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Enhancing Healthcare Productivity through Digitalization and Digital Transformation: A Comparative Case Studies Analysis

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Abstract. *The healthcare sector faces increasing pressure to enhance efficiency and productivity through digital technologies. Long-term gains can be obtained through digital transformation, which optimizes health outcomes while reducing costs and resource waste. Healthcare systems can improve clinical decision-making, operational efficiency, patient safety, emergency response, data management, and the cost-effectiveness of care services by using digital tools.*

Despite the growing interest in digitalization, limited research exists on the comparative effectiveness of different digital initiatives. This study aims to address the gap by analyzing successful implementations, highlighting significant obstacles, and offering practical advice to optimize the healthcare sector. Specifically, it examines the impact of digital healthcare solutions on productivity through four case studies from the American Medical Association's "Future of Health Report". The goal is to identify key enablers, challenges, and policy implications for successful digital adoption.

This paper uses a comparative case studies approach with mixed methods, integrating qualitative thematic analysis and quantitative performance benchmarking.

Findings show that digital tools reduce hospital readmissions, improve disease management, and expand access to care. However, challenges remain, including EHR interoperability issues, reimbursement barriers, and patient engagement. Value-based payment models and AI-driven predictive analytics are essential for financial sustainability.

To maximize digital health's impact, policymakers should prioritize reimbursement reforms, interoperability requirements, and digital literacy programs. Future research should evaluate the long-term effects of digital interventions on patient care and the economy.

Keywords: healthcare productivity, digital transformation, digitalization, telemedicine, electronic health records.

Introduction

Recently, the world has experienced an unprecedented period of innovative fast changes driven by the necessity to adapt to the changing global environment following the outbreak of COVID-19 and various political and social changes. Since COVID-19 was a global medical emergency rather than a localized crisis, healthcare systems around the world faced a major pressure to accelerate digital transformation within a short period of time to slow the spread of the virus. However, this change has had long-term benefits, as the digitalization of healthcare is more than merely pandemic response strategies, improving the efficiency and productivity of medical systems in everyday healthcare operations, contributing to the overall improvement of healthcare delivery.

Providing timely patient care and treating as many patients as possible are key components of productivity in the healthcare industry. Despite its importance, achieving quality healthcare is becoming more and more challenging, due to an aging population, a growing burden of common diseases, and healthcare workforce shortages (VinBrain, 2024). For example, the World Health Organization estimates that there will be a global healthcare workforce shortage of 15 million by 2030, mostly driven by burnout, retirements, and rising healthcare demand. The COVID-19

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pandemic only made these problems worse (Horner et al., 2022). To tackle these issues, digitalization plays an important role in addressing these challenges by automating different medical tasks, making processes more efficient, and improving overall healthcare operations.

Digitalization in healthcare, often referred to as "digital health", means using information and communication technologies (ICTs) to improve prevention, diagnosis, treatment, monitoring, and management of health-related conditions. It also helps to track and regulate lifestyle factors influencing overall health (Mumtaz et al., 2023).

Before discussing technological innovation within the healthcare system, it is important to understand the differences between *digitization*, *digitalization*, and *digital transformation* – terms that are frequently used synonymously, but refer to different phases of technological adoption. According to Kraus et al. (2022), digitization represents the process of converting analog information into digital form, such as scanning medical documents to create digital files. Digitalization, on the other hand, refers to the use of technology to improve or automate existing processes, such as the implementation of electronic health records (EHRs). Digital transformation goes further to a broader and more strategic shift, involving the rethinking and redesigning system processes, culture and patient experiences using advanced technologies, such as artificial intelligence (AI)-driven diagnostics or telemedicine. According to a study conducted in 2022, 44% of respondents trust AI for diagnosis and treatment in healthcare (Stewart, 2023).

