and those who were overweight had higher prevalence rates of foot ulcers. These findings suggest that diabetic foot ulcers have become a significant health concern among diabetic patients in Punjab, Pakistan, and preventative measures and improved strategies are necessary to address this problem (Akhtar et al., 2022).

Ahluwalia et al. (2021) state that patients with diabetic foot ulcers face ongoing challenges even after their ulcer has healed. In ulcer recurrence, it is important to shift focus toward offloading strategies. Both short and long-term offloading treatments should be considered, including prophylactic measures. A risk-based system has been developed to classify types of diabetic foot surgery in case that an open wound or ulcer is found, with four categories defined: Elective, Prophylactic, Curative, and Emergent. Prophylactic surgery can help lower the ulceration or re-ulceration risks in neuropathic with non-open wound (Ahluwalia et al., 2021).

The authors remark that the solution may involve reconstructive procedures to realign or remove bony prominences that lead to the formation of diabetic foot ulcers. In addition, a combined approach to surgical treatment may be necessary, including both emergent and prophylactic procedures as needed. However, there is still a lack of standardization in offloading measures and outcomes, and more high-quality research is needed to better understand the impact of surgical offloading procedures on the healing of non-complicated and complicated foot ulcers. Finally, while surgical approaches are raising, it is indispensable that researchers perform more well-performed case-control experiments and randomized controlled trials to confirm the efficacy of these surgical approaches (Ahluwalia et al., 2021).

Francia et al. (2021) consider diabetic peripheral neuropathy can lead to foot deformities, soft tissue damage, and gait imbalance, leading all these factors to the mechanical stress on the foot leading to Charcot neuroarthropathy. Present guidelines on offloading for neuropathic foot ulcers focus on managing pressure, with only two out of nine recommendations involving surgical interventions. This study aimed to evaluate the role played by the surgical techniques in offloading to cure and prevent diabetic foot ulceration. The researchers conducted a systematic analysis of data released from January 2000 to November 2020, evaluating surgical offloading

methods and related outcomes for reconstruction made by surgeries, including healing and remission rates, return to ambulation, related issues, and restrictions (Francia et al., 2021).

The results of the study identified five categories of surgical offloading used in recalcitrant ulcers: lesser toe tenotomies, metatarsal head resection with or without Achilles tendon release, hallux procedures, bony offloading procedures in the form of exostectomy, and complex surgical foot reconstruction. Adjuvant modalities, such as surgically placed antibiotic delivery systems, also showed promise, but further studies are required to clarify their role and effect on systemic antibiotic requirements (Francia et al., 2021).

The study concludes that surgery is crucial in mechanically stabilizing and harmonizing the foot for long-term offloading and foot protection. Not only surgery should be done for just recalcitrant cases but also aimed at ulcer prevention and remission. Further comparative studies are necessary to guide surgical decision-making and avoid recurrence while defining the time point when surgical offloading could protect against irretrievable tissue loss or re-ulceration. Overall, this study highlights the importance of surgical interventions in offloading for diabetic foot ulcers. The findings suggest that surgical techniques should be considered as a gold standard practice to avoid and heal ulcers, and not just for recalcitrant cases. Other research studies are required to establish optimal surgical techniques and adjuvant modalities and to clarify their role in preventing and treating diabetic foot ulcers. Ultimately, this study has important implications for improving patient outcomes and reducing the inconvenience costs of diabetic foot ulcers on healthcare systems (Francia et al., 2021).

A systematic review published by Lazzarini et al. (2020) considers that diabetic foot ulcers cause high rates of hospitalization, disability, and amputation worldwide. These ulcers often result from excessive mechanical stress on the foot, which accumulates over time due to

plantar pressure, shear stress, and ambulatory activity. In the treatment of neuropathic DFU, offloading interventions are necessary to reduce mechanical stress. Such interventions comprise offloading devices, footwear, surgical procedures, and felted foam. This response focuses on a question regarding the efficacy of non-removable offloading devices in healing plantar DFUs compared to removable offloading devices (Lazzarini et al., 2020).

The authors report that five meta-analyses and one controlled study were identified, reporting on individuals who suffer from a neuropathic plantar forefoot or midfoot DFUs. The studies included a combination of 14 controlled studies, including 12 randomized controlled trials (RCTs) and two other controlled studies. Among these studies, seven were evaluated as having a very low or low risk of bias, while the remaining seven had a high risk of bias. The most recent meta-analysis reported a significant difference in favor of non-removable offloading using the total contact cast (TCC) compared with removable knee-high walkers to achieve healing at three months (Lazzarini et al., 2020).

Another meta-analysis reported a non-significant relative risk in favor of non-removable offloading using TCC compared to removable offloading devices. For time-to-healing, three meta-analyses reported a major difference in favor of non-removable offloading contrasting removable offloading devices. Overall, non-removable offloading devices appear to be more effective in promoting the healing of neuropathic plantar forefoot or midfoot DFUs in contrast to removable offloading devices (Lazzarini et al., 2020).

Orlando et al. (2021) consider that the development of diabetic foot ulcers (DFUs) can lead to physical deterioration, loss of independence, psychological distress, and poor quality of life. Clinical depression is also common among individuals with DFUs, which increases their risk of amputation and mortality. While most research has focused on the psychosocial

consequences of DFUs, recent studies have examined the psychological factors that influence patient engagement in preventive foot self-care. These factors include the patient cognitive and emotional representations of DFU risk, deep sadness, personality characteristics, and impaired cognitive functioning. The greatest evidence supports the link between a patient interpretation of their DFU risk and related emotional responses and preventive foot self-care (Orlando et al., 2021).

The systematic review aimed to investigate the perspectives that patient and provider have on the use of smart wearable devices in high risk DFU individuals and to analyze the factors that hinder or facilitate their use in clinical practice. However, the review solely found few studies, with methodological issues and conflicting results. These limitations prevent definitive conclusions from being drawn about patient and provider acceptance of smart wearable devices for preventing DFU (Orlando et al., 2021).

Moreover, the review suggests that using as a proxy, the behavioral intention for accepting technology could give little insight into actual technology use and fails to prefer health system complexity and temporality. Thus, powered research is highly required to evaluate the effectiveness of the factors identified by the studies in preventing DFU. Additionally, the involvement of the major parties: Patient and healthcare provider in the advancement and distribution of such technologies is crucial for promoting sustained behavior change. Finally, the review recommends incorporating DFU-particular domains, such as patient insights of their DFU risk and emotional reactions, into theoretical models guiding such studies (Orlando et al., 2021).

Psychological and behavioral factors have been shown to predict the first occurrence of DFUs, but not recurrent ones. Current basic foot care behavioral strategies have been ineffective in preventing secondary DFUs. However, the use of smart wearable devices such as intelligent

socks and insoles that monitor foot pressure and temperature has shown promising results in reducing DFU recurrence. These devices may alert patients to modify their behavior through a mobile interface, but they also introduce additional complexity and digital literacy challenges. Currently, limited information is available on the ideas that patient and healthcare providers have on smart wearable devices and their use in DFU prevention (Orlando et al., 2021).

Jodheea-Jutton et al. (2022) published a cost analysis of DFU; DFU is a condition that is linked to high rates of morbidity and mortality, highly impacting on an individual's quality of life, financial stability, and balanced psychologically. As the prevalence of diabetes mellitus continues to increase, the DFU expected implications become more frightening. Although there are various treatments available for managing DFU, their affordability remains a significant barrier, especially in low and middle-income economies. Despite promising results from pre-clinical studies on scaffolds and s, a lack of translational evidence hinders their implementation (Jodheea-Jutton et al., 2022).

Therefore, those prospective clinical studies which are well designed are crucial to validate new products to be used in the DFU management. Furthermore, worldwide infectious disease outbreaks undoubtedly impact diabetes disease outcomes and should be taken into account in coming healthcare planning. The financial costs of DFU are extensive, with the risk of recurrence being high, requiring efficient secondary preventive strategies. Direct costs such as admission, s, antibiotics, and surgery, as well as indirect costs related to the social and psychological impact, all contribute to the overall DFU expenses. Collaborating partners, including healthcare professionals and patients, play a crucial role in the DFU prevention and management. Admissions are the most significant direct expenses, while factors such as the quality of life and loss of productivity later contribute to major expenses. DFU costs are

considerably higher than that of colorectal cancer, highlighting the urgent need for effective prevention and management strategies (Jodheea-Jutton et al., 2022).

The article from (Jeffcoate et al., 2018) also presents a cost analysis. The authors consider that despite important progress made in DFUs) over the past 25 years, they continue to be a significant problem on the healthcare system. DFUs are common and can take up to 12 weeks to heal without surgery. They are also linked to a high risk of limb loss through amputation, and the five-year survival rate following presentation with a new DFU is only 50-60%, worse than many common cancers. While mortality is lowering with the more widespread use of cardiovascular risk reduction, recent data shows that 1-, 2-, and 5-year survival rates are only 81, 69, and 29%, respectively, and the link between mortality and DFU is stronger than that of any macrovascular disease. The cost of healthcare services is also enormous, with estimates of up to one-third of diabetes expenditure being spent on lower-limb-related problems in the US and the total annual cost of managing DFUs exceeding £1 billion ($1.32 billion) in the UK and $9-13 billion in the US (Jeffcoate et al., 2018).

It is true that burden of DFUs is high, but it does not justify the adoption of several products and procedures published in recent years in clinical practice because of the poor evidence of success. It is crucial to use guidelines that indicate clinicians to follow solely treatments that have been effective based on robust studies, primarily randomized controlled trials (RCTs). However, RCTs need improvement in design and conduct, not always are supported by the evidence they claimed, low governance and standard are seen in some of them. New guidance is highly required on the conduct of RCTs in this area, including items covered in the 21-item checklist of study quality. In addition, training should be provided to clinicians to

evaluate the relative validity of published studies, including strengths and limitations in trial design, conduct, and reporting (Jeffcoate et al., 2018).

Assessment of trial conduct demands an evaluation on the relevance of reported findings to clinical practice. The reason behind this statement is because they are simply assessed by experts in the field, but this assessment also needs the results given by comparison groups. Therefore, a deep scrutiny of the outcomes and the quality of care. Also, the report released on a statistically significant difference between intervention and control groups is insufficient.

The current culture of trial planning by generic contract research organizations hired by the industry that appoint chief and principal researchers expecting that they play no more than a token role, is one that demands urgent review. In addition, improving the evidence base for specific interventions, needs that attention should be paid to the structure of the care pathway for DFUs.

Structural changes are suggested based on available evidence. Needed improvements can occur if structural changes are made concerning the ways in which professionals work and deliver care. Structural changes can turn the care of food needs from a subspecialty into a super one, if focus on the creation of clear pathways is done to raise the awareness on the significance of early assessment of DFUs by rendering a specialized multidisciplinary service and the provision of structured surveillance and care for those who have had a DFU and are in remission after healing (Jeffcoate et al., 2018).

In a novel article entitled: "Development of a self-monitoring tool for diabetic foot prevention using smartphone-based thermography: Plantar thermal pattern changes and usability in the home environment," the authors recommend the practice of monitoring foot skin temperature for self-management which has been instrumental in the prevention of diabetic foot

ulcers. Various skin-temperature monitoring devices have been developed over the past two decades, including infrared dermal thermometers, remote temperature monitoring systems, and temperature sensor devices. Thermographic devices can also be used to see skin temperature as a map, helping patients to be more adherent to treatment when they understand better their conditions and the consequences derived from lack of compliance. However, these devices have certain environmental constraints and are costly, so they are typically only used in clinical settings (Qin et al., 2022).

Technological progress has enabled the development of smartphone-based thermography tools that are clinically validated and relatively inexpensive. Researchers proposed a smartphone-linked thermal imaging camera on a selfie stick as a self-assessment tool for high-risk patients. The prototype was tested on two older adults with diabetes, and while one participant found it difficult to use, the study showed that this tool could be used for self-assessment in the home setting. For reliable evaluation, it is recommended to perform assessments immediately after waking up. It is also recommended daily self-assessments and establish communication with trained healthcare professionals on abnormal patterns. This tool is valuable for patients with foot problems because they can do their own self-care (Qin et al., 2022).

Sibbald and Ayello (2018), state that experts informed that a rise in the prevalence of diabetes worldwide is expected, and currently people with diabetes reached 425 million, with half of them undiagnosed. Foot ulcers and lower limb amputation are unfortunately a significant concern, with the 5-year survival rate after amputation lower than that of breast cancer in females or prostate cancer in males. Foot amputations is a pressing issue that requires worldwide attention as complications of diabetes, despite the fascinating focus on diabetic myonecrosis in a

continuing education article. The United Nations and other organizations usually discuss diabetes and other non-communicable diseases in New York City (Sibbald & Ayello, 2018).

Most diabetic foot amputations are preventable if a patient-centered approach is implemented with a coordinated interprofessional team that follows the 5 S's consisting of screenings, smoking cessation, wearing appropriate shoes, systemic blood glucose control, and blood pressure control, and skin temperature assessments. Healthcare systems and providers should use validated screening tools, make interventions available for smoking cessation, provide shoes, socks, and offloading devices, control systemic blood glucose and blood pressure, and infrared thermometry for skin temperature assessments, which is a simple, inexpensive, and effective tool for assessing infection (Sibbald & Ayello, 2018)

Luo et al. (2022) report the results of a study to determine whether special therapeutic footwear could help prevent or reduce diabetic foot ulcers in at-risk patients. To do this, the researchers conducted a systematic review and meta-analysis of randomized controlled trials. They searched multiple electronic databases to find relevant studies published up until June 11, 2021. Two reviewers independently assessed the quality of the studies and extracted data. The literature search yielded 906 results with 1,587 participants. Following research evaluation, the authors found eight RCTs that matched the inclusion requirements. They used statistical analysis to explore the efficacy of the therapeutic footwear and to assess any heterogeneity or publication bias (Luo et al., 2022).

Special therapeutic footwear significantly reduced the incidence of diabetic foot ulcers compared to conventional footwear. However, the effectiveness of the footwear decreased over time. The reasons for this are unclear, but it suggests that the optimal usage time and renewal frequency of the footwear should be observed (Luo et al., 2022).

According to Martín-Vaquero et al. (2019), various studies have been conducted to investigate the effectiveness of therapeutic footwear in preventing the recurrence of foot ulcers in diabetic patients with risk factors, but so far, no significant protective benefits have been found. It is important to focus on chronic illness care and work on patients' self-management skills, as well as implement tracking devices to improve the quality of life for diabetic patients. However, patients should also take responsibility for their own healthcare (Martín-Vaquero et al., 2019).

The authors report that the lifetime incidence of foot ulcers among diabetics is estimated to be around 15-25%, with the prevalence varying by sex, age, and population (Martín-Vaquero et al., 2019). Foot ulcers can cause major complications and are a frequent cause of hospitalization. A diabetic foot ulcer can be defined as an infection, ulceration, and/or destruction of deep tissues associated with neurologic abnormalities and various degrees of peripheral vascular disease in the lower limbs. It can be caused by diabetic peripheral neuropathy, peripheral vascular disease, minor foot trauma, foot deformity, and decreased tissue perfusion. Approximately 50% of patients with a diabetic foot ulcer have co-existing peripheral artery disease, and if wounds take a long time to heal, an infection may set in, leading to lower limb amputation. Foot infection is the most common cause of non-traumatic amputation in people with diabetes, and it is estimated that about 85% of diabetics who suffer from amputations have previously had an ulcer (Martín-Vaquero et al., 2019).

Early evaluation and treatment of diabetic neuropathy are often neglected by patients, even though it is a common and frequent cause of morbidity and disability. Some studies have found a correlation between the values of vibration perception threshold (i.e., diabetic neuropathy) and the mean foot temperature but not between glycated hemoglobin and mean foot temperature. Diabetic patients with neuropathy had higher mean values compared to non-

neuropathic subjects, highlighting the importance of temperature monitoring to avoid or reduce foot ulcers in diabetic patients. Prevention of diabetic foot may involve optimizing metabolic control, identifying and screening people at high risk for diabetic foot ulceration, and educating patients to promote foot self-examination and foot care knowledge. Different clinical methods can be used to assess small fiber function, including electrical contact thermometry, cutaneous temperature discrimination thresholds, infrared thermography, and Liquid Crystal Thermography (LCT). Infrared (IR) thermography is a real-time temperature measurement technique that produces a colored visualization of thermal energy emitted by the measured site at a temperature above absolute zero. Patients should be taught to routinely inspect their feet for hyperkeratosis, fungal infection, skin lesions, and foot deformities. Control of footwear is also crucial, as repeated trauma derived from tight shoes can be a triggering factor. However, there is limited evidence that patient education would have a long-term impact as a preventive measure (Martín-Vaquero et al., 2019).

Hinchliffe et al. (2020) published the update of the International Working Group on the Diabetic Foot (IWGDF), and the main recommendation is:

- Conduct an annual examination of diabetic patients' feet to check for peripheral artery disease, even without foot ulcers, by taking a relevant history and palpating foot pulses.
- Examine all diabetic patients with foot ulcers for the presence of PAD by taking a relevant history and palpating foot pulses.
- Evaluate pedal Doppler arterial waveforms in combination with systolic ankle pressure and systolic ankle-brachial index or toe systolic pressure and toe brachial index measurement when clinical examination alone cannot reliably exclude PAD

in diabetic patients with foot ulcers. There is no definite threshold value above which PAD can reliably be excluded, but the presence of ABI, 0.9-1.3, TBI, ≥0.75, and triphasic pedal Doppler waveforms indicates a lower likelihood of PAD.

- Perform at least one bedside test (skin perfusion pressure of ≥40 mmHg, the pressure of ≥30 mmHg, or transcutaneous oxygen pressure of ≥25 mmHg) in diabetic patients with foot ulcers and PAD, which increases the pretest probability of healing by at least 25%.
- Use the Wound, Ischaemia, and foot Infection classification system to assess amputation risk and revascularization benefit in diabetic patients with foot ulcers and PAD.
- Consider urgent vascular imaging and revascularization in diabetic patients with foot ulcers and an ankle pressure of <50 mmHg, ABI of <0.5, the pressure of <30 mmHg, or TcPO2 of <25 mmHg.
- Consider vascular imaging in diabetic patients with foot ulcers, regardless of bedside test results, if the ulcer does not heal within 4-6 weeks despite good standard care.
- Consider revascularization in diabetic patients with foot ulcers and PAD, regardless of bedside test results, if the ulcer does not heal within 4-6 weeks despite optimal management.
- Do not assume diabetic microangiopathy is the sole cause of poor healing in diabetic patients with foot ulcers; consider other possibilities.

- Use color duplex ultrasound, computed tomographic angiography, magnetic resonance angiography, or intra-arterial digital subtraction angiography to obtain anatomical information for revascularization. Evaluate the entire lower extremity arterial circulation with detailed visualization of below-the-knee and pedal arteries in an anteroposterior and lateral plane.
- Aim to restore direct blood flow to at least one-foot artery, preferably the one supplying the ulcer area, during revascularization in diabetic patients with foot ulcers. Evaluate effectiveness with an objective measurement of perfusion post-procedure.
- Make decisions about endovascular, open, or hybrid revascularization techniques for diabetic patients with foot ulcers based on individual factors such as PAD distribution, availability of autogenous vein, patient co-morbidities, and local expertise, as there is inadequate evidence to determine which technique is superior.
- Ensure that centers treating diabetic patients with foot ulcers have the expertise and rapid access to facilities for diagnosing and treating PAD using endovascular and bypass surgery techniques.
- Provide multidisciplinary care plans for diabetic patients with foot ulcers after revascularization procedures.
- Urgently assess and treat diabetic patients with signs or symptoms of PAD and foot infection as they have a high risk of major limb amputation.
- Avoid revascularization in diabetic patients where the risk-benefit ratio for the success of the procedure is unfavorable from the patient's perspective.

- Provide intensive cardiovascular risk management for diabetic patients with ischaemic foot ulcers, including smoking cessation support, hypertension treatment, and glycaemia control (Hinchliffe et al., 2020, p. 2).

According to Aalaa et al. (2022) training the care providers for diabetes can play a significant role in reducing complications such as foot amputation. Diabetes is a chronic disease that affects millions of people worldwide, and one of its most debilitating complications is the development of foot ulcers. Diabetic foot ulcers are painful and can lead to severe infections, amputations, and even death. Preventing and managing these ulcers is critical to maintaining the quality of life of patients and reducing healthcare costs (Aalaa et al., 2022).

To address this issue, healthcare providers need to be adequately trained in the diagnosis and management of diabetic foot ulcers. Therefore, we conducted a study to evaluate the effectiveness of a diabetic foot workshop on the knowledge of nurses and physicians. The workshop was designed by a team of experts in the field and consisted of two days of theoretical and practical training. The authors used a quasi-experimental design to compare the knowledge of a non-randomized group of nurses and physicians who participated in the workshop. The workshop's learning objectives, agenda, content, and evaluation methods were carefully designed to ensure that participants would acquire the necessary skills to diagnose, manage, and rehabilitate patients with diabetic foot ulcers. A pretest-posttest design was used to evaluate the participants' knowledge before and after the workshop using a valid and reliable questionnaire with 20 multiple-choice questions (Aalaa et al., 2022).

The results of the study showed a significant increase in the level of knowledge among the 396 registered nurses and physicians who participated in the workshop series. The mean score on the posttest was more than 20% higher than the pretest score, indicating that the educational intervention was successful in improving participants' knowledge of diabetic foot care. The results suggest that the use of real patients, team-working, and educational movies in the workshop contributed to the increase in knowledge levels. Healthcare providers who have a better understanding of the diagnosis, management, and rehabilitation of diabetic foot ulcers can provide more effective and efficient patient care, ultimately improving the quality of life of patients with diabetes. In conclusion, the study suggests that diabetic foot workshops can be an effective way to improve healthcare providers' knowledge and skills in the prevention and management of diabetic foot ulcers (Aalaa et al., 2022).

According to Tan et al. (2022), individuals with diabetes have a higher likelihood of undergoing lower extremity amputation and repeat amputations compared to the general population in the United States. The medical costs associated with diabetic foot ulcers (DFUs) are estimated to be $9-13 billion annually, in addition to other diabetes-related costs. DFUs and amputations are disproportionately prevalent among racial and ethnic minorities, those with low socio-economic status, and low insurance coverage, and living in geographically isolated areas. African American, Hispanic, and Native American adults with diabetes are more likely to develop DFUs and require amputation compared to White individuals. Similarly, those in the lowest income quartiles and those without proper medical insurance are at a higher risk for amputation and death related to peripheral artery disease (Tan et al., 2022).

The reasons for these disparities in DFU incidence and progression are not fully understood, but research suggests that inadequate access to affordable and quality medical care, preventive services, and limb salvage care may contribute to disparities in amputation rates. Tan et al. (2022) study aimed to explore the personal experiences of patients with DFUs in a safety net health system, including the challenges they faced while navigating the healthcare system. The study identified multiple barriers at different levels of the healthcare system that may impede access to care for individuals at an elevated risk of DFU and amputation. Understanding these barriers can inform efforts to improve healthcare delivery and reduce the prevalence of DFUs and amputations in vulnerable populations (Tan et al., 2022).

According to Tan et al. (2022) research, individuals with diabetes face several barriers to receiving appropriate care for diabetic foot complications. One such barrier is a lack of health literacy, which can prevent patients from understanding appropriate terminology to describe their condition and making informed decisions about when to seek medical care. To overcome this barrier, the authors recommend a more aggressive and tailored education approach that emphasizes the importance of seeking medical care quickly and emphasizes the increased risk of infection and amputation associated with seemingly minor foot injuries (Tan et al., 2022).

The burden of expenses related to diabetic foot ulcer (DFU) care, is a barrier that also prevent individuals from accessing necessary treatments. It is suggested that continued advocacy for full coverage of DFU care among safety net insurance providers is necessary to address this issue. On the interpersonal level, disruptions to the patient-clinician relationship can damage rapport with patients and hinder optimal DFU care. This can be caused by difficulties in accessing appropriate healthcare providers, changes in insurance status or location, and other

factors. To address this gap, it is possible to develop solutions to address medical provider shortages and to fill in healthcare assessments in a timely manner, potentially through the use of trained community health workers (Tan et al., 2022).

At the community level, participants reported significant challenges in receiving medical equipment such as wound care supplies or diabetic shoes, often due to shortcomings at medical supply companies. Developing collaborations between pharmacies, providers, or healthcare systems to allow pharmacists to provide medical equipment may be an effective approach. It should be also added that pharmacist-supported diabetes care is well-received by minority patients and in improved diabetes outcomes. To conclude, it should also be stated that the societal level, preventive care for DFUs is crucial for limb salvage. It is essential also to stress the education of patients and healthcare providers to teach patients self-foot inspection by themselves and foot examination by a medical professional. The use of appropriate footwear is also crucial. Standardized protocols and care pathways to learn when, where, and how patients should go to the healthcare provider for the initial DFU care and treatment which are instrumental to avoid amputations and other situations that lead to immobility, delays in care should not occur (Tan et al., 2022).

Practice Recommendations

The primary question of this project was **"**In nurses from a Home Health provider (P), what is the effect of a nursing training program on the patient's foot self-care and the nurse's ability to estimate the risk of foot ulcers compared to standard care (I), before and after the intervention program (C) in terms of program efficacy and patient outcomes (Outcome) over an ten-weeks period (Time)?

It is important to implement a comprehensive educational program for healthcare professionals, patients, and caregivers to prevent and manage diabetic foot ulcers (DFUs) effectively. Educating healthcare professionals, patients, and caregivers about the prevention and management of diabetic foot wounds, particularly DFUs, is crucial in reducing the incidence of complications such as amputation. This recommendation aligns with the findings of Nather et al. (2018), who emphasized the importance of prevention and education in managing diabetic foot wounds.

By implementing a comprehensive educational program, healthcare professionals can gain the necessary knowledge and skills to provide effective education to patients and caregivers. This, in turn, empowers individuals to actively participate in their foot care, recognize potential issues, and seek timely medical assistance, ultimately reducing the risk of complications and amputations associated with DFUs.

Considering that a significant majority of diabetics reside in low- and middle-income nations where access to diagnostic tools and resources is limited, it is essential to tailor interventions to their unique circumstances. Understanding that different factors have varying impacts on DFU outcomes in different regions, interventions should focus on ad the prevalent risk factors specific to each nation. For example, in nations where antibiotics are difficult to obtain, interventions should prioritize infection prevention and alternative wound care approaches. Conversely, in regions with a higher prevalence of peripheral artery disease, interventions should emphasize strategies for managing and improving blood circulation.

By developing targeted interventions and strategies, healthcare providers and policymakers can effectively address the challenges faced by diabetic patients in low- and

middle-income nations. These interventions should be context-specific, cost-effective, and accessible to empower patients, reduce DFU incidence, and mitigate associated complications such as hospitalization, lower extremity amputations, and mortality (Monteiro-Soares et al., 2020).

The International Working Group on the Diabetic Foot (IWGDF) is a renowned organization that provides comprehensive and up-to-date guidelines for the prevention and management of diabetic foot complications. These guidelines encompass various aspects, including foot care education, risk assessment, ulcer prevention, wound management, and multidisciplinary care (Monteiro-Soares, Russell et al., 2020). By implementing and adhering to the IWGDF guidelines, healthcare professionals can ensure standardized and evidence-based care for individuals with diabetic foot complications. This includes regularly assessing patients' risk for foot ulcers, educating them about foot care practices, promoting proper footwear, identifying early signs of ulcers, and providing appropriate wound care interventions. Healthcare facilities and professionals should familiarize themselves with the IWGDF guidelines, undergo training if necessary, and integrate these recommendations into their clinical practice.

Another practice recommendation considers establishing specialized diabetic foot clinics with comprehensive screening protocols to facilitate early detection and diagnosis of diabetic symmetric polyneuropathy (DSPN), including the assessment of sudomotor dysfunction, in order to prevent foot ulceration and related complications. Sanz-Corbalán et al. (2018) highlight the significant role of diabetic symmetric polyneuropathy (DSPN) as the most common cause of foot ulceration in 90% of diabetic foot ulcer (DFU) patients. DSPN is a chronic form of diabetes characterized by the destruction of distal nerve fibers, leading to a loss of protective sensation

and an increased risk of foot complications. Early detection of DSPN is crucial to initiate appropriate interventions and prevent foot ulceration and subsequent amputations.

To implement this recommendation, healthcare systems should establish specialized diabetic foot clinics equipped with trained healthcare professionals who can perform comprehensive screening protocols for DSPN. These protocols should include diagnostic methods to identify the disease as early as possible, including assessments of sudomotor dysfunction, which may manifest as dry skin and anhydrosis. New and advanced diagnostic tools should be explored and incorporated into the screening process to enhance early detection accuracy.

