JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH
ISSN: 2576-0017
2024, VOL 7, NO S11

Optimizing Diabetes Management: The Essential Role of Nurses in Education, Medication, and Psychological Care

Sara Jafeen Ameer Alqahtani[1], Latifa Khalaf Alshammery[2], Areej Khalil Alajaji[3], Aiyedh Hzaim G Al-Resheedi[4], Dalia Abdullah Alharbi[5], Sultan Saeed M Aldhahri[6], Khalid Shaya Mohammed[7], Fahad Raihan Mosaad Alyami[8], Hashel Ali Alhashel[9], Mohammed Abdullah Alshehri[10], Mohammed Rada k Alrouaily [11], Abdulrhman Nasser Alhuzaim[12], Abdullah Naif Ahmad Almalki[13], Abdullah Abed Abdullah Althagafi[14], Afaf Fahad Al Harbi [15].

1. *Nursing Specialist, Najran health cluster. Salqahtani202@moh.gov.sa*
2. *Nurse specialist, King Salman Specialist Hospital, Ministry of Health,kingdom of Saudi Arabia. Lalshmmiri@moh.gov.sa*
3. *Nurse, King Salman hospital, Ministry of Health, Kingdom of Saudi Arabia. Aalajaji@moh.gov.sa*
4. *Nursing technician, Kabshan Health Center, Ministry of Health, Kingdom of Saudi Arabia. ayhalrashidy@moh.gov.sa*
5. *Nurse, Madinah Health Cluster, Ministry of Health, Kingdom of Saudi Arabia. Saliaa@moh.gov.sa*
6. *Technician-public Health, ALIMAN Hospital, Ministry of Health, Kingdom of Saudi Arabia. iirz@hotmail.com*
7. *Epidemiology technician, Al-Iman General Hospital, Ministry of Health, Kingdom of Saudi Arabia. Khsh82@hitmail.com*
8. *Epidemiological monitoring technician, Aliman General Hospital, Ministry of Health, Kingdom of Saudi Arabia. Faralyami@moh.gov.sa*
9. *Epidemiology Technician, ALIman General Hospital, Ministry of Health, Kingdom of Saudi Arabia. HAlhashil@moh.gov.sa*
10. *Epidemiology Technician, Imam Abdulrahman Al Faisal Hospital, Ministry of Health, Kingdom of Saudi Arabia. Amohammed31@moh.gov.sa*
11. *Technician Public Health, Al-yamama hospital, Ministry of Health, Kingdom of Saudi Arabia. Kaakaakk23@gmail.com*
12. *Technician Public Health, Al-Yamama Hospital, Ministry of Health, Kingdom of Saudi Arabia. Ab.na@hotmail.com*
13. *nurse, Irada and Mental Health Complex in Taif, Ministry of Health, Kingdom of Saudi Arabia. analmalki@moh.gov.sa*
14. *nurse, Compliance Taif, Ministry of Health, Kingdom of Saudi Arabia. ababalthagafi@moh.gov.sa*
15. *nurse, Bagedo health center, Ministry of Health, Kingdom of Saudi Arabia. faf5884@gmail.com*

Abstract

Diabetes mellitus (DM) presents a significant global health challenge, with increasing prevalence and complex management requirements. Nurses, particularly Diabetes Specialist Nurses (DSNs), play a crucial role in the effective management of DM, encompassing aspects of education, medication management, psychosocial support, and patient empowerment. This review examines the various contributions of nurses in diabetes care, particularly through nurse-led interventions, such as DSME programs, telephone consultations, and psychological care. Studies consistently show that nurse-led interventions lead to improvements in clinical outcomes, including glycemic control, lipid management, and quality of life (QoL) for patients with diabetes. Furthermore, nurses' involvement in medication management and their ability to support patients through behavioral changes have demonstrated positive effects on patient outcomes and healthcare utilization. Despite these significant contributions, challenges remain in expanding the roles of nurses, particularly in low- and middle-income countries (LMICs), where systemic barriers, such as legal restrictions on prescribing medications, limit their full potential. This review emphasizes the need for educational reforms, policy changes, and recognition of nurses' roles to optimize diabetes care, improve patient outcomes, and address global healthcare demands.

Keywords: nurses, diabetes, management

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder resulting from defects in insulin function, insulin secretion, or both, leading to elevated blood glucose levels (Galicia-Garcia et al., 2020). DM is recognized globally as one of the top four non-communicable diseases and remains the most prevalent metabolic disorder. The primary types of DM include type 1 DM (T1DM) and type 2 DM (T2DM), with T2DM being more common, accounting for approximately 90–95% of all DM cases. DM represents a major public health challenge worldwide due to the continual increase in the number of individuals living with DM (PWD) (Cho et al., 2018, p. 20). According to the World Health Organization (WHO), the number of PWD has risen dramatically from 108 million in 1980 to 422 million in 2014. This trend is expected to continue, with projections suggesting the global number of PWD will reach 592 million by 2025. In the adult population, the global prevalence of DM has nearly doubled since 1980, increasing from 4.7% to 8.5%. Additionally, the number of deaths attributed to DM has seen a significant rise of 70% between 2000 and 2019. The prevalence of DM is particularly concerning in developing nations, where approximately 77% of PWD reside in middle- and low-income countries. The International Diabetes Federation forecasts that by 2030, the global prevalence of DM will increase to 9.9%. Individuals with DM face an elevated risk of complications and are more likely to experience longer hospital stays (LOS). In 2019, the National Diabetes Inpatient Audit (NaDIA) found that 18% of all hospital beds were occupied by PWD, an increase from 14% in 2010 (Akiboye et al., 2021). Therefore, DM necessitates urgent attention as its complications can lead to adverse health outcomes and contribute to the excessive utilization of healthcare resources.