Paul et al. (2023) view digitalization as a necessary step to improve healthcare system productivity. By using broad, equitable, and integrated digital models, healthcare systems can advance digital transformation and improve patient care. In the context of treatment, digitalization has strengthened clinical decision support, disease surveillance, and supply chain monitoring, thereby enhancing patient safety, operational efficiency, and cost-effectiveness. Moreover, it has increased healthcare systems' capacity to respond effectively to emergencies such as pandemics and natural disasters. From a data management perspective, digitalization makes it easier to transform raw data into actionable insights through the integration of AI, blockchain, and cloud computing. This allows for more effective data processing, interoperability, and well-informed decision-making in healthcare systems. Furthermore, by addressing inequalities related to geography, financial constraints, language obstacles, and unwillingness to seek care, digital transformation plays a critical role in advancing healthcare equity. It also reduces the unequal distribution of medical facilities, as is seen in India, where 75% of physicians work in cities even though 69% of people live in rural areas. These marginalized areas can now obtain remote consultations, medical care, and necessary supplies thanks to technologies like telemedicine, artificial intelligence, and drone delivery (Gupta et al., 2023).

While digital transformation has the potential to substantially improve healthcare, it is important to acknowledge the challenges associated with putting these technologies into practice. One of the biggest obstacles is getting both patients and healthcare professionals to actually adopt these innovations, since they are the primary end-users of these technological implementations. In this regard, Davis (1989) developed the Technology Acceptance Model (TAM), which suggests that an individual's acceptance of a new technology is influenced by two key factors: perceived usefulness and perceived ease of use. Consequently, for any newly implemented technology in the healthcare system to be effectively accepted, it must be viewed as beneficial and easy to use by both healthcare professionals and patients. In addition to technology adoption, the healthcare sector must also address challenges such as data privacy, internet access, digital literacy, infrastructure limitations, interoperability, regulatory compliance, and reimbursement (Mumtaz et al., 2023).

Therefore, the potential of digital transformation to improve the healthcare system's productivity, efficiency and organization makes it more than merely a trend. A productive healthcare system can deliver faster and more effective treatments, resulting in better patient outcomes and shorter hospital stays. It also helps to cut down operational and administrative costs, making healthcare more affordable and accessible, particularly for people living in underserved areas.

Despite the growing interest in digitalization and its effects on productivity, there is limited research on how efficient different digital tools work across healthcare systems. This study aims to fill this gap by conducting a comparative analysis of case studies showing successful implementations and their impact on accessibility, efficiency, and productivity of the respective healthcare systems. This approach provides comprehensive information on the metrics and key performance indicators used to assess the effectiveness of these digital initiatives, as well as an insightful perspective on the difficulties and achievements encountered by organizations when implementing digital technologies. The findings can serve as a guide for other healthcare systems seeking to enhance accessibility and efficiency through digitalization.

This paper is structured as follows: Section 2 reviews the literature on healthcare digitalization and sector productivity, Section 3 describes the methodology for the comparative analysis, Section 4 presents key findings from individual cases' presentation and the comparative analysis. Finally, Section 5 discusses conclusions and their implications for future research and policy.

Literature review

Given that health systems must deal with high demand, but limited resources to provide essential medical services to the population, the healthcare sector, more than most others, must continuously work to increase productivity. This is motivated by its primary goal to deliver the best possible health outcomes for patients while ensuring that resources are used as efficiently as possible to benefit as many as many patients as possible. In other words, the goal is to use the limited funds efficiently to promote health and deliver care.

Often, productivity and efficiency are used as interrelated concepts and they are, indeed: efficiency compares current performance to the best possible outcome, while productivity measures how much is produced with the least effort or resources (Androutsou et al., 2022). In healthcare, productivity is strongly linked to cost efficiency, which involves maximizing value for money by selecting the optimal mix of services within budget constraints (Thomas & Chalkidou, 2016). It also includes workflow optimization, which is often achieved by automating time-consuming manual processes (Zayas-Cabán et al., 2022). Additionally, healthcare productivity is often measured by patient outcomes (i.e., quality, patient satisfaction, physical health improvements), which reflect the effectiveness of care (Liu et al., 2014). However, while productivity is crucial in a healthcare system, its measurement can be a complex and challenging task. It is difficult to determine if improvements – whether digital, technological, or otherwise – actually increase overall productivity by making the best use of both human and material resources within a medical facility.

