# Improving Diabetic Foot Ulcers Using a Management Protocol for Home Health Nurses

By

Kim G. Geiger

Touro University, Nevada

In partial fulfillment of the requirements for the Doctor of Nursing Practice

DNP Project Chair: Denise Zabriskie DNP, RN

DNP Project Member: Salli Vannucci DNP, APRN, PMHNP-BC, RN, GCPH

# Overview of the project

- Lack of  a standardized DFU prevention and management protocol and lack of knowledge among the health care providers has resulted to poor management of DFU.
- The aim of the project was to create a DFU protocol to guide in prevention and management of DFU.
- The project resulted to increased knowledge and compliance among the home health nurses.
- Training the nurses in DFU prevention and management will help increase knowledge and enhance compliance with the protocol.
- Knowledge and compliance with protocol are important to bearing effective outcomes during care delivery to DFU patients.

# Background

- One of the main complications of diabetes mellitus (DM) is diabetic foot ulcers (DFU)
- Nurses are obligated to prevent and manage DM.
- Poor management of DM can lead to complications .
- However, the nurses have limited education pertaining to prevention of the diabetic foot ulcer (DFU) (Standl et al 2019).
- Secondly, there is no standardized protocol to guide in the prevention and management of DFUs.
- This has resulted to lower standards of care and the omission of prevention and management of DFU.

# Impact of the problem

- Deteriorates the quality of life.
- Increased hospitalization and risk of mortality.
- Increased health care costs.
- Loss of income.
- Leg amputation.

# Significance to nursing and host site

- By creating and training home health nurses about the new DFU protocol, the nurses will become more knowledgeable one prevention and management of DFU.
- The host site and other health care providers will get a standardized protocol that can guide in prevention and management of DFU.
- This will help in improving the quality of life for the patients with DFU.
- The patients will save on health care costs and the length of stay in hospital will be reduced hence less infections.
- Additionally, the nurses and patients satisfaction will improve.

# DNP project problem

- The home health nurses prevent, diagnose and manage DFU services in routine interactions.
- However, nurses lack a standardized protocol to prevent and manage DFU in the home health setting.
- The home health nurses provide broad services such as, wound care and administration of intravenous medication and IV catheter changes.
- Therefore, developing a DFU protocol will be important for the home health nurses to offer quality patient care (Kaya & Karaca, 2018).

# Purpose statement

- The purpose of the project was to develop and implement a DFU prevention and management protocol.
- The protocol would  provide a pathway to improve  knowledge and care delivery and create a standardized care guide or DFU prevention and management.

# Project Objectives

- Create an evidence-based DFU management protocol.
- Educate home health nursing staff on the new DFU management protocol.
- Assess knowledge of DFU treatment and prevention by using pre-and posttests.
- Evaluate participant compliance with the DFU management protocol by performing a chart audit.

# Literature Review

- A literature review was carried out  by evaluating the of scholarly articles related to DFU.
- The databases used included CINAHL, PubMed, Jay Sexter Library, and Google scholar.
- The key words used were diabetic foot ulcers, diabetic foot ulcer management, prevention of diabetic foot ulcers, diabetic wound care, and emerging technologies in DFU.
- The  themes explored in the literature review included
  - Risk factors
  - Prevention protocols
  - National guideline initiatives
  - Management of DFU
  - Emerging technologies

# Risk factors and prevention protocols

- Risk factors
  - DFUs can be prevented through proper screening and identifying the patients with high risk.
  - The common risk factors are peripheral vascular disease, poor glycemic control, neuropathy, smoking of cigarette , previous foot ulcerations and amputation (Standl et al 2019)
- Prevention protocols
  - The International Working Group on the Diabetic Foot (IWGDF) developed evidenced based prevention and management guidelines.
  - DM patients should be screened annually and educated according to the guidelines.

# National Guideline Initiatives and Management of DFU.

- National guideline initiative
  - National Institute for Health and Care Excellence (2015) also recommends annual screening of DFU among DM patients (Lim, Ng & Thomas, 2017).
- Management of DFU
  - DFU can be managed using
    - Education
    - Blood sugar control
    - Wound debridement
    - Offloading
    - Advanced wound care
    - Technological advancement

# Theoretical Model

- The settler model of research utilization served as the framework for implementing DFU prevention and management protocol.
- The model provides the health care providers with a guide to assess medical evidences and research findings hence integrate the results in health care practice safely (Damschroder et al., 2020) .
- The model has five phases which include:
  - Preparation
  - Validation Phase
  - Comparative evaluation phase.
  - Implementation
  - Evaluation

# Project Design

- The project utilized a quality improvement design
- A DFU protocol was implemented in home health setting to improve quality of care through prevention and management of DFU.
- Quality measures includes improving assessment, management and treatment of DFU and increasing nurses knowledge on DFU prevention and management..
- The implementation involved developing DFU protocol, Nurses training and assessment of staff knowledge after training and compliance to the protocol using patients charts.
- Data analysis was performed using SPSS version 26.

