

# Evaluation of Comprehensive Care in the Management of Diabetes in Chronic Patients from Family and Internal Medicine

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## Abstract

Diabetes mellitus is a chronic disease with a high global prevalence, whose comprehensive care requires coordinated strategies between family and internal medicine. This study evaluates the efficacy of a comprehensive care model in chronic patients with type 2 diabetes mellitus, based on health promotion, interdisciplinary management, and continuous follow-up. Through a 12-month observational analysis, metabolic indicators, treatment adherence and quality of life were compared in patients treated under a comprehensive model versus a conventional approach. The results show significant improvements in glycemic control and quality of life in the group with comprehensive care. This approach reinforces the need for patient-centered care to optimize clinical outcomes in diabetes.

**Keywords:** Diabetes mellitus, comprehensive care, family medicine, internal medicine, chronic patients, quality of life.

## Introduction

Type 2 diabetes mellitus represents a priority public health challenge globally, with an estimated prevalence of 537 million people affected in 2021, according to the International Diabetes Federation (IDF) Atlas, 2022. This number is projected to increase due to population aging, urbanization, and sedentary lifestyles, underscoring the need for effective and sustainable strategies for its management (World Health Organization [WHO], 2021).

Uncontrolled diabetes is associated with microvascular complications, such as nephropathy and retinopathy, and macrovascular complications, such as cardiovascular disease, which place a significant burden on health systems and affect patients' quality of life (American Diabetes Association [ADA], 2023). In this context, comprehensive care has emerged as a key model to address the complexities of diabetes management in chronic patients.

Comprehensive care involves coordination between different levels of care and disciplines, with a patient-centered approach that includes prevention, education, comorbidity management, and psychosocial support (Funnell & Anderson, 2020). Family medicine, with its holistic and continuous vision, is combined with internal medicine to provide optimal management of complex cases and prevent serious complications (Garber et al., 2022). This model aligns with current ADA recommendations, which highlight the importance of personalized interventions and interdisciplinary teams to improve clinical outcomes (ADA, 2023).

However, despite the recommendations and available evidence, the implementation of comprehensive care models continues to face barriers. These include a lack of resources, insufficient training of health professionals, and difficulties in integrating digital health technologies such as telemedicine (Powers et al., 2021). In addition, socioeconomic disparities and unequal access to specialized services affect the effectiveness of comprehensive management in vulnerable populations (WHO, 2021).

This study seeks to contribute to the existing literature by evaluating the efficacy of a comprehensive care model in patients with type 2 diabetes, comparing clinical and psychosocial indicators with a conventional approach. The results could inform health policies and clinical guidelines, promoting interdisciplinary and patient-centered management that responds to the needs of this growing population.

### **Theoretical Framework**

Type 2 diabetes mellitus, characterized by chronic hyperglycemia due to defects in insulin secretion and action, is associated with complications affecting multiple body systems (WHO, 2021). Recent guidelines highlight that the management of this condition should focus not only on glycemic control, but also on the prevention of comorbidities and the improvement of quality of life (ADA, 2023).

The concept of comprehensive care involves an approach that combines prevention, treatment, and rehabilitation, adapting to the specific needs of each patient (Funnell & Anderson, 2020). This holistic approach encompasses not only the clinical dimension, but also the psychosocial and educational aspects, which are fundamental for the management of chronic diseases such as type 2 diabetes mellitus. Recent literature underscores that comprehensive care models, properly implemented, can significantly reduce complication and hospitalization rates (Powers et al., 2021).

### **Importance of the Interdisciplinary Model**

The interdisciplinary model in diabetes management includes active collaboration between different disciplines, such as family medicine, internal medicine, nutrition, and psychology. Each brings a unique perspective to address the multidimensional challenges presented by this disease:

- **Family Medicine:** Responsible for primary prevention and continuous patient monitoring, ensuring a family- and community-centered approach (ADA, 2023).
- **Internal Medicine:** Provides specialized management for advanced complications and coordinates complex pharmacological treatments (Garber et al., 2022).
- **Nutrition:** Design personalized meal plans that optimize glycemic control and prevent metabolic complications (Funnell & Anderson, 2020).
- **Psychology:** Addresses the emotional impact of diabetes, promoting adherence to treatment and self-care (Powers et al., 2021).

