

Interdisciplinary Approach to Diabetes Management: Integrating Pharmacy, Nursing, Health Informatics, and Laboratory Services for Improved Patient Outcomes

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ABSTRACT

Background: Diabetes mellitus is a serious public health concern that requires efficient management techniques due to its increasing prevalence. A small percentage of diabetics can reduce and maintain their normal blood glucose levels, and many struggle to follow their doctor's recommendations for self-management. To help diabetes patients obtain better outcomes, interdisciplinary teams are a potential strategy. One promising approach to improving diabetes outcomes is interdisciplinary care that incorporates pharmacy, nursing, health informatics, and laboratory services.

Aim: Investigating the effectiveness of a multidisciplinary approach in the management of diabetes is the goal of this review, which places special attention on the roles that various healthcare professionals perform as well as the integration of informatics and laboratory services.

Result and Discussion: Multidisciplinary teams of pharmacists, nurses, and health informatics experts improved clinical outcomes, such as better lipid profiles, blood pressure control, and glycemic control (HbA1c). Health informatics tools enhanced communication and decision-making, while laboratory services offer vital monitoring for optimal care. The combination of many medical specializations leads to more comprehensive and effective diabetic care. This approach improves clinical outcomes while reducing healthcare costs. Future research should concentrate on larger trials to validate these findings and explore ways to optimize interdisciplinary collaboration in diabetes care.

Conclusion: It has been shown that the interdisciplinary approach to diabetes care, which integrates pharmacy, nursing, health informatics, and laboratory services, greatly improves patient results, including better glucose control and overall health management. This paradigm promotes patient monitoring and decision-making by promoting team-based care. While encouraging, further research is needed to fully validate the effectiveness of these integrated care models and enhance techniques for their broader use in the management of diabetes, particularly large-scale studies.

Keywords : Diabetes, Interdisciplinary team, Nursing, Pharmacy, Health informatics

INTRODUCTION

The World Health Organization reports that Saudi Arabia has the seventh-highest diabetes rate globally and the second highest in the Middle East. According to estimates, a million people have pre-diabetes, and 7 million people have diabetes. The current rise in diabetes in Saudi Arabia is possibly much more concerning. In fact, the prevalence of diabetes has increased by about ten times in Saudi Arabia during the last thirty years. (Abdulaziz Al Dawish et al., 2016)

In addition, the overall prevalence of type 2 diabetes in Saudi Arabia (2000–2020) was 16.4%, according to a meta-analysis, with notable regional and study-specific variations. The prevalence was higher among older persons, highlighting the necessity of coordinated healthcare approaches and focused, region-specific public health policies to effectively address the disease's impact. (Jarrar et al., 2023). Patients must manage their own diabetes symptoms in order to improve outcomes and prevent complications. Effective diabetic self-management includes self-monitoring blood glucose levels, a healthy diet, daily medication, regular foot inspections, and weight control. With proper self-management, blood glucose levels are maintained within a range of normal values. ((Zuñiga et al., 2020a) Hemoglobin A1C, a measure of the average blood glucose during the preceding three months, is used to assess glucose control. A1C should be less than 6.5% for diabetics and less than 5.5% for non-diabetics. One Patients may find it difficult to complete these tasks, which means they can only lower their average blood glucose by tiny amounts—typically less than 1%-age point.4- Although the national mean A1C level for diabetics has decreased from 7.6% to 7.4% since 1999, it is still higher than the target. Only around 14% of diabetic patients fulfill goals for all three outcomes, and between one-third and one-half of all patients do not meet goals for A1C, BP, or cholesterol.