In many cases, DM is a secondary diagnosis rather than the primary cause of hospitalization, meaning that individuals with DM are often under the care of non-specialist physicians. It has been reported that healthcare professionals in training within these teams often lack comprehensive knowledge about DM management, with only 28% expressing full confidence in managing the condition (George et al., 2011). In addition to physicians, specialist nurses and nursing teams are increasingly involved in the care of PWD. These nurses provide essential education and support to both patients and healthcare staff across various specialties, as well as offering clinic or phone follow-up to facilitate timely discharge or avoid unnecessary hospital admissions. Nurses are uniquely positioned to offer care and education to PWD, spending significant time with patients compared to other healthcare professionals. Moreover, nurses are often better equipped to implement effective care practices and provide optimal diabetes management than their counterparts in other fields, such as doctors (Alhaiti et al., 2019). Research by Lou et al. suggests that nurses tend to be more empathetic listeners and possess greater knowledge of PWD than other healthcare providers. These findings indicate that nurses' commitment and attitude towards the care of PWD generally surpass those of other healthcare professionals. Diabetes inpatient specialist nurses (DISNs) are highly trained professionals who play a crucial role in coordinating, educating, counseling, motivating, and assisting in the management of PWD. The National Health Service (NHS) and the National Institute for Health and Care Excellence (NICE) emphasize the importance of DISNs, with NICE recommending at least one DISN for every 300 hospital beds. Despite this, there remains a shortage of dedicated DISNs in clinical settings, with the NaDIA reporting in 2018 that 22% of hospitals lacked dedicated DISNs (Dhatariya et al., 2012).

The rising incidence of T2DM underscores the need for innovative models of care and management. Several studies have highlighted the importance of preparing nurses with the necessary knowledge and skills to implement best practices in diabetes care. However, there is still a lack of clarity regarding the specific roles of nurses in managing DM, particularly in countries such as Saudi Arabia, where DISNs are not yet recognized as a distinct professional

group. Although nurses play a critical role in DM management, their contributions to collaborative care with other healthcare providers are often underappreciated. Nonetheless, healthcare systems are increasingly adopting nurse-led models of care, which prioritize patient-centered approaches in contrast to the traditional physician-led, medically oriented models. Research has shown that, with proper training, nurses can effectively assume roles in managing DM, and there has been a shift in recent years toward nurses taking on tasks previously performed by physicians. Nurses can contribute to the development, implementation, and oversight of DM interventions by directly providing care, supervising care delivery, and training non-medical staff in managing DM for a wide range of patients (Hunt, 2013). This review article aims to provide an overview of various nursing interventions and roles, including their work as educators, motivators, and caregivers, all of which are essential in the management of T2DM. Additionally, the article explores the various outcomes used to assess the impact of nursing interventions, as well as strategies to address both existing and emerging challenges faced by nurses in diabetes care.

Roles of Nurses in the Management of Diabetes

1. Educating Patients with Diabetes

Diabetes nurse educators (DNEs) are increasingly recognized for their significant contributions in empowering patients with the confidence and knowledge required to achieve self-care goals in the management of diabetes mellitus (DM) (Funnell et al., 2011). Effective self-care management is influenced by seven major factors, including the adoption of healthy coping strategies such as risk reduction, problem-solving, monitoring blood glucose levels, medication adherence, physical activity, and a balanced diet. However, the success of health education initiatives is largely contingent on a patient's acceptance of their diabetes. Additionally, sociodemographic factors, including educational attainment, can influence the degree of adherence to self-care practices in DM management. The methods of care delivery also need to be tailored to individual needs. For instance, the use of visual aids and the teach-back method are recommended for individuals with low literacy. In contrast, one-on-one consultations have been shown to be more effective than group-based sessions. Several studies have assessed the impact of nursing interventions, highlighting the pivotal role nurses play in educating patients on disease management. Further research has demonstrated that nurse-led educational interventions lead to positive outcomes for patients, including enhanced glycaemic control (Wexler et al., 2012).

A recent study by Bostrom et al. emphasized the critical role of nurses in patient education. One key responsibility of diabetes specialist nurses (DSNs) is to provide instruction on diabetes management, including explaining the outcomes of diagnostic tests and potential complications. In another randomized trial by Wexler et al., participants were divided into two groups to evaluate the effectiveness of diabetes education. One group received standard care, while the other received formal education and intervention care from specialist nurses. The results revealed that patients in the intervention group experienced significantly lower mean blood glucose levels compared to those receiving standard care. Moreover, the intervention group showed a reduction in the average level of glycosylated hemoglobin A1c (HbA1c) one year after discharge. The HbA1c test, commonly used to assess average blood glucose levels over the preceding three months, served as a key measure in the study. Similarly, Raballo et al. conducted a study comparing group care and traditional care. Patients in the group care model, led by one or two health professionals (such as nurses, educators, dietitians, doctors, or psychopedagogues), demonstrated more favorable outcomes. Furthermore, participants in the group care model exhibited more positive attitudes and expressed a broader range of concepts related to their care than those in the usual care group. In contrast, patients receiving standard

care tended to describe their healthcare experience in more negative terms, reflecting an external locus of control, lower empowerment, and negative attitudes. These findings underscore the evolving and essential role of nurses in diabetes education, particularly in improving glycaemic control (Azami et al., 2019).

2. Nurse-Led Diabetes Self-Management Education and Support (DSMES) and Educational Intervention

It has been well-established that self-care knowledge and practices can be significantly improved through diabetes self-management education (DSME) and support for patients with diabetes mellitus (DM). The American Diabetes Association (ADA) recognizes the importance of DSME and advocates for the inclusion of nurse-led DSMES in the management of DM. Additionally, global health organizations such as the International Diabetes Federation, the Centers for Disease Control and Prevention, and the World Health Organization support the integration of nurse-led DSMES in diabetes care. As part of routine care, the primary objectives of DSMES, which are monitored and evaluated, include improving quality of life (QoL), health status, supporting self-management, and enhancing clinical outcomes. A study conducted at an American Diabetes Association center by Brunisholz et al. demonstrated that DSME, delivered by certified diabetes educators, including registered nurses or dietitians, significantly improved various components of diabetes care. These improvements included reductions in HbA1c levels (below 8.0%), low-density lipoprotein levels (below 100 mg/dL), blood pressure (below 140/90 mmHg), nephropathy screening or prescription of angiotensin receptor or angiotensin-converting enzyme blockers, and retinal eye examinations. These findings highlight the benefits of incorporating DSME programs into the treatment regimen for people with diabetes (PWD). Furthermore, such programs are associated with low operational costs. Various strategies have been developed and implemented by nurses in different settings. Sherifali et al. assessed the impact of a patient-tailored, computer-generated feedback intervention on glycaemic control. Another study evaluated the effects of a hospital-based clinic intervention on glycaemic control. Additionally, Kang et al. compared the efficacy of conventional care with a family partnership intervention for diabetes management. Nurse-led studies often take into account socially appropriate diabetes interventions (Hailu et al., 2018).

