Prevent Wounds by Conducting a Comprehensive Foot Examination and Intervention

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Abstract: Lower extremity wounds and falls are on the rise with the demographics and projected aging population. Diabetes and heart disease supersede cancer deaths. A basic foot exam—performed routinely on patients identified as high risk allows time for early intervention and prevention. A Certified Foot and Nail Care Nurse (CFCN) who evaluates clients on a regular basis, conducts a comprehensive lower extremity exam for loss of protective sensation (LOPS) and compromised peripheral blood flow is more likely to provide needed care in a timely manner. Why a nurse? Because nurses who have the level of education, expertise through acquired training, and are board certified are competent to assess, educate, provide intervention, and refer. Utilizing CFCNs is cost-effective and efficient. CFCN is utilized as a member of the multidisciplinary team. Nurses are educators and education is an effective method for prevention. Nurses, as the most trusted health care provider, communicate, establish rapport, and develop sustaining relationships. Utilizing the Wound Ostomy Continence Nurses’ Credentialing Board (WOCNCB) CFCN raises the standard of care substantially and reduces overall costs to life, limbs, and dollars. This innovation in practice improves outcomes, patient satisfaction, and safety while reducing hospital admissions.

Keywords: type 2 diabetes; self-care activities; adult learning principles; Certified Foot Care Nurse (CFCN); comprehensive foot exam; prevention of wounds; proactive providers; amputation prevention; chronic lower extremity wound
1. Introduction

Chronic costly wounds will continue to impact Medicare beneficiaries and caregivers until health care focuses on prevention by implementing proactive interventions. Pain, suffering, loss of limb, and infection are a few of the associated problems with a chronic, non-healing lower extremity wound. Eighteen million people suffer from lower extremity arterial disease (LEAD) of which many are asymptomatic [1]. Age and diabetes are two significant risk factors for LEAD. Age, smoking, and sedentary life style increase the risk of LEAD and type 2 diabetes mellitus (T2DM). Almost twenty-six million Americans suffer with diabetes of which 18.8 million are diagnosed and seven million undiagnosed. Over twenty-six percent are 65 years or older [2].

2. Significance

The average cost of a foot ulcer is $4,595 per episode [3]. Almost $28,000 is spent annually on each Medicare beneficiary who requires care, with a total national cost of $1.6 billion, with added costs of prior ulcer care exceeding six billion annually. Expenditures for diabetic foot patients are three times higher than the general population. Disease, disability, and related co-morbidities are devastating and expensive. Are they also avoidable?

Approximately forty-five to sixty percent of foot ulcers are due to lower extremity neuropathic disease (LEND) with the remaining forty five percent due to neuropathy and lower extremity arterial disease [1,2]. Foot ulcers and wounds are the most common reason for people with diabetes to be admitted and re-admitted to an acute care hospital. Of all foot wounds admitted, approximately seventy percent of those have no follow-up once discharged from the in-patient setting, less than two percent referred for off-loading, and eleven percent referred for home health care or a wound care center [4]. Patients’ assessment of quality or discharge instructions for care at home are strongly correlated with the overall mean score of patient satisfaction [5]. Fifty to eighty percent of all amputations are due to diabetes-related complications. Amputations are a major cause of morbidity and mortality. People with diabetes whose non-healing wounds result in amputation have a mortality rate of up to fifty percent in five years, a rate similar to several types of cancers [1,2,6].

Medicare provides beneficiaries coverage for shoes and inserts in an effort to reduce neuropathic wounds directly related to footwear. Since 1993, Medicare has provided coverage for a pair of shoes and three sets of inserts annually but only nine percent eligible are being referred for therapeutic shoes and inserts. In 2006, Medicare recognized the need for “pay for performance” for reimbursement. It is a voluntary program by reporting care delivered and referrals for the Therapeutic Shoe Bill. In 2005, the Wound Ostomy Continence Nurses’ (WOCN) Society recognized the need for a front-line nurse, to specialize in foot care for prevention of wounds [7].

