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The Role of Pharmacists in Improving Treatment Adherence and Patient Outcomes among diabetic patients

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Abstract:

Diabetes mellitus affects approximately 8.5% of the global population and poses a substantial economic burden in the United States, where 25% of healthcare expenditures are attributed to diabetes management. Effective diabetes care is crucial for preventing complications that significantly diminish quality of life, including macrovascular and microvascular issues. Given the challenges of providing comprehensive diabetes management amidst shortages of healthcare providers, pharmacists have emerged as essential members of the diabetes care team. This study explores various pharmacist-managed diabetes care models, highlighting their roles in patient education, therapeutic recommendations, and chronic disease management through collaborative drug therapy management (CDTM) agreements. The article reviews educational interventions, telemanagement approaches, and the integration of technology in enhancing patient care and adherence. It provides evidence that pharmacist interventions lead to significant improvements in glycemic control, demonstrated by average reductions of 1% to 2% in A1c levels. Through team-based and telehealth frameworks, pharmacist-led diabetes management not only improves patient outcomes but also enhances the overall health system's efficiency by addressing medication adherence and facilitating regular patient follow-up. This analysis emphasizes the vital contribution of pharmacists in the evolving

landscape of diabetes care, advocating for their greater involvement in multidisciplinary healthcare teams to optimize patient outcomes.

Keywords: diabetes, hyperglycemia, pharmacist, pharmacy interventions, outcomes, cost-effectiveness.

Introduction:

Diabetes mellitus ranks among the most prevalent disease conditions, impacting 8.5% of the global population [1]. In the United States, it stands out as the chronic illness with the greatest economic impact, consuming one-quarter of all health care expenditures for individuals with the condition. Effective management of diabetes is vital for preventing complications that contribute to this economic strain. These complications consist of macrovascular issues, such as cardiovascular diseases, and microvascular problems, including retinopathy and neuropathy, both of which have a significant effect on individuals' quality of life. Fortunately, appropriate management of diabetes has proven to be both cost-effective and beneficial in improving health outcomes for those affected [2].

The lack of primary care providers and endocrinologists, combined with the substantial time needed for comprehensive diabetes management, makes it challenging to deliver all necessary care, often resulting in providers having limited time for each patient. Additionally, patients with diabetes may present with comorbid conditions that require tailored approaches, such as those involving solid organ transplants or pregnancy, adding further complexity to their treatment. Other issues contributing to inadequate diabetes control include poor adherence to medication, complicated treatment plans, side effects from medications, ineffective communication between patients and providers, and financial constraints faced by patients. Considering the frequent monitoring and extensive education these patients require, pharmacists have the potential to play a crucial role in diabetes management [3].

The role of pharmacists has evolved considerably over the past fifty years. They have shifted from being primarily dispensers of medication to offering clinical services that encompass patient education, direct patient care, and chronic disease management through collaborative care models. Advanced training programs for pharmacists, such as residency and certificate programs, have been essential in broadening their professional scope. For instance, community pharmacists play a vital role in enhancing access to healthcare by dispensing medications, providing educational resources, and, with additional certification, prescribing and administering immunizations and various medications (such as naloxone). Clinical pharmacists who have completed residency training possess specialized skills in direct patient care and are typically integrated into clinic environments alongside other healthcare providers. The American Diabetes Association identifies pharmacists as essential members of the diabetes care team. As healthcare shifts from fee-for-service systems to value-based models focused on the quadruple aim—improving population health, reducing care costs, enhancing patient experiences, and boosting provider satisfaction—there are significant opportunities for pharmacists. Pharmacist-led diabetes management is evident in various formats [4].

Objectives:

In this study we aimed to:

1. Evaluate the current knowledge, skills, and competencies of pharmacists in managing diabetes and their role in promoting treatment adherence among diabetic patients.
2. Investigate the effectiveness of pharmacist-led interventions in improving treatment adherence rates among diabetic patients.
3. Analyze the effect of pharmacy interventions on patient outcomes, including blood glucose control, incidence of diabetes-related complications, and overall health-related quality of life for diabetic patients.
4. Identify common barriers faced by diabetic patients in adhering to their treatment regimens, and explore how pharmacists can address these challenges effectively.

Methods of Pharmacist Management in diabetes:

Pharmacists play a vital role as part of diabetes management teams across a wide range of ambulatory care environments, delivering direct patient care through various practice models. They engage in patient education, offer therapeutic recommendations, and frequently possess prescriptive authority via collaborative drug therapy management (CDTM) agreements. A CDTM agreement specifies the required level of clinician oversight for clinical pharmacy services and outlines the pharmacist's scope of practice [5]. The nature of CDTM agreements differs according to state laws and the specific preferences of institutions. Some agreements may focus solely on particular disease states and medications, adhering to strict algorithmic guidelines, while others may be more general without restrictions on disease states or drug classes [6]. Many CDTM agreements grant pharmacists the professional responsibility to conduct patient assessments, order laboratory tests related to medications, administer medications, and modify medication regimens. While certain CDTM agreements empower pharmacists to start, stop, and adjust drug treatment plans, others may limit them to only altering existing therapies [7]. Additionally, beyond CDTM agreements, pharmacists can collaboratively manage diabetes through established protocols (such as insulin titration protocols) or by providing therapeutic recommendations directly to clinicians for implementation. Evidence suggests that interventions enabling pharmacists to adjust medications, rather than merely conducting drug reviews and providing disease education, are associated with more significant improvements in patient outcomes [8].

