RESEARCH PAPER

Implementation of a Telemonitoring System for Glucose Control in Geriatric Patients during and After Their Hospitalization

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ABSTRACT
Diabetes mellitus is one of the most common chronic diseases among older people, requiring regular monitoring of blood sugar levels to avoid serious complications. However, the absence of remote monitoring in hospitals and at home makes it difficult to identify problems early and increases the rate of hospital readmissions. This case study suggests the creation of a telemonitoring system using fourth and fifth generation glucometers, which are capable of sending real-time information to secure digital platforms. The proposal includes the training of nursing staff, protocols for responding to alerts and the participation of family members in patient care. The expected results are a decrease in the workload for health personnel, a reduction in repeated hospitalizations and an improvement in the quality of life of the elderly with diabetes mellitus. This model demonstrates how information and communication technologies, applied to the care of the elderly, can improve continuity of care and patient safety in both hospital settings and at home.
Keywords: *Remote monitoring; Diabetes mellitus; Geriatric patients; Smart glucometer; 4G and 5G technologies; Home care; Infirmary.*
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1. INTRODUCTION

Diabetes mellitus (DM) has firmly established itself as one of the most prevalent chronic diseases worldwide, with a persistent rise in its prevalence among the elderly population. According to projections by the International Diabetes Federation, by 2045, 783 million people will be affected by this disease, 90% of whom will be patients with type 2 diabetes mellitus (DM2), with a global prevalence of approximately 12.2% (Santillán Haro, Ortiz, & Benavides, 2024). This situation poses a significant challenge for health systems. In order to meet this challenge, health systems must offer not only adequate pharmacological treatments, but also innovative approaches to monitoring and controlling the disease.

Older adults are a group especially affected by this disease, since factors such as advanced age, fatness, genetic predisposition, an inactive lifestyle, and the presence of other diseases worsen their clinical situation (Santillán Haro et al., 2024). The most common complications include cardiovascular problems, kidney disease, nerve damage, vision problems, and diabetic foot, all of which are related to poor blood sugar control. In this scenario, constant and real-time monitoring becomes a crucial aspect to maintain the health and improve the quality of life of elderly patients.

Traditional care that relies on sporadic measurements has limitations, as it does not detect sudden changes in glucose levels between assessments. This increases the risk of hypoglycemia or hyperglycemia events that are not recognized, which can delay appropriate medical intervention. In the hospital setting, nurses also face a high workload, which makes continuous supervision difficult and reduces the time available to care for each patient. Faced with this situation, technological solutions are necessary to strengthen continuous care, both in hospitals and at home.

Telemedicine, and especially telemonitoring, has emerged as an additional strategy to care for patients in hard-to-reach places, where there is a shortage of health personnel and economic limitations (Santillán Haro et al., 2024). These tools not only facilitate the recording and analysis of clinical data in real time, but also allow direct communication between patients, caregivers and healthcare professionals. Therefore, telemonitoring is an essential component in the search for more effective care models adapted to the needs of patients.

Several studies have shown that telemonitoring in people with type 2 diabetes can help improve glucose control. For example, a meta-analysis showed significant reductions in glycated hemoglobin (HbA1c) levels in patients who received remote follow-up, compared to those who were seen only in person (Lee et al., 2022). These results validate the potential of telemedicine as a useful tool for

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disease self-management and the prevention of complications.

In the older adult population, the acceptance of new technologies presents additional obstacles related to the technological gap, the level of digital literacy, and the need for caregivers (García-Sánchez et al., 2021). The effectiveness of telemonitoring is not only determined by the device but also by the training of the health personnel, the active involvement of family members and the disposition of the patient. Therefore, it is critical to take a holistic approach that brings together technological advancements with training and support.

The development of telecommunications, especially with the advent of 4G and 5G networks, opens new possibilities for remote control. These innovations allow for faster data transmission, lower latency, and greater connection capacity, thus ensuring the availability of clinical information in real-time (Scribd, 2023). In addition, mobile connectivity has become an essential resource for smart digital health systems, facilitating the union of applications, biomedical sensors and data analysis platforms.

In this context, devices such as implantable microchips and smart glucose meters have been created, which can record glucose levels and automatically sending them to digital platforms. These devices not only facilitate the monitoring of the disease but also generate instant alerts in the event of critical deviations, leading to quick and effective decisions (Yano, 2024). Automation in monitoring and secure transmission of information marks a significant advance in the care of people with chronic diseases.

The current article is situated within this context and proposes an innovation in health, focusing on the development of a teleglucose monitoring system for elderly patients, both in hospitals and in their homes. This model contemplates the integration of fourth and fifth generation chips in glucometers, protocols for action in the event of alerts, training of nursing staff and the active participation of family members in care.

The main objective of this proposal is to raise the quality of life of elderly people with diabetes mellitus by preventing complications, reducing frequent hospitalizations and optimizing the workload of nursing staff. Although empirical results from a clinical study are not presented, the proposed structure establishes a solid basis for future implementation research and pilot trials that can assess its efficacy in practice.

