



“Nursing Strategies for Prevention of Diabetic Foot Complications: Advancing Evidence-Based Foot Care for Improved Patient Outcomes”

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Abstract: Diabetes mellitus is a major global health challenge associated with numerous chronic complications, among which diabetic foot complications represent one of the most debilitating and costly conditions. Diabetic foot complications include foot ulcers, infections, Charcot neuroarthropathy, gangrene, and lower-extremity amputations. These complications significantly affect quality of life, increase healthcare expenditures, and contribute to morbidity and mortality. Effective prevention remains the most successful approach to reducing the burden of diabetic foot disease. Nurses play a pivotal role in preventing diabetic foot complications through patient education, early risk identification, routine foot assessment, wound prevention strategies, glycemic control promotion, multidisciplinary collaboration, and community-based interventions. This review explores the pathophysiology, risk factors, and epidemiology of diabetic foot complications while emphasizing evidence-based nursing strategies for prevention. The article highlights current guidelines, nursing interventions, patient-centered education approaches, technological advancements, and future directions in diabetic foot care. Strengthening nursing involvement in preventive care can significantly reduce diabetic foot-related morbidity and improve overall health outcomes among individuals living with diabetes.

Keywords: Diabetes Mellitus, Diabetic Foot, Foot Ulcer Prevention, Nursing Care, Peripheral Neuropathy, Patient Education, Foot Assessment, Wound Prevention, Glycemic Control, Community Health Nursing

Introduction

Diabetes mellitus is one of the fastest-growing chronic diseases worldwide, affecting millions of individuals across developed and developing countries. The increasing prevalence of diabetes has resulted in a parallel rise in diabetes-related complications, among which diabetic foot complications constitute a major public health concern. Diabetic foot complications are defined as infections, ulcerations, or destruction of deep tissues associated with neurological abnormalities and varying degrees of peripheral vascular disease in the lower extremities (International Working Group on the Diabetic Foot [IWGDF], 2023).

Diabetic foot complications contribute significantly to hospitalization rates, disability, healthcare costs, and lower-extremity amputations. Studies estimate that approximately 15–25% of individuals with diabetes may develop a foot ulcer during their lifetime (Armstrong et al., 2017). Furthermore, diabetic foot ulcers precede nearly 85% of diabetes-related

amputations, emphasizing the critical importance of preventive care (Boulton et al., 2020).

Nurses are often the healthcare professionals who maintain the closest and most consistent contact with patients. Consequently, they occupy a central position in diabetic foot prevention programs. Through comprehensive assessment, education, counseling, and coordinated care, nurses can identify risk factors early and implement interventions that prevent progression to severe complications. This review examines evidence-based nursing strategies aimed at preventing diabetic foot complications and promoting optimal foot health among diabetic patients.

Overview of Diabetic Foot Complications

Diabetic foot complications encompass a spectrum of pathological conditions affecting the lower extremities in individuals with diabetes. These complications arise primarily due to peripheral neuropathy, peripheral arterial disease, and impaired immune function. The combination of these factors



predisposes patients to injuries, delayed wound healing, infections, and tissue destruction.

Peripheral neuropathy is among the most significant contributors to diabetic foot complications. Sensory neuropathy reduces the ability to perceive pain, pressure, heat, and trauma, resulting in unnoticed injuries. Motor neuropathy causes muscle imbalance and foot deformities, increasing abnormal pressure points. Autonomic neuropathy leads to dry skin and fissures that facilitate bacterial entry (Boulton et al., 2020).

Peripheral arterial disease further compromises tissue perfusion and oxygen delivery, impairing wound healing and increasing the likelihood of ulceration. Hyperglycemia also contributes to immune dysfunction, reducing the body's ability to fight infections. As a result, minor injuries can rapidly progress to severe infections, osteomyelitis, gangrene, and eventual amputation.

The most common diabetic foot complications include foot ulcers, cellulitis, abscesses, osteomyelitis, gangrene, and Charcot foot. These conditions significantly impair mobility, independence, psychological well-being, and overall quality of life.