# Implementation

- The implementation of the DNP project occurred in a home heath care agency in Los Angeles
- This is one of the most populous cities in California
- The city has a population of approximately 10.6 million and noteworthy ethnic range (Population of Los Angeles , 2019).

# Population of Interest

- The direct population of interest is the home health nurses; Six home health nurses including three registered nurses and three LVNs.
- The inclusion criteria is the nurses who fulfill the California State Board of Nursing licensing requirements and those involved in offering direct care to patients as full time employees.
- Per diem, contracted and home health nurses, physical therapists, speech therapists, occupational therapists , certified nurse assistants and those waiting for certification were excluded.

# Tools of Implementation

- Diabetic foot ulcer prevention and management protocol
- Education presentation
- Pre and post test
- Content validity index
- Chart audit tool

# Educational Training

- During the first week of implementation, educational training for the home health nurses was performed.
- The training lasted for four days.
- During the training the nurses were educated on DFU prevention and management.
- Pretest were also administered.

# Week 2 , week 3, week 4 , week 5.

- Implementation of the protocol continued in week 2
- Chart audit began in week 3
- In week 4 implementation continued
- In week 5 data was compiled ready for analysis .

# Evaluation

- The following methods were used for evaluation of the project
  - Pre and post test
  - Patient chart audit
  - Paired T test
  - SPSS Program

# Findings

- Paired t Test was uses to assess the knowledge of the participants .
- There was a significant difference in pre and post test scoves (M=83.33, SD=8.16) and post-test scores (M=100.00, SD=0); t (5) =5.00, d = 2.04, p = 0.004.

| | Post | | | | Pre | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | 95% CI | |
| | M | SD | n | | M | SD | n | t | df | p | Lower | Upper |
| Knowledge | 100.00 | 0.0 | 6 | | 83.33 | 8.16 | 6 | 5.00 | 5 | .004 | 8.10 | 25.24 |

# Provider compliance

- Data was collected through retrospective chart audits using and auditing tool.
- Data was placed in binary format for easy identification.

## Provider compliance

| Nurse | Week3 | | Week4 | | Week5 | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Compliant | Not | Compliant | Not | Compliant | Not | Compliant | Not |
| Nurse1 | 4 | 1 | 2 | | 2 | | 8 | 1 |
| Nurse2 | 4 | | 2 | 1 | 2 | | 8 | 1 |
| Nurse3 | 4 | | 3 | | 2 | | 9 | 0 |
| Nurse4 | 2 | | 3 | | 2 | | 7 | 0 |
| Nurse5 | 3 | 1 | 2 | | 2 | | 7 | 1 |
| Nurse6 | 3 | 1 | 4 | | 2 | | 9 | 1 |
| Totals | 20 | 3 | 16 | 1 | 12 | 0 | 48 | 4 |

## Compliance proportion

| | Compliant | | Proportion | 95% CI[1] | |
|---|---|---|---|---|---|
| | Yes | No | | Upper | Lower |
| **Total** | 48 | 4 | 48/52=.92 | .97 | .82 |

# Conclusion

- The complications related with DFU are harmful to patients health as they can cause longer hospital stays, amputation and death.
- The nurses who took part in the training showed more knowledge on evidence based approached in DFU treatment and prevention and on complying with the protocol.
- The protocol can be used to guide the present and future health care experts in their practice.
- However there is a need for further research to determine the effect of the protocol in reducing DFU rates.

# Dissemination

- The DNP project will be disseminated in the online DNP repository and to the faculty and students of TUN.
- A poster presentation will be conducted in wound care facility and wild on wounds conference in June 2022.

# Project Poster

Touro University Nevada

## Improving Diabetic Foot Ulcers Using a Management Protocol for Home Health

KIM GEIGER DNP PROJECT

Touro University Nevada

Touro University Nevada


### ABSTRACT

**Background:** Poor management of diabetes mellitus leads to complications such as Diabetic Foot Ulcers (DFU). DFUs are associated with high costs of medical care, limb amputation, and increased length of stay in the hospitals or even death. The patient's quality of life is also affected because the disease causes reduced mobility and depression. The negative impact of DFU can be prevented by following strict DFU prevention and management protocol.

