

Evaluating a Program Process Change to Improve Completion of Foot Exams and Amputation Risk Assessments for Veterans with Diabetes

Tiffany V. Quach, DNP, FNP-BC; and Michele H. Goldschmidt, EdD, MS, RN, CNL

A quality improvement initiative significantly increased the number of veterans receiving thorough foot exams and amputation risk assessments as well as the number of appropriate podiatry referrals.

At the time this article was written, **Tiffany Quach** was a Registered Nurse and **Michele Goldschmidt** was the Health Promotion and Disease Prevention Program Manager, both at Veterans Affairs Portland Healthcare System in Oregon. Tiffany Quach was a doctoral Nurse Practitioner Student at Gonzaga University School of Nursing and Human Physiology in Spokane, Washington.
Correspondence:
Tiffany Quach
(tiffanyquach@gmail.com)

Individuals with diabetes mellitus (DM), peripheral vascular disease, or end-stage renal disease are at risk for a nontraumatic lower limb amputation.¹ Veterans have a high number of risk factors and are especially vulnerable. More than 70% of veterans enrolled in US Department of Veterans Affairs (VA) healthcare are at increased risk for developing DM due to excess weight, poor eating habits, and physical inactivity.² One in 4 veterans has DM, compared with 1 in 6 in the general population.²

DM can lead to long-term complications including limb amputations. Annually in the US about 73,000 nontraumatic lower limb amputations are performed and > 60% occur among persons with DM.³ Complications from diabetic wounds are the cause of 90% of lower limb amputations, and foot ulcers are the most prevalent complication.⁴ Diabetic ulcers are slow to heal due to vascular impairments and nerve damage.⁵ Peripheral vascular disease, a common comorbid condition, contributes to restricted blood flow and can lead to tissue death or gangrene requiring amputation.⁶

Between 2010 and 2014, VA Portland Healthcare System (VAPORHCS) had one of the highest national amputation rates in VA.⁷ A clinical chart review found that annual foot examinations and amputation risk assessments (ARAs) were not completed with all at-risk veterans. In 2013, a VA Office of Inspector General (OIG) national report found that more than one-third of veterans enrolled in VA with DM had no documentation of required annual foot exams.⁸ In 2017, VA released Directive 1410, which outlined the scope of care required to prevent and treat lower

limb complications and amputations for veterans at risk for primary or secondary limb loss.¹ This national initiative is a comprehensive approach that engages multiprofessional teams to perform routine foot examinations and amputation risk assessments; identify and promptly treat foot ulcers; track, monitor and educate at-risk veterans; and participate in clinical education to enhance staff skills.

To decrease the amputation rate, VAPORHCS redesigned its foot-care program to comply with the national initiative. As is typical in VA, VAPORHCS uses a team-based approach in primary care. The basic 4-member team patient-aligned care team (PACT) consists of a physician or nurse practitioner (NP) primary care provider (PCP), a registered nurse (RN) care manager, a licensed practical nurse (LPN), and a medical staff assistant (MSA) for administrative support. Each PACT cares for about 1,800 veterans. Formerly, LPNs completed the annual diabetic foot exams, and PCPs verified the exams and completed the ARA based on the LPNs' findings. If patients were moderate risk or high risk, they were referred to podiatry. The VAPORHCS audit found that not all at-risk veterans had both the foot exam and ARA completed, or were referred to podiatry when indicated. There was a need for a process improvement project to develop a seamless program consisting of all recommended foot care components crucial for timely care.

This quality improvement project sought to evaluate the effectiveness of the process changes by examining PCPs' adoption of, and consistency in completing annual diabetic foot

exams and ARAs with veterans. The goals of the project were to evaluate changes in the: (1) Number of accurate diabetic foot exams and amputation risk assessments completed with veterans with DM; (2) Number and timeliness of appropriate referrals to podiatry for an in-depth assessment and treatment of veterans found to be at moderate-to-high risk for lower limb amputations; and (3) Number of administrative text orders entered by PCPs for nurse care managers to offer foot care education and the completion of the education with veterans found to be at normal-to-low risk for lower limb amputations. The institutional review boards of VAPORHCS and Gonzaga University approved the study.