Epidemiology and Burden of Diabetic Foot Disease

Diabetic foot disease represents a major global healthcare challenge. The prevalence of diabetic foot ulcers varies across regions but is estimated to affect approximately 6–10% of individuals with diabetes at any given time (Zhang et al., 2017). Developing countries often experience higher rates due to limited access to preventive services, delayed diagnosis, inadequate patient education, and socioeconomic barriers.

Hospital admissions related to diabetic foot complications account for a substantial proportion of diabetes-related healthcare utilization. Diabetic foot ulcers are among the leading causes of prolonged hospitalization and non-traumatic lower-limb amputations worldwide. The mortality rate following major amputation remains alarmingly high, often exceeding that of several cancers (Armstrong et al., 2017).

The economic burden is equally significant. Costs associated with wound care, hospitalization, surgical interventions, rehabilitation, prosthetics, and long-term disability create substantial strain on healthcare systems. Prevention therefore remains the most cost-effective strategy for reducing morbidity and healthcare expenditure.

Risk Factors for Diabetic Foot Complications

Several factors increase the likelihood of developing diabetic foot complications. Understanding these risk factors enables nurses to identify high-risk individuals and implement targeted interventions.

Poor glycemic control is a primary risk factor because persistent hyperglycemia accelerates neuropathy, vascular disease, and immune dysfunction. Longer duration of diabetes further increases the risk due to cumulative damage to nerves and blood vessels.

Peripheral neuropathy is strongly associated with ulcer formation because patients may fail to recognize injuries or pressure-related damage. Peripheral arterial disease reduces tissue viability and delays wound healing. Foot deformities such as hammer toes, claw toes, bunions, and Charcot foot create abnormal pressure points that predispose patients to skin breakdown.

Previous history of foot ulceration or amputation is among the strongest predictors of future complications. Additional risk factors include smoking, obesity, advanced age, visual impairment, limited mobility, poor footwear, inadequate foot hygiene, chronic kidney disease, and low socioeconomic status (IWGDF, 2023).

Nurses must assess these factors systematically during routine patient encounters to facilitate early intervention and risk reduction.

Role of Nurses in Diabetic Foot Prevention

Nurses serve as essential members of multidisciplinary diabetes care teams. Their role extends beyond direct clinical care to include health promotion, disease prevention, education, counseling, advocacy, and care coordination.

In diabetic foot prevention, nurses perform comprehensive foot assessments, identify risk factors, educate patients



regarding self-care practices, promote adherence to treatment plans, monitor glycemic control, facilitate referrals, and support behavioral changes. Through continuous patient engagement, nurses can detect subtle changes that may indicate emerging complications.

Evidence demonstrates that nurse-led diabetic foot programs significantly reduce ulcer incidence, improve self-care behaviors, and decrease amputation rates (Bus et al., 2023). Therefore, strengthening nursing competencies in diabetic foot care is critical for improving patient outcomes.

Comprehensive Foot Assessment

Routine foot assessment is one of the most effective nursing interventions for preventing diabetic foot complications. Comprehensive assessments facilitate early identification of abnormalities before severe damage occurs.

Visual inspection includes examination of skin integrity, color changes, calluses, fissures, blisters, fungal infections, nail abnormalities, edema, and deformities. Nurses should assess both feet thoroughly, including interdigital spaces and plantar surfaces.

Neurological assessment evaluates protective sensation using monofilament testing. Additional tests such as vibration perception, pinprick sensation, and ankle reflex assessment help determine the extent of neuropathy.

Vascular assessment involves evaluating pedal pulses, capillary refill, skin temperature, and signs of ischemia. Nurses should identify symptoms such as intermittent claudication, rest pain, and delayed wound healing.

Musculoskeletal evaluation focuses on structural deformities, gait abnormalities, pressure distribution, and footwear assessment. Documentation of findings facilitates ongoing monitoring and risk stratification.

Regular foot examinations should be conducted annually for low-risk patients and more frequently for high-risk individuals according to established guidelines.

