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Advancing Healthcare Communication Through Information and Communication Technologies: A Focus on Marketing and Patient Care

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Abstract:

The adoption of modern ICT technologies in healthcare has become indispensable in today's world. A key aspect is reducing patient service costs through effective interactive communication supported by ICT tools, such as smartphone applications. Interactive communication is increasingly essential for the marketing strategies of healthcare providers, patients, and mobile app developers.

This article aims to examine the implementation of new information and communication technologies in healthcare services, focusing on their contribution to enhancing communication between patients and doctors in the treatment process. This objective holds significant importance for the healthcare sector, as well as for advancing management theory and relationship marketing. The evolution of the healthcare sector necessitates comprehensive research to strengthen theoretical foundations and improve practical solutions, particularly in marketing communication. The findings of the diagnostic survey highlight the need for further in-depth analysis, as the successful integration of ICT depends on the scope and pace of changes within the healthcare system.

Keywords: information and communications technology, healthcare sector, marketing communication.

JEL Classification: I15, L86, M31.

Introduction

In the digital age, Information and Communication Technology (ICT) has transformed nearly every industry, including healthcare. With its ability to streamline processes, bridge gaps, and enhance interactions, ICT plays a pivotal role in advancing healthcare communication. This essay explores how ICT enhances healthcare marketing and patient care, examining its tools, challenges, and potential to revolutionize the industry.

Effective communication is fundamental to healthcare. It ensures that patients, providers, and stakeholders remain informed and engaged. ICT facilitates this by enabling seamless information exchange through various digital platforms and tools. From electronic health records (EHRs) to telemedicine, ICT tools enhance access to healthcare services, improve decision-making, and foster collaboration.

The World Health Organization (WHO) has defined digital health (or e-health) as the use of digital technologies in health-related activities. This term encompasses a wide range of technologies, including mobile health (mHealth), telemedicine, telehealth, sensor-based monitoring, digital health games, and health information technology (WHO, 2019; European Commission, 2012; Lupton, 2014). Digital ICT tools can strengthen the healthcare system by improving the efficiency of care in healthcare facilities, increasing adherence to clinical guidelines (Keasberry et al., 2017), providing opportunities to support clinical practice (Shojania et al., 2009), and fostering the development of patient-centered care (Sittig & Singh, 2010).

Scandinavian countries (such as Finland and Sweden) have ambitious goals to enhance digitalization in healthcare; however, the perspective of the end users (patients and specialists) requires further attention (Allvin et al., 2020; Hyppönen et al., 2017; Lundgren et al., 2020).

Health Information Technology (HIT) technologies, a subset of ICT, further enhance the quality and safety of healthcare by supporting various aspects of patient management and medical processes. For instance, Computerized Physician Order Entry (CPOE) systems significantly reduce treatment errors, though their integration with Clinical Decision Support (CDS) systems may present limitations. CDS systems streamline processes through automation, reminders, and predictive clinical outcomes. Additionally, technologies such as barcode medication administration and automated dispensing systems are particularly effective in reducing errors, especially in laboratory environments and intensive care units. Patient data management systems improve the quality of care and reduce patient waiting times, while electronic medical records (EMRs) ensure comprehensive data documentation and facilitate policy development.

Telemedicine, encompassing virtual consultations and telemonitoring, enhances healthcare accessibility regardless of geographic location and improves treatment efficiency, particularly in critical scenarios. Nevertheless, its adoption is often hindered by infrastructural limitations. Similarly, patient portals strengthen communication between patients and healthcare providers while reducing administrative burdens, though they introduce potential data security concerns. Despite the significant benefits offered by these tools, challenges such as system integration, data security, and the need for robust infrastructure remain critical to their successful implementation (Annamalai et al., 2023).

In marketing, ICT allows healthcare organizations to reach broader audiences and tailor their messaging. Websites, social media, and email campaigns enable institutions to educate the public, promote services, and build trust. For patient care, ICT tools such as patient portals and telehealth applications empower patients to access their health information, schedule appointments, and communicate with healthcare professionals in real-time.