There is no single best method for measuring productivity in healthcare because the approach depends on the specific aspect being evaluated. If we focus on quantitative indicators, we might examine efficiency metrics such as bed occupancy rate, patient throughput (Hillier et al., 2009), average length of stay, and resource utilization (Hussey et al., 2009). Additionally, financial metrics like cost per patient, revenue per physician, and return on investment help assess economic performance (Schreyer & Martin, 2017). However, efficiency alone is not enough to measure healthcare productivity; quality of care indicators like patient outcomes, patient satisfaction, and

medical error rates must also be included (Busse et al., 2019). Moreover, digital and technological advancements play a key role, with factors such as EHR utilization, telemedicine adoption, and automation efficiency contributing to overall productivity (Productivity Commission, 2024). The systematic review of Hussey et al. (2009), which identified 265 distinct healthcare efficiency measures in peer-reviewed literature as of 2009, reflects the huge variety of methods used to quantify healthcare productivity. This highlights how difficult it is to define and assess productivity in the healthcare sector. Among the various methods used to measure healthcare productivity, the most widely applied methods are Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA). Both of them concentrate on assessing how effectively medical units transform inputs (e.g., medications) into outputs (e.g., number of treated patients), but DEA is frequently used alongside the Malmquist Productivity Index (MPI) to track efficiency changes over time.

Measuring productivity in healthcare also involves looking at three different levels: unit level (e.g., a hospital department), organizational level (e.g., a single hospital or a network of hospitals), and system level (e.g., a national or regional healthcare system). Each level has specific productivity indicators and distinct challenges in measurement. For the best possible healthcare results, however, a balance between cost efficiency and quality of care must be established at all levels (Kämäräinen et al., 2016).

As previously mentioned, there is no doubt that digitalization has the ability to increase healthcare productivity by automating and optimizing processes. Thus, workflows are made simpler and administrative burdens are reduced. Furthermore, in an era where patients are becoming health service consumers, who seek and demand personalized, fast, and convenient healthcare experiences, the importance of digitalizing healthcare is even greater. Telemedicine expands access to medical services by facilitating remote care, reducing the pressure on healthcare facilities, and addressing issues associated with socio-economic changes, such as increasing healthcare demand and an aging population (Stoumpos et al., 2023). Similar to telemedicine, remote patient monitoring enhances patient care and treatment effectiveness by digitally transmitting real-time health data (De Farias et al., 2019). Usually, digitally collected health data, along with manually entered information, is stored in the patient's electronic health record (EHR) – a digital repository that documents their complete medical history. Predictive analytics and AI play are essential in identifying health trends and detecting early disease outbreaks (Phillips et al., 2022), which improves resource allocation and crisis response. According to Dixon et al. (2024) AI-driven predictive analysis can also be used as a decision support to develop personalized treatment plans by integrating data from various sources, including medical history and genetic information. This would increase patient satisfaction and treatment efficiency. The Hospital Network in Connecticut successfully reduced hospital stay lengths by an average of 0.67 days per patient by integrating patient outcome predictions into day-to-day operations. This led to significant cost savings, ranging from $55 million to $72 million annually (Na et al., 2023).

Blockchain technology and the Internet of Things (IoT) also make it easier to maintain medical inventories and avoid shortages, ensuring that essential medicines are available when needed (Nanda et al., 2023). Real-time data sharing is made possible by integrated health information systems, which enhances coordination among healthcare providers. Furthermore, medical errors are reduced by AI-powered decision-support systems, resulting in more accurate diagnoses and treatments (Chen et al., 2023).

By leveraging these advancements, digitalization ensures that healthcare systems operate more efficiently, cost-effectively, and equitably, ultimately improving patient care and public health outcomes.