Diabetes and heart disease now supersede cancer deaths in the aging population of the United States [6]. This population struggles with diminished mobility, flexibility, visual acuity, and circulation in the extremities. With the increased incidence of diabetes, and obesity—examining and caring for one’s own feet is difficult, often times impossible.
3. Discussion

LEAD and LEND wounds constitute a high volume of service and consumes large percentage of finite human and financial resources. There is no standardized plan of care for delivering proactive foot and nail care or an outcome based database to ascertain the efficiency of foot care practices, education, appropriate referral, procedures, and policies. A front-line service is missing—but what? A basic foot exam—performed routinely and regularly on patients identified as having the potential of developing an ulcer. [8–11]. It is imperative that foot and nail care be delivered safely, effectively, and efficiently.

The Agency for Health Care Quality and Research (AHRQ), Institute of Medicine (IOM), Healthy People 2020, and the Lower Extremity Amputation Prevention (LEAP) organizations have all recognized the necessity for early intervention that leads to prevention—of a potential complication [12–15]. Currently, there are no resources available for professionals for the high risk patient population. Though several nurse-led studies and initiatives exist they have not organized for dissemination as a universal or global initiative [8,9,16–19].

Newly enacted programs focus on preventative care and help Certified Foot and Nail Care Nurse (CFCN) assume a key role in reducing the costly impact of care for people with LEAD and LEND. A CFCN evaluates patients on a regular basis, conducts a lower extremity foot assessment specifically for loss of protective sensation (LOPS) and compromised blood flow. With frequency and deliberate surveillance there is a greater chance of discovering problems. If a pressure point is identified and the shoes worn are the culprit, the CFCN advises on appropriate off-loading and tight glucose control [15,20–22].

Identified barriers for patients to conduct foot self-care are physical ability, perceived importance, knowledge, education, social integration, risk status, and patient-provider communication [23]. Identified enablers for patients to conduct foot care are perceived importance, higher risk for lower extremity injury, positive patient-provider communication, experiences and relationships, strong social networks either electronic or face-to-face and education perceived as empowering and motivational [23]. By monitoring and encouraging tight glucose control and a one percent decrease in hemoglobin A1c (HbA1c) results in a forty-three percent decrease in amputation, readmission, and an eight hundred dollar reduction in health care costs per patient [24,25].

Why a nurse? Because nurses have the level of education, critical thinking, expertise, and with acquired training may become board certified in foot and nail care. They have knowledge specific to lower extremity exam and management of issues and intervention opportunities. Utilizing CFCNs would be cost-effective and efficient [6,9,26].

Certified Foot and Nail Care Nurse (CFCN) can—in 10 min or less [27,28] (Table 1).

| Exam                        | Instruments/Issues                                      | Goal                                                |
|-----------------------------|--------------------------------------------------------|-----------------------------------------------------|
| Assess for Sensation        | 5.07 Semmes-Weinstein Monofilament                     | Determine loss of protective sensation and position of toe in shoe |
|                             | 128 mHz Tuning Fork                                    |                                                     |
| Assess Pulses and Blood Flow| Doppler Posterior Tibialis and Dorsalis Pedis           | Determine if compromised blood                       |
|                             | Conduct an Ankle-Brachial Index or Toe Pressure         |                                                     |
| Assess for Musculoskeletal Deformities | Hyperkeratotic lesions and balance issues       | Determine pressure points, fall risk, and safety issues |
| Assess for Dermatologic Conditions | Malignant melanoma, Tinea Pedis, Onychomycosis | Determine and treat major / minor skin and nail conditions |
Certified Foot and Nail Care Nurse (CFCN) can, based on the following assessment, qualify risk (Table 2).

**Table 2. Risk Assessment.**

| Low Risk                                      | High Risk                                      |
|-----------------------------------------------|-----------------------------------------------|
| Low Risk (all must be present qualify low risk) | High Risk (any one qualify high risk)          |
| Intact protective sensation                   | Loss of protective sensation                   |
| Adequate blood flow                           | Inadequate blood flow                          |
| No severe deformities                         | Severe deformity                               |

Certified Foot and Nail Care Nurse (CFCN) can based on the following assessment and risk (Table 3).

