

Revolutionizing Family Healthcare: Examining the Benefits and Obstacles of E-Health

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Abstract

This review explores the challenges and barriers associated with the implementation of e-health initiatives in primary care settings. It identifies several key factors that hinder the widespread adoption of e-health applications, including the lack of adequate awareness of medical informatics and e-health's role in healthcare development, insufficient evidence on their effectiveness, difficulties in meeting the costs of developing and implementing e-health infrastructure, and the marginalization of the private sector and private health institutions. Furthermore, the review highlights issues such as low health and informatics literacy among

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Highlights:

- E-health can improve quality and cost-effectiveness in primary care.
- E-health applications facilitate the storage and processing of medical data.
- E-health has the potential to both increase and reduce inequalities in health.
- Cyber security and legal infrastructure make e-health sustainable.

Background

Primary care assumes a vital responsibility in providing exceptional healthcare that is easily accessible and economically viable for an increasingly aging population burdened with multiple chronic ailments and intricate health challenges. To effectively tackle these obstacles, it is advisable for primary care practitioners to embrace innovative practices, particularly those pertaining to e-health. By leveraging e-health applications, primary care can potentially surmount the challenges encountered when delivering care to individuals with complex medical and psychosocial needs. Nonetheless, numerous unresolved inquiries persist regarding the cost-effectiveness, integration into the healthcare system, and the acceptance of e-health initiatives by healthcare professionals

Definiton of e-Health

Beyond WHO's provision of e-health, health services, and health surveillance, the term encompasses the utilization of information and communication technologies (ICT) to facilitate healthcare support, health literature, information dissemination, and research for health education. Telehealth encompasses a range of interventions, including telemedicine, mobile health (mHealth), electronic medical records (eMR/eHR), big data management for health, wearable devices, and even the application of artificial intelligence.

Substantial evidence demonstrates the expanding impact of e-health on healthcare delivery worldwide, leading to enhanced efficiency and responsiveness of health systems to address people's needs and expectations¹. It is widely acknowledged that e-health applications can play a pivotal role in achieving overarching global health objectives, such as Universal Health Inclusion and the attainment of Sustainable Development Goals

Benefits of e-Health

E-health initiatives are anticipated to yield numerous direct and indirect advantages for individual and public health. The implementation of e-health services has revealed three potential benefits:

1. The implementation of e-health services brings forth perceived and quantifiable benefits, including quantitative advantages and financial-economic gains.

Historically, information technology (IT) products catering to healthcare providers were primarily tailored for large-scale organizations, entailing significant costs. However, recent technological advancements have fostered increased affordability and improved content accessibility of IT applications for primary care physicians².

Various information technologies, such as electronic health records, e-prescribing, decision support systems, electronic chronic disease management applications, and drug and biological product barcoding, have demonstrated their potential in curbing healthcare expenses and reducing medical errors³.

In order for e-health applications to attain widespread adoption and facilitate a patient-centered care approach that is holistic and comprehensive, it is imperative that these e-health products are easily accessible and tailored to suit individual patients' needs⁴.

2. *E-health initiatives yield benefits that encompass the enhancement of health service efficiency and quality, reduction of medical errors, expedited intervention speed, improved access to information, and facilitated information sharing.*

The implementation of e-health technologies elevates the quality and expedites the delivery of health services. Numerous studies have demonstrated its efficacy in reducing medical practice errors. Electronic health record-keeping, utilization of decision support systems, and seamless integration of laboratory services have been instrumental in augmenting the quality of health services and patient care.

Notably, the adoption of electronic prescription applications has shown to effectively mitigate errors encountered during the prescribing process⁵. Decision support tools possess the capacity to equip physicians with warnings regarding contraindicated drugs, thereby serving as a vital safety measure⁶.

Furthermore, e-health technology enables the implementation of opportunity-sensitive strategies for health promotion, which prioritize patient autonomy, self-management of health, provision of preventive health services, and evidence-based chronic disease management⁴. E-health holds promise in expanding healthcare self-management and personalized medical care, empowering patients, and fostering cost-effectiveness⁷⁻⁸. It facilitates patient monitoring of (unhealthy) behaviors, encourages and enables lifestyle interventions, and supports behavioral changes when necessary⁹⁻¹⁰⁻¹¹. Literature evidence underscores the need to cultivate individuals' potential to assume self-management and take charge of their own health, while involving patients in decisions pertaining to their health, thereby alleviating the burden on primary healthcare institutions¹². Establishing an environment in which primary care professionals support evidence-based and structured self-management of patients, while embracing a person-centered approach in daily clinical practice, necessitates the utilization of electronic support tools.

