



REVIEW

# The Implication of Diabetes-Specialized Nurses in Aiming for the Better Treatment and Management of Patients with Diabetes Mellitus: A Brief Narrative Review

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## ABSTRACT

Diabetes mellitus (DM) is regarded as one of the most critical public health challenges of the 21st century. It has evolved into a burgeoning epidemic since the last century, and today ranks among the major causes of mortality worldwide. Diabetes specialist nurses (DSNs) are central to good patient care and outcomes including

confident self-care management. Evidence shows that DSNs are cost-effective, improve clinical outcomes, and reduce length of stay in hospital. In this brief narrative review, we aim to describe the roles of DSNs and their contribution in the treatment and management of patients with DM. This narrative review describes the importance of DSNs in healthcare practice, in the inpatient and outpatient departments, in the pediatrics department, in managing diabetic foot ulcers, in the treatment and management of gestational diabetes, in prescribing medications for DM and in diabetes self-management education on glycosylated hemoglobin, and

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cardiovascular risk factors. To conclude, DSNs have a crucial role in the treatment and management of patients with DM and its complications. DSNs have a great impact on diabetes therapy, and hence implementation of DSNs and nurse-led diabetic clinics might be beneficial for the health care system. Finally, having DSNs might significantly contribute to good healthcare practice and support. Even though DSNs are not available in several regions around the globe, and even though this post is still new to several health care institutions, the presence of DSNs recognized and certified by the various healthcare systems would be very useful.

**Keywords:** Diabetes mellitus; Diabetes specialist nurses; Gestational diabetes; Diabetes treatment; Healthcare practice; Inpatient care; Outpatient care

### Key Summary Points

Diabetes mellitus (DM) is recognized as one of the most significant public health challenges of the 21st century. It has emerged as a growing epidemic since the last century, coinciding with the exponential increase in obesity rates. Today, it stands as one of the leading causes of mortality worldwide.

Diabetes specialist nurses (DSNs) are central to good patient care and outcomes including confident self-care management.

Evidence shows that DSNs are cost-effective, improve clinical outcomes, and reduce the length of stay in hospitals.

DSNs have a crucial role in the treatment and management of patients with DM and its complications.

DSNs have a great impact on diabetes therapy, and hence implementation of DSNs and nurse-led diabetic clinics might be beneficial for the health care system.

Finally, having DSNs might significantly contribute to good healthcare practice and support.

Even though DSNs are not available in several regions around the globe and even though this post is still new to several health care institutions, the presence of DSNs recognized and certified by the various healthcare systems would be very useful.

## INTRODUCTION

Diabetes mellitus (DM) is considered one of the most pressing public health challenges of the 21st century. It has emerged as a growing epidemic since the last century, coinciding with the exponential increase in obesity rates. Today, it stands as one of the leading causes of mortality worldwide [1]. According to World Health Organization (WHO) statistics, over 537 million adults worldwide were suffering from DM in 2021 [2], and a continuous rise has been noted during the past recent years. DM is believed to have a major impact not only in terms of clinical effects but it also has a great impact on the worldwide economic burden [3]. The current global healthcare expenditures estimates due to DM have already reached US \$376 billion and are expected to rise further to US \$490 billion by the year 2030 [4].

Specialist nurses are registered nurses who have worked for a significant period in a specialized field of nursing with additional nursing qualifications and have been granted permission to practice as a specialist with advanced expertise in a clinical specialty to involve in clinical practice, teaching, consultation, and research [5]. The minimum qualification for a diabetes specialist nurse (DSN) has been set at post-graduate diploma level. A bachelor's degree in nursing offers a foundation that typically includes knowledge of biology and chemistry. Becoming licensed as a registered nurse requires passing a licensure exam offered by an organization such as the National Council of State Boards of

Nursing (NCSBN). Pursuing an advanced degree such as a Master of Science in Nursing (MSN) or a post-master's nursing certificate can prepare nurses for advanced and specialized roles [6], such as that of diabetes nurse specialist. In Australia, registered nurses undertook an accredited Australian Diabetes Educators Association course in order to become an expert in the management of patients with DM [7].

DSNs are central to good patient care and outcomes including confident self-care management [8]. Evidence shows that DSNs are cost-effective, improve clinical outcomes, and reduce the length of hospital stays [9].

While it is the doctors who are responsible for medical decisions, specialized nurses contribute something new to patient management and can help facilitate the tasks of the doctors, which this review will discuss. Therefore, in this brief narrative review, we aim to describe the roles of DSNs and their contribution in the treatment and management of patients with DM.