In addition, this study seeks to enrich the academic and practical debate on the incorporation of emerging technologies in hospital and community settings, emphasizing the importance of telemonitoring as an economical and patient-centered strategy. The approach to innovation in health presented here can serve as a model for organizations that wish to adjust their services to the demands of an aging population and the increase in chronic diseases.

In summary, this paper presents an idea that combines existing information and suggests a viable approach to implementing glucose telemonitoring in elderly care. Apart from the technological aspects, it is understood that the success of this innovation depends on the collaboration between health professionals, patients and their families, in addition to the ability of institutions to ensure a system that is sustainable, safe and accessible.

2. OBJECTIVES

2.1 General objective

Propose the implementation of a teleglucose monitoring system in geriatric patients diagnosed with diabetes mellitus, both during hospitalization and in home follow-up, using digital technologies and smart devices, in order to improve quality of life, reduce complications and optimize the workload of health personnel.

2.2 Specific objectives

- Design a glucose telemonitoring model that integrates smart glucometers with 4G/5G connectivity and real-time data transmission to secure digital platforms.
- Establish protocols for responding to glycemic alerts that allow the immediate intervention of health personnel and timely communication with patients and relatives.
- Train nursing staff in the use of connected devices and in the use of digital tools for the care and monitoring of geriatric patients with diabetes.
- Involve family members and caregivers in the telemonitoring process, through education programs in the basic management of alerts, critical values and preventive care.
- To evaluate the feasibility of the proposal through projected indicators, such as reduction in hospital readmissions, improvement in adherence to treatment, and reduction in the care burden of health personnel.

3. THEORETICAL FRAMEWORK

Diabetes mellitus (DM) is considered one of the most common chronic diseases globally and represents a significant public health challenge, especially in older people. According to the International Diabetes Federation, a steady increase is anticipated to exceed 700 million affected individuals by 2045 (Santillán Haro, Ortiz, & Benavides, 2024). Type 2 DM is strongly linked to risk factors such as obesity, older age, and lack of physical activity, making older adults an especially susceptible group. Complications associated with this disease include cardiovascular problems, kidney damage, peripheral neuropathy, diabetic foot, and retinopathy, seriously impacting both quality of life and the economic burden on health services.

In this context, glucose control becomes crucial. Conventional methods, which rely on spot measurements using traditional glucometers, are not sufficient to detect variations in glucose levels that occur over short periods. This makes it difficult for healthcare professionals to make

clinical decisions in a timely manner and can lead patients to experience episodes of hypoglycemia or hyperglycemia without being aware of it. As Zhou, Chen, and Huang (2021) point out, digital monitoring platforms help solve this problem by providing constant and automated follow-up, which improves clinical safety and promotes adherence to treatment.

Telemonitoring is part of digital health initiatives and refers to the use of information and communication technologies to record and send clinical data remotely. According to the World Health Organization (WHO, 2021), this system is a fundamental element of the global digital health strategy, designed to improve universal coverage and optimize care for chronic diseases. In the field of diabetes, this approach has been shown to be effective in decreasing glycosylated hemoglobin (HbA1c) levels, increasing treatment adherence, and reducing the number of hospital readmissions (Lee, Lee, & Nasir, 2022).

The advent of smart technological devices has expanded opportunities in the field of telemedicine. Implantable microchips, for example, allow glucose to be measured continuously without requiring multiple punctures, which reduces discomfort and improves patient adherence (Sociedad, 2022). Likewise, systems such as Medtronic's MiniMed™ 670G represent a significant advance by automating insulin injection every five minutes, somehow simulating the normal function of the pancreas (Medtronic, 2024). These innovations represent a shift towards a more individualized and predictable model of care.

At the same time, smart glucometers have incorporated advanced features such as real-time connectivity, integration with mobile apps, and automatic alert generation. For example, the Yano device allows glucose data to be stored in the cloud, to schedule reminders, and to facilitate communication between patients, doctors, and family members, which increases patient safety and promotes the participation of the family environment (Yano App, 2024). These characteristics are essential for the health management of older individuals, who often depend on the help of a primary caregiver for their self-care.

The transformation of telecommunications is another crucial aspect. While 4G has already made possible significant advancement in speed and coverage, 5G provides extremely low latencies and the ability to connect thousands of devices at the same time, enabling the integration of biomedical sensors, wearables, and AI systems into hospitals and communities. In the field of digital health, this connectivity becomes the basis for extending telemedicine to rural areas and hard-to-reach communities.

However, telemonitoring in older people requires a holistic approach that not only considers technology, but also social and educational aspects. García-Sánchez, Fernández-Alemán and Toval indicate that the willingness of older adults to use telemedicine services is influenced by the ease of use of interfaces, confidence in information security and the support of caregivers or family members. In this context, the training of professionals, patients and their families is key to ensuring the success of interventions.