Ignorance of the diabetes treatment strategy and dissatisfaction with the failure to achieve glycemic control. Six Pharmacists and case managers are examples of clinic support personnel who can help patients manage their own health. The short time allotted for office visits frequently makes it difficult for health care providers to address self-management difficulties. Adding experts who can offer more thorough diabetes education and assistance to the medical team is one way to go about this. It has been demonstrated that multidisciplinary teams improve results for patients in community settings who are at high risk for complications associated to diabetes, such as reaching A1C objectives. Successful interdisciplinary teams can comprise physician, nursing, clinical pharmacists, case managers, laboratory technician, laboratory specialists, and community health workers. Additionally, health informatics plays a critical role in interdisciplinary teams by improving the health of patients with chronic diseases like diabetes and assisting them in taking care of themselves. Therefore, the aim of this review is to emphasize and highlight the value of an interdisciplinary approach to diabetes management and its significant role in patient outcomes. (Zuñiga et al., 2020)

Method

The search was carried out using major electronic databases, such as Google Scholar, PubMed, Scopus, and CINAHL. Using specific key words such as diabetes management, Interdisciplinary Approach, Pharmacy, nursing, Health informatics and laboratory services and covered the period from January 2010 to October 2024. We select peer-reviewed articles, including cohort studies, observational studies, and randomized controlled trials, that explored multidisciplinary interventions in diabetes care, with focusing on outcomes such as management of blood glucose, quality of life, patient satisfaction, and clinical effectiveness.

RESULT AND DISCUSSION

Applying an interdisciplinary team (IDT) approach to type 2 diabetes (T2DM) management was one of the ten specific actions recommended by the Global Partnership to assist more patients reach their glycemic target through effective diabetes management. IDT approaches to diabetes care delivery have been demonstrated to have the greatest positive impacts on glycemic control in people with type 2 diabetes. Breaking free from an existing hierarchical system can be challenging, and a lack of financing is one of the largest barriers to delivering high-quality IDT treatment. Additionally, under the direction of strong leadership, it is imperative to increase patient access to the appropriate specializations and to establish collaborative, integrated working relationships across several disciplines (including enhanced and active communication). Patients must be included in the treatment team to promote regular contact and talk about management goals because they are crucial in controlling their own conditions. It also has been shown that using interdisciplinary care teams to manage diabetes greatly improves clinical and patient-reported outcomes.

Diabetes

Diabetes is a chronic, complicated illness that frequently necessitates a multimodal approach to treatment, involving medicine, lifestyle changes, and psychological support. Multidisciplinary care, which brings together a variety of healthcare professionals, such as primary care physicians, advanced practice nurses, clinical pharmacists, diabetes educators, nutritionists, psychologists, and other specialists, has proven to be more capable of meeting these varied needs than traditional care models that depend on a single healthcare provider. The impact that multidisciplinary treatment has on glycemic control is one of its primary features. Collaboration teams are more effective than normal diabetes treatment at lowering HbA1c levels, according to numerous research. HbA1c levels were considerably lower in randomized controlled research, for instance, that used a nurse-led interdisciplinary team that included diabetes nurse educators, psychologists, pharmacists, and nutritionists. (-1.3% vs. -0.2% for conventional care, $p < 0.0001$). This improvement is important to avoiding

diabetic conditions, such as cardiovascular diseases retinopathy, and neuropathy. It has been found the reduction in HbA1c in these programs

This improvement is crucial for reducing the risk of diabetic complications, such as retinopathy, neuropathy, and cardiovascular disease. The reduction in HbA1c observed in these programs frequently occurs in conjunction with better management of other cardiometabolic risk factors, such as blood pressure and lipid profile, which lowers the probability of problems even more. Multidisciplinary teams help with glycemic control and improve self-management skills. Research indicates that patients are more likely to adhere to treatment programs and form healthy habits when they are actively involved in their care through objectives, education, and ongoing monitoring from a diverse care team. For instance, by making sure patients are taking the right medicines, maximizing dosages, and keeping an eye out for adverse effects, pharmacists play a critical role in medication management. By assisting patients in comprehending their conditions and making informed decisions regarding their care, nurses play a crucial part in patient education. Together, these initiatives improve blood glucose management, dietary and exercise practices, and adherence to treatment plans.