### **Self-Care Strategies and Diabetes Education**

Diabetes education is an essential component of comprehensive management. Programs such as Diabetes Therapeutic Education (ETD) have been shown to significantly improve treatment adherence and glycemic control (Garber et al., 2022). These programs include workshops, group and one-on-one sessions, and the use of digital tools to educate patients about the disease, treatments, and lifestyle changes.

**Benefits of Therapeutic Education in Diabetes:**

Indicator	Before the ETD	After the ETD	Reference
Average HbA1c (%)	8.5	6.8	Garber et al. (2022)
Adherence to treatment	60%	85%	Powers et al. (2021)
Quality of Life (SF-36)	Moderate	Loud	Funnell & Anderson (2020)

**Technological Innovations in Diabetes Management**

Technology has transformed diabetes management, facilitating remote monitoring and self-care. Devices such as continuous glucose monitors (CGMs) and mobile apps allow patients and healthcare providers to access real-time data, improving clinical decision-making (Powers et al., 2021).

**Impact of Technology on Diabetes Management:**

Technology	Clinical Benefit	Reference
Continuous glucose monitor (CGM)	20% reduction in hypoglycemic events	ADA (2023)
Tracking Apps	30% increase in treatment adherence	Powers et al. (2021)
Telemedicine	Improved patient satisfaction and equitable access	Garber et al. (2022)

**Barriers and Challenges**

Despite the advances, the implementation of a comprehensive model faces significant barriers:

- **Socioeconomic Disparities:** Limitations in Access to Health Resources in Vulnerable Communities (WHO, 2021).
- **Professional Training:** Lack of training in comprehensive and interdisciplinary management (Powers et al., 2021).
- **Financial Sustainability:** Difficulties in maintaining comprehensive long-term programs due to budget constraints (Garber et al., 2022).

These barriers highlight the need for health policies that promote equity and investment in sustainable models of comprehensive care.

**Methodology**

A comparative observational study with a longitudinal design of 12 months was carried out, implemented in a medical center specialized in diabetes that combines primary and secondary care.

**Study Design**

The study included two groups:

- **Experimental group (n=100):** They received comprehensive care under an interdisciplinary approach that includes a team made up of family doctors, internists, nutritionists, and psychologists.
- **Control group (n=100):** Conventional care limited to sporadic visits with a single provider.

**Selection of Participants**

Patients with:

- Confirmed diagnosis of type 2 diabetes mellitus.
- Age between 35 and 70 years.
- HbA1c > 7.5% in the last 6 months.

Patients with:

- Serious complications such as advanced kidney failure or blindness.
- Inability to provide informed consent.

### Indicators Evaluated

1. **Clinical indicators:**

- HbA1c.
- Blood pressure.
- Lipid profile (LDL, HDL, triglycerides).

2. **Adherence to treatment:**

- Assessed with the Morisky-Green scale.

3. **Quality of life:**

- Measured through the SF-36 questionnaire, considering physical and mental domains.

### Interventions Applied in the Experimental Group

- **Health education:** Workshops on nutrition, physical activity and medication management.
- **Technology:** Use of mobile applications for daily glucose monitoring.
- **Emotional support:** Monthly sessions with psychologists to reduce stress levels and improve therapeutic attachment.

### Statistical analysis

- Student's t-tests were used to compare the means of clinical indicators between the two groups.
- ANOVA to identify significant differences between follow-up times.
- Logistic regression to evaluate the association between adherence and glycemic control.

### Study Timeline

Activity	Month 1	Month 3	Month 6	Month 9	Month 12
Patient recruitment	X				
Educational interventions	X	X	X	X	X
Clinical follow-up	X	X	X	X	X

### Basal Characteristics of Participants

Feature	Experimental Group	Control Group
Average age (years)	58.4 ± 8.3	59.1 ± 7.8
Average HbA1c (%)	9.2 ± 1.3	9.1 ± 1.5
Average BMI (kg/m <sup>2</sup> )	31.5 ± 4.2	30.8 ± 3.9
Gender (M/F)	40/60	42/58

With this methodological approach, we sought to guarantee comparable and statistically significant results.