Moreover, e-health applications foster a streamlined and healthier interaction between patients and healthcare providers¹⁰. Encouraging patient participation in decision-making processes is advocated to balance traditional, paternalistic relationship models, which can limit patients' agency and increase pressure on physicians¹³. Patient involvement entails collaborative care planning, information exchange, goal-setting, and engagement in self-management activities¹³. This partnership has been recognized as invaluable in supporting symptom management and control, particularly for patients with chronic health conditions¹⁴. Self-management strategies, encompassing the adaptation of clinical decisions to align with patients' circumstances, values, and priorities, as well as patients' active engagement in their own care, are increasingly acknowledged as vital components of chronic disease management and secondary prevention¹⁵⁻¹⁶.

Notably, personalized e-health approaches have demonstrated superior effectiveness compared to standardized approaches applicable to all individuals¹⁷. Personalized (e-health) medicine entails the creation of tailored care plans and strategies for patients through the integration of patient characteristics spanning from genetic factors to environmental influences, facilitated by informatics applications.

The utilization of machine learning techniques to gain insights into patient characteristics represents a burgeoning field of interest¹⁸. Machine learning can be employed to elucidate diagnostic processes, support patient education, predict treatment responses, and facilitate individualized treatment approaches¹⁹⁻²⁰.

The incorporation of individualized e-health practices holds paramount importance. E-health possesses the potential to both amplify and diminish health inequalities²¹. As the utilization of e-health contributes to bolstering patient autonomy and fostering self-management, it also serves to reinforce the core competencies of family medicine, including a patient-centered approach and comprehensive, holistic care¹¹. Patient responsibilities, essential for achieving these clinical objectives and underpinning the quality of primary healthcare, can be more readily fulfilled through e-health practices⁸⁻¹⁰⁻²².

Over the past two decades, the prevalence of remote and virtual teleconsultation experiences has steadily increased. While concerns persist regarding the potential loss of face-to-face contact and its impact on the unique quality of primary care services, existing trials have demonstrated that telemedicine is both acceptable²³.

3. *Strategic benefits encompass data collection and utilization in research and strategic planning processes, as well as the determination of long-term healthcare needs.*

Given the mounting expectations, shifting demographics, prevalence of multimorbidity and complex diseases, and financial resource constraints, investment in e-health solutions that effectively cater to ever-expanding healthcare demands becomes imperative. The solutions devised and tested today will serve as the bedrock, constituting the application and technological infrastructure for decades to come. To ensure sustainable e-health solutions, it is essential to establish robust, evidence-based, transparent, and defensible e-health strategies. This process lays the groundwork for constructing a viable policy environment and institutional architecture²⁴. Internationally accepted goals pertaining to e-health revolve around the establishment of a safe, high-quality health system predicated on patient-centered care, facilitated by e-health within the framework of standardized practices.

E-health applications can be classified in accordance with Shaw's conceptual model. Accordingly: (1) e-health serves to monitor health parameters, encompassing metrics such as step count and sleep quality; (2) e-health facilitates communication between stakeholders, including patients and healthcare professionals; and (3) e-health encompasses the collection, analysis, and management of data through electronic health records⁹.

Barriers and Challenges to Use of e-Health

There are also many barriers and challenges hindering the implementation of e-health services and medical informatics. Key challenges and barriers to e-health services;

1. *Insufficient awareness regarding the role of medical informatics and e-health in the advancement of healthcare services persists.*

Concerns abound regarding the potential misalignment between supply and demand, whereby barriers to patient acceptance and utilization of e-health applications contribute to investment failures by healthcare providers²⁵⁻²⁶. Many e-health initiatives encounter challenges in finding their niche in the market and sustaining demand among the target audience²⁷. This predicament, which entails higher investments and risks compared to traditional diagnostic and treatment elements, represents a prevalent issue in e-health applications²⁸.

Multiple factors contribute to the inadequate adoption of e-health initiatives by patient groups. These factors include patients' limited awareness of e-appointment services, prevailing underappreciation of novel online services among the majority of patients, incongruity between telemedicine services and patients' preferences for verbal communication, as well as certain technical limitations associated with the provided service²⁹.