**Table 3. Foot Care Interventions/Rationale.**

| Interventions                                      | Rationale                                                                 |
|----------------------------------------------------|---------------------------------------------------------------------------|
| Debride toenails-reduce height and length          | Safety, comfort, prevention of injuries to feet or legs                   |
| Reduce hyperkeratotic lesions                      | Prevention of fissures, corns, calluses, wounds, promotion of comfort     |
| Monitor HbA1C—tight glucose control                | Prevention of loss of protective sensation, wounds, falls, and amputation |
| Monitor foot wear and sock use—reduce edema, facilitate therapeutic shoes and inserts | Reduce wounds related to edema and pressure on feet due to ill-fitting shoes leading to wounds and amputations |

Certified Foot and Nail Care Nurse (CFCN) can based on the following assessment, risk, and interventions (Table 4).

**Table 4. Education Interventions/Rationale.**

| Education Interventions                           | Rationale                                                                 |
|---------------------------------------------------|---------------------------------------------------------------------------|
| Daily inspection of feet                          | Prevent minor condition lead to major issue                               |
| Self-care foot care                               | Daily basic hygiene and moisturize, avoid bathroom or kitchen surgery    |
| Aging related foot changes and pathology          | Normal vs abnormal changes                                                |
| Problems to report                                | Report any abnormal changes in timely manor                              |

With implementation of a nurse-managed safety-net foot and nail care clinic, quality healthcare services can successfully be developed and implemented despite financial and staffing limitations [15]. A CFCN with the experience and expertise uses knowledge and a multidisciplinary approach to refer to specialists promptly as deemed appropriate. Delay in utilizing the team approach is the greatest reason for people with diabetes and others with compromised blood flow to lead to amputations. A seemingly minor condition such as an ingrowing or ingrown toe nail can lead to a major problem and amputation. Lack of therapeutic foot care and identifying who is at risk is compounded with falls in the same population, those with LEAD and LEND especially of the frail vulnerable older population [29–32].
4. Conclusions

This initiative for innovation in practice is in direct response to the AHRQ, IOM, Healthy People 2020, and LEAP initiatives, mandates, and programs. The AHRQ and IOM have charged nurses to practice to the full extent of their education and develop innovative health care proposals specifically to lead change, improve care, and reduce costs. Healthy People 2020 and LEAP challenged health care providers to address the high cost of foot ulcers and reduce the costs of lives and limbs lost and dollars spent. The CFCN is considered a front-line proactive provider in prevention, providing information and incorporating a weekly phone call to check on the beneficiary is essential for patient satisfaction [33].

Utilizing the Wound Ostomy Continence Nurses’ Credentialing Board (WOCN) Certified Foot and Nail Care Nurse (CFCN) raises the standard of care substantially and reduces overall costs to life, limbs, and Medicare dollars [34]. This innovation in practice to improve health care delivery includes diagnostics and intervention that focuses on early detection of lower extremity neuropathic and arterial disease. This proposal is a simple innovation that could have tremendous positive outcomes worldwide. The CFCN can be the case manager of the multidisciplinary team approach to the prevention of wounds and amputations and ensure alignment with AHRQ, IOM, Healthy People 2020, and LEAP initiatives.

5. Key Messages

1. Amputations, falls, and wounds are related to poor or lack of foot care, lower extremity deformities, and loss of protective sensation.
2. Lack of foot and nail care is the most neglected area of health care in every setting.
3. The two most important components of a lower extremity assessment is determining loss of protective sensation and compromised blood flow.
4. Amputations, falls, and wounds are costly in resources utilized, admissions, readmissions, and treatment.
5. A Certified Foot and Nail Care Nurse (CFCN) is a proactive provider to case manage high risk individuals, monitor glucose control and foot wear, and provide basic foot and nail care.

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Conflicts of Interest

The author declares no conflict of interest.