Numerous studies have also explored the effects of nurse-led educational interventions. One study utilized newly formed focus groups for individuals with type 2 diabetes mellitus (T2DM) to identify their educational needs and design an intervention based on the group's findings. Another approach involved developing a symptom-based educational intervention to address the symptoms of DM, enabling patients to choose self-management strategies based on their unique preferences and needs. A web-based DSME program was also created to allow patients to complete modules at their own pace and achieve targeted health goals. Overall, educational intervention studies have been designed to evaluate the impact of specific diabetes education programs on various outcomes, such as HbA1c levels, self-management activities, and diabetes knowledge. Additionally, other studies have investigated the impact of innovative educational methods, including telephone-delivered education, multimedia educational programs, web-based diabetes education, and tailored educational approaches (Walker et al., 2011). Collectively, the findings from these studies indicate that these educational methods yield positive outcomes.

3. Interprofessional Teamwork in Diabetes Care

Nurses, as members of an interprofessional healthcare team, employ a variety of strategies to assist with the self-management of PWD. Nurses often collaborate with nutritionists to provide guidance on appropriate dietary intake and food choices, a critical area of DM self-management. Furthermore, nurses work closely with psychologists to offer counseling services to PWD (Tang et al., 2012). Nurses also collaborate with physicians to screen patients and

adjust healthcare plans as necessary. The ADA recommends that PWD should receive DSME according to the National Standards for DSMES at the time of diagnosis and as needed thereafter. Both group and individual nurse-led sessions are used to deliver diabetes management education (Rygg et al., 2012). Additionally, web-based formats may be employed to provide education. It is also recommended that partners or family members of PWD be included in the educational process, with nurses playing a key role in this aspect of care.

4. Nurse Prescribing in Diabetes Care

Nurse-led clinics for diabetes management represent an emerging strategy that could potentially enhance the management of the disease. These clinics vary in structure and the delegation of responsibilities. In the context of standard diabetes management, nurses are primarily responsible for patient education and support, with a particular emphasis on insulin administration. Recently, however, some clinics have expanded the role of nurses to include prescribing and monitoring drug therapies. In these settings, nurses serve as substitutes for physicians, complementing their role in the management of diabetes. The primary objective of this model is to ensure that individuals receive timely and effective healthcare. Nurse prescribing includes the initiation, modification, or cessation of medication dosages. The scope of nurse prescribers' roles can vary, ranging from protocols that limit their authority to specific indications and drug choices, to a more independent approach where they are involved in all aspects of prescribing, including drug selection. The extent of this autonomy is influenced by both training and regulatory frameworks that apply to each specific setting. For example, in New Zealand, registered nurses working in specialty teams and primary healthcare are authorized by the Nursing Council of New Zealand to prescribe certain medications, including antidiabetic drugs, upon completing an approved postgraduate diploma.

Several studies have highlighted the positive outcomes of nurses' roles in improving diabetes management. However, these studies do not specifically focus on nurse prescribers but rather on the broader contributions of nurses in chronic disease management. In 2010, a meta-analysis was conducted to evaluate the impact of nurse case management interventions on glycaemic control, which demonstrated a clinically significant improvement in blood glucose control as measured by HbA1c levels. Another study reported that nurse-led interventions using structured care algorithms were associated with reductions in cardiovascular disease (CVD) risk factors, such as high blood pressure, in individuals with diabetes. Martinez-Gonzalez et al. found that there were no significant differences between physician-led and nurse-led care in reducing HbA1c levels (Martínez-González et al., 2014).

Education and Support for Community Health Advisors

Lay health workers, or community health advisors, play an important role in providing diabetes care and education. Nurses can support and educate these community health advisors to enhance their effectiveness. For instance, in a study aimed at exploring the use of promotoras (community health workers) for delivering diabetes self-management interventions, nurses provided 8 weeks of training and education to promotoras. After completing the training, the nurses and promotoras co-delivered a diabetes educational course. Following the course, the promotoras visited patients' homes to deliver tailored educational sessions, with the nurses available for consultation as needed. In addition to community health advisors, telecarers can also be trained to deliver self-management support to people with diabetes. Nurses are well-positioned to supervise and educate telecarers, who can contact participants to discuss blood glucose control, medication adherence, and diabetes knowledge. A study compared printed diabetes self-management interventions with telephone-based support. In this study, diabetes nurse educators supervised and trained health educators who conducted the telephone calls. The conversations, which primarily focused on medication adherence, also included

discussions on lifestyle changes, such as increasing physical activity and adopting healthier eating habits (Walker et al., 2011).

6. Nurse-Led Telephone Interventions

Telephone counseling sessions are utilized to provide support and education for individuals with diabetes (PWD). In one study, participants were contacted by a registered nurse at least once per week over a twelve-week period. The calls covered self-monitoring of blood glucose, medication adherence, exercise, and diet discussions. Participants were given the opportunity to ask questions and adjust their treatment plans as necessary, based on their dietary intake and blood glucose records. In another study, participants received pre-recorded weekly telephone calls. In addition, automated health education messages were sent, and nurses followed up with phone calls based on the responses of participants during these interactions. Telephone counseling can provide individualized care to PWD, as confirmed by a study in which participants completed questionnaires related to diabetes self-management. The responses were then used to tailor instruction and support during telephone sessions. Nurses can also monitor and provide education via telephone interventions. In one study, a telehealth nurse monitored insulin doses and blood glucose levels via the internet. After reviewing the patient data, telehealth nurses contacted the participants as needed, based on the data, to suggest follow-up with primary healthcare providers or to recommend adjustments to the treatment plan (Tan et al., 2011).