### Results

The comprehensive care model showed significantly superior results compared to the conventional approach:

**1. Metabolic Control:**

- The average reduction in HbA1c was **1.8%** in the experimental group, compared to **0.7%** in the control group ( $p < 0.01$ ).
- Improvement in lipid profile: LDL decrease by **20%** in the experimental group compared to **10%** in the control group.

Indicator	Basal Experimental Group	Final Experimental Group	Baseline Control Group	Final Control Group
HbA1c (%)	9.2 ± 1.3	7.4 ± 0.9	9.1 ± 1.5	8.4 ± 1.2
LDL (mg/dL)	120 ± 20	96 ± 15	118 ± 22	108 ± 18
Blood pressure (mmHg)	140/90 ± 10	130/85 ± 8	138/88 ± 9	135/87 ± 10

**2. Adherence to Treatment:**

- Adherence to treatment increased by **35%** in the experimental group, while in the control group it only increased by **12%**.

Indicator	Experimental Group	Control Group
Initial adhesion (%)	45	48
Final adhesion (%)	80	60

**3. Quality of Life:**

- Average SF-36 questionnaire scores improved significantly in the physical and mental domains in the experimental group.

SF-36 Domain	Experimental Group (Initial)	Experimental Group (Final)	Control Group (Initial)	Control Group (Final)
Physical	50 ± 10	75 ± 8	48 ± 12	55 ± 11
Mental	52 ± 9	78 ± 7	50 ± 10	58 ± 9

These results reinforce the effectiveness of the comprehensive care model in improving metabolic control, therapeutic adherence and quality of life in chronic patients.

**Conclusions**

The present study confirms the effectiveness of the comprehensive care model to improve multiple dimensions in the management of type 2 diabetes mellitus. Specifically, the interdisciplinary model achieved a significant reduction in HbA1c, improved the lipid profile, and increased levels of therapeutic adherence. In addition, notable improvements in quality of life were observed, evidenced by the high scores on the SF-36 questionnaire.

From a clinical perspective, these findings highlight the importance of integrating multidisciplinary teams to provide patient-centered care. Collaboration between family physicians, internists, nutritionists, and psychologists proved crucial in addressing the complexities associated with the management of patients with type 2 diabetes. Additionally, the use of technologies such as mobile apps and continuous glucose monitors proved to be effective in optimizing self-care and improving clinical outcomes (Powers et al., 2021).

Regarding the implications for public policies, it is recommended to promote the implementation of comprehensive models in health institutions, guaranteeing equitable access to technological and educational resources. It is also essential to ensure the continuous training of health teams to promote the sustainability of this approach (Garber et al., 2022).

In addition, the findings suggest that comprehensive care not only improves immediate clinical outcomes, but also potentially reduces costs associated with long-term complications, thereby contributing to the efficiency of the health system (WHO, 2021). This reinforces the

need for additional studies that explore the implementation of the model in varied contexts, especially in developing countries where barriers to access to health are more significant. Finally, future studies should explore the economic viability of the comprehensive model and its applicability in various populations, considering socioeconomic and cultural factors that may influence its effectiveness (WHO, 2021).

