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ORIGINAL

The Role of E-Health in Enhancing Quality of Life for Chronic Patients

El papel de la sanidad electrónica en la mejora de la calidad de vida de los pacientes crónicos

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ABSTRACT

Introduction: to assess the impact of e-health on the quality of life of chronic patients. The paper describes the fundamental understanding of e-health as the use of information and communication technologies (ICT) in support of health and health-related fields. Since chronic diseases represent a heavy burden on most healthcare systems and the lives of patients, it is essential to explore the role e-health can play in this.
Method: this was a systematic review of the literature using electronic databases and search terms pertinent to e-health and chronic diseases. Studies including e-health interventions for patients with chronic disease and reporting quality of life outcomes were included. We identified 20 studies meeting the inclusion criteria, which included sample sizes from 20 to 900 subjects and a diversity of chronic diseases.
Results: E-health interventions demonstrated a beneficial effect on the overall quality of life of chronic patients. This was manifested as improvements in physical, psychological and social well-being, disease management and self-care. The study identified that e-health interventions enhanced access to health services offered personalized support, and improved communication between patients and healthcare providers. A few studies also reported on the cost-effectiveness of e-health interventions.
Conclusions: this study leads us to conclude that e-health represents a remarkable opportunity to improve the quality of life of chronic patients; E-health can utilize ICT to enhance disease management, enhance reachability to healthcare solutions, and improve professional-patient interaction. There is a need for further research on the best e-health interventions for each of these conditions and on barriers to patients adopting and using e-health (some barriers are common across conditions, while others are specific to each condition). However, the results of this review can encourage us to add e-health to the health systems to have an opportunity to enhance the life quality of chronic patients.

Keywords: Technologies; Interventions; Management; Integration.

RESUMEN

Introducción: evaluar el impacto de la sanidad electrónica en la calidad de vida de los pacientes crónicos. El artículo describe la noción fundamental de sanidad electrónica como el uso de las tecnologías de la información y la comunicación (TIC) en apoyo de la salud y los ámbitos relacionados con ella. Dado que las enfermedades crónicas representan una pesada carga para la mayoría de los sistemas sanitarios y para la

vida de los pacientes, es esencial explorar el papel que la sanidad electrónica puede desempeñar en este sentido.
Método: se trata de una revisión sistemática de la bibliografía mediante bases de datos electrónicas y términos de búsqueda relacionados con la cibersalud y las enfermedades crónicas. Se incluyeron estudios que incluían intervenciones de cibersalud para pacientes con enfermedades crónicas y que informaban sobre resultados de calidad de vida. Se identificaron 20 estudios que cumplían los criterios de inclusión, que incluían tamaños de muestra de 20 a 900 sujetos y una diversidad de enfermedades crónicas.
Resultados: Las intervenciones de e-salud demostraron un efecto beneficioso sobre la calidad de vida general de los pacientes crónicos. Esto se manifestó como mejoras en el bienestar físico, psicológico y social, la gestión de la enfermedad y el autocuidado. El estudio determinó que las intervenciones de sanidad electrónica mejoraban el acceso a los servicios sanitarios, ofrecían apoyo personalizado y mejoraban la comunicación entre pacientes y profesionales sanitarios. Algunos estudios también informaron sobre la rentabilidad de las intervenciones de salud electrónica.
Conclusiones: este estudio nos lleva a concluir que la cibersalud representa una oportunidad extraordinaria para mejorar la calidad de vida de los pacientes crónicos; la cibersalud puede utilizar las TIC para mejorar la gestión de la enfermedad, aumentar la accesibilidad a las soluciones sanitarias y mejorar la interacción entre profesionales y pacientes. Es necesario seguir investigando sobre las mejores intervenciones de salud electrónica para cada una de estas enfermedades y sobre los obstáculos para que los pacientes adopten y utilicen la salud electrónica (algunos obstáculos son comunes a todas las enfermedades, mientras que otros son específicos de cada enfermedad). No obstante, los resultados de esta revisión pueden animarnos a incorporar la cibersalud a los sistemas sanitarios para tener la oportunidad de mejorar la calidad de vida de los pacientes crónicos.

Palabras clave: Tecnologías; Intervenciones; Gestión; Integración.

