

Improving Healthcare Providers' Adherence to Foot Exams for Type-II Diabetic Patients in a Primary Care Clinic

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ABSTRACT

Foot wounds are complications of type II diabetes mellitus (T2DM), which may be prevented with proper foot assessments. Diabetic foot exams are not consistently performed despite evidence-based screening tools available. **Objective:** To determine if the implementation of an electronic medical record (EMR) alert using Inlow's 60-Second Diabetic Foot Screen would impact the number of diabetic foot exams performed among T2DM patients at a primary care level. **Method:** A quantitative quasi-experiment design was used to implement an electronic medical record (EMR) alert using Inlow's 60-Second Diabetic Foot Screen to impact the frequencies of diabetic foot exams. Sample size was 65, n=35 in the comparative group and n= 30 in the implementation group. Population consisted of male and female patients ages 18 years and older, diagnosed with T2DM within the last two years, no previous diabetic foot exams or received foot care education, did not perform self-reported foot inspections, and were able to read, write, and speak English. A chi square test was run to analyze the frequencies of foot exams between groups. **Results:** A Pearson's chi-square showed a statistically significant increase in the foot exams $X^2(1, N=65) = 5.286, p= 0.02$ using an EMR alert with Inlow's 60-Second Diabetic Foot screen. **Conclusion:** EMR alerts increase performance of diabetic foot exams. Recommendations include sustainment of the program, dissemination of results, and further investigation of the impact of EMR alerts.

KEY WORDS: Diabetes, Foot screening, EMR alert.

Introduction

Type 2 diabetes mellitus (T2DM) is a widespread chronic health condition in the United States. Individuals diagnosed with type-2 diabetes lead the country in lower limb complications, such as foot ulcers, infections, and lower limb amputation.^[1] In this population at an Illinois primary care clinic, there was a substantial difference in how foot care was approached and performed. Foot exams are a vital part of diabetes care, as they prevent morbidity, loss of function, diabetic foot complications, and death.^[2] Unfortunately, foot examinations were frequently not performed by healthcare providers,

contributing to increased foot ulceration rates and other complications such as foot infections and lower limb amputation.^[1] Proper diabetic management, including routine foot exam performance, proper foot care, and wearing the correct footwear, could help avoid complications. The purpose of this quantitative quasi-experimental project was to determine to what degree the implementation of an electronic medical record (EMR) alert using Inlow's 60-Second Diabetic Foot Screen would impact the number of diabetic foot exams performed compared to the current practice among T2DM patients at a primary care clinic in urban Illinois.

In the study by Hickes,^[3] providers are not performing a diabetic foot exam at every patient visit. A comprehensive foot evaluation should be completed to identify risk factors. The goal was to shift the providers' attention from a traditional approach to a strength-based approach.^[2,4] Strength-based approaches are critical care points in preventing diabetic foot ulcers, infections, and lower limb

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amputation.^[4]

Frequently, guidelines are not established for the exams' performance at the primary care provider (PCP) clinics; hence, very few are being completed, emphasizing the need for quality improvement initiatives related to foot care. The American Diabetes Association (ADA) guidelines for the management of diabetes include general recommendations for foot care. One of the ADA's recommendations is to inspect the feet every visit.^[5] This recommendation is extremely imperative for patients with evidence of sensory loss, prior ulceration, or amputation.

The clinic strived to meet the American Diabetes Association^[5] and the International Diabetes Federation (IDF)^[6] guidelines, which focused on the providers' early intervention and sense of urgency to complete diabetic foot exams and patient education. The two national benchmarks, which are quality metrics outlined by the National Healthcare Quality and Disparities Report, included patients receiving diabetic foot care and patient education (98.6%), and adults diagnosed with diabetes check their feet for sores, irritations, and ulcerations daily (75.2%)^[7,8]. The standards of diabetic care for providers focus on the obvious such as monitoring glucose levels, glycated hemoglobin (Hemoglobin A1C), diet, and lifestyle.^[9] These are considered significant factors in managing diabetes; unfortunately, one aspect frequently lost is foot care. Providers must shift their focal point to include diabetic foot care as a standard of care. There must be an increased emphasis on provider education and reinforced teaching to note a change in current clinical practices.