It comes as no surprise that physicians frequently harbor uncertainties regarding the quality of e-health applications and face challenges in determining which ones to recommend to their patients³⁰. This finding underscores the imperative for a more patient-centered and personalized approach to e-health, one that considers individual needs and tailors practices accordingly³¹.

2. *Inadequate evidence regarding the efficacy of e-health applications persists.*

Opinions abound regarding the insufficiency or inadequate research surrounding the quality and effectiveness of e-health applications. For instance, a content analysis of hypertension-related applications concluded that the majority exhibited subpar quality³².

Proponents of e-health applications argue that technology fortifies patients' position within the healthcare ecosystem and serves as a fundamental element enabling the realization of patient-centered care ideals³³. However, critics assert that many contemporary e-health solutions lack a robust evidence base, suffer from limited accessibility by primary care physicians, and fail to adequately address privacy concerns or obtain informed consent⁷⁻³⁴. E-health has played a pivotal role during the current COVID-19 pandemic, and numerous frontline physicians recognize the necessity of enhancing online communication with patients. This period has yielded valuable evidence in the realms of telemedicine and online mental health services³⁵⁻³⁶. Additional factors influencing the utilization and adoption of e-health in daily practice are linked to healthcare

providers' preferences. For instance, the inclination to evaluate patients through face-to-face consultations and negative perceptions regarding the impact of e-consultations on the patient-physician relationship³⁷. The displacement of face-to-face contact by e-health necessitates a reevaluation of the role, significance, and implications of human interaction in primary care³⁸. Moreover, the fact that the effectiveness of many new e-health applications remains unexplored further underscores the existence of an evidence gap within this domain³⁹.

If the use of an e-health application poses challenges for family doctors in their daily practice or results in increased costs, job insecurity, and income loss, it is not uncommon for family physicians to refrain from utilizing such applications. Coordinated efforts between academia, field professionals, and industry stakeholders, rooted in a shared understanding, are poised to offer utilitarian solutions that enhance the motivation and engagement of healthcare service providers in this regard³⁷.

3. Challenges in meeting the financial demands of developing and implementing e-health service infrastructures persist.

E-health initiatives garner favor among policymakers, leading to the development and implementation of numerous applications at significant costs⁴⁰.

The high initial costs and uncertain returns pose major barriers to the adoption of electronic health records and other clinical IT applications for physicians. Research conducted among primary care physicians by Anderson et al. revealed that those lacking financial support and apprehensive about investment costs are less inclined to adopt electronic prescribing and decision support tools⁴¹. Encouraging physicians to take these steps necessitates their willingness to embrace publicly supported projects and exhibit greater courage.

The primary care population is remarkably diverse, encompassing individuals with varying socioeconomic statuses, health literacy levels, educational backgrounds, and age groups, as well as individuals from diverse cultural contexts. Economic or cognitive factors may impede equal accessibility of e-health applications for all these groups, thereby exacerbating existing health inequalities⁴².

When discussing e-health approaches, emphasis should be placed on the accessibility, equity, and inclusivity of practices²⁹.

4. Lack of experience in medical informatics and lack of qualified human resources.

Evidence suggests that health professionals often lack knowledge about current e-health practices⁴³⁻⁴⁴. Determining the minimum qualifications necessary for integrating e-health applications into clinical practice requires needs analysis and expert opinions derived from academic knowledge and performance assessments. The learning process can be further facilitated through motivational experiences drawn from daily practice⁴⁵⁻⁴⁶. However, utilizing e-health applications in daily practice is, in itself, an educational endeavor, and educational needs should not be indefinitely postponed at the expense of field activities¹⁸. The necessity for e-health education has been advocated for the past decade, yet there are limited educational initiatives even on a global scale⁴⁶. In one study, a majority of family physicians believed that e-health would alleviate their workload, while another study conducted in the same country revealed that only 10% held similar expectations⁴⁷. It is recommended that e-health learning programs be integrated into medical curricula to promote standardization and widespread dissemination. Such integration would facilitate a smoother transition to widespread e-health practices in primary care, overcoming resistance encountered along the way⁴⁸.

5. Inadequate infrastructure, including the human resources necessary to ensure the seamless continuity of e-health services, poses a significant challenge.