Methodology

This paper conducts a comparative analysis of four case studies selected from the *Future of Health Report* published by American Medical Association (AMA) in 2025 (American Medical Association, 2025). The primary reason for selecting case studies from the AMA report is that the AMA is a highly respected and representative authority in healthcare research. Their reports provide reliable, well-documented case studies that reflect real-world applications across a range of healthcare settings (e.g., hospitals, clinics, specialized medical units). This diversity allows for meaningful comparisons across different environments. Furthermore, each case study includes quantifiable data, enabling a performance benchmarking analysis.

By definition, comparative case studies analysis is a qualitative research method that systematically examines two or more real-world cases with shared characteristics but also notable differences (Goodrick, 2014). To obtain valuable insights, a mixed-method approach was employed, integrating quantitative performance benchmarking with qualitative thematic analysis. The study also aims to pinpoint key policy barriers and enablers of digital transformation across healthcare systems.

To ensure a balanced comparison, four cases, namely Atrium Health, Concert Health, Omada Health, and Oshi Health, were selected from the AMA report based on two key criteria: (1) healthcare level and setting, and (2) type of digital intervention. While the AMA report includes additional case studies, this paper focuses on analyzing only these four selected cases to ensure a diverse representation of healthcare settings and digital interventions. By limiting the number of cases, a more in-depth analysis may be conducted, revealing more robust theoretical and practical insights, rather than a broad, superficial comparison. Including too many case studies could lead to overgeneralization, potentially diluting the study's impact and applicability. These four cases also provide valuable insights into healthcare productivity by offering diverse perspectives on digital transformation, its role in improving efficiency, and its impact on patient outcomes across various settings – the ultimate goal of any healthcare system.

Going back to the primary selection criteria, the first one - healthcare level and setting - is essential for assessing the ways in which digital transformation influences productivity, efficiency, and patient outcomes across different healthcare levels. It also allows for a cross-setting analysis. The second criterion, namely type of digital intervention, enables a deeper examination of which innovations result in the biggest productivity gains. Below, we provide a brief overview of each case, focusing on two key perspectives identified across the studies: digital integration strategy and productivity gains, supported by quantitative data. In addition to this approach, we will also highlight the challenges each case faced in adopting its digital strategy. Finally, we will perform a comparative analysis of the four cases, examining their similarities and differences based on the two key criteria outlined above.

For full reports with comprehensive details, please refer to the AMA report.

Results and discussions

Individual case study presentation

Atrium Health

In the case of Atrium Health, a nonprofit health system and part of Advocate Health, the digital strategy focuses on a hospital-wide transformation that integrates multiple digital solutions. While telehealth allows patients with chronic and acute conditions to have daily virtual visits, remote patient monitoring relies on twice-daily paramedic visits to patients' homes and a monitoring kit

provided by the hospitals that includes pulse oximeters, blood pressure monitors, and tablets. Data-gathered through these monitoring tools is analyzed using AI-driven predictive analytics, in order to improve the quality of care. Additionally, electronic health record (EHR) integration ensures smooth data sharing, with a data-enabled router and Bluetooth are used to connect to the remote devices. This setup ensures interoperability, regardless of whether a patient has Wi-Fi, and allows paramedics to document patient health information directly into the EHR, ensuring real-time visibility for the entire care team.

As a result of these digital interventions, Atrium Health has seen significant increases in productivity. The readmission rate has notably dropped, with fewer than one readmission per patient enrolled in the Atrium Health Hospital - at - Home (AH-HaH) program. When compared to patients receiving treatment in a hospital setting, remote patient outcomes have either stayed the same or improved. Additionally, since its launch, the program has saved approximately 30,000 bed days, which has allowed hospitals to accommodate patients requiring in-person care. In terms of cost efficiency, the program delivers care at 20% lower costs compared to traditional hospital-based treatment, contributing to a strong return on investment. Regarding users' satisfaction, patients rated their experience 13% higher than that of traditional hospital stays, while clinicians appreciated the program's impact on care coordination. Moreover, in terms of health equity, paramedics assess patients' social determinants of health (SDOH) during home visits, ensuring they receive necessary resources like food and housing, regardless of their financial situation. Through this digital transformation, Atrium Health has improved overall patient care, optimized hospital resources, and reduced administrative workload. Obviously, as with any new implementation, the program faces some challenges. Although traditional Medicare and Medicaid compensate Atrium Health for its AH-HaH service, coverage by commercial payers remains inconsistent. Because it can limit the program's growth or accessibility for patients with private insurance, this inconsistency presents a financial barrier.

