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Review article

Diabetes management in patients in primary care

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Abstract

Introduction: Diabetes is a chronic disease that demands continuous management and poses a major public health challenge. Its rising prevalence and treatment costs highlight the need for holistic, non-pharmacological approaches. Registered nurses play a key role in diabetes care, particularly through patient education. This article analyses nursing interventions in diabetes management and evaluates their effects on clinical outcomes and patient satisfaction.

Methods: A systematic review of the scientific literature was conducted using PubMed, Cochrane Library, and ScienceDirect. Source selection was guided by a PRISMA diagram, after which we conducted a content analysis of the included studies.

Results: Fourteen studies published between 2020 and 2025 were included in the detailed analysis. Four main diabetes management interventions performed by registered nurses were identified: (1) patient education, which proved to be one of the most effective methods for improving diabetes self-management; (2) implementation of screening tests; (3) support for self-management of the disease; and (4) care coordination or interdisciplinary collaboration. Content analysis resulted in the main category: "Interventions of Registered Nurses in Primary Health Care for Diabetes Management." Subcategories were: (1) Clinical Outcomes, (2) Prevention of Complications, (3) Self-Management and Education, and (4) Patient Satisfaction. The results demonstrated improved glycaemic control, earlier detection of complications, increased patient self-efficacy, and higher patient satisfaction.

Conclusion: Registered nurses make a significant contribution to diabetes management in primary health care. Their interventions reduce complications, enhance patients' quality of life, and support the sustainable development of the health system.

Keywords: Diabetes; Nurse interventions; Primary health care; Registered nurses

Introduction

Diabetes mellitus is a group of disorders characterised by persistently elevated blood glucose levels (NIJZ, 2024). It is a chronic metabolic disorder caused by insulin deficiency, reduced tissue sensitivity to insulin, or a combination of both mechanisms (Banday et al., 2020; Tamiru et al., 2023). Over the past several decades, diabetes has become one of the fastest-growing chronic non-communicable diseases worldwide. It represents a major global health problem, affecting all age groups, causing numerous complications, and placing a significant burden on healthcare systems (IDF, 2025; NIJZ, 2022).

Diabetes is a key global health priority. It affected 537 million adults in 2021 and is expected to rise to 643 million by 2030 and 783 million by 2045 (IDF, 2024). In Slovenia, 290,617 people were diagnosed with diabetes in 2021, with an additional 97,435 cases undiagnosed. Projections indicate this number will exceed 308,543 by 2030. The treatment of diabetes represents a significant financial burden, amounting to €321 million in Slovenia in 2021 (NIJZ, 2022).

Diabetes is associated with multiple acute and chronic complications, including hypoglycaemia, diabetic ketoacidosis, diabetic foot, retinopathy, nephropathy, and cardiovascular disease, which increase mortality and reduce quality of life (Ferjan et al., 2022; Globočnik Petrovič and Urbančič, 2022; NIJZ, 2024). Because it requires long-term, comprehensive treatment, the organisation of healthcare services is crucial.

Beyond health implications, diabetes has significant social consequences, often leading to reduced work capacity, premature retirement, increased absenteeism, and economic and social burdens for families and communities (Tamiru et al., 2023). Thus, diabetes extends beyond a medical problem to a broader societal challenge.

Effective diabetes management requires adequate patient knowledge, skills, and resources for self-management, alongside support from an interdisciplinary healthcare team. Evidence emphasises the importance of large-scale community interventions for successful disease management (Campbell et al., 2020). Long-term management is essential to prevent adverse outcomes but requires maintaining numerous daily habits over a lifetime (Reininger, et al., 2020). Interventions should support adults in navigating the psychological and practical challenges associated with disease management (Alexandre et al., 2021).

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Primary health care offers a holistic, lifelong approach that encompasses comprehensive health services for all age groups; from health promotion and disease prevention to treatment, rehabilitation, and palliative care. It addresses broader determinants of health through cross-sectoral interventions and empowers individuals, families, and communities to manage their health effectively. This approach ensures accessibility, equity, and coordinated care, enabling support for individual health needs (WHO, 2025). Integrating primary and secondary care facilitates improved diabetes management and better clinical and economic outcomes compared to usual care, where collaboration between sectors is often suboptimal (Zarora et al., 2022).

