The Effect of Bundled Interventions on Self-Management Skills for Patients With Diabetic Foot Ulcerations

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Background: Foot ulcerations present significant problems for patients with diabetes. Consequences related both to diminished physical functioning and decreased social interaction may create socioeconomic hardships such as potential loss of income as well as increased pain, anxiety, and depression. Physiological factors associated with the progression of disease (i.e. poor diabetic control, peripheral vascular disease, diabetic neuropathy, restricted joint mobility) contribute to the development of these ulcerations and impact delayed healing. Without being able to effectively adopt healthy behaviors, people with limited diabetic management skills may develop worsening symptoms and health outcomes with a resultant higher burden and cost on the healthcare system (Al-Rubeaan et al., 2015; Ebadi Fardazar, Tahari, and Solhi, 2018; Hoogeveen, 2015).

Purpose: The purpose of this project was to examine the self-management skills of patients with diabetes who have a preexisting ulceration, and to determine the impact of a high-intensity, nurse-administered foot care intervention bundle (NA-FCIB) upon self-management knowledge, skills and outcomes for diabetic patients with existing foot ulcerations.

Design: Utilizing the Johns Hopkins Nursing Evidence-Based Practice Model (JHN-EBP), this project was conducted at a dedicated wound care clinic over a 3 month period. The sample consisted of 39 patients with diabetic foot ulcerations. The NA-FCIB was administered at each office visit and as part of periodic phone calls for patients whose clinic visits were more than 1 month apart. Baseline measures of foot care knowledge and reported self-care practices were recorded prior to, at 6 weeks and 12 weeks, after the start of NA-FCIB implementation. Ulcerations were measured at each visit and HgbA1C levels were measured at pretest and 12 week posttest.

Search of literature/best evidence: An extensive search of the literature was conducted to identify relevant evidence. Multiple, overlapping databases were searched, specifically PubMed, Medline, Cochrane Library, and CINAHL, as well as Google Scholar. Evidence, based on JHN-EBP criteria and multiple high level randomized controlled studies, was reviewed regarding interventions to promote diabetic patient self-management to prevent the development of foot ulcerations (Al Lenjawi et al., 2017; Campbell, Dunt, Fitzgerald & Gordon, 2015; Hoogeveen et al., 2015; Hemmati Maslakpak et al., 2018; Jutterstrom et al., 2016; Lavallee, Dumville, Russell & Cullum, 2017. The review supported the potential value of enhancing foot care practices with a bundled approach.

Clinical appraisal: Relevant evidence provided support for the implementation of nursing interventions to promote patient self-management of diabetes, and engaging patients with diabetes with periodic foot examination, institution of basic foot hygiene procedures, implementation of measures to protect feet from injury and infection, seeking prompt clinical care in the event of injury, and tight glycemic control. The
apparent simplicity of interventions such as daily foot inspection, use of clean socks, etc. may have contributed to the lack of research regarding their individual efficacy. The literature was congruent with the development and testing of a bundle of foot care interventions that reflect the available evidence, have minimal risk, and whose individual interventions represent standard of care. Standardizing and formalizing care of this select population was a concern though, with individual providers and individual nurses often approaching diabetic interventions from different viewpoints. Prior studies have indicated a relationship between higher intensity interventions for patients with diabetes, and better quality outcomes with improved self-care management.

**Integration into practice:** Utilizing evidence based practice initiatives, the NA-FCIB was established to promote improved self management skills in patients with diabetes, with existing foot ulcerations. Patient education materials were developed to help teach and guide in prevention of further ulceration and in optimal care of the diabetic foot. Staff guidelines for support in teaching were formalized.

**Results and evaluation of evidenced based practice:**
Results of this project showed consistent statistical significance of less than .02 on both the bundled interventions, as well as improvement in ulceration size and HgbA1C levels. As shown by the results of the hypothesis testing, the project had discernable benefits at increasing self-management for patients with diabetes. This bundled intervention significantly improved patients' knowledge, and reported foot care behaviors. Self-reported practices increased as a result of the interventions and their repetition.

The formative evaluation indicated that the NA-FCIB was feasible to implement with no major barriers identified. The NA-FCIB was associated with significantly improved foot care related-knowledge and skills. Over the intervention period, there were also significant decreases in HBA1C and ulcer size and stage which also reflects tighter pharmacologic controls by the clinicians and the specific wound treatment protocols as well as the self-management approaches addressed in the NA-FCIB.

**Conclusion:** The NA-FCIB was effective in improving diabetic self-management practices of individual patients. It was feasible to implement at the level of the individual clinic and was incorporated into routine clinic care. The NA-FCIB also has potential value for other wound care clinics where diabetic foot ulcerations are treated. Translation and evaluation of the outcomes of this project has provided essential information regarding future interventions in the prevention of diabetic foot ulcerations, and the DNP can act as a leader in application of research to practice. The bundled interventions were found to have good patient outcomes and significant effect, and recommendation was to advance into standard practice. Thus the NA-FCIB and the implementation processes associated with this EBP project have larger potential benefit at the level of individual patients and health care systems.

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**Keywords:**
bundled intervention, diabetic foot ulceration and self management

**References:**


Abstract Summary:
This project examined the self-management skills of patients with diabetes who have a preexisting ulceration, and determined the impact of a high intensity, nurse-administered foot care intervention bundle (NA-FCIB) upon self-management knowledge, skills and outcomes for diabetic patients with existing foot ulcerations.