References

1. WOCN. Best Practice Guidelines Management of Wounds in Patients with Lower-Extremity Arterial Disease; WOCN: Mount Laurel, NJ, USA, 2014.
2. WOCN. Best Practice Guidelines Management of Wounds in Patients with Lower-Extremity Neuropathic Disease; WOCN: Mount Laurel, NJ, USA, 2012; p. 100.
3. Driver, V.R.; Fabbi, M.; Lavery, L.A.; Gibbons, G. The costs of diabetic foot: The economic case for the limb salvage team. *J. Vasc. Surg.* **2010**, *52*, 17S–22S.

4. Alvarsson, A.; Sandgren, B.; Wendel, C.; Alvarsson, M; Brismar, K. A retrospective analysis of amputation rates in diabetic patients: Can lower extremity amputations be further prevented? *Cardiovasc. Diabetol.* **2012**, *11*, doi:10.1186/1475-2840-11-18.

5. Press-Ganey. The relationship between HCAHPS performance and readmission penalties. Available online: http://omg.en25.com/Web/PressGaneyAssociatesInc/PerformanceInsights_Readmissions_7871.pdf (accessed on 1 March 2015).

6. Armstrong, D.G.; Kanda, V.A.; Lavery, L.A.; Marston, W.; Mills, J.L., Sr.; Boulton, A.J. Mind the gap: Disparity between research funding and costs of care for diabetic foot ulcers. *Diabetes Care* **2013**, *36*, 1815–1817.

7. Gallagher, D. The certified foot care nurse and the importance of comprehensive foot assessments. *J. Wound Ostomy Cont. Nurs.* **2012**, *39*, 194–196.

8. Aalaa, M.; Tabatabaei Malazy, O.; Sanjari, M.; Peimani, M.; Mohajeri-Tehran, M.R. Nurses’ role in diabetic foot prevention and care; a review. *J. Diabetes Metab. Disord.* **2012**, *11*, doi:10.1186/2251-6581-11-24.

9. Chan, H.Y.L.; Lee, D.T.F.; Leung, E.M.F.; Man, C.W.; Lai, K.M.; Leung, M.W.; Wong, I.K.Y. The effects of a foot and toenail care protocol for older adults. *Geriatr. Nurs.* **2012**, *33*, 446–453.

10. Etnnyre, A.; Zarate-Abbott, P.; Roehrick, L.; Farmer, S. The role of certified foot and nail care nurses in prevention of lower extremity amputation. *J. Wound Ostomy Cont. Nurs.* **2011**, *38*, 242–251.

11. Howett, M.; Conner, A.; Downes, E. Nightingale theory and intentional comfort touch in management of tinea pedis in vulnerable populations. *J. Holist. Nurs.* **2010**, *28*, 244–250.

12. AHRQ. Guide to Patient and Family Engagement in Hospital Quality and Safety. Retrieved from US Department of Health and Human Services. 2013. Available online: http://www.ahrq.gov/professionals/systems/hospital/engagingfamilies/guide.html; https://innovations.ahrq.gov/profiles/daily-text-messages-and-nurse-followup (accessed on 13 June 2013).

13. Institute of Medicine. *Crossing the Quality Chasm*; National Academy Press: Washington, DC, USA, 2010.

14. Healthy People 2020. Diabetes, Co-Leaders Centers for Disease Control and Prevention and National Institutes of Health. Available online: http://healthypeople2020.gov (accessed on 2 March 2015).

15. Lower Extremity Amputation Prevention (LEAP) Retrieved from Health Resources and Services Administration. 2013. Available online: http://www.hrsa.gov/hansensdisease/leap (accessed on 2 March 2015).

16. Bakker, K.; Apelqvist, J.; Schaper, N.C. Practical guidelines on the management and prevention of the diabetic foot 2011. *Diabetes Metab. Res. Rev.* **2012**, *28*, S225–S231.