One argument for the implementation of modern technologies in healthcare is the need to collect patient information, exchange knowledge between service relationship parties, and educate patients. The use of ICT enables the reduction of medical service costs, which should be considered one of the main reasons for its broader application than is currently the case (Andreassen, 2012). This issue appears especially relevant to EU residents and countries such as Poland, where there is a continuous increase in the unit cost of patient care due to low reimbursement rates from the National Health Fund (NFZ), coupled with a steadily growing post-productive population and increasing life expectancy. These demographic processes necessitate support, thus requiring expanded healthcare in both quantitative and qualitative terms.

The issue of implementing modern technologies in healthcare poses a challenge for healthcare managers, as well as for mobile app developers. Therefore, diagnosing the use of new communication technologies in the broadly understood healthcare sector from various perspectives appears to be an important concern. A key challenge for public healthcare, in the context of the electronic flow of medical documentation, is ensuring patient data security. According to specialists, IT solutions provide much greater security than traditional cards and archives. Patients' personal and medical data are protected by appropriate safeguards, and backups are also available (Czerska, 2020).

The main goal of the paper is to diagnose the implementation of new information and communication technologies by attempting to determine whether they contribute to improving communication between patients and doctors in the treatment process. Achieving this goal seems important for the healthcare sector, as well as for management theory and relationship marketing. Another objective is to outline the direction of changes in the marketing communication of service providers and mobile app developers, so that the perspectives of the discussed phenomena can be identified.

1. Literature Review

The development of information and communication technologies (ICT) has transformed virtually every aspect of social life (Rattle, 2010), from business transactions and lifestyle to the economy. As a result, sectors such as e-economy, e-education, and e-health are emerging and deserve attention (Çilan et al., 2010).

The changes brought about by the ICT revolution spark discussions in areas related to health and the flow of information, which enable the learning process for organizations and societies. United Nations (UN) estimates suggest that by 2053, over 9 billion people will live on Earth. This will be due to improvements in the quality of medical care, specifically technological advancements in healthcare, more effective disease control, and global economic development (Collins, 2008). Moreover, the growing burden on state budgets from healthcare costs (Gartner, 2009) will pose challenges even for the wealthiest nations (Roper et al., 2011).

Information and communication technology can contribute to improving and reducing expenditures on healthcare systems, but much will depend on the scope of its implementation and the costs borne by the parties involved in the service relationship, namely healthcare service providers and mobile application developers.

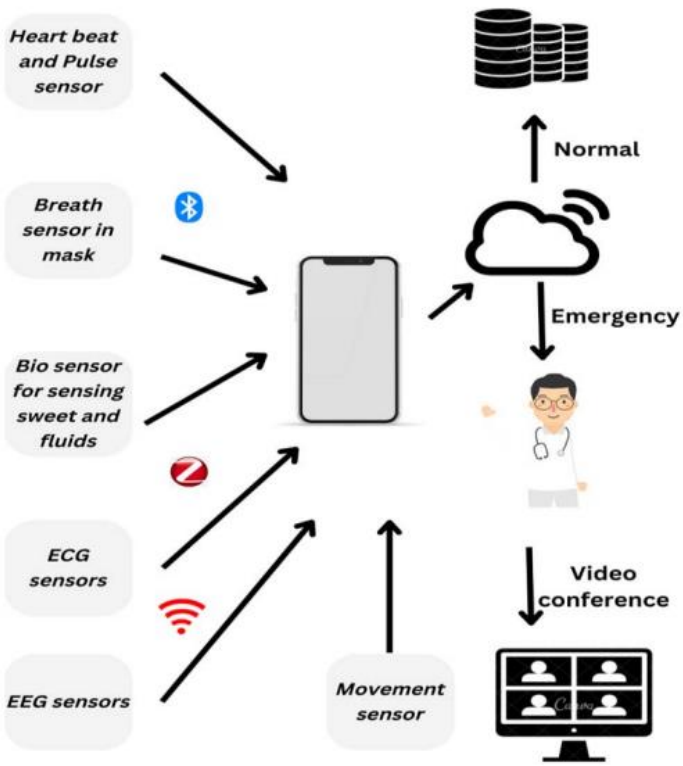
Thus, it becomes increasingly relevant to seek ways to reduce even a portion of the costs generated by healthcare systems. Ueki et al. (2009) indicate that healthcare services delivered through ICT applications can effectively improve patients' health by motivating them to follow medical recommendations. ICT solutions in healthcare, therefore, help meet the requirements for long-term care at patients' homes, as well as in underserved populations and remote areas, at significantly lower costs compared to hospitalization in highly specialized medical facilities (Huh et al., 2013).

