

Empowering Patients with Diabetes Mellitus Through Diabetic Foot Care Education for Ulcer and Skin Integrity Disorder Prevention

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ABSTRACT

Background: Diabetes mellitus may lead to peripheral neuropathy, impaired circulation, and other lower-extremity complications that increase the risk of foot ulcers, infection, impaired skin integrity, and amputation. Inadequate knowledge and foot-care skills may limit patients' ability to recognize and prevent early foot problems. Structured education combined with practical skills training can strengthen preventive self-care.

Objectives: This community service program aimed to improve the knowledge and practical skills of patients with diabetes mellitus in performing diabetic foot care to support the prevention of foot ulcers and impaired skin integrity.

Methods: Thirty patients with diabetes mellitus participated in health education, demonstration, and guided practice covering daily foot inspection, foot hygiene, safe nail care, skin care, appropriate footwear, early recognition of wounds and infection, and blood glucose monitoring. Outcomes were evaluated using pre-test and post-test knowledge assessments and a diabetic foot-care skills checklist.

Results: The mean knowledge score increased from 56.3 before the program to 87.0 after the program. The proportion of participants demonstrating good foot-care skills increased from 40.0% to 90.0%. Participants also demonstrated improved ability to inspect their feet, maintain appropriate skin hygiene and moisture, select suitable footwear, and recognize early signs of wounds and infection requiring professional care.

Conclusions: Diabetic foot-care education combined with practical skills training was followed by improved patient knowledge and preventive foot-care skills. Continuing education and regular reinforcement are recommended to strengthen self-care and support prevention of diabetes-related foot complications.



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Introduction

Diabetes mellitus is a major chronic disease associated with substantial morbidity and long-term complications. The World Health Organization reported that approximately 830 million people worldwide were living with diabetes in 2022, with prevalence increasing particularly rapidly in low- and middle-income countries. Diabetes can damage blood vessels and peripheral nerves and is an important cause of kidney disease, cardiovascular complications, visual impairment, foot ulceration, and lower-limb amputation.

Foot complications constitute one of the most preventable yet clinically significant consequences of diabetes. Peripheral neuropathy may reduce protective sensation, while peripheral arterial disease can impair tissue perfusion and healing. When these conditions occur together with trauma, inappropriate footwear, structural deformity, callus formation, or inadequate foot-care practices, the risk of ulceration increases. Current American Diabetes Association recommendations therefore emphasize systematic foot assessment, identification of sensory loss and vascular disease, and education regarding preventive self-care.

The clinical significance of these complications is illustrated by cases in which apparently limited foot trauma develops into tissue damage, necrosis, infection, and potential amputation. The clinical case used as the foundation for this community service program documented diabetes mellitus accompanied by a gangrenous foot wound and impaired skin integrity. The patient presented with a wound requiring dressings, necrotic tissue management, infection monitoring, and ongoing wound care. KIA Moch Sholehudin Tuffa Such a case demonstrates why prevention should begin before patients develop open wounds or advanced diabetic foot complications.

In the source case, laboratory assessment also demonstrated markedly elevated fasting and postprandial glucose and an HbA1c of 13.5%, indicating the importance of glycemic management in addition to local foot care. KIA Moch Sholehudin Tuffa Chronic hyperglycemia is among the factors associated with increased risk for diabetic foot complications, and diabetes management therefore requires integration of foot self-care with glucose monitoring, medication adherence, nutrition, and other recommended self-management behaviors.

Preventive foot care includes regular inspection of the skin and nails, appropriate hygiene, maintenance of skin condition, avoidance of avoidable trauma, and use of properly fitting footwear. The International Working Group on the Diabetic Foot specifically advises people at risk not to walk barefoot, in socks without shoes, or in thin-soled slippers because these practices may expose the foot to mechanical stress or trauma. Current ADA guidance similarly recommends daily surveillance for early foot problems and education regarding appropriate skin and nail care.