METHODS

Established by the American Diabetes Association and endorsed by the American Association of Clinical Endocrinologists, the comprehensive foot exam includes a visual exam, pedal pulse checks, and a sensory exam.^{9,10} The templated Computerized Patient Record System (CPRS) electronic health record note specifies normal and abnormal parameters of each section. On the same template, the provider assigns an ARA score based on the results of the completed foot exam. Risk scores range from 0 to 3 (0, normal or no risk; 1, low risk; 2, moderate risk; 3, high risk) If the veteran has normal or low risk, the PCP can encourage the veteran to remain at low risk by entering an administrative CPRS text order for the nurse care manager to offer education about daily foot care at the same visit or at a scheduled follow-up visit. This process facilitates nurse care managers to include routine foot care as integral to their usual duties coaching veterans to engage in self-care to manage chronic conditions. If the risk is assessed as moderate or high risk, PCPs are prompted to send a referral to podiatry to repeat the foot exam, verify the ARA score, and provide appropriate foot care treatment and follow-up.

On October 31, 2017, following training on the updated foot exam and ARA template with staff at the 13 VAPORHCS outpatient clinic sites, 2 sites piloted all components of the Comprehensive Foot Care program. An in-person training was completed with PCPs to review the changes

TABLE
Diabetes Registry Chart Review Results

Patient Care Steps	Aug 2017-	Nov 2017-	Feb 2018	May 2018
	Oct 2017	Jan 2018	- Apr 2018	- Jul 2018
Diabetic Foot Examinations	360	237	313	332
Accurately completed	191	222	308	332
Inaccurately completed	169	15	5	0
Moderate risk or high risk	83	107	132	140
New referrals	12	50	50	53
Established patients	23	31	53	54
Veterans without referrals	48	26	29	33
Normal risk or low risk	108	115	176	192
Veterans with text order/coaching	0	2	10	2
Veterans with text order/without coaching	0	4	2	2
Veterans without text order/coaching	0	1	2	2

of the foot care template in CPRS and to answer their questions about it. PCPs were required to complete both the 3-part foot exam and ARA at least once annually with veterans with DM.

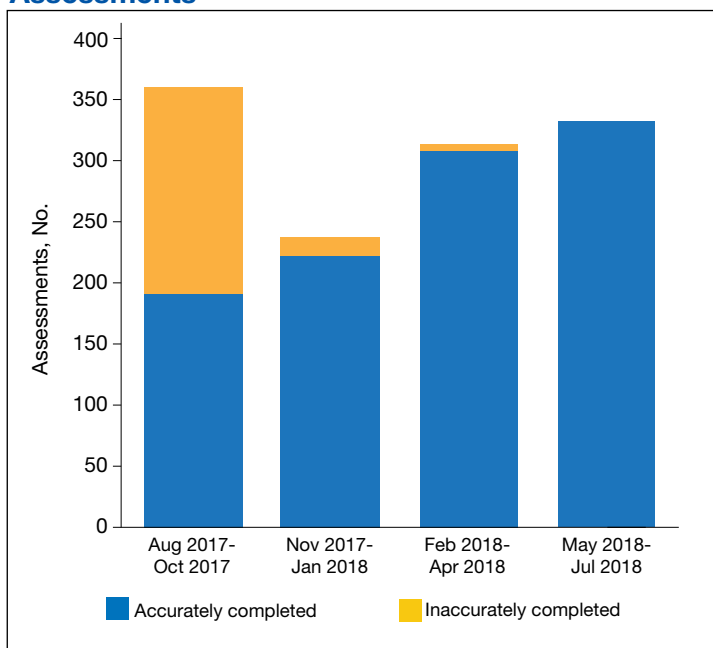
An electronic clinical reminder was built to alert PCPs and PACTs that a veteran was either due or overdue for an exam and risk assessment. VA podiatrists agreed to complete the reminder with veterans under their care. One of the 2 sites was randomly selected for this study. Data were collected from August 1, 2017 to July 31, 2018. Patients were identified from the Diabetes Registry, a database established at VAPORHCS in 2008 to track veterans with DM to ensure quality care.¹¹ Veterans' personal health identifiers from the registry were used to access their health records to complete chart reviews and assess the completion, accuracy and timeliness of all foot care components.