Given this, it can be assumed that the use of smartphones in healthcare should develop towards remote access to care and medical assistance, as well as the ability to collect data about one's own body and health. This would facilitate better monitoring and regulation of medication compliance (de Kare-Silver, 2011).

Figure 1 illustrates a real-time health monitoring environment that utilizes mobile (M) technology, supported by a network of sensors and external device connections. The system comprises several components working together to facilitate efficient health monitoring and rapid response. The environment includes various sensors that monitor vital signs. A heartbeat and pulse sensor collects data on heart rate and pulse, transmitting the information to a mobile phone. A breath sensor, embedded in a mask, monitors the user's respiratory rate and quality, communicating with the device via Bluetooth. Additionally, a biosensor detects bodily fluids and glucose levels, using a Zigbee connection to transmit the data. Furthermore, ECG and EEG sensors track electrical signals related to heart and brain activity, relaying the information through a Wi-Fi connection. A movement sensor is also integrated into the system, analysing the user's movements to detect falls or changes in mobility. All sensor data is transmitted to a mobile phone, which acts as the central processing and forwarding unit. This data is then sent to the cloud for further analysis. Based on the results of this analysis, the system classifies the user's condition as either "normal" or "emergency." In the case of an emergency, the system alerts a doctor to ensure a swift response. It also supports video conferencing, enabling the user to consult with medical professionals for accurate diagnostics and recommendations.

This environment serves as an example of an ample healthcare system that combines IoT (Internet of Things) technologies and cloud analytics. It facilitates the rapid detection of health issues, enhances communication between patients and healthcare providers, and improves access to remote medical care.

Figure 1. Mobile health environment



Source: Annamalai et al. (2023)

Another significant manifestation of the use of digital technology in healthcare is the increasingly widespread idea of a biometric society in highly developed countries, which serves as an alternative to the concept of a chip-embedded society. In a biometric society, medical services will be managed efficiently without the costly and vulnerable "paper" health cards. After biometric identification, a patient will be able to check their health status anytime and anywhere. Naturally, this will be possible with the support of mobile (electronic) biometric identification systems (Bromba, 2009). However, the issue of data security arises in the context of the digitization and development of electronic medical services. This development brings new risks related to breaches of confidentiality, integrity, and availability of information. This is partly due to the mass-scale use of customer-patient profiling, the result of which is the assessment of individuals and their behaviour. Profiling can be understood in two ways. First, it is the process of extracting information about an individual from data sets and combining them through profiles. Second, profiling involves using the collected information to make certain decisions about the profiled individual. The distinguishing element between these two definitions is the decision-making process, which imposes obligations on the medical profiling entity, regulated by the GDPR (Niezgódka, 2018).

These areas may open up opportunities to improve information flow, triggering processes that benefit healthcare institutions. These institutions gain up-to-date knowledge and the ability to respond, which significantly supports the treatment process and allows patients to engage in consciously building knowledge about their health condition.

Technological progress has also led to the generation of increasingly large amounts of data, to the point where they have become unmanageable by currently available technologies. This has led to the emergence of the term big data, which describes data that is vast and difficult to control. Defining the scope of data referred to as big data (BD) presents certain difficulties, as the concept has evolved over the years and is not uniformly understood. Big data includes such a vast and complex range of information that it cannot be processed using traditional models. According to Douglas Laney's definition, big data consists of large volumes of data generated at an extremely rapid pace, primarily from unstructured sources such as web clickstreams, social networks (Facebook, Instagram, Messenger, TikTok, Twitter), blogs, industrial camera recordings, call centers, and information from various sensors, GPS devices, smartphones, and identification and monitoring systems. As reported by Gartner Inc. (Gartner, 2012), big data is characterized by its significant volume, wide spectrum, and vast amounts, ranging from thousands to hundreds of millions of entries, with no defined maximum area for analysis.