Preventive examinations in family medicine clinics allow early detection of chronic non-communicable diseases and the identification of behavioural risk factors (Bulc et al., 2022). These preventive examinations are often performed by registered nurses. They proactively invite individuals aged 30 years or older to participate and provide guidance to patients with well-managed chronic conditions. Well-managed patients are those who are informed about their condition and actively engaged in their treatment (Ministry of Health, 2025). In addition, Health Promotion Centres and Health Education Centres operate within primary care facilities, implementing health education activities for adults (NIJZ, 2025).

Primary care also includes home care services, which provide preventive support to patients with chronic conditions. During home visits, registered nurses monitor health status, detect additional risk factors early, slow disease progression, and prevent potential disability. They may deliver one longer or up to three shorter treatment sessions per patient at home (Horvat et al., 2025).

Through a literature review, this article aims to examine which interventions by registered nurses in primary health care most effectively contribute to successful diabetes management.

Materials and methods

We conducted a review of the scientific literature on interventions by registered nurses in primary care for diabetes management. To ensure the inclusion of the most reliable evidence, we applied the PCC (Population, Concept, and Context) framework, which enables a systematic, efficient, and thorough literature review. The research question was: "What are the interventions of registered nurses (Concept) in primary health care (Context) for the management of diabetes (Population)?"

We searched three major databases in the fields of medicine and nursing: PubMed, Cochrane Library, and ScienceDirect. To obtain relevant scientific and professional literature, we developed a search strategy including keywords from the research question and their synonyms in English. The search string contained the terms: *diabetes management, community nursing (patronage care), primary care (primary healthcare), and nursing interventions (registered nurse interventions)*. Boolean operators AND, OR, and NOT were applied, resulting in the following search string: ("diabetes management" OR "diabetes control" OR "diabetes care") AND ("primary health" OR "primary care" OR "general practice" OR "primary level" OR "model of family practice" OR "community nursing") AND (strategies OR interventions OR approaches OR tasks) NOT (hospital OR "secondary care" OR "specialist care").

The final analysis included research articles written in Slovenian or English, published between 2020 and 2025, and addressing interventions by registered nurses in primary health care in patients with diabetes. Studies were excluded if they did not address relevant topics, were of an inappropriate type, were published in languages other than Slovenian or English, or were published before 2020, as the aim was to capture the most recent research on the topic. To ensure the review remained focused on the role of registered nurses in primary care diabetes management, strict exclusion criteria were applied. Studies were excluded if they did not involve patients with diabetes (Population), were conducted primarily in hospital settings or specialised diabetes centers rather than primary care (Context), or examined interventions delivered solely by other health professionals, such as physicians or pharmacists, without the participation of registered nurses (Concept). In addition, duplicate records, editorials, case studies, conference abstracts, and reports without original data were excluded to maintain the quality and reliability of the evidence. This approach was essential to keep the review focused on interventions directly relevant to primary care nursing and to ensure that the findings were reliable, comparable, and generalisable across studies.

We conducted content analysis that followed Elo and Kyngäs (2008) to analyse and synthesise the data. Findings were categorised into four groups: clinical outcomes, prevention of complications, self-management, and patient satisfaction.

In writing this article, we applied the descriptive method for reporting, the analytical method for examining individual studies, the compilation method to summarise results, the comparative method to analyse and compare findings, and the synthesis method to integrate the results. The process of searching and selecting sources was illustrated using a PRISMA diagram (Page et al., 2021).

Results

The initial search in the selected databases yielded 995 records. After removing duplicates (n = 2), 993 articles remained. Following a title and abstract screening, 750 articles were excluded as irrelevant. Of the remaining 243 articles, the full text of three could not be obtained, leaving 240 articles for full-text review. During this stage, 226 articles were excluded due to inappropriate topics, resulting in 14 studies being included in the detailed literature analysis (Diagram 1).

According to the research methodology, the articles were categorised as quantitative (n = 11) and qualitative (n = 2). One article (n = 1) could not be categorised into either of these two categories because it was a professional guideline.

The included studies were conducted in the following countries:Spain: n = 1 (De la Fuente Coria et al., 2020), Turkey: n = 1 (İlhan et al., 2021), Belgium: n = 1 (Matthys et al., 2021), United States: n = 3 (Ju et al., 2023; Leonard, 2024; Reininger et al., 2020), Iran: n = 1 (Noroozi et al., 2024), Brazil: n = 1 (Oliveira and Franco, 2021), China: n = 1 (Ma et al., 2021), Slovenia: n = 1 (Horvat et al., 2025), international research: n = 4 (Aldahmashi et al., 2024; Campbell et al., 2020; Davis et al., 2021; Sun et al., 2025).