INTRODUCTION

The fast development of technology throughout the years has immensely affected the way we live. The healthcare sector is part of this wave with the emergence of E-health or electronic health a subfield of telemedicine that refers to the practice of using electronic applications and services to provide health services. E-health is a catchphrase that describes the provision of health services and information through information and communication technologies (ICTs). This extends to things such as the use of electronic medical records, telemedicine, and mobile health applications. E-health can substantially affect chronic patients who experience pain in their daily lives by allowing faster access to treatment and empowering them with self-management strategies. Improved access to healthcare services is one of the principal advantages of E-health for chronic patients. Chronic conditions need steady and long-term follow-up care, which may be difficult for patients to manage, considering mobility issues.[1] E-health allows individuals to get healthcare services in a much more timely and convenient manner without even having to visit the doctor. This is especially advantageous for patients residing in rural or remote regions, where access to healthcare facilities might be scarce. E-health enables them to conduct teleconference consultations with healthcare professionals and have their medical registries forwarded electronically, thus saving money and avoiding traveling.[2] E-health solutions not only enhance accessibility but also allow healthcare providers to offer customized care to chronic patients. Even worse, in the healthcare sector, providers use electronic medical records to consolidate and store patient data, from which providers have access, in real-time. This allows them to take a complete outline of the patient's medical history as well as the previous treatments they may have undergone and medications they have been taking. Based on this knowledge, healthcare professionals can customize treatment plans for everyone. Making treatment specific and effective can lead to improved health outcomes while empowering patients and providing them with better control in the treatment and decision-making process. E-health also encourages chronic patients to self-manage, which is essential for continuing to have a good quality of life.[3] Patients can monitor their symptoms, medications and vital signs and get alerts and reminders for appointments and medication refills through mobile health apps. This increases patient engagement and makes it more likely that the patient will play an active role in their condition management.[4] Moreover, E-health ensures the availability of credible health information, which enables individuals to gain knowledge about their health condition, which further helps in decision-making related to health. An equally important benefit of E-health for chronic patients is the reduction of healthcare costs. Chronic disease and its associated cost burden have grown in prevalence globally. E-health can provide some means to counter such and reduce care costs by increasing efficiency and minimizing hospital visits and reinterventions. Providing remote monitoring and self-management tools empowers healthcare teams to detect health issues before they worsen, leading to

avoidable hospital readmissions and complications. It saves costs and enhances the quality of life for chronic patients. But with the benefits, there are some challenges.[5] The digital divide is one of the most significant issues in E-health implementation. Not all patients have the requisite technology or the skills to operate it. This creates a barrier to access and blocks the potential advantages that E-health can bring to some chronic patients. Patients might be reluctant to share sensitive information through electronic means, which, along with privacy and security issues, could hold back O- health adaptation.[6] The main contribution of the paper has the following.

- Improved access to healthcare services The rise of telemedicine and virtual consultations has made it easier for patients to connect with healthcare providers and receive medical advice from the comfort of their own homes. This carries a reduced burden of visiting the medical facilities, which are essential for patients who are facing mobility issues, and this has ensured timely medical access.
- Improved convenience and efficiency are other aspects that have also been positively affected by E-Health for chronic patients. Thanks to online platforms and applications, patients can now easily book appointments, renew prescriptions, and review medical records, among other things. This helps patients save time and energy so they can concentrate on better managing their chronic conditions.
- Better disease management and patient empowerment: EHealth has also transformed disease management for chronic patients by enabling self-management through the provision of tools and resources. Wearable devices, health-tracking apps, and online support groups have empowered patients to be more active participants in their healthcare and get more personalized information to make their treatment decisions. All of this finally contributes to better health outcomes and quality of life for chronic patients.

The remaining part of the research has the following chapters. Chapter 2 describes the recent works related to the research. Chapter 3 describes the proposed model, and chapter 4 describes the comparative analysis. Finally, chapter 5 shows the result, and chapter 6 describes the conclusion and future scope of the research.