Patients also need to understand when self-care is insufficient. Open ulceration, unexplained swelling, erythema, increased skin temperature, signs of infection, or other concerning changes warrant prompt professional assessment. Patients with loss of protective sensation, peripheral arterial disease, structural abnormalities, previous ulcers, or previous amputations require closer surveillance and, when indicated, specialist care.

Education is therefore central to diabetic foot prevention. A systematic review and meta-analysis by Ayaz et al. found that diabetic foot-care education improved patients' foot-care knowledge and behaviors. A more recent meta-analysis of 29 randomized trials similarly reported that educational interventions generally improved diabetic-foot knowledge and self-care behaviors, although the certainty and quality of evidence for clinical outcomes varied substantially across studies.

This distinction is important. Education can improve what patients know and what they do, but improvement in knowledge should not automatically be interpreted as proof that ulcers or amputations have been prevented. An umbrella review concluded that evidence for single-component education alone remains insufficient for consistently demonstrating reductions in ulceration and amputation, supporting the use of multifaceted and continuing preventive approaches.

Practical training may strengthen education by helping patients translate information into everyday behavior. Patients can be shown how to inspect difficult-to-see areas of the foot, clean and dry the feet appropriately, care for skin safely, examine footwear, and identify conditions requiring professional assessment. A recent review of diabetic foot self-care literature identified washing, drying, moisturizing, appropriate nail care, foot inspection, footwear selection, avoidance of barefoot walking, and routine healthcare consultation among commonly recommended preventive practices.

The clinical source for the present program also emphasized patient and family education regarding keeping the wound environment clean, avoiding inappropriate loading of affected areas, and using footwear that does not cause new injury or exacerbate existing lesions. KIA Moch Sholehudin Tuffa Based on these clinical needs and current preventive recommendations, this community service program was developed to empower patients through diabetic foot-care education, demonstration, and guided practice. The program aimed to improve patients' knowledge and practical foot-care skills to support prevention and early recognition of diabetic foot complications.

Methods

Program Design/Approach

This community service program used a patient-empowerment approach combining health education, demonstration, discussion, and guided practice. The program focused on preventive diabetic foot self-care and early recognition of abnormalities rather than professional treatment of established diabetic foot ulcers.

The learning strategy was designed to address both cognitive and psychomotor outcomes. Health education provided participants with information about diabetes-related foot complications and preventive behaviors, whereas demonstration and guided practice allowed participants to apply preventive foot-care techniques under supervision.

The program therefore emphasized the sequence:

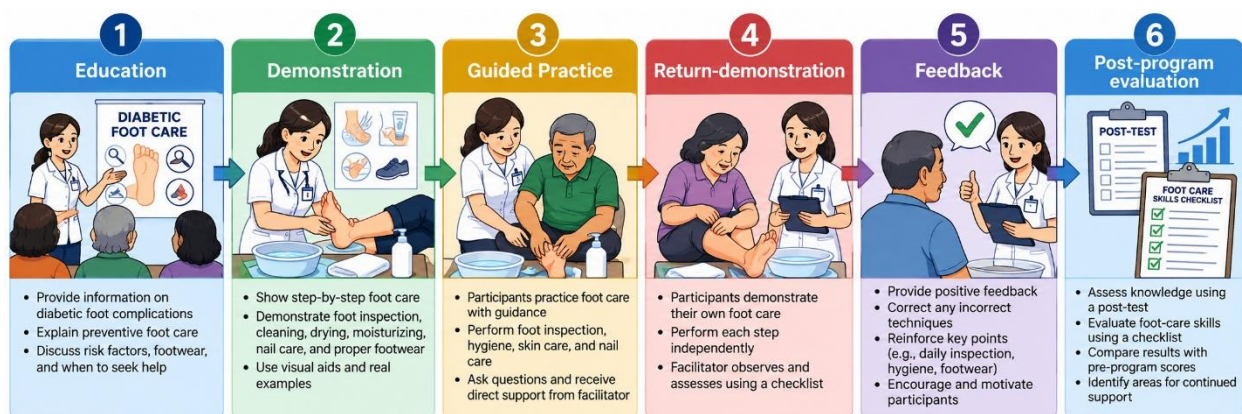


Figure 1. Educational and skills-training process for diabetic foot care.