We categorised the included articles according to Polit and Beck's (2021) hierarchy of evidence strength. This distinguishes seven levels of evidence – from the highest level (I), which includes systematic reviews of randomised controlled trials (RCTs), to the lowest level (VII), which includes expert opinions and recommendations. In level I, which includes systematic reviews and meta-analyses of randomised controlled trials (RCTs), we classified three articles (n = 3): Campbell et

al. (2020); Davis et al. (2021); Sun et al. (2025). Three articles (n = 3) were classified in level II, which represents individual randomised controlled trials (RCTs): De la Fuente Coria et al. (2020); Noroozi et al. (2024); Reininger et al. (2020). In Level III, which includes quasi-experimental research, we also classified three articles (n = 3): Ju et al. (2023); Ma et al. (2021); Matthys et al. (2021). In level IV, which represents qualitative research, we classified one article (n = 1): Leonard (2024). In level V, which covers a systematic or integrative review of non-experimental research, we classified one article (n = 1): Aldahmashi et al. (2024). In level VI, which represents non-experimental research, two articles (n = 2) were classified: İlhan et al. (2021); Oliveira and Franco (2021). In level VII, which represents expert opinions and guidelines, there was one article (n = 1): Horvat et al. (2025).

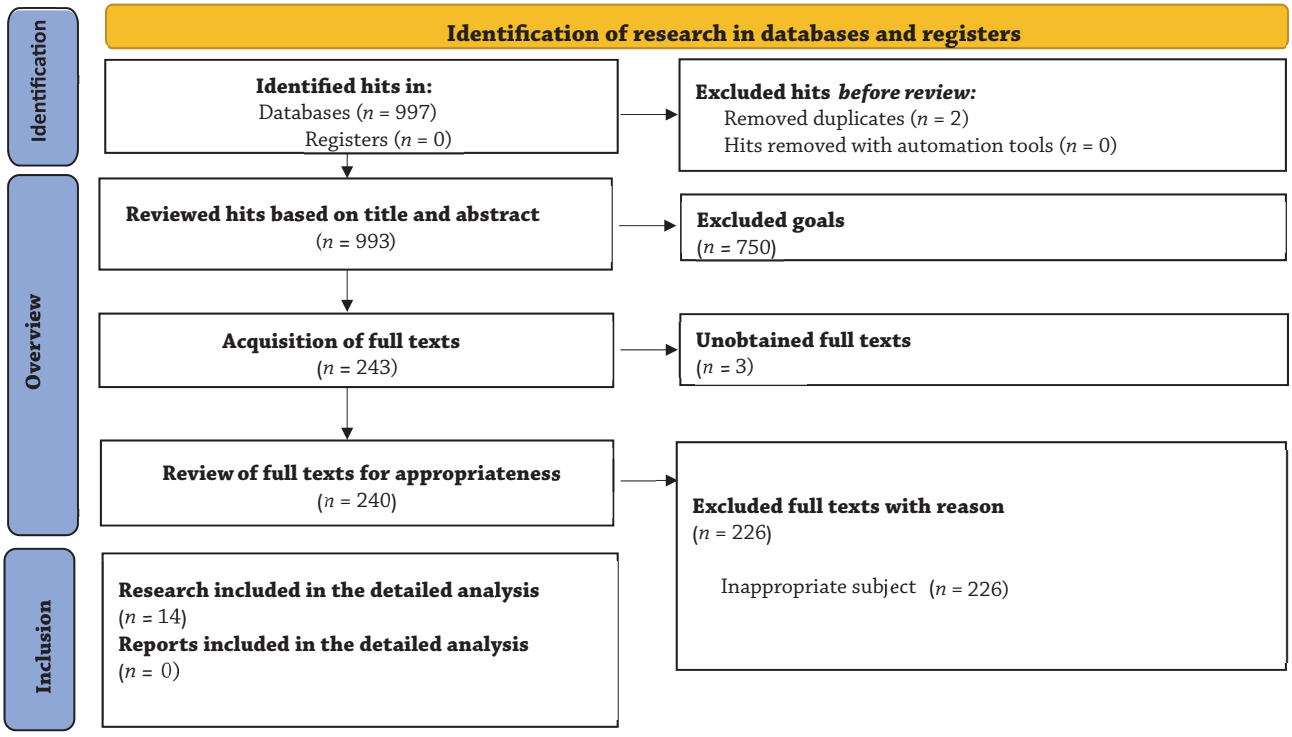

Diagram 1. Illustrates the review process with a PRISMA diagram

In the initial phase, the 14 included studies (n = 14) were examined to identify the main topics related to diabetes management in primary health care (Suppl. materials). In the following section, we present a content analysis of the included studies.

The main category was "Interventions of Registered Nurses in Primary Health Care for Diabetes Management". The subcategories were: (1) Clinical outcomes, (2) Prevention of complications, (3) Self-management and education, (4) Patient satisfaction (Table 1).

Table 1 – Content analysis

Main category	Subcategories	Free codes	References
Interventions of registered nurses in primary health care in diabetes management	Clinical outcomes	Lowering HbA1c, reducing blood pressure, lowering LDL-cholesterol, long-term improvements, glycaemic control, blood sugar reduction	Ma et al. (2021) Matthys et al. (2021) Reininger et al. (2020)
	Preventing complications	Foot screening, amputation reduction, early detection, nephropathy, diabetic foot, retinopathy, telemedicine monitoring, risk factor identification, preventive measures	Aldahmashi et al. (2024) De la Fuente Coria et al. (2020) Ju et al. (2023) Leonard (2024)
	Disease self-management and education	Improved health literacy, increased self-efficacy, lifestyle changes, structured educational programs, behavioural changes	Campbell et al. (2020) İlhan et al. (2021) Ma et al. (2021) Oliveira and Franco (2021) Sun et al. (2025)