Content Outline:

Introduction:
Foot ulcerations may present significant problems for patients with diabetes. Consequences related both to diminished physical functioning and decreased social interaction may create socioeconomic hardships such as potential loss of income as well as increased pain, anxiety, and depression. Physiological factors associated with the progression of disease (i.e. poor diabetic control, peripheral vascular disease, diabetic neuropathy, restricted joint mobility) contribute to the development of these ulcerations and impact delayed healing (Al-Rubeaan et al., 2015).
Without being able to effectively adopt healthy behaviors, people with limited diabetic management skills may develop worsening symptoms and health outcomes with a resultant higher burden and cost on the healthcare system (Barshes et al., 2013).

Background and Problem:
The literature indicates that people with limited diabetic management skills may develop worsening health outcomes with associated higher costs unless they are able to effectively adopt healthy behaviors (Barshes et al., 2013). Nurses may help diabetics to understand their risk for, and the consequences of, foot ulcerations. The patient’s role in risk reduction through self-care practices and the overall health benefits of such practices were identified at targets for this nurse led intervention.
Standardizing and formalizing care of this select population has been a concern, with individual providers and individual nurses often approaching diabetic interventions from different viewpoints and focus. This in turn speaks to the need for evidence-based interventions. The effectiveness of prior interventions and the supportive evidence may have been lacking.

Purpose:
The purpose of this project was examine the self-management skills of patients with diabetes who have a preexisting ulceration, and to determine the impact of a high
intensity, nurse-administered foot care intervention bundle (NA-FCIB) upon self-management knowledge, skills and outcomes for diabetic patients with existing foot ulcerations, and a more unified approach to patient care.

**Methods:**
The Johns Hopkins Nursing Evidence-Based Practice Model (JHN-EBP) was selected for this project. The “PET” component of the JHN-EBP model was used in the implementation and evaluation of this project. “PET” refers to three successive phases involving (a) P: defining and identifying the Practice question (i.e. preparation), (b) E: collecting and synthesizing the Evidence, and (c) T: Translating the evidence into optimal, effective patient care practice (Dearholt, & Dang, 2012). The philosophy of informed choice was utilized because of its applicability to diabetic foot care self-management, its incorporation of various educational and behavioral change theories, and allowing for different learning preferences Skinner, Cradock, Arundel and Graham (2003). Significance of this project rests in identifying interventions to improve aspects of self-management in diabetics, specifically related to foot care.

Literature review, aligning with the Evidence component of the JHN-EBP model, was compiled. Prior studies have indicated a relationship between higher intensity interventions for diabetics, and improved self-care management, and supported the potential value of enhancing foot care practices with a bundled approach (Al Lenjawi et al., 2017; Campbell, Dunt, Fitzgerald & Gordon, 2015; Ebadi Fardazar, Tahari, & Solhi, 2018; Hemmati Maslakpak et al., 2018; Hoogeveen et al., 2015; Jutterstrom et al., 2016; Lavallee, Dumville, Russell & Cullum, 2017).

**Evaluation:**
A repeated measures approach was used with development of the Nurse-Administered Foot Care Intervention Bundle (NA-FCIB). Variables were calculated based on values assigned to certain response questions and demonstration/teach back of skills offered to the patients in the form of bundled interventions. Analysis used repeat measures ANOVA. Paired sample T-tests demonstrated significant affect on target outcomes of decreased ulceration size and decreased HgbA1C levels.

**Results:**
Results of this project showed consistent statistical significance of less than .02 on both the bundled interventions, as well as improvement in ulceration size and HgbA1C levels. As shown by the results of the hypothesis testing, the project had discernable benefits at increasing self-management for patients with diabetes. This bundled intervention significantly improved patients' knowledge, and reported foot care behaviors. Self-reported practices increased as a result of the interventions and their repetition.

**Interventions:**
The NA-FCIB was formalized as standard patient care in this project, “bundled” into one overall intervention approach. The project focused on simplistic to complex but essential issues: foot care exam and demonstration, food planning, medication administration, glycemic control, and risk factor reduction. Reinforcement of the components of the NA-FCIB were completed after each visit and subsequent retesting. Final testing compared pre/post testing of project. Hypotheses were formulated based on the topics covered within bundled subset areas.

**Conclusion:**
Over the intervention period, there were also significant decreases in HBA1C and ulcer size that also reflected tighter pharmacologic controls by the clinicians and the specific wound treatment protocols as well as the self-management approaches addressed in the NA-FCIB.
Translation and evaluation of the outcomes of this project has provided essential information regarding future interventions in the prevention of diabetic foot ulcerations, and the DNP can act as a leader in application of research to practice. The bundled interventions were found to have good patient outcomes and significant effect, and recommendation was to advance into standard practice.

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Author Summary: Janice Zima has been a wound care nurse practitioner for 12 years, specializing in diabetic foot ulcerations. She has a passion and vision to improve the delivery of care to patients with diabetes, addressing self-management issues while allowing for different learning styles. Her development of the Nurse Administered Footcare Intervention Bundle has shown significant improvement not only in self-management skills of patients but also in improved healing of their ulcerations, and decreased HgbA1C scores.