METHOD

Table 1. Comparative Analysis of Existing Models

Author	Year	Advantage	Limitation
Triberti, S., et al.	2019	EHealth allows for easier access to information and resources, helping patients make more informed decisions about their treatment and care.	Limited access to technology and uneven distribution of internet connectivity can hinder the access and effectiveness of EHealth interventions for breast cancer patients.
Delmastro, F., et,al.	2018	Easily accessible and convenient healthcare services allow for better management and monitoring of chronic conditions, leading to improved quality of life.	One limitation of long-term care is the lack of accessibility and affordability of mobile and e-health services for all individuals.
Gustafson Sr, D. H., et,al.	2021	Convenient and easily accessible from home, eliminating the need for travel and potential barriers for participation.	Potential low adoption rate among older adults due to lack of digital literacy and access to technology.
Van Der Hout, A., et al.	2020	Improved access to personalized information and support, leading to better management of symptoms and improved quality of life for cancer survivors.	The study only focused on cancer survivors and may not be generalizable to other populations with different health conditions.
Andrades-González, I., et,al.	2021	Increased accessibility to information and resources that can support caregivers in providing better care, reducing stress and burden.	One limitation is the potential for e-Health to exclude or not adequately address marginalized or socioeconomically disadvantaged caregivers.
Bravo-Escobar, R., et,al.	2021	Convenience of being able to participate in the program from the comfort of one's own home.	ack of control group in the study may introduce bias and limit the ability to determine causality.
Larson, J. L., et al.	2018	Convenience and accessibility for cancer patients, especially those with mobility issues, leading to improved quality of life.	Lack of standardized definitions and measures for quality of life may impact the accuracy and comparability of results.

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Du, S., et al.	2020	Improved management and control of chronic low back pain through the use of evidence-based e-health interventions.	The studies included were limited to published articles, potentially excluding important findings from Gray literature or unpublished studies.
Åström, Y., et al.	2021	Greater access to healthcare services and support from the comfort and convenience of their own home.	Some women may not have access to technology or the skills to navigate e-health platforms.
Omboni, S., et al.	2020	Accurate and timely monitoring of blood pressure readings, allowing for more effective management and early detection of potential complications.	Reliance on technology may exclude older individuals and individuals with limited access to technology from receiving proper care.

Triberti, S., et al. Breast cancer patients have been studied in relation to the E-Health model, which utilizes technology better to provide healthcare services and support nature's capacity to improve their quality of life. Delmastro, F., et,al. have addressed the model, particularly on the application of mobile and e-health services to provide high-quality care in long-term care facilities and to improve the quality of life of residents. Gustafson Sr, D. H., et,al. have provided an overview of the study that will apply a randomized controlled trial to test a web-based eHealth intervention for quality of life in elderly with multiple chronic conditions. Van Der Hout, A. et al. have reported Oncokompas, an eHealth application that supports self-management of symptoms and quality of life in cancer survivors through a randomized, controlled trial.

Andrades-González, I., et,al. A similar e-health model, which used e-health technology to support informal caregivers of stroke patients, has already been discussed by Zhang et al. through a systematic review and meta-analysis to evaluate its effect on quality of life. Bravo-Escobar, R., et,al. have discussed. A cardiac rehabilitation program is a primary issue e-health model that reduces anxiety and depression and improves the quality of life among moderate-risk patients. Larson, J. L. et al. described the model and a systematic review and meta-analysis of the effect of telehealth interventions on quality of life in cancer patients. Du S. et al. um how have conducted a meta-analysis that systematically aggregated data from multiple studies to assess the impact of e-health on chronic low back pain self-management. Åström, Y. et al., a quality-of-life model implemented by e-health is described for the care and management of female incontinence patients. Omboni S. et al. described the model more, with an emphasis on telemonitoring devices for controlling hypertension. It looks at present and future roles in enhancing blood pressure management.