Concert Health

The second case study looks at the digital strategy implemented by Concert Health, a behavioral health medical group that uses the Collaborative Care Model (CoCM) to integrate behavioral health services into primary care. This patient-centered approach relies on a team of clinicians dedicated to diagnosing and treating common behavioral health conditions, such as depression and anxiety, while providing multiple treatment options. The digital platform offered by Concert Health guarantees interoperability between EHRs and care coordination platforms, allows same-day access to teletherapy, and facilitates real-time communication and information sharing among healthcare professionals. Through this integration, the patient register is optimized for more effective care management and access to patient medical data is improved.

As a result of this digital approach, Concert Health saw a 50% reduction in depression and anxiety symptoms among its patients, and 85% of those who were referred were actively participating in treatment. Financially and operationally, the digital platform reduced care costs, by categorizing billing under primary care services and linking reimbursement to care quality, which resulted in a 1% to 4% positive operating margin. Overall, this digital intervention has expanded mental health access and reduced drop-off rates among the approximately 70,000 individuals served nationwide. 85% of patients are satisfied with Concert Health's digital program, and clinicians appreciate how easily it integrates behavioral health, reducing workload. The program provides assistance to rural clinics and federally recognized health centers, increasing access to underserved communities.

One of the key challenges Concert Health faced was to ensure adequate reimbursement for its services. In order to solve this, the organization made use of specific CMS (Centers for Medicare & Medicaid Services) reimbursement codes which helped physicians overcome common barriers such as prior authorization requirements, service limitations, and specialty copays that are often related to mental healthcare.

Omada Health

The third case study explores Omada Health, a digital care provider that was established in 2011, and provides virtual support to help patients prevent and manage chronic conditions, particularly diabetes, hypertension, and musculoskeletal (MSK) issues. The program's two main goals are to help patients prevent disease by encouraging them to adopt healthier habits that lower their risk and to aid people who have already been diagnosed with chronic diseases to manage and improve their medical condition. Omada Health's platform helps patients achieve these goals, by making it simple for them to browse, interact with their care team, take part in weekly interactive lessons, and join peer support groups. The provider also offers connected health devices that enable real-time data collection and sharing, such as wireless scales, continuous glucose monitors (CGMs), blood glucose meters, and blood pressure monitors. This data is integrated with CommonWell and Carequality – two health information networks that improve care coordination and reduce fragmentation between patients and their primary care physicians.

Omada Health's digital interventions have demonstrated significant health and cost benefits. 48% of patients improved their blood pressure through self-management tools. Employers partnering with Omada reported an average cost savings of $1,000 per employee in the program's first year. The program generated annual gross medical cost savings per member of $1,169 in the Prevention Program, $1,300 in the Diabetes Program after one year, $1,981 in the Hypertension Program, and a 27% reduction in medical expenses for patients in the Musculoskeletal Program. More than 90% of patients were satisfied with Omada Health's personalized, tech-enabled care, while clinicians benefited from reduced administrative tasks. Additionally, the program's culturally sensitive care and behavioral health self-management tools enhanced health equity. Virtual care, data-driven decision-making processes, and seamless provider coordination have all been combined by Omada Health to improve patient outcomes and lower healthcare costs for both patients and medical facilities.