The program was implemented through six sequential stages: education, demonstration, guided practice, return-demonstration, feedback, and post-program evaluation. Participants first received information on diabetic foot complications and preventive foot-care practices, followed by step-by-step demonstrations. They then practiced the skills under supervision, independently demonstrated the procedures, received corrective feedback, and completed post-program knowledge and skills assessments. This approach is consistent with evidence showing that foot-care educational interventions can improve patient knowledge and self-care behaviors.

Community Partner and Target Population

The community service program involved 30 patients with diabetes mellitus. Participants were individuals requiring education and practical preparation regarding independent diabetic foot care.

The program was developed in response to common risks associated with diabetes, including impaired sensation, circulation problems, poor recognition of early lesions, unsafe foot-care practices, inadequate footwear, and delayed presentation to healthcare services.

The clinical needs assessment was additionally informed by the source case of diabetes mellitus with impaired skin integrity. The original patient developed a gangrenous foot lesion requiring professional wound management, and the case emphasized the role of patient and family education in maintaining wound cleanliness and recognizing infection.

Community Service Intervention/Activities

The program was organized into five stages.

Stage 1 – Preparation and Needs Assessment. Educational needs were identified in relation to patients' understanding of diabetic foot complications, daily foot inspection, hygiene, skin care, footwear, nail care, blood glucose monitoring, and recognition of wounds or infection. The needs assessment focused on prevention rather than teaching participants to independently manage advanced ulcers.

Stage 2 – Program Planning. Educational materials and practical demonstrations were prepared to address the principal components of diabetic foot self-care. Evaluation instruments consisted of a knowledge assessment and a diabetic foot-care skills checklist.

Stage 3 – Health Education and Practical Training. Participants received education and guided practice in the following areas.

1. Understanding diabetic foot complications. Participants were informed about the relationship between diabetes, neuropathy, impaired circulation, reduced protective sensation, delayed wound healing, infection, ulceration, and potential amputation.
2. Daily foot inspection. Participants were taught to inspect all areas of both feet regularly, including the soles and areas between the toes. Participants who had difficulty visualizing the soles were encouraged to use an appropriate mirror or request assistance.
3. Foot hygiene. Participants were taught to keep the feet clean and to dry them appropriately, especially between the toes.
4. Skin care. Participants were educated about preventing excessive dryness and maintaining skin condition appropriately. Moisturizer can be used for dry skin while avoiding unnecessary application between the toes where excessive moisture may contribute to skin problems. Current ADA guidance includes moisturization of dry, scaly skin as part of preventive management.
5. Safe nail care. Participants received education about appropriate nail care and were instructed not to attempt unsafe self-treatment of ingrown nails, calluses, or other abnormalities requiring professional management.
6. Appropriate footwear. Participants were taught to inspect footwear, select appropriately fitting protective footwear, and avoid walking barefoot. People at elevated ulcer risk may require professionally evaluated or therapeutic footwear according to their risk category.
7. Early recognition of wounds and infection. Participants learned to identify redness, swelling, skin breakdown, blisters, wounds, drainage, increased temperature, and other abnormal findings and to seek healthcare assessment promptly rather than attempting inappropriate self-treatment.
8. Blood glucose monitoring and diabetes self-management. Foot care was presented as one component of comprehensive diabetes management. Participants were reminded of the importance of glucose monitoring, prescribed medication, nutrition, physical activity, and routine healthcare follow-up. The source KIA similarly incorporated monitoring of blood glucose and patient education regarding independent glucose monitoring in the management of diabetes.