This article is based on previously conducted studies and does not contain any new studies with human participants or animals performed by any of the authors.

### **DSNs and Their Positions and Postings in This New Era**

Recently DSNs have more been implemented in the United Kingdom (UK), the United States (US) and other European countries. However, this position is new, and several health institutions especially in African and Asian countries, have yet to approve DSNs. We believe that DSNs should be implemented worldwide. A large UK diabetes charity (Diabetes UK), working group of diabetes nurses (Trend UK), and the Royal College of Nursing's position statement on DSNs mentioned that DSNs are cost-effective, significantly improve clinical outcomes in the hospital setting, as well as reduce the length of hospital stays [10]. Even though DSNs have been approved in the UK, they have been greatly undervalued, and the number of DSNs has significantly been lower than the recommended quantity that the National Diabetes Inpatient Audit (NaDIA) reported up to 28% of hospitals

which do not have DSNs in the UK [11]. NICE Quality Standards for diabetes care for adults recommend that all hospitals should include an inpatient DSN service [10]. NaDIA further strengthens this statement by mentioning that this should be provided everyday including weekends but unfortunately by 2017, only 8.8% of health institutions in England and Wales provided a 7-day service for inpatient DSN [12].

### **The Importance of Diabetes Specialist Nurses in Healthcare Practice**

The importance of DSNs in healthcare practice has previously been described [13]. In many health care systems, DSNs provide education about the disease including the importance of nutrition, monitoring, management of weight, teaching them how to identify signs of complications, and supportive services in order to help patients to self-manage their blood sugar levels and control their disease [14]. Patients are educated by DSNs on ways to prevent complications in this phase of chronic disease, thus minimizing the burden on healthcare systems. DSNs are also implicated in coordinating any ongoing care of patients, counseling patients, and providing advice on medication and management of inter-current disease [15–17]. DSNs work in both primary and secondary care. DSNs also act as an intermediate and often liaise with other multi-disciplinary diabetes team including medical health officers, dietitians, and clinical psychologists [18]. Therefore, the presence of DSNs might have significantly improved the healthcare system in general and has improved the treatment and management of patients with DM.

### **The Importance of Diabetes Specialist Nurses for Inpatient Care**

DSNs also have major roles during inpatient care. In the in-patient setting, DSNs have a significant role during referral of patients from admission to discharge [19]. Admission referrals include patients who have been newly diagnosed with DM, patients with diabetic ketoacidosis or hyperosmolar hyperglycemic state, patients with

hypoglycemia, or with sub-optimally controlled diabetes. DSNs often review referrals which have been made by ward-based staff, and triage these so that some could be reviewed by doctors and some might be reviewed by nurses. Patients could also be referred to DSNs upon admission due to persistent hyper or hypoglycemia, for any advice on insulin dosage, steroid-induced hyperglycemia, any support for using an insulin pump, pre-operative advice, and end-of-life diabetes care, as well as education on medications and control of disease prior to discharge. When they are referred patients, DSNs attend wards in the in-patient settings to assess the patients and gather further details from the patients and staff, which could aid in the decision-making process. Appropriate insulin injection technique, blood glucose monitoring, and management of hypoglycemia in the in-patient department are taught by DSNs. Hence, having DSNs might significantly contribute to good healthcare practice and support. A systematic review based on the impact of DSNs on inpatient care showed a reduction in the length of hospital stay and improved clinical care among patients with DM with this introduction of DSNs [20]. The study showed that a reduction in bed occupancy from 39 to 47% was observed with DSNs [20]. Therefore, DSNs contribute a lot in the improvement and control of DM through good diabetes therapy and management.

### **The Importance of Diabetes Specialist Nurses for Outpatient Care**

Similar to inpatient settings, DSNs have an important role in outpatient care [21]. In an outpatient setting, DSNs are involved in providing continuity of care for patients who were reviewed when they were admitted to the hospital. DSNs also run outpatient clinics referred to as nurse-led clinics and support consultants and dietitians [22]. Patients with DM often have follow-ups with DSNs where their blood pressure, glycated hemoglobin (HbA1c), medications, injection sites, foot check, and retinopathy screening are carried out to monitor continuity of treatment and observe for complications. In the outpatient setting, DSNs are