17. Meaney, B. Diabetic foot care: Prevention is better than cure. *J. Ren. Care* **2012**, *38*, S90–S98.

18. Mustapha, J.A.; Heaney, C.; Clark, M.; McGoff, T.; Peterson, A.; Finton, S.; Fox, C.; Cusack, K. Building a successful amputation prevention program. Available online: http://evtoday.com/2013/05/building-a-successful-amputation-prevention-program/.

19. Peterson, J.M.; Virden, M.D. Improving diabetic foot care in a nurse-managed safety-net clinic. *J. Am. Assoc. Nurse Pract.* **2013**, *25*, 263–271.
20. Chin, Y.F.; Huang, T.T. Development and validation of a diabetes foot self-care behavior scale. *J. Nurs. Res.* 2013, 21, 19–24.

21. Gravely, S.S.; Hensley, B.K.; Hagood-Thompson, C. Comparison of three types of diabetic foot ulcer education plans to determine patient recall of education. *J. Vasc. Nurs.* 2011, 29, 113–119.

22. Woodbury, M.G.; Botros, M.; Kuhnke, J.L.; Greene, J. Evaluation of a peer-led self-management programme PEP talk: Diabetes, healthy feet and you. *Int. Wound J.* 2013, 10, 703–710.

23. Matricciani, L.; Jones, S. Who cares about foot care? Barriers and enablers of foot self-care practices among non-institutionalized older adults diagnosed with diabetes: An integrative review. *Diabetes Educ.* 2015, 41, 106–117.

24. U.S. Department of Health and Human Services; Health Resources and Services Administration. ACT Report Diabetes HbA1c. 2002. Available online: http://www.hrsa.gov/quality/toolbox/508pdfs/diabetesmodule.pdf ACT Report (accessed on 11 June 2012).

25. Christman, A.L.; Selvin, E.; Margolis, D.J.; Lazarus, G.S.; Garza, L.A. Hemoglobin A1c is a predictor of healing rate in diabetic wounds. *J. Invest. Dermatol.* 2011, 131, 2121–2137.

26. Wu, S.V.; Tung, H.H.I.; Liang, S.Y.; Lee, M.C.; Yu, N.C. Differences in perceptions of self-care, health education barriers, and educational needs between diabetes patients and nurses. *Contemp. Nurse* 2014, 46, 187–196.

27. Sibbald, R.G.; Ayello, E.A.; Alavi, A.; Ostrow, B.; Lowe, J.; Botros, M.; Goodman, L.; Woo, K.; Smart, H. Screening for the high-risk diabetic foot: A 60-second tool (2012). *Adv. Skin Wound Care* 2012, 25, 465–476.

28. Miller, J.D.; Carter, E.; Shih, J.; Giovinco, N.A.; Boulton, A.J.M.; Armstrong, D. How to do a 3-min diabetic foot exam. *J. Fam. Pract.* 2014, 63, 646–656.

29. Aliberti, E. The domino effect: The Risk of falls in older adults with diabetes. Available online: http://www.lifelinesystems.com (accessed on 2 March 2015).

30. Eckles, R. The biomechanics of aging. Available online: http://www.podiatrym.com (accessed on 2 February 2012).

31. Kruse, R.L.; LeMaster, J.W.; Madsen, R.W. Fall and balance outcomes after an intervention to promote leg strength, balance, and walking in people with diabetic peripheral neuropathy: “Feet first” randomized controlled trial. *Phys. Ther.* 2010, 90, 1568–1579.

32. Richie, D.H. Preventing Falls in the Elderly. Available online: http://www.podiatrytoday.com/preventing-falls-elderly-where-dpms-can-have-impactCyrus (accessed on 2 March 2015).

33. Cyrus, O.; Vanderstrasse, A.; Gilliss, C.L.; Lesueur, B. Improving diabetes self-management through telephonic education: A quality improvement study. *Pract. Diabetol.* 2014, 33, 6–11.

34. Sumpio, B.E.; Armstrong, D.G.; Lavery, L.A.; Andros, G. The role of interdisciplinary team approach in the management of the diabetic foot. *J. Vasc. Surg.* 2010, 51, 1504–1506.