**Purpose**: This quality improvement project aimed in creating a DFU protocol on prevention and treatment of DFU, increasing nurse's knowledge on DFU management and evaluating participant compliance with the DFU management protocol by performing a chart audit.

**Methodology**: This was demonstrated by use of evidence based clinical research and theoretical method to design the DFU protocol. The DNP project was guided by The Stetler Model of Research Utilization that offers a framework used in assessing healthcare services and facilitates understanding how to integrate the results into healthcare practice safely.

**Results**: The project led to an increase knowledge and compliance with the protocol, which are significant towards producing effective results when offering care to the DFU patients.

**Conclusion:** Training nurses in DFU prevention and management can help to increase knowledge of DFUs and improve compliance with the use of DFU protocol.


### INTRODUCTION

Diabetic Foot Ulcers is one of the common complication of diabetes mellitus (Standl et al., 2019). DFU can be prevented through identifying the individuals at high risk and implementing management measures. Poor management of DFU mostly results from low competency among the primary care givers and the absence of a standardized foot ulcer prevention and management protocols to guide the nurses in the home health setting (Harding et al., 2019). For the nurses to deliver quality services in prevention and management of DFU complications, they need to be competent. Developing a DFU prevention and management protocol would help the nurses prevent , detect early and treat DFU.

### PROBLEM STATEMENT

The home health nurses are strategically positioned to provide DFU prevention, diagnostic and management services during routine interactions. However, they lack a standard protocol for DFU prevention and management. Additionally, the home health nurses default to basic training in wound care (Warfield, 2019). Because of the lack of knowledge there is a need to educate home health nurses and ensure that they are certified in DFU care (Joyce et al., 2018).

### PROJECT OBJECTIVES

1. Create an evidence-based DFU management protocol.
2. Educate home health nursing staff on the new DFU management protocol.
3. Assess knowledge of DFU treatment and prevention by using pre-and posttests.
4. Evaluate participant compliance with the DFU management protocol by performing a chart audit.

***Project Design***

The Doctor of Nursing Practice project utilized quality improvement design. A DFU protocol was developed and implemented . The project would help in improving the prevention and management of DFU through increasing nurses knowledge on DFU . Compliance to the DFU protocol would also improve.

***Setting***

The project setting is a nursing practice located in Manhattan Beach in California. The practice specialize in family medicine and is open seven days in a week.

***Measurements***

The knowledge on DFU prevention and management was measured using pre and post test. Before the education training, a pretest was administrated and a post test was administrated after the education . The pre and post test were identical. The results of the two tests would be compared to determine if there was an improvement. Participants compliance was measured using patient chart audit . The DFU patient charts were filtered from the electronic health record. The charts were reviewed to determine compliance of nurses in the implemented DFU management protocol.

***Analysis***

A paired t-test was used to analyze the results of pre and post test to determine if there was any significant change in nurses knowledge after the training. The analysis using T-test was based on the assumption that the participants are an accurate representation of the entire population. SPSS version 26 program was used to analyze and compare pre and post test results. A simple percentage of nursing compliance was determined and 95% confidence interval (CI) was used.

### RESULTS

*Nurses Knowledge*

A paired T- test analysis was performed to asses the significance of educational intervention on the knowledge of the participants pre and post sample at $\alpha = 0.05$ significance level. The results showed that the difference between pre and post knowledge was significant. (M=83.33, SD=8.16) and post-test scores (M=100.00, SD=0); $t(5) = 5.00$, $d = 2.04$, $p = 0.004$. The results showed that education intervention increases nursing staff knowledge on the DFU prevention and management measures.

*Table 1. Paired T-tests*

| | Post | | | Pre | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | 95% CI | |
| | M | SD | n | M | SD | n | t | df | p | Lower | Upper |
| Knowledge | 100.00 | 0.0 | 6 | 83.33 | 8.16 | 6 | 5.00 | 5 | .004 | 8.10 | 25.24 |

*Provider compliance*

To determine whether the participants were compliant, data was collected through retrospective chart audit using an audit tool. The collected data was placed in a binary format to ensure easy identification. The question in the audit tool was whether the staff was compliant with the chart audit . The answer was either "yes or no". Descriptive statistics was used and the results showed that the compliance with the protocol was 92%. The compliance population mean was between the confidence level; 82% and 97% for the assessment period of week 3, 4 and 5 . Compliance was calculated as 48 charts compliance and four charts were not compliant. 92% of the nurses were compliant.