involved in educating newly diagnosed patients with DM about their disease and management options. Depending on the type of diabetes and its presentation, some patients will require insulin therapy and home blood glucose monitoring, while others may require oral hypoglycemic drugs and lifestyle modifications. DSNs work in collaboration with dietitians in delivering the education required at the patient level. For those patients on insulin therapy, the role of DSNs is to educate patients about the different types of insulin, their onset of action, peak and duration, as well as teaching them about the administration techniques, including site rotation, storage, and sharps disposal [23]. For those patients who require carbohydrate count, DSNs teach those patients about how to match their mealtime insulin to carbohydrates. In addition, concerning oral hypoglycemic agents, some general practitioners will prescribe SGLT2 inhibitors [24] and DPP4 inhibitors [25] and refer patients for follow-up with DSNs. Therefore, the DSNs teach those patients how the medications work and how to deal with potential side effects. Hence, whether inpatient or outpatient, DSNs work hard and improve diabetic care in order to empower self-management and provide support and prevent hospitalization wherever possible. Therefore, the implication of DSNs in aiming for the better treatment and management of patients with DM is justified.

### **The Role of Pediatrics Diabetes Specialist Nurses**

DSNs also have special roles in the pediatrics department. Diabetes is becoming more common in the United Kingdom and throughout the world. A quality standard on diabetes in children and young people has been published by the National Institute for Health and Care Excellence (NICE) describing high-priority areas for improvement and consists of specific, measurable statements designed to achieve better care. Information from the latest National Pediatrics Diabetes Audit shows the number of children and young people who are being treated in children's diabetes units has an annual increase of 4% [26]. In the year 2014–2015, the prevalence

of type 1 diabetes mellitus in those aged 15 or less in the United Kingdom was 192 per 100,000 of the general population [26]. Studies have shown that pediatric DSNs could significantly improve outcomes. Collaborative teamwork with a substantial input of pediatrics diabetes specialist nurses showed a reduction in the number of newly diagnosed children with DM requiring hospitalization, a significant reduction in the length of hospital stay among those children with DM, resulting in substantial bed availability in the hospital setting and improved clinic attendance. The introduction of innovative methods of education and support was also noted. Positive outcomes with the introduction of pediatric DSNs resulted in new post being created in the pediatrics department. A survey was also carried out with the aim of identifying the job title, work setting, qualifications, and training of the pediatric DSNs and to examine the composition of the multidisciplinary diabetes team [27]. The findings of that survey support the fact that pediatric DSNs play a key role in the education of children with diabetes as well as their parents [27]. Similar to adult inpatient and outpatient settings, pediatric DSNs are also involved in teaching these young patients about their disease, administration of insulin, signs of hypoglycemia, and other techniques which would be helpful in their disease management [28]. Thus, pediatric DSNs definitely contribute to the progress of diabetes therapy among children in the healthcare settings.

### **The Role of Diabetes Specialist Nurses in Patients with Diabetic Foot Ulcers**

Diabetic foot ulcer (DFU) is one among the major causes of hospital admissions in patients with diabetes, and this can result in complications including infection, gangrene, amputation, and can even lead to death if care is not given on time. DSNs also have a vital implication in patients with diabetic foot ulcers [29]. Nowadays, most of the diabetic foot clinics are run by DSNs [30]. The American Diabetes Association (ADA) recommends one of the most effective ways to manage diabetic foot ulcer by considering a multi-disciplinary team

consisting of a medical health officer, a nurse, an educator, podiatrists, and some departmental consultants [31]. However, even though all the members of the team have their own tasks in reducing the incidence of diabetic foot ulcer and foot amputation, the nurses' roles seem to cover a major part and seem more essential [32]. In most developed countries, diabetes nursing is divided into various sub-groups, including the diabetic foot specialist nurse, who plays a crucial role in the preventive care and rehabilitation of patients with diabetic foot ulcers. Nurse approaches in managing diabetic foot ulcers include the control of blood sugar, focusing on wound debridement, implementing advanced dressings, offloading modalities, and surgery [33]. As per the World Health Organization (WHO), nurses form part of a major percentage of healthcare staff and are actively implicated in preventing and detecting DM and its complications at an early stage. Another case report showed that amputation was avoided in a patient's diabetic foot as a result of the optimal management that the patient received from trained nurses, even though the patient encountered several physicians who decided that amputation would be the only remaining option.