Data exchange and interoperability, more especially sharing health data with primary care physicians while maintaining data privacy, are two challenges probably faced by Omada Health during its digital transformation, even though the report does not specifically list them. Besides this, patient engagement and retention in a virtual healthcare model continue to be default issues to digital transformation. Another obstacle Omada Health had in delivering efficient virtual healthcare was personalizing care by adjusting digital interventions to individual patient needs, including behavioral and lifestyle factors.

Oshi Health

The fourth and final case analyzed in this paper is Oshi Health, a virtual gastrointestinal (GI) clinic that offers digital care to supplement traditional in-person services. Through Oshi platform, patients can make appointments, communicate with their physicians, monitor their symptoms and nutrition, and access educational resources. Moreover, this platform provides them 24/7 access to a multidisciplinary GI care team, including dietitians, behavioral health clinicians, and gastroenterologists, and round-the-clock phone and chat support to help patients stay engaged with their in-person GI care. Moreover, by managing patient inquiries in the electronic medical record

(EMR) and ensuring ongoing visibility into patient treatment, Oshi reduces the administrative workload of primary care physicians and in-person GI teams by providing patient updates and monthly reports. While it does not offer in-person procedures, it ensures smooth integration with local providers for necessary treatments.

As a result of Oshi Health's digital-first strategy, physicians' administrative burdens have decreased, particularly the time spent in EMR. It has also contributed to maintaining high-quality care, while lowering operational costs and increasing revenue. In terms of clinical outcomes, a clinical study conducted by a national payer found that 92% of patients experienced symptom improvement and control through Oshi Health. The platform also showed notable cost savings and reduced healthcare utilization, including $6,724 in GI-related cost savings per patient, $10,292 in overall cost savings per patient, and a 64% decrease in GI-related emergency room visits. With a Net Promoter Score of 80+ and 98% patient satisfaction, Oshi Health's virtual GI clinic offers a very successful patient experience. Clinicians benefit from reduced administrative burden and improved workflow. The hybrid model expands access to rural areas or those with limited access to healthcare, while culturally and geographically tailored dietary and health recommendations promote equity.

The study specifically points out the challenges in implementing this digital approach, identifying issues with traditional reimbursement methods. To overcome this, the business adopted an alternative payment plan that included value-based agreements with payers and bundled payments for different stages of healthcare service. This innovative strategy supports a digital-first, multidisciplinary care model, while facilitating reimbursement while reinforcing

Comparative analysis

Cross-setting comparison

In terms of healthcare level and setting, the case studies focus on different healthcare levels where their digital solutions are implemented. Atrium Health is a system-level organization that seeks to revolutionize inpatient care by replacing hospital stays with home-based treatment. Concert Health, on the other hand, focuses on a clinic-level approach, integrating behavioral health services into primary care, pediatrics, and women's health clinics. Omada Health and Oshi Health, however, carry out digital transformation at the department level, targeting specific domains of healthcare: Omada Health provides chronic care services for diabetes, hypertension, and musculoskeletal conditions, while Oshi Health serves as a specialty-focused digital GI clinic integrated into primary care and existing gastroenterology practices.

When discussing the cross-setting comparison of digital healthcare implementation, we must consider its scalability – the capacity to expand across various healthcare settings, populations, or geographical areas while preserving effectiveness, cost-efficiency, and quality of care. The main barriers to scaling, according to Brown (2023) include outdated systems, resource limitations, interoperability challenges, and data privacy and security. To address these challenges, implementations of digital health should include interoperable solutions that integrate with existing systems, ensure strong data security, and optimize resource utilization. In this regard, Concert Health and Omada Health programs demonstrate high scalability. Because Omada Health's AI-driven chronic disease management depends on cloud-based data systems and automated coaching, it is highly adaptable and easy to expand. Similarly, Concert Health's Collaborative Care Model can be quickly and widely adopted because it is designed to be integrated into any primary care setting. Further evidence for this highly scalable type of telehealth intervention is the case of

VitalCare Network, which expanded its patient reach by 60% through its telehealth program (DigitalDefynd, 2024).