*Table 2*

| Nurse | Week3 | | Week4 | | Week5 | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Compliant | Not | Compliant | Not | Compliant | Not | Compliant | Not |
| Nurse1 | 4 | 1 | 2 | | 2 | | 8 | 1 |
| Nurse2 | 4 | | 2 | 1 | 2 | | 8 | 1 |
| Nurse3 | 4 | | 3 | | 2 | | 9 | 0 |
| Nurse4 | 2 | | 3 | | 2 | | 7 | 0 |
| Nurse5 | 3 | 1 | 2 | | 2 | | 7 | 1 |
| Nurse6 | 3 | 1 | 4 | | 2 | | 9 | 1 |
| Totals | 20 | 3 | 16 | 1 | 12 | 0 | 48 | 4 |

### RESULTS

Table 3

Compliance Proportion

| | Compliant | | Proportion | 95% CI | |
|---|---|---|---|---|---|
| | Yes | No | | Upper | Lower |
| Total | 48 | 4 | 48/52=.92 | .97 | .82 |

The Wilson procedure without correction for continuity was used.

### Discussion

The project used a pre and post strategy to asses the knowledge of participants before and after training on DFU management. The pretest showed that most of the nurses were not aware of DFU prevention and management measures. The project showed that a high number of DFU complications were caused by lack of knowledge among the home-based nurses. This was revealed by the paired t-test analysis which showed a significant difference between pre and post test scores. The education intervention was effective in equipping the nurses with knowledge on DFU prevention and management. The nurses knowledge is important in conducting foot assessment, and providing foot care to diabetic individuals. Nurses with knowledge on DFU can identify etiology and assess comorbidities to provide the proper therapeutic approach to lower the risk of amputation of legs. The findings show that the nurses were quick to adapt to the DFU management protocol. The high rate of efficacy is attributed to the need to manage DFU related complications and reduce the rates of Chospitalizations from DFU. Compliance facilitates provision of uniform care hence improves DFU outcomes. 92% compliance shows that the nurses used the protocol which is likely to improve patients outcomes. Despite how effective the protocol was, the outcomes would have been ineffective if the instructions were not adequately followed (Fielding & Duff, 1999).

There is a need to design formal training for all nurses on DFU care. Education on would care should be incorporated in the curriculum of the nursing schools. Scholarly doctorate prepared nurses change the nursing profession through creating evidence based protocols to improve patients outcomes.

### CONCLUSION

The complications associated with DFU are detrimental to patient's health as they can cause amputation, length of stay in hospital or even death. The purpose of this project was to implement a DFU prevention and treatment protocol and increase nurses' knowledge and compliance with the protocol through training. The nurses who participated in the training demonstrated increased knowledge on evidence based approached in prevention and treatment of DFU and on compliance with the protocol. This protocol may serve as a guide to the current and future health care professionals in their practice. Although the project may seem successful and has improved outcomes by increasing nurses knowledge and compliance, there is need for further research to determine the effect of the protocol on reducing DFU rates.

### REFERENCES


Fielding, D., & Duff, A. (1999). Compliance with treatment protocols: interventions for children with chronic illness. *Archives of Disease in Childhood, 80*(2), 196-200. https://adc.bmj.com/content/80/2/196

Harding, J. L., Pavkov, M. E., Magliano, D. J., Shaw, J. E., & Gregg, E. W. (2019). Global trends in diabetes complications: A review of current evidence. *Diabetologia, 62*(1), 3-16. https://doi.org/10.1007/s00125-018-4711-2

Joyce, B. L., Harmon, M., Johnson, R. G. H., Hicks, V., Brown-Schott, N., Pilling, L., & Brownrigg, V. (2018). Community public health nursing faculty's knowledge, skills, and attitudes of the Quad Council Competencies for Public Health Nurses. *Public Health Nursing, 35*(5), 427-439. https://doi.org/10.1111/phn.12499

Standl, E., Khunti, K., Hansen, T. B., & Schnell, O. (2019). The global epidemics of diabetes in the 21st century: Current situation and perspectives. *European Journal of Preventive Cardiology, 26*(2_Suppl.), 7-14. https://doi.org/10.1177/2047487319881021

Warfield, T. M. (2019). *Implementation of an evidence-based diabetic foot care protocol and impact on health outcomes* (Publication No. 27548916) [Doctoral dissertation, Walden University]. ProQuest Dissertations and Theses Global.