In contrast, personalized interventions involve modifying the approach to meet the individual preferences, abilities, and needs of patients, with nurses supporting individuals in adhering to a recommended treatment plan. Nurses may also provide customized educational plans based on patient-developed goals and assessments for diabetes management. Additionally, educational sessions may be adjusted according to the participants' experiences with diabetes self-management and their questions. Nurses focus on empirical learning to help solve problems and establish targets for diabetes self-management. Furthermore, nurses can act as coaches for PWD, guiding them through the self-management treatment plan. They assist patients in setting personal goals for self-management and help them problem-solve and adjust these goals as needed, drawing on their own knowledge of diabetes or utilizing established procedures from the healthcare team (Frosch et al., 2011).

7. Psychological Care and Counselling

In both primary and secondary care settings, Diabetes Specialist Nurses (DSNs) play a critical role during hospital stays. An intervention review revealed that patients preferred contacting their DSNs rather than their general practitioners (GPs). Furthermore, DSNs provide essential social, psychological, and emotional support not only to patients but also to their family members. It was observed that patients who maintained regular contact with DSNs were typically more satisfied with the level of care they received. Indeed, DSNs have been shown to positively impact the outcomes of diabetes patients. Their roles are vital in helping both patients and their families develop confidence and trust in healthcare providers, contributing to optimal health promotion. Additionally, DSNs serve an important function in bridging communication gaps between patients and clinical teams, acting as intermediaries who can prevent the escalation of problems. This communication is particularly crucial when diabetes progresses, requiring treatment modifications such as the introduction of new medications (e.g., insulin) or dosage adjustments to existing treatments. Fear and anxiety are common among patients with diabetes, especially when medical complications and poor metabolic outcomes are present. In one study, a diabetes patient expressed feelings of anxiety and concern during hospital visits, as the hospital staff lacked adequate knowledge and expertise in diabetes management. These findings underscore the importance of psychological care and counseling for PWD, particularly in inpatient settings (Lawler et al., 2019).

Nurses play a significant role in motivating patients with diabetes. Numerous studies have highlighted the importance of nurses in providing psychological support to PWD. Compared to physicians, nurses are more attuned to the needs of patients and are better able to identify the psychosocial challenges that significantly impact the management and self-care of diabetes. While nurses are more proactive in providing psychosocial care, they often feel less capable of addressing the psychosocial needs of patients compared to their physical care responsibilities. As a result, nurses frequently refer patients to specialists in psychosocial care. Nurses have also observed the need to help their diabetes patients feel more hopeful and secure. It has been noted that nurses assist patients in addressing issues like illiteracy and denial, employing various strategies such as humanizing complex issues, valuing relationships, reflecting on actions, advocating for change, and promoting empowerment through education (N. M et al., 2019).

8. Nurses as Advanced Caregivers

According to definitions of advanced practice nurses (APNs) provided by the Nursing and Midwifery Council and the UK regulatory board, skilled nurses have the capacity to assume a variety of roles, such as ensuring that patient care and treatment are grounded in best practices, leading teams, performing physical examinations, and making treatment decisions. APNs play an integral role in the medical management and education of individuals with diabetes. Numerous studies have highlighted the involvement of nurses in medication prescribing, with some studies indicating variability in the extent of this responsibility. In one study, over two-thirds of specialized nurses in the UK were involved in prescribing medications for common diabetes complications such as cardiovascular disease, hyperlipidemia, and hypertension, although they dedicated no more than 20% of their weekly work to prescribing medications. This suggests that most of their time is spent on other aspects of nursing care, with less emphasis on prescribing and advising. Despite nurses acquiring more advanced skills and knowledge for the management of diabetes-related medications, concerns remain regarding their actual involvement in this role (N. M et al., 2019).

Several studies have also underscored the role of APNs in screening for diabetes complications. Research has shown that nurses are significantly involved in screening for foot and eye complications, while other studies have documented nurses' roles in briefing physicians about emerging problems or complications. Nurses are also heavily involved in administrative responsibilities related to diabetes care, including managing diabetes care protocols. Furthermore, nurses are increasingly assuming managerial roles within diabetes care, such as administrators, bureaucrats, and executives. As collaborators, nurses play a vital role as assistants to physicians, which is an essential aspect of their profession. Interestingly, nurses themselves have reported that assisting physicians is more important to them than providing direct care and spending time educating and supporting patients. It has also been reported that general practitioners (GPs) frequently base their decisions on the assessments made by nurses, suggesting a high degree of trust in nurses' clinical evaluations. Nurses also provide advice on medication, assist doctors in recommending treatment plans, inform them about complications, and act as intermediaries between patients and doctors. Moreover, nurses play a central role in planning and coordinating diabetes care, working collaboratively with physicians and other healthcare professionals, all while emphasizing their shared mission in managing diabetes care.

4. Impact of Nurse Interventions on Patient Outcomes

1. Increased Patient Satisfaction

Diabetes Specialist Nurses (DSNs) make a significant contribution to enhancing patient satisfaction. In a study involving 214 patients in the UK, Courtenay et al. observed an improvement in satisfaction among people with diabetes (PWD) when consultations were

conducted by prescribing nurses (C. M et al., 2015). This was attributed to increased consultation time and the development of stronger relationships between patients and nurses. Additionally, around 92% of patients reported that the care management program led by DSNs was moderately to highly supportive in managing their condition. Another study found that a DSN-led care program for newly diagnosed patients with Type 2 diabetes (T2DM) was clinically effective and resulted in higher levels of patient motivation and satisfaction. In workshops held in London to improve patient experience and diabetes care, patients with Type 1 diabetes (T1DM) expressed a desire for more support and education for their friends and family, while patients with T2DM requested more personalized care and preferred to be seen by the same healthcare provider. These findings suggest that DSNs can enhance patient satisfaction through self-management empowerment, educational sessions, and more personalized and extended consultations.