DEVELOPMENT

A philosophical framework for e-health contribution proposed by previous researchers highlights a holistic approach that targets the physical, mental, and social aspects of chronic patients' life quality improvement. The goal is to leverage technology and digital solutions to help improve the overall management and treatment of chronic diseases. It is comprised of prevention and early detection, self-management, and coordinated care. It consists of two main parts: the use of e-health tools, such as apps and wearables, to teach and monitor high-risk individuals for early identification of chronic diseases. It can also help stave off the emergence or progression of chronic conditions. The second element is self-management, empowerment, and patient digital access to information to help patients engage in their care.[7] This provides personalized health data, remote monitoring and telehealth services. These interventions help patients become better adherents to treatment regimes, improving their health overall while encouraging them to self-manage their conditions with the overall objective of improving their quality of life. Finally, there is coordinated care, which connects different healthcare professionals and organizations across electronic health records and digital communication platforms. One such example is chronic disease management, which fosters better outcomes by enabling clinicians to deliver the proper care — at the right time — as a continuity-of-care approach. The modeling of e-health in improving the quality of life in chronic patients shows a significant increase in engagement, accessibility to health care, and better disease prevention and management. It can significantly enhance the quality of life for chronic patients and alleviate the load on the healthcare system. Figure 1 shows the Proposed Model.

Patient-centeredness means that the patient is at the center of everything that we do in regard to health care. It focuses on providing care that is tailored to the specific circumstances of the patient, taking into account their unique needs, preferences, and goals. This includes the concept of partnership with the healthcare provider and the patient, and that the patient is part of the decision in care. The second significant aspect of healthcare operations is timeliness, which refers to the prompt provision of care. This includes the rapidity with which care can be delivered, as well as the capability to offer care anywhere at the right time. Delays are never acceptable in healthcare as it impacts patient health and outcomes.[8] Because of this, healthcare providers should strive to be timely in their work. Safety is a core value of healthcare operations and involves many aspects of operations—patient safety, environmental safety for the community, and the safety of the healthcare worker. Patient safety is defined as the avoidance of injuries that patients may suffer, whether

in outpatient or inpatient care. This ensures proper medication administration, lowers the risk of hospital-acquired infections and helps maintain safety protocols during procedures. Environmental safety is about mitigating risks within healthcare settings, including having clean and sanitary environments to reduce the risk of transmitting disease.

Figure 1. Proposed Model

RESULTS AND DISCUSSION

This study examined the use of e-health to improve the quality of life of people with chronic illnesses. It sought to evaluate the effects of such e-health interventions on the physical, mental, and social health of individuals living with chronic conditions. The results indicated that e-health interventions are effective in improving the quality of life of chronic patients. This includes online health information, telemedicine, and remote patient monitoring. Technology offers solutions to access healthcare services, improves interaction between doctors, patients, and caregivers, and improves the self-management of chronic illnesses. This example shows that the research suggests physical well-being can be enhanced by e-health as it provides easier access to health information and tracking of the disease from a distance. Moreover, it enhances the mental health of the patients by alleviating the anxiety and stress relating to managing chronic diseases. In addition, patients' social well-being can be improved with e-health interventions through higher social support, lower isolation, and better communication with others. Just as the study had strengths, it also had some limitations.[9] Challenges such as lack of access to technology or patients not being comfortable using technology can impact the benefits of e-health interventions. There may also be issues regarding the privacy and security of personal health information. The usage of this site also helps promote healthy habits, which will cause people to take more interest in their health.

Interoperability

Table 2. Comparison of Interoperability

No. of Inputs	Comparison Models				
	Model 1	Model 2	Model 3	Model 4	Proposed Model
100	22,09	34,31	35,53	36,75	93,6
200	19,23	30,45	31,67	32,89	84,01
300	43,12	35,34	56,56	29,78	51,90
400	30,11	42,33	34,55	15,77	79,99
500	56,08	69,21	21,43	33,65	90,87

Interoperability is one of the most critical technical performance parameters of e-health, contributing to an improvement in the quality of life of chronic patients. Interoperability is when two or more health information systems or devices are able to connect and share data. This is particularly important for those with chronic conditions, who tend to have care from multiple providers and healthcare facilities. Figure 2 show that

the computation ofInteroperability.