	Patient satisfaction	Greater satisfaction, accessibility, relationships, more time for counselling, greater satisfaction in multidisciplinary teams, active patient participation, trust, effective communication, support	Davis et al. (2021) Horvat et al. (2025) Matthys et al. (2021) Noroozi et al. (2024)

Clinical outcomes

Glycated haemoglobin (HbA1c) was the most frequently monitored indicator across all studies and served as the standard measure of glycaemic control. Interventions led by registered nurses were associated with significant improvements in HbA1c as well as other clinical parameters, including blood pressure, weight, and lipid profiles. The average reduction in HbA1c ranged from 0.5% to 1.0% over 6–12 months (Ma et al., 2021; Matthys et al., 2021; Reininger et al., 2020).

Reininger et al. (2020) reported that community interventions, including education, nutritional counselling, and group workshops, resulted in a mean HbA1c reduction of 0.8% ($p < 0.05$) over 12 months. In a randomised trial of 150 patients in China, Ma et al. (2021) found significant improvement in the intervention group receiving structured education and nurse support, compared to no significant change in the control group. Matthys et al. (2021) observed that integrating registered nurses into a multidisciplinary team in Belgium led to long-term improvements, with an average HbA1c reduction of 0.5%. Multidisciplinary teams comprising doctors, nurses, dietitians, and pharmacists showed enhanced care coordination and adherence to guidelines, resulting in better glycaemic outcomes.

Preventing complications

Registered nurses in primary care play a crucial role in the early detection of complications and regular monitoring of patients with diabetes (Aldahmashi et al., 2024). Early recognition of complications affecting the kidneys, eyes, or nervous system allows timely preventive interventions that can significantly improve long-term treatment outcomes. The involvement of registered nurses at this stage of disease management ensures that patients are closely monitored, enabling early intervention when complications arise.

Nurse-led care in primary health settings contributes to ongoing disease monitoring and helps reduce glycosylated hemoglobin (HbA1c), blood pressure, and LDL-cholesterol levels. This, in turn, lowers the risk of developing microvascular and macrovascular complications, particularly cardiovascular diseases, and improves long-term outcomes (De la Fuente Coria et al., 2020). Early detection and prevention of chronic diabetes-related complications remain a key responsibility of registered nurses.

Quality improvement programs involving nurses have proven effective in increasing the proportion of patients receiving recommended foot screenings, thereby reducing the risk of severe complications, including amputations (Leonard, 2024). Ju et al. (2023) demonstrated the effectiveness of telemedicine programs for diabetic foot monitoring; it enables earlier detection of changes and reduces the need for hospitalisation.