On the other hand, Oshi Health's digital strategy offers medium-to-high scalability, because it can be potentially expanded to more health plans but it still has issues with insurance acceptance. According to the AMA report, 75% of the U.S. population is covered by Oshi Health, which has developed the first true value-based contracts with different health insurers and employers. However, because regional healthcare laws and policies differ, this type of payment arrangement may not be suitable everywhere. For digital health solutions to be widely adopted and expanded, especially in low- and middle-income nations, insurance companies' support is essential (Okuzu et al., 2022). In contrast, Atrium Health's scalability is low-to-medium, as its Hospital-at-Home program depends on CMS waivers – a special approval from Medicare and Medicaid that allows providers to avoid certain regulations to test new care models. This program has limited growth potential than the other models, because it requires substantial hospital and regulatory approvals before it can be expanded. A similar problem occurred during the COVID-19 pandemic, when CMS waivers expanded telehealth coverage for Medicare beneficiaries. This enabled rapid scalability, but the expiration of these waivers raises concerns about their long-term sustainability without implementing permanent policy changes (Goldman, 2025).

Comparison based on type of digital intervention

Following the cross-setting analysis, it is essential to examine the type of digital intervention used in each case study and how these approaches influenced productivity gains. By comparing these interventions, we can assess which models deliver the greatest productivity improvements and identify key similarities and differences.

All four case studies highlight the importance of seamless health data integration, whether through remote monitoring devices or direct physician input into EHRs, to improve communication between physicians and patients as well as between care teams. They also include virtual consultations with specialists from various medical departments. Atrium Health and Omada Health further provide specialized medical equipment for remote patient monitoring (RPM), which improves the digital interventions. In order to alleviate inequalities in Internet and Wi-Fi access, Atrium Health has made investments in wearable technology that connect directly to a data-enabled router via Bluetooth, ensuring uninterrupted data transmission. Unlike the other case studies, Atrium Health offers a more intensive level of care by combining its virtual patient monitoring with in-home visits from nurses or paramedics. Additionally, with the exception of Omada Health, all the other healthcare providers utilize a hybrid care model, which means that their digital interventions enhance in-person visits, rather than replace them. Instead of completely switching to virtual-only care, these models primarily seek to support patients in between hospital visits by increasing health outcomes and care adherence. A comparable model that enables patients to manage their health outside of clinic visits and proved its efficacy is BlueStar, a digital tool for diabetes patients and one of the first digital solutions to receive FDA approval (Mumtaz et al., 2023).

An important aspect to mention when we talk about the different types of digital implementation within the healthcare sector is the digital health reimbursement. Digital health solutions, such as telemedicine or remote patient monitoring, often require insurance approval for widespread adoption. Particularly in the United States, the adoption of remote patient monitoring has been significantly influenced by reimbursement policies from the CMS (Bowman, 2024). Unless this buy-in from insurers (the process in which a healthcare provider tries to convince health insurance companies to cover and reimburse a new digital solution and not only), the patients would

have to pay out-of-pocket for the digital care, making adoption difficult due to specific social and context conditions of each patient. Vaidya (2024) also highlights the importance of a regulatory exemption that allows people with HDHP (high-deductible health plan) insurance to use telehealth services without having to pay in advance. She warns that if this exemption expires, fewer people will seek telemental healthcare, which could make mental health issues worse. In the case studies analyzed in this paper, Atrium Health's program is supported by CMS waivers, but is dependent on regulatory extensions for reimbursement in the future. Concert Health makes use of existing CoCM billing codes, meaning that Medicare and private insurers cover the program. Omada Health was able to build a strong buy-in from employers and insurers, because of the proven cost savings, while Oshi Health still secures full buy-in, since some insurers cover it, but others are hesitant to adopt bundled payment (one fixed payment for the entire course of care) and some patients still have to pay the fee-for-service.