Background

Type 2 diabetes mellitus and the disease's complications have a significant effect globally. It is the seventh leading cause of death in the United States.^[10] Diabetes poses a public health issue, involving roughly 415 million individuals and will increase from 642 million to 700 million by 2040.^[11] 1.6 million people have experienced diabetes-related complications, including death.^[12] In a study by the Centers for Disease Control and Prevention,^[13] 79,535 deaths occur annually because of diabetic complications. On average, individuals with diabetes may accumulate \$16,752 per year in medical expenses.^[14]

Promoting routine assessment of the diabetic patient's feet could prevent or decrease the severity of

limb complications associated with T2DM. In a study by Formosa, Gatt, and Chockalingam,^[15] diabetic foot exams should be embedded in everyday clinical practice. This routine could substantially reduce amputation rates by almost 75%. The literature supports the health advantages of diabetic foot exams performed by the PCP and patient education regarding daily self-foot inspections.^[16] Although the evidence supports the health advantages of annual diabetic foot exams for patients who are at low risk of developing ulcers, infections, and lower limb amputation, these foot exams should be performed by the PCP at each visit for patients who are at a higher risk.^[17]

A study by Williams, Jones, and Johnson, revealed that one-third of patients with diabetes do not receive a foot examination from their primary healthcare provider.^[18] Failure to perform a thorough diabetic foot exam negatively impacts the patient and contributes to ulcers, foot infections, neuropathy, and lower-limb amputations. Raghav et al. suggested that the cost of diabetic foot ulcers devoid of lower limb amputations ranges in the U.S. from \$993 to \$17,519.^[19] These fees are overwhelming to any patient, especially those who have experienced treatment of a foot ulcer, amputation of foot or limb, and the additional expenditures of the lifestyle modifications, such as frequent doctors' visits and in-home care. These expenses can be avoided with proper foot exams and patient education regarding the daily inspection of the feet.

Electronic medical record alerts and prompts can help providers prioritize their clinical practice to perform foot exams. Electronic medical records are capable of alerts and prompts, including using an assessment tool like Inlow's 60-second screening tool, which can significantly increase the number of foot exams performed at the primary care level.^[20] Patient education related to daily inspections and foot care must be a part of the patient's clinic visit. Consequently, there is an apparent need to address the current gap in evidence-based practice related to diabetic foot care at the primary care clinic.

Purpose

The aim of this quality improvement project was to determine to what degree an EMR alert with Inlow's 60-Second Diabetic Foot Screen instrument would impact the frequency of routine foot inspection among T2DM patients at a primary care clinic in urban Illinois.^[20] Evidence-based strategies such

as EMR alerts have helped remind providers to perform diabetic foot exams.^[21] A quantitative quasi-experiment design was used to implement an electronic medical record (EMR) alert using Inlow's 60-Second Diabetic Foot Screen to impact the number of diabetic foot exams compared to the current practice. In a study by Johnson, Jones, and Williams et al. 2018, advocated that foot care was crucial in preventing incidences related to foot ulcer development, foot infections, and amputation of a limb.^[22]

Foot exams are a vital part of diabetes care as they prevent morbidity, loss of function, diabetic foot complications, and death.^[2] Although diabetic foot exams are believed to decrease diabetic foot ulcers by 60% and non-traumatic lower-limb amputations by 95% annually, these exams are not routinely completed by PCPs.^[1,23] Additionally, no patient education is provided to patients regarding foot care and daily foot inspections.^[24]

Design and Methods

A quantitative quasi-experiment design was applied to make inferential statements about the data producing quantifiable, objective, and easy-to-interpret results. This quasi-experimental design was considered reliable for determining a difference in the pre- and post-intervention foot exams using a quantitative method. The instrument used was Inlow's 60-Second Diabetic Foot Screen coupled with an electronic medical alert (EMR). Inlow's tool was used to help the providers complete a structured foot exam on their patients to identify any foot abnormalities early. The EMR was used as an alert for the physicians. Physicians were alerted of their patients appointment type and diagnosis visible via the EMR health condition list and prompted to complete the diabetic foot exams. The population included male and female patients ages 18-years old and older, diagnosed with T2DM within the last two years, had no diabetic foot exam or received foot care education, did not perform or complete self-reported foot inspections, and able to read and write English.

