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Advances in the Nurse-Led Diabetes Management Model

Feng Li[1*], Yonghong Jiang[1], Lixia Peng[1], Liling Wang[2#]

[1]Department of Nursing, University of Jinan, Guangzhou, China
[2]Baoan Central Hospital of Shenzhen, Shenzhen, China
Email: lifengzai2022@163.com, [#]wangliling@163.com

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Abstract

Diabetes mellitus is an important chronic disease that affects the health of the population worldwide, causing a serious impact on patients' quality of life and increasing the burden on the healthcare system. With the increasing number of diabetic patients, the traditional healthcare model is under tremendous pressure. In recent years, the nurse-led diabetes management model, as an innovative approach to nursing intervention, has gradually become an important part of comprehensive diabetes management. This article reviews the conceptual model, specific types of nurse-led diabetes management models, barriers faced by nurses during implementation, and corresponding strategies, with a view to providing a reference for the management of diabetic patients and the development of diabetes specialty nurses.

Keywords

Diabetes Mellitus, Management Model, Nurse-Led, Specialized Care

1. Introduction

According to the World Health Organization, diabetes is predicted to be the seventh leading cause of death in 2030 [1]. Globally, the number of people diagnosed with type 2 diabetes mellitus is increasing rapidly in both developing and developed countries, and as the global burden of diabetes continues to rise, the role of nurses is becoming increasingly important in diabetes management [2], and diabetes specialist nurses, as one of the specialized professionals in diabetes management, are an important player in diabetes management [3]. The National Nursing Career Development Plan (2021-2025) points out that it is necessary to combine

*First author.
#Corresponding author.

the actual needs of the public, innovate the nursing service model, and encourage hospitals to innovate and develop diversified nursing services [4]. In order to achieve this goal, nursing staff have been exploring the management model of diabetic patients. At present, nurse-led diabetes management models are in various forms, each with its own advantages, all of which play an important role in the management of diabetic patients. This study reviews the nurse-led diabetes management models at home and abroad, with a view to providing a reference for the management of diabetic patients and the development of diabetes-specialized nurses.

2. Concept of Nurse-Led Diabetes Management Model

The nurse-led diabetes management model is a type of diabetes management in which nurses play an integrated and leading role in the comprehensive management of diabetic patients. The traditional management of diabetic patients is managed and led by doctors, which leads to a gradual increase in the pressure and workload of doctors, and in order to meet the changing clinical requirements, nurses can choose a certain number of patients to manage, thus reducing the pressure within the medical clinic [5]. The content of the nurse-led diabetes management model is mainly as follows: the nurse organizes the multidisciplinary staff to form a diabetes management team and lead the progress of the process; the nurse is responsible for the communication between the department and various specialties, responsible for making appointments for diabetic patients and collecting patient data, discussing with diabetic patients and their families about the development of a health plan, and carrying out the evaluation of the results and the follow-up visits. In recent years nurses have been involved in the rise of workload in the management of diabetic patients in the course of practice, and nurse-led diabetes management models have gradually developed into a variety of types, such as the case management model [6], the mmc management model based on the National Standards Metabolism Center [7], the shared outpatient model [8], the multidisciplinary diabetes care team [9], and the diabetes care clinic [10], which have enriched the diabetes management model.

3. Main Types of Nurse-Led Diabetes Management Models

3.1. Diabetes Case Management Model

The American Case Management Association [11] defines case management as a collaborative process of assessing, planning, implementing, coordinating, monitoring, and evaluating selected treatments and services to promote high-quality, cost-effective outcomes by communicating and making available resources to meet the comprehensive health needs of individuals and families. Diabetes case managers are teams of specialists, psychologists, dietitians, exercise rehabilitators, and diabetes nurse specialists, with diabetes nurse specialists being the most important and effective case managers [12]. Case managers are healthcare professionals who act as communication centers, linking individuals/caregivers to

healthcare teams and community members, directing, and coordinating care to influence acute and chronic disease management and improve population health.

The nurse-led diabetes case management model is divided into two main phases, in-hospital case management and community/out-of-hospital case management, according to the patient's location, and gradually the whole process of admission-discharge-home case management has been explored. A study found [13] that a nurse-led case management model resulted in patients with diabetes mellitus having significantly lower glycated hemoglobin levels and diabetes distress scores, eating more fruits and vegetables, increasing more exercise, increasing the number of times they checked their feet, and being less depressed compared to usual care. Similar findings were obtained in a 2-year study of patients with type 2 diabetes in China [14]. Crowe *et al.* [6] demonstrated that a nurse-led diabetes case management model was effective in diabetes management, with nurses scoring higher than physicians in satisfaction and playing a crucial role in improving patients' self-management skills, improving glycemic control, and reducing the risk of complications. Role. The advantages of the nurse-led diabetes case management model are that nurses can promote multidisciplinary collaboration, patients can receive personalized nursing care and health education, health care expenditures can be reduced, and self-management skills can be improved. Disadvantages include high work pressure for nurses, dependence on individual nurse level, low patient acceptance, and high workload for patient data management and tracking.