Stage 4 – Monitoring and Evaluation. Knowledge was evaluated before and after the program. Practical foot-care skills were assessed using a checklist before and following education, demonstration, and guided practice.

Stage 5 – Follow-up and Sustainability. Participants were encouraged to continue preventive foot-care practices at home and obtain regular foot assessment from healthcare professionals. Continuing reinforcement was recommended because diabetic foot-care knowledge may decline over time without repeated education

Table 1. Components of the Diabetic Foot-Care Education Program

Program Component	Main Educational Content	Learning Strategy	Learning Strategy
Diabetic foot awareness	Neuropathy, circulation problems, ulcers, infection	Health education	Health education
Daily foot inspection	Skin, soles, toes, interdigital areas, abnormalities	Demonstration and guided practice	Demonstration and guided practice
Foot hygiene	Cleaning and appropriate drying	Demonstration	Demonstration
Skin care	Recognition of dryness and appropriate moisturizing	Education and demonstration	Education and demonstration
Nail care	Safe nail-care principles and indications for professional care	Education and demonstration	Education and demonstration
Footwear	Fit, protection, shoe inspection, avoidance of barefoot walking	Education and discussion	Education and discussion
Early problem recognition	Redness, blistering, wounds, swelling, infection	Image/example-based education and discussion	Image/example-based education and discussion
Diabetes monitoring	Blood glucose and comprehensive self-management	Health education	Health education
Guided practice	Integration of preventive skills	Return-demonstration and feedback	Return-demonstration and feedback

Instruments and Program Evaluation

Two program outcomes were evaluated: knowledge and practical diabetic foot-care skills. Knowledge regarding diabetic foot complications and preventive care was evaluated before and after the educational activities. The mean knowledge score was 56.3 at pre-test and 87.0 at post-test. Practical skills were assessed using a diabetic foot-care skills checklist. Before the program, 40.0% of participants demonstrated good foot-care skills. Following education, demonstration, and guided practice, 90.0% were categorized as demonstrating good skills. Skills evaluation focused on practical behaviors including foot inspection, skin hygiene and moisture management, footwear selection, and recognition of abnormalities requiring healthcare assessment. No questionnaire validity coefficient, reliability statistic, cut-off value, or number of items is reported unless confirmed from the actual program documentation.

Data Collection

Data collection followed a pre-program–intervention–post-program sequence. Participants initially underwent assessment of their knowledge and practical foot-care ability. They subsequently participated in health education, demonstration, and guided practice. Knowledge and practical skills were reassessed after completion of the program.

Data Analysis

Program outcomes were analyzed descriptively. Mean values were used to summarize knowledge scores, while percentages were used to describe the proportion of participants demonstrating good foot-care skills. Absolute changes between pre-program and post-program values were calculated. No inferential statistical significance, confidence interval, or effect size is reported because these analyses were not provided in the available program dataset.

Results

Program Implementation

Thirty patients with diabetes mellitus participated in the diabetic foot-care education program. The activities combined health education, demonstration, discussion, and guided practice to strengthen participants' knowledge and ability to perform preventive foot care independently. The training focused on practical behaviors that could be incorporated into daily self-management, including inspection of the feet, hygiene and skin care, appropriate nail-care principles, footwear selection, recognition of early wounds and infection, and blood glucose monitoring.

Changes in Knowledge

The mean participant knowledge score increased from 56.3 before the program to 87.0 after the program, representing an absolute increase of 30.7 points.

Table 2. Knowledge Scores Before and After the Program

Indicator	Pre-program	Post-program	Absolute Change
Mean knowledge score	56.3	87.0	+30.7

The increase indicates improved understanding of diabetic foot risk, preventive foot-care practices, and early recognition of abnormalities following the educational intervention.

Changes in Diabetic Foot-Care Skills

Before the program, 40.0% of participants demonstrated good foot-care skills. Following the program, this proportion increased to 90.0%, representing an increase of 50.0 percentage points.