Another fundamental element is the protection and confidentiality of medical information. Managing sensitive data in the cloud requires following rigorous security regulations, enforcing encryption protocols, and clearly defining access roles. Ignoring these requirements not only puts patient privacy at risk but also affects trust and acceptance of digital health systems.

From an institutional perspective, the implementation of telemonitoring systems brings with it additional benefits, such as better management of nursing staff time, cost savings for frequent hospitalizations, and improved continuity of care. Zhou and his colleagues have indicated that digital tools can reduce the workload by automating data collection and generating reports in real time, resulting in more effective care.

Finally, telemonitoring should be seen not only as a support resource, but as an innovative model in the field of health that transforms the relationship between patient and professional. This article adopts this perspective by presenting a proposal that seeks to maximize the synergy between emerging technologies, nursing protocols, and family engagement to provide comprehensive care to geriatric patients with diabetes mellitus. This proposal is based on the need to merge technological advances with educational and clinical management methods, to improve quality of life, avoid complications and ensure the sustainability of the health system.

4. METHODOLOGY

The research in question is developed in the context of a study that proposes the creation of a model for the telemonitoring of glucose in elderly patients diagnosed with diabetes mellitus. Since it is not an experimental trial, but an innovative idea for the field of health, the methodology focuses on describing the stages of implementation, the actors involved, the protocols to be followed and the mechanisms for the planned evaluation.

The methodological approach chosen is descriptive and proactive, with the goal of identifying a current problem (the lack of telemonitoring for geriatric patients, both hospitalized and at home) and presenting an innovative solution that encompasses the incorporation of smart technologies, digital platforms and response protocols. This approach is based on the scientific literature that advocates meticulous planning of telemedicine projects before carrying out their practical validation (WHO, 2021; Zhou, Chen, & Huang, 2021).

During the diagnostic phase, a documentary review of the current situation in internal medicine was carried out, where it was found that there was no exclusive telemonitoring system for geriatric patients with diabetes mellitus. Currently, nursing staff carry out manual controls and periodic check-ups, which limits the ability to detect

problems in time and increases the risk of hospital readmissions (Santillán Haro, Ortiz, & Benavides, 2024).

In the design stage of the proposal, the choice of feasible technological tools for continuous glucose monitoring was included, such as implantable microchips, smart glucometers, and 4G/5G connectivity systems. These technologies allow the transmission of information in real time to secure digital platforms and the generation of automatic alerts if the values are outside the established limits (Sociedad, 2022; Medtronic, 2024; Yano App, 2024).

The implementation phase that is envisaged is structured in four stages:

1. **Beneficiary Screening:** hospitalized geriatric patients with decompensated diabetes mellitus and those who have been discharged and require follow-up at home.
2. **Device Provision:** Delivering smart glucometers with wide screens, digital connectivity, and embedded chips.
3. **Technology Integration:** Device tuning so that records are stored in the institutional cloud and send automatic alerts to family members and nurses.
4. **Telecontinuity:** establishment of communication channels between the patient, their family and health professionals through calls, video calls or teleconsultations in the event of critical alerts.

The training of nursing staff is essential to ensure the sustainability of the system. An initial training program of two to three days on the use of smart glucometers and telemonitoring platforms is proposed, complemented by biannual refresher workshops. The training will cover simulations of clinical situations, interpretation of alerts and action protocols for critical episodes of hypoglycemia and hyperglycemia (Zhou et al., 2021).

Response protocols are divided into three alert categories: low, moderate, and high. Low-level alerts will generate automatic recommendations for the patient and their manager. Moderate alerts will require remote consultations to tailor treatments, while critical alerts will trigger immediate coordination with emergency services. These protocols aim to ensure a gradual and effective response, reducing the likelihood of severe complications (Medtronic, 2024).

The role of family members and caregivers is equally fundamental. It is planned to train them in the interpretation of glucose levels, in the identification of warning signs and in the use of the digital platform. The research highlights that the success of interventions in geriatric telemedicine is based on the active participation of the family environment as support in the self-management of the health condition (García-Sánchez, Fernández-Alemán, & Toval, 2021).

In the planned evaluation stage, success indicators will be suggested, including: decrease in hospital reduction due to decompensation, reduction in the response time of nursing staff to alerts, improvement in patient and family satisfaction, and reduction in the workload of health personnel. These indicators will be collected through satisfaction surveys, digital reports and comparative analyses before and after implementation.

Finally, ethical and safety consideration is part of the proposed methodology. The system must adhere to confidentiality protocols, data encryption, and differentiated access to clinical information, ensuring respect for patient privacy and the reliability of the digital platform (WHO, 2021). These measures are essential to strengthen user confidence in technological innovations.

5. EXPECTED RESULTS

5.1 Reduction of clinical complications

One of the most important goals of implementing telemonitoring for elderly patients with diabetes mellitus is to reduce clinical complications that arise from poor glucose control. The fluctuation of blood sugar levels in this group of people is usually high due to the vulnerability that accompanies old age, the presence of other diseases and, in many cases, the difficulty in properly following treatment recommendations. In this context, continuous and real-time monitoring makes it possible to identify problems in advance and act before they become serious situations of hypoglycemia or hyperglycemia.