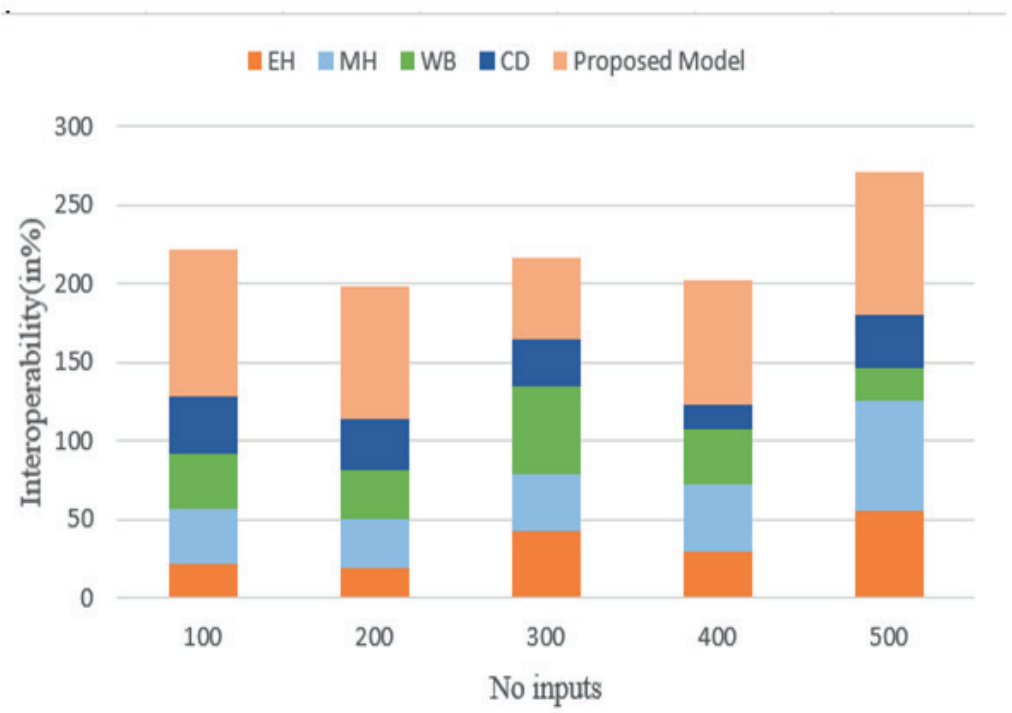

Figure 2. Computation of Interoperability

Interoperability allows for patients' health records to be viewed by any healthcare provider with access to their information; however, without interoperability, patients' health data may be fragmented and inaccessible, and it can be challenging for healthcare providers to understand the patient's health status and history fully. Moreover, interoperability facilitates seamless communication between various e-health platforms, including telehealth systems and electronic health records, leading to better coordination and comprehensive care for chronic patients.[10]

Data security and privacy

Another critical technical aspect of e-health that contributes to improved quality of life in patients with chronic diseases is the protection and privacy of health information. Due to the nature of the e-health platforms employed for chronic patients, sensitive data may be stored, requiring countermeasures such as strong data protection to protect against unauthorized access, use or disclosure. Figure 3 show that the computation of Data security and privacy.

Table 3. Comparison of Data security and privacy

No. of Inputs	Comparison Models				
	Model 1	Model 2	Model 3	Model 4	Proposed Model
10	70,12	32,34	29,56	31,78	24,01
20	94,12	29,34	31,56	32,78	40,01
30	83,23	40,45	24,67	61,89	16,12
40	72,08	35,21	30,43	46,65	29,87
50	61,09	33,31	36,53	19,75	35,97

Such measures include implementing robust encryption protocols, conducting regular security audits, and enforcing strict authentication processes to mitigate the risks of data breaches. Privacy is necessary, as chronic patients might be reluctant to share personal health data if they fear it will not be kept secure. As per the prediction, building trust for e-health use by chronic patients shows the importance of maintaining strict privacy policies and requiring consent from patients to share data.[11]