Nicola-Gavrilă & Dincă (2023) explore the interdisciplinary integration of artificial intelligence technologies and psychology, with a particular focus on how big data analytics is transforming psychological research and practice. Big data analytics has not only enhanced the scalability of psychological studies but also uncovered patterns and insights that were previously inaccessible, enabling a deeper understanding of human behavior and cognitive processes. In healthcare, there is a challenge not only with the surplus of data but also with effective funding models. Expenditures and outcomes are not measured in the same units, and beyond financial gains, there are social benefits to consider. This benefit is understood as improving the health of the population under care (Rudawska, 2005). This creates opportunities for commercialization and the introduction of marketing activities that can be promoted by healthcare providers or mobile app developers.

Existing legal regulations at the national level, in countries like Poland, significantly limit mass communication methods in healthcare marketing. However, they favour communication tools developed for relationship marketing. The relationship marketing paradigm advocates for opening communication channels between businesses and understanding their target audience in an individualized manner. This increases the importance of post-sale activities and dialogue with identified clients, who can no longer remain anonymous buyers or consumers (Kotler et al., 2002). Such a process, however, necessitates that both parties in the service relationship engage in informative and educational activities to raise awareness of the benefits of these solutions for patients or app users.

Therefore, relationship marketing in the healthcare sector should conceptualize the market as "a network of interactions between participants" (Rudawska, 2006). Janoś-Kresło and Dąbrowska (2006) emphasize that the increasingly competitive environment in which service companies operate necessitates not only the transmission of information to the market but also the reception of signals from it. This requires engaging in an interactive dialogue with both current and potential market participants. Such dialogue often manifests in the form of user opinions and feedback regarding mobile applications, enabling two-way communication that enhances the understanding of consumer needs and facilitates the tailoring of service offerings.

In this context, direct and close contact with consumers – patients - is important to the success of healthcare services. Mobile applications present a unique opportunity to achieve this level of interaction. Reviews posted by patients on websites or references regarding mobile applications become critical resources for guiding development within the healthcare sector. Accurately identifying the preferences and expectations of service recipients should form the foundation of business strategies, including marketing strategies (Dąbrowska & Janoś-Kresło, 2006). This becomes especially significant in light of recent changes in the healthcare sector and the challenge of adapting specific relationship marketing tools. The unique nature of healthcare services demands a marketing approach centered on communication with patients (Urbanowska-Sojkin & Sojkin, 2000).

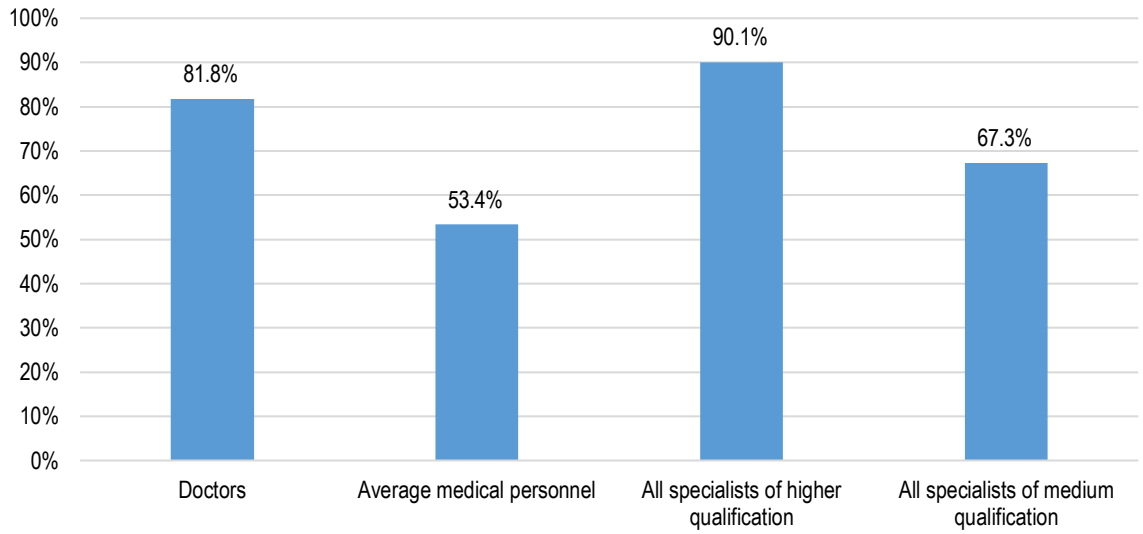
In this regard, relationship marketing in healthcare prioritizes interpersonal relationships, underscoring the importance of establishing a partnership-based, balanced arrangement between the parties. A system that fosters cooperation and mutual understanding is essential for achieving lasting marketing equilibrium (Dobska, 2006).