2. Prevention of Hospital Admissions and Shorter Length of Hospital Stay

The care provided by diabetes inpatient specialist nurses (DISNs) has been shown to reduce the length of hospital stays for PWD. According to NHS England, having one DISN per 250 inpatient beds can decrease the length of stay (LOS) for inpatients with diabetes, a finding that has been supported by several studies. One such study reported a significant reduction in LOS following the introduction of a ward-based diabetes nurse advisor. Data collected before and after the intervention suggested that the presence of a DSN prescriber resulted in a median LOS of 3 days for PWD, which contributed to notable cost savings. A team of DISNs can also ensure appropriate follow-up care and timely discharge. Furthermore, patients with diabetes reported that hospital admissions could be prevented by involving DISNs in accident and emergency (A&E) departments. In a study conducted over 3.5 years, a significant number of individuals attending A&E received treatment and were discharged home without needing to be admitted to the hospital. Interestingly, the hospital saved approximately GBP 35,000 over the 3.5-year period by providing patient-focused care and reducing bed occupancy. In a separate study, it was demonstrated that fewer hospital resources were consumed by patients under DSN care, with notably fewer hospitalizations and emergency room visits for preventable diabetes-related issues. The introduction of a DISN service also decreased excess bed occupancy related to diabetes over a 6-year study. DISNs play a crucial role in promoting patient self-management and patient education, as increased diabetes knowledge and awareness can lead to shorter hospital stays. Moreover, educational programs led by inpatient diabetes educators have been associated with reduced readmission rates (Lawler et al., 2019).

3. Enhanced Diabetes Knowledge

In nursing intervention studies, diabetes knowledge is often measured to assess the effectiveness of educational interventions. A study involving 52 contact hours of instruction and support over a year focused on diabetes self-management and basic diabetes education found significant increases in diabetes knowledge compared to a waitlisted control group. The impact of interactive multimedia on self-directed learning about diabetes, through a collection of nursing and medical instructions on compact discs, was also examined. The control group received diabetes self-management counseling and a booklet, while the intervention group demonstrated significant improvement in diabetes knowledge. In another study, the intervention group received monthly telephone discussions and group and individual educational sessions focused on family involvement, whereas the control group received standard care. The knowledge scores of the intervention group were significantly higher than those of the control group. Furthermore, a study evaluated the effectiveness of ongoing group-based diabetes self-management education (DSME), where nurse-led educational sessions focused on Type 2 diabetes management, including metabolic control, physical activity, diet,

complications, and foundational diabetes knowledge. The intervention group showed enhanced diabetes knowledge (Rm et al., 2010).

Several studies have also reported significant improvements in diabetes knowledge in the intervention groups after educational interventions. In studies involving various formats of educational interventions, both control and experimental groups showed improvements, although differences between groups were not always observed. For instance, a study that involved a video-based behavior support intervention for the control group, along with a brochure on diabetes self-management and telephone coaching sessions, as well as a workbook provided by a registered nurse for the experimental group, found a marked increase in diabetes knowledge in both groups, with no significant difference between them (Frosch et al., 2011). Another study found small increases in diabetes knowledge in the experimental group after providing needs-driven, patient-centered education, compared to conventional DSME for the control group, but no substantial difference was observed between the groups. Additionally, the feasibility of diabetes and cardiac self-management programs was tested in a pilot study, where three educational sessions and a follow-up telephone call were provided by a nurse one week after discharge. Text messaging was used to address questions related to self-management a week after the telephone contact. Slight improvements in diabetes knowledge were observed in the experimental group; however, no significant difference was found between the control and experimental groups (Cj et al., 2012).

4. Reduction in Inpatient Harm

Medication errors are frequently observed in hospitalized patients due to the complexity of diabetes management. According to the NaDIA in 2017, 31% of patients with diabetes experienced at least one medication error during their hospital stay. These errors, which included both medication management and prescription mistakes, were notably higher than those found in patients with other conditions. In 2014, hospitals in the United Kingdom reported an average medication administration error rate of 3–8% and a prescribing error rate of 7%. NHS England has noted that the involvement of Diabetes Inpatient Specialist Nurses (DISNs) can help mitigate inpatient harm, particularly by reducing hypoglycemic events and medication errors. The NaDIA highlighted in 2016 the importance of healthcare professionals having the necessary confidence, experience, and knowledge to manage diabetes medications effectively, to reduce medication errors. Furthermore, research by the Royal College of Nursing, Trend UK, and Diabetes UK demonstrated that DSNs, especially those with prescribing roles, were associated with significantly fewer insulin errors and reduced lengths of stay (LOS).

In 2017, the NaDIA found that approximately 1 in 800 inpatients with Type 2 diabetes (T2DM) and about 1 in 25 inpatients with Type 1 diabetes (T1DM) developed diabetic ketoacidosis (DKA) during their hospital stay. These hospital-acquired conditions are serious and potentially fatal; however, they are largely preventable with proper diabetes management during hospitalization. It is essential for diabetes specialist teams to possess sufficient expertise and resources to manage medications effectively and prevent such emergencies (Ross et al., 2014). A study conducted on 56 patients with diabetes over 8 months in an inpatient setting revealed positive outcomes regarding medication delivery systems, with the DSN-led group experiencing significantly fewer medication errors. Furthermore, improvements in glucose control were observed in the patients following insulin dose adjustments recommended by diabetes nurse educators. Vissarion et al. emphasized the crucial role of DSNs in crisis management (Vissarion et al., 2014). Despite the growing demand for diabetes services, the number of DSNs has not increased. Additionally, 78% of DSNs expressed concern that their workload was negatively affecting patient care and safety.

5.Self-Management Behaviours

Patients with diabetes are actively involved in the planning and execution of their care. Healthcare professionals should support patients in self-management to enable them to effectively and confidently manage their diabetes. Nurses play a critical role in assisting patients with self-management by helping them set goals and resolve problems related to diabetes management. The American Diabetes Association (ADA) indicates that people with diabetes receive support for self-management activities, including monitoring complications, medication administration, self-blood glucose monitoring, physical activity, and healthy eating. Nursing interventions also facilitate behavioural changes that promote effective diabetes management. A nurse-led intervention program found significant improvements in health-promoting behaviours, including the prevention of complications, medication adherence, hygiene, exercise, and dietary behaviours, in the experimental group compared to the control group, who received standard care. In a similar study, the experimental group exhibited substantial improvements in glucose self-monitoring, medication adherence, exercise, and diet in adults with T2DM.