By implementing specialized diabetic foot clinics and comprehensive screening protocols, healthcare professionals can identify individuals with DSPN at an early stage, enabling timely interventions and appropriate management strategies. This approach aims to prevent foot ulceration, reduce the risk of amputation, and improve patient outcomes. Moreover, it emphasizes the importance of multidisciplinary collaboration among healthcare providers to ensure holistic care for individuals with diabetic foot complications.

Following the IWGDF guidelines helps to establish a systematic approach to diabetic foot care, reducing the incidence of foot ulcers, amputations, and associated complications. Additionally, it facilitates better collaboration and communication among healthcare providers involved in the management of diabetic foot conditions, ultimately improving patient outcomes and quality of life care (Monteiro-Soares, Russell et al., 2020).

The varying levels of evidence and recommendations found in the clinical practice guidelines (CPGs) regarding the management and treatment of diabetic foot (DF) make it challenging to interpret and apply them effectively in clinical practice to determine the most appropriate procedures. However, based on a thorough analysis of the included guidelines, it can be deduced that the interventions highly recommended for DF management are debridement (supported by a very high level of evidence and strongly recommended), foot evaluation (backed by a moderate level of evidence and fairly recommended), and therapeutic footwear (supported by a moderate level of evidence and fairly recommended) (Pérez-Panero et al., 2019).

Implement a nursing training program focused on patient foot self-care and risk estimation of foot ulcers for home health providers to improve program efficacy and patient outcomes over a selected period. The effect of a nursing training program on patient foot self-care and the nurse's ability to estimate the risk of foot ulcers, it is recommended to design and implement a comprehensive training program for home health providers. This program should emphasize the importance of foot self-care practices for patients and enhance the nurse's ability to assess and estimate the risk of foot ulcers accurately.

The nursing training program should cover key areas such as foot care techniques, proper foot hygiene, regular self-inspection, early detection of potential issues, appropriate footwear selection, and the significance of prompt reporting to healthcare professionals. The program should also include training on standardized risk assessment tools and techniques to accurately estimate the likelihood of foot ulcers (Kaya & Karaca, 2018). For the evaluation of the program, a pre-and post-intervention study design can be employed, comparing the outcomes before and after the implementation of the nursing training program. The study should assess patient

outcomes related to foot health, such as the incidence of foot ulcers, wound healing rates, and patient-reported foot care knowledge and practices. Additionally, the study should evaluate the nurse's ability to accurately estimate the risk of foot ulcers using standardized assessment tools (Kaya & Karaca, 2018).

Recommendation for practice change based on scientific evidence.

1. Evaluation: Begin by conducting a comprehensive evaluation of the current practices and outcomes related to foot ulcer prevention in Diabetes Mellitus II patients. The evaluation will provide a baseline understanding of the current situation and help identify areas for improvement (Tenny & Varacallo, 2020).

2. Assessment: Perform a thorough assessment of each patient's risk factors for foot ulcers, including their medical history, foot care habits, and lifestyle factors. Utilize validated assessment tools to accurately identify patients at higher risk for foot ulcers. This assessment will guide the development of personalized educational interventions and treatment plans (Tenny & Varacallo, 2020).

3. Diagnosis: Once the risk factors have been assessed, establish a diagnosis for each patient, categorizing them into low, moderate, or high risk for foot ulcers. This diagnosis will assist in tailoring the educational program to meet the specific needs of each patient, ensuring targeted interventions and resources are allocated appropriately (Tenny & Varacallo, 2020).

4. Planning: Develop a comprehensive plan for the educational program, including the content, delivery methods, and resources required. The program should focus on patient education

regarding foot care, including proper hygiene, self-examination, footwear selection, and prevention strategies (Tenny & Varacallo, 2020).

5. Implementation: Execute the educational program by delivering the planned interventions to patients and their caregivers. Ensure that the program is culturally sensitive, taking into account individual patient preferences and language barriers. Collaborate with the healthcare team, including physicians, nurses, and podiatrists, to ensure a multidisciplinary approach to foot ulcer prevention and management. Regularly evaluate the program's effectiveness through patient feedback, data analysis, and follow-up assessments (Tenny & Varacallo, 2020).

By following these evidence-based recommendations, the home health setting can effectively implement an educational program to reduce foot ulcer rates in Diabetes Mellitus II patients. This holistic approach, focusing on evaluation, assessment, diagnosis, planning, and implementation, will enhance patient knowledge, promote self-care practices, and ultimately contribute to the prevention of foot ulcers in this vulnerable population.

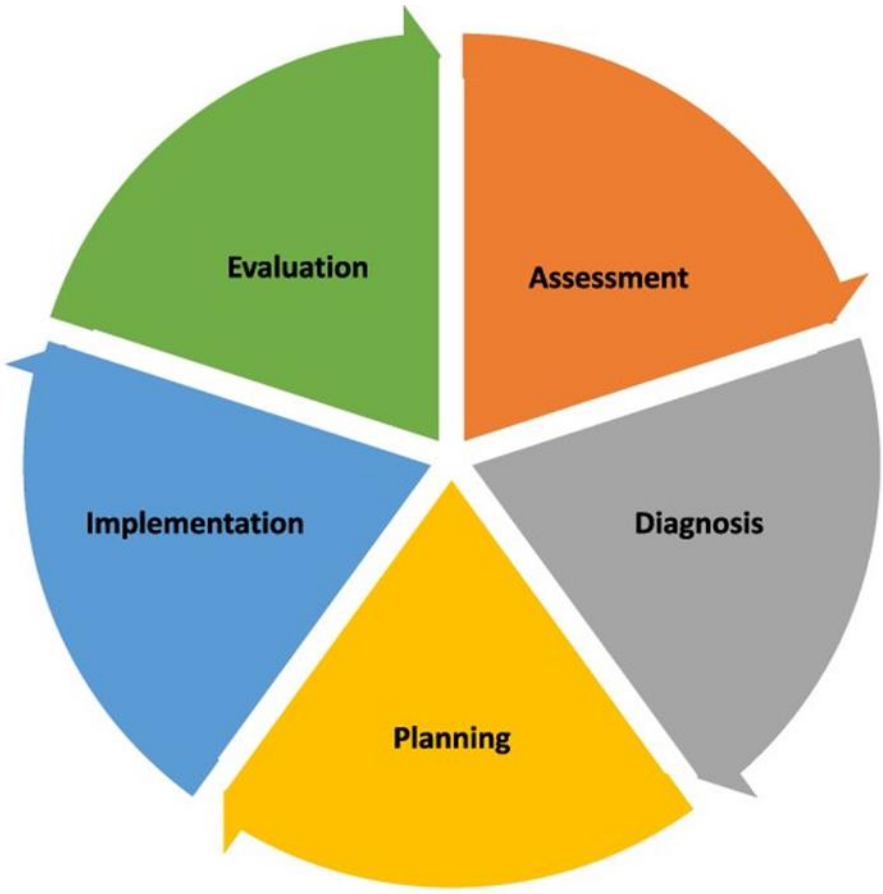

Figure 1

Traditional steps to the nursing process. Adapted from the American Nurses Association, 2019

Source: (Toney-Butler & Thayer, 2022)

Project Setting

The purpose of this research is to evaluate if an educational program implemented in the home health nurses, reduces infection rates in Diabetes Mellitus patients in the Home Health Agency setting**.**

The training will be at the setting conference rooms, equipped with computers and screens, regularly used to deliver meetings, classes, and lectures. These areas of the center are very secluded and with good silence and no interruptions. The training sessions will be held in different schedules not to interfere with the participants' working schedules.

The Home Health Agency setting serves as the backdrop for the research activities. The center provides top-notch home health services encompassing prevention, promotion, and medical care. The center prioritizes the utmost confidentiality of patient's health information to establish a foundation of trust and ensure their satisfaction. Center's philosophy is the holistic approach that recognizes the interconnectedness of the mind, body, and spirit in treating individuals.

Project Vision, Mission, and Objectives

Location of the organization: A Home Health Agency in South Florida.

It is a widespread truth for a project to be successful and progress to have realistic objectives and not only to uphold the mission and vision when one has objectives which are realistic to attain and place the nurses on the right track of the lane of the road which leads to success. Whenever a nurse in on duty, the mission and vision of the project are vitals but also jointly with realistic objective (Flaubert et al., 2021).

Managing patients not only means to have a meaningful, updated training because the profession of nursing means engaging in human health, but also having a true moment with the patients despite the state-of-the art machinery and the hectic activities, nurses have to do during their shifts. That smile and personal care for patients are also part of high-care quality, according to noted theorist Jean Watson (Davidson et al., 2017).

At the hospital setting, nurses are also in need to know how to work with patients from different cultures and beliefs. This information is vital for living and practicing in a multicultural world where travels, immigration, and access to healthcare are a current reality that demands from nurse's time to absorb crucial information for an effective communication with patients and families. The aim is to deliver an equitable nursing practice and these moral principles should also be part of the nurses' training (Weber et al., 2022).

Therefore, for nurses to have a high-quality training, effective communication should be emphasized, and also achieve empathy and rapport with the patient. It is not only the body, it is also the soul, the mind, the wellbeing of a patient who is in a strange setting with new people. Medical devices and drugs and specifically medical treatment cure the body, but it would be unethical and also too one-line treatment, having poor communication with patients and families. Good medical treatment and effective communication are catalysts of a successful patient outcome and a proof that patients receive an ethical and respectful care (Weber et al., 2022).

The project missions.

1. Provide quality encompassing training to nurses in both home health and home agency settings. High quality training provided to nurses, undoubtedly improves their capabilities, thus contributing to solve patients' problems (Wood, 2021). In this regard, it should be stated that the project is aimed at boosting nurses' skills to have the tools to solve from simple to complicated problems as those considered emergency situations so that they develop confidence in themselves before these challenges. Technically, quality training of nurses comprises teaching tools in the fields of academic knowledge and practice.

2. To improve patients' quality of care in these settings.

The priority is that nurses are well trained. In home health agency settings, nurses need to learn handling medical equipment efficiently both manually and technologically within the health setting. Provide good care by developing both good communication and well-designed treatment skills (Stein et al., 2022). Nurses should learn and practice good communication skills to be used when handling a patient in the health sector. Ethics is also vital. It is crucial to establish empathy and rapport to patients that lead to confidence.

3. To reduce errors and adverse events in these settings.

One of the main goals of this project is to reduce errors in home health settings. Poor training of nurses leads to complaints on poor quality treatment. For example, the delivery of drugs is an activity that should be done very carefully taken in high consideration to verify the name of the drug, dosage, and time of delivery. Mistakes in this regard can lead to side effects or a more serious health problems for patients. The project is designed to reduce these errors and others for poor training of nurses (Stein et al., 2022).

4. To improve communication and collaboration among all care team members.

Effective communication in every field of life is important, but in the health, sector is crucial because human life is at stake. Not only good communication among colleagues in the health department is necessary, also with patients and families, and other departments that deal with patients, so that the orders and the labs and the treatment care well understood to ensure quality performance for better patient outcomes.

5. To ensure that all care team members are competent and skilled in providing quality care.

According to Seelbach and Brannan (2021), it is vital to ensure that nurses know how to manage patients while in the healthcare center. Therefore, the recruitment process should encompass several theoretical and practical training along with the passing of a number of tests. This is a way to ensure efficiently that sufficient knowledge was acquired and tests were passed to join a healthcare setting.

The project visions.

1. It is also important to encourage nurses to participate in research work individually or as a member of a research team. This activity will surely improve knowledge and quality of care for patients. It is an important asset for the organization where the nurses render their healthcare services. The project is aimed at inspiring nurses to always participate in research works that will raise knowledge to be translated into more efficient outcomes for patients (Sevy-Majers & Warshawsky, 2020).

2. The mandate of the project is to provide the technical skills for nurses required to function well in the healthcare field. In this regard, the implementation of new technologies for teaching nurses ensure they can effectively handle patients' complicated health problems.

The congruence of the mission statement project.

The project's mission should be compatible with the statement. In this regard, the mission states the provision of competent skills to nurses while the mission statement is to provide both

professional and paraprofessional health services to clients at home. Then it can be stated that the mission and the vision statement are compatible.

The congruence of the project vision statement.

The vision statement of services is being the one of the home health agency which is the provision of professionalism and compassion to patients at home. Therefore, this vision is congruent with the proposed project to research on the impact of providing high knowledge to nurses while training aimed at rendering sustainable treatment services.

The long-term objectives of the project

1. Provide high quality training for nurses in home health agency settings: It is crucial that nurses are highly trained to provide the best care possible for patients. Home health agency settings is complex and challenging. Therefore, nurses should be prepared and trained for the complexity to be faced.

2. Transitioning nursing should be adapted to the modern ways of transformation of nursing from the old times to the new ones. Preparation and training for nurses are required to know how to solve the new challenges with the new modern ways. Nurses should be capable of dealing with today's new technologies and approaches.

Short-term and long-term objectives of the project.

1. To develop new nursing models better suited to the needs of patients in the 21st century.

There are many challenges that nurses face in the 21st century. One of the biggest challenges is the increasing demand for quality care. With an aging population, more people need nursing care than ever before. Nurses are also facing a shortage of qualified staff. This means a lot of pressure on nurses to provide quality care. To meet these challenges, nurses must be trained in new and innovative ways. Traditional teaching methods may be unable to keep up with the demands of the 21st century. One way to transform nursing education is by using technology. Technology can be used to create simulations that allow nurses to practice their skills in a safe environment. Additionally, online courses can give nurses the flexibility they need to complete their education.

2. To better understand the new era of health care and how to provide quality care in this era. Healthcare professionals must be regularly updated on the latest developments of technology to provide quality care. This is a new era where progress and development are constant, and patient-centered care can be supported with the new inventions and advanced technology. Better quality care is possible. It is crucial that providers should understand and respond to the needs of their patients (Hannawa et al., 2021).

The unintended consequences and risks of the project.

There are minimum risk unintended consequences in this project. All stakeholders should be notified of them. Honestly, the most important potential consequences to be considered are the following:

At the moment, there are minimum risks you may be experiencing if you decide to participate in the investigation. These risks could be tiredness or boringness. However, you should not worry, because we have an action plan to meet your needs in case of an unexpected event. These include rest periods after each activity.

Project Plan and Evaluation Plan

The change model selected for the specific change of implementing an educational program for home health nurses to reduce foot ulcer rates in patients with Diabetes Mellitus II is the ADKAR model. The ADKAR model is a goal-oriented approach that focuses on individual change management. It stands for Awareness, Desire, Knowledge, Ability, and Reinforcement (Ovington, 2022).

Model steps

The ADKAR model was chosen for this practice change because it provides a structured framework for understanding and ad the key elements necessary for successful change (Ovington, 2022). There are several components of the ADKAR model in relation to the implementation of the educational program:

1. **Awareness:**

   The first step in the change process is creating awareness among home health nurses about the importance of reducing foot ulcer rates in patients with Diabetes Mellitus II. This involves educating them about the potential risks, consequences, and the need for preventive measures (Nakibuuka, 2022).

2. Desire:

Once the nurses are aware of the problem, it is crucial to generate a desire or motivation to change their current practices. This can be achieved by emphasizing the impact of foot ulcers on patients' quality of life, the potential for improved patient outcomes, and the personal satisfaction derived from making a positive difference in patients' lives.

3. Knowledge:

Providing the necessary knowledge and skills to home health nurses is essential for them to implement the recommended changes effectively. This involves training sessions, workshops, or educational materials that cover topics such as diabetic foot care, identification of at-risk patients, proper wound management, and preventive measures.

4. Ability:

It is crucial to ensure that home health nurses have the necessary ability and confidence to apply the knowledge and skills acquired during the educational program. This may involve offering hands-on practice, role-playing scenarios, and providing ongoing support to address any challenges or concerns that arise during implementation.

5. Reinforcement:

To sustain the change, it is important to reinforce the desired behaviors and outcomes. This can be done through regular performance feedback, recognition of achievements, sharing success stories, and creating a supportive environment that encourages ongoing learning and improvement.

By following the ADKAR model, the change management process for implementing the educational program can be structured, systematic, and tailored to the needs of the home health nurses. This model helps to address potential barriers to change, build individual commitment, and ultimately improve the foot ulcer rates in patients with Diabetes Mellitus II under the care of home health nurses (Nakibuuka, 2022).

Project Evaluation Plan

According to (Brown University, 2019), the project evaluation plan start with a statement about the PICOT question of this project is in nurses from a Home Health providers (P) what is the effect of a nursing training program about the patient’s foot self-care, and the nurse's ability to estimate risk of foot ulcers compared to standard care (I), before and after the intervention program (C) in terms of program efficacy and patient outcomes (Outcome) over a six-month period (Time)?

The study will utilize a compare design, before and after the training. They participants will receive quality training in-home health, about DFUs. The participants knowledge about FU will be evaluated at the beginning of the training program, and al the end, where is suppose that the group shall be assessed for knowledge and skills proficiencies against the initial condition before training.

Outcomes

It is expected that the training nurses shall develop more home health care knowledge and skills proficiencies, and confidence to operate alone in-home health care Health nursing care scenarios measured through qualitative analysis about their patients with FU. The quality of engagement of home healthcare workers (HHWs) who work with diabetic patients is the cornerstone of preventing this DFU. The foot care prevention and awareness appear to be done only after the initial DFU has developed. Patients some time have their first contact with HCWs in home healthcare, which is the most important level of care because it shapes the foundation of care that the patient with diabetes will receive (Ranuve & Mohammadnezhad, 2022).

Plan Objectives:

a. To assess the effectiveness of a nursing training program on patient's foot self-care.

b. To evaluate the impact of the nursing training program on the nurse's ability to estimate the risk of foot ulcers.

c. To compare the outcomes of the intervention group using pre and post evaluation.

Study Design:

a. Quasi-experimental design with pre- and post-intervention assessments.

b. Intervention group: Nurses receiving the nursing training program.

Sample Selection:

a. Identify and recruit nurses from the Home Health agency providers that are willing to participate in the study.

b. Ensure an adequate sample size for both groups to provide statistically significant results.

Recruitment and Selection of Participants:

- Inclusion criteria: skilled nurses, bilingual, both sexes, between the ages of 21-65, working at the Home Health Agency.
- Exclusion criteria: adults who are not a skilled nurse, monolingual, ages less than 21 or more than 65 year-old who don't work at the Home Health Agency .

Data Collection:

a. Pre-intervention data collection:

i. Assess baseline knowledge and skills of nurses regarding foot self-care and risk estimation.

ii. Collect demographic information of participating nurses.

iii. Record baseline foot self-care practices and risk estimation abilities of patients.

b. Intervention:

i. Implement the nursing training program for the intervention group.

c. post-intervention data collection:

i. Evaluate the impact of the training program on nurses' knowledge and skills.

ii. Assess changes in foot self-care practices and risk estimation abilities among patients.

d. Ensure data collection tools are valid and reliable, such as standardized questionnaires and observation checklists.

Data Analysis:

a. Perform descriptive analysis to summarize the demographic characteristics of participating nurses and patients.

b. Conduct comparative analysis between the intervention pre and posttest.

c. Use appropriate statistical tests to examine the differences in outcomes between groups.

d. Analyze changes in patient outcomes and program efficacy over the six-month period.

Ethical Considerations:

a. Obtain informed consent from participating nurses and patients.

b. Ensure data confidentiality and anonymity.

Protecting Human Rights and Health Information Privacy:

- Informed consent will be obtained from participants, ensuring their voluntary participation, and understanding of the project's purpose.

- Anonymity and confidentiality of participants will be maintained by de-identifying data and securely storing any identifiable information.

- The project will adhere to ethical guidelines and regulations governing the protection of human subjects and health information privacy.

Protection of Privacy and Confidentiality:

All information related to your identity will be handled in a private and confidential manner and will be always protected. Under no circumstances will the participant's information be shared with third parties. The database information will be stored and preserved for a period of five (5) years once the study is published and will be kept in the principal investigator's private office outside the setting, in sealed envelopes under extreme security. After fives (5) years, all remainder documents will be destroyed with paper shredder and discarded. All electronic storage devises will be destroyed using a blunt object. Only the principal investigator will have access to the information obtained.

Limitations:

a. The study relies on self-reported data, which may be subject to biases.

b. Generalizability may be limited to the specific Home Health nurses involved.

Timeline (Appendix A)

a. Pre-intervention data collection

b. Intervention implementation:

c. Post-intervention data collection

d. Data analysis and interpretation

e. Report writing

Reporting and Dissemination:

a. Summarize the findings in a comprehensive report.

b. Share the results with participating nurses, and relevant stakeholders.

c. Consider publishing the findings in academic journals or presenting them at conferences to contribute to the existing knowledge in the field.

Continuous Improvement:

a. Reflect on the evaluation process and identify areas for improvement.

b. Incorporate feedback from participants and stakeholders to enhance future iterations of the nursing training program.

Timing

The PICOT study is anticipated to occur within ten weeks, including conducting the training program, subjecting the participant's in-home health care scenarios, and finalizing the qualitative analysis.

To evaluate the reliability and validity of the tools used in the evaluation plan, let's consider two main aspects: the evaluation tool for nurses and the evaluation tool for patients.

Evaluation Tool for Nurses:

The questionnaire (Appendix B) tool aims to assess nurses' knowledge and skills regarding foot self-care and risk estimation before and after the nursing training program (Abate et al., 2020).

Reliability:

Reliability refers to the consistency and stability of the measurement. To assess the reliability of the evaluation tool for nurses, you can employ methods such as:

a. Test-Retest Reliability: Administer the evaluation tool to a group of nurses, then re-administer it after a specific interval (e.g., one week) to assess the correlation between the results. A high correlation indicates good test-retest reliability.

b. Internal Consistency: Use Cronbach's alpha or other measures of internal consistency to assess how well the items within the evaluation tool correlate with each other. A higher value indicates greater internal consistency.

Validity:

Validity refers to the accuracy and appropriateness of the measurement in capturing the intended construct. To assess the validity of the evaluation tool for nurses, you can consider the following types:

a. Content Validity: Ensure that the evaluation tool covers all relevant aspects of foot self-care and risk estimation. Consult experts in the field to review and provide feedback on the tool's content.

b. Construct Validity: Assess whether the evaluation tool measures the intended constructs accurately. You can use methods such as factor analysis or correlation analysis to establish construct validity.

c. Concurrent Validity: Compare the results of the evaluation tool with another established tool or measure that assesses similar constructs. A high correlation between the two measures indicates good concurrent validity.

Data Type:

The data produced by the evaluation tool for nurses is typically ordinal or interval in nature. Likert scale questions are commonly used in such tools, where respondents rate their knowledge or skills on a scale (e.g., 1 to 5), providing ordinal data. Additionally, some evaluation tools may include questions that require numerical responses, providing interval data.

Evaluation Tool for Patients:

This tool aims to assess changes in patients' foot self-care practices and risk estimation abilities before and after the nursing training program.

Reliability:

The reliability of the evaluation tool for patients can also be assessed using test-retest reliability and internal consistency measures similar to those used for nurses.

Validity:

The validity of the evaluation tool for patients can be evaluated through content validity, construct validity, and concurrent validity, similar to the evaluation tool for nurses.

Data Type:

The data produced by the evaluation tool for patients can vary depending on the specific questions used. For example:

a. Questions related to foot self-care practices may involve categorical responses (nominal data), such as "yes/no" or multiple-choice options.

b. Questions related to risk estimation abilities may require respondents to rank or rate their level of understanding or confidence on a Likert scale, providing ordinal or interval data.

It's important to note that the specific design and content of the evaluation tools may vary depending on the preliminary application of the tools and the constructs being measured. Therefore, the reliability and validity assessment methods mentioned here serve as general guidance and can be adapted as needed for the specific evaluation tools in your project.

Dissemination Plan

The DNP project's purpose is quantitative, quasi-experimental research related to the education of nurses that works in a home health care system to increase their knowledge about the risk of foot ulcer in Diabetes Mellitus patients. The objectives of the research are

1. To plan, implement, and assess the nursing education program's efficacy.

2. To determine the level of diabetes patients' nursing knowledge of foot self-care.

3. To determine how well-versed nurses are in estimating diabetic patients' risk of developing foot ulcers.

4. To assess the nursing education program's efficacy.

The dissemination of evidence-based practice outcomes entails the targeted distribution of information and interventions to a specific public health or clinical practice audience. The primary goal of dissemination is to increase and promote the spread of knowledge about evidence-based interventions in order to improve their application and patient outcomes.

Researchers have a responsibility to exercise honesty and rigor at all times (University of Canberra, 2021), which includes observing the following practices:

• disseminating a full and accurate account of their research, including negative and neutral findings and results contrary to hypotheses.

• Correct the record as soon as possible if they become aware of errors or misleading statements in their work. In some cases, retraction may be needed.

• acknowledging all sources of support for the research, including individuals, funding bodies, other institutions, and sponsors.

• attributing and acknowledging all authorship and contributions to the output; and

• disclosing any interests,

Disseminating evidence-based projects can be done in a variety of ways, both internally and externally. However, the method used must be effective. In a dissemination plan, there are several steps: an empirical phase, concept classification, framework development, and critical reflection on the conceptual framework. An exploratory, descriptive, and contextual research design should be used to develop the framework, in our case, the dissemination plan (American Association of Colleges of Nursing, 2021).

At the end of the project, the dissemination plan will use the following strategies:

1. Internal method: The project with the main results will be presented at the setting to the stakeholders.
2. The final draft with the results will be presented to Ana G Mendez University, with two alternatives: PowerPoint presentation or E-Poster, which may be used for other students as a reference for other projects.
3. External method

   The project, with an adequate presentation, could be submitted to a nursing magazine (Ayala et al., 2022) as evidence of the impact of an" Educational Program Implemented in Home Health Nurses to Reduce Foot Ulcers Rates in Patients with Diabetes Mellitus 2." Another external method is the presentation at any Seminar or Conference on this subject.

In the following frame, there is a schedule for the dissemination plan.

Dissemination plan	Date
PowerPoint Presentation to stakeholders	The first week after the end of the project
PowerPoint Presentation to Ana G Mendez University	When the University schedules the presentation
E-Poster Presentation to be published on the website of the University.	When the University schedules the presentation
Preparation of the draft for a Nursing Journal	2024
Participation in a Conference with the main results of the project	According to the Conferences schedules.

Conclusion

The DNP proposal evaluated the possibility of lowering infection rates in patients with diabetes mellitus in a South Florida Home Health Agency through the implementation of an educational program. The project was focus on educating nurses in a home health care system to increase their knowledge about the risk of foot ulcers in patients with diabetes.

The research questions and hypotheses based on conventional theories and actual processes, allow for the creation of new studies and the ethical testing of ideas. The outcomes shows improved knowledge and skills proficiency among trained nurses, as well as increased confidence in providing home health care for patients with foot ulcers. The quality of engagement of home healthcare workers is crucial in preventing diabetic foot ulcers, and early foot care prevention and awareness are essential.

Patients with type 2 diabetes mellitus are at a high risk of infection, and promoting health strategies and appropriate counseling are necessary to help patients with risky behaviors. The management of diabetes responds better when patients are educated, and nursing plays a vital role in setting up optimal conditions for patients, families, and communities. Advocacy programs can raise patients' education and promote better health behaviors.

Health is described as attaining human potential through goal-directed behavior, self-care, and relationships with others. Illness is seen as a discrete event that can hinder or expand a patient's quest for health. The project included a comprehensive literature review, and the methods and tools for the project that were developed, including a pre and post evaluation using a validated tool. The outcomes after 10-weeks period help to answer the PICOT question, with positive results expected. The analysis of the results were included in the final draft of the DNP project, along with recommendations for future actions.

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Statistic Tool to Evaluate Project Results

Evaluation is a crucial step in any project implementation to determine its effectiveness, success, and impact. Statistical tools play a vital role in this evaluation process by providing objective and quantitative measures to assess the outcomes and draw meaningful conclusions. This essay aims to explore and describe several statistical tools that were used to evaluate the results obtained after project implementation. These tools offer reliable means of analyzing data, detecting patterns, identifying trends, and drawing meaningful insights, thereby enabling decision-makers to make informed decisions based on evidence-based findings.

Statistical methods involved in carrying out a study include planning, designing, collecting data, analysing, drawing meaningful interpretation and reporting of the research findings. The statistical analysis gives meaning to the meaningless numbers, thereby breathing life into a lifeless data. The results and inferences are precise only if proper statistical tests are used (Ali & Bhaskar, 2018).

Different tools help for the statistical process.

1. Database: Excel with this tool the data were tabulated and some graphics were used.
2. Software SPSS ver 26.1, to calculate use the descriptive statistics and inferential statistics tool for the project (Wagner, 2019 ; SPSS, 2019).