2. Research Methodology

Modern societies are becoming increasingly dependent on information and communication technologies, and the healthcare sector is no exception. Although recent years have seen the publication of studies and analyses on the use of new technologies (particularly mobile applications) in healthcare, there is still a shortage of diagnoses regarding the implementation of new information and communication technologies in healthcare or attempts to outline the direction of marketing communication changes among healthcare providers and mobile application developers. These gaps prompted the author to conduct their own research in this area.

In the diagnostic survey conducted, 172 respondents participated. The largest percentage of respondents - nearly half (48.3%) - were rural residents. The remaining respondents were primarily from small and medium-sized towns. Most respondents (53.5%) had a high school education, while 45.9% had completed higher education. The modern workplace increasingly requires the use of computer technologies, which is reflected across various professional groups. The highest percentage applies to specialists with higher qualifications (90.1%), while the lowest pertains to average medical personnel (53.4%). Doctors (81.8%) and specialists with medium qualifications (67.3%) occupy intermediate positions. The results are shown in Figure 1.

Figure 1. Percentage of specialists using computer equipment at work

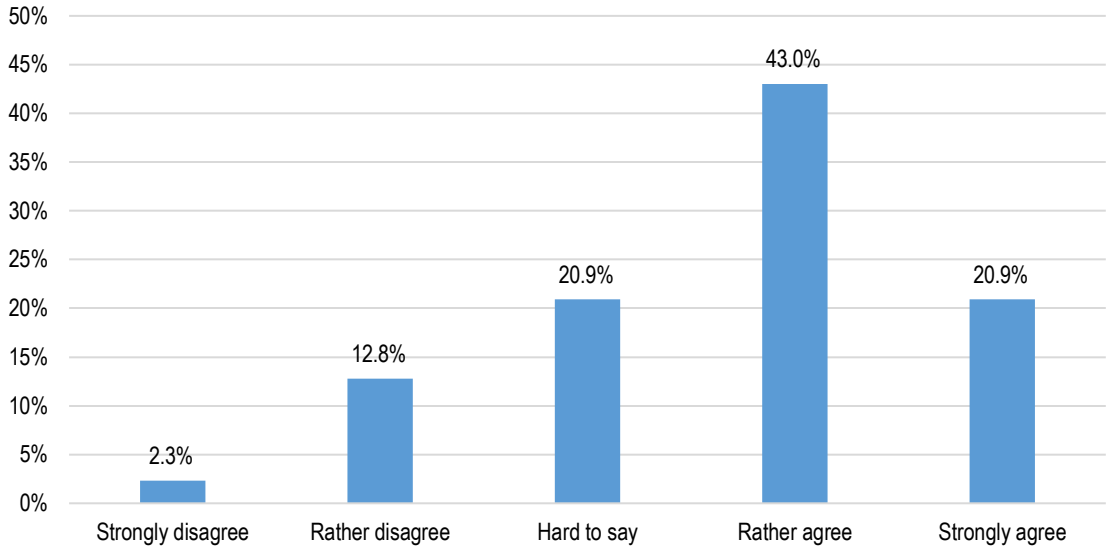


Source: Kolennikova (2022)

The key question of this research explored whether mobile applications enhance patient-doctor communication during the treatment process. The majority of respondents answered affirmatively, with 43% selecting "rather yes" and 20.9% selecting "definitely yes." In contrast, 15.1% expressed disagreement, divided into 12.8% "rather no" and 2.3% "definitely no." Notably, 20.9% of respondents were uncertain and unable to provide a definitive answer. Patient-doctor communication is often characterized by a significant asymmetry of knowledge regarding health-related matters. Health monitoring applications, which collect critical information (big data), can address this asymmetry by improving the flow of information. Such applications are particularly valuable in cases where patients face challenges in communicating medical facts, whether due to low health awareness or other barriers. By recording essential data, these tools can help in supporting communication within the treatment process.