Table 3. Diabetic Foot-Care Skills Before and After the Program

Indicator	Before Program	After Program	Absolute Change
Participants able to perform diabetic foot exercises correctly	40.0%	90.0%	+53.3 percentage points

Following training, participants demonstrated greater ability to inspect their feet, maintain appropriate hygiene and skin condition, select protective footwear, and identify early signs of wounds or infection requiring professional healthcare.

Discussion

The program was followed by a marked descriptive improvement in patients' diabetic foot-care knowledge, with the mean score increasing from 56.3 to 87.0. This finding is clinically relevant because effective prevention requires patients to recognize that foot care is a routine part of diabetes management rather than an activity performed only after a wound develops.

The observed improvement is consistent with current evidence. A systematic review and meta-analysis involving randomized trials found that diabetic foot-care education significantly improved patient knowledge and foot-care behavior. Drovandi et al. similarly reported that educational programs improved diabetic-foot knowledge in most evaluated trials and foot self-care behavior in 19 of 20 trials reporting this outcome.

The proportion of participants demonstrating good practical skills increased from 40.0% to 90.0%. This result highlights the importance of combining verbal information with demonstration and guided practice. Foot self-care requires psychomotor abilities: patients must know where and how to inspect their feet, recognize abnormal skin changes, care for the skin and nails appropriately, and evaluate footwear before use. Information alone may therefore be insufficient.

Health education appears particularly valuable for improving self-care practices. A systematic review focusing on podiatric knowledge and self-care found that educational interventions generally increased foot self-care among adults with diabetes. A review of patient knowledge and practice also identified regular washing and drying, moisturizing, nail care, examination of the feet, use of appropriate footwear, avoidance of barefoot walking, and healthcare consultation as important components of diabetic foot self-management.

Daily foot inspection is one of the most important behaviors taught in the program. Reduced protective sensation can allow small injuries to progress without being noticed. Current ADA guidance recommends preventive foot self-care education for all people with diabetes, including instruction in appropriate methods of daily inspection for early foot problems. Patients with loss of protective sensation, previous ulceration, or other high-risk conditions require more intensive surveillance.

Appropriate footwear represents another central prevention strategy. IWGDF recommends that people at risk of ulceration avoid walking barefoot, walking only in socks, or using thin-soled slippers both indoors and outdoors. For moderate- and high-risk patients, footwear should adequately accommodate the foot and reduce potentially harmful pressure, and professionally prescribed therapeutic footwear may be required.

The emphasis on skin integrity was strongly supported by the original clinical case. The source patient developed tissue damage and a diabetic gangrenous foot lesion requiring wound monitoring, removal of necrotic tissue, cleansing, dressing, and infection assessment. The original implementation also included education of the patient or family regarding signs and symptoms of infection. KIA Moch Sholehudin Tuffa This experience provides a clinically meaningful rationale for shifting attention upstream—from treatment of established tissue damage toward education for prevention and early recognition.

However, an important distinction must be maintained between preventive self-care and professional wound treatment. Patients should not be encouraged to perform debridement, treat infected ulcers independently, remove significant calluses, or manage ingrown nails without appropriate professional guidance. ADA recommendations indicate that patients with open ulceration, unexplained swelling, erythema, or increased skin temperature should be referred promptly for specialist or interprofessional evaluation.

The program also included blood glucose monitoring because foot health cannot be separated from overall diabetes management. Chronic hyperglycemia is associated with neuropathy, vascular damage, delayed healing, and elevated risk of foot complications. The original clinical case illustrates this relationship: fasting glucose was 295 mg/dL, 2-hour postprandial glucose was 319 mg/dL, and HbA1c was 13.5%. KIA Moch Sholehudin Tuffa The KIA therefore emphasized monitoring blood glucose and teaching independent glucose monitoring as part of diabetes management.