Poor glucose control is linked to both immediate and long-term complications. Acute complications include diabetic ketoacidosis and severe hypoglycemia, both of which have the potential to cause urgent hospitalizations and increased risk of death. Chronic complications, meanwhile, include kidney problems, peripheral neuropathy and retinopathy, conditions that affect the autonomy and well-being of older adults. Research has shown that the adoption of telemonitoring programs is related to a considerable decrease in glycated hemoglobin (HbA1c), which translates into a lower frequency of complications associated with diabetes.

The main advantage of remote monitoring systems is their ability to issue automatic alerts when glucose levels are outside the established limits. These notifications, addressed to the patient, their relatives and the nursing staff, allow a rapid clinical response. For example, if an episode of persistent hyperglycemia occurs (more than 200 mg/dl), the system can activate a teleconsultation to adjust the treatment, preventing the situation from worsening and requiring hospitalization. Alerts are also sent in cases of critical hypoglycemia.

5.2 Optimizing the workload of health personnel

One of the most important aspects of introducing telemonitoring in older patients suffering from diabetes mellitus is the improvement in the workload of healthcare personnel, especially in the nursing area. Currently, work in inpatient services encompasses a variety of activities, including monitoring vital signs, administering medications, educating patients, and taking medical histories. This accumulation of tasks, together with the

high number of decompensated diabetic patients who are admitted, complicates the adequate and timely follow-up of each case (Santillán et al., 2024).

Telemonitoring is presented as an effective tool to automate and centralize the collection of information, which prevents the repetition of tasks and reduces the probability of errors in manual notes. Automatic transmission of glucose levels to a digital platform minimizes constant interruptions for routine measurements and frees up nurses to provide direct care, educate patients, and communicate with their families. This change not only increases efficiency but also benefits the quality of service.

In addition, real-time alerting systems are a key resource for workload management. Instead of having to constantly monitor every patient, nurses can focus on those who really need care, based on the notifications they receive. This method of prioritizing care has been shown to shorten response times and strengthen clinical safety, especially in hospitals with high demand (Zhou, Chen, & Huang, 2021).

Telemonitoring also supports collaboration between different disciplines. By centralizing information in an institutional cloud, doctors, nurses, diabetes experts, and coordinators have simultaneous access to patient data, reducing fragmentation in care and facilitating shared decision-making. The telemedicine literature highlights that this type of system promotes effective communication and improves continuity of care, which are essential elements in the treatment of patients with chronic diseases (García-Sánchez, Fernández-Alemán, & Toval, 2021).

On the other hand, the adoption of telemonitoring is expected to have an indirect impact on the decrease in frequent hospitalizations. Each hospital readmission entails a thorough administrative and clinical process, from admission to intensive monitoring, which increases the burden on staff. By anticipating complications through remote monitoring and reducing avoidable hospitalizations, telemonitoring frees up time and resources that can be allocated to other patients or prevention efforts (Lee, Lee, & Nasir, 2022).

An additional element to consider is job satisfaction among nursing workers. The care and administrative burden is one of the main sources of stress and exhaustion in this group. The implementation of technologies that simplify repetitive tasks and improve the organization of care can increase the feeling of control over their work, increase motivation and reduce professional burnout syndrome. This impact has been recorded in digital health initiatives carried out in chronic care areas, where professionals reported an increase in satisfaction and autonomy in their clinical practice (WHO, 2021).

Finally, the proposal implies a permanent training program in technology. Although the initial stage requires time and resources, training on the use of connected devices, the interpretation of alerts and teleconsultation protocols improves professional skills and prepares nurses to face the challenges of digital health. This approach coincides with the recommendations of the World Health Organization (2021), which highlight training as a fundamental element to ensure the sustainability of technological innovations in the health sector.

In summary, the application of telemonitoring in older patients is not only seen as a resource to improve clinical outcomes, but also as a model to reorganize work in the field of health. By reducing manual tasks, optimizing patient prioritization, facilitating communication between disciplines, and promoting the well-being of health personnel, this innovation is established as a comprehensive strategy that reinforces both the quality of care and the satisfaction of the care team.

5.3 Improving the quality of life of the patient and family

Health-related quality of life is considered a key aspect when evaluating treatments for people suffering from chronic diseases, especially in the case of the elderly. Regarding diabetes mellitus, poor control of glucose levels causes common symptoms such as excessive thirst, heavy urination, tiredness, vision problems, and weight loss, which affects the patient's independence and physical and emotional well-being (Santillán Haro, Ortiz, & Benavides, 2024). These effects not only affect the patient, but also impact caregivers and family members, who often play a critical role in caring for the elderly.

The introduction of telemonitoring offers an opportunity for patients and their families to feel more capable of managing their disease. By allowing immediate access to glucose information, automatic alerts and direct communication with medical staff, this system promotes self-management and reduces the need to go exclusively to hospital consultations. According to García-Sánchez, Fernández-Alemán, & Toval (2021), the acceptance of telemedicine tools among the elderly increases when family members are actively involved, as this generates trust, security, and emotional support.