A symptom-focused, nurse-delivered intervention, conducted in patients' homes, provided diabetes management modules to patients with T2DM. The intervention resulted in significant improvements in glucose monitoring, diet, and medication practices in the experimental group. However, no significant differences were observed between the groups regarding exercise. Another study evaluated the effectiveness of a structured diabetes education program on self-care, where nurses delivered telephone and face-to-face educational sessions that addressed problem-solving and self-care. This intervention led to significant improvements in physical activity participation and self-blood glucose monitoring in the experimental group, with notable changes compared to the control group (Jm et al., 2013, p. 2). A study cofacilitated by a psychologist and a certified diabetes educator focused on diabetes self-management, goal-setting, coping strategies, experiential learning, and problem-solving over a 24-month period. This study showed marked improvements in foot complications, blood glucose monitoring, and diet after 6 months, with continued improvement in insulin usage and diet after 24 months. Many studies have reported that nurse-led interventions lead to notable improvements in both experimental and control groups.

6.Physiological Outcomes

Nurse intervention studies often assess physiological outcomes such as blood pressure, weight, body mass index (BMI), lipids, fasting blood glucose, and HbA1c levels. Significant improvements have been observed in BMI, lipids, fasting blood glucose, and HbA1c levels following nursing interventions that included both support and educational components. In one study, participants in the experimental group showed considerable improvements in low-density lipoprotein (LDL) levels and HbA1c after a telehealth intervention, which included nurse-directed educational sessions. However, no differences were noted in BMI or blood pressure. In another study, patients in the experimental group exhibited significant improvements in daily fasting blood glucose levels following a nurse-directed follow-up telephone intervention. A controlled nursing intervention focusing on counselling and education led to marked improvements in HbA1c levels in the experimental group compared to the control group. Additionally, a study evaluating a culturally sensitive, multifaceted, primary care-based behavioural intervention, led by a nurse case manager and community health advisor, found significant reductions in lipid levels and diastolic blood pressure, with improvements in HbA1c levels, although the reductions were not statistically significant. Another study focused on reducing cardiovascular risk in individuals with T2DM involved a nurse-led course that included both group and individual sessions to support participants in

setting and meeting self-care targets. In this study, both systolic blood pressure and BMI were significantly reduced in the experimental group.

A randomized controlled trial revealed a notable improvement in lipid levels among people with diabetes (PWD) following a 20-month period of algorithm-driven, nurse-led telephone care. In this trial, nurses contacted patients, assessed their lipid values, and initiated as well as titrated lipid-lowering medications. Additionally, participants in the intervention group utilized fewer healthcare resources and demonstrated enhanced lipid control. In a separate study, patients attended a half-day diabetes self-management education (DSME) class before being randomly assigned to either an intervention or usual care group to assess the effect of web-based care management on blood pressure and glucose regulation in individuals with poorly controlled diabetes mellitus (DM). The experimental group was provided with a blood pressure monitor, a glucose meter, and a notebook computer, enabling them to view educational modules, upload blood pressure and glucose data, and interact with the provided tools. A significant reduction was observed in systolic blood pressure and HbA1c among the individuals in the intervention group, with a substantial difference noted between the intervention and control groups. As an alternative to group classes, another study offering web-based DSME found significant improvements in HbA1c levels compared to the control group, which participated in traditional DSME classes. Several studies have reported significant improvements in HbA1c levels following nursing interventions, although some studies indicated no significant differences or changes between the control and experimental groups. Additionally, other studies have shown substantial improvements in various physiological outcomes for both the control and intervention groups (Weinger et al., 2011).

7. Psychosocial Outcomes

The evaluation of quality of life (QoL) and psychosocial factors, such as attitudes towards depression, diabetes, and diabetes-related anxiety, should be sustained for people with diabetes (PWD). Positive outcomes in diabetes management are closely associated with emotional well-being. In fact, nursing intervention studies often address psychosocial factors and examine the impact of interventions on these outcomes. One such study involved nurse-led motivational interviewing, which aimed to encourage individuals to explore their feelings about change and discuss self-management behaviors. Both the control and intervention groups received multidisciplinary education and participated in a diabetes club, where they engaged in group discussions about personal experiences living with diabetes. Following the intervention, a significant improvement in QoL was observed in the intervention group compared to the control group. Interestingly, both groups showed a notable decrease in the mean scores for stress, anxiety, and depression, though there was no significant difference between the groups. This lack of difference may be attributed to the exposure of the control group to the diabetes club's support and educational activities. In a nurse-led intervention aimed at promoting healthy behaviors in adults with diabetes, the intervention group scored significantly higher on family domains, as well as social and psychological-spiritual aspects, compared to the control group. Furthermore, a study using a personalized educational and goal-setting program led by a nurse showed a significant improvement in QoL. Participants who received a nurse-led, symptom-centered diabetes management intervention reported significantly lower distress related to symptoms and markedly higher perceptions of their QoL.

5. Overcoming the Challenges for Nurses in Diabetes Care

To extend the role of nurses in diabetes care, management, and prevention, it is essential not only to provide proper training but also to implement fundamental changes at the levels of nursing education, healthcare systems, policies, and society. These efforts are critical to enabling nurses to realize their full potential in addressing global challenges. A 2021

referendum in Switzerland highlighted the importance of nursing and emphasized the country's responsibility to ensure an adequate nursing workforce in recognition of the significant role nurses play. Despite their valuable contributions, nurses often do not receive adequate recognition in governance frameworks. In Switzerland, the leadership gap in nursing is addressed by appointing a cantonal nurse responsible for conveying the perspectives of nurses and liaising with policymakers and other stakeholders. Modifying the services that nurses provide and increasing compensation for nurse-provided services are effective ways to acknowledge the importance of nursing roles. It is crucial within healthcare systems to identify barriers to the expansion of nurses' roles. For instance, in Kyrgyzstan, a low- and middle-income country (LMIC), the inability of nurses to prescribe medication remains a major barrier from a systemic or legal standpoint. Additionally, the general public's and even doctors' perceptions of the roles nurses play in caring for non-communicable diseases, such as diabetes, further limits the scope of nurses' responsibilities.