3.2. Diabetes Management Model Based on National Standardized Metabolic Disease Management Center

The National Standardized Metabolic Management Center (MMC) was initiated by Academician Ning Guang of the Chinese Academy of Engineering and the Endocrinology and Metabolism Physicians Branch of the Chinese Physicians Association in 2016 and promoted nationwide. Its core concept is "one center, one-stop service, one standard". "One standard" means that all diagnostic treatments follow the uniform standards set by the National Center for Metabolic Diseases. "One-stop service" means that after the patients get the doctor's diagnosis and treatment service in MMC, there are educational nurses outside the hospital to follow up and guide the patients, remind them to take medication, and make appointments for follow-ups. Meanwhile, the extended quality nursing service team goes out of the departments, out of the hospitals, into the communities, and into the enterprises to carry out health education for the residents and the workers, so as to realize that we can go from treating to preventing the diseases. To prevent diseases. "One Center" means that at MMC, patients can complete registration, print the identity information code, measure blood pressure, measure height and body mass, draw blood for laboratory tests, and screen for other complications, such as visceral fat, fundus photography, arteriosclerosis testing, etc. The model, through the establishment of a mobile Internet platform, advanced diagnosis and treatment technology, and the Internet of Things, the Internet, big data, and other

means of combining to achieve online and offline, in-hospital and out-of-hospital, multi-center sharing of multiple benefits [15]. In recent years, a new, effective way to realize the whole management of metabolic disease diabetes has been proposed. It is a new and effective way of diabetes management proposed in recent years, which realizes the whole management of metabolic diseases.

After the establishment of MMC, thousands of hospitals across the country have signed up to join the program, and medical and nursing teams have been managing diabetic patients based on this platform, and significant results have been achieved [7] [16]. Based on the MMC platform, Wang *et al.* [7] formed a specialist nurse-led MMC management team and implemented interventions to collect patient data through the MMC platform and unified management through the platform, and the results showed that the patients' glycated hemoglobin, diabetes knowledge scores, and diabetes self-management behavior scores improved significantly after the intervention. Wang Kerong *et al.* [17] established a diabetes management model based on the MMC platform led by specialist nurses, and the diabetes self-management behavior scale scores for each dimension in the specialist group were higher than those in the conventional group. The MMC management model led by specialized nurses can apply the specialized skills and knowledge of specialized nurses to the process of diabetes management through the platform, manage diabetic patients in a standardized and efficient way, help improve the level of diabetes self-education and management of patients, and help patients control their blood glucose, making full use of medical resources, saving patients' time and physical strength, and providing patients with a pleasant and relaxing experience of medical treatment. MMC centers provide reminder services through the app, urging patients to learn and self-monitor, and healthcare workers can also supervise patients in real time through the app. Disadvantages There are problems such as technical dependence, lack of personnel training, inability to establish MMC centers in some areas due to various conditions, and low acceptance by the elderly.

3.3. Shared Medical Appointments Management Model for Diabetes

Shared medical appointments (SMA), also known as group outpatient appointments, are an appointment-based model of care that was proposed by psychologist Dr. Edward Noffsinger in 1996, emphasizing patient-centeredness and group support to enable more patients with common illnesses to be seen in a timely manner and to provide more opportunities for patients to receive medical care without increasing the burden on physicians [18]. burden, giving patients greater access to medical care [18]. Nurse-led diabetes shared clinics are multidisciplinary teams of diabetes nurses, outpatient nurses, specialists, dietitians, pharmacists, rehabilitation physicians, and psychologists led by a diabetes nurse specialist to provide ongoing medical visits to patients with diabetes [8]. The preparation of the shared diabetes clinic is based on three main aspects: personnel, goods, and space. Specific preparations include the nurse booking about 10 patients a week in advance

and inviting relevant staff to participate; preparing disease-related information of patients participating in the activity, diabetes health education molds, educational materials, diagnostic and treatment equipment, and playback equipment needed for the activity and questionnaire information needed before and after the shared clinic; and preparing a room with a capacity of more than 20 people. The implementation process of the diabetes shared clinic is as follows: after patients register and sign in, the nurse presides over the activity process; each patient introduces his/her own disease diagnosis and treatment situation and effect, followed by diabetes-related theme study and discussion, according to the need for a multidisciplinary team to communicate with patients one by one to consult, to understand the clinical problems of each patient, to give the patient an individual plan, and finally, to summarize the common and characteristic problems of this group clinic.