One of the most significant benefits expected is the decrease in anxiety and uncertainty related to the control of glucose levels. Older people with diabetes are often constantly worried about potential complications, while caregivers are distressed by the possibility of severe episodes of hypoglycemia or hyperglycemia. The adoption of early warning systems and action protocols helps to calm these fears, providing the assurance that any anomaly will be detected and addressed quickly (Medtronic, 2024).

In addition, telemonitoring makes it possible to reduce the number of hospitalizations that are not necessary, which alleviates the emotional and economic burden on families. Each remission to the hospital entails a reorganization of daily life, transportation expenses, interruption of family routines and, in some cases, loss of income. By avoiding these hospitalizations, the proposal favors greater stability in the lives of patients and their caregivers, which has a positive effect on their overall quality of life (Zhou, Chen, & Huang, 2021).

Another important aspect is to promote the patient's independence. Although elderly people with diabetes often

rely on the support of a caregiver, access to easy-to-operate devices with large screens and intuitive features allows them to actively participate in managing their condition. This partial independence not only improves their self-esteem, but it also promotes a sense of control and dignity in their aging process. Research has shown that management assisted by digital technologies increases treatment adherence and improves perceived health indicators (Lee, Lee, & Nasir, 2022).

Likewise, the incorporation of additional applications, such as reminders for medication, dietary schedules and physical activity programs, expands the scope of telemonitoring. These tools reinforce a comprehensive approach to diabetes and help to adopt healthy lifestyles, which supports secondary prevention and contributes to more active and functional ageing (WHO, 2021).

The effect of telemonitoring also encompasses the family nucleus, which has become a key ally in the care process. The option to receive notifications directly on caregivers' mobile phones provides greater peace of mind and facilitates quick decisions in critical situations. In addition, active participation in the management of the disease strengthens family ties, fosters co-responsibility, and reduces the emotional burden of facing diabetes alone. As García-Sánchez et al. (2021) highlight, digital health models that include the family tend to provide higher levels of satisfaction and adherence.

Another anticipated benefit is decreased stress and overload on the primary caregiver. Caring for an elderly person with diabetes often generates physical and emotional wear and tears on the family members in charge. Remote monitoring lessens some of this burden by providing clear, accessible, and real-time information, reducing the need for constant manual checks and increasing safety in disease management. Therefore, an improvement in the quality of life of both the patients and those who support them in their care process is expected.

Finally, quality of life is strengthened by the continuity of care that telemonitoring allows, establishing a link between the hospital and the home. Transition after hospital discharge is often a risky period for elderly patients, as clinical supervision is often reduced and the chance of complications increases. By maintaining active and remote monitoring during this period, the system ensures comprehensive, continuous, patient-centered care, which promotes clinical safety and supports healthier aging.

In conclusion, telemonitoring is presented as an innovative tool that, beyond improving clinical indicators, can transform the experience of the geriatric patient and their family. By reducing uncertainty, preventing hospitalizations, promoting autonomy and alleviating the burden on the caregiver, this model is established as an essential pillar to improve quality of life in the management of diabetes mellitus.

5.4 Institutional and economic impact

The introduction of a telemonitoring system in elderly people with diabetes mellitus not only affects the clinical and family environment but also has a significant impact at the institutional and economic level. Currently, hospitals and healthcare facilities are facing increasing pressure due to the increase in chronic diseases, an aging population, and a shortage of resources to meet this need. In this context, telemonitoring is presented as a strategic alternative to improve the use of resources, reduce the expenses associated with repeated hospitalizations and increase the efficiency of care processes.

One of the clearest benefits is the decrease in hospitalizations and remediation caused by complications of diabetes. Each hospitalization entails direct expenses related to consultations, medication, diagnostic tests and hospital stays, in addition to indirect costs related to reduced productivity and the burden on caregivers. According to Zhou, Chen, and Huang (2021), digital health programs focused on chronic diseases have proven to be cost-effective by reducing acute episodes and, therefore, the need for hospitalization. The reduction of unnecessary income favors the sustainability of the health system and frees up resources that can be used in other critical areas.

Telemonitoring also has an impact on improving care times in the institution. By automating data collection and generating digital reports in real-time, repetitive tasks are eliminated and manual recording times are shortened. This allows health personnel to dedicate more time to activities with high clinical value, which not only improves care, but also increases the productivity of the institution. According to the World Health Organization (2021), the digitization of clinical processes results in a more efficient use of human resources, representing a real benefit for hospitals.

An important aspect is the strengthening of administrative management. Telemonitoring systems provide centralized and organized information about patients, making it easier to make strategic decisions, plan resources, and evaluate performance indicators. This flow of information contributes to the creation of more complete and reliable electronic records, which are essential for the modern management of health institutions. According to García-Sánchez, Fernández-Alemán, and Toval (2021), the integration of interconnected digital systems improves internal coordination and reduces errors caused by information fragmentation.