Descriptive Statistics:

Descriptive statistics involves summarizing and presenting data using measures such as mean, median, mode, standard deviation, and range, according to variable type (Laerd Statistics, 2018). In the project the descriptive statistics provided an initial understanding of the data by highlighting central tendencies, dispersion, and the distribution of the project results, also the

range allow to be found if some data were out of the range, and permit to rectify the primary data. These measures will be used to present pre- and post-implementation data.

Inferential Statistics:

Inferential statistics will allow to propose conclusions beyond the immediate data set by making inferences and generalizations based on statistical techniques. This tool is particularly useful when dealing with a large population and making predictions or testing hypotheses (Laerd Statistics, 2018). In this project it was used to compare the pre and post test data, using a level of significance of .05, To support that analysis, techniques such as hypothesis testing, confidence intervals, and t student analysis help assess the significance of project outcomes, determine the relationship between variables, and explore causality. In other analysis a Chi-Square will be use for the comparison pre and post.

Graphics:

Data visualization is an essential statistical tool that enables effective communication and interpretation of project results. Graphs, charts, and other visual representations help identify patterns, trends, and outliers that may not be immediately apparent from raw data. Visualizations aid in conveying complex information in a concise and understandable manner, facilitating decision-making and fostering a deeper understanding of the project's impact. Some example about the graph information related with the pretests selected variable are shown in the figures.

Statistical tools provide an indispensable means of evaluating project results objectively and systematically. The aforementioned tools, including descriptive statistics, inferential statistics, data visualization offer a comprehensive toolkit for analyzing data, uncovering patterns, and drawing meaningful insights. By employing these tools appropriately, decision-makers can make evidence-based decisions, improve future project outcomes, and effectively communicate the impact of the implemented project.

Statistical Analysis to Evaluate Project Results

Diabetic Ulcers - A Pre and Post-Test Analysis

This study aimed to assess the impact of an educational intervention on participants' knowledge and beliefs regarding diabetic ulcers. The research utilized a pre and post-test design, collecting responses from a diverse group of participants. Statistical tools, including Chi-Square tests, were employed to analyze the data. The findings reveal notable shifts in participants' perspectives post-intervention, emphasizing the effectiveness of the educational program.

Diabetic ulcers pose a significant health concern, often leading to severe complications. This study investigates the effectiveness of an educational intervention in improving participants' understanding of diabetic ulcers. The research analyzes pre and post-test responses, employing statistical tools to quantify knowledge changes and identify key areas of improvement.

Summary of Data and Methods

Participants:

Twenty participants from diverse backgrounds participated in the study. Demographic information, including age, gender, and educational background, was collected.

Intervention:

Participants underwent an educational program focused on diabetic ulcers, with information presented through various mediums, including lectures and visual aids.

Data Collection:

Pre and post-tests were administered to gauge participants' knowledge and beliefs before and after the intervention. The survey included questions on neuropathy, ulcer characteristics, wound care, and demographic details.

Statistical Analysis:

Statistical analysis was done using Chi-Square tests, were applied to compare pre and post-test responses. The analysis aimed to determine if there were significant changes in participants' knowledge following the intervention. The variables included in the study were the question of the tool applied: questionnaire, that include 18 questions: with demographic data and specific questions related with the knowledge about Diabetes Foot Ulcer. Appendix A present the SPSS processing results (SPSS VER 26.0)

Specific Results:

Demographics:

Age: 55% were in the 21-35 age range, 30% in 36-45, and 15% in 45-65.

Gender: 40% male, 60% female.

Educational Background: 15% had an associate degree, and 85% had a bachelor's degree.

Pre-Test Results:

Participants exhibited varied knowledge and beliefs regarding neuropathy, ulcer characteristics, and wound care.

Responses highlighted misconceptions and gaps in understanding.

Post-Test Results:

Significant improvements were observed across several key areas.

Participants demonstrated a higher level of agreement with accurate statements.

Consistency checks were performed to validate the reliability of responses.

Statistical Tools:

Chi-Square tests were applied to compare pre and post-test responses.

The analysis focused on identifying statistically significant changes in participants' beliefs. The level selected to consider a significant value was .05

Interpretation:

Consistency Checks:

Some variables were constant, indicating a lack of variability in responses.

This suggests that certain beliefs remained unchanged post-intervention.

Notable Changes:

Statistically significant improvements were observed in variables related to neuropathy, ulcer characteristics, and wound care.

The educational intervention effectively influenced participants' knowledge.

Demographic Influence:

Age, gender, and educational background did not exhibit significant influence on knowledge improvement.

The intervention was equally effective across diverse participant groups.

Chi-Square Tests:

Variables showing no variability limited the application of Chi-Square tests.

This emphasizes the importance of targeted educational content in areas with consistent beliefs.

ANALITIC RESULTS

Pre-Test Results:

1. Neuropathy and Diabetic Ulcers:

80% of participants believe that neuropathy is the predominant factor responsible for diabetic ulcers.

70% agree that sensory neuropathy leads to unnoticed skin damages and ulcer formation.

40% associate autonomic neuropathy with dry skin predisposing to ulcer formation.

45% believe that diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot.

55% think that diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers.

20% believe neuropathy can be excluded if the foot skin is cool and pulses are absent.

70% believe that the risk of amputation is higher when a diabetic foot ulcer is associated with limb ischemia.

15% believe the presence of slough is not an indication of infection in diabetic ulcers.

60% believe the presence of osteomyelitis impairs the healing of diabetic ulcers.

35% think wound healing progress is unsatisfactory if the wound bed appears pink.

50% believe mechanical offloading should be advised to facilitate ulcer healing.

30% recommend hyperbaric oxygen therapy for ulcer healing even in a well-perfused foot.

55% agree that infected, highly exuding wounds should be cleansed daily.

40% believe iodine s are effective for wounds with clinical signs of infection.

40% find hydrogel s useful.

2. Participant Demographics:

Age: 55% are in the age range of 21-35, 30% in the range of 36-45, and 15% in the range of 45-65.

Gender: 40% are male, and 60% are female.

RN (Educational Background): 15% have an associate degree, and 85% have a bachelor's degree.

Post-Test Results:

1. Neuropathy and Diabetic Ulcers:

95% of participants now believe neuropathy is the predominant factor responsible for diabetic ulcers.

95% agree that sensory neuropathy leads to unnoticed skin damages and ulcer formation.

95% associate autonomic neuropathy with dry skin predisposing to ulcer formation.

90% believe diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot.

100% believe diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers.

90% believe neuropathy can be excluded if the foot skin is cool and pulses are absent.

95% believe the risk of amputation is higher when a diabetic foot ulcer is associated with limb ischemia.

100% believe the presence of slough is not an indication of infection in diabetic ulcers.

90% believe the presence of osteomyelitis impairs the healing of diabetic ulcers.

5% believe wound healing progress is unsatisfactory if the wound bed appears pink.

85% recommend mechanical offloading to facilitate ulcer healing.

90% recommend hyperbaric oxygen therapy for ulcer healing even in a well-perfused foot.

90% believe infected, highly exuding wounds should be cleansed daily.

90% believe iodine s are effective for wounds with clinical signs of infection.

100% find hydrogel s useful.

Analysis of Results

Consistency: In some cases, the post-test results show high consistency with pre-test results, indicating that the knowledge or beliefs of participants did not change significantly.

Notable Changes: There are notable changes in some responses, suggesting an improvement or shift in understanding after the educational intervention.

Demographic Influence: It's important to consider the demographic distribution of participants to understand if certain groups showed distinct patterns of knowledge or belief change.

Chi-Square Tests: Some variables (e.g., "Neuropathy is the predominant factor responsible for diabetic ulcers") were constant, which means there was no variability, making statistical tests (Chi-Square) uninformative.

The Appendix B present the cross tab of each variable of the questionnaire pre and post, the analysis of the results are the following:

the significant findings from the provided crosstabulations and chi-square tests:

1. **Neuropathy and Diabetic Ulcers:**

- 80% of the total cases have neuropathy as the predominant factor responsible for diabetic ulcers.

- Chi-square test shows an asymptotic significance of 0.051, suggesting a borderline significance.

- The contingency coefficient is 0.479, indicating a moderate association between neuropathy and diabetic ulcers.

2. **Sensory Neuropathy and Unnoticed Skin Damages:**

- 70% of the cases with sensory neuropathy result in unnoticed skin damages leading to ulcers.

- Chi-square test shows an asymptotic significance of 0.051, suggesting borderline significance.

- The contingency coefficient is 0.479, indicating a moderate association between sensory neuropathy and unnoticed skin damages.

3. **Autonomic Neuropathy and Dry Skin:**

- 40% of the cases with autonomic neuropathy are associated with dry skin, predisposing to ulcer formation.

- Chi-square test shows no significant association (p-value: 0.376).

4. **Diabetic Neuropathic Ulcers on Weight-Bearing Areas:**

- 45% of diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot.

- Chi-square test shows no significant association (p-value: 0.189).

5. **Diabetic Ischemic Ulcers and Pain Perception:**

- No analysis is provided due to the constant variable.

6. **Exclusion of Neuropathy based on Foot Skin Coolness and Pulses:**

- 60% of the cases suggest neuropathy can be excluded if the foot skin is cool, and pulses are absent.

- Chi-square test shows no significant association (p-value: 0.307).

7. **Risk of Amputation with Diabetic Foot Ulcer and Limb Ischemia:**

- 70% of the cases indicate a higher risk of amputation when the diabetic foot ulcer is associated with limb ischemia.

- Chi-square test shows no significant association (p-value: 0.206).

8. **Presence of Slough as an Indication of Infection in Diabetic Ulcers:**

- No analysis is provided due to the constant variable.

9. **Presence of Osteomyelitis and Impaired Healing of Diabetic Ulcers:**

- 66.7% of the cases suggest the presence of osteomyelitis impairs the healing of diabetic ulcers.

- Chi-square test shows a borderline significant association (p-value: 0.068).

10. **Wound Bed Appearance and Unsatisfactory Healing:**

- 35% of cases with pink wound bed appearance indicate unsatisfactory healing.

- Chi-square test shows no significant association (p-value: 0.376).

11. **Mechanical Offloading for Ulcer Healing:**

- 50% of cases recommend mechanical offloading for ulcer healing.

- Chi-square test shows a significant association (p-value: 0.047).

12. **Hyperbaric Oxygen Therapy for Ulcer Healing in Well-Perfused Foot:**

- 50% of cases recommend hyperbaric oxygen therapy for ulcer healing even in a well-perfused foot.

- Chi-square test shows a significant association (p-value: 0.047).

The analysis suggests some moderate associations between neuropathy and diabetic ulcers, as well as sensory neuropathy and unnoticed skin damages. Additionally, recommendations for mechanical offloading and hyperbaric oxygen therapy for ulcer healing

show significant associations. However, some associations were not significant, and further investigation may be needed to understand these relationships better.

Statistics Conclusion

This study provides valuable insights into the effectiveness of an educational intervention in enhancing participants' knowledge and beliefs about diabetic ulcers. The findings underscore the importance of targeted educational programs in ad specific misconceptions. The manuscript, accompanied by statistical graphs, serves as a comprehensive documentation of the research results.

Future studies could explore long-term knowledge retention post-intervention.

Tailored interventions may address persistent misconceptions identified in consistency checks.

Continuous evaluation and refinement of educational programs are essential for sustained impact.

Statistical Significant Results to remarks:

- 2. **Sensory Neuropathy and Unnoticed Skin Damages:**

- 70% of the cases with sensory neuropathy result in unnoticed skin damages leading to ulcers.
- Chi-square test shows an asymptotic significance of 0.051, suggesting borderline significance.
- The contingency coefficient is 0.479, indicating a moderate association between sensory neuropathy and unnoticed skin damages.

- 9. **Presence of Osteomyelitis and Impaired Healing of Diabetic Ulcers:**
  - 66.7% of the cases suggest the presence of osteomyelitis impairs the healing of diabetic ulcers.
  - Chi-square test shows a borderline significant association (p-value: 0.068).
- 11. **Mechanical Offloading for Ulcer Healing:**
  - 50% of cases recommend mechanical offloading for ulcer healing.
  - Chi-square test shows a significant association (p-value: 0.047).
- 12. **Hyperbaric Oxygen Therapy for Ulcer Healing in Well-Perfused Foot:**
  - 50% of cases recommend hyperbaric oxygen therapy for ulcer healing even in a well-perfused foot.
  - Chi-square test shows a significant association (p-value: 0.047).

In summary, the analysis suggests some moderate associations between neuropathy and diabetic ulcers, as well as sensory neuropathy and unnoticed skin damages. Additionally, recommendations for mechanical offloading and hyperbaric oxygen therapy for ulcer healing show significant associations. However, some associations were not significant, and further investigation may be needed to understand these relationships better.

APPENDIX A: FREQUENCY STATISTICS

Frequencies Variables Pre and Post Test

Pre or Post = PRE

Pre Test Frequency Table

Neuropathy is the predominant factor responsible for diabetic ulcers[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	16	80.0	80.0	80.0
	NO	3	15.0	15.0	95.0
	DON'T KNOW	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	14	70.0	70.0	70.0

	NO	3	15.0	15.0	85.0
	DON'T KNOW	3	15.0	15.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	8	40.0	40.0	40.0
	NO	5	25.0	25.0	65.0
	DON'T KNOW	7	35.0	35.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	9	45.0	45.0	45.0
	NO	3	15.0	15.0	60.0
	DON'T KNOW	8	40.0	40.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers[a]

		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	YES	11	55.0	55.0	55.0
	NO	4	20.0	20.0	75.0
	DON'T KNOW	5	25.0	25.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Neuropathy can be excluded if the foot skin is cool, and pulses are absent[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	4	20.0	20.0	20.0
	NO	12	60.0	60.0	80.0
	DON'T KNOW	4	20.0	20.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	14	70.0	70.0	70.0
	NO	1	5.0	5.0	75.0
	DON'T KNOW	5	25.0	25.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Presence of slough is not an indication of infection in diabetic ulcers[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	3	15.0	15.0	15.0

	NO	9	45.0	45.0	60.0
	DON'T KNOW	8	40.0	40.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Presence of osteomyelitis impairs the healing of diabetic ulcers[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	12	60.0	60.0	60.0
	DON'T KNOW	8	40.0	40.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Wound healing progress is unsatisfactory if the wound bed appears pink[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	7	35.0	35.0	35.0
	NO	11	55.0	55.0	90.0
	DON'T KNOW	2	10.0	10.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Mechanical offloading should be advised to facilitate ulcer healing[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	10	50.0	50.0	50.0

	NO	5	25.0	25.0	75.0
	DON'T KNOW	5	25.0	25.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	6	30.0	30.0	30.0
	NO	4	20.0	20.0	50.0
	DON'T KNOW	10	50.0	50.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Infected, highly exuding wounds should be cleansed daily[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	11	55.0	55.0	55.0
	NO	1	5.0	5.0	60.0
	DON'T KNOW	8	40.0	40.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

Iodine dessings are effective for wounds with clinical signs of infection[a]

		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	YES	8	40.0	40.0	40.0
	NO	2	10.0	10.0	50.0
	DON'T KNOW	10	50.0	50.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = PRE

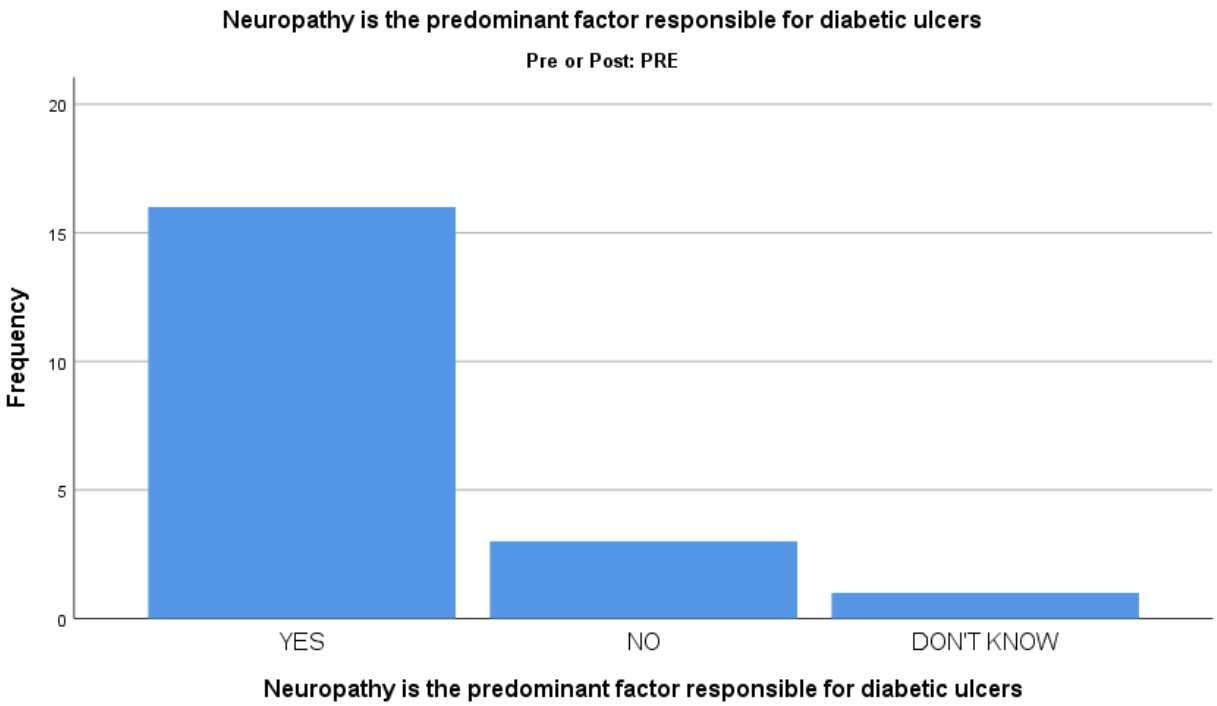
Hydrogel dressint is useful?[a]

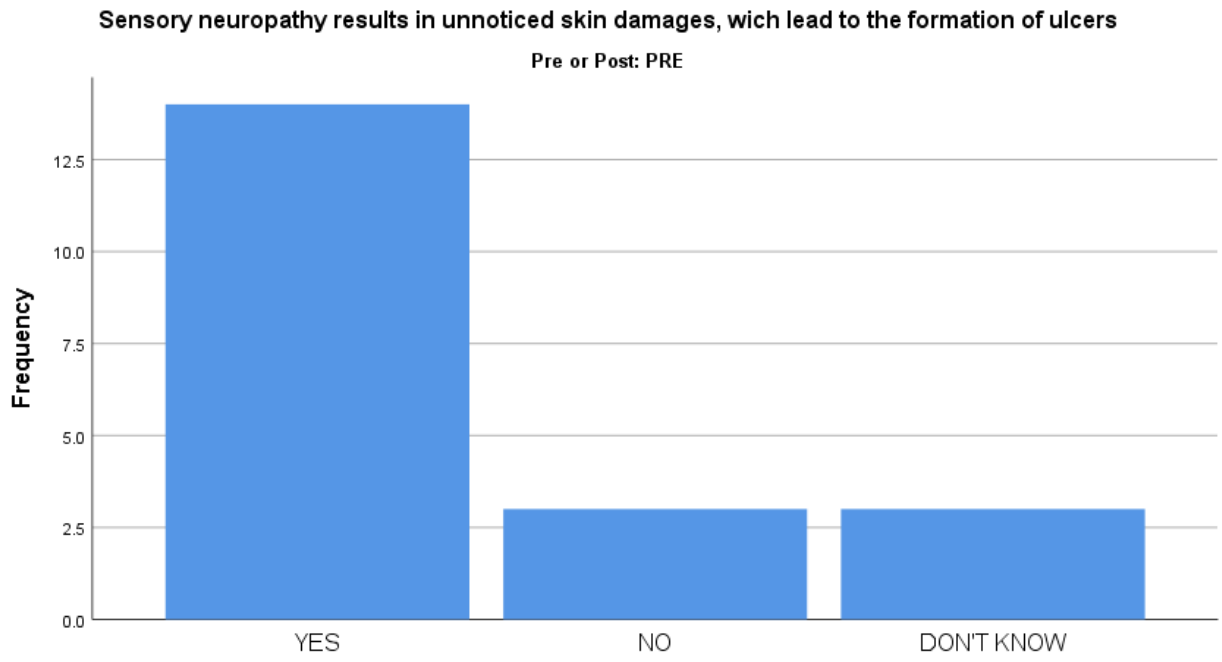
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	8	40.0	40.0	40.0
	NO	2	10.0	10.0	50.0
	DON'T KNOW	10	50.0	50.0	100.0
	Total	20	100.0	100.0	