Definition of Terms

Electronic Medical Record (EMR): An electronic collection of medical information regarding the patient is stored on a computer and used in the patient's clinical care. An electronic medical record includes information about a patient's health history, such as diagnoses, medicines, tests, allergies, immunizations, and treatment plans.^[25] The EMR

was managed by EPIC, which was used to provide the Smart Phrase alert to the provider, which presented the foot exam screening tool.

Inlow's 60 -Second Diabetic Foot Screening: An educational instrument that includes evidence-based tested messages to help physicians and staff identify patients with diabetic foot complications.^[20,26]

Results

Frequencies on diabetic foot exam performance were collected from two non-equivalent groups utilizing convenience sampling to obtain a sample of the targeted population. This population consisted of male and female patients ages 18 years and older, diagnosed with T2DM within the last two years and were able to read, write, and speak English.

The overall sample consisted of $N = 65$ diabetic patients, 18 years old and older, with $n = 34$ (52%) receiving a diabetic foot exam. The groups sampled were $n=35$ in the pre-intervention group and $n=30$ in the post intervention group. This overall proportion of patients from both groups getting a foot exam shows the continuing need to increase the performance of routine foot exams. The EMR alert was implemented to make the practitioner aware of the need for an exam and provide Inlow's 60-Second Diabetic Foot Screening for use. The EMR was used to identify patients who received a foot exam from both groups. The demographic information for patients receiving a foot exam from both groups was displayed in Table 1. Thirty-two percent of patients had foot exams performed before implementation of the EMR alert compared to 77% of patients having foot exams performed after the intervention was implemented. This finding represents a 45% mean difference in the performance of foot exams. It appeared that using the EMR alert and an evidence-based tool for foot screening helped providers conduct more diabetic foot exams. Thirty-four patients out of 65 (52% in both groups), were recipients of a foot exam, with 11 (32%) in the baseline group and 23 (76%) in the post-implementation group. The EMR alert implementation (0-pre and 1-postintervention) and foot exam frequencies (0-no exam or 1-foot exam performed) were variables compared in the analysis. Both variables were measured using counts or frequencies and subsequently compared using a Pearson chi-square test (χ^2). Table 2 displays the Pearson's Chi-square results showing the difference between pre/post intervention frequencies of foot exams was statistically significant [χ^2 (1, $N=65$) =

5.286, p= 0.02].

Table 1: Sample Demographics of Patients Receiving a Foot Exam from Both Groups (N = 34)

Variables:	N	%
Groups		
Pre-intervention Foot Exams Performed	11	32%
Post-Intervention Foot Exams Performed	23	68%
Gender		
Male	25	74%
Female	9	26%
Age		
35 to 44	9	26%
45 to 54	15	44%
55 and over	10	30%
Ethnicity		
Hispanic	7	21%
African American	23	67%
White	4	12%

Table 2: Chi-square test of Difference between Groups on Number of Foot Exams Performed

Group	No Foot Exam	Foot Exams Performed	χ^2	p
Pre implementation (n = 35)	24 (68%)	11 (32%)	5.286	.021*
Post implementation (n = 35)	7 (24%)	23 (76%)		
Total (N =65)	31 (47%)	34 (52%)		

Notes: N = 65; *p-level <.05

Conclusion

Healthcare providers are the first line of defense against diabetes complications. Completing foot exams on their patient at each office visit could be one strategy for monitoring the disease and its complications.^[27] Clinicians must develop strategies to identify and prevent foot complications early to avoid invasive treatment modalities, including amputation. The results showed a 45% increase in the performance of foot exams after the intervention of coupling an EMR with an evidenced-based tool for foot screenings.