The proposal includes advantages in terms of long-term savings. Although the initial investment in equipment, training and digital platforms can be considerable, the savings achieved by reducing complications and frequent hospitalizations outweigh these costs over time. Research worldwide has shown that the implementation of telemedicine technologies for the treatment of diabetes is cost-effective, showing cost-effectiveness figures that are favorable compared to traditional care. Thus, telemonitoring is presented not only as a clinical

improvement, but also as an economically viable investment.

The effect on the institutional image is also fundamental. The integration of innovative technologies places healthcare institutions at the forefront in the adoption of digital solutions, which raises community trust and reinforces the perception of quality of care. This non-tangible value positively affects the reputation of the organization and favors the obtaining of resources and new projects. Global experience indicates that hospitals that have integrated telemedicine and telemonitoring into their service offerings have increased their competitiveness and visibility in the health sector.

In addition, telemonitoring can promote equality in access to health care, especially in areas where there is a deficit of hospital infrastructure. By reducing the need for frequent travel and in-person consultations, transportation costs are reduced, and geographic barriers are eliminated for patients and their families. This direct economic effect on households is significant, as it alleviates the financial burden on families with fewer resources, who tend to have more difficulty accessing continuous and quality care.

Finally, in an environment of digital transformation worldwide, telemonitoring adapts to international trends towards more integrated, sustainable and patient-focused health systems. Investment in these technologies not only addresses immediate needs, but also prepares institutions for the future, where digitalization will be essential to maintain competitiveness and ensure the economic sustainability of health systems.

In summary, the expected institutional and economic impact of the implementation of telemonitoring for geriatric patients with diabetes mellitus includes the reduction of hospital costs, the improvement in the use of time and human resources, the improvement of administrative management, long-term sustainability and the strengthening of the institutional image. These advantages underline the feasibility of the proposal as an innovative model that benefits both the efficiency of the system and the well-being of the patient and their environment.

5.5 Strengthening technological innovation in health

The implementation of a telemonitoring system to monitor glucose levels in older people with diabetes is not only a medical intervention, but also a technological innovation in the field of health. This perspective is fundamental as it positions the institution in a process of digital modernization that incorporates smart devices, advanced connectivity and health management platforms, keeping pace with global trends in modernization in health.

One of the highlights of this innovation is the incorporation of advanced technology into healthcare. The use of smart glucometers equipped with 4G and 5G technology ensures real-time data transfer with minimal latency, giving healthcare professionals immediate access to patient information. As Alfaiot (2023) points out, the 5G network represents a crucial advance for digital health, facilitating the simultaneous connection of thousands of devices and the application of artificial intelligence in medical decision-making.

This model also reinforces the trend towards more personalized and predictive medicine. By obtaining continuous data and storing it on secure digital platforms, telemonitoring allows for the analysis of glucose patterns and the anticipation of complications before they occur. Recent research indicates that the combination of telemonitoring and advanced data analytics can improve the ability to predict critical episodes in diabetic patients, facilitating anticipated and accurate interventions (Zhou, Chen, & Huang, 2021).

The proposal for technological innovation is not only limited to the acquisition of devices but also implies a change in organizational culture. The implementation of telemonitoring requires healthcare professionals to develop new digital skills and become familiar with technological tools such as teleconsultation platforms, integrated electronic health records, and real-time communication systems. The literature highlights that training in digital skills is essential to ensure the continuity of digital health initiatives (WHO, 2021).

In addition, telemonitoring promotes interoperability between clinical systems, allowing glucose data to be integrated with the patient's electronic medical record and accessible at different levels of care. This approach avoids fragmentation of information, facilitates continuity of care, and encourages the development of more coordinated and effective health networks. According to García-Sánchez, Fernández-Alemán, and Toval (2021), interoperability is one of the foundations of digital transformation in the health sector, as it ensures the secure and efficient exchange of clinical data.

Another anticipated outcome is the creation of an innovative ecosystem that goes beyond individual attention. The inclusion of telemonitoring technologies can encourage collaboration between health institutions, technology companies, universities, and government agencies, promoting the development of joint solutions in the field of digital health. This cross-sectoral synergy helps accelerate innovation and build environments that are more prepared to meet the challenges of chronic diseases.

The effect of this technological innovation is also manifested in the empowerment of patients. The ability to access your glucose data instantly, analyze it through friendly apps, and share it with your medical team reinforces your active role in managing your disease. This empowerment is considered one of the goals of today's digital health, which aims to move from a paternalistic approach to one that is patient-centered (Lee, Lee, & Nasir, 2022).

Finally, the initiative suggests a multiplier effect on innovation within institutions. The experience gained from telemonitoring older patients with diabetes could be applied to other chronic diseases such as hypertension, heart failure or chronic obstructive pulmonary disease,

thus increasing the scope of digital transformation. In this way, the institution not only enhances its innovative capacity, but also establishes itself as a model to follow in the integration of technological solutions in the field of health.