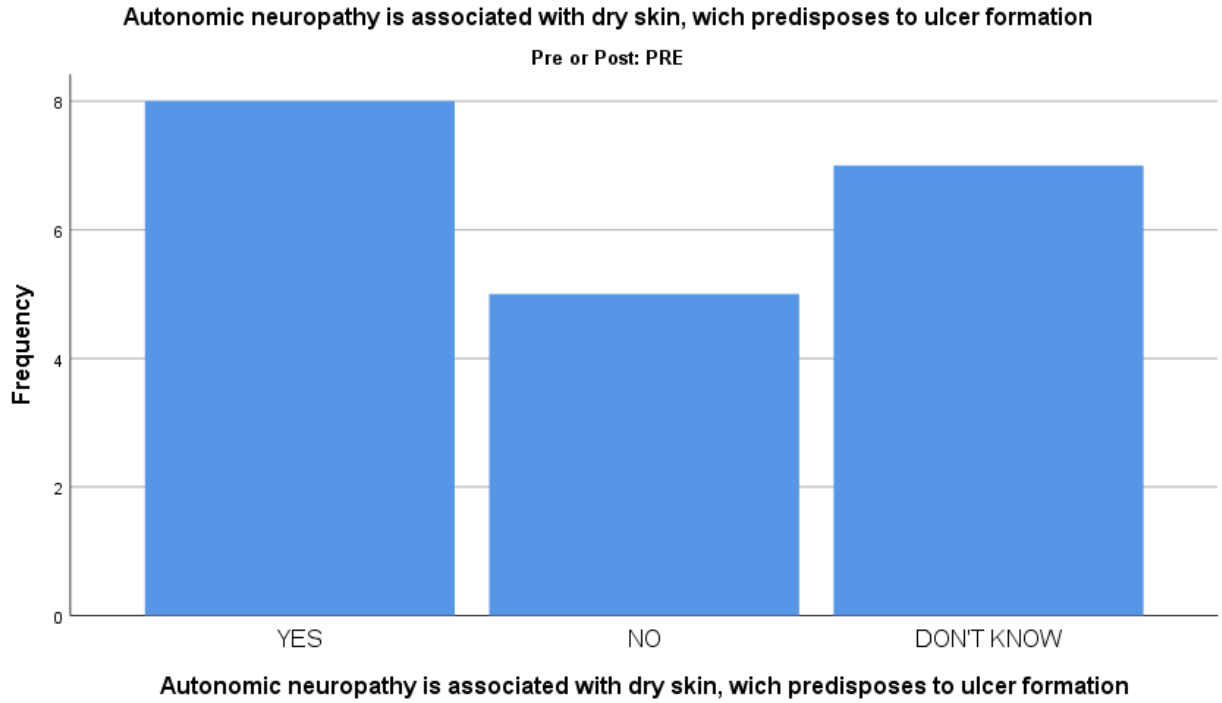
a. Pre or Post = PRE

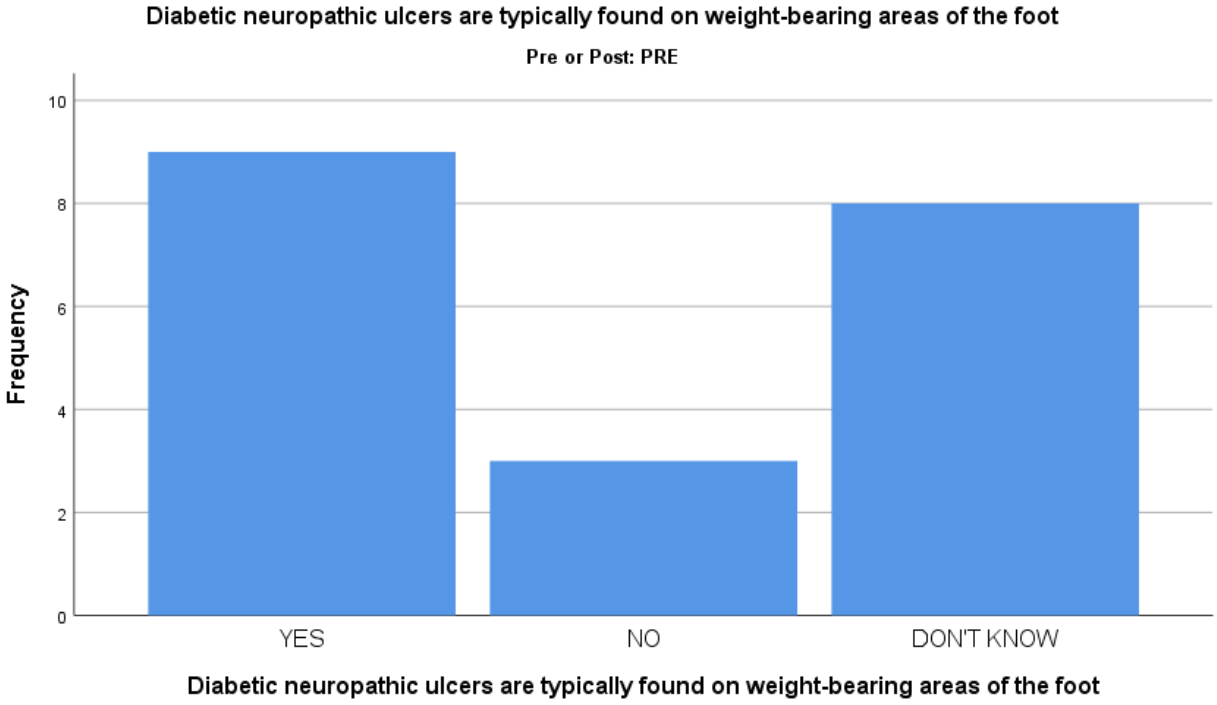
Pre test Graphics

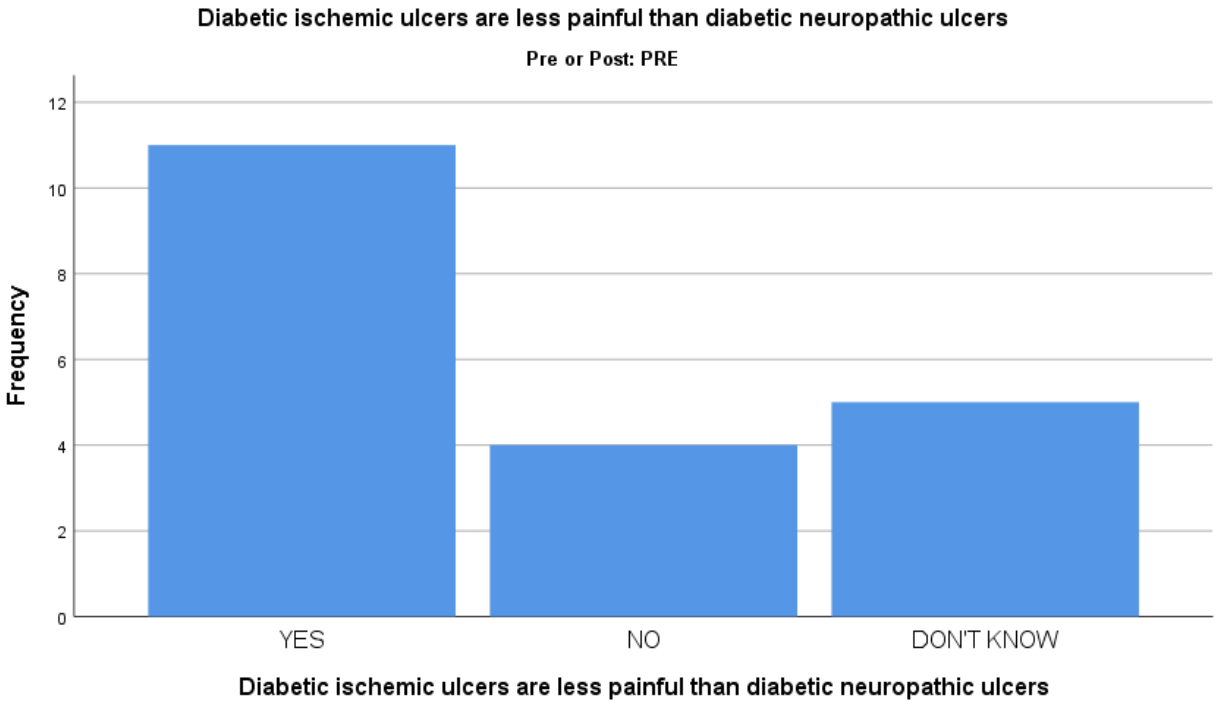
Bar Chart

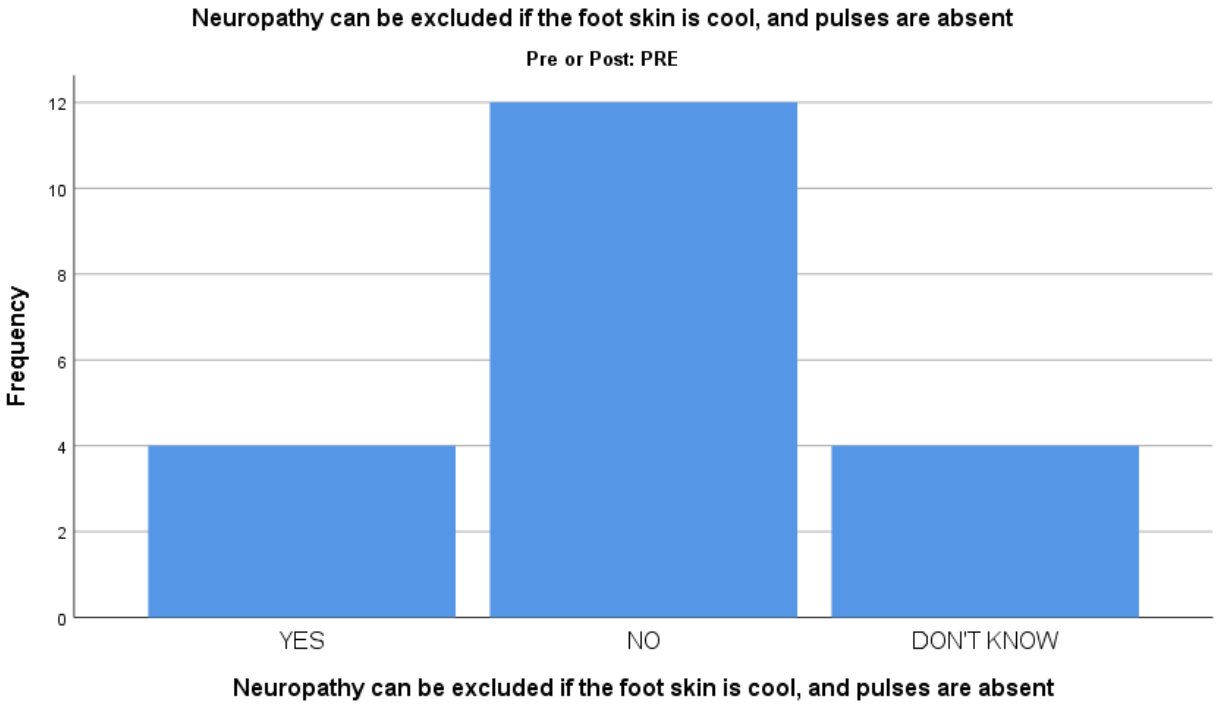


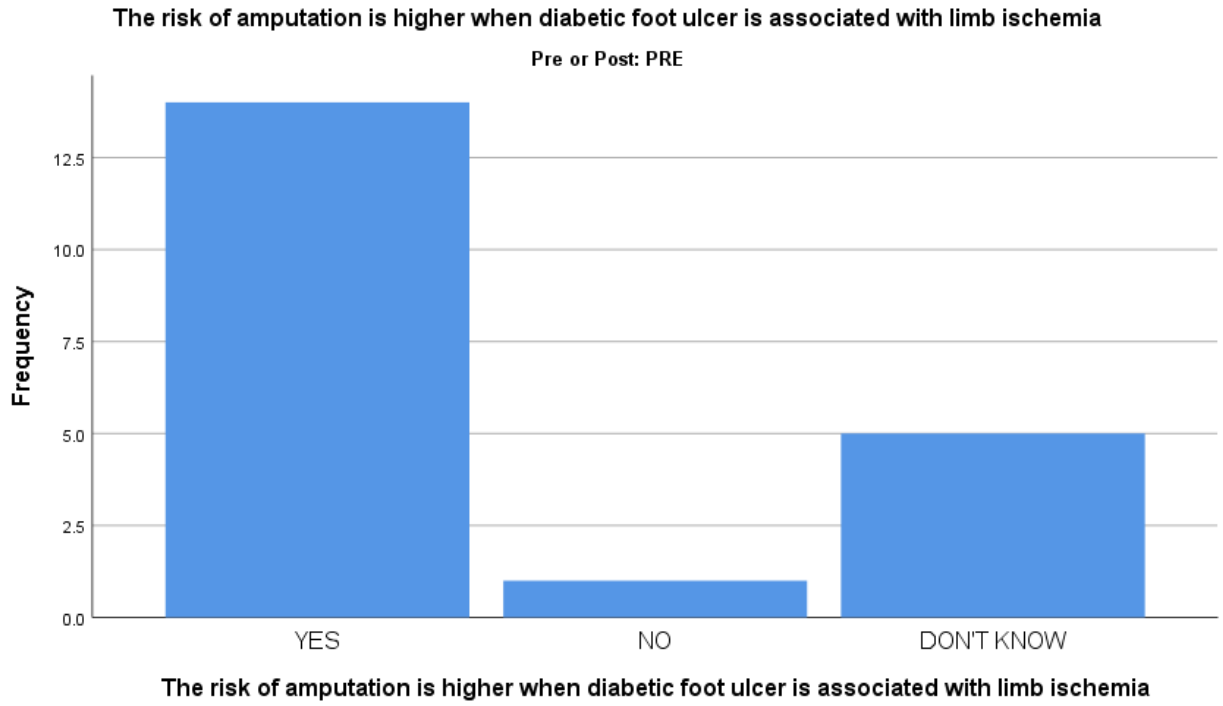

Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers
Pre or Post: PRE
Frequency
12.5
10.0
7.5
5.0
2.5
0.0
YES
NO
DON'T KNOW
Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers

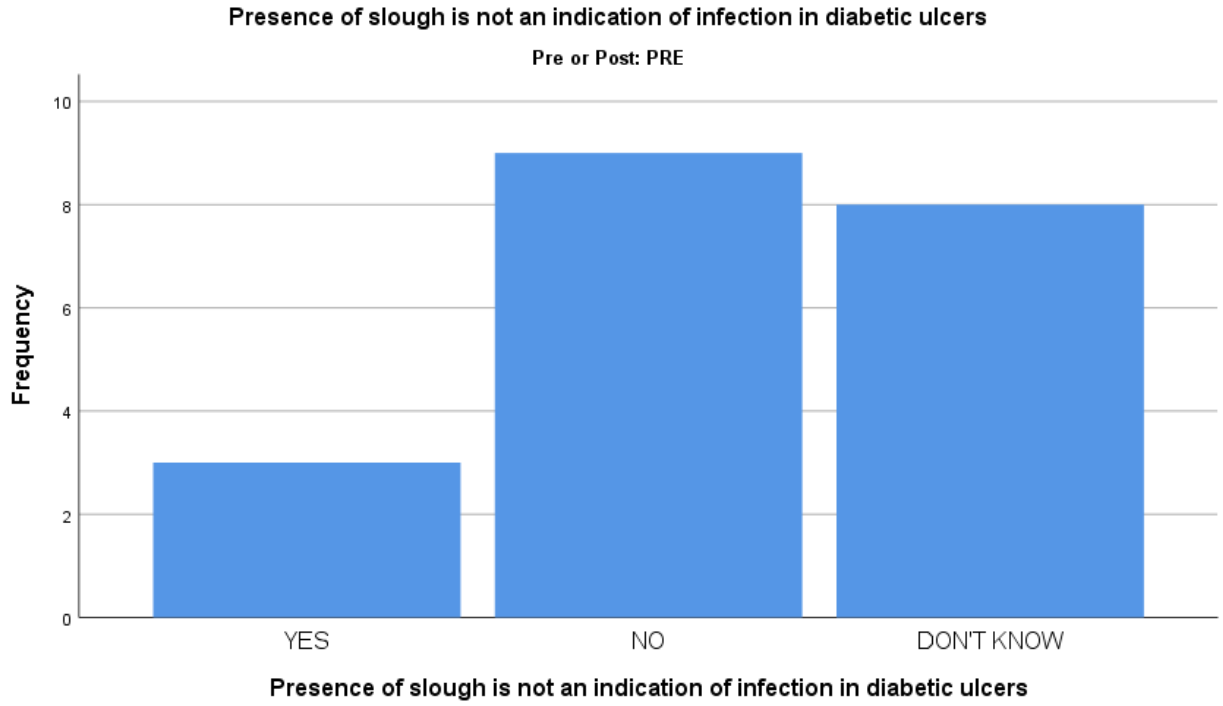

Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation
Pre or Post: PRE
Frequency
8
6
4
2
0
YES
NO
DON'T KNOW
Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation

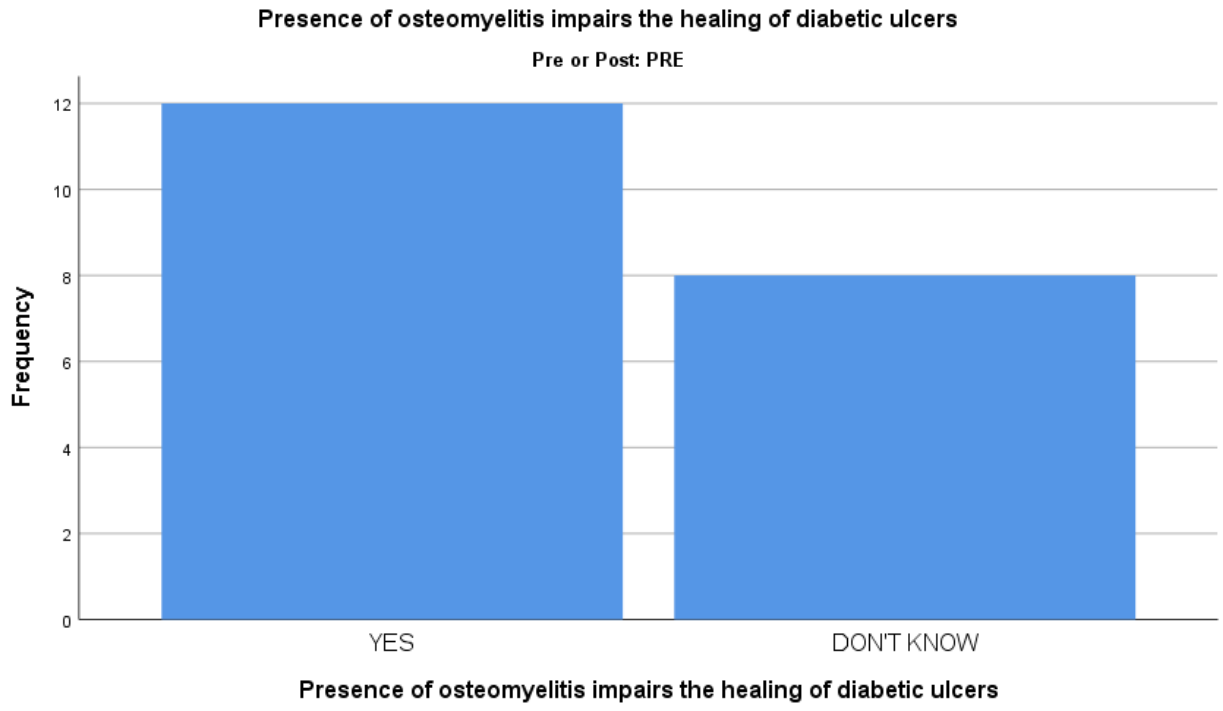

Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot
Pre or Post: PRE
Frequency
10
8
6
4
2
0
YES
NO
DON'T KNOW
Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot

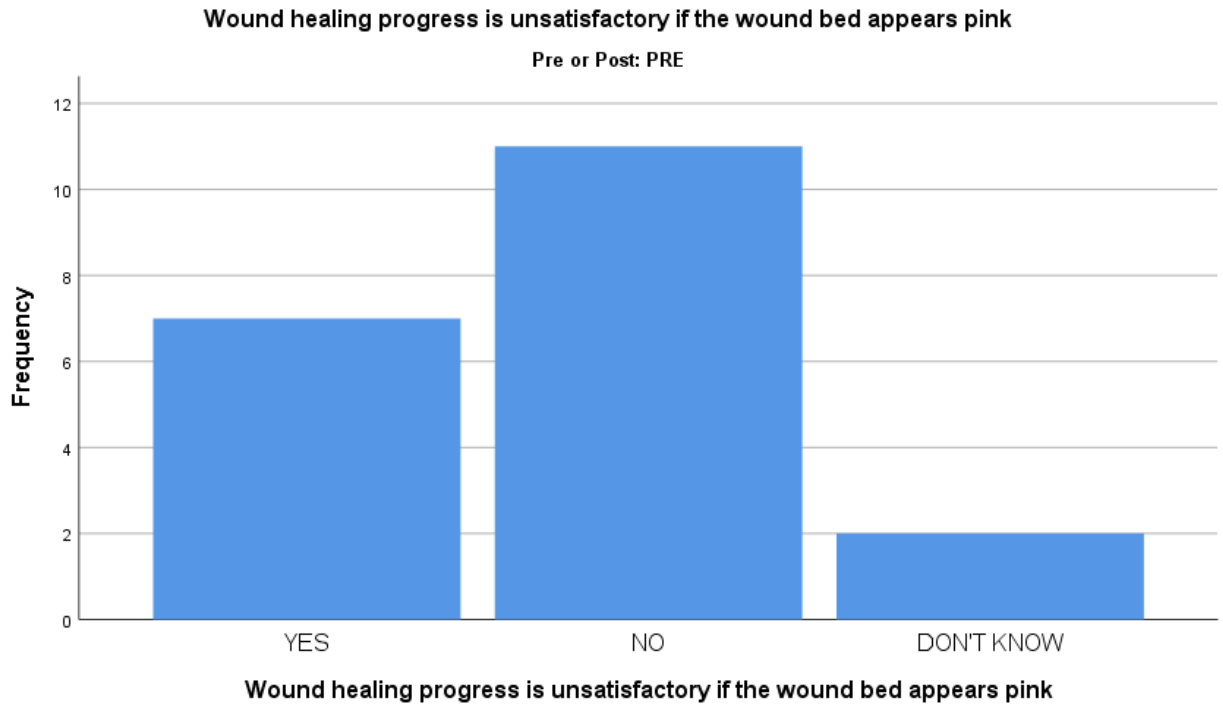

Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers
Pre or Post: PRE
Frequency
12
10
8
6
4
2
0
YES
NO
DON'T KNOW
Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers

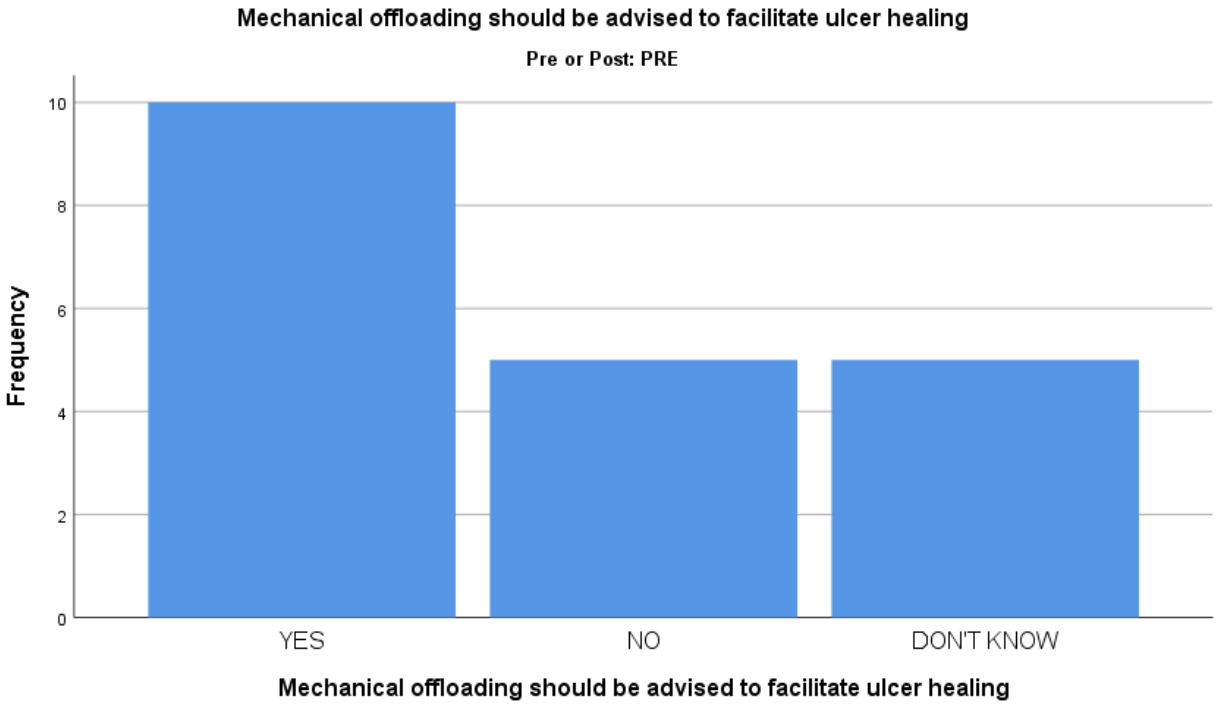

Neuropathy can be excluded if the foot skin is cool, and pulses are absent
Pre or Post: PRE
Frequency
12
10
8
6
4
2
0
YES
NO
DON'T KNOW
Neuropathy can be excluded if the foot skin is cool, and pulses are absent

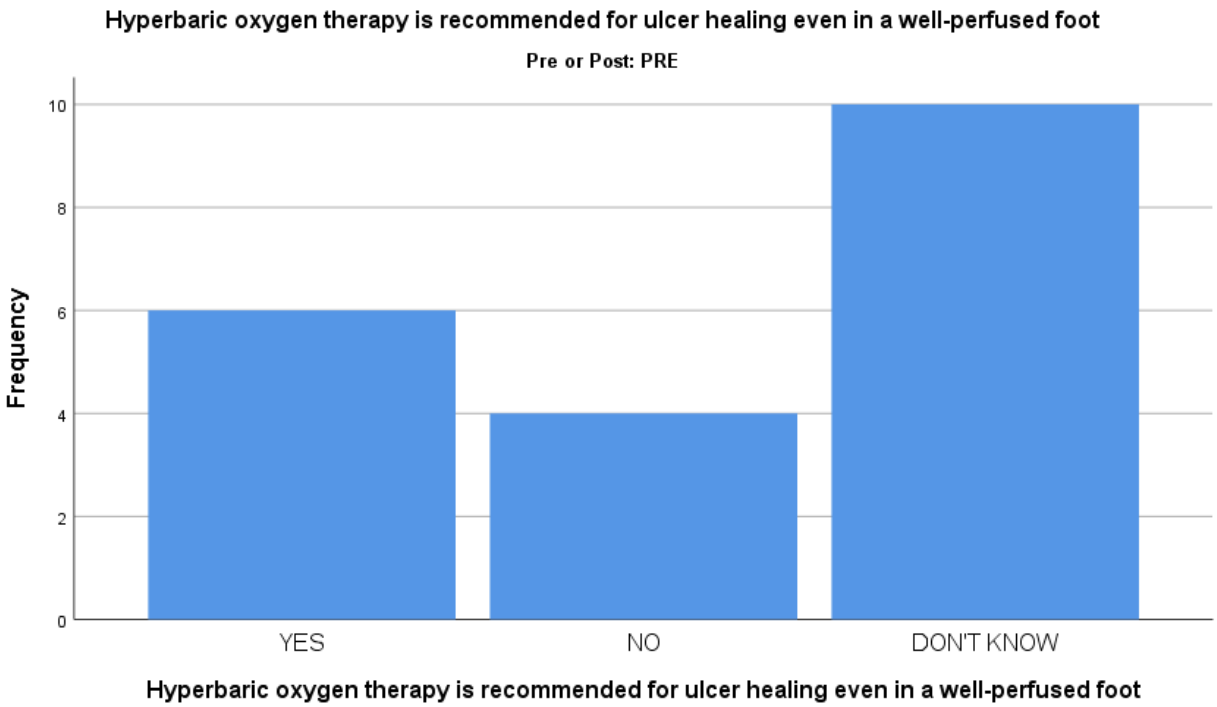

The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia
Pre or Post: PRE
Frequency
12.5
10.0
7.5
5.0
2.5
0.0
YES
NO
DON'T KNOW
The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia

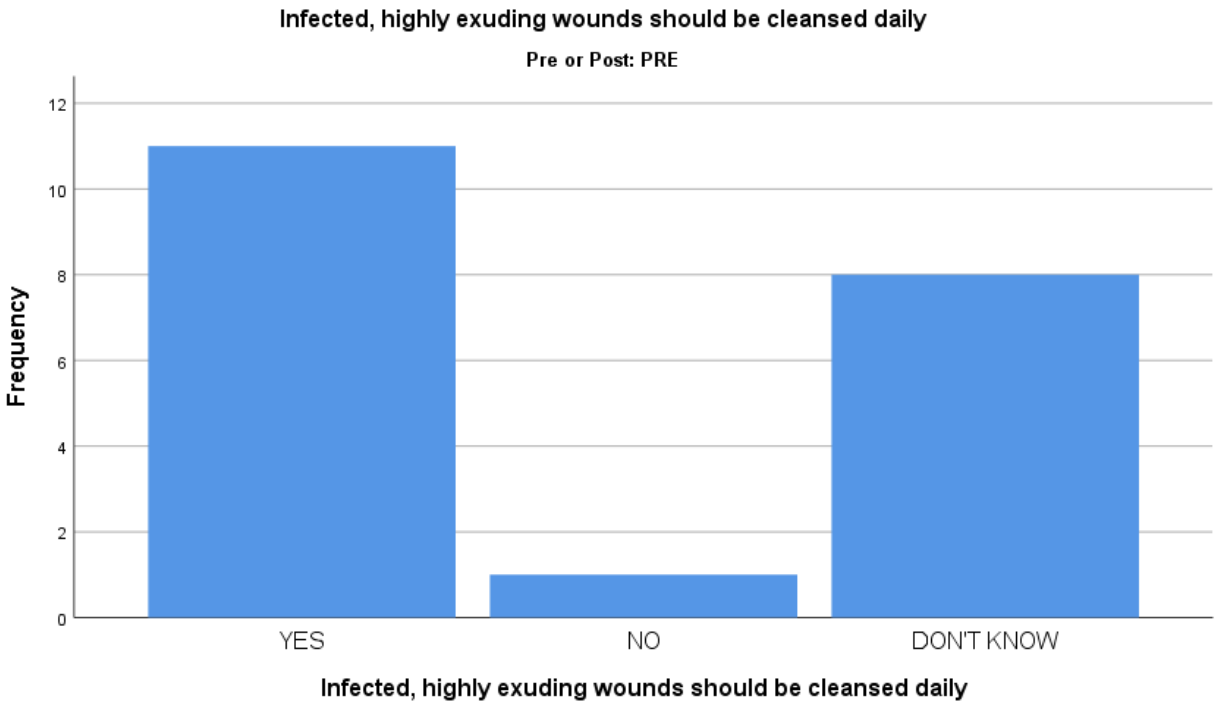

Presence of slough is not an indication of infection in diabetic ulcers
Pre or Post: PRE
Frequency
10
8
6
4
2
0
YES
NO
DON'T KNOW
Presence of slough is not an indication of infection in diabetic ulcers

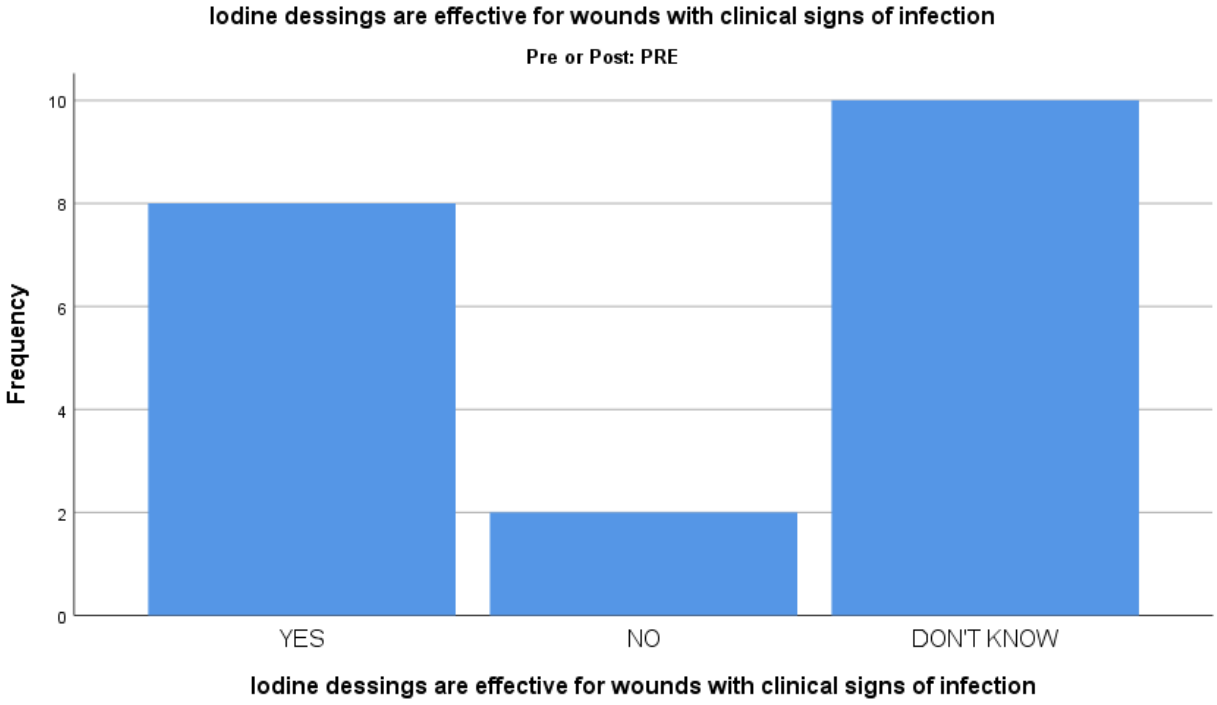

Presence of osteomyelitis impairs the healing of diabetic ulcers
Pre or Post: PRE
Frequency
12
10
8
6
4
2
0
YES
DON'T KNOW
Presence of osteomyelitis impairs the healing of diabetic ulcers

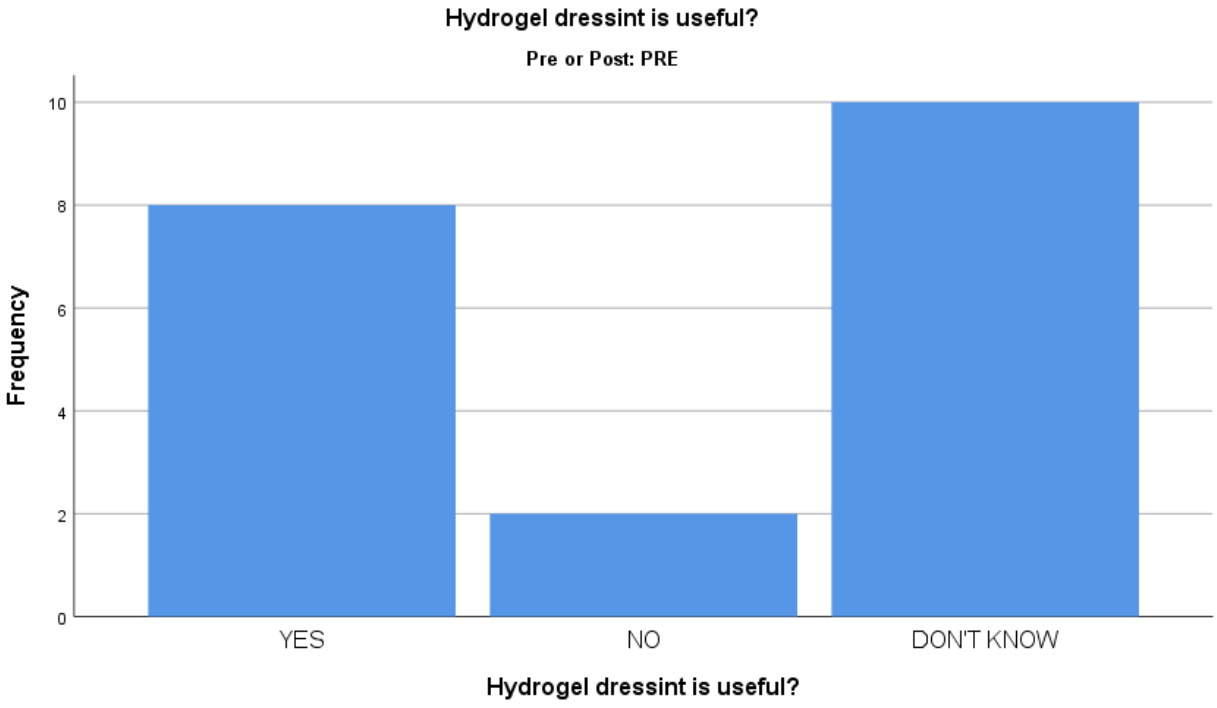

Wound healing progress is unsatisfactory if the wound bed appears pink
Pre or Post: PRE
Frequency
12
10
8
6
4
2
0
YES
NO
DON'T KNOW
Wound healing progress is unsatisfactory if the wound bed appears pink