Pharmacists and educational interventions:

Educational programs implemented by pharmacists for diabetes management generally encompass diabetes self-management education, emphasizing healthy eating, physical activity, self-monitoring, medication adherence, problem-solving, healthy coping strategies, and risk reduction [9]. Pharmacists are particularly equipped to offer personalized education regarding medication timing, administration, and adherence, which is critical given the complexity of medication regimens for diabetes patients, along with the challenges of polypharmacy and medication non-adherence. Clinical pharmacists can deliver evidence-based guidance on medication choices, including dosage, predicting adverse reactions, and suggesting interventions. The clinical interventions performed by pharmacists focus on medication effectiveness, safety, tolerability, adherence, and cost-effectiveness [10]. Patients under pharmacist care typically have more frequent follow-ups compared to their visits to physicians.

This allows pharmacists to adjust medication regimens promptly, often leading to a quicker achievement of treatment objectives [11]. Since patients with diabetes need various essential health maintenance screenings, pharmacists involved in diabetes management programs can help ensure that patients complete annual retinal examinations, monofilament tests for neuropathy, urine microalbumin tests, and receive recommended vaccinations. Additionally, pharmacist-managed diabetes programs frequently incorporate motivational interviewing aimed at setting patient goals and identifying obstacles to better control. Beyond diabetes, pharmacists also commonly manage other chronic conditions, such as hypertension and dyslipidemia, which frequently coexist with diabetes [12].

Pharmacists in Primary Care:

Pharmacist-led diabetes management within primary care is typically delivered through a collaborative, team-based approach. Pharmacists work closely with primary care providers (PCPs) such as physicians, advanced practice registered nurses (APRNs), and physician assistants (PAs). They often play a key role in identifying patients who may need referrals to registered dietitians or other specialists, including podiatrists, exercise physiologists, and ophthalmologists, among others. Many clinics also involve pharmacy students and trainees in patient care, with the pharmacist frequently responsible for educating physician residents and other medical learners [13].

Pharmacist-managed diabetes clinics in primary care function via voluntary referrals from physicians, proactive identification of patients, or a combination of both strategies. While some clinics provide referral criteria that may focus on patients with poorly controlled diabetes (e.g., A1c >9%), it is more common for referrals to encompass a broad range of patients, including those with newly diagnosed diabetes, longstanding diabetes, and those with varying levels of control. Common reasons for referral to a pharmacist include the necessity for medication adjustments, initiation of insulin or other injectable treatments, diabetes education, and close monitoring for high-risk patients. Additionally, beyond voluntary clinician referrals, patients can be admitted to a pharmacist-managed diabetes clinic through proactive identification by the pharmacist or their support personnel, based on established enrollment criteria [14].

Numerous primary care practices have integrated pharmacists into their clinics. These embedded pharmacists may work onsite five days a week or on a less frequent basis, which is influenced by the size of the primary care office and the pharmacist's additional responsibilities, such as collaborating in other disease management clinics or fulfilling teaching obligations at a pharmacy school [15]. It is increasingly common for embedded pharmacists to independently manage diabetes patients through prescribing, as outlined in Collaborative Drug Therapy Management (CDTM) agreements; however, other effective patient care models have also been identified. These include joint appointments where both the pharmacist and physician assess the patient together to create a treatment plan on-site, pharmacist-patient appointments in which the pharmacist consults with the primary care provider (PCP) to formulate a plan, or cases where pharmacists provide recommendations via the electronic health record (EHR) for the PCP to implement or for the pharmacist to execute after obtaining PCP authorization [16]. Additional models have focused on using pharmacists exclusively for diabetes education delivery, while others employ tiered management strategies based on referral scope. Within these diabetes management frameworks,

pharmacists might offer 1) diabetes education and counseling, 2) diabetes education and counseling in conjunction with management and monitoring, or 3) education and diabetes management along with oversight of other coexisting conditions. Tiered referral strategies recognize the varying levels of comfort that PCPs may possess regarding pharmacist-led diabetes management. Furthermore, there are documented initiatives of pharmacist-led insulin titration programs in primary care, specifically targeting insulin adjustments to meet predefined blood sugar targets [17].

Most diabetes programs managed by pharmacists in primary care provide services through a mix of in-person visits and telephone follow-ups. Additionally, pharmacists make use of secure messaging platforms to communicate with patients between scheduled appointments. The frequency of pharmacist appointments can vary based on individual patient needs, ranging from weekly to intervals of 12 weeks or longer. The initial visits typically last between 45 to 90 minutes, while follow-up appointments are generally shorter, lasting about 15 to 30 minutes. Many patients under pharmacist care in primary care settings are returned to their primary care provider (PCP) for management after achieving their metabolic goals but retain the option to be referred back to the pharmacist if necessary [18]. Patients may also be discharged from pharmacist-managed services if they miss multiple consecutive appointments, choose to discontinue care with the pharmacist, or cannot be reached to arrange follow-up appointments [19].