The perception of mobile applications enhancing patient-doctor communication during treatment is generally positive. Many believe that these apps improve communication by providing easy access to information, allowing for quicker updates, and facilitating more frequent interactions. Patients can track their progress, ask questions, and receive advice, while doctors can monitor treatment adherence and offer timely feedback. However, some concerns exist about privacy, data security, and the potential for over-reliance on technology, which may affect the personal connection in doctor-patient interactions. The findings are illustrated in Figure 2.

Figure 2. Perceptions of whether mobile applications enhance patient-doctor communication during the treatment process



Source: Own study.

The data presented in Table 1 examines respondents' beliefs about whether mobile applications used in the treatment process contribute to improving communication between patients and doctors, categorized by place of residence (rural vs. urban). The data indicates a notable difference in perceptions between urban and rural residents. A higher percentage of urban respondents (71.6%) believe that mobile applications enhance communication, compared to rural respondents (40.3%).

Table 1. Patient-doctor communication in the treatment process using mobile applications by place of residence

Q: Do you believe that mobile applications used in the treatment process contribute to improving communication between patients and doctors during the treatment process?	Place of residence		Overall
	Country	City	
Count	37	25	62
No	59,7%	40,3%	100,0%
Place of residence in %	**44,6%**	**28,4%**	36,3%
Overall %	21,6%	14,6%	36,3%
Count	46	63	109
Yes	42,2%	57,8%	100,0%
Place of residence in %	**55,4%**	**71,6%**	63,7%
Overall %	26,9%	36,8%	63,7%
Count	83	88	171
Overall responses in %	48,5%	51,5%	100,0%
Place of residence in %	100,0%	100,0%	100,0%
Overall %	48,5%	51,5%	100,0%
Chi-square independence test	Chi^2 = 4,832, df =m1, p = 0,028		

Source: Own study.

The results of the Chi-square test ($Chi^2 = 4.832$, $p = 0.028$) indicate a statistically significant association between place of residence and the belief that mobile applications improve communication in the treatment process. This suggests that urban residents are more likely to view mobile applications as beneficial tools for enhancing patient-doctor interactions. A plausible explanation for this finding is the greater access to healthcare infrastructure in urban areas, where modern technologies, including mobile applications, are more commonly employed to monitor and manage treatment. Furthermore, the higher levels of digital literacy and mobile device usage among urban populations may contribute to their more favourable attitudes toward the use of such technologies in healthcare settings.

3. Discussion

The effective use of new technologies in the healthcare sector should focus on reducing operational costs, which, in the context of the European and particularly the Polish healthcare sector, seems invaluable. Most healthcare organizations today have implemented big data solutions, including programs that allow for digital patient data management, such as online registration, collecting medical history, prescriptions, therapies, and remote health monitoring. The widespread use of these tools, as well as mobile ICT solutions, including apps, could significantly reduce the per-patient cost of care. Health data would flow into the system seamlessly, at any time and place, without requiring medical personnel's time. This would lead to more effective communication between healthcare facilities and patients, improve the exchange of information, and reduce the number of visits and hospitalizations, which would alleviate the financial and organizational burden on the healthcare system.

Moreover, thanks to the use of digital mobile tools, patients could be treated outside of medical facilities, and medication intake could be monitored, ensuring continuity in pharmacological treatment. This could improve treatment effectiveness and, in turn, the efficiency of the healthcare system.

The marketing dimension of interactive communication is also important for the development of relationship marketing for healthcare service providers and mobile app developers. Implementing mobile tools requires coordination of marketing efforts and collaboration among healthcare staff, patients, and IT specialists. A key requirement for introducing applications as tools to support treatment or preventive health measures in the healthcare sector is not only their financial attractiveness but also the trust of the service interaction parties in the technology and its conscious implementation. Another area for improvement should be coordinated consumer education and ensuring standards and norms for the use of ICT tools in the form of mobile applications, which are crucial to the quality of life in this essential sphere of human activity.