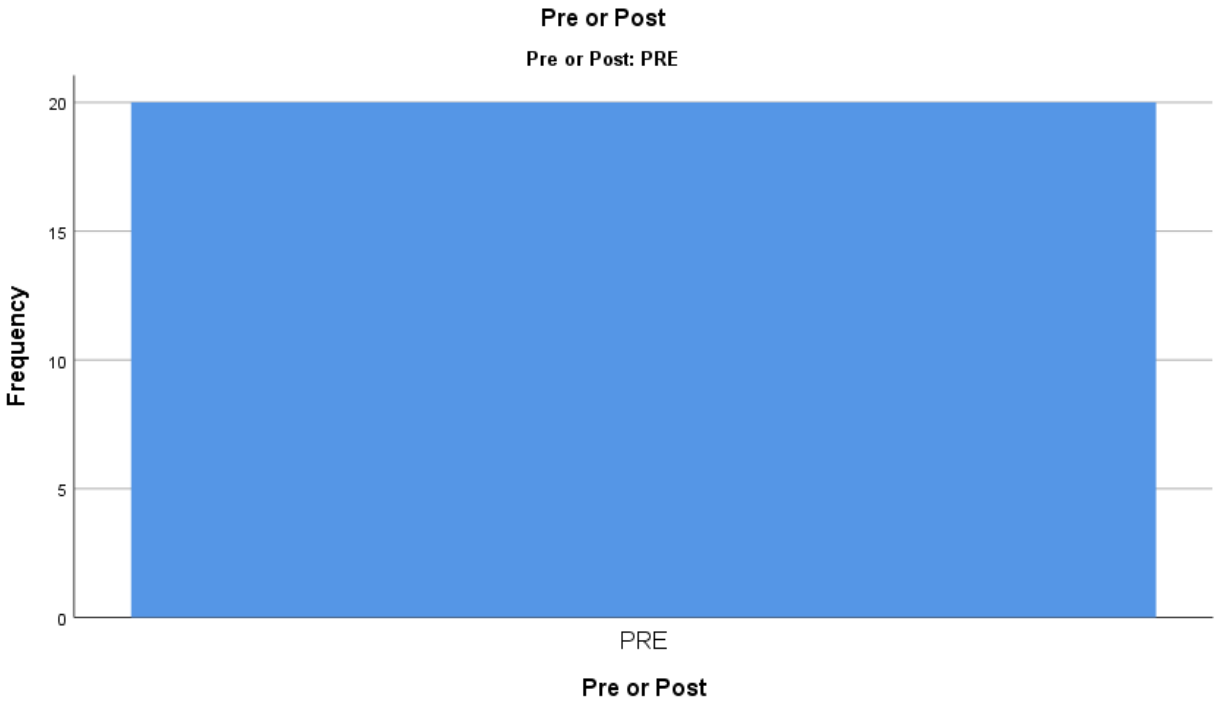

Mechanical offloading should be advised to facilitate ulcer healing
Pre or Post: PRE
Frequency
10
8
6
4
2
0
YES
NO
DON'T KNOW
Mechanical offloading should be advised to facilitate ulcer healing


Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot
Pre or Post: PRE
Frequency
10
8
6
4
2
0
YES
NO
DON'T KNOW
Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot


Infected, highly exuding wounds should be cleansed daily
Pre or Post: PRE
Frequency
12
10
8
6
4
2
0
YES
NO
DON'T KNOW
Infected, highly exuding wounds should be cleansed daily


Iodine dessings are effective for wounds with clinical signs of infection
Pre or Post: PRE
Frequency
10
8
6
4
2
0
YES
NO
DON'T KNOW
Iodine dessings are effective for wounds with clinical signs of infection


Hydrogel dressint is useful?
Pre or Post: PRE
Frequency
10
8
6
4
2
0
YES
NO
DON'T KNOW
Hydrogel dressint is useful?


Pre or Post
Pre or Post: PRE
Frequency
20
15
10
5
0
PRE
Pre or Post

Post Test Frequency Results

Frequency Table

Neuropathy is the predominant factor responsible for diabetic ulcers[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	19	95.0	95.0	95.0
	NO	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = POST

Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	19	95.0	95.0	95.0
	DON'T KNOW	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = POST

Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	19	95.0	95.0	95.0
	DON'T KNOW	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = POST

Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	18	90.0	90.0	90.0
	DON'T KNOW	2	10.0	10.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = POST

Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	20	100.0	100.0	100.0

a. Pre or Post = POST

Neuropathy can be excluded if the foot skin is cool, and pulses are absent[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	18	90.0	90.0	90.0
	NO	1	5.0	5.0	95.0
	DON'T KNOW	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = POST

The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	19	95.0	95.0	95.0
	DON'T KNOW	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = POST

Presence of slough is not an indication of infection in diabetic ulcers[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	20	100.0	100.0	100.0

a. Pre or Post = POST

Presence of osteomyelitis impairs the healing of diabetic ulcers[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	18	90.0	90.0	90.0
	DON'T KNOW	2	10.0	10.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = POST

Wound healing progress is unsatisfactory if the wound bed appears pink[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	1	5.0	5.0	5.0
	NO	19	95.0	95.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = POST

Mechanical offloading should be advised to facilitate ulcer healing[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	17	85.0	85.0	85.0
	NO	2	10.0	10.0	95.0
	DON'T KNOW	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = POST

Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	18	90.0	90.0	90.0

	NO	1	5.0	5.0	95.0
	DON'T KNOW	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = POST

Infected, highly exuding wounds should be cleansed daily[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	18	90.0	90.0	90.0
	DON'T KNOW	2	10.0	10.0	100.0
	Total	20	100.0	100.0	

a. Pre or Post = POST

Iodine dessings are effective for wounds with clinical signs of infection[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	18	90.0	90.0	90.0
	NO	1	5.0	5.0	95.0
	DON'T KNOW	1	5.0	5.0	100.0
	Total	20	100.0	100.0	

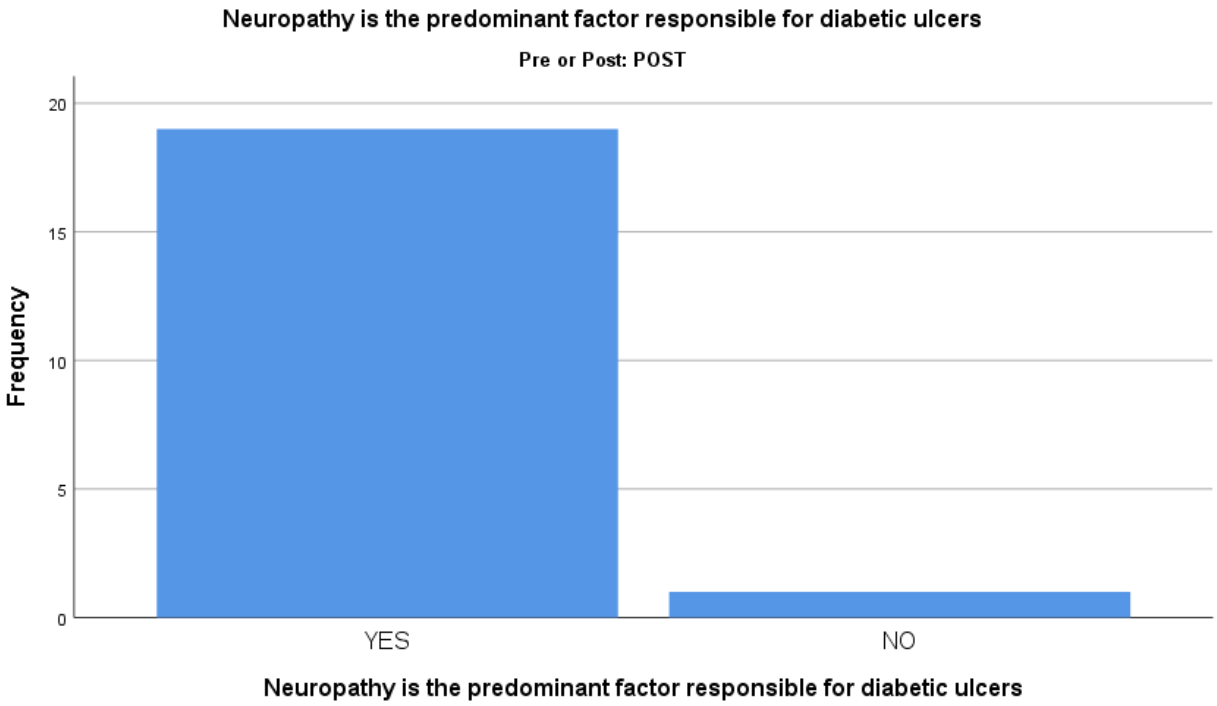
a. Pre or Post = POST

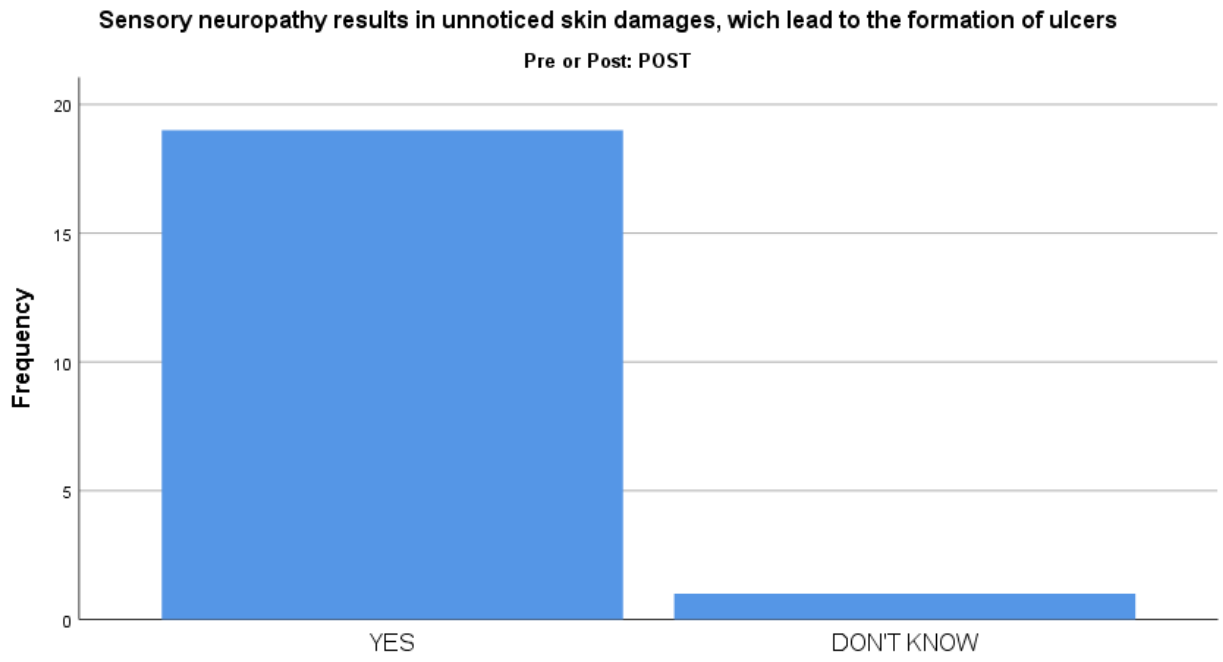
Hydrogel dressint is useful?[a]

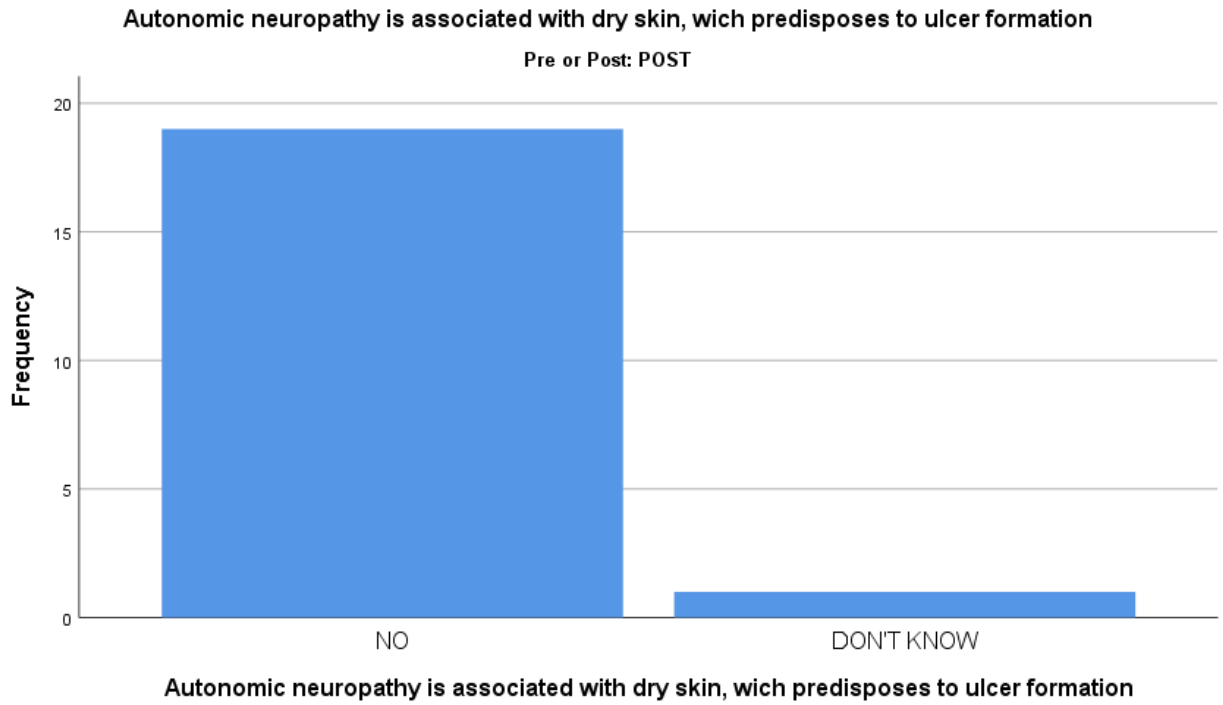
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	YES	20	100.0	100.0	100.0

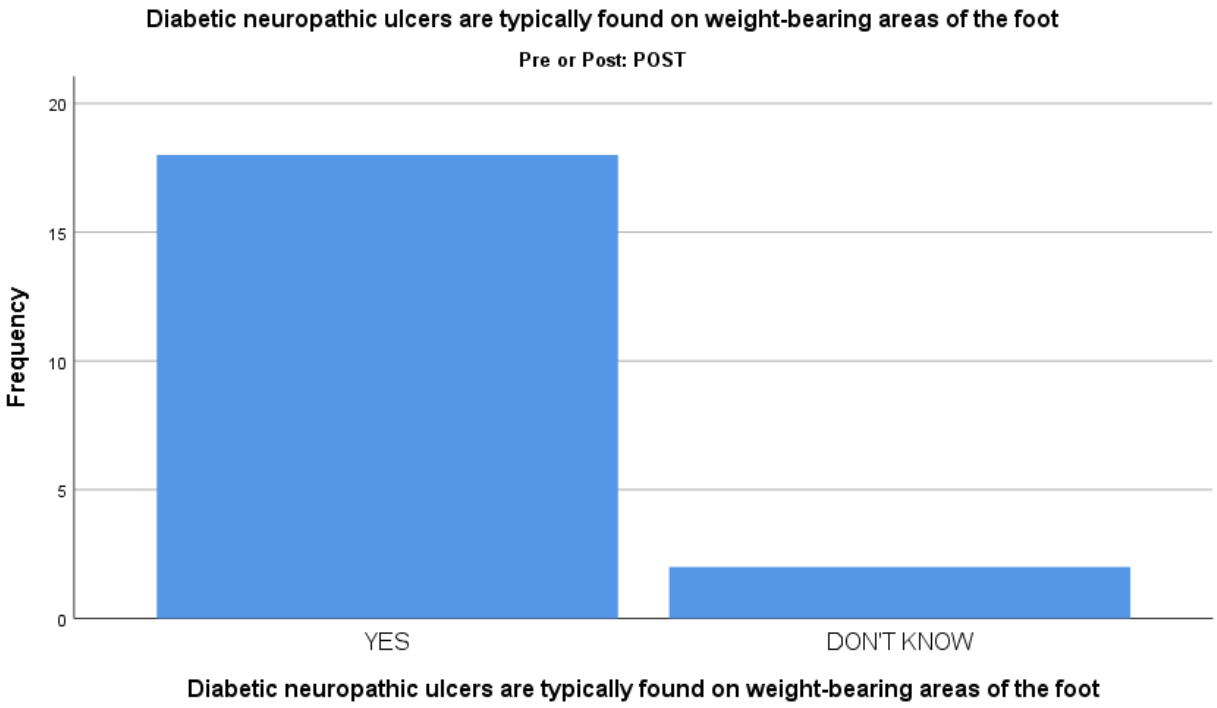
a. Pre or Post = POST

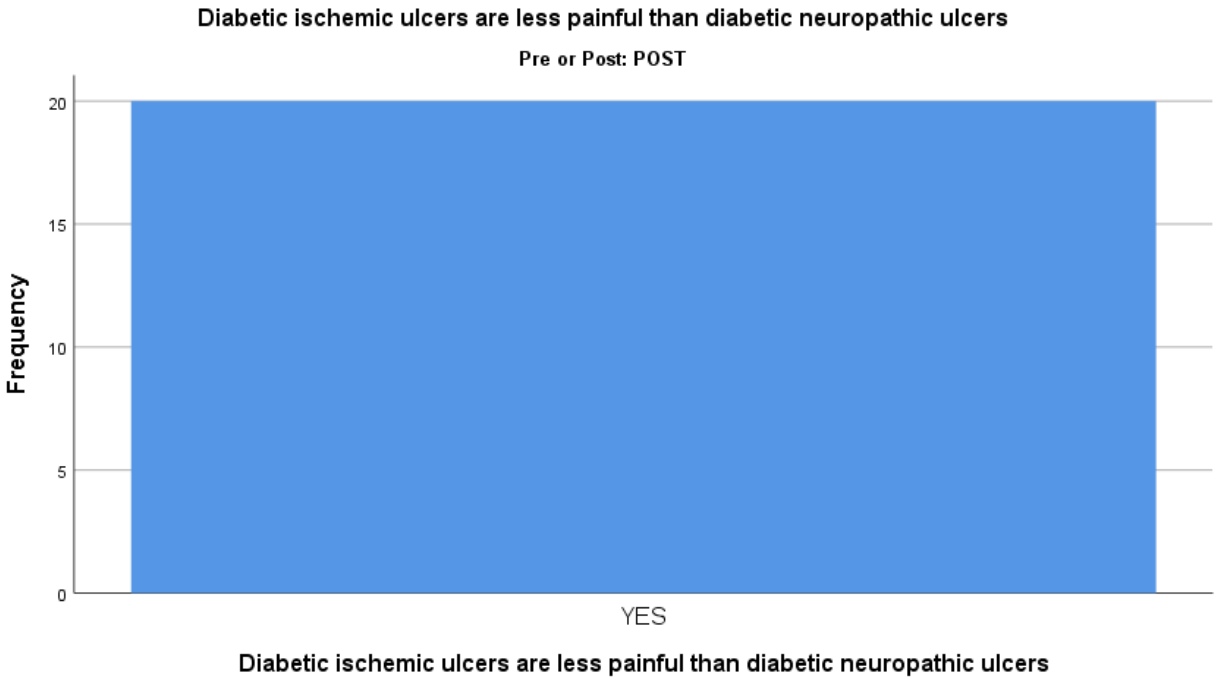
Bar Chart Post Test

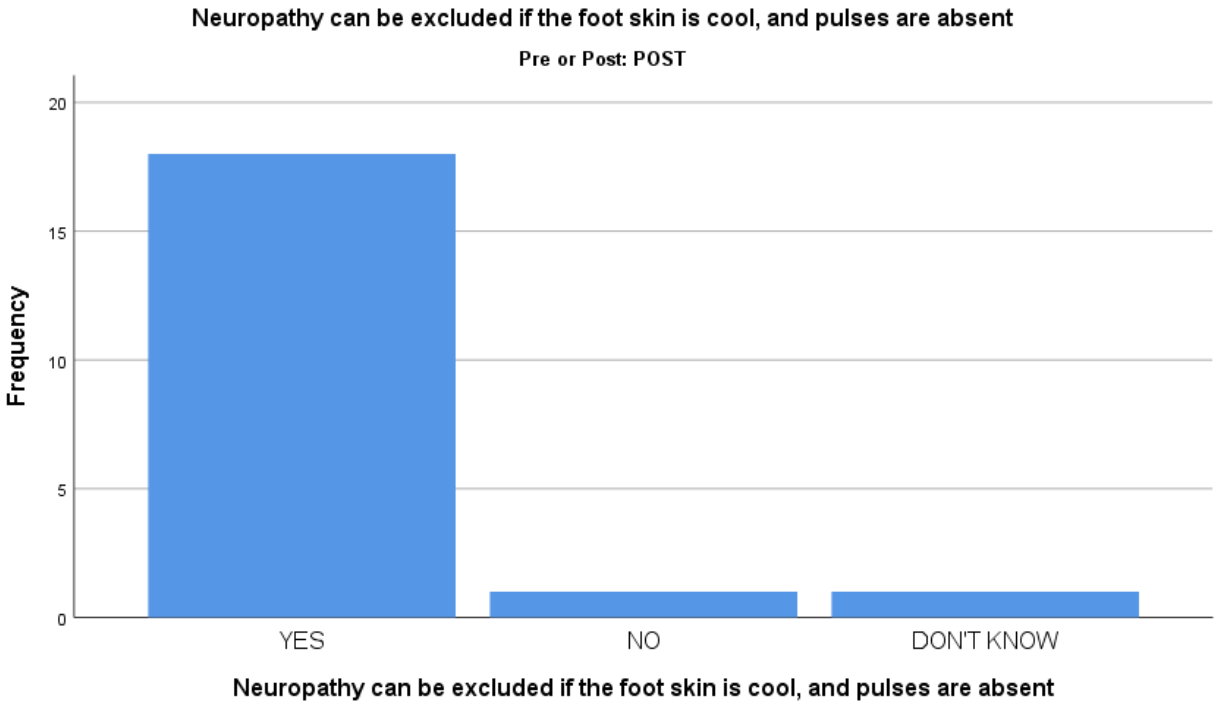


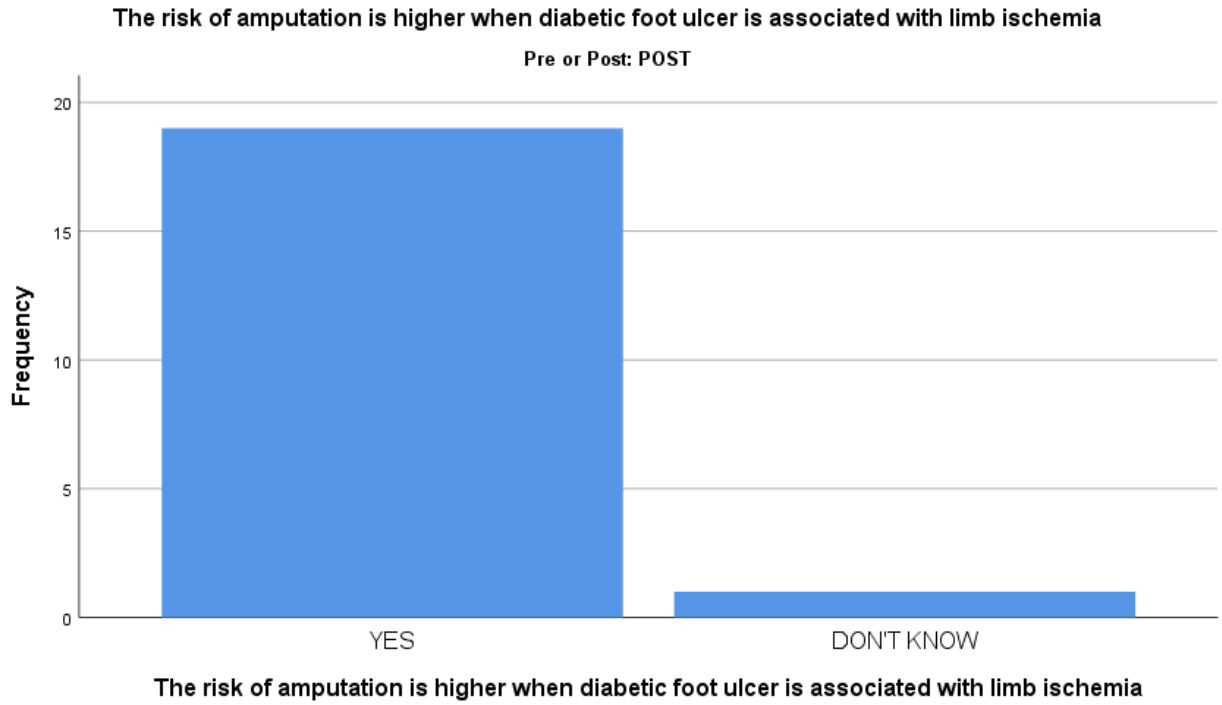

Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers
Pre or Post: POST
Frequency
20
15
10
5
0
YES
DON'T KNOW
Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers

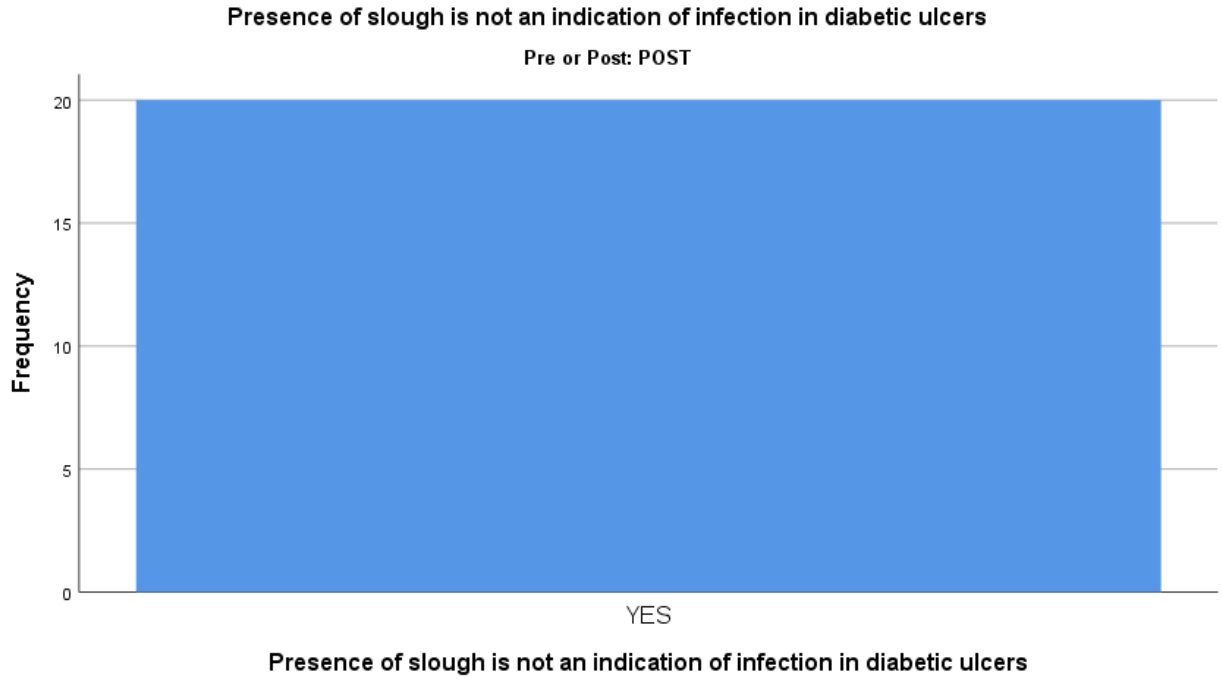

Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation
Pre or Post: POST
Frequency
20
15
10
5
0
NO
DON'T KNOW
Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation

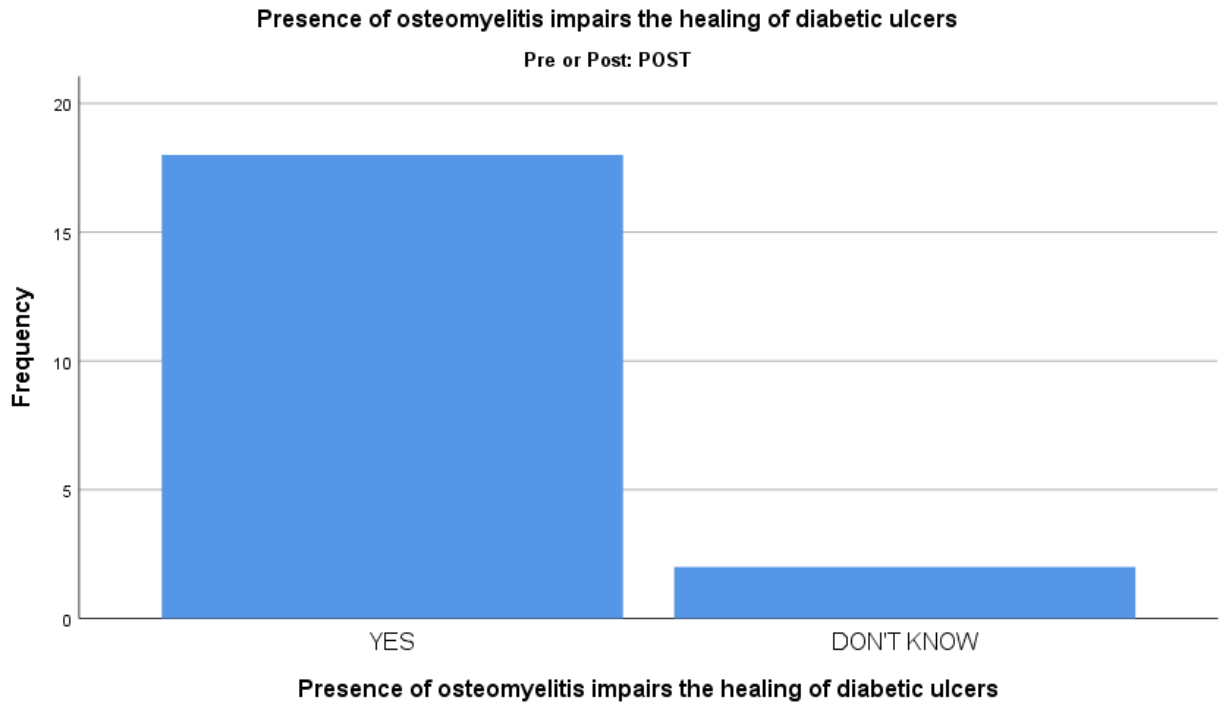

Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot
Pre or Post: POST
Frequency
20
15
10
5
0
YES
DON'T KNOW
Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot

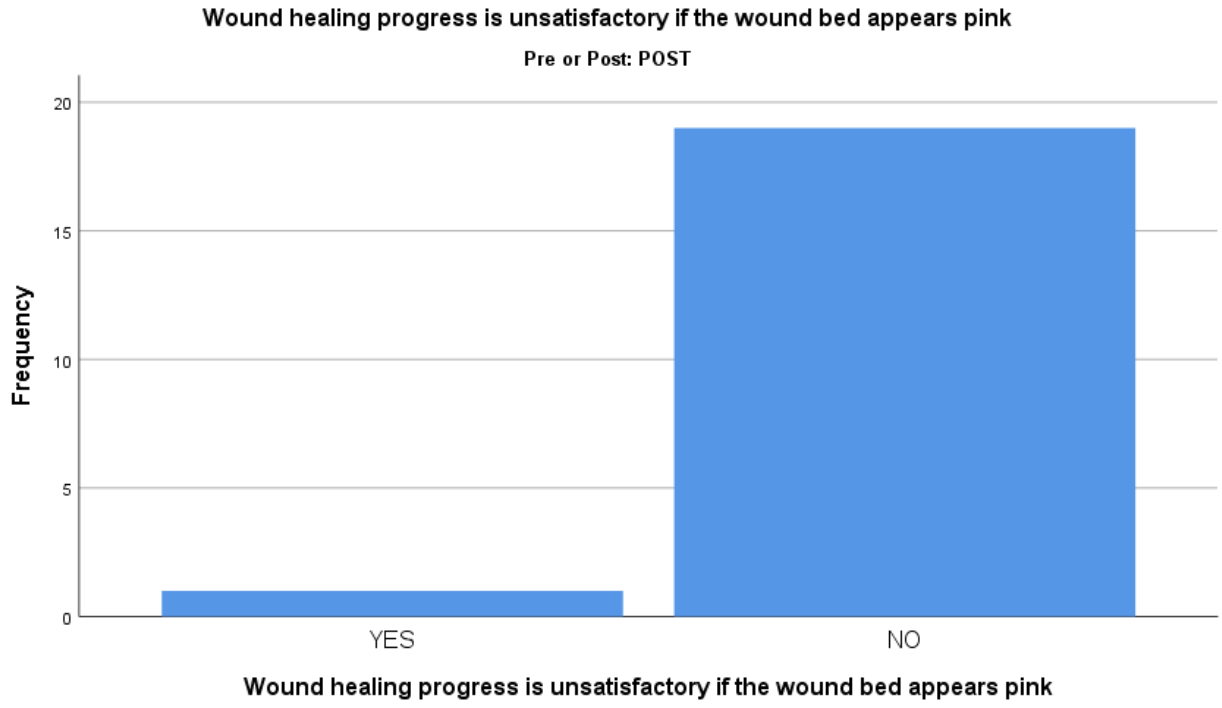

Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers
Pre or Post: POST
Frequency
20
15
10
5
0
YES
Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers

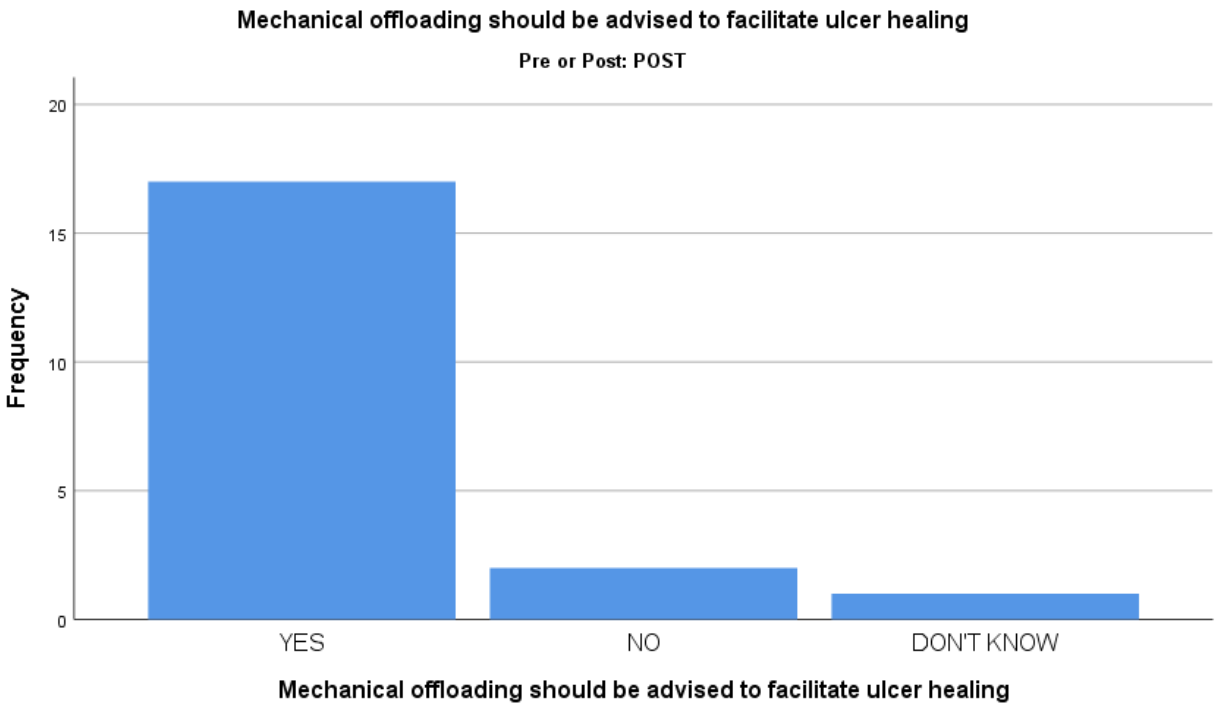

Neuropathy can be excluded if the foot skin is cool, and pulses are absent
Pre or Post: POST
Frequency
20
15
10
5
0
YES
NO
DON'T KNOW
Neuropathy can be excluded if the foot skin is cool, and pulses are absent

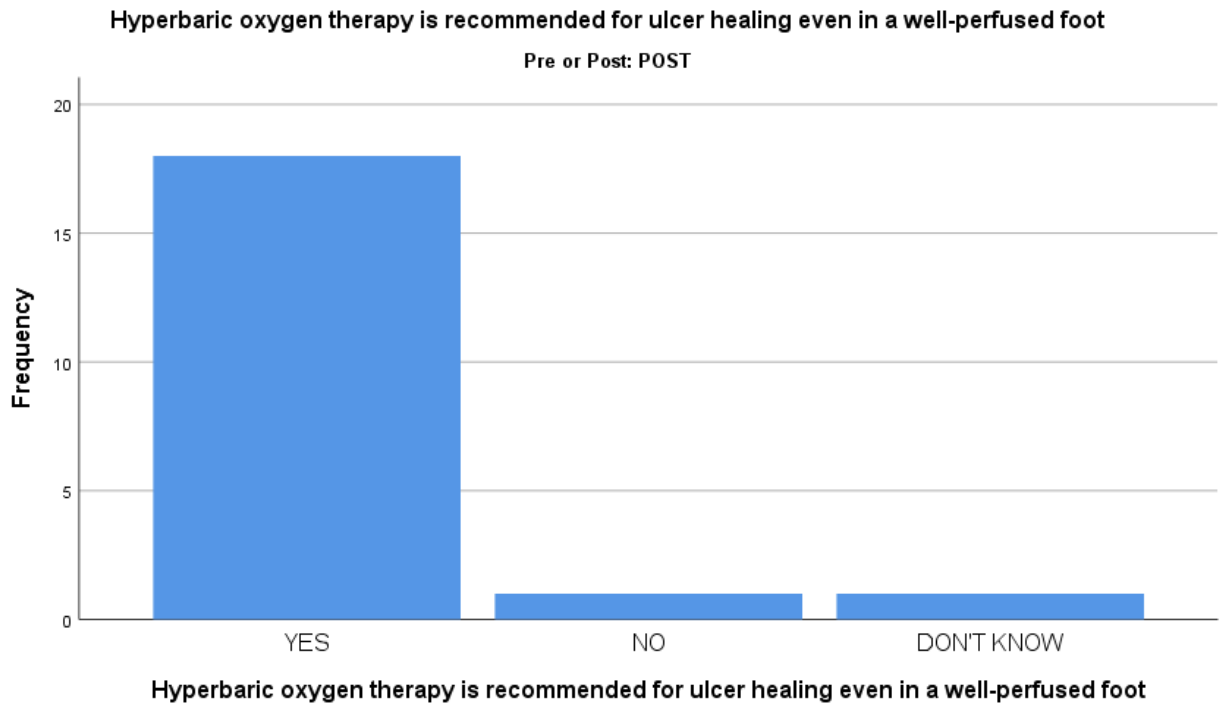

The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia
Pre or Post: POST
Frequency
20
15
10
5
0
YES
DON'T KNOW
The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia

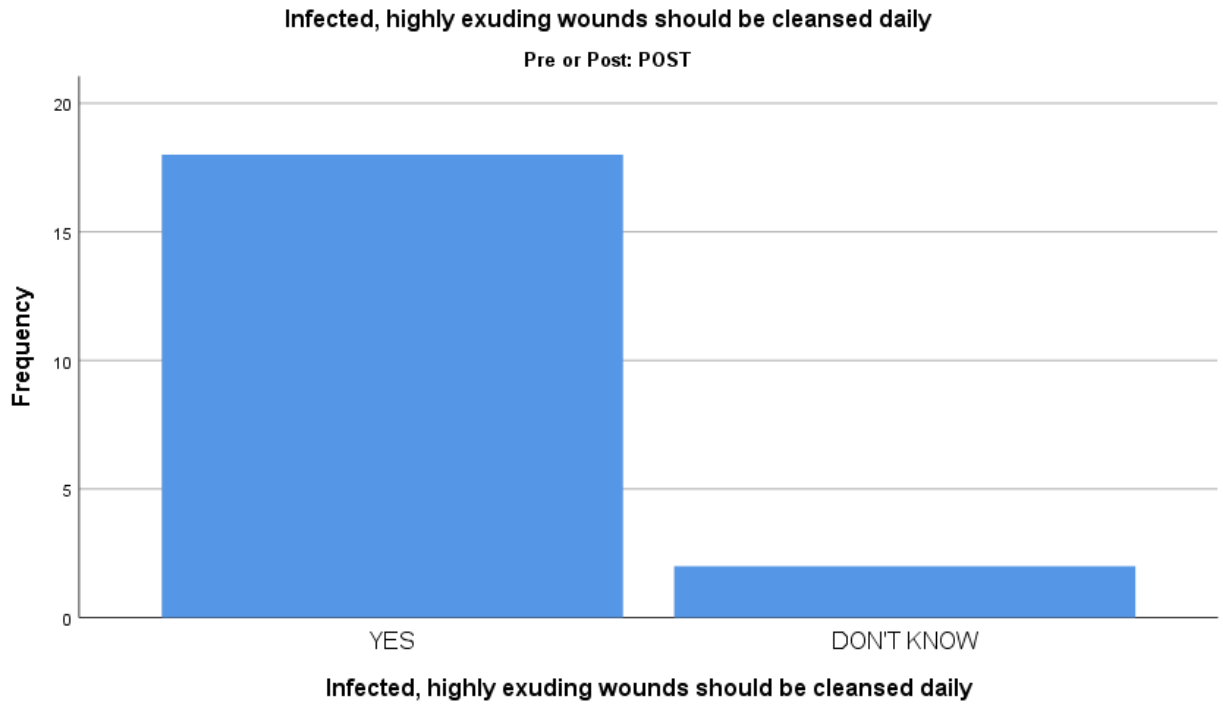

Presence of slough is not an indication of infection in diabetic ulcers
Pre or Post: POST
Frequency
20
15
10
5
0
YES
Presence of slough is not an indication of infection in diabetic ulcers

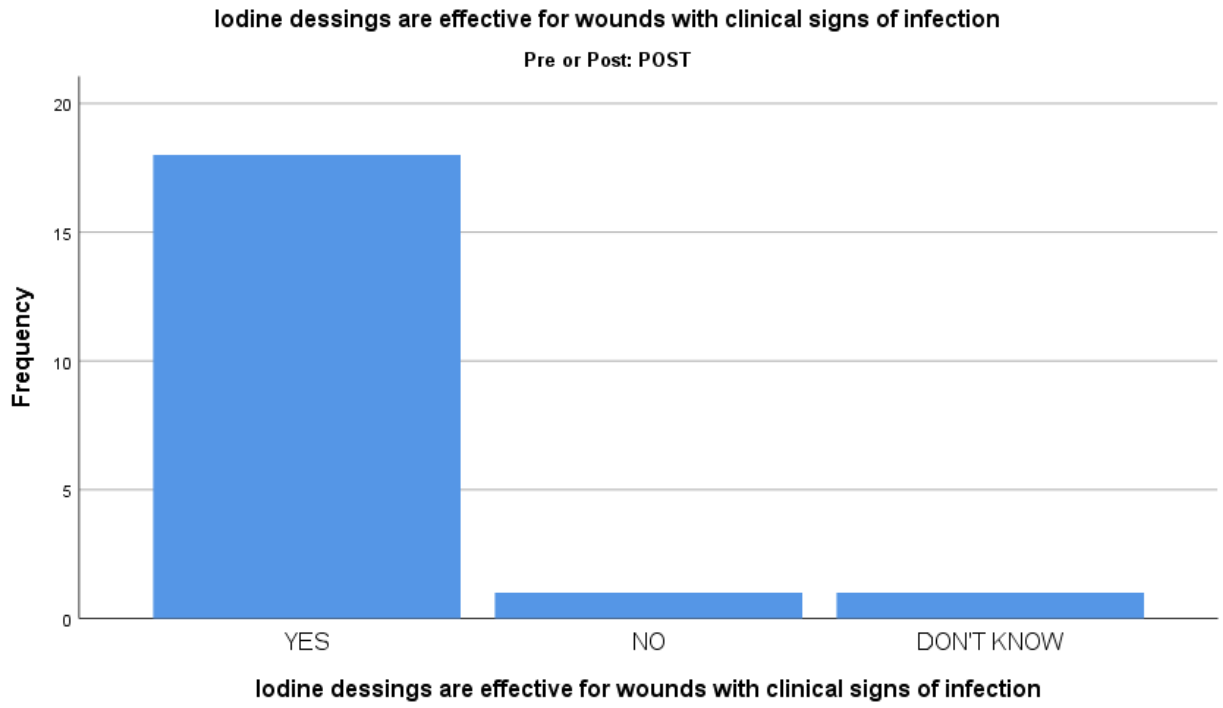

Presence of osteomyelitis impairs the healing of diabetic ulcers
Pre or Post: POST
Frequency
20
15
10
5
0
YES
DON'T KNOW
Presence of osteomyelitis impairs the healing of diabetic ulcers


Wound healing progress is unsatisfactory if the wound bed appears pink
Pre or Post: POST
Frequency
20
15
10
5
0
YES
NO
Wound healing progress is unsatisfactory if the wound bed appears pink

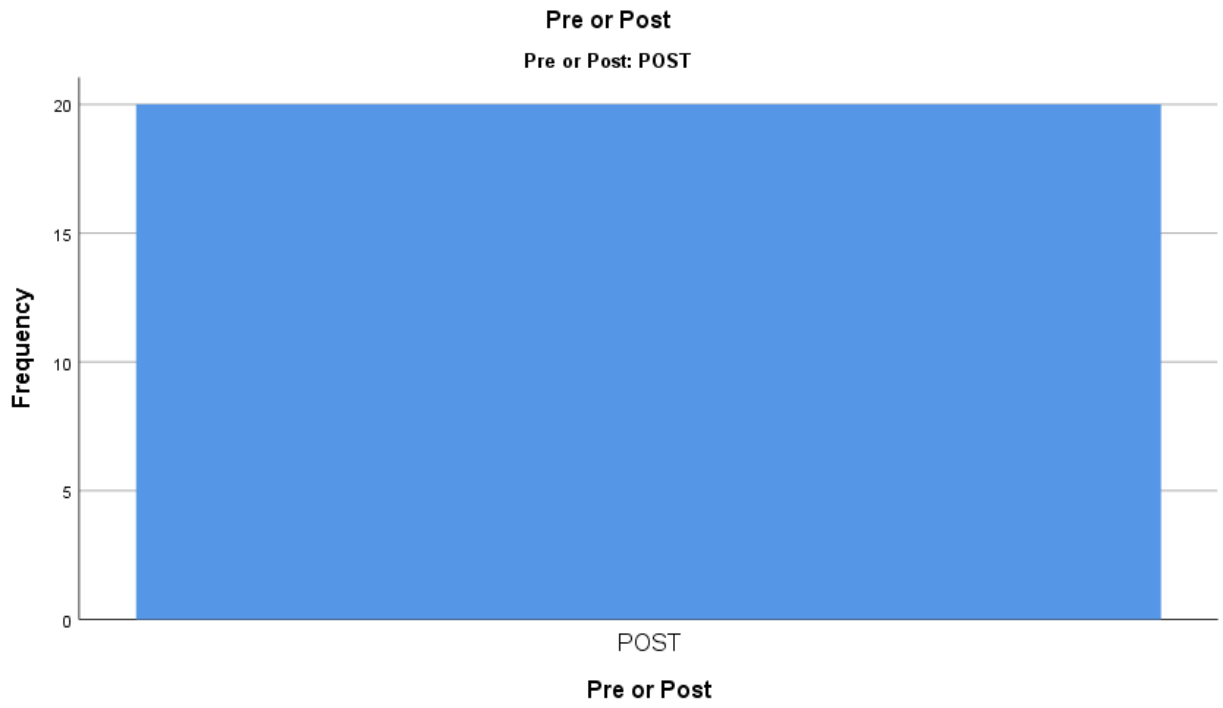

Mechanical offloading should be advised to facilitate ulcer healing
Pre or Post: POST
Frequency
20
15
10
5
0
YES
NO
DON'T KNOW
Mechanical offloading should be advised to facilitate ulcer healing


Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot
Pre or Post: POST
Frequency
20
15
10
5
0
YES
NO
DON'T KNOW
Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot


Infected, highly exuding wounds should be cleansed daily
Pre or Post: POST
Frequency
20
15
10
5
0
YES
DON'T KNOW
Infected, highly exuding wounds should be cleansed daily


Iodine dessings are effective for wounds with clinical signs of infection
Pre or Post: POST
Frequency
20
15
10
5
0
YES
NO
DON'T KNOW
Iodine dessings are effective for wounds with clinical signs of infection


Hydrogel dressint is useful?
Pre or Post: POST
Frequency
20
15
10
5
0
YES
Hydrogel dressint is useful?



Frequencies Demographic Data

Age[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21-35	11	55.0	55.0	55.0
	36-45	6	30.0	30.0	85.0
	45-65	3	15.0	15.0	100.0
	Total	20	100.0	100.0	

Gender[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MALE	8	40.0	40.0	40.0
	FEMALE	12	60.0	60.0	100.0
	Total	20	100.0	100.0	

RN[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	ASSOCIATE	3	15.0	15.0	15.0
	BACHELOR	17	85.0	85.0	100.0
	Total	20	100.0	100.0	

APPENDIX B: CROSS TAB TABULATION ANALYSIS PRE AND POST FOR EACH VARIABLE

*Neuropathy is the predominant factor responsible for diabetic ulcers * Neuropathy is the predominant factor responsible for diabetic ulcers Crosstabulation*

			Neuropathy is the predominant factor responsible for diabetic ulcers		
			A	B	Total
Neuropathy is the predominant factor responsible for diabetic ulcers	A	Count	16	0	16
		% within Neuropathy is the predominant factor responsible for diabetic ulcers	100.0%	0.0%	100.0%
		% within Neuropathy is the predominant factor responsible for diabetic ulcers	84.2%	0.0%	80.0%
		% of Total	80.0%	0.0%	80.0%
	B	Count	2	1	3
		% within Neuropathy is the predominant factor responsible for diabetic ulcers	66.7%	33.3%	100.0%
		% within Neuropathy is the predominant factor responsible for diabetic ulcers	10.5%	100.0%	15.0%
		% of Total	10.0%	5.0%	15.0%

	C	Count	1	0	1
		% within Neuropathy is the predominant factor responsible for diabetic ulcers	100.0%	0.0%	100.0%
		% within Neuropathy is the predominant factor responsible for diabetic ulcers	5.3%	0.0%	5.0%
		% of Total	5.0%	0.0%	5.0%
Total		Count	19	1	20
		% within Neuropathy is the predominant factor responsible for diabetic ulcers	95.0%	5.0%	100.0%
		% within Neuropathy is the predominant factor responsible for diabetic ulcers	100.0%	100.0%	100.0%
		% of Total	95.0%	5.0%	100.0%

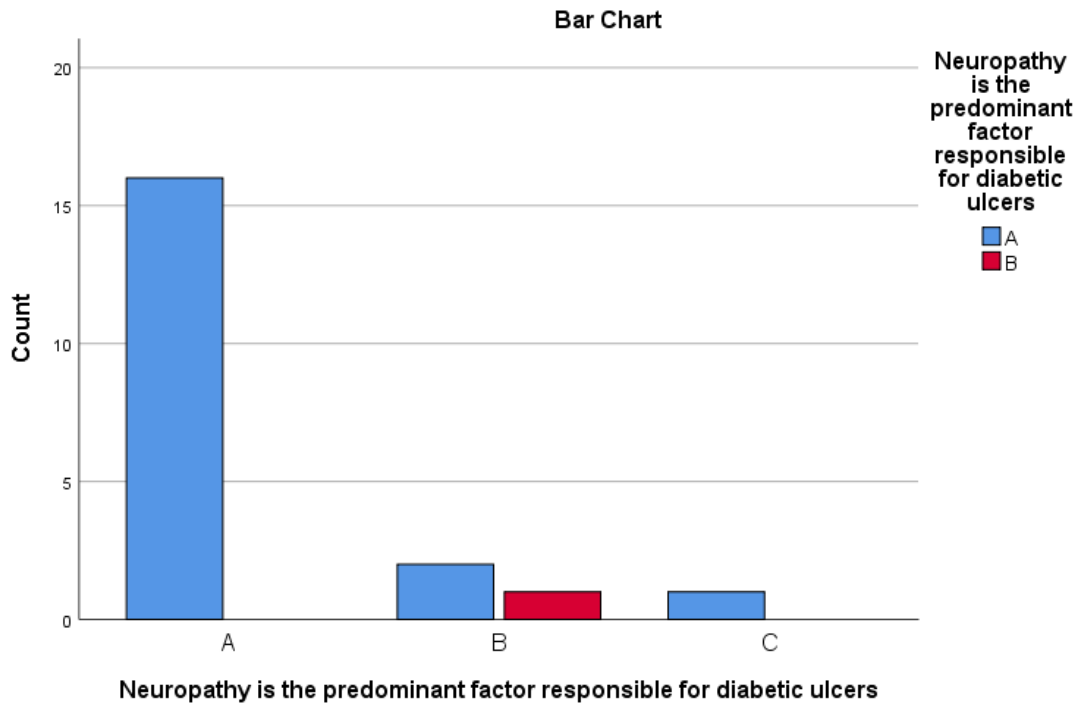
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.965[a]	2	.051
Likelihood Ratio	4.122	2	.127
N of Valid Cases	20		

a. 5 cells (83.3%) have expected count less than 5. The minimum expected count is .05.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.479	.051
N of Valid Cases		20	



Crosstabs

*Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers * Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers Crosstabulation*

			Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers		
			A	C	Total
Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers	A	Count	14	0	14
		% within Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers	100.0%	0.0%	100.0%
		% within Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers	73.7%	0.0%	70.0%
	B	Count	2	1	3
		% within Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers	66.7%	33.3%	100.0%
		% within Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers	10.5%	100.0%	15.0%
	C	Count	3	0	3

	% within Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers	100.0%	0.0%	100.0%
	% within Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers	15.8%	0.0%	15.0%
Total	Count	19	1	20
	% within Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers	95.0%	5.0%	100.0%
	% within Sensory neuropathy results in unnoticed skin damages, wich lead to the formation of ulcers	100.0%	100.0%	100.0%