## References

1. American Diabetes Association. (2023). Standards of medical care in diabetes—2023. *Diabetes Care*, 46(Supplement 1), S1–S154. <https://doi.org/10.2337/dc23-S001>
2. Funnell, M. M., & Anderson, R. M. (2020). Empowerment and self-management of diabetes. *Clinical Diabetes and Endocrinology*, 6(1), 1-9. <https://doi.org/10.1186/s40842-020-00119-y>
3. Garber, A. J., Abrahamson, M. J., Barzilay, J. I., et al. (2022). Consensus statement by the American Association of Clinical Endocrinology and the American Diabetes Association. *Endocrine Practice*, 28(4), 305-312. <https://doi.org/10.4158/EP-2022-CS>
4. International Diabetes Federation. (2022). *Diabetes atlas (10th ed.)*. Retrieved from <https://www.diabetesatlas.org>
5. Powers, M. A., Bardsley, J., Cypress, M., et al. (2021). Diabetes self-management education and support in adults. *The Diabetes Educator*, 47(1), 34-39. <https://doi.org/10.1177/0145721720982561>
6. World Health Organization. (2021). *Global report on diabetes*. Retrieved from <https://www.who.int>
7. Holt, R. I. G., Cockram, C., Flyvbjerg, A., & Goldstein, B. J. (2017). *Textbook of diabetes* (5th ed.). Wiley-Blackwell.
8. Beck, J., Greenwood, D. A., Blanton, L., et al. (2017). 2017 National standards for diabetes self-management education and support. *Diabetes Educator*, 43(5), 449-464. <https://doi.org/10.1177/0145721717722968>
9. Basu, S., Yudkin, J. S., & Kehlenbrink, S. (2019). Estimation of global insulin need and supply for the next century. *The Lancet Diabetes & Endocrinology*, 7(10), 748-760. [https://doi.org/10.1016/S2213-8587\(19\)30161-7](https://doi.org/10.1016/S2213-8587(19)30161-7)
10. Buse, J. B., Wexler, D. J., Tsapas, A., et al. (2020). 2019 Update to: Management of hyperglycemia in type 2 diabetes. *Diabetes Care*, 43(2), 487-493. <https://doi.org/10.2337/dc19-0890>
11. Khan, M. A., Hashim, M. J., King, J. K., et al. (2020). Epidemiology of type 2 diabetes – Global burden of disease and forecasted trends. *Journal of Epidemiology and Global Health*, 10(2), 107-111. <https://doi.org/10.2991/jegh.k.191028.001>
12. Bodenheimer, T., Wagner, E. H., & Grumbach, K. (2002). Improving primary care for patients with chronic illness. *JAMA*, 288(15), 1909-1914. <https://doi.org/10.1001/jama.288.15.1909>
13. Rutten, G. E., van Vugt, H. A., de Grauw, W. J., et al. (2018). Comprehensive management of type 2 diabetes in primary care. *Diabetes Care*, 41(6), 1145-1156. <https://doi.org/10.2337/dc17-2186>
14. Verma, M., Banerjee, R., & Saxena, D. (2020). Telemedicine in diabetes care: Evidence from low- and middle-income countries. *Diabetes Technology & Therapeutics*, 22(12), 893-899. <https://doi.org/10.1089/dia.2020.0174>

15. Stone, J. L., & Gilbert, B. (2021). Psychosocial aspects of diabetes care: The role of behavioral interventions. *Clinical Diabetes*, 39(1), 18-25. <https://doi.org/10.2337/cd20-0029>
16. Bailey, C. J., & Day, C. (2019). The future of new therapies for type 2 diabetes. *Diabetes Research and Clinical Practice*, 155, 107785. <https://doi.org/10.1016/j.diabres.2019.107785>
17. McKee, M., & Stuckler, D. (2018). The crisis of chronic disease in developing economies. *The Lancet*, 391(10125), 1973-1974. [https://doi.org/10.1016/S0140-6736\(18\)30993-4](https://doi.org/10.1016/S0140-6736(18)30993-4)
18. Wild, S. H., & Roglic, G. (2021). Global prevalence of diabetes: Estimates for the year 2030. *Diabetes Care*, 44(12), 3026-3029. <https://doi.org/10.2337/dc21-0231>
19. Natarajan, S., Lipsitz, S. R., & Nietert, P. J. (2020). Trends in co-management of type 2 diabetes in primary care. *Annals of Family Medicine*, 18(4), 305-312. <https://doi.org/10.1370/afm.2516>
20. Barnett, K., Mercer, S. W., Norbury, M., et al. (2012). Epidemiology of multimorbidity and implications for health care. *The Lancet*, 380(9836), 37-43. [https://doi.org/10.1016/S0140-6736\(12\)60240-2](https://doi.org/10.1016/S0140-6736(12)60240-2)