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The Impact of using Modern Technology on the Effectiveness and Efficiency of Healthcare Institutions and their Management in the Public and Private Sectors

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Abstract

Aim: The current study aims to assess how modern technology impacts the effectiveness and efficiency of healthcare services among all healthcare providers in urban India.

Methods: The study compared 20 hospitals (10 public and 10 private) in Delhi, Mumbai, and Bengaluru. We collected data from 200 healthcare professionals using structured surveys, conversations, and real-time observations of their work. The KPIs included patient waiting time, patient satisfaction, staff workload, and the speed of technology adoption. Quantitative data were analyzed using descriptive statistics and t-tests.

Results: By combining health technologies, many improvements were made in healthcare delivery. People in public hospitals had to wait 38.2% less, and those in private hospitals waited 44.2% less. Patients were much more satisfied with public institutions, whose scores rose from 6.1 to 7.9 and private institutions, where scores rose from 6.8 to 8.5. The burden on staff, measured by patient numbers each physician sees daily, was reduced by 21.4 percent in

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public hospitals and 25 percent in private hospitals. It was found that AI and robotic surgery were more commonly used in private hospitals.

Conclusion: Advancements in technology help healthcare services and keep patients happy in hospitals across the country. However, the fact that private institutions use and benefit from digital services more strongly indicates that public healthcare should introduce and improve digital services. The research demonstrates that modern technology greatly helps nations with fewer resources strengthen their health systems.

Keywords: Healthcare technology**,** Urban India, Patient satisfaction, Public and private hospitals, Efficiency, Technology adoption

Introduction

The healthcare sector is experiencing significant changes because of the rapid development of modern technology. With digital records and AI in diagnostics and telemedicine, innovations transform how healthcare services are given, arranged and received [1]. Both public and private healthcare institutions have found that using technology effectively improves their services, workflow efficiency, and patient outcomes. As global health systems face more patients, fewer staff and budget issues, modern technology is now a good way to sustain healthcare [2].

High performance in a health system is built on effective and efficient healthcare. To be effective, a healthcare system must bring about the intended health results to be efficient, it must use the best possible resources [3]. Usually, healthcare organizations in low- and middle-income nations face problems with ineffective administration, disconnected services and restricted access to expert care [4]. In that scenario, technologies including EHR, HMS, telemedicine and diagnostic AI can open up new possibilities. They make data easier to manage, help healthcare providers collaborate, reduce repetitive tasks and help doctors make evidence-based decisions [5].

When the public sector is under budget pressure and deals with busy facilities, technology can improve how administrative work is handled and benefit patients [6]. For example, digital queue systems help reduce wait times and using EHRs means fewer paper problems and makes it easier to keep care consistent [7]. Even so, using new technologies in public organizations takes more time because of problems with infrastructure, lack of budget and issues with educating staff [8]. By contrast, private healthcare companies, motivated by competition and more financial resources, are more likely to spend on new technology that pleases patients, speeds service and adds to their profits [9]. These institutions are among the first to introduce robotic surgeries, custom medicine services and predictive data tools.

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Their benefits are noticed, but the reach of health technologies is quite different for public and private organizations. Private hospitals can show higher adoption and faster payback, yet public hospitals have special difficulties when it comes to scaling up and sustaining changes [10]. To fully assess the role of technology in healthcare, it is essential to look at patient throughput, wait times, diagnostic accuracy, staff happiness, patient trust and what it is like to use the technology [11]. For this reason, it is essential to know the effects of technology in healthcare to create successful digital health strategies and policies.

Recently, several studies have focused on how health technologies are adopted and used in different places. Hospitals implementing EHRs achieved better quality results [12]. Telemedicine helped people in underserved areas get the care they needed. Nonetheless, these studies concentrate on a few technologies rather than comparing the public and private sectors globally [13]. Developed countries have achieved a lot in digital health, but India and similar nations are still figuring out the best ways to put it into practice in public health settings.