In summary, the strengthening of technological innovation in the health sector is an expected key result of this proposal. By combining smart devices, high-quality connectivity, secure digital platforms and clinical interoperability, telemonitoring is established as a fundamental tool to update health services, empower patients and stimulate an environment of sustainable innovation that can be replicated in different healthcare contexts.

Table 1. Expected results of the implementation of telemonitoring in geriatric patients with diabetes mellitus

Dimension	Description of the expected result	Projected impact
1. Reduction of clinical complications	Early detection of hypoglycemic and hyperglycemic episodes through automated alerts and real-time monitoring.	Decrease in hospitalizations due to acute complications and prevention of chronic sequelae.
2. Optimization of the workload of health personnel	Automating records and prioritizing critical patients through digital notifications.	Reduction of manual tasks, improvement in the efficiency of nursing work and lower risk of burnout.
3. Improved quality of life for the patient and family	Patient and caregiver empowerment through accessible devices, ongoing communication, and educational support.	Greater autonomy, reduction of anxiety and caregiver overload, and strengthening of family ties.
4. Institutional and economic impact	Reduction of recurring hospital admissions and optimization of administrative processes.	Reduction of direct and indirect costs, financial sustainability and strengthening of the institutional image.
5. Strengthening technological innovation in health	Integration of smart devices, 4G/5G networks and interoperable digital platforms.	Promotion of digital transformation, development of professional skills and creation of an innovative ecosystem in health.

Source: Own elaboration

6. DISCUSSION

The article that is presented proposes an innovative alternative in the field of health, focused on glucose monitoring for older adults with diabetes mellitus through a telemonitoring system. Unlike previous research, the focus here is to highlight the advantages that technology could bring to both clinical practice and home care. Thus, it is relevant to analyze how these findings connect with previous experiences in scientific literature, as well as the challenges that must be faced to ensure their successful implementation.

First, the proposal is aligned with global studies that have shown the effectiveness of telemonitoring in reducing complications associated with diabetes. Lee, Lee, and Nasir (2022) found that remote monitoring programs can significantly reduce HbA1c levels compared to traditional treatments. This supports the idea that an automated alert and monitoring system can help prevent acute episodes of hypoglycemia or hyperglycemia in the geriatric population. However, it is essential to mention that most research has been conducted in younger groups, which underscores the need to confirm these results in older adults with more fragile clinical conditions.

Regarding the workload of healthcare personnel, the literature indicates that the digitization of clinical processes helps to reduce the administrative burden and focus more on direct care (Zhou, Chen, & Huang, 2021). Still, the adoption of these technologies requires a period of initial training and adjustment that could temporarily increase the workload. In this context, the proposal highlights the relevance of continuous training programs, following the recommendations of the World Health Organization (2021), which emphasizes that training is key to maintaining digital health.

Another important point to consider is the quality of life of both the patient and their family, where the proposal clearly shows the benefits in terms of empowerment, reduction of anxiety and support for the caregiver. These improvements have been supported by García-Sánchez, Fernández-Alemán, and Toval (2021), who observe that the acceptance of telemedicine tools in older adults increases when there is family support and access to technology. However, it is necessary to recognize that the digital divide and the cognitive limitations typical of age can be an obstacle for some patients, which requires that friendly interfaces and education programs appropriate to this group be designed.

From an institutional perspective, evidence indicates that telemonitoring can help reduce costs and improve the use of resources in hospitals. A meta-analysis conducted by

Zhou and colleagues in 2021 determined that digital health programs not only raise certain clinical indicators but also prove to be cost-effective. This finding is directly related to the impact expected in the proposal. However, the initial investment in equipment, digital infrastructure, and training can be high, presenting a challenge for organizations with financial constraints. Therefore, concrete cost-benefit studies are required to clarify feasibility in different health contexts.

Regarding the promotion of technological innovation, the literature indicates that the implementation of 5G networks will provide a significant advance in digital health, allowing the connection of many devices at the same time and decreasing latency in transmission (Alfaiot, 2023). This relates to the proposal, which suggests the integration of smart glucometers linked to secure digital platforms. However, it is important to note that the adoption of new technologies also brings with it challenges in terms of regulation and data security, which must be addressed with clear policies that protect clinical information and establish robust encryption protocols (WHO, 2021).

An additional aspect to consider concerns the scalability of the model. Although telemonitoring is initially conceived for geriatric patients with diabetes mellitus, its design could be adaptable to other chronic diseases such as hypertension, heart failure or chronic obstructive pulmonary disease. This possibility significantly increases the impact of the proposal and makes telemonitoring a comprehensive strategy for the management of chronic diseases in health systems that are moving towards digitalization.

Finally, it is essential to understand that the current proposal does not replace in-person care but rather complements it. Telemonitoring should be seen as an extra resource that improves continuity of care and facilitates communication between patients, family members, and health professionals. Its success will depend on the institution's ability to merge technological innovation with existing clinical processes, ensuring quality, safety, and equitable access to health care.