The complexity of clinical IT applications represents another barrier to the adoption of e-health. Surveys reveal that physicians perceive the time and effort required to learn and utilize these technologies as a major obstacle. In fact, 86% of physicians reported that vendors' inability to provide satisfactory products

constituted a significant hindrance to the integration of clinical IT in their practice⁴¹. Industry organizations involved in this realm should not overlook the imperative for field-based research and development activities.

6. Lack or Insufficiency of Laws and Regulations Governing the Provision of E-Health Services

The absence or inadequacy of laws and regulations governing the provision of e-health services poses a significant barrier to implementation.

Privacy concerns emerge as a prominent obstacle due to the web-based nature of many e-health systems, raising apprehensions among doctors and patients regarding the security of medical records. This concern is further exacerbated when wireless internet is utilized for transmitting records to multiple locations. It is imperative to recognize that e-health applications, particularly those involving the utilization of big data, cannot be regarded in isolation from organizational cybersecurity policies⁴⁹.

Legal hurdles also impede the adoption of information technology in healthcare. The lack of clarity in laws pertaining to fraud and abuse, tax regulations, intellectual property rights, liability and malpractice, and licensing laws creates an environment of uncertainty for healthcare providers in implementing information technology solutions⁵⁰. Consequently, certain strategic plans for e-health applications may prove unfeasible due to inadequate consideration of the available resources' quality and scope.

Addressing these legal and regulatory challenges is crucial to foster an environment conducive to the successful implementation and widespread adoption of e-health services.

7. The marginalization of the private sector and private health institutions undermines the potential of e-health initiatives.

For sustainable and widespread success in the realm of e-health, it is crucial to foster collaboration between the private sector and public entities. The demand generated by public services and the incentives put forth, along with the establishment of a legal framework by policymakers, will facilitate the supply of innovation and production by the private sector and academic entities. Detractors of e-health contend that the lack of cooperation among these stakeholders gives rise to concerns such as workforce depletion, inability to adequately test technical aspects such as algorithms utilized, failure to ensure fair competition circumstances, commercial conflicts of interest, and potential medicolegal challenges. Addressing these issues is vital to prevent the stagnation of e-health initiatives³⁴⁻⁵¹⁻⁵².

8. Limited health and informatics literacy among society hinders the effective utilization of e-health.

The successful utilization of most e-health applications necessitates users to possess a reasonable degree of (health) literacy, along with a moderate understanding and proficiency in digital technology. When e-health exacerbates health inequalities, it is often associated with the exacerbation of existing disparities rather than the emergence of new inequities⁴².

It has been observed that younger, healthier, and more educated individuals tend to utilize e-health services more frequently. Consequently, there is a genuine risk that e-health may primarily benefit the so-called 'anxious-well' population, rather than the vulnerable and high-risk groups. In this regard, e-health has the potential to widen health inequalities²¹.

Research has also explored the physical limitations that older adults face in accessing e-health services (75). Choi reported a decline in the rate of older adults using the Internet for health-related purposes, from 32.2% in the 65-74 age group to 14.5% in the 75-84 age group⁵³.

The complexity of e-health initiatives, spanning from simple information-based applications to intricate data-driven systems, directly influences patients' adoption of these applications⁴⁸. Other factors that influence the utilization of e-health services include age, income, and education⁵⁴.

Innovative approaches have been proposed to enhance patient engagement and stimulate product sales in e-health applications. Examples include incorporating features like gamification and telepresence into e-health applications. Such measures can increase the interest of diverse age groups in e-health and strengthen the

patient-physician relationship by fostering a heightened sense of reality for the patient. Currently, a significant number of e-health initiatives are either under development or in the implementation phase⁵⁵ .

Conclusion

The implementation of e-health applications in primary care settings presents significant challenges. However, expanding the body of evidence-based knowledge concerning the barriers and facilitators influencing the adoption of e-health practices is crucial. Such knowledge can contribute to the widespread acceptance and utilization of this innovative healthcare initiative, thereby advancing public health objectives and fostering commercially successful, cost-effective service models. Major barriers identified include concerns related to cost, privacy, security, and the absence of universally accepted standards for e-health practices. Conversely, stakeholder engagement, robust implementation planning, availability of comprehensive training, and reliable support systems are viewed as facilitators. Scientific evidence will serve as the foundation for addressing all these factors. To overcome these challenges, it is essential to develop context-specific strategies tailored to the different stages of the implementation process.

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