The Diabetes Registry lists a veterans' upcoming appointments and tracks their most recent clinic visits; laboratory tests; physical exams; and screening exams for foot, eye, and renal care. Newly diagnosed veterans are uploaded automatically into this registry by tracking all DM-related International Classification of Diseases (ICD-10) codes, hemoglobin A_{1c} (HbA_{1c}) levels $\geq 6.5\%$, or outpatient prescriptions for insulin or oral hypoglycemic agents.¹¹

Study Design

This quality improvement project evaluated PCPs' actions in a program process change intended to improve foot care provided with veterans at-risk for nontraumatic lower limb amputations. Audits of CPRS records and the Diabetes Registry

FIGURE 1
Frequency of Foot Exams and Amputation Risk Assessments



determined the results of the practice change. Data on the total number of foot exams, amputation risk scores, appropriate podiatry referrals, administrative orders for nurse coaching, and completed foot care education were collected during the study period. Data collected for the 3-month period preceding the process change established preimplementation comparison vs the postimplementation data. Data were collected at 3, 6, and 9 months after implementation. The foot exams and ARAs were reviewed to determine whether exams and assessments were completed accurately during the pre- and post-implementation timeframes. Incomplete or clearly incorrectly completed documentation were considered inaccurate. For example, it was considered inaccurate if only the foot exam portion was completed in the assessment and the ARA was not.

Data Analysis

Data on the total number of accurately completed foot examinations and ARAs, total number of podiatry referrals, and total number of administrative text orders placed by PCPs, and education completed by nurse care managers were assessed. Statistical significance was evaluated using χ^2 and Fisher exact test as appropriate. A Pearson correlation coefficient was

used to determine whether there was a statistically significant increase in accurate foot examinations and ARAs as well as total number of podiatry referrals during the study period. Statistical analyses were performed using Stata 14.1 statistical software (College Station, TX).

RESULTS

A total of 1,242 completed diabetic foot examinations were identified from August 1, 2017 to July 31, 2018 using the Diabetes Registry (Table). For the 3 months prior to the change, there were 191 appropriately completed foot examinations and ARAs. This number increased progressively over three 3-month periods (Figure 1). Within the 1-year study period, there was a statistically significant increase in the number of appropriate foot examinations ($r = 0.495$). PCPs placed 34 podiatry referrals during the prechange period. After the change, the number of appropriate referrals increased statistically significantly in the 3 following 3-month-periods ($r = 0.222$) (Figure 2).

To determine the accuracy of documentation and ratio of appropriate referrals, the 3-month prechange data was compared with the 9-month postchange period. There was a statistically significant increase from pre- to postchange accuracy of documentation for examinations and ARAs (53.1% vs. 97.7%). The percentage of appropriate podiatry referrals increased significantly from 41.5% to 76.8%. Overall, there was poor adherence to protocol for the text order and education that was implemented during the change. Only 4.6% of patients had an administrative text order entered into CPRS and 3.9% were provided with foot care coaching. There was no statistical difference in the use of text orders between the first 3-month period and the last 3-month period (5.2% vs. 2.1%). Similarly, there was no statistical difference in the rate of patient education between the first 3-month period and the final 3-month period (2.6% vs. 2.1%).

Notably, at the end of the first year of this evaluation, 119 veterans at the clinic did not show a recorded comprehensive foot examination since receiving a DM diagnosis and 299 veterans were due for an annual examination—a 25.2% gap of veterans without the recommended progression of foot care services. Of those that previously had a recorded foot examination, 51 (17.0%) veterans were found to be ≥ 2 years overdue.