Multidisciplinary teams also effectively manage the psychological and emotional components of diabetes care. Diabetes can be extremely difficult to control, and people with the disease frequently feel anxious, depressed, or lonely. When psychologists, social workers, or mental health specialists are on the team, patients get the emotional assistance they need to manage their illness. This support is associated with increases in mental health, self-efficacy, and overall quality of life. For example, research indicates that patients who receive motivational interviewing and counseling as part of their therapy are less likely to feel emotionally uncomfortable and are more likely to feel confident in their abilities to manage their illness. Additionally, when diabetes educators help patients create and accomplish their own goals, they are more motivated and get better results. The interdisciplinary approach's capacity to manage the comorbid conditions that frequently accompany diabetes is another important benefit. Diabetic nephropathy, dyslipidemia, and hypertension are among the problems that patients with diabetes are more likely to experience. To treat these disorders more thoroughly, the care team can involve specialists including podiatrists, cardiologists, and nephrologists. While frequent screenings and early interventions by a nephrologist can greatly lower the incidence of diabetic nephropathy, the involvement of a podiatrist helps avoid foot issues and lowers the risk of amputation. These interventions are frequently more successful when implemented as a coordinated team effort as opposed to depending on a single doctor to oversee all treatment-related activities. To offer interdisciplinary diabetes care, health informatics, laboratory services, and medical specialists must collaborate. Collaboration among medical professionals, laboratory services, and health informatics is necessary to deliver interdisciplinary diabetes care. Critical diagnostic data from laboratory tests, such as cholesterol levels and HbA1c, help monitor problems and advise treatment choices. In order to improve provider communication and enable the care team to make prompt, data-driven choices, health informatics systems combine patient data from multiple sources. EHRs, for example, improve the overall efficacy and efficiency of diabetes care by tracking patient progress, notifying physicians of aberrant results, and reminding patients of follow-up appointments.

The impact of pharmacist care on diabetes outcomes

The ability of pharmacists to do medication reconciliation, drug therapy evaluation and care planning using a problem-solving approach, educate patients and their families about diseases, drugs, and lifestyle modifications, and conduct planned telephone follow-ups is acknowledged. Reductions in hemoglobin A1c (HbA1c), blood pressure, hospitalizations, risk of complications from diabetes, and mortality have been demonstrated when pharmacists are added to the healthcare team in primary settings. Also, medication adherence and quality of life of patients with diabetes have been shown to improve. Primary care settings, such as community pharmacies, outpatient clinics, ambulatory settings, and healthcare centers, make it simple for patients to contact pharmacists who are reliable, approachable, and eager to offer direct medical care, particularly for long-term illnesses like diabetes. To assess how pharmacists might improve diabetes outcomes in primary care settings, several novel studies were done. In this study, the influence of pharmacist care, the type and intensity of the intervention, the role of the pharmacist, and the outcomes evaluated were all different. Recent years have seen the publication of a large number of systematic reviews (SRs) on this subject. Because the original studies' inclusion and exclusion criteria varied, published SRs about pharmacists' effects on diabetes outcomes in primary care settings are scattered.

The impact of pharmacist interventions in multidisciplinary diabetic care teams was assessed using a systematic analysis of several published systematic reviews (SRs), with a particular emphasis on clinical, humanistic, and financial outcomes in primary care settings. Seven SRs evaluated a variety of studies, including randomized controlled trials and other study designs, as part of this review. The main interventions emphasized were educational initiatives run by clinical pharmacists, which have been shown to enhance clinical outcomes associated with diabetes. Notably, over 50% of the SRs reported excellent results from pharmacist treatments, which led to favorable and significant reductions in key parameters such as body mass index, blood pressure, fasting blood glucose, cholesterol, and HbA1c. Pharmacist care also improved cost-utility and cost-benefit ratios