A sample size of N = 65 patients were compared using a chi-square analysis with a significance level set at p<.05. Two sample groups were compared:

current practice or pre-implementation group of 35 patients and a post-implementation group of 30. The number of foot exams completed was reviewed pre-implementation and then again post-implementation. The current practice group only had 11-foot exams performed on 35 patients compared to 23-foot exams performed on the 30 post intervention patients. Providers who were prompted to complete the foot exams from the EMR alert showed an increase in exams.

Recommendations suggest that providers should choose to incorporate foot exams into their clinical practice as a standard of diabetic care. These practices are expected to improve the clinic's workflow, increase healthcare providers' knowledge levels, and contribute to a higher quality of patient-centered care. These recommendations provided an opportunity for growth and improvement related to patient outcomes.

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References

- Bonner T, Foster M, Spears-Lanoix E. Type 2 diabetes-related foot care knowledge and foot self-care practice interventions in the United States: a systematic review of the literature. *Diabetic Foot & Ankle* . 2016;7(1):1-8. Available from: <https://doi.org/10.3402/dfa.v7.29758>.
- Allen ML, Van Der Does AMB, Gunst C. Improving diabetic foot screening at a primary care clinic: A quality improvement project. *African Journal of Primary Health Care & Family Medicine*. 2016;8(1):1-9. Available from: <https://doi.org/10.4102/phcfm.v8i1.955>.
- Hicks CW, Selvin E. Epidemiology of Peripheral Neuropathy and Lower Extremity Disease in Diabetes. *Current Diabetes Reports*. 2019;19(86). Available from: <https://doi.org/10.1007/s11892-019-1212-8>.
- Bus SA, Netten JJ, Lavery LA, Monteiro-Soares M, Rasmussen A, Jubiz Y, et al. IWGDF guidance on the prevention of foot ulcers in at-risk patients with diabetes. *Diabetes, Metabolism, Research and reviews*. 2016;32(S1):16-24. Available from: <https://doi.org/10.1002/dmrr.2696>.
- Introduction: Standards of Medical Care in Diabetes—2021 . *Diabetes Care* . 2020;44(Supplement_1):S1-S2. Available from: <https://doi.org/10.2337/dc21-Sint>.
- Clinical practice recommendation on diabetic foot: A guide for healthcare professionals. 2017.