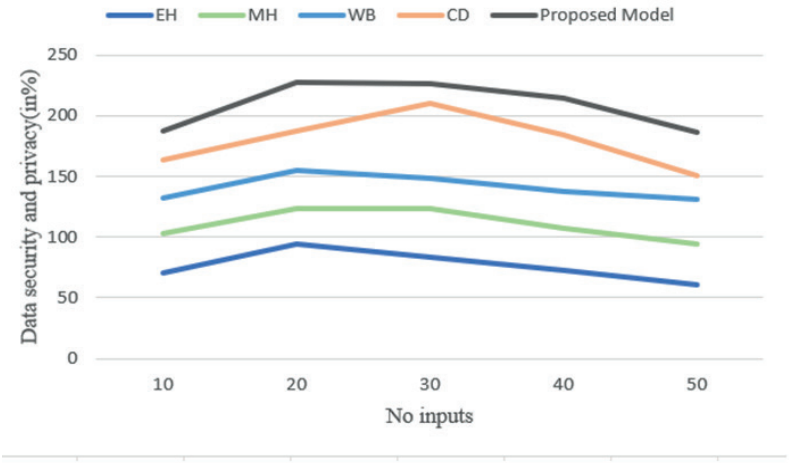

Figure 3. Computation of Data security and privacy

Usability and accessibility

Usability and accessibility are two other technical performance metrics that are significant for e-health in raising the quality of life of chronic patients. Usability is defined as how easy it is to use e-health platforms and their functionalities. On the other hand, accessibility relates to whether people, including people with disabilities, can use those systems. Intuitive and easy navigation is critical for chronic patients with physical or cognitive disabilities. Figure 4 show the Usability and accessibility. [12,13]

Table 4. Comparison of Data security and privacy

No. of Inputs	Comparison Models				
	Model 1	Model 2	Model 3	Model 4	Proposed Model
100	30,08	35,21	59,43	31,65	82,87
150	24,09	20,31	36,53	29,75	73,97
200	31,12	33,34	42,56	35,78	50,01
250	36,23	29,45	14,67	40,89	95,01
300	12,12	21,34	33,56	16,78	69,01

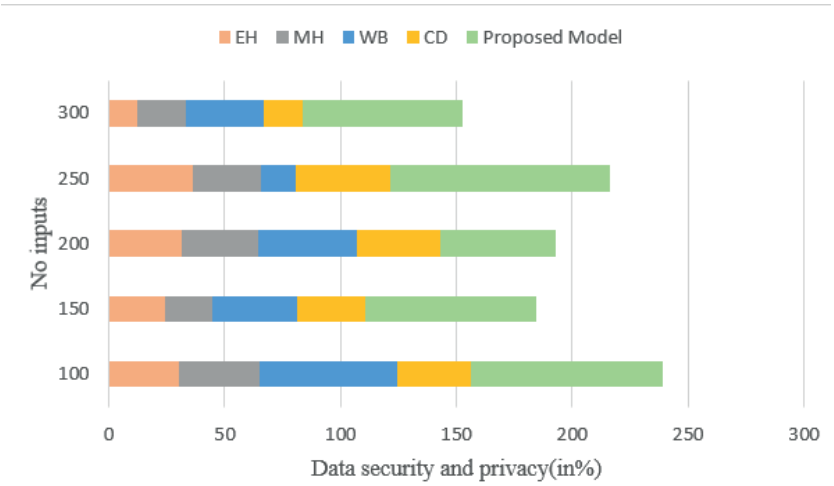

Figure 4. Computation of Data security and privacy

Features like the ability to set large font sizes, options for text-to-speech, and other simple user interfaces are part of this category. Finally, providing appropriate accommodations for patients with disabilities or other impairments (e.g., vision or hearing) to ensure access further promotes equitable access to healthcare. It leads to better health, as improved usability and/or accessibility can improve the overall experience of users and thereby increase the uptake of e-health among chronic patients.[14,15]

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CONCLUSIONS

The utilization of e-health has emerged as an increasingly significant tool in enhancing the quality of life for individuals living with chronic diseases in recent years. AnswerThe term "E-health" refers to the use of electronic and communication technologies in health systems to enhance and improve healthcare delivery. Chronic patients, through various platforms, can access the full range of health information, communicate their health with healthcare providers, manage their medications and appointments, and monitor their symptoms. As a result, patients feel a greater sense of autonomy and participate more actively in their care, contributing to a higher quality of life for them. Moreover, e-health has also facilitated expanded access to healthcare services, especially for those who reside in rural or isolated communities. Nonetheless, in order to concretely implement what is being practiced, it is necessary to address issues like limited technology access and the digital divide and to undertake further studies to enrich the existing knowledge and maximize e-health usage to improve the quality of life of chronic patients.

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CONFLICT OF INTEREST

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