Pharmacists in telemanagement:

Pharmacists have used telehealth in combination with in-person visits to facilitate frequent follow-up visits that help reduce the transportation burden and related indirect costs to the patient. Studies have found that both in-person and virtual visits have similar outcomes. The majority of published pharmacist models generally focus on scheduled telephone visits with interventions focused on pharmacist-led telephonic clinics, post-discharge follow-up, laboratory monitoring, and medication counseling [20].

Pharmacists have incorporated technology into their practice in various ways. In one approach, pharmacists conducted electronic visits, sometimes alongside in-person consultations, utilizing video or phone communication. In this scenario, pharmacists were permitted to manage drug therapy under the oversight of a licensed clinician, following a protocol tailored to their practice setting. In another approach, pharmacists provided patient education through a mobile application that offered daily reminders for medication adherence and diabetes self-care activities [21]. Remote patient monitoring (RPM) devices, such as continuous glucose monitoring (CGM) systems, have also become increasingly popular, enhancing access to healthcare resources and transparency regarding clinical information. CGM represents a groundbreaking tool that delivers crucial data trends for efficient blood glucose management. Certain CGMs feature compatible applications that enable the transmission of real-time data to healthcare providers. Pharmacists are uniquely positioned to leverage CGM technology to enhance patient care and facilitate transitional care by interpreting and managing diabetes treatment plans and educating patients about the devices. One model introduced an eConsult program, creating a new referral pathway for clinical pharmacists. The interventions conducted by pharmacists included patient education, placing CGM devices, and retrieving CGM data. Endocrinologists analyzed this data and pharmacist documentation to formulate a treatment strategy [22]. Another study examined the integration of CGM into a pre-existing

pharmacist-managed diabetes service at the Veterans Affairs (VA) facility. Pharmacists at the VA were authorized to prescribe medications for diabetes management. Besides their routine responsibilities, they also gathered and analyzed CGM data to make necessary therapy adjustments. Their findings indicated that patients participating in this program experienced a noteworthy reduction in A1c levels, likely attributable to enhanced self-monitoring [23].

The impact of pharmacy interventions on patient outcomes:

Most research assessing the effects of diabetes care provided by pharmacists tends to be retrospective. There is a limited number of randomized controlled trials published on this topic. In many of the studies reviewed, authors employed a within-subjects design, where patients acted as their own controls before and after pharmacist intervention, or they compared two groups: one receiving care involving a pharmacist and the other managed exclusively by healthcare providers without pharmacist involvement.

The majority of studies investigating the effects of pharmacist-led diabetes care focused on A1c outcomes, specifically the change in A1c levels and the proportion of patients reaching predetermined A1c targets. The reported changes in A1c levels varied across studies, showing average reductions between 1% and 2%. A meta-analysis encompassing 35 studies that evaluated pharmacist interventions in outpatient settings identified a mean difference of 1.1% [24]. Among the notable findings was a reported 2.8% reduction in A1c for patients enrolled in a pharmacist-managed diabetes program. Multiple studies indicated that individuals with poorer baseline glycemic control derived the greatest benefits from pharmacist interventions [25,26]. Research that examined telehealth consultations also noted analogous improvements in A1c levels [27,28].

The beneficial role of pharmacists in promoting medication adherence is well-documented and equally applicable in the management of diabetes. Strategies to enhance medication adherence encompass medication education, device training, adherence telephone calls, and the organization of pillboxes. One research study assessed the pharmacist's effectiveness by utilizing telephonic interventions and analyzing medication adherence as determined by the Proportion of Days Covered (PDC). PDC is a widely used adherence metric that calculates the percentage of days a patient has medication coverage based on prescription refill dates and supplied days. Pharmacists reached out to patients whose PDC was below 80%. Following the intervention, 69% of patients taking anti-hypertensive medications and 64% of those on oral anti-diabetics managed to achieve a PDC exceeding 80% within three months [29].

Conclusion:

In conclusion, the evolving role of pharmacists in diabetes management is essential for improving patient outcomes and optimizing health care resources. As demonstrated in this study, pharmacists enhance diabetes care through direct patient engagement, education, and collaborative drug therapy management, effectively addressing medication adherence and adjusting treatment regimens to achieve better glycemic control. Their involvement within multidisciplinary teams not only facilitates access to care but also improves the quality of management for patients with diabetes, particularly those with complex needs. As healthcare continues to shift towards value-based models, integrating pharmacists into diabetes care strategies has the potential to significantly reduce

complications and associated costs, ultimately benefiting the healthcare system and enhancing the overall patient experience. With the successful implementation of innovative models, including telehealth and collaborative practices, pharmacists are well-positioned to play a pivotal role in the ongoing fight against diabetes.

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