To address these limitations, it is important to incorporate more practical measures alongside the introduction of diabetes specialist nurses (DSNs), which would allow nurses to prescribe medications, run nurse-led diabetes clinics, conduct diabetes research, and provide diabetes education. In Thailand, a successful expansion of nursing roles has been implemented, with nurses serving as advanced practice nurses, case managers, and educators in diabetes care. However, studies from LMICs report that these efforts have led to moderate outcomes in diabetes management, including modest reductions in blood glucose levels. Nurses should play a central role in both management and prevention to ensure access to diabetes care and meet global health targets. Given the increasing global prevalence of diabetes, there is an urgent need to expand the nursing workforce and enhance leadership and training. Moreover, substantial changes must be made within the broader nursing environment. This includes providing better employment opportunities, clearer career paths, and stronger professional recognition. Global challenges such as migration and staff retention require tailored solutions to ensure that addressing staff shortages in one country does not exacerbate nurse shortages in others. In addition to societal recognition from the public and policymakers, the health system must fully acknowledge the essential roles that nurses play.

This recognition should also address the gender dynamics within the nursing profession, as it continues to be predominantly female in many countries with healthcare systems that are largely male-dominated. Nurses need clearly defined responsibilities and roles to deliver optimal diabetes care within the healthcare system. Additionally, nurses require access to the skills and tools necessary for carrying out their tasks in various settings. This approach might involve empowering nurses with diagnostic tools, providing interprofessional patient education, offering supportive supervision, sharing tasks, and training nurses in specific disease areas, including prescribing. These roles must be officially recognized through appropriate positions, qualifications, career progression opportunities, and competitive salaries. An interprofessional approach could support these strategies, encouraging nursing and medical students to train together, ensuring they are well-prepared to work as collaborative teams in their future professional environments. The healthcare system must create an environment that enables different health professionals to work together effectively for the benefit of people with diabetes (V et al., 2023).

Conclusion

Nurses, particularly DSNs, have demonstrated a critical role in the management and prevention of diabetes, contributing significantly to improved patient outcomes across various domains. Through initiatives like nurse-led educational programs, personalized care, and psychosocial support, they enhance self-management, glycemic control, and overall quality of life for people with diabetes (PWD). Their ability to support medication management, monitor

and adjust treatment, and provide ongoing education has been linked to reduced hospitalizations, fewer medication errors, and lower healthcare costs. However, challenges persist, particularly in resource-limited settings where nurses face systemic barriers to expanding their roles. To fully harness the potential of nurses in diabetes care, substantial changes are needed in nursing education, healthcare policy, and societal recognition. The inclusion of nurses in advanced roles, such as medication prescribing and leading diabetes care teams, is essential to addressing the increasing global burden of diabetes. Policymakers must ensure that nurses are empowered with the tools, knowledge, and support necessary to provide optimal care, thereby improving both patient outcomes and the efficiency of healthcare systems worldwide.

References

Akiboye, F., Sihre, H. K., Al Mulhem, M., Rayman, G., Nirantharakumar, K., & Adderley, N. J. (2021). Impact of diabetes specialist nurses on inpatient care: A systematic review. *Diabetic Medicine: A Journal of the British Diabetic Association*, *38*(9), e14573. https://doi.org/10.1111/dme.14573

Alhaiti, A. H., Senitan, M., Shanmuganathan, S., Dacosta, C., Jones, L. K., & Lenon, G. B. (2019). Nurses' attitudes towards diabetes in tertiary care: A cross-sectional study. *Nursing Open*, *6*(4), 1381–1387. https://doi.org/10.1002/nop2.334

Azami, G., Soh, K. L., Sazlina, S.-G., Salmiah, Md. S., Aazami, S., Mozafari, M., Taghinejad, H., & Badakhsh, B. (2019). Developing and Validating the Educational Materials for a Nurse-Led Self-Management Education in Adults with Type 2 Diabetes. *Dubai Diabetes and Endocrinology Journal*, *25*(1–2), 1–10. https://doi.org/10.1159/000495762

Cho, N. H., Shaw, J. E., Karuranga, S., Huang, Y., da Rocha Fernandes, J. D., Ohlrogge, A. W., & Malanda, B. (2018). IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetes Research and Clinical Practice*, *138*, 271–281. https://doi.org/10.1016/j.diabres.2018.02.023

Cj, W., Am, C., M, C., & Ma, R. (2012). Using user-friendly telecommunications to improve cardiac and diabetes self-management programme: A pilot study. *Journal of Evaluation in Clinical Practice*, *18*(3). https://doi.org/10.1111/j.1365-2753.2010.01621.x

Dhatariya, K., Levy, N., Kilvert, A., Watson, B., Cousins, D., Flanagan, D., Hilton, L., Jairam, C., Leyden, K., Lipp, A., Lobo, D., Sinclair-Hammersley, M., Rayman, G., & Joint British Diabetes Societies. (2012). NHS Diabetes guideline for the perioperative management of the adult patient with diabetes. *Diabetic Medicine: A Journal of the British Diabetic Association*, *29*(4), 420–433. https://doi.org/10.1111/j.1464-5491.2012.03582.x

Frosch, D. L., Uy, V., Ochoa, S., & Mangione, C. M. (2011). Evaluation of a behavior support intervention for patients with poorly controlled diabetes. *Archives of Internal Medicine*, *171*(22), 2011–2017. https://doi.org/10.1001/archinternmed.2011.497

Funnell, M. M., Brown, T. L., Childs, B. P., Haas, L. B., Hosey, G. M., Jensen, B., Maryniuk, M., Peyrot, M., Piette, J. D., Reader, D., Siminerio, L. M., Weinger, K., & Weiss, M. A. (2011). National Standards for Diabetes Self-Management Education. *Diabetes Care*, *34*(Suppl 1), S89–S96. https://doi.org/10.2337/dc11-S089