Diabetic foot specialist nurses are believed to effectively contribute to the prevention and control of diabetic foot ulcers and preventing foot amputation by screening high-risk patients, providing educational interventions including addressing all the factors that could affect and interfere with wound healing such as high blood sugar, limb ischemia secondary to atherosclerosis, infections, repeated trauma on a specific site, improper wound dressing, and so on, and providing appropriate healthcare [34]. In addition, such special nurses could help in teaching patients how to carry out physical examination on themselves and caring for their feet daily [35]. Patients were encouraged to perform several minor actions to prevent foot ulcers or recurrence. For example, they were advised to check their shoes before wearing them, ensure their feet are clean and dry, and consistently maintain skin and nail care to prevent fungal infections. Moreover, any change in skin or foot sensation could easily be detected by the

specialized nurses at an earlier stage, and would focus on foot care and specific dressings.

In rehabilitation centers, these specialist nurses can help patients with diabetic foot ulcers or those who have had an amputation by encouraging and making them learn how to use assistive devices including canes, walkers, and wheelchairs. Thus, by considering these strategies, diabetic foot specialist nurses can partly contribute to the reduction of the number of amputations and enable a better quality of life among the patients with DM and to be less dependent on others. Hence, the implication of DSNs in aiming for the better treatment and management of patients with DM is again justified.

### **The Importance of Diabetes Specialist Nurses in Prescribing for Diabetes Care**

The role of diabetes specialist nurses also encompasses medicine management. Today, the government of the UK's National Health Service (NHS) modernization strategy is expanding nurses' roles to include prescribing into the curriculum of nurses [36]. Today, over 18,000 nurses from a total of 690,000 have rights to prescribe medications and one-third of them prescribe medications for patients with DM. Opinions from patients were well appreciated [37]. Having a nurse for prescribing diabetes medications could significantly free more time for doctors, reduce waiting time, and improve efficiency of the health service [38]. Less patients were required to visit a doctor since they could get their prescriptions updated or reviewed by the nurses. Moreover, having a nurse to prescribe the medications would render it easier to contact the nurse prescriber by telephone and this could significantly be of help to the patients especially if they are learning a new treatment regimen. In addition, nurses could prescribe medications for normal non-emergency cases, as outpatient prescriptions while doctors could spare more time for serious illness including emergency and more complicated cases. Confidence was inspired when nurses demonstrated awareness of their own limitations and referred to doctors or other services. Where patients witnessed such

communication, it gave them increased confidence in the safety of the system. Moreover, a comparative case study showed that prescribing nurses had a long-term relationship with their patients and longer consultation time periods compared to non-prescribing nurses [39]. In a survey carried out in the UK based on the views of the patients with DM about nurse prescribing diabetes medications, it was stated that since the nurses could prescribe medications during routine appointments, the waiting time of the patients was shortened since they no more had to wait for the nurse to obtain a prescription from the doctor. Instead, they could obtain their prescriptions directly from the nurse [37]. Patients even commented that "they usually have to see the nurse first and then see the doctor and now if the nurse can prescribe our diabetes medications including our insulin, then we think it is going to save a lot of time" [37]. The patients also stated that nurses were more flexible to see the patients when required in comparison to the doctors who were most of the time busy in other tasks [40]. Nevertheless, there are limitations with nurse prescribers. DSNs could adjust the dosage of insulin and they could adjust the dosage of oral hypoglycemic agents without taking the advice of a doctor. However, in several cases, they might contact the doctor with complicated cases or if a new drug has to be initiated.

### **The Role of Diabetes Nurses in the Management of Gestational Diabetes Mellitus**

Gestational diabetes (GDM) is a common major complication of pregnancy. To minimize GDM-related morbidity and mortality, appropriate perinatal care, counseling of the mother and family, and individualized nursing interventions play a major role [41]. Recent epidemiological data have indicated a global increase in gestational diabetes mellitus. GDM could lead to maternal and fetal complications and is usually associated with higher costs for its treatment and management [42]. DSNs have several roles in GDM. In GDM, the nursing management includes lifestyle modifications (exercise, diet, and nutrition)

and the taking of diabetes medications if required, medication adherence thereto which would be crucial to prevent maternal and neonatal and perinatal complications [43]. Sometimes patients who are diagnosed with GDM do not have enough information about their disease condition. Therefore, it is the role of DSNs to emphasize the importance of early education on GDM. A guideline, developed from rigorous evidence, would assist nurses and midwives in the screening, diagnosis, and management of GDM [44]. As they are often the first point of care for women, this is particularly important in contexts where medical care is scarce.