DISCUSSION

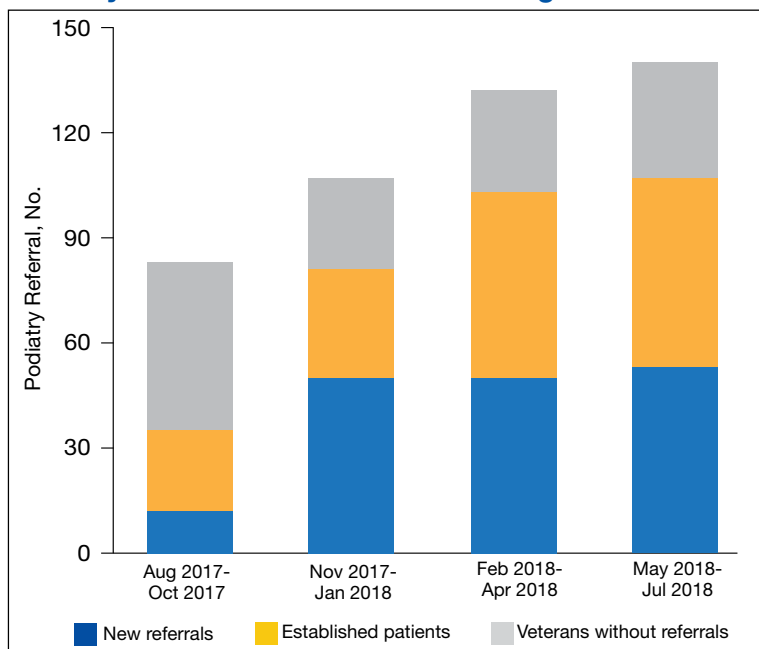
DM management requires a comprehensive team-based approach to help monitor for associated complications. At the VA, PACTs are veterans' initial and primary point of contact for chronic condition management. PACTs have regular opportunities to engage veterans in initial and follow-up care and appropriate self-care. PCPs are critical in placing referrals for specialized care promptly to prevent and minimize complications such as foot ulcers, and ultimately, lower limb amputations.^{9,10,12}

When PCPs assume responsibility for the entire foot examination, they are able to identify problems early.¹ Left untreated, foot wounds and ulcers have the potential to grow into serious infections.⁹ Early risk identification and management can lead to increased patient satisfaction, improved life expectancy, quality of life, and ultimately, lower healthcare costs.¹²

Multiple studies have shown the clinical importance of foot examinations in preventative care. In one study, researchers found that completing foot examinations, among other early interventions, increased life expectancy and reduced foot complications.¹³ Diabetic foot management programs involving screening and categorizing patients into low- and high-risk groups had a 47.4% decrease in the incidence of amputations and 37.8% decrease in hospital admissions.¹⁴ Amputations were found to be inversely correlated with multidisciplinary foot care programs with reduction of lower limb amputations at 2 years.¹⁵ The Centers for Disease Control and Prevention found that comprehensive foot care programs that include a foot examination, ARA, appropriate referrals to specialists, and foot-care education and preventative services can reduce lower limb amputation rates by 45% to 85%.¹⁶

With one of the highest amputation rates in VA, VAPORHCS needed an integrated approach to ensure that appropriate foot care occurred regularly with veterans with DM. Prior to the process change, LPNs completed foot examinations and PCPs completed the ARA. Separating these clinical services resulted in few veterans receiving an amputation risk score. Of those with scores, the lack of a standardized program protocol resulted in discrepancies between ARAs from patient to patient as health care providers did not have clear or enough information to select the cor-

FIGURE 2
Podiatry Referrals for Moderate and High-Risk Veterans



rect score and make the appropriate referrals. Thus, veterans previously identified as at moderate or high risk also lacked podiatric follow-up care.

The new quality-driven process change corrected the documentation process to nationally accepted standards. The goal was to create a consistent template in the electronic health record for all health care providers. The new template simplifies the documentation process and clarifies the amputation risk score assignment, which allows for proper foot care management. The PCP completes the process from assessment through referral, removing gaps in care and improving efficiency. Although this change was initially met with resistance from PCPs, it led to a significant increase in the number of patients with accurately documented examinations. Similarly, the number of appropriate referrals significantly rose during the study period. The standardized documentation process resulted in improved accurate examinations and ARAs over the past year. The new program also resulted in an increased number of appropriate podiatry referrals for those identified to be at moderate or high risk. This elevation of care is crucial for veterans to receive frequent follow-up visits for preventative care and/or treatment, including surgical modalities to promote limb salvage.