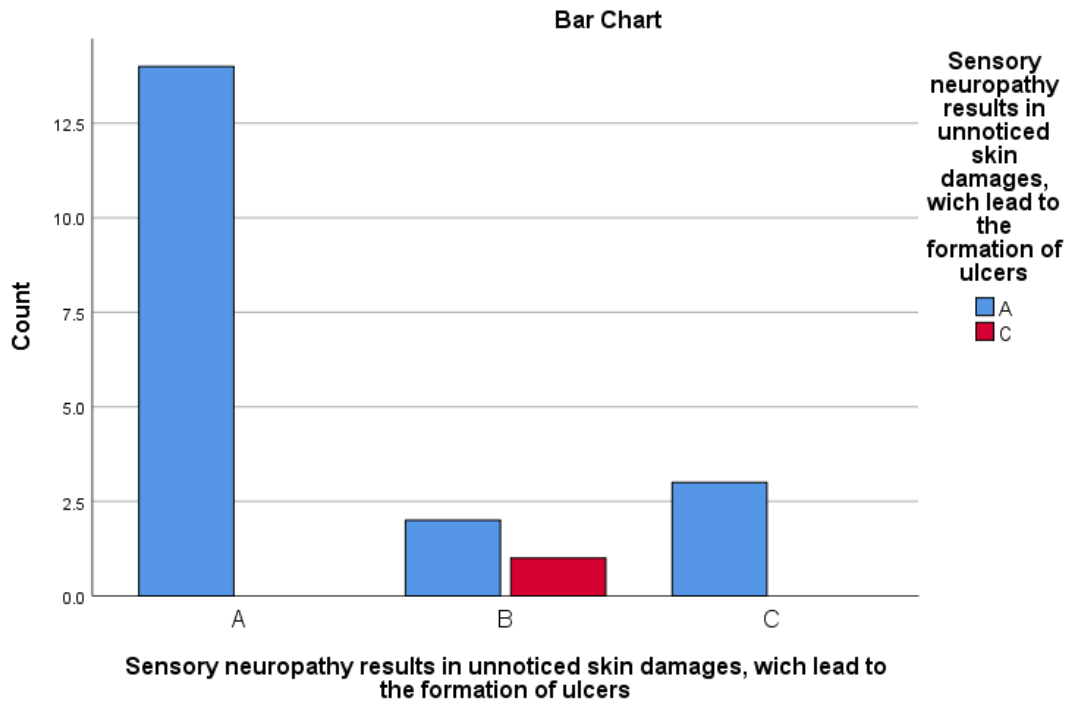
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.965[a]	2	.051
Likelihood Ratio	4.122	2	.127
N of Valid Cases	20		

a. 5 cells (83.3%) have expected count less than 5. The minimum expected count is .15.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.479	.051
N of Valid Cases		20	



Crosstabs

*Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation * Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation Crosstabulation*

			Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation		
			B	C	Total
Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation	A	Count	8	0	8
		% within Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation	100.0%	0.0%	100.0%
		% within Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation	42.1%	0.0%	40.0%
	B	Count	5	0	5
		% within Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation	100.0%	0.0%	100.0%
		% within Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation	26.3%	0.0%	25.0%
	C	Count	6	1	7

	% within Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation	85.7%	14.3%	100.0%
	% within Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation	31.6%	100.0%	35.0%
Total	Count	19	1	20
	% within Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation	95.0%	5.0%	100.0%
	% within Autonomic neuropathy is associated with dry skin, wich predisposes to ulcer formation	100.0%	100.0%	100.0%

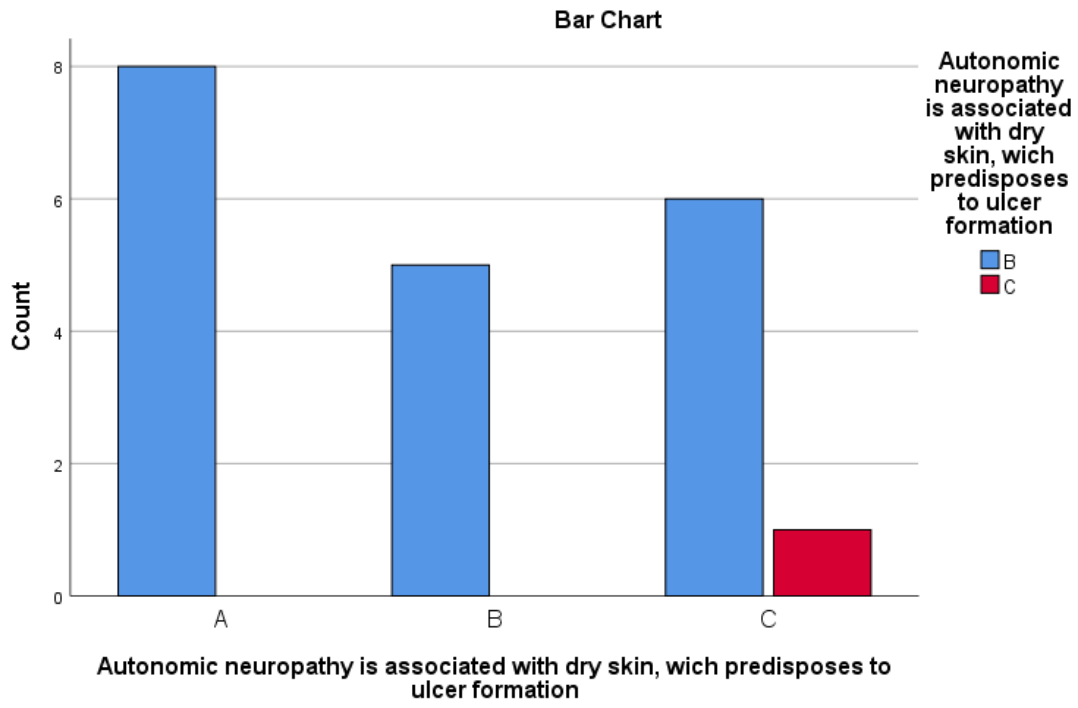
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.955[a]	2	.376
Likelihood Ratio	2.199	2	.333
N of Valid Cases	20		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .25.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.298	.376
N of Valid Cases		20	



Crosstabs

*Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot * Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot Crosstabulation*

			Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot		
			A	C	Total
Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot	A	Count	9	0	9
		% within Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot	100.0%	0.0%	100.0%
		% within Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot	50.0%	0.0%	45.0%
	B	Count	3	0	3
		% within Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot	100.0%	0.0%	100.0%
		% within Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot	16.7%	0.0%	15.0%
	C	Count	6	2	8
		% within Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot	75.0%	25.0%	100.0%

	% within Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot	33.3%	100.0%	40.0%
Total	Count	18	2	20
	% within Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot	90.0%	10.0%	100.0%
	% within Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot	100.0%	100.0%	100.0%

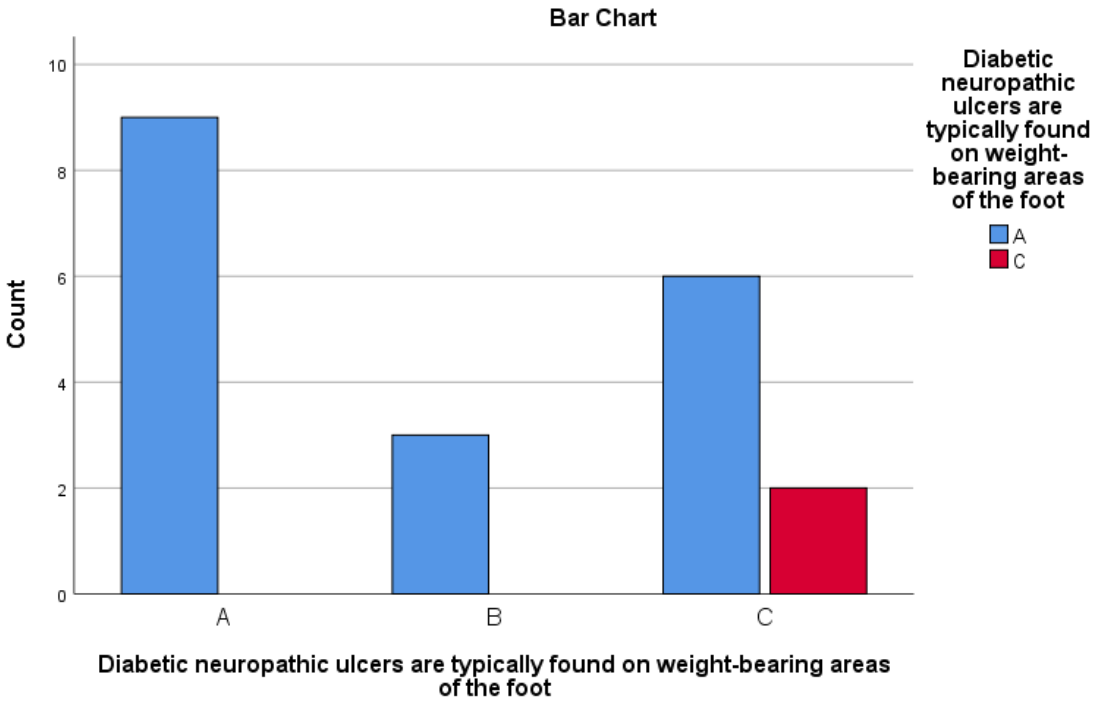
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.333[a]	2	.189
Likelihood Ratio	4.006	2	.135
N of Valid Cases	20		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .30.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.378	.189
N of Valid Cases		20	


Bar Chart
Count
10
8
6
4
2
0
A
B
C
Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot
Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot
A
C

-Crosstabs

*Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers * Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers Crosstabulation*

			Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers	
			A	Total
Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers	A	Count	11	11
		% within Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers	100.0%	100.0%
		% within Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers	55.0%	55.0%
	B	Count	4	4
		% within Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers	100.0%	100.0%
		% within Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers	20.0%	20.0%
	C	Count	5	5
		% within Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers	100.0%	100.0%
		% within Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers	25.0%	25.0%
Total		Count	20	20
		% within Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers	100.0%	100.0%

	% within Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers	100.0%	100.0%

Chi-Square Tests

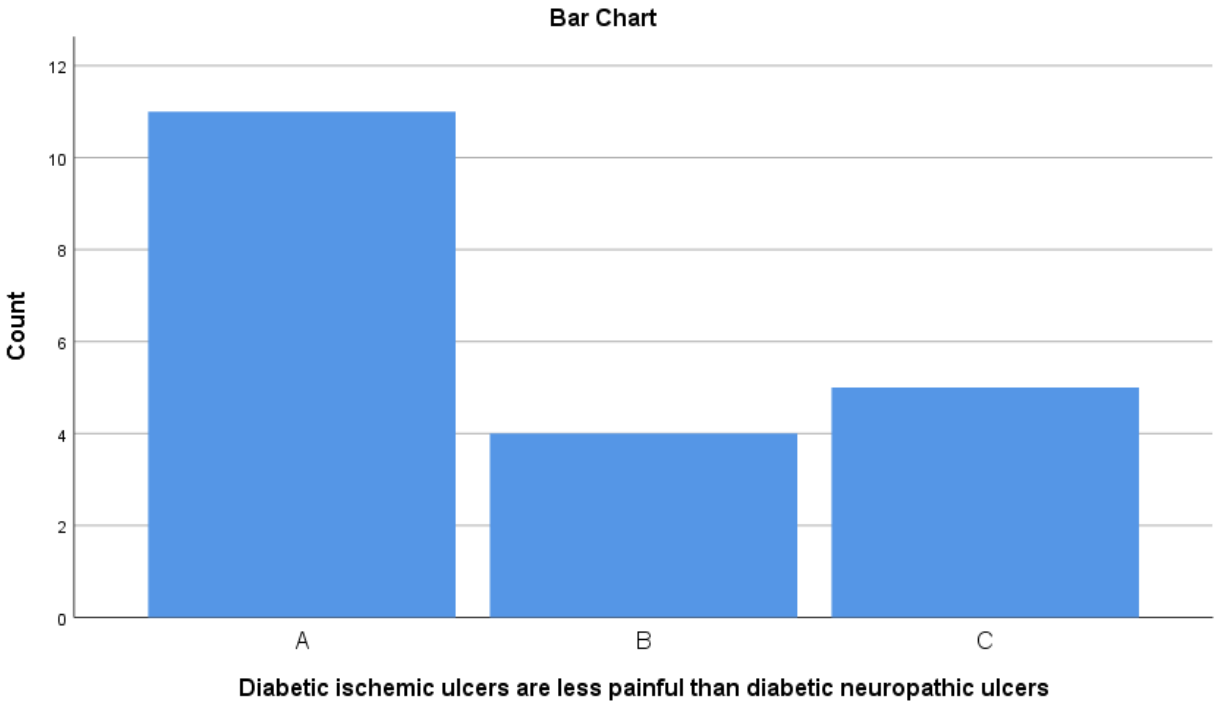
	Value
Pearson Chi-Square	.[a]
N of Valid Cases	20

a. No statistics are computed because Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers is a constant.

Symmetric Measures

		Value
Nominal by Nominal	Contingency Coefficient	.[a]
N of Valid Cases		20

a. No statistics are computed because Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers is a constant.


Bar Chart
Count
12
10
8
6
4
2
0
A
B
C
Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers

Crosstabs

*Neuropathy can be excluded if the foot skin is cool, and pulses are absent * Neuropathy can be excluded if the foot skin is cool, and pulses are absent Crosstabulation*

			Neuropathy can be excluded if the foot skin is cool, and pulses are absent			
			A	B	C	Total
Neuropathy can be excluded if the foot skin is cool, and pulses are absent	A	Count	4	0	0	4
		% within Neuropathy can be excluded if the foot skin is cool, and pulses are absent	100.0%	0.0%	0.0%	100.0%
		% within Neuropathy can be excluded if the foot skin is cool, and pulses are absent	22.2%	0.0%	0.0%	20.0%
	B	Count	11	1	0	12
		% within Neuropathy can be excluded if the foot skin is cool, and pulses are absent	91.7%	8.3%	0.0%	100.0%
		% within Neuropathy can be excluded if the foot skin is cool, and pulses are absent	61.1%	100.0%	0.0%	60.0%
	C	Count	3	0	1	4

*Neuropathy can be excluded if the foot skin is cool, and pulses are absent * Neuropathy can be excluded if the foot skin is cool, and pulses are absent Crosstabulation*

			Neuropathy can be excluded if the foot skin is cool, and pulses are absent			
			A	B	C	Total
Neuropathy can be excluded if the foot skin is cool, and pulses are absent	C	% within Neuropathy can be excluded if the foot skin is cool, and pulses are absent	75.0%	0.0%	25.0%	100.0%
		% within Neuropathy can be excluded if the foot skin is cool, and pulses are absent	16.7%	0.0%	100.0%	20.0%
Total		Count	18	1	1	20
		% within Neuropathy can be excluded if the foot skin is cool, and pulses are absent	90.0%	5.0%	5.0%	100.0%
		% within Neuropathy can be excluded if the foot skin is cool, and pulses are absent	100.0%	100.0%	100.0%	100.0%

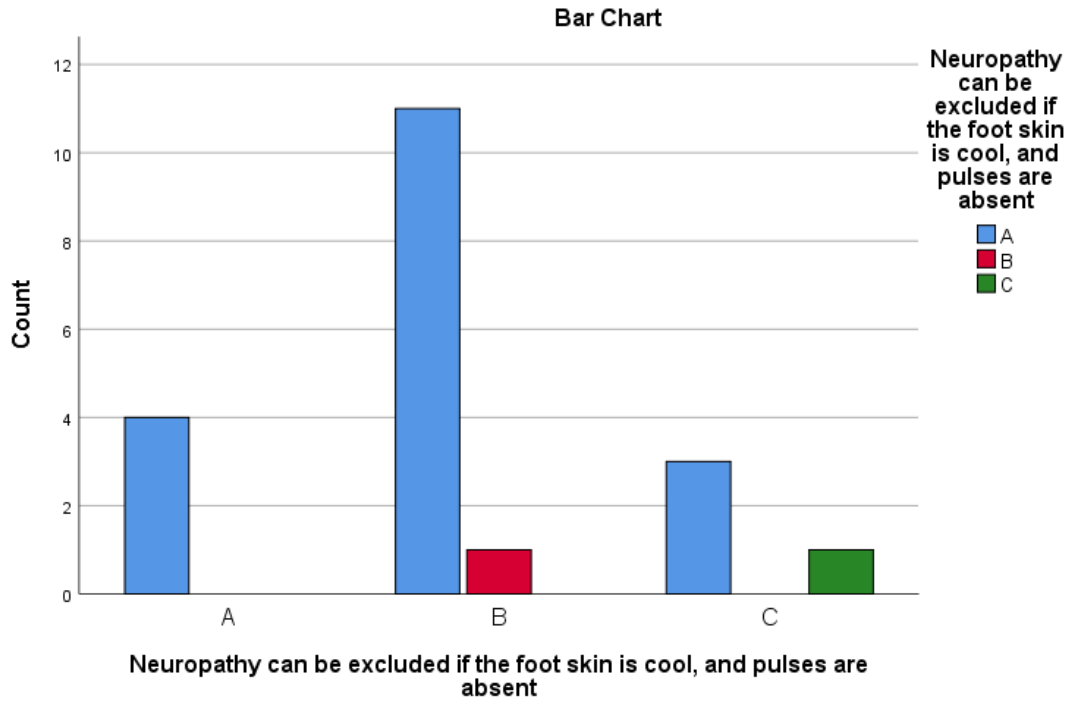
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.815[a]	4	.307
Likelihood Ratio	4.393	4	.355
N of Valid Cases	20		

a. 8 cells (88.9%) have expected count less than 5. The minimum expected count is .20.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.440	.307
N of Valid Cases		20	



Crosstabs

*The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia * The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia Crosstabulation*

			The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia		
			A	C	Total
The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia	A	Count	14	0	14
		% within The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia	100.0%	0.0%	100.0%

		% within The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia	73.7%	0.0%	70.0%
	B	Count	1	0	1
		% within The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia	100.0%	0.0%	100.0%
		% within The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia	5.3%	0.0%	5.0%
	C	Count	4	1	5
		% within The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia	80.0%	20.0%	100.0%
		% within The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia	21.1%	100.0%	25.0%
Total		Count	19	1	20
		% within The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia	95.0%	5.0%	100.0%

	% within The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia	100.0%	100.0%	100.0%

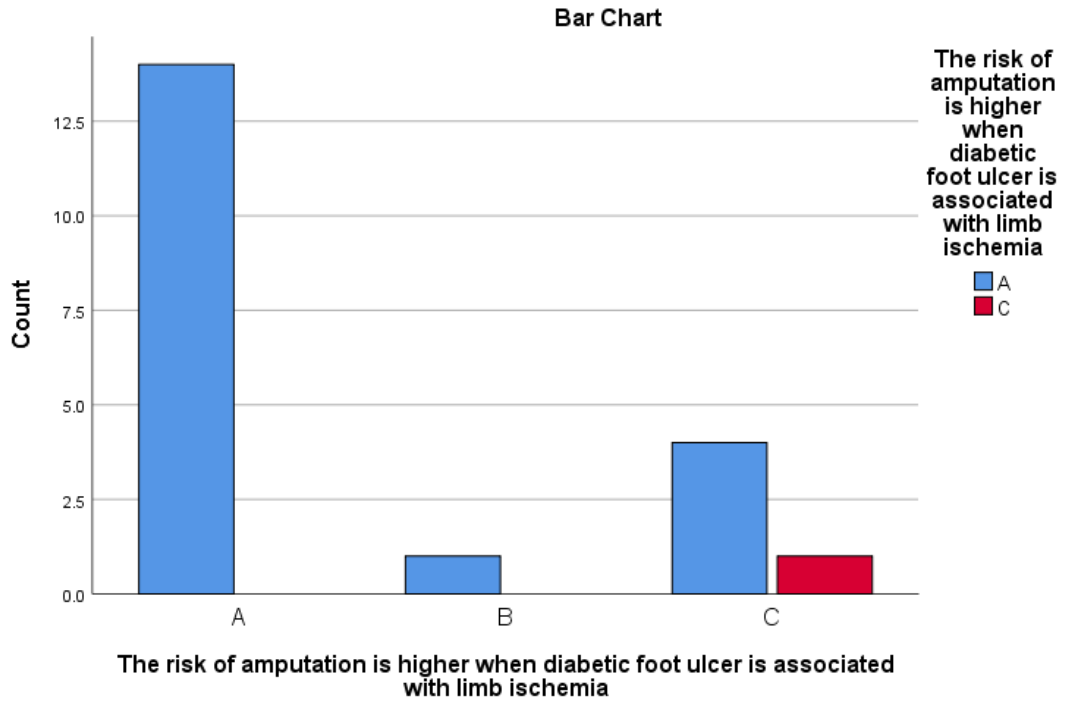
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.158[a]	2	.206
Likelihood Ratio	2.937	2	.230
N of Valid Cases	20		

a. 5 cells (83.3%) have expected count less than 5. The minimum expected count is .05.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.369	.206
N of Valid Cases		20	



Crosstabs

*Presence of slough is not an indication of infection in diabetic ulcers * Presence of slough is not an indication of infection in diabetic ulcers Crosstabulation*

			Presence of slough is not an indication of infection in diabetic ulcers	
			A	Total
Presence of slough is not an indication of infection in diabetic ulcers	A	Count	3	3
		% within Presence of slough is not an indication of infection in diabetic ulcers	100.0%	100.0%

		% within Presence of slough is not an indication of infection in diabetic ulcers	15.0%	15.0%
	B	Count	9	9
		% within Presence of slough is not an indication of infection in diabetic ulcers	100.0%	100.0%
		% within Presence of slough is not an indication of infection in diabetic ulcers	45.0%	45.0%
	C	Count	8	8
		% within Presence of slough is not an indication of infection in diabetic ulcers	100.0%	100.0%
		% within Presence of slough is not an indication of infection in diabetic ulcers	40.0%	40.0%
Total		Count	20	20
		% within Presence of slough is not an indication of infection in diabetic ulcers	100.0%	100.0%
		% within Presence of slough is not an indication of infection in diabetic ulcers	100.0%	100.0%

Chi-Square Tests

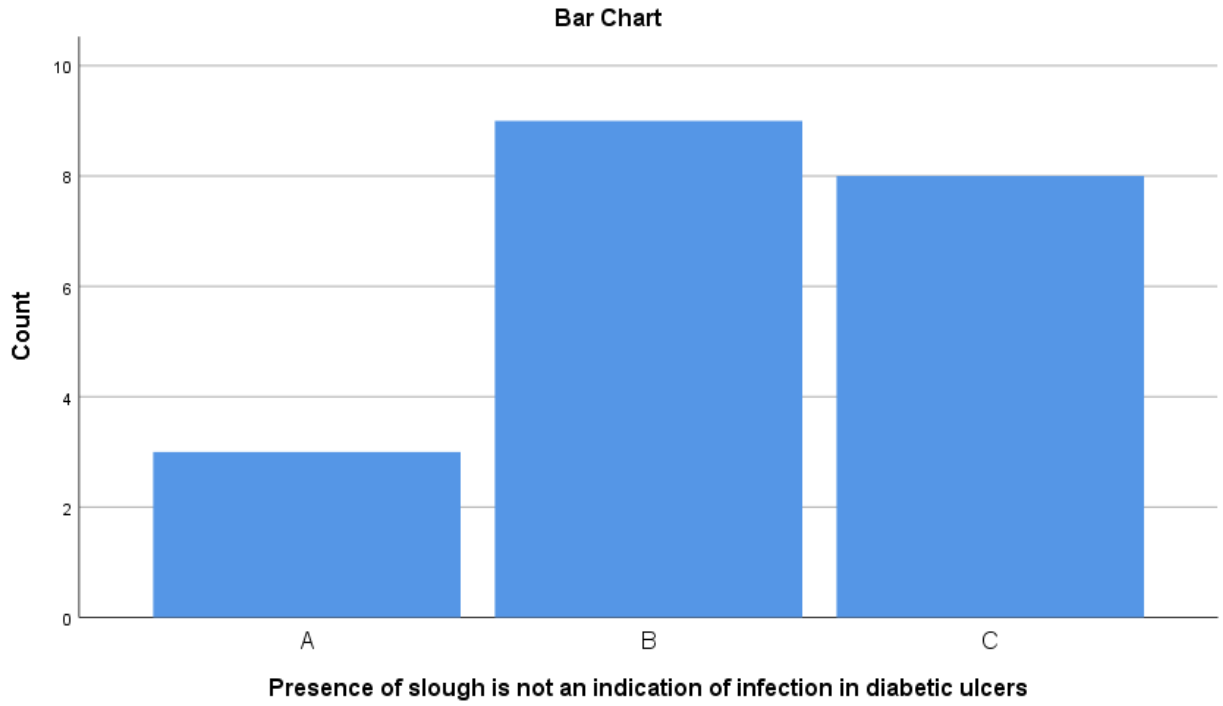
	Value
Pearson Chi-Square	.[a]
N of Valid Cases	20

a. No statistics are computed because Presence of slough is not an indication of infection in diabetic ulcers is a constant.

Symmetric Measures

		Value
Nominal by Nominal	Contingency Coefficient	.[a]
N of Valid Cases		20

a. No statistics are computed because Presence of slough is not an indication of infection in diabetic ulcers is a constant.


Bar Chart
Count
10
8
6
4
2
0
A
B
C
Presence of slough is not an indication of infection in diabetic ulcers

Crosstabs

*Presence of osteomyelitis impairs the healing of diabetic ulcers * Presence of osteomyelitis impairs the healing of diabetic ulcers Crosstabulation*

			Presence of osteomyelitis impairs the healing of diabetic ulcers		
			A	C	
Presence of osteomyelitis impairs the healing of diabetic ulcers	A	Count	12	0	
		% within Presence of osteomyelitis impairs the healing of diabetic ulcers	100.0%	0.0%	
		% within Presence of osteomyelitis impairs the healing of diabetic ulcers	66.7%	0.0%	
	C	Count	6	2	
		% within Presence of osteomyelitis impairs the healing of diabetic ulcers	75.0%	25.0%	
		% within Presence of osteomyelitis impairs the healing of diabetic ulcers	33.3%	100.0%	
Total		Count	18	2	
		% within Presence of osteomyelitis impairs the healing of diabetic ulcers	90.0%	10.0%	
		% within Presence of osteomyelitis impairs the healing of diabetic ulcers	100.0%	100.0%	

Chi-Square Tests

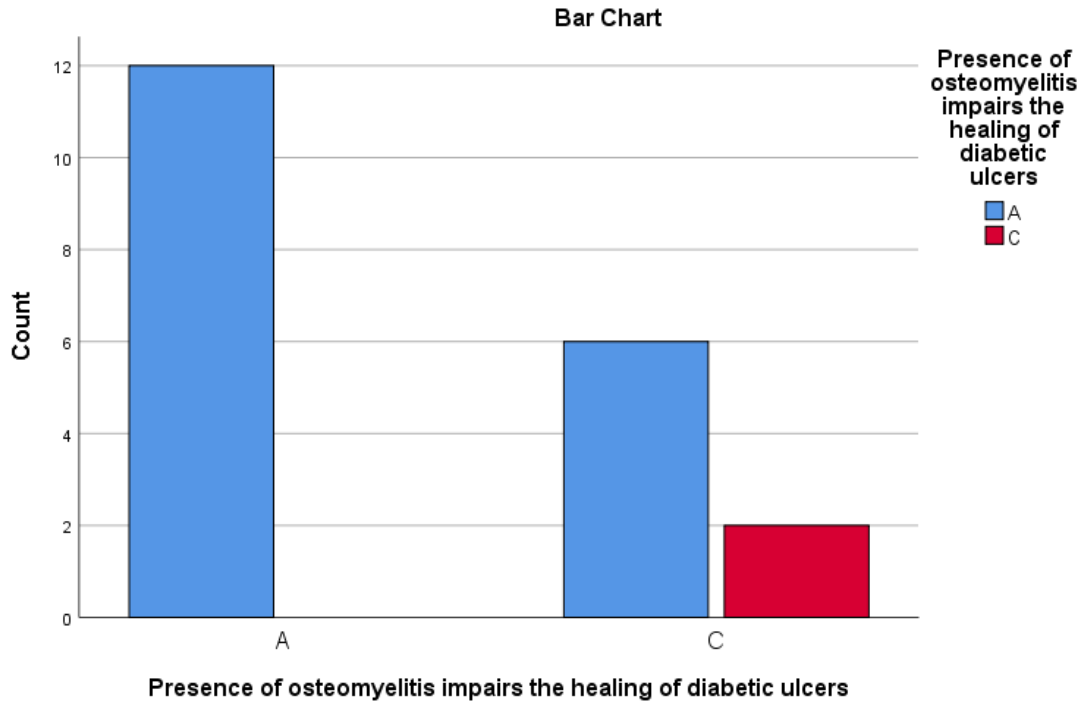
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.333[a]	1	.068		
Continuity Correction[b]	1.134	1	.287		
Likelihood Ratio	4.006	1	.045		
Fisher's Exact Test				.147	.147
N of Valid Cases	20				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .80.

b. Computed only for a 2x2 table

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.378	.068
N of Valid Cases		20	



Crosstabs

*Wound healing progress is unsatisfactory if the wound bed appears pink * Wound healing progress is unsatisfactory if the wound bed appears pink Crosstabulation*

			Wound healing progress is unsatisfactory if the wound bed appears pink		
			A	B	Total
Wound healing progress is unsatisfactory if the wound bed appears pink	A	Count	1	6	7
		% within Wound healing progress is unsatisfactory if the wound bed appears pink	14.3%	85.7%	100.0%