However, challenges were faced by the hospital nursing staffs and midwives when managing patients' blood sugar levels, thus to make sure of patients' optimal self-management, and to ensure that suitable foods were provided in a proper timely manner. Another important point is to involve patients in their diabetes care, including the control of blood sugar levels, the types of foods to eat, and the correct timings to have certain meals. It is also very essential to provide nursing staff and midwives with proper and regular up-to-date training and resources to ensure quality diabetes care to the patients during their hospital stay in order to reach a certain level of satisfaction by the patients as well as the staff. In addition, to ensure a better pregnancy outcome in patients with GDM, health education should be mixed with personalized psychological nursing to effectively control patients' conditions [45, 46], which merits widespread promotion. In brief, nurses should further be equipped to tackle high-risk pregnancy conditions including GDM.

### **The Effect of a Nurse-Led Diabetes Self-Management Education on Glycosylated Hemoglobin and Cardiovascular Risk Factors**

The Diabetes Education and Self-management for Ongoing and Newly Diagnosed (DESMOND) randomized trial failed to find a significant relationship among 824 adult patients with DM, and another Cochrane review in 2009 found that individuals with nurse-led diabetes self-management education (DSME), compared with

usual care (UC), did not significantly improve glycemic control, although there was a suggestion of benefit for those with an glycosylated hemoglobin (HbA1c) greater than 8.0%. However, a recent meta-analysis based on nurse-led diabetes self-management education on blood glucose and cardiovascular risk factors has significantly improved glycemic control, showing effectiveness [47]. The meta-analysis including 5993 participants with a mean age of 52.8 years and a baseline HbA1c of 8.5%, a difference of  $-0.70\%$  in HbA1c was noted with nurse-led support compared to the usual care whereby a difference of  $-0.21\%$  was observed.

Nurses, when compared to other healthcare staff, more often promote preventive health-care-seeking behaviors among patients [48]. A nurse-led DSME on HbA1c was recently investigated [49]. A total number of 142 adults with DM were randomized and categorized into two groups whereby one group received either 'usual diabetes care' (control group) and the other group received usual care plus a nurse-led diabetes self-management education (intervention group). HbA1c values were considered as the primary outcome whereas blood pressure changes, changes in body weight, differences in lipid profiles, self-efficacy, self-management behaviors, quality of life as described by the patients, social support, and depression were considered as the secondary outcomes. Patients in the intervention group showed significant improvement in HbA1c, blood pressure, body weight, efficacy expectation, outcome expectation, and diabetes self-management behaviors. Nurse-led intervention continued to show beneficial effects, which significantly improved clinical outcomes, outcomes related to lifestyle, and psychology.

### **Need for Recognition of DSNs in Some Countries**

Today, there is a higher demand for more involvement by nurses, especially specialist nurses mainly in diabetes care [50]. Therefore, DSNs should be made available all round the world in the near future. However, despite multiple benefits, DSNs have not yet been approved or recognized in certain countries due to several

reasons including restrictive government legislations, poor infrastructures with reference to the hospital setting, inadequate training of nurses, lack of awareness and confidence in care provided by nurses, disagreement and lack of acceptance among medical colleagues and patients, dominance of medical fraternity, perceived lower status of this nursing profession, and a weak nursing leadership might be the possible reasons. In addition, the nurses' potentials are often underestimated, unrecognized, and underutilized since most of the nurses with specialized qualifications still work as general nurses or nurse educators [51]. However, due to the lack of a clearly defined scope of practice within the nursing practice act, which includes specified licensing, practice titles, and cadre structure for nursing practitioners within the healthcare system, no measures have been taken to fully recognize the beneficial nursing potentials. [52].

## CONCLUSIONS

DSNs have a crucial role in the treatment and management of patients with DM and its complications. DSNs have a great impact on diabetes therapy, and hence implementation of DSNs and nurse-led diabetic clinics might be beneficial for the health care system. Finally, having DSNs might significantly contribute to good health-care practice and support. Even though DSNs are not available in several regions around the globe and even though this post is still new to several health care institutions, the presence of DSNs recognized and certified by the various health-care systems would be very useful.

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### Declarations

**Conflict of Interest.** The authors Yefang Zhu, Hongmei Zhang, Ying Xi, Hongli Zhu, Yan Lu, Xue Luo, Zhangui Tang and Hong Lei declare that they have no competing interests.

**Ethical Approval.** This article is based on previously conducted studies and does not contain any new studies with human participants or animals performed by any of the authors.

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