A shared diabetes clinic has a positive effect on patients' self-management efficacy, quality of survival, blood glucose stability, and doctor-patient satisfaction. Tea Li *et al.* [8] conducted a 3-month intervention by constructing a shared clinic for patients with type 2 diabetes led by specialist nurses, comparing the relevant indicators before and after the intervention, and found that the shared clinic led by specialist nurses was able to effectively reduce waist circumference, total cholesterol, and triglycerides in patients with type 2 diabetes, improve self-management behaviors and self-management efficacy in patients, and improve the quality of patients' survival. Heyworth *et al.* [19] pointed out that nurses play a more prominent role during shared clinic treatment, spend more time with patients, patients' needs are more easily observed, and patients who participate in 2 or more shared clinics give higher satisfaction to nurses. Compared with traditional health education, the nurse-led shared clinic bridges the two-way communication between nurses and patients, and the nursing staff can better understand the needs of the patients and make targeted guidance and intervention, which is conducive to the management of patients with diabetes mellitus. The advantages of this model are that it reduces patients' waiting time for consultation, improves medical efficiency, enhances patient engagement, enhances patient education through group learning, and patients can receive advice from multiple experts in the field of health within a single time period. The disadvantages are that it is difficult to protect patient privacy in a group setting, they cannot obtain fully personalized healthcare services, and they cannot ensure that each patient has enough time to express his or her needs, and some patients may prefer traditional one-on-one counseling and have reservations about the shared clinic model.

3.4. Multidisciplinary Diabetes Care Team Management Model

The multidisciplinary diabetes care team (MDCT) consists of diabetes nurses, nurse practitioners, specialists, primary care physicians, nutrition experts, pharmacists, exercise therapists, and other relatively permanent working groups, centered on patients with diabetes, and interdisciplinary cooperation to provide

patients with highly personalized and beneficial diagnosis and treatment plans [9]. of beneficial programs for their diagnosis and treatment [9]. The multidisciplinary teamwork model emphasizes multidisciplinary cooperation and is different from the traditional model of diabetes management, in which only endocrine specialists or nurse specialists are responsible for management. In recent years, studies on nurse-led multidisciplinary diabetes care teams have emerged, and the team is led by specialist nurses, who are responsible for filing, collecting, organizing, and summarizing patient information, as well as overseeing the implementation of the diabetes management plan, communicating with physicians about the patient's follow-up plan, and arranging for patients to be followed up on time. The nurse, as an important member of the multidisciplinary diabetes care team, plays an important role in coordinating between the patient and team members; the specialist is responsible for the development of the patient's diagnosis and treatment plan, and adjusting the dosage of oral medication or insulin; the dietitian develops personalized nutritional prescriptions based on the patient's condition, blood glucose control level, and nutritional status; the exercise therapist develops a scientifically sound exercise program for the patient after exercise assessment; and the community PCP interfaces with the specialist to manage the diabetes management program in the community at the time of the patient's discharge. Management.

Nurse-led multidisciplinary teams collaborating in the management of diabetes in nursing practice can improve glycemic control, reduce glycated hemoglobin levels, and enhance nurses' sense of worth. A study by Handlow [9] and his team found that a 12-week intervention by primary care multidisciplinary teams for patients with diabetes in a primary care clinic resulted in significant reductions in glycated hemoglobin in patients completing a diabetes program. Nayeri *et al.* [20] conducted a qualitative study of nurses involved in multidisciplinary team care and found that nurse-led multidisciplinary team care in patients with diabetic feet improved the patient experience and boosted nurses' sense of professional worth and self-confidence. The multidisciplinary diabetes care management model has obvious advantages in providing comprehensive delivery of holistic care, optimizing resource utilization, promoting teamwork, improving patient prognosis, and enhancing patient satisfaction, but it also faces challenges such as difficulty in coordination, cost issues, time management, division of responsibilities, patient privacy, and differences in various specialties. Implementation requires comprehensive consideration of these factors to ensure that the team can operate effectively and provide high-quality care.