		% within Wound healing progress is unsatisfactory if the wound bed appears pink	100.0%	31.6%	35.0%
	B	Count	0	11	11
		% within Wound healing progress is unsatisfactory if the wound bed appears pink	0.0%	100.0%	100.0%
		% within Wound healing progress is unsatisfactory if the wound bed appears pink	0.0%	57.9%	55.0%
	C	Count	0	2	2
		% within Wound healing progress is unsatisfactory if the wound bed appears pink	0.0%	100.0%	100.0%
		% within Wound healing progress is unsatisfactory if the wound bed appears pink	0.0%	10.5%	10.0%
Total		Count	1	19	20
		% within Wound healing progress is unsatisfactory if the wound bed appears pink	5.0%	95.0%	100.0%

	% within Wound healing progress is unsatisfactory if the wound bed appears pink	100.0%	100.0%	100.0%

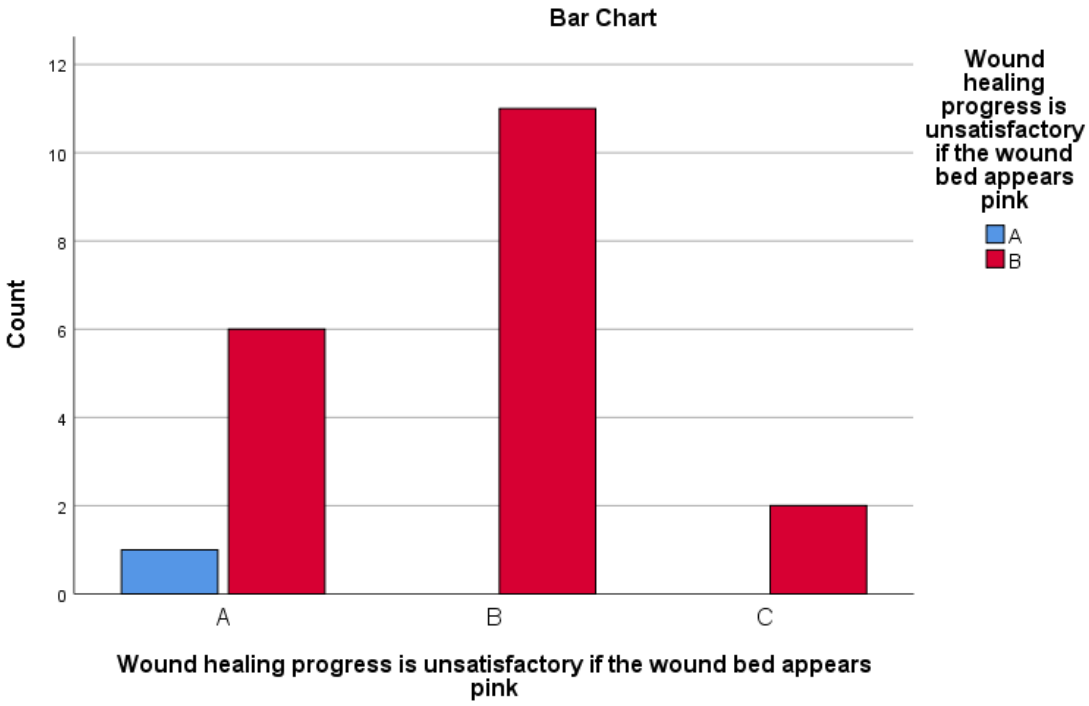
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	1.955[a]	2	.376
Likelihood Ratio	2.199	2	.333
N of Valid Cases	20		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .10.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.298	.376
N of Valid Cases		20	


Bar Chart
Count
12
10
8
6
4
2
0
A
B
C
Wound healing progress is unsatisfactory if the wound bed appears pink
Wound healing progress is unsatisfactory if the wound bed appears pink
A
B

Crosstabs

*Mechanical offloading should be advised to facilitate ulcer healing * Mechanical offloading should be advised to facilitate ulcer healing Crosstabulation*

			Mechanical offloading should be advised to facilitate ulcer healing			
			A	B	C	Total
Mechanical offloading should be advised to facilitate ulcer healing	A	Count	10	0	0	10
		% within Mechanical offloading should be advised to facilitate ulcer healing	100.0%	0.0%	0.0%	100.0%
		% within Mechanical offloading should be advised to facilitate ulcer healing	58.8%	0.0%	0.0%	50.0%
	B	Count	3	2	0	5
		% within Mechanical offloading should be advised to facilitate ulcer healing	60.0%	40.0%	0.0%	100.0%
		% within Mechanical offloading should be advised to facilitate ulcer healing	17.6%	100.0%	0.0%	25.0%
	C	Count	4	0	1	5
		% within Mechanical offloading should be advised to facilitate ulcer healing	80.0%	0.0%	20.0%	100.0%
		% within Mechanical offloading should be advised to facilitate ulcer healing	23.5%	0.0%	100.0%	25.0%

Total	Count	17	2	1	20
	% within Mechanical offloading should be advised to facilitate ulcer healing	85.0%	10.0%	5.0%	100.0%
	% within Mechanical offloading should be advised to facilitate ulcer healing	100.0%	100.0%	100.0%	100.0%

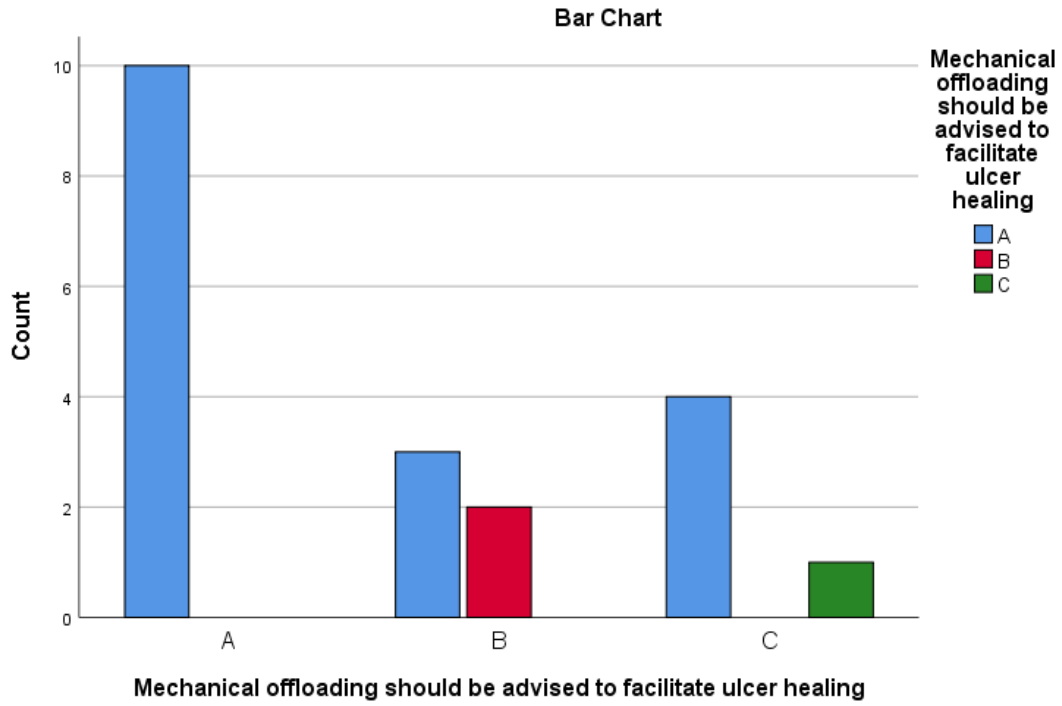
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	9.647[a]	4	.047
Likelihood Ratio	8.993	4	.061
N of Valid Cases	20		

a. 8 cells (88.9%) have expected count less than 5. The minimum expected count is .25.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.570	.047
N of Valid Cases		20	



Crosstabs

*Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot * Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot Crosstabulation*

		Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot			
		A	B	C	Total
A	Count	6	0	0	6

Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot		% within Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot	100.0%	0.0%	0.0%	100.0%
		% within Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot	33.3%	0.0%	0.0%	30.0%
	B	Count	3	1	0	4
		% within Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot	75.0%	25.0%	0.0%	100.0%
		% within Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot	16.7%	100.0%	0.0%	20.0%
	C	Count	9	0	1	10
		% within Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot	90.0%	0.0%	10.0%	100.0%
		% within Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot	50.0%	0.0%	100.0%	50.0%
Total		Count	18	1	1	20

	% within Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot	90.0%	5.0%	5.0%	100.0%
	% within Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot	100.0%	100.0%	100.0%	100.0%

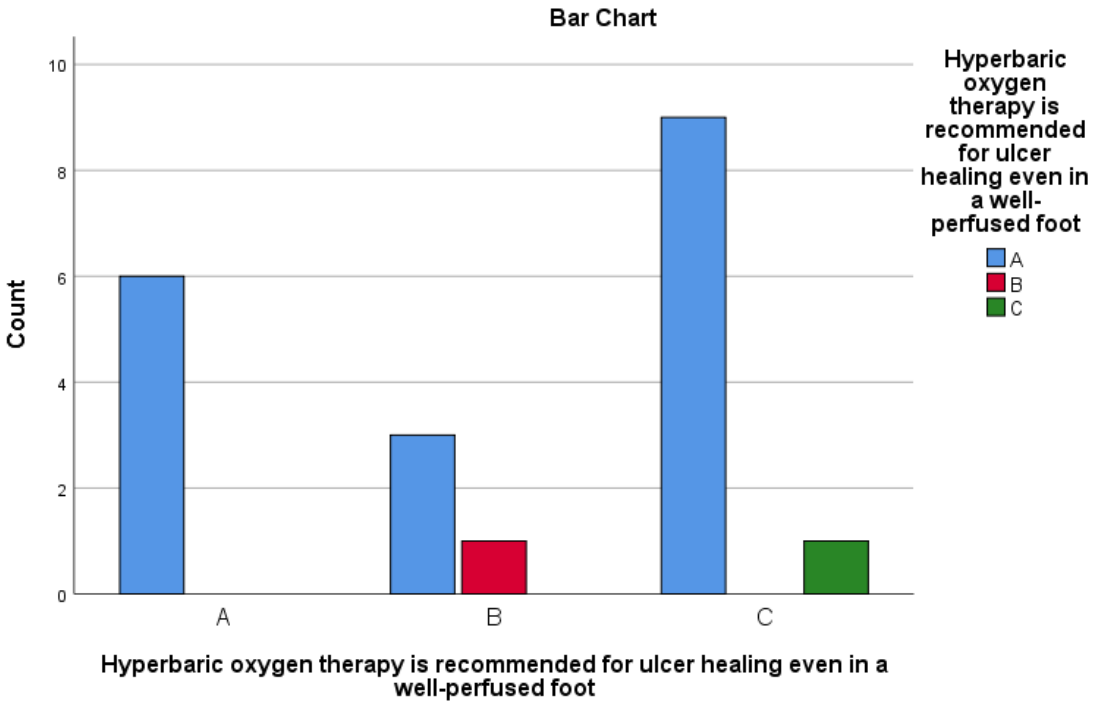
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	5.167[a]	4	.271
Likelihood Ratio	4.776	4	.311
N of Valid Cases	20		

a. 7 cells (77.8%) have expected count less than 5. The minimum expected count is .20.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.453	.271
N of Valid Cases		20	


Bar Chart
Count
10
8
6
4
2
0
A
B
C
Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot
Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot
A
B
C

Crosstabs

*Infected, highly exuding wounds should be cleansed daily * Infected, highly exuding wounds should be cleansed daily Crosstabulation*

			Infected, highly exuding wounds should be cleansed daily		
			A	C	Total
Infected, highly exuding wounds should be cleansed daily	A	Count	11	0	11
		% within Infected, highly exuding wounds should be cleansed daily	100.0%	0.0%	100.0%
		% within Infected, highly exuding wounds should be cleansed daily	61.1%	0.0%	55.0%
	B	Count	1	0	1
		% within Infected, highly exuding wounds should be cleansed daily	100.0%	0.0%	100.0%
		% within Infected, highly exuding wounds should be cleansed daily	5.6%	0.0%	5.0%
	C	Count	6	2	8
		% within Infected, highly exuding wounds should be cleansed daily	75.0%	25.0%	100.0%
		% within Infected, highly exuding wounds should be cleansed daily	33.3%	100.0%	40.0%
Total		Count	18	2	20
		% within Infected, highly exuding wounds should be cleansed daily	90.0%	10.0%	100.0%

	% within Infected, highly exuding wounds should be cleansed daily	100.0%	100.0%	100.0%

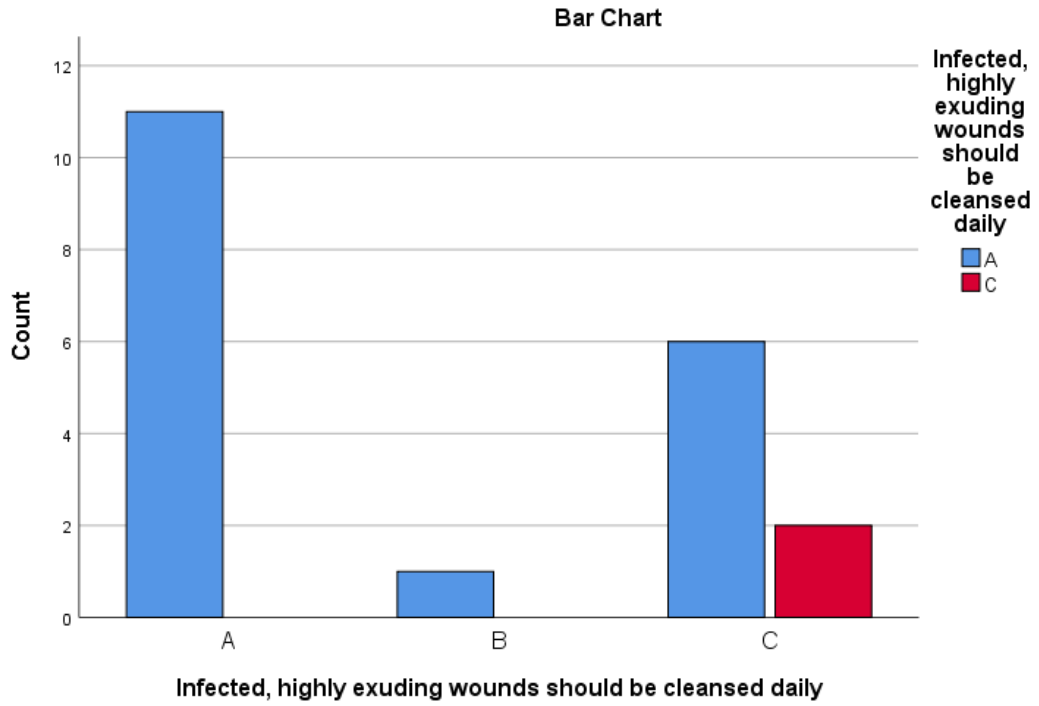
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.333[a]	2	.189
Likelihood Ratio	4.006	2	.135
N of Valid Cases	20		

a. 4 cells (66.7%) have expected count less than 5. The minimum expected count is .10.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.378	.189
N of Valid Cases		20	


Bar Chart
Count
12
10
8
6
4
2
0
A
B
C
Infected, highly exuding wounds should be cleansed daily
Infected, highly exuding wounds should be cleansed daily
A
C

Crosstabs

*Iodine is effective for wounds with clinical signs of infection * Iodine s are effective for wounds with clinical signs of infection Crosstabulation*

			Iodine dressings are effective for wounds with clinical signs of infection			
			A	B	C	Total
Iodine dessings are effective for wounds with clinical signs of infection	A	Count	8	0	0	8
		% within Iodine dessings are effective for wounds with clinical signs of infection	100.0%	0.0%	0.0%	100.0%
		% within Iodine dessings are effective for wounds with clinical signs of infection	44.4%	0.0%	0.0%	40.0%
	B	Count	1	1	0	2
		% within Iodine dessings are effective for wounds with clinical signs of infection	50.0%	50.0%	0.0%	100.0%
		% within Iodine dessings are effective for wounds with clinical signs of infection	5.6%	100.0%	0.0%	10.0%
	C	Count	9	0	1	10

	% within Iodine dessings are effective for wounds with clinical signs of infection	90.0%	0.0%	10.0%	100.0%
	% within Iodine dessings are effective for wounds with clinical signs of infection	50.0%	0.0%	100.0%	50.0%
Total	Count	18	1	1	20
	% within Iodine dessings are effective for wounds with clinical signs of infection	90.0%	5.0%	5.0%	100.0%
	% within Iodine dessings are effective for wounds with clinical signs of infection	100.0%	100.0%	100.0%	100.0%

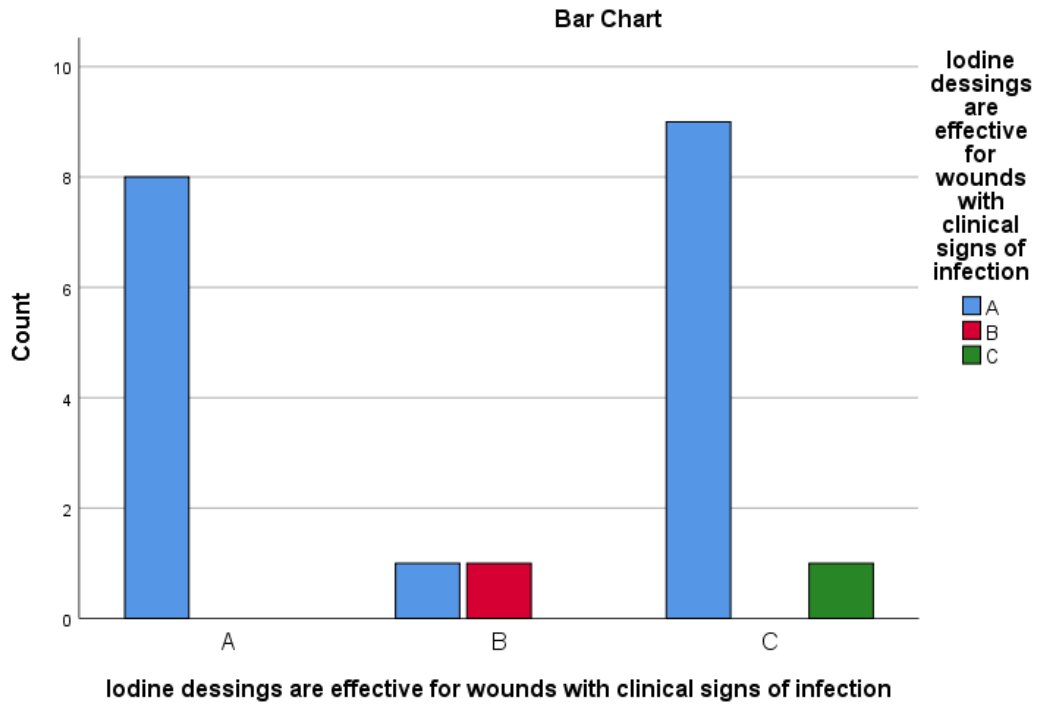
Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.444[a]	4	.034
Likelihood Ratio	6.502	4	.165
N of Valid Cases	20		

a. 7 cells (77.8%) have expected count less than 5. The minimum expected count is .10.

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Contingency Coefficient	.586	.034
N of Valid Cases		20	



Crosstabs

*Hydrogel dressint is useful? * Hydrogel dressint is useful? Crosstabulation*

			Hydrogel dressint is useful?	
			A	Total
Hydrogel dressint is useful?	A	Count	8	8
		% within Hydrogel dressing is useful?	100.0%	100.0%
		% within Hydrogel dressing -is useful?	40.0%	40.0%
	B	Count	2	2
		% within Hydrogel dressing is useful?	100.0%	100.0%
		% within Hydrogel dressing is useful?	10.0%	10.0%
	C	Count	10	10
		% within Hydrogel dressing is useful?	100.0%	100.0%
		% within Hydrogel dressing is useful?	50.0%	50.0%
Total		Count	20	20
		% within Hydrogel dressing is useful?	100.0%	100.0%
		% within Hydrogel dressing is useful?	100.0%	100.0%

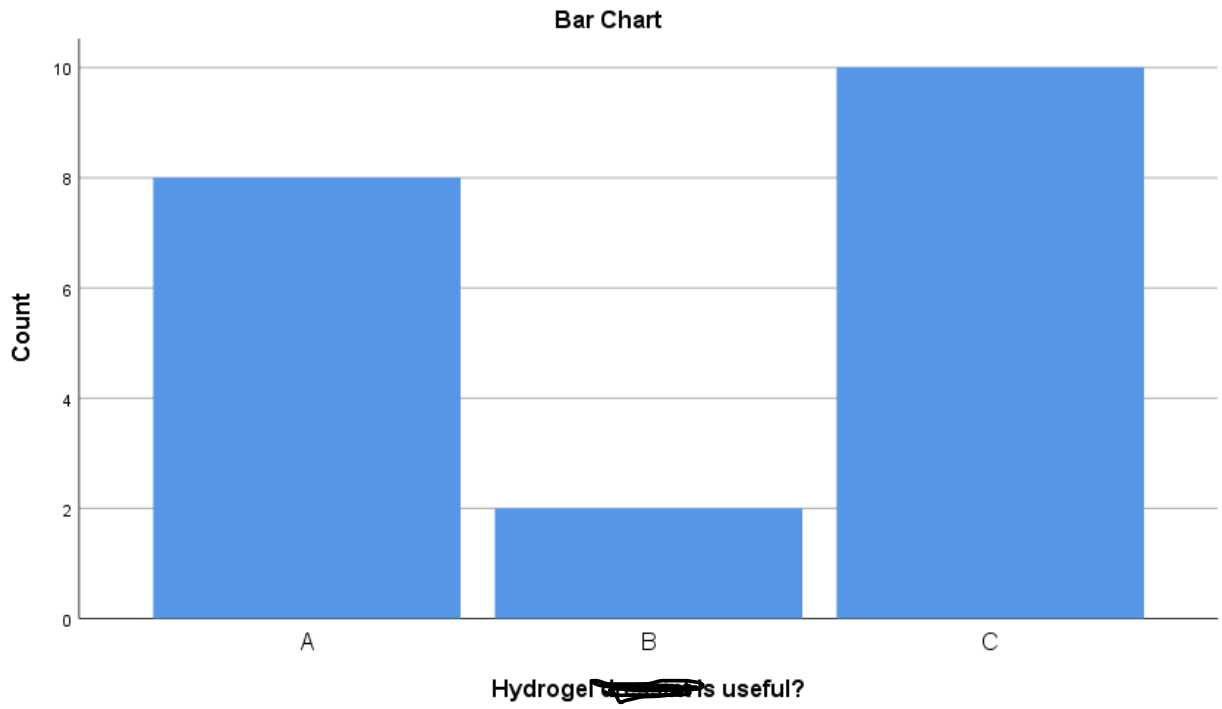
Chi-Square Tests

	Value
Pearson Chi-Square	.[a]
N of Valid Cases	20

Symmetric Measures

		Value
Nominal by Nominal	Contingency Coefficient	.[a]
N of Valid Cases		20

a. No statistics are computed because Hydrogel is useful? is a constant.



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Final consideration of the practice change project

The DNP proposal targeting the reduction of infection rates in patients with diabetes mellitus within a South Florida Home Health Agency through an educational program for nurses is a significant and promising initiative. The project is grounded in well-established theories and real-world processes, ensuring its scientific integrity and ethical foundation. By formulating research questions and hypotheses, the project not only contributes to existing knowledge but also opens avenues for further studies in the field.

The focus on educating nurses within the home health care system about the risks of foot ulcers in diabetic patients is particularly relevant, given the high infection risk faced by individuals with type 2 diabetes mellitus. The expected outcomes, including improved knowledge, enhanced skills proficiency, and increased confidence among trained nurses, have the potential to positively impact patient care and outcomes.

Recognizing the pivotal role of home healthcare workers in preventing diabetic foot ulcers, the project aligns with the broader goal of fostering early prevention and awareness of foot care. By ad these aspects, the initiative not only contributes to individual patient well-being but also supports the overall health of communities.

The incorporation of a comprehensive literature review and the development of robust research methods and tools, including a validated pre and post evaluation, demonstrate the project's meticulous planning. The period of implementation gave positive results, ad the PICOT question and providing valuable insights into the effectiveness of the educational program.

Furthermore, the understanding of health as a holistic concept, encompassing goal-directed behavior, self-care, and interpersonal relationships, underpins the project's approach. By

viewing illness as a discrete event that can impact a patient's journey toward health, the project acknowledges the multifaceted nature of healthcare.

As the project progresses, the analysis of results and subsequent recommendations for future actions were crucial in translating findings into practical interventions. The potential positive impact on patients, families, and communities, as well as the broader implications for diabetes management, underscores the importance of this DNP project.

In essence, this proposal not only addresses a specific healthcare concern but also contributes to the advancement of nursing knowledge and practices. The success of this initiative has the potential to shape future strategies in diabetic care, emphasizing the role of education and awareness in preventing complications and improving overall health outcomes.

Questionnaires

Instruction Statemen for the Questionnaire

Before proceeding with the "Nurses' Knowledge Questionnaire Towards Diabetic Foot Ulcer Care," please carefully read and follow the instructions provided below:

1. Voluntary Participation: Your participation in this study is entirely voluntary. You have the right to decline participation without providing any reason, and this decision will not result in any negative consequences or impact your employment or professional standing.
2. Confidentiality: All information you provide will be treated with strict confidentiality. Your responses will be anonymized, and no individual participant will be identifiable in any publication or presentation resulting from this research.
3. Honest Responses: Please answer all questions in the questionnaire truthfully and to the best of your ability. There are no evaluation on right or wrong answers; we are interested in assessing your current knowledge in diabetic foot ulcer care.
4. Time Frame: The questionnaire should take approximately 10-15 minutes to complete. However, you could take more time is needed.
5. Data Submission: Once you have completed the questionnaire, present to the PI who will be in charge of this step of the whole process.
6. Withdrawal: If you decide to withdraw from the study at any point before submitting the questionnaire, you may do so without providing a reason. Your decision to withdraw will not affect your relationship with the researchers or the institution.

Thank you for your participation in this research. Your input is valuable in improving our understanding of diabetic foot ulcer care and enhancing patient outcomes. If you agree to participate and have understood the instructions provided above, please proceed to begin the questionnaire.

The Impact of an Educational Program Implemented in Home Health Nurses to Reduce Foot Ulcers Rates in Patients with Diabetes Mellitus Type 2

Data Collection Tool: "Nurses' knowledge questionnaire towards diabetic foot ulcer care"

The outcome measures of the project will be in relation with the nurse knowledge (good knowledge/insufficient knowledge), the tools that will be used is the "Nurses' knowledge questionnaire towards diabetic foot ulcer care" (Abate et al., 2020), that consist of 15 questions, with 3 possible answers: Yes (1); No (2); Do not know (3).

	Questions	Yes (1)	No (2)	Do not know (3)
1	Neuropathy is the predominant factor responsible for diabetic ulcers			
2	Sensory neuropathy results in unnoticed skin damages, which lead to the formation of ulcers			
3	Autonomic neuropathy is associated with dry skin, which predisposes to ulcer formation			
4	Diabetic neuropathic ulcers are typically found on weight-bearing areas of the foot			
5	Diabetic ischemic ulcers are less painful than diabetic neuropathic ulcers			
6	Neuropathy can be excluded if the foot skin is cool and pulses are absent			
7	The risk of amputation is higher when diabetic foot ulcer is associated with limb ischemia			
8	Presence of slough is not an indication of infection in diabetic ulcers			
9	Presence of osteomyelitis impairs the healing of diabetic ulcers			
10	Wound healing progress is unsatisfactory if the wound bed appears pink			
11	Mechanical offloading should be advised to facilitate ulcer healing			
12	Hyperbaric oxygen therapy is recommended for ulcer healing even in a well-perfused foot			
13	Infected, highly exuding wounds should be cleansed daily			
14	Iodine s are effective for wounds with clinical signs of infection			
15	Hydrogel s are useful to rehydrate the wound bed and control the moisture in wounds			

Also, general information will be recorded:

General information	
Code number (same code number for pre and post intervention questionnaire)	
Age (years) No less than 21 years-old. From 21 year-old to 65 year-old.	
Gender	Female_____ Male _____
Educational level	Licensed practical nurse (LPN)_____ Registered nurses (RNs)_____ Advanced practice registered nurses (APRNs) ____

Other References

Abate, T. W., Enyew, A., Gebrie, F., & Bayuh, H. (2020). Nurses' knowledge and attitude towards diabetes foot care in Bahir Dar, North West Ethiopia. *Heliyon*, *6*(11), e05552. https://doi.org/10.1016/j.heliyon.2020.e05552

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