Patient Education as a Cornerstone of Prevention

Patient education remains the foundation of diabetic foot prevention. Effective education empowers individuals to

actively participate in self-care and recognize early warning signs of complications.

Nurses should teach patients the importance of daily foot inspection. Patients should examine their feet for cuts, blisters, redness, swelling, nail abnormalities, and changes in skin condition. Individuals with limited mobility or visual impairment may require assistance from family members or caregivers.

Education regarding proper foot hygiene is essential. Patients should wash their feet daily with lukewarm water, dry them thoroughly, particularly between the toes, and apply moisturizers to prevent skin cracking. However, moisturizers should not be applied between toes because excess moisture may promote fungal growth.

Patients should be instructed never to walk barefoot, even indoors. Appropriate footwear helps protect feet from injuries and pressure-related damage. Nurses should also emphasize prompt reporting of any foot abnormalities to healthcare providers.

Educational interventions are most effective when individualized, culturally appropriate, and reinforced regularly through multiple teaching sessions.

Promotion of Optimal Glycemic Control

Maintaining optimal blood glucose levels is fundamental to preventing diabetic foot complications. Persistent hyperglycemia contributes to neuropathy, vascular disease, impaired immunity, and delayed wound healing.

Nurses play a key role in promoting glycemic control through medication education, self-monitoring guidance, nutritional counseling, and lifestyle modification support. They help patients understand the relationship between blood glucose management and complication prevention.

Regular monitoring of glycated hemoglobin (HbA1c) provides valuable information regarding long-term glycemic control. Nurses should encourage adherence to prescribed treatment regimens and assist patients in overcoming barriers to diabetes self-management.

Collaboration with dietitians, endocrinologists, and diabetes educators further enhances comprehensive glycemic management.



Footwear Assessment and Management

Appropriate footwear is a critical component of diabetic foot prevention. Ill-fitting shoes contribute significantly to ulcer development through friction, pressure, and trauma.

Nurses should assess patients' footwear during clinical visits. Shoes should fit properly, provide adequate support, accommodate deformities, and minimize pressure points. Seamless interiors reduce friction-related injuries.

Patients should be advised to inspect shoes before wearing them to identify foreign objects, rough seams, or damaged linings. New shoes should be introduced gradually to prevent pressure injuries.

High-risk individuals may benefit from therapeutic footwear, custom orthotics, or specialized diabetic shoes. Nurses facilitate referrals to podiatrists and orthotists when specialized footwear is required.

Skin and Nail Care Interventions

Maintaining skin integrity is essential for preventing ulcer formation. Nurses educate patients regarding proper skin care practices and monitor for early signs of breakdown.

Dry skin should be managed with appropriate moisturizers to reduce cracking and fissure formation. Excessive moisture between toes should be avoided to prevent fungal infections. Nail care requires special attention because improper trimming can cause injuries and ingrown toenails. Patients should be instructed to trim nails straight across and avoid cutting corners excessively. High-risk patients may require professional podiatric nail care.

Management of calluses and corns should be performed by trained healthcare professionals. Patients should be discouraged from using chemical agents, sharp instruments, or home remedies that may damage skin.

Smoking Cessation Counseling

Smoking significantly increases the risk of diabetic foot complications by impairing circulation and delaying wound healing. Tobacco use accelerates peripheral arterial disease and reduces tissue oxygenation.

Nurses play a vital role in smoking cessation programs by assessing readiness to quit, providing counseling, offering behavioral support, and facilitating access to cessation resources. Evidence indicates that structured smoking cessation interventions improve vascular health and reduce complication risks among diabetic patients.

Continuous encouragement and follow-up support are essential for sustaining long-term smoking abstinence.

Early Detection and Management of Peripheral Neuropathy

Peripheral neuropathy often develops gradually and may remain unnoticed until complications arise. Early detection is therefore crucial.

Nurses should routinely screen for symptoms such as numbness, tingling, burning sensations, reduced sensation, and balance disturbances. Objective neurological assessments help identify neuropathy before ulceration occurs.

Patient education regarding neuropathy-related risks enhances self-protective behaviors. Individuals with sensory loss should avoid exposure to extreme temperatures and perform frequent foot inspections.