Conclusion

This paper provides a comparative analysis of four case studies to examine the impact of digital healthcare solutions on productivity, efficiency, and patient outcomes. By identifying key similarities, differences, scalability factors, reimbursement challenges, and implementation barriers, this research contributes to the understanding of how digital transformation can be effectively integrated into healthcare systems.

One important finding from the analysis is that all four digital health models place a high priority on minimizing unnecessary hospitalization and encouraging long-term patient engagement, while reducing healthcare system fragmentation. Despite these common goals, significant differences exist in their digital strategies, cost structures, and reimbursement models. Notably, Omada Health's AI-driven approach demonstrates the highest scalability, while Oshi Health's model stands out in cost savings per patient. In contrast, despite its effectiveness, Atrium Health's model faces scalability challenges because of hospital-level regulations. Furthermore, the adoption of digital health is still heavily influenced by reimbursement. While Concert Health benefits from existing Medicare billing codes, Oshi Health encounters the most resistance due to the dynamic nature of bundled payment models. These findings highlight the complex relationship that exists between financial sustainability, digital strategy, and healthcare delivery.

These case studies suggest that when putting a digital transformation strategy into practice, context-dependent challenges could appear. Beyond the need for a robust IT infrastructure capable of supporting digital implementation, key challenges include substantial investments in staff training, ensuring data privacy, and addressing interoperability issues, particularly in multi-hospital integrations. Furthermore, there can be major obstacles due to reimbursement complexities in traditional fee-for-service models, which frequently rely on insurance agreements and employer-based healthcare models. Additionally, implementing a hybrid care model requires seamless coordination between virtual and in-person visits to ensure continuity of care.

Since financial support is a key factor in widespread digital implementation, policymakers should concentrate on financial and reimbursement sustainability by expanding value-based payment models in order to promote successful adoption of digital healthcare. Technology adoption can be promoted by providing financial rewards to healthcare practitioners who use digital solutions. Additionally, ensuring interoperability across digital platforms and effortless health data integration is important for effective care coordination. Data sharing between healthcare systems can be improved using universal standards for EHR integration. Strong governance frameworks must also be established to regulate AI-driven healthcare solutions, ensuring the innovation is

balanced with patient safety and that AI-driven diagnostics and decision-making tools are transparent, explainable, and unbiased. Moreover, equitable access to digital healthcare must also be a priority, with policies aiming to support digital literacy programs, Internet expansion, and subsidized health technologies for vulnerable communities. To increase the usage of technology and reduce inequities, nationwide digital health training programs for patients and doctors should be put into place.

It is vital for healthcare providers to overcome resistance to digital adoption. This can be achieved through structured training programs and by demonstrating measurable efficiency gains. Reducing opposition and increasing acceptance rates can be achieved by requiring staff members to complete digital competency training. The advantages can be further highlighted by showcasing quantifiable efficiency gains, such as fewer readmissions, shorter appointment durations, and cost savings. Maintaining patient engagement and retention is also important, with behavioral nudging and real-time feedback playing a valuable role. Techniques such as push notifications, gamification, and AI-driven reminders can encourage patients to adhere to treatments. Hybrid care models that combine virtual and in-person care are particularly promising, as they may satisfy a range of patient demands while maintaining continuity of care. Finally, strengthening cybersecurity standards is essential by regularly updating security measures (e.g., multi-factor authentication, encrypted communications, and real-time threat monitoring) to protect patient data.

While this study provides valuable insights about the digital transformation in healthcare, certain limitations should be acknowledged. The analysis focuses on four case studies from technologically advanced healthcare systems, which may limit the generalizability of findings to lower-resource settings. Additionally, the study primarily examines short- to medium-term impacts, which leaves space for further research on the long-term economic and clinical outcomes of digital healthcare adoption. Future studies should explore how these digital interventions perform over extended periods and assess their adaptability to different healthcare environments.

This study offers a framework for guiding future digital healthcare implementations by synthesizing evidence from successful digitalization initiatives. The findings support the promise of digital transformation to enhance healthcare accessibility, efficiency, and resilience in a changing environment.

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