These findings highlight that the role of registered nurses extends beyond patient education; nurses actively contribute to preventing serious complications that have the greatest long-term impact on both treatment costs and patients' quality of life. Routine screening has been shown to decrease the incidence of foot ulcers and facilitate earlier detection of retinopathy. Furthermore, telemedicine solutions have enhanced the accessibility of preventive programs, allowing patients to receive timely interventions and improving overall care delivery (Aldahmashi et al., 2024; De la Fuente Coria et al., 2020; Ju et al., 2023; Leonard, 2024).

Disease self-management and education

Self-efficacy in managing diabetes is critical for treatment success. Registered nurses frequently deliver structured educational programs covering nutrition, physical activity, glucose self-monitoring, and medication management (Oliveira and Franco, 2021; Sun et al., 2025).

Sun et al. (2025) demonstrated that intensive educational programs significantly improved patients' health literacy, enhancing disease understanding and adherence to therapeutic recommendations. İlhan et al. (2021) found a strong association between health literacy and self-efficacy, with well-informed patients demonstrating better self-control and adherence to lifestyle modifications. Oliveira and Franco (2021) reported that older patients with regular contact with primary care nurses achieved better glycaemic control (mean HbA1c ↓ 0.6%).

One of the key tasks of registered nurses in primary health care is to encourage patients to actively self-manage their illness. Higher health literacy is directly linked to better disease management, as patients are more likely to take responsibility for their health and make the necessary lifestyle changes. Involving patients in the decision-making process and actively participating in treatment is crucial to maintaining their confidence and motivation (Oliveira and Franco, 2021).

Registered nurses encourage patients to actively self-manage their conditions, with higher health literacy associated with improved disease management and adherence to lifestyle modifications. Involving patients in decision-making fosters confidence and motivation (Oliveira and Franco, 2021). Ma et al. (2021) found that health education improved quality of life and psychosocial outcomes. In a systematic review of 27 studies, Campbell et al. (2020) confirmed that nurse interventions consistently enhance health literacy and reduce HbA1c.

These results indicate that structured educational programs significantly improve health literacy, self-efficacy, and behavioural changes, which are essential for long-term successful diabetes management (İlhan et al., 2021; Oliveira and Franco, 2021; Sun et al., 2025).

Patient satisfaction

Quality of care depends not only on clinical outcomes but also on patient satisfaction. Research indicates that patients value accessibility, comprehensive care, and partnership with registered nurses more than traditional medical treatment alone (Davis et al., 2021).

Matthys et al. (2021) found that patient satisfaction in groups receiving nurse-led care was significantly higher than in control groups ($p < 0.01$). In Slovenia, Horvat et al. (2025) confirmed that nurses in referral clinics perform independent examinations and consultations, relieving doctors and improving both accessibility and patient satisfaction. Patients reported that nurses provided more time for individualised counselling, were easier to contact, and were more approachable for questions related to their disease. Overall, nurse-led care enhanced patient satisfaction through accessibility, comprehensive counselling, and collaborative care (Davis et al., 2021; Noroozi et al., 2024).

Discussion

Research has confirmed that high-quality nursing care and health education help patients manage negative emotions more effectively, enhance their ability to optimally manage their illness, and improve satisfaction with treatment (Ma et al., 2021). Primary care interventions and structured health education have been shown to strengthen self-care skills and empower patients, leading to better self-management, reduc-

tions in glycated haemoglobin (HbA1c), improved blood glucose control, weight management, enhanced quality of life, reduced stress, and adherence to proper medication use (Wuri Kartika et al., 2021).

The results of this review indicate that registered nurses play a pivotal role in diabetes management in primary care. Their interventions extend beyond basic patient education and encompass a comprehensive range of activities, including monitoring clinical indicators, implementing screening programs, supporting self-management, and providing psychosocial support. In Africa, Tamiru et al. (2023) demonstrated that nurse-led education programs increased patients' self-efficacy and improved their ability to manage both hypoglycaemia and hyperglycaemia. The most significant effect of interventions led by registered nurses was observed in glycaemic control, reflected in statistically significant reductions in HbA1c across several studies (Ma et al., 2021; Matthys et al., 2021; Reininger et al., 2020). This indicator is particularly important, as every 1% reduction in HbA1c is associated with a 37% decrease in the risk of microvascular complications and a 14% reduction in cardiovascular disease (Bulc et al., 2022).