(from 1:1 to 8.5:1) and resulted in significant cost savings, with estimates ranging from \$8 to \$85,000 per person year. Although it pointed out that it was challenging to get firm conclusions regarding the overall effect on QoL due to the variety of QoL assessment instruments employed, the review also found increases in patients' quality of life (QoL). Notwithstanding these differences, the SRs' combined results provide credence to the idea that pharmacists should be part of multidisciplinary diabetes care teams since their interventions improve clinical, humanistic, and financial outcomes, which in turn lessen the financial toll that diabetes takes on healthcare systems. (Abdulrhim S et al., 2020)

In an outpatient diabetes clinic for patients 70 years of age and older, a retrospective exploratory study showed the importance of pharmacists in a multidisciplinary diabetes care team. 75.5% of the 138 patients in this study who spoke with the pharmacist had at least one drug-related issue identified, with an average of 2.5 issues per patient. Underutilization of pharmacotherapy was the most often addressed issue by the pharmacist (60%), followed by side effects (22.2%). Significantly, 75% of these interventions were deemed "moderately significant," highlighting the vital role pharmacists play in improving aged diabetic patients' care through a team-based approach (Kassam & Meneilly, 2007)

Nursing Care in Diabetes

Many critical tasks that improve patient outcomes are done by nurses, who are essential to the overall care of diabetes. Their responsibilities extend beyond those of a typical nurse and include writing prescriptions, educating, and supporting patients, and taking part in health promotion initiatives. Because of the diverse nature of their work, they must collaborate with interprofessional teams to provide patient-centered, holistic treatment. By combining their talents and independence, nurses can empower patients, encourage self-management, and modify treatment programs as needed. The responsibilities and tasks of nurses in diabetes care are examined in the sections that follow, along with how their participation enhances patient well-being. It was found that nurses played a variety of challenging responsibilities in the treatment of patients with diabetes. A variety of activities, such as prescribing, patient support, health education and promotion, and other interprofessional responsibilities, were reported by nurses. Providing these services in a diabetic care context came with unique responsibilities, even though most were related to basic nursing duties. The function that nurses play in diabetes treatment was further broken down into several sub-themes.

Promotion of Health and Health Education

Nurses reported delivering health promotion messages to patients that they believed would be helpful. They devoted much time to patient consultation, collecting baseline data, and providing relevant diabetes care information. Additionally, they instructed patients on how to understand test results. Diabetes treatment and control involve empowering patients and providing them with self-management support.

Giving Holistic Treatment

Nurses responded to each patient's unique needs by offering a variety of forms of support. By attending to additional needs that are not directly related to diabetes, they reported taking a holistic approach to their patients. One nurse described how her unit addressed the various requirements of her patients, such as foot care, physical and psychological care, social assistance, and cultural and economic concerns.

Prescribing

While prescribing, nurses played a significant part in giving patients advice on their medications. Following successful completion of a prescribing course, nurses also reported being able to write prescriptions. Typically, the prescription job involved prescribing and modifying insulin dosages.

Roles in Interprofessional Practice

Together with other nurses and medical specialists, nurses providing diabetes care were performing their duties. The responsibilities performed on patients other than those with diabetes increased the workload for the nurse providing diabetes care and were occasionally perceived as interfering with the role of diabetes care.

The Nurse's Role in Diabetes Care and Its Implications

Nurses talked about their thoughts on how their work affected the overall treatment of patients with diabetes. The patients' quality of life improved as a result of prompt, patient-focused interventions, which they believed their role made possible. Their function was seen as one that increased their autonomy in practice, broadened their scope of practice, and offered patient-centered treatment.

Giving Care That Is Patient-Centered The nurses viewed diabetes patient care as patient-centered since it aimed to meet the patients' demands for complete treatment. While acknowledging that they were often unable to personally address patients' issues, nurses provided a method to follow to address their worries.