Galicia-Garcia, U., Benito-Vicente, A., Jebari, S., Larrea-Sebal, A., Siddiqi, H., Uribe, K. B., Ostolaza, H., & Martín, C. (2020). Pathophysiology of Type 2 Diabetes Mellitus. *International Journal of Molecular Sciences*, *21*(17), 6275. https://doi.org/10.3390/ijms21176275

George, J. T., Warriner, D., McGrane, D. J., Rozario, K. S., Price, H. C., Wilmot, E. G., Kar, P., Stratton, I. M., Jude, E. B., & McKay, G. A. (2011). Lack of confidence among trainee doctors in the management of diabetes: The Trainees Own Perception of Delivery of Care (TOPDOC) Diabetes Study. *QJM: An International Journal of Medicine*, *104*(9), 761–766. https://doi.org/10.1093/qjmed/hcr046

Hailu, F. B., Hjortdahl, P., & Moen, A. (2018). Nurse-Led Diabetes Self-Management Education Improves Clinical Parameters in Ethiopia. *Frontiers in Public Health*, *6*, 302. https://doi.org/10.3389/fpubh.2018.00302

Hunt, C. W. (2013). Self-care management strategies among individuals living with type 2 diabetes mellitus: Nursing interventions. *Nursing: Research and Reviews*, 99. https://doi.org/10.2147/NRR.S49406

Jm, A., M, A., F, K., M, R., Z, F., & J, J. (2013). Group education and nurse-telephone follow-up effects on blood glucose control and adherence to treatment in type 2 diabetes patients. *International Journal of Preventive Medicine*, *4*(7). https://pubmed.ncbi.nlm.nih.gov/24049598/

Lawler, J., Trevatt, P., Elliot, C., & Leary, A. (2019). Does the Diabetes Specialist Nursing workforce impact the experiences and outcomes of people with diabetes? A hermeneutic review of the evidence. *Human Resources for Health*, *17*, 65. https://doi.org/10.1186/s12960-019-0401-5

M, C., N, C., H, G., K, S., & P, W. (2015). A comparison of prescribing and non-prescribing nurses in the management of people with diabetes. *Journal of Advanced Nursing*, *71*(12). https://doi.org/10.1111/jan.12757

M, N., Cs, C., E, A., & M, D. (2019). The Role of Nurses and the Facilitators and Barriers in Diabetes Care: A Mixed Methods Systematic Literature Review. *Behavioral Sciences (Basel, Switzerland)*, *9*(6). https://doi.org/10.3390/bs9060061

Martínez-González, N. A., Tandjung, R., Djalali, S., Huber-Geismann, F., Markun, S., & Rosemann, T. (2014). Effects of Physician-Nurse Substitution on Clinical Parameters: A Systematic Review and Meta-Analysis. *PLoS ONE*, *9*(2), e89181. https://doi.org/10.1371/journal.pone.0089181

Rm, D., Ad, H., Mm, S., Wh, H., Ie, Z.-G., & Ej, M.-D. (2010). TeleHealth improves diabetes self-management in an underserved community: Diabetes TeleCare. *Diabetes Care*, *33*(8). https://doi.org/10.2337/dc09-1919

Ross, A. J., Anderson, J. E., Kodate, N., Thompson, K., Cox, A., & Malik, R. (2014). Inpatient diabetes care: Complexity, resilience and quality of care. *Cognition, Technology & Work*, *16*(1), 91–102. https://doi.org/10.1007/s10111-012-0247-2

Rygg, L. Ø., Rise, M. B., Grønning, K., & Steinsbekk, A. (2012). Efficacy of ongoing group based diabetes self-management education for patients with type 2 diabetes mellitus. A randomised controlled trial. *Patient Education and Counseling*, *86*(1), 98–105. https://doi.org/10.1016/j.pec.2011.04.008

Tan, M. Y., Magarey, J. M., Chee, S. S., Lee, L. F., & Tan, M. H. (2011). A brief structured education programme enhances self-care practices and improves glycaemic control in Malaysians with poorly controlled diabetes. *Health Education Research*, *26*(5), 896–907. https://doi.org/10.1093/her/cyr047

Tang, T. S., Funnell, M. M., Noorulla, S., Oh, M., & Brown, M. B. (2012). Sustaining short-term improvements over the long-term: Results from a 2-year diabetes self-management support (DSMS) intervention. *Diabetes Research and Clinical Practice*, *95*(1), 85–92. https://doi.org/10.1016/j.diabres.2011.04.003

V, T., A, A., Sa, P., Mc, P., B, L., A, M., L, P., & D, B. (2023). The role of nurses in diabetes care: Challenges and opportunities. *The Lancet. Diabetes & Endocrinology*, *11*(1). https://doi.org/10.1016/S2213-8587(22)00314-X

Vissarion, B., Malliarou, M., Theofilou, P., & Zyga, S. (2014). Improvement of Diabetic Patients Nursing Care by the Development of Educational Programs. *Health Psychology Research*, *2*(1), 931. https://doi.org/10.4081/hpr.2014.931

Walker, E. A., Shmukler, C., Ullman, R., Blanco, E., Scollan-Koliopoulus, M., & Cohen, H. W. (2011). Results of a successful telephonic intervention to improve diabetes control in urban adults: A randomized trial. *Diabetes Care*, *34*(1), 2–7. https://doi.org/10.2337/dc10-1005

Weinger, K., Beverly, E. A., Lee, Y., Sitnokov, L., Ganda, O. P., & Caballero, A. E. (2011). The Impact of a Structured Behavioral Intervention on Poorly Controlled Diabetes: A Randomized Controlled Trial. *Archives of Internal Medicine*, *171*(22), 1990. https://doi.org/10.1001/archinternmed.2011.502

Wexler, D. J., Beauharnais, C. C., Regan, S., Nathan, D. M., Cagliero, E., & Larkin, M. E. (2012). Impact of inpatient diabetes management, education, and improved discharge transition on glycemic control 12 months after discharge. *Diabetes Research and Clinical Practice*, *98*(2), 249–256. https://doi.org/10.1016/j.diabres.2012.09.016