Additionally, screening programs conducted by registered nurses have been shown to reduce the incidence of complications such as foot ulcers and diabetic retinopathy (Bulc et al., 2022; Globočnik Petrovič and Urbančič, 2022; Matthys et al., 2021). The combination of education, screening, and interdisciplinary collaboration was found to be the most effective approach, with benefits observed at both clinical levels (e.g., reductions in HbA1c and blood pressure) and behavioural levels (e.g., improved self-management). Structured educational programs consistently enhanced patients' health literacy, self-efficacy, and motivation to implement lifestyle changes (İlhan et al., 2021; Oliveira and Franco, 2021; Sanaeinasab et al., 2021). Patients with a clear understanding of their disease were more likely to adhere to prescribed therapies, perform regular self-monitoring, and actively participate in their treatment.

Differences between studies can often be explained by cultural factors, variations in health system organisation, and the degree of registered nurses' involvement in clinical decision-making. In Slovenia, registered nurses already work in family medicine referral clinics, implementing chronic disease monitoring programs. However, the analysis indicates that their potential remains underutilised (Horvat et al., 2025; NIJZ, 2024).

Three key areas where registered nurses could further enhance diabetes management include: (1) Expanding screening programs: Systematic screenings led by registered nurses increase early detection of complications (Ferjan et al., 2022; Globočnik Petrovič and Urbančič, 2022) and should become standard practice in all family medicine clinics. (2) Use of telemedicine: Telemedicine solutions allow better monitoring of patients in remote areas and reduce hospitalisations (Ju et al., 2023). In Slovenia, developing digital platforms for remote glucose monitoring and nurse-patient communication could facilitate timely interventions in case of disease deterioration. (3) Enhancing educational programs: Educating patients on disease self-management is fundamental for successful treatment (İlhan et al., 2021; Sanaeinasab et al., 2021). Referral clinics should incorporate regular workshops and group sessions, during which registered nurses provide guidance on nutrition, physical activity, stress management, and proper medication use.

Furthermore, increasing the involvement of registered nurses in clinical decision-making should be systematically regulated. In many countries, nurses with advanced competencies can independently prescribe certain medications and perform diagnostic procedures. Expanding these roles could relieve family doctors and improve healthcare system efficiency in the long term.

The main limitations of this review include the small number of studies in Slovenia, heterogeneity of methods, and short-term follow-up periods. Future research should adopt longitudinal designs (3–5 years) to monitor the durability of intervention effects, include larger sample sizes, and evaluate cost-effectiveness, specifically assessing the financial impact of enhanced nurse-led prevention of complications.

Conclusion

Diabetes represents one of the greatest public health challenges of our time, affecting an increasing number of people and leading to substantial health and socio-economic consequences. The findings of this systematic review demonstrate that registered nurses in primary care play a pivotal role in diabetes management. Their interventions significantly improve clinical outcomes, including reductions in HbA1c, blood pressure, and lipid levels, while also decreasing the incidence of complications such as foot ulcers and diabetic retinopathy. Beyond clinical effects, registered nurses contribute substantially to enhancing patients' self-efficacy and health literacy. Patient education on disease management forms the foundation for long-term successful treatment, as confirmed by numerous international and Slovenian studies. Moreover, patient satisfaction is higher when registered nurses are actively involved, as patients value accessibility, individualised care, and collaborative partnerships.

Moving forward, it is crucial to strengthen the role of registered nurses in Slovenian referral clinics and to provide them with greater autonomy in clinical decision-making. Key measures to enhance diabetes management include the development of telemedicine solutions, expansion of screening programs, and additional professional training for registered nurses.

Comprehensive, interdisciplinary care, with registered nurses playing a central role, is essential for improving patients' quality of life and reducing the financial burden on the healthcare system. Expanding nurses' roles, investing in their education, and integrating digital technologies represent important opportunities for the future. Such holistic, team-based approaches are fundamental for the long-term, effective management of diabetes in Slovenia and worldwide.

Limitations of study

Due to the exclusive focus on RCT studies, we were limited to a small number of identified studies.

Ethical aspects and conflict of interest

The authors have no conflict of interest to declare.

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