3.5. Diabetes Nursing Clinic

Nurse-Led Clinic (NLC) is a nurse clinic run independently by practicing nurses or by a nurse-led team of several clinical nursing experts and clinical consultants in the appropriate disciplines to provide patients with health assessment, health education, counseling, treatment, psychological support, and case management [10]. In recent years, due to the popularization of the Internet and smart tools,

remote blood glucose management has also become one of the tasks of a diabetes care clinic. The diabetes care clinic is an effective nursing intervention model to promote health improvement and quality of life for diabetic patients. A study of patients who received diabetes education in the hospital and were discharged to receive insulin therapy found that patients were discharged to a diabetes care clinic for diabetes interventions and individual care plans, and follow-up results showed that the diabetes care clinic enabled patients to improve their diabetes management and that the care clinic provided safe and effective care for patients with diabetes in between transitions from the hospital to the community [21]. A meta-analysis study [22] showed that nursing clinics significantly reduced patients' glycated hemoglobin levels in both developed and developing countries, and there was no significant difference between nurse prescribing and physician prescribing in controlling glycated hemoglobin levels. This model has obvious advantages in improving patient self-management, improving glycemic control and enhancing patient satisfaction, and increasing nurses' sense of value, but it also faces challenges such as resource allocation, nurses' work pressure, nurses' prescriptive authority, and policy restrictions.

4. Impediments and Recommendations for the Implementation of a Nurse-Led Diabetes Management Model

4.1. Policy Deficiencies and Recommendations

The implementation of policy measures related to the diabetes management model needs to be improved [23]. At present, the main problems are as follows: The nurse-led diabetes patient management model is mostly for nursing staff to conduct scientific research and exploration in this area; the policy does not have sufficient funding to support the study of its continued development. Nurse prescribing is growing rapidly globally, but there is a lack of harmonized standards for the role of nurses, policies related to nurse prescribing, and pre-practice education globally. In high-income countries, nurse prescribing has developed more rapidly, whereas in many low- and middle-income countries, there are still multiple restrictions on nurse prescribing [24], and consequently, the autonomy of nurses is limited. Health insurance reimbursement of costs incurred during patient visits is difficult. The infrastructure for the management of patients with diabetes needs to be improved; for example, data information systems are only available in countries or regions with better economic conditions and are not connected to each other, making it impossible for hospitals to retrieve cases, and it is also difficult for primary health care organizations, which have to manage a large number of patients with diabetes, to systematically manage the data and records of patients with diabetes.

Improvement of relevant government policies can promote the development of nursing and diabetes management. It is recommended that the government introduce detailed policies to support nurses in diabetes management and provide financial support. Drawing on the experiences of countries around the world, the

government should improve the policy on nurses' prescribing rights and limit the role of nurses, the scope of nurses' prescriptions, and the access and supervision of prescribing nurses according to the national conditions, so as to give nurses more authority and stimulate nurses' motivation and autonomy. It is recommended that the health administrative department establish an effective financial support mechanism for medical insurance payment and expense reimbursement on the basis of argumentation and formulate policy guidelines on charging systems and standards, so as to ensure the sustainable development of the nurse-led diabetes management model. Funds have been invested in promoting the construction of digital platforms to connect hospitals and primary health-care institutions so that patient information can be shared, and health-care workers can have a more comprehensive grasp of patients' diagnostic and therapeutic information and manage it.

4.2. Deficiencies and Improvement Measures in Medical Institutions

Medical institutions provide diagnosis and treatment places, medical personnel, diagnosis and treatment technology, and file management services for the management of diabetic patients, but there are still some deficiencies. The connection between hospitals, primary health care institutions, and families is not close; the up-and-down referral process is simplified, and some diabetic patients are not transferred to primary health care institutions to continue standardized management after being discharged from hospitals, so nurses are not able to carry out continuous follow-up visits. Chronic disease management of diabetes involves doctors, nurses, dietitians, rehabilitation therapists, and other multidisciplinary talents. The division of labor is unclear, there is no uniform standard for charging, the staff's time and effort are not proportional to the return [23], and it cannot be effectively based on the distribution of income from their labor. There is a shortage of human resources, especially diabetes specialty nurses. Liang Yuemei *et al.* surveyed 563 hospitals in 10 provinces in China in their 2019 study, and only 165 hospitals had diabetes-specialized nurses (29.3%) [25]. The nurse-led diabetes management model mostly relies on nurse specialization, but the level of diabetes management nurses varies [26]. It is recommended that hospitals provide leadership and organize all levels of medical institutions to implement a referral system for diabetic patients discharged from hospitals, to realize the whole process of management from hospitals to primary health care institutions to families, and to guarantee the smooth implementation of follow-up. Hospitals can formulate relevant rules and regulations to standardize the responsibilities of multidisciplinary diabetes management teams, consultation and treatment fees, and salary allocation. Hospitals can increase the training of specialized diabetes nurses and set up assessment and supervision mechanisms to ensure the quality of nurses.