Early management of neuropathy through glycemic control, symptom management, and protective strategies reduces the likelihood of injury and ulcer formation.

Community-Based Nursing Interventions

Community health nurses play a critical role in extending diabetic foot prevention services beyond healthcare facilities. Community-based interventions improve accessibility, particularly in underserved populations.

Screening programs conducted in community settings facilitate early identification of high-risk individuals. Educational workshops, home visits, support groups, and outreach campaigns enhance awareness regarding diabetic foot care.

Community nurses also address social determinants of health that influence diabetes management, including access to healthcare, financial barriers, health literacy, and social support systems.



Evidence suggests that community-based diabetic foot programs improve self-care practices and reduce preventable complications.

Multidisciplinary Collaboration in Diabetic Foot Prevention

Successful prevention of diabetic foot complications requires multidisciplinary collaboration. Nurses coordinate care among endocrinologists, podiatrists, vascular surgeons, wound care specialists, diabetes educators, physiotherapists, and dietitians.

Interprofessional communication ensures comprehensive assessment and timely intervention. Nurses often serve as care coordinators, facilitating referrals and monitoring follow-up adherence.

Multidisciplinary diabetic foot clinics have demonstrated significant reductions in ulcer recurrence, hospitalization rates, and amputations (Bus et al., 2023). Collaborative care models therefore represent a best-practice approach to diabetic foot prevention.

Technological Innovations Supporting Prevention

Emerging technologies are transforming diabetic foot prevention strategies. Telehealth platforms enable remote monitoring, patient education, and timely clinical consultations. These technologies are particularly valuable for individuals residing in rural or underserved areas.

Mobile health applications facilitate symptom tracking, medication reminders, blood glucose monitoring, and educational reinforcement. Smart insoles equipped with pressure sensors can identify areas of excessive pressure before tissue damage occurs.

Artificial intelligence and predictive analytics are increasingly being explored for risk assessment and early detection of foot complications. Nurses play an important role in integrating these technologies into routine patient care while ensuring patient engagement and adherence.

Challenges in Preventing Diabetic Foot Complications

Despite advances in preventive care, numerous challenges persist. Limited patient awareness, poor adherence to self-

care recommendations, financial constraints, inadequate healthcare access, and shortages of specialized foot care services continue to hinder prevention efforts.

Healthcare providers may also face barriers including time constraints, insufficient training, and inconsistent implementation of evidence-based guidelines. Cultural beliefs and health literacy limitations further affect patient engagement.

Addressing these challenges requires healthcare system support, ongoing professional education, policy development, and increased investment in preventive programs.

Future Directions for Nursing Practice

Future nursing practice should focus on strengthening preventive care models through enhanced education, research, technology integration, and interdisciplinary collaboration. Development of standardized foot assessment protocols and competency-based training programs can improve consistency of care.

Telehealth and digital health technologies should be expanded to support remote patient monitoring and education. Research examining the effectiveness of innovative nursing interventions will further strengthen evidence-based practice.

Policy initiatives aimed at improving access to preventive foot care services, particularly in resource-limited settings, are essential for reducing disparities in diabetic foot outcomes.

As diabetes prevalence continues to rise globally, nurses will play an increasingly important role in preventing foot complications and promoting long-term health.

Conclusion

Diabetic foot complications remain among the most serious and costly consequences of diabetes mellitus. However, many of these complications are preventable through early identification of risk factors, comprehensive assessment, patient education, glycemic control, appropriate footwear management, and multidisciplinary collaboration. Nurses occupy a central position in preventive care due to their continuous patient contact and broad scope of practice.



Evidence-based nursing interventions can significantly reduce the incidence of foot ulcers, infections, hospitalizations, and amputations. Strengthening nursing leadership in diabetic foot prevention, expanding community-based programs, and integrating emerging technologies will further enhance patient outcomes and reduce the global burden of diabetic foot disease. Investment in preventive nursing strategies represents an essential component of comprehensive diabetes care and a critical pathway toward improving quality of life for individuals living with diabetes.

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