Improving Professional Independence

Nurses stated that their self-confidence in managing their patients was influenced by their position in diabetes care. Self-confidence expression may be seen as a facilitator of nurses' autonomy in decision-making, problem-solving, and patient care planning. To guarantee patients' continuity of care, nurses who worked in diabetes care had their own patients, each of whom they were committed to caring for. The nurses had their own caseloads of patients and devised strategies to address most patients' concerns, including those unrelated to diabetes treatment. Nurses believed their professional autonomy was increased when they reported modifying patients' insulin consumption when needed. (Alshammari et al., 2021)

Enhancing Diabetes Care through Clinical Laboratory Services and Health Informatics Integration

Clinical laboratory experts' knowledge and skills are crucial to the efficient provision of treatment in the intricate healthcare system of today. These experts are essential in making evidence-based judgments about diagnosis and treatment, which guarantees the best use of available resources and lowers medical expenses. In addition to being the least intrusive and most economical way to obtain objective health data, clinical laboratory services also play a major role in public health surveillance, illness prevention, diagnosis, and patient safety. Through their efforts, safe, patient-centered, prompt, effective, and equitable care is guaranteed.

Similarly, the integration of Health informatics has shown encouraging potential to improve patient outcomes in diabetes care. This is demonstrated by recent pilot research that investigated how a clinical informatics system affected the standard of diabetic care. This study identified 48 diabetic individuals who were scheduled for their yearly microalbumin, low-density lipoprotein (LDL), and hemoglobin A1c (HbA1c) tests. Through a recently created clinical informatics project, these patients were reminded to make their doctor's appointments and test appointments. The control group consisted of 75 patients who were not reminded.

The findings showed that the intervention group's LDL control had significantly improved, with 35.4% of patients reporting improved LDL levels as opposed to 13.3% in the control group ($P=0.004$). Additionally, more patients in the intervention group completed all three suggested tests. Although the intervention group showed a trend toward improved HbA1c management, this difference was not statistically significant.

These results highlight how clinical informatics systems can provide proactive, coordinated treatment that improves process metrics and certain quality outcomes for diabetic patients. The authors of the study stress the necessity of more extensive research to validate these preliminary results and firmly establish the function of informatics in all-encompassing diabetes care approaches. (Chaudhry MBBS MPH et al., 2009)

In order to address the backlog of care in healthcare systems with limited resources, another noteworthy study demonstrating the advantages of digital health informatics was carried out. 4022 diabetics (52% male, 30% non-Caucasian) from a large university hospital in London participated in this pragmatic study. In order to optimize clinical outcomes and resource allocation, the goal was to create an informatics tool that would identify and prioritize patients who were at risk of clinical deterioration while they were waiting for appointments. Prioritization was done using six risk indicators based on new clinical occurrences or data since the last regular clinic appointment.

A sample of 450 patients was assessed to test this data-driven prioritization technique versus a conventional clinical strategy. The tool showed an 81% specificity in identifying lower-risk patients and an 83% sensitivity in detecting high-risk patients. According to a three-month operational pilot with 101 high-risk participants, 40% of them received prompt interventions and care optimization to stop their health from getting worse.

This practical, data-driven approach is a prime example of how health informatics systems may improve care delivery, boost operational effectiveness, and promote improved healthcare outcomes for diabetic patients, particularly in environments with limited resources. These resources show how transformative informatics can be used to address significant healthcare concerns. (Karalliedde et al., 2023)

CONCLUSION

Patient outcomes have been shown to be significantly improved by the integration of pharmacy, nursing, health informatics, and laboratory services in diabetes treatment. Care teams can offer more thorough, individualized, and effective treatment plans by encouraging cooperation between different specialties. To minimize complications related to diabetes, pharmacists are essential in medication management, patient education, and therapy optimization. To fully reap the rewards of a multidisciplinary approach, however, issues including resource constraints, role ambiguity, and communication hurdles must be resolved. Subsequent studies ought to concentrate on improving these cooperative models and assessing their long-term effects on clinical and financial results. Another viable way to improve care coordination and maximize treatment approaches is through the integration of cutting-edge health informatics systems. To improve diabetes treatment, ongoing initiatives for interdisciplinary education and policy support will be essential.

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