- Available from: <https://idf.org/?s=Clinical+practice+recommendation+on+diabetic+foot>.
- National healthcare quality and disparities reports. 2020. Available from: <https://www.ahrq.gov/research/findings/nhqrd/index.html>.
 - National diabetes benchmark details. 2020. Available from: http://nhqrnet.ahrq.gov/inhqrd/National/benchmark/table/Disease_and_Conditions/Diabetes.
 - Powell PW, Corathers SD, Raymond J, Streisand R. New Approaches to Providing Individualized Diabetes Care in the 21st Century. *Current Diabetes Reviews*. 2015;11(4):222–230. Available from: <https://doi.org/10.2174/1573399811666150421110316>.
 - Rowley WR, Bezold C, Arikan Y, Byrne E, Krohe S. Diabetes 2030: Insights from Yesterday, Today, and Future Trends. *Population Health Management*. 2017;20(1):6–12. Available from: <https://doi.org/10.1089/pop.2015.0181>.
 - Al-Lawati JA. Diabetes Mellitus: A Local and Global Public Health Emergency! *Oman Medical Journal*. 2017;32(3):177–179. Available from: <https://doi.org/10.5001/omj.2017.34>.
 - Diabetes Morbidity. 2018. Available from: <https://www.cdc.gov>.
 - National diabetes statistics report. 2020. Available from: <https://www.cdc.gov/diabetes/library/features/diabetes-stat-report.html>.
 - Whaley CM, Bollyky JB, Lu W, Painter S, Schneider J, Zhao Z, et al. Reduced medical spending associated with increased use of a remote diabetes management program and lower mean blood glucose values. *Journal of Medical Economics*. 2019;22(9):869–877. Available from: <https://doi.org/10.1080/13696998.2019.1609483>.
 - Formosa C, Gatt A, Chockalingam N. A Critical Evaluation of Existing Diabetic Foot Screening Guidelines. *Review of Diabetic Studies*. 2016;13(2-3):158–186. Available from: <https://pubmed.ncbi.nlm.nih.gov/28012281/>.
 - Buschkoetter KL, Powell W, Mazour L. Implementation of a comprehensive diabetic foot exam protocol in rural primary care. *Online Journal of Rural Nursing and Health Care*. 2019;19(1):43–63. Available from: <https://doi.org/10.14574/ojrnhc.v19i1.560>.
 - Gallman EC, Conner RS, Johnson E. Improving the Detection of Foot Abnormalities in Patients With Diabetes. *Clinical Diabetes*. 2017;35(1):55–59. Available from: <https://doi.org/10.2337/cd16-0017>.
 - Williams Y, Jones S, Johnson K. Increasing healthcare provider compliance in performing foot examinations in diabetic patients. *Online Journal of Nursing Informatics*. 2018;22(3):86–89. Available from: <https://www.himss.org/resources/increasing-healthcare-provider-compliance-performing-foot-examinations-diabetic-patients>.
 - Raghav A, Khan ZA, Labala RK, Ahmad J, Noor S, Mishra BK. Financial burden of diabetic foot ulcers to world: a progressive topic to discuss always. *Therapeutic Advances in Endocrinology and Metabolism*. 2017;9(1):29–31. Available from: <https://doi.org/10.1177/2042018817744513>.
 - How to use Inlow's 60-second Diabetic Foot Screen. 2018. Available from: <https://www.woundscanada.ca/docman/public/wound-care-canada-magazine/2018-16-no1/1266-wcc-summer-2018-v16n1-final-p-26-29-inlow-tool/file>.
 - O'neil N, Hoyt KS. Implementing an EMR Change for the Diabetic Foot Assessment. San Diego, CA, USA. 2017. Available from: <https://digital.sandiego.edu/cgi/viewcontent.cgi?article=1055&context=dnf>.
 - Johnson K, Jones S, Williams Y. Increasing Healthcare Provider Compliance in Performing Foot Examinations in Diabetic Patients. *Healthcare Information and Management System*. 2018;24(1):8–10. Available from: <https://www.himss.org/resources/increasing-healthcare-provider-compliance-performing-foot-examinations-diabetic-patients>.
 - Living with diabetes: Keep your feet healthy. 2015. Available from: <https://www.cdc.gov/features/diabetesfoothealth/index.html>.
 - Yazdanpanah L, Shahbazian H, Nazari I, Arti HR, Ahmadi F, Mohammadianinejad SE, et al. Incidence and Risk Factors of Diabetic Foot Ulcer: A Population-Based Diabetic Foot Cohort (ADFC Study)—Two-Year Follow-Up Study. *International Journal of Endocrinology*. 2018;2018:1–10. Available from: <https://doi.org/10.1155/2018/7631659>.
 - Kruse CS, Stein A, Thomas H, Kaur H. The use of Electronic Health Records to Support Population Health: A Systematic Review of the Literature. *Journal of Medical Systems*. 2018;42(214):1–16. Available from: <https://doi.org/10.1007/s10916-018-1075-6>.
 - Parasuraman M, Giridharan B, Vijayalakshmi G. Reliability and credibility analysis of Inlow's 60 second diabetic foot screening tool for diabetic foot risk stratification and its feasibility in India: a systematic review. *International Surgery Journal*. 2017;4(9):2878–2888. Available from: <https://doi.org/10.18203/2349-2902.isj20173867>.
 - Frykberg RG, Banks J. Management of Diabetic Foot Ulcers: A Review. *Journal of Federal Practitioners*. 2016;33(2):16–23. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6368931/?report=reader>.

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