4.3. Reasons and Countermeasures on the Part of Patients

Diabetic patients have insufficient mastery of their underlying conditions and a low level of self-management. Several studies have shown that the participation

rate of diabetes self-management education (DSME) among diabetic patients is generally low. The DSME participation rates of diabetic patients in China, the United States, and Canada are in the low-to-moderate range [27]-[29]. Elderly patients have a poor grasp of electronic information such as mHealth, "Internet+," and big data, and are not able to receive timely and effective preventive and therapeutic advice from healthcare workers, nor are they able to provide timely feedback on their own disease conditions and the occurrence and development of complications.

It is recommended that healthcare workers increase the frequency of explaining the knowledge related to diabetes disease management for diabetic patients so that patients can have a better understanding of their own condition and master the process related to diabetes self-management and education, which can highlight the importance of nurse guidance [21] and peer support [30], improve the degree of patient self-efficacy and social support, improve the patient's perception of the disease from the psychological aspect, and increase the patient's confidence in rehabilitation as well as in the confidence in recovery. Provide popularization lectures on mobile diagnosis and treatment technology to elderly patients, gradually teach patients to use portable intelligent monitoring devices, and provide easy-to-understand and interesting health education materials for elderly patients to learn.

5. Discussion

5.1. The Nurse-Led Diabetes Management Model has a Significant Impact on the Economic Level

The model helps to reduce overall healthcare costs by optimizing resource allocation and improving the efficiency of care. Nurse-led case management can reduce unnecessary hospitalizations and emergency room visits, thereby reducing healthcare costs. In addition, diabetes complications can be reduced through early identification and intervention, which further reduces long-term treatment costs. However, the implementation of this model also requires additional investment, including training of nurses, construction and maintenance of information technology systems, and so on. Therefore, policymakers and healthcare organizations need to weigh the relationship between short-term investment and long-term savings and develop sound economic strategies.

5.2. The Nurse-Led Diabetes Management Model involves Multiple Ethical Issues

On the one hand, nurses exercise more autonomy while assuming greater responsibility, which requires them to follow professional ethics and standards in their practice. On the other hand, patient privacy and data security are important ethical issues, especially when using electronic health records and remote monitoring technologies [31]. In addition, nurse-led models may affect the roles and responsibilities of physicians and other healthcare professionals, which requires clear communication and collaboration mechanisms within the team to ensure that

patients receive optimal care. Finally, equity is also a key ethical issue and should ensure that all patients, regardless of socioeconomic status, have equal access to high-quality diabetes management services.

5.3. Nurse-Led Diabetes Management Models need to be Adapted from the Patient's Perspective

Nurse-led diabetes management models provide more personalized and continuous care, which can help improve patient satisfaction and treatment adherence. Patients may be more inclined to have a long-term relationship with a nurse because nurses provide more comprehensive and detailed care. In addition, the nurse-led model emphasizes patient education and self-management, which can help improve patients' knowledge and management of their illnesses, thereby improving their quality of life. However, patients may have concerns about nurses' prescriptive authority and decision-making ability, which requires nurses to demonstrate a high degree of professional competence and communication skills in their practice in order to gain patients' trust. In addition, patients may respond differently to acceptance and adaptation of the new model, which requires nurses to individualize and support the implementation process.

6. Conclusion

This review synthesizes and analyzes the various types of nurse-led diabetes management models and their strengths and weaknesses. Each of these models demonstrates the potential to enhance patient self-management, improve glycemic control, and reduce the risk of complications. These models provide more comprehensive and personalized care for patients with diabetes by optimizing resource allocation, enhancing patient education, and improving quality of care. This study also has some limitations. The study relied mainly on published literature and may not cover all the latest practices and research findings. In addition, there is a lack of in-depth analysis of the long-term effects and economic impact of nurse-led models, limiting a comprehensive assessment of the sustainability and cost-effectiveness of these models. Finally, the lack of patient experience and qualitative data is also a limitation of this study, which limits in-depth understanding of the actual effects of nurse-led models. Future research is needed to overcome these limitations and provide more comprehensive and in-depth insights through more diverse methodologies and broader data collection.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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