Barriers

This project identified several barriers to the Comprehensive Foot Care program. One major barrier was health care provider resistance to using the new process. For example, VAPORHCS podiatrists are not using the new template with established patients, which requires PCPs to complete the clinical reminder template for quality performance, an additional burden unrelated to clinical care. PCPs that do complete the foot examination/ARA templated note use the podiatrist's visit note without personally assessing the patient.

PCPs also have been resistant to entering administrative text orders for preventative foot care in normal- or low-risk veterans (4.6% overall), which has resulted in decreased patient education (3.9% overall). Education for normal-risk and low-risk patients is designed to engage veterans in self-care and prevent risk progression, critical to prevention.

It was found that PCPs often did not ask nurses to coach normal- or low-risk veterans on preventative foot care, as suggested by the low rates at which patients were offered education. This is an area we will target with future quality improvement efforts. All patients with DM should have general education about risk factors and appropriate management of them to decrease their risk for complications.⁹ Preventative foot care education is a critical resource to share with patients during health coaching opportunities to clarify misunderstandings and support change talk when patients are ambivalent or resistant to change. Individual or group-based nurse visits can facilitate better coaching for patients.

At the VA, coaching begins with a conversation about what matters most to the veteran, facilitating the development of a personalized plan based on patients' values, needs, preferences and goals.^{9,10,12,17} Coaching allows nurses to assess veterans' knowledge and willingness to engage in healthy habits; and identify additional resources to help them achieve their goals.

Limitations

There are many limitations to this short quality improvement analysis. For example, only 1 of 2 clinics that piloted the program change was evaluated. In addition, there are 11 other clinics that need additional in-depth education on the program change. Although this analysis was overwhelmingly positive, it may not be as suc-

cessful at other clinic sites and may be subject to the Hawthorne effect—since the 2 piloted locations knew they were being observed for the quality improvement program and may have made an extra effort to be compliant.¹⁸ Additionally, we were unable to track the records of veterans receiving care through the VA Choice Program for this analysis resulting in a lack of documentation of completed diabetic foot examinations and a lack of internal referrals to VA podiatry.

Another major limitation of this project involved calculating the number of referrals placed to podiatry. On January 1, 2018, about halfway through the program evaluation, a national VA decision enabled veterans to self-refer to podiatry, which may have limited the number of podiatry referrals placed by PCPs. Finally, patients could refuse podiatry referrals. In the 9-month postimplementation period, 57 (64.8%) veterans declined podiatry referrals, according to their CPRS records.

Although, there was an improvement in the accuracy of diabetic foot examinations, ARAs, and appropriate podiatry referrals, the ultimate goal of reducing diabetic foot ulcers and lower limb amputations was not tracked due to the limited timeframe of this analysis. Tracking these endpoints with continuous plan-do-study-act cycles are needed for this ongoing quality improvement project.

CONCLUSION

The goal of the VAPORHCS Comprehensive Foot Care program is to provide veterans with a program that is predictable, easy and consistent to prevent and treat foot ulcers to reduce the rate of lower limb amputations. It requires multidisciplinary team collaboration for success. Implementation of this new comprehensive program has increased the number of accurate annual foot exams, ARAs and podiatry referrals. Despite these improvements, areas of future improvement include emphasizing patient education and ongoing provider compliance with annual assessments.

Author contributions

MHG proposed the program evaluation project idea. TVQ collected and analyzed the data and wrote the manuscript. MHG oversaw the project and edited the manuscript. TVQ is the guarantor of this project and takes responsibility for the contents of this journal article.

Acknowledgments

The authors thank Tyra Haebe, VAPORHCS Prevention of

Amputation in Veterans Everywhere (PAVE) Manager, and the entire VAPORHCS PAVE committee for their support in this program evaluation project.

Author disclosures

The authors report no actual or potential conflicts of interest with regard to this article.

Disclaimer

The opinions expressed herein are those of the authors and do not necessarily reflect those of *Federal Practitioner*, Frontline Medical Communications Inc., the U.S. Government, or any of its agencies.