# References


- Armstrong, D. G., Boulton, A. J., & Bus, S. A. (2017). Diabetic foot ulcers and their recurrence. *New England Journal of Medicine*, *376*(24), 2367-2375. https://doi.org/10.1056/NEJMra1615439
- Boulton, A. J., Armstrong, D. G., Kirsner, R. S., Attinger, C. E., Lavery, L. A., Lipsky, B. A., Mills, J. L., Sr., & Steinberg, J. S. (2018). Diagnosis and management of diabetic foot complications. American Diabetes Association. https://www.ncbi.nlm.nih.gov/books/NBK538977/
- Damschroder, L. J., Reardon, C. M., & Lowery, J. C. (2020). The consolidated framework for implementation research (CFIR): Progress to date, tools and resources, and plans for the future. *Implementation Science, 10*(Suppl. 1), A12. https://doi.org/10.1186/1748-5908-10-S1-A12
- Harding, J. L., Pavkov, M. E., Magliano, D. J., Shaw, J. E., & Gregg, E. W. (2019). Global trends in diabetes complications: A review of current evidence. *Diabetologia*, 62(1), 3-16. https://doi.org/10.1007/s00125-018-4711-2
- Hammad, K., Peng, L., Anikeeva, O., Arbon, P., Du, H., & Li, Y. (2017). Emergency nurses' knowledge and experience with the triage process in Hunan Province, China. *International Emergency Nursing, 35*, 25-29. http://dx.doi.org/10.1016/j.ienj.2017.05.007
- Joyce, B. L., Harmon, M., Johnson, R. G. H., Hicks, V., Brown-Schott, N., Pilling, L., & Brownrigg, V. (2018). Community/public health nursing faculty's knowledge, skills, and attitudes of the Quad Council Competencies for Public Health Nurses. *Public Health Nursing*, *35*(5), 427-439. https://doi.org/10.1111/phn.12409
- Karri, V. V. S. R., Kuppusamy, G., Talluri, S. V., Yamjala, K., Mannemala, S. S., & Malayandi, R. (2016). Current and emerging therapies in the management of diabetic foot ulcers. *Current Medical Research and Opinion*, *32*(3), 519-542. https://doi.org/10.1185/03007995.2015.1128888
- Kaya, Z., & Karaca, A. (2018). Evaluation of nurses' knowledge levels of diabetic foot care management. *Nursing Research and Practice*, *2018*, Article 8549567. https://doi.org/10.1155/2018/8549567
- Lim, J. Z., Ng, N. S., & Thomas, C. (2017). Prevention and treatment of diabetic foot ulcers. *Journal of the Royal Society of Medicine*, *110*(3), 104–109. https://doi.org/10.1177/0141076816688346
- Population of Los Angeles. (2019). https://theuspopulation.com/los-angeles-population/
- Sanz-Corbalán, I., Lázaro-Martínez, J. L., García-Morales, E., Molines-Barroso, R., Álvaro-Afonso, F., & García-Álvarez, Y. (2018). Advantages of early diagnosis of diabetic neuropathy in the prevention of diabetic foot ulcers. *Diabetes Research and Clinical Practice*, *146*, 148-154. https://doi.org/10.1016/j.diabres.2017.12.018
- Schaper, N. C., van Netten, J. J., Apelqvist, J., Bus, S. A., Hinchliffe, R. J., & Lipsky, B. A. (2020). Practical guidelines on the prevention and management of diabetic foot disease (IWGDF 2019 update). *Diabetes/Metabolism Research and Reviews*, *36*, Article e3266. https://doi.org/10.1002/dmrr.3266
- Standl, E., Khunti, K., Hansen, T. B., & Schnell, O. (2019). The global epidemics of diabetes in the 21st century: Current situation and perspectives. *European Journal of Preventive Cardiology*, *26*(2, Suppl.), 7-14. https://doi.org/10.1177/2047487319881021
- Zhong, A., Li, G., Wang, D., Sun, Y., Zou, X., & Li, B. (2017). The risks and external effects of diabetic foot ulcers on diabetic patients: A hospital-based survey in the Wuhan area, China. *Wound Repair and Regeneration*, *25*(5), 858-863. https://doi.org/10.1111/wrr.12589

# Acknowledgments


- First and foremost I would like to thank God for blessing me and for giving me the opportunity and the strength to complete the DNP program, along with my family and friends who has definitely been my rock. Thank you to all Touro University faculty who have made my academia journey a smooth experience. I would like to give special thanks to Doctor Denise Zabriskie who is a very passionate professor. Thank you for your guidance, your support, your listening ear, you had my back and you push me to the end you are greatly appreciated.

Thank you again Touro University you made my dream come true!

Dr. Kim Geiger, DNP