The program's focus on patient empowerment is also important. Preventive foot care occurs primarily outside healthcare facilities and depends on daily behavior. Patients need sufficient knowledge to recognize risk, practical skills to care for their feet, and confidence to seek help early when abnormalities occur. In this sense, education is not simply the transfer of information; it is preparation for sustained self-management.

Nevertheless, the present results should not be interpreted as evidence that the program itself prevented diabetic foot ulcers. The measured outcomes were knowledge and practical skills, not new-ulcer incidence, infection, amputation, or long-term clinical outcomes. This caution is consistent with the broader evidence base. An umbrella review found that single educational interventions have not consistently demonstrated reductions in ulceration or amputation, although multifaceted interventions appear more promising. A systematic review of ulcer-prevention strategies likewise judged evidence for structured education alone to be of low certainty.

Consequently, the main contribution of this community service program is evidence of short-term improvement in prevention-related knowledge and skills. These outcomes are valuable because they address modifiable behaviors that form part of comprehensive diabetic foot prevention, but longer follow-up would be necessary to determine whether they translate into fewer wounds or other clinical complications.

Implications, Sustainability, and Limitations

The program has direct implications for community and nursing practice. Nurses can incorporate diabetic foot assessment and education into routine diabetes encounters and use

demonstration and return-demonstration to verify that patients can apply preventive behaviors correctly. Education should include not only what patients should do but also what they should **not** attempt independently and when they need professional assessment.

Sustainability can be strengthened through repeated educational sessions, visual educational materials, periodic skills reassessment, family involvement, and integration of foot-care education into primary-care and community diabetes programs. Repetition is important because ADA guidance notes that knowledge related to diabetic foot care may be forgotten and therefore requires regular reinforcement.

Several limitations should be considered. The program used a descriptive pre-test and post-test evaluation without a comparison group or inferential statistical analysis. Participant demographic and clinical-risk characteristics were not available for subgroup analysis. The evaluation focused on immediate knowledge and practical skills; therefore, long-term retention of foot-care behavior was not established. The program also did not measure subsequent incidence of diabetic foot ulcers, infection, hospitalization, amputation, or quality of life. Accordingly, the results demonstrate short-term educational improvement rather than clinical effectiveness in preventing ulceration.

Relevance for Practice

Nurses and community healthcare providers should consider preventive diabetic foot care a routine component of diabetes self-management education. A practical approach includes assessing individual foot risk, providing concise education, demonstrating daily inspection and skin-care practices, observing patient return-demonstration, reinforcing protective footwear, and teaching patients to recognize abnormalities that require professional assessment. Patients with loss of protective sensation, peripheral arterial disease, previous ulceration, structural abnormalities, or active lesions require closer professional surveillance and should not rely solely on self-care education.

Conclusion

The diabetic foot-care education and skills-training program was followed by substantial improvements in patient knowledge and practical preventive foot-care skills. Combining education with demonstration and guided practice enabled participants to strengthen their ability to inspect their feet, maintain appropriate skin and foot hygiene, use suitable footwear, and recognize early abnormalities requiring healthcare assessment. These findings support the incorporation of structured foot-care education into diabetes self-management programs. Continued education, repeated skills reinforcement, regular professional foot assessment, and comprehensive diabetes management are recommended to support prevention of diabetic foot complications.

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Author Contribution

Moch Sholehudin Tuffa contributed to the conceptualization of the community service program, needs assessment, program planning, implementation of diabetic foot-care education and skills training, data collection, program evaluation, literature review, data interpretation, and preparation of the original manuscript.

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Declaration of Conflicting Interest

The authors declare no conflict of interest related to the implementation of this community service program or the publication of this manuscript.

Declaration of Use of AI in Scientific Writing

The authors declare that generative AI and AI-assisted technologies were used solely to support language editing, grammatical refinement, and improvement of the clarity and readability of the manuscript. The authors reviewed, verified, and revised all AI-assisted content and remain fully responsible for the accuracy, integrity, interpretation, and final content of the manuscript.

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