References

1. US Department of Veterans Affairs, Veterans Health Administration. VHA directive 1410, prevention of amputation in veterans everywhere (PAVE) program. http://vaww.medical.surgical.va.gov/podiatry/docs/VHADirective_1410_PAVE.pdf. Published March 31, 2017. Accessed October 11, 2019.
2. US Department of Veterans Affairs. Close to 25 percent of VA patients have diabetes <http://www.va.gov/health/NewsFeatures/20111115a.asp>. Accessed 14 October 2017
3. Centers for Disease Control and Prevention. National diabetes statistics report, 2017: Estimates of Diabetes and Its Burden in the United States. <https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf>. Accessed October 11, 2019.
4. Gibson LW, Abbas A: Limb salvage for veterans with diabetes: to care for him who has borne the battle. *Crit Care Nurs Clin North Am*. 2012;25(1):131-134
5. Boyko EJ, Monteiro-Soares M, Wheeler SGB. "Peripheral arterial disease, foot ulcers, lower extremity amputations, and diabetes." In: Cowie CC, Casagrande SS, Menke A, et al, eds. *Diabetes in America*. 3rd ed. Bethesda, MD: National Institutes of Health Publication; 2017:20-21,20-34.
6. National Institute of Health, National Institute of Neurological Disorders and Stroke. Peripheral neuropathy fact sheet. <https://www.ninds.nih.gov/Disorders/Patient-Caregiver-Education/Fact-Sheets/Peripheral-Neuropathy-Fact-Sheet>. Updated August 13, 2019. Accessed October 11, 2019.
7. US Department of Veterans Affairs, Veterans Health Administration, Support Services Center. Amputation cube, lower amputations 2015. <http://vssc.med.va.gov/AlphaIndex>. [Nonpublic source, not verified]
8. US Department of Veterans Affairs, Office of Inspector General. Healthcare inspection: Foot care for patients with diabetes and additional risk factors for amputation. <https://www.va.gov/oig/pubs/VAOIG-11-00711-74.pdf>. Published January 17, 2013. Accessed October 11, 2019.
9. American Diabetes Association. Standards of medical care in diabetes - 2017. *Diabetes Care*. 2017;40(suppl 1):1-142.
10. Boulton AJM, Armstrong DG, Albert SF, et al. Comprehensive foot examination and risk assessment: a report of the Task Force of the Foot Care Interest Group of the American Diabetes Association, with endorsement by the American Association of Clinical Endocrinologists. *Diabetes Care*. 2008;31(8):1679-1685.
11. Yang J, McConnachie J, Renfro R, Schreiner S, Tallett S, Winterbottom L. The diabetes registry and future panel management tool <https://docplayer.net/19062632-The-diabetes-registry-and.html>. Accessed October 11, 2019.
12. National Institute of Health, Centers for Disease Control and Prevention, the National Diabetes Education Program. Working together to manage diabetes: a guide for pharmacy, podiatry, optometry, and dentistry. <https://www.cdc.gov/diabetes/ndep/pdfs/ppod-guide.pdf>. Accessed October 11, 2019.
13. Ortegon MM, Redekop WK, Niessen LW. Cost-effectiveness of prevention and treatment of the diabetic foot: a Markov analysis. *Diabetes Care*. 2004;27(4):901-907.
14. Lavery LA, Wunderlich RP, Tredwell JL. Disease management for the diabetic foot: effectiveness of a diabetic foot prevention program to reduce amputations and hospitalizations. *Diabetes Res Clin Pract*. 2005;70(1):31-37.
15. Paisey RB, Abbott A, Levenson R, et al; South-West Cardiovascular Strategic Clinical Network peer diabetic foot service review team. Diabetes-related major lower limb amputation incidence is strongly related to diabetic foot service provision and improves with enhancement of services: peer review of the south-west of England. *Diabet Med*. 2017;35(1):53-62.
16. Centers for Disease Control and Prevention. National diabetes fact sheet: National estimates and general information on diabetes and prediabetes in the United States, 2011. https://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf. Published 2011. Accessed October 11, 2019.
17. US Department of Veterans Affairs. Whole health for life. <https://www.va.gov/patientcenteredcare/explore/about-whole-health.asp>. Updated July 20, 2017. Accessed October 11, 2019.
18. Parsons HM. What happened at Hawthorne? New evidence suggests the Hawthorne effect resulted from operant reinforcement contingencies. *Science*. 1974;183(4128):922-9322.