The limitations of using mobile devices in healthcare services paradoxically stem from their popularity. Combined with the relatively low development requirements for basic mobile software, this has led to the creation of applications that, despite their professional appearance, are not backed by adequate expert knowledge (Masters, 2014). Among the medical applications available on distribution platforms, only a small percentage have the CE mark, which in Europe is one of the requirements for approving medical products for use (Shuren, 2014; Popat et al., 2013). Therefore, the marketing communication strategies of app developers should work more closely with healthcare representatives to alleviate concerns, worries, and the lack of trust in technology. Developing IT tools aimed at reducing healthcare costs in Poland seems to be a justified and desirable solution for efficient management of the entire healthcare system. This also necessitates conducting marketing research in this area to develop effective models for implementing IT solutions in healthcare (Czerska, 2020).

To ensure the effectiveness of healthcare services, medical personnel must have up-to-date competencies in using digital tools in their work. At the same time, critical studies on the use of ICT tools have reminded us that concerns such as the digital divide causing inequalities, issues with patient integrity and safety, and the work environment for healthcare staff must be addressed from the perspective of digital health competencies (Erlingsdóttir & Sandberg, 2016; Lupton, 2014). Research confirms (Wass et al., 2017; Zanaboni & Fagerlund, 2020) that most patients accept digital tools during the treatment process, and digital health services have been shown to positively affect various aspects of patient well-being, such as medication adherence (Jeminiwa et al., 2019) and healthy behaviours (Posadzki et al., 2016).

The integration of health-related IT products, which some end-users (patients) already use, will, in the long run, reduce healthcare costs. However, it is also important to consider that slow ICT adoption in healthcare in the US has been attributed to the high cost of assets, which reflects the current reality of many European countries, including Poland. Additionally, the need for procedures and the training of numerous employees may lead to slow and low-paced implementation of ICT innovations among medical staff. Boonstra & Broekhuis (2010) identified a subset of important and interrelated factors that hinder innovation and cause resistance among doctors themselves. These include financial, technical, time, psychological, social, legal, organizational, and change-process barriers.

Conclusions

The use of ICT in the healthcare sector can lead to improved efficiency and create opportunities to build value for patients, which is particularly significant in the context of interactive communication in relationship marketing. The ongoing technological development in healthcare should be supported by tools such as interactive communication. However, this requires educational and informational efforts directed at healthcare workers, their clients, and app developers. Respondents indicated that urban residents are more convinced and more frequently use mobile applications in communication with doctors compared to rural residents.

Thus, further development of the healthcare sector requires in-depth research that will strengthen management theory and provide a foundation for improving practical solutions. The results of the diagnostic survey call for further analysis, especially since the implementation of ICT will depend on the extent of changes within the healthcare sector. These efforts are important not only for patients but also for improving healthcare organizations themselves. Effective healthcare management should focus on reducing operational costs, which, in the context of the Polish healthcare system, is particularly critical. Most healthcare facilities in Poland have already implemented programs that enable digital patient data management, such as online registration, collecting medical histories, prescribing medications and therapies, and remote health monitoring.

Patient-centered care through ICT includes recognizing the patient's willingness to use digital solutions for monitoring their health, assessing the patient's digital capabilities, evaluating the delivery of equitable services, and integrating patient needs into digital health services. It is widely accepted that a patient's readiness to adopt digital health tools determines whether a professional can utilize these digital services during care. The willingness of patients to use ICT tools often depends on their subjective perception of their digital competencies. Specialists note that a patient's age and digital readiness influence whether they can effectively use digital health services. Researchers as Haluza & Jungwirth (2016) observed that, in general, older age is associated with poorer digital skills, as younger patients are more accustomed to using various digital devices, which enhances their abilities.

The implementation of such mobile tools, therefore, requires coordination and cooperation among all participants in the service process, including medical staff, patients, ICT specialists, and managers.

Credit Authorship Contribution Statement

Jopkiewicz, Sz., as the sole author, was responsible for all aspects of the study, including conceptualization, data collection and analysis, writing, and final revisions of the paper.

Conflict of Interest Statement

The author declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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