In summary, the discussion allows us to conclude that telemonitoring for geriatric patients with diabetes mellitus is a viable proposal supported by the literature, although it still requires empirical validations and cost-benefit analyses specific to local contexts. The incorporation of this strategy can be positioned as an innovative model that drives digital transformation in the field of health and helps to face the challenges related to the aging of the population and the increase in chronic diseases.

7. CONCLUSIONS

The idea of establishing a telemonitoring system for glucose in elderly people suffering from diabetes mellitus is seen as an innovative solution to a growing challenge: inadequate glycemic control and complications derived from the disease in a particularly vulnerable population group. Through the combination of smart devices, digital connectivity and response protocols, a model capable of strengthening care both in hospitals and at home is proposed, improving continuity of care and safety in clinical care.

One of the most outstanding aspects of this proposal is its ability to reduce medical complications, since it allows for early identification of critical episodes and facilitates appropriate interventions. This quality is especially significant in older patients, whose vulnerability and additional conditions increase the risk of adverse incidents. The availability of real-time information makes a noticeable difference compared to traditional sporadic monitoring methods.

In addition, an improvement in the workload of health personnel is anticipated, since the time spent on manual records is reduced and the prioritization of urgent cases is possible through automatic alerts. This impact not only increases the efficiency of care, but also favors the professional satisfaction of nursing staff, by freeing up time to dedicate to direct care and patient education.

The model is also focused on improving the quality of life of patients and their families, promoting autonomy, reducing anxiety in the face of possible complications and alleviating the burden on the caregiver. Thus, telemonitoring is presented as a tool that goes beyond the purely clinical and seeks the integral well-being of the home, favoring co-responsibility in the care process.

From an institutional point of view, the proposal is associated with economic and administrative advantages, since the reduction of repeated hospitalizations and a more efficient use of resources favor the financial sustainability of health systems. Although the initial investment in technology and training is high, international experience indicates that the savings in the medium and long term justify the adoption of this type of initiative.

Finally, telemonitoring is configured as a catalyst for the advancement of technological innovation in the health sector, by integrating advanced telecommunications networks, digital platforms, and smart devices in a unified environment. This innovation not only affects diabetes care but also lays the foundations to expand the model to other chronic diseases, consolidating the institutions as leaders in digital transformation in health.

In summary, the article presents a viable and evidence-based conceptual model that can be gradually implemented in health institutions. Beyond the clinical and economic advantages, the true value of this proposal lies in its ability to unite professionals, patients and families around a common goal: to improve the quality of life of older adults with diabetes mellitus and ensure comprehensive, continuous and patient-focused care.

8. RECOMMENDATIONS

First, it is advisable to improve the training of health personnel in the use of digital technologies and remote monitoring systems. Technological competence is key to ensuring the sustainability of the project, so both initial and continuous training programs must be created that cover technical aspects and clinical protocols to respond to glucose-related alerts.

Secondly, it is essential that family members and caregivers are actively integrated into the telemonitoring process. It is proposed to develop educational programs that adjust to the sociocultural characteristics of older patients, paying special attention to the basic understanding of glucose levels, the identification of warning signs and effective communication with health personnel. Co-responsibility in care is a fundamental element for the success of these initiatives.

At the institutional level, it is suggested to carry out a cost-effectiveness analysis before implementation, with the aim of evaluating the financial viability of the proposal in various hospital settings. This analysis should cover both the direct costs (devices, infrastructure, and training) and the potential savings that arise from the decrease in hospitalizations and complications. International evidence indicates that these types of initiatives are cost-effective, but their sustainability requires an analysis adapted to each context.

In terms of security, it is essential to adopt protocols to protect clinical data, including advanced encryption measures, access control, and regular audits. Patient trust and acceptance of the system are strongly linked to the confirmation of confidentiality and privacy in the handling of information.

In addition, it is advised that institutional managers promote the interoperability of clinical information systems, allowing the data obtained through telemonitoring to be automatically integrated into electronic medical records, making them accessible to all levels of care. This initiative prevents the fragmentation of information and improves continuity of care.

From a health policy perspective, it is recommended to promote the updating of regulations related to telemedicine and telemonitoring, to establish clear regulatory frameworks that facilitate the safe and sustainable adoption of these technologies. Legislation should address aspects related to data protection, professional responsibility and medical device certification.

Finally, in the academic and scientific field, it is suggested to carry out pilot studies and controlled clinical trials that allow empirically verifying the results anticipated in this proposal. These studies should examine clinical (such as HbA1c and hospitalization rates), care (response times and workload), economic (care expenditures), and psychosocial (quality of life and satisfaction of the patient and family) indicators. These contributions are necessary to substantiate the evidence and facilitate the publication of future research in high-impact journals.

In summary, the adoption of telemonitoring in older adults with diabetes mellitus requires a holistic approach that includes advanced technology, staff training, family involvement, institutional management, and policy support. Only then can it be ensured that the anticipated benefits translate into effective improvements for patients, their families and health systems.

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