Looking at India helps us discover how modern technology has transformed healthcare institutions. Because there is a combination of big public and fast-growing private health sectors in the country, there are continuous problems in making health care accessible, affordable and of high quality [14]. In cities, we observe digital tools being used by private healthcare facilities, but public hospitals still suffer from common inefficiencies. It demonstrates that more work is needed to analyze technology's impact on healthcare performance in different organizations and gather lessons for a fairer and more effective system [15].

Therefore, the present research looks at how modern technologies affect how well and efficiently healthcare institutions operate in public and private areas. It specifically studies how changes in patient waiting, ratings of satisfaction, workloads for employees and the adoption of new technology occur after introducing digital tools. The study uses a comparative cross-sectional design to show the pros and cons of technology in healthcare. The results aim to show policy leaders, hospital executives and health technology firms what can be expected from digital health and help plan improvements in health systems.

Methodology

Research Design

This study applied a comparison design focused on how new technology affects healthcare institutions' effectiveness and efficiency. Through this approach, we compared public and private healthcare sectors by examining how technology affects key performance indicators in each case. It captured information simultaneously from several institutions and offered a

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picture of the present use of technology and its outcomes in different healthcare environments.

Objectives

The study had two main aims, the first was to examine how new healthcare technologies make operations more efficient and improve service. Objective two was to measure the amount of technology used and how that affects public and private healthcare institutions. Because of the dual perspective, we could find shared positives and problems that technology brings to healthcare.

Sample Selection

The research was conducted across urban hospitals in three major metropolitan cities in India: Delhi, Mumbai, and Bengaluru. A purposive approach was chosen to select a group of healthcare institutions that equally represented the industry's public and private sectors. In total, 20 hospitals were selected, including 10 public and 10 private facilities. The research involved 200 healthcare professionals, half from public and half from private hospitals. There were nurses, physicians, office staff and IT staff, letting us see how technology affects their roles.

Data Collection Tools

Data collection involved a mixed-methods approach to capture quantitative and qualitative insights [16]. Structured questionnaires were administered to healthcare professionals to collect quantitative data related to institutional performance metrics such as patient waiting times, patient satisfaction scores, staff workload, and the use of electronic health records. The surveys were intended to judge how technology changed the company’s efficiency and effectiveness. Besides surveys, face-to-face interviews were held with hospital leaders to learn more about the problems, benefits and approaches to using technology. To complement these self-reported data, on-site observations were conducted to directly assess the degree and manner of technology integration within daily hospital operations.

Technologies Considered

The study focused on five key categories of modern healthcare technologies widely recognized for their potential to improve service delivery. These included EHR, which facilitate digital documentation and easy access to patient information; Telemedicine platforms, which enable remote consultations and expand healthcare reach; AI-powered diagnostic tools, which support more accurate and timely diagnoses HMS, which streamline administrative and operational workflows, and Robotic surgical systems, which represent

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advanced technology adoption in surgical procedures, primarily in private hospitals where such investments are more feasible.

Data Analysis

Quantitative data were analyzed using descriptive statistics to summarize how central tendencies and variation are distributed within the data. Independent sample t-tests and analysis of variance (ANOVA) were used to identify significant differences between the two sectors. All analyses were done with R Studio and Microsoft Excel to appropriately handle and visualize the data. At the same time, qualitative data from interviews was analyzed using thematic analysis to find and report recurring patterns. Applying this method enabled us to identify main ideas about how technology supports institutions, what holds back its adoption and what institutions plan for future technology use.

Results

Modern technologies have improved the main results for both public and private healthcare organizations. The study found that patient service, administrative work and healthcare quality improved, and there were differences between public and private hospitals.

Patient Waiting Time

Electronic Health Records (EHR) and Hospital Management Systems (HMS) significantly reduced patient waiting times, as shown in Figure 1. The time patients had to wait in public hospitals dropped from 68 minutes to 42 minutes, a decrease of 38.2%. On average, private hospitals saw their waiting times decrease by 44.2%, from 52 minutes to 29 minutes in Table 1.

Table 1. Reduction in Patient Waiting Time

Sector	Pre-Tech Avg. (min)	Post-Tech Avg. (min)	% Decrease
Public	68	42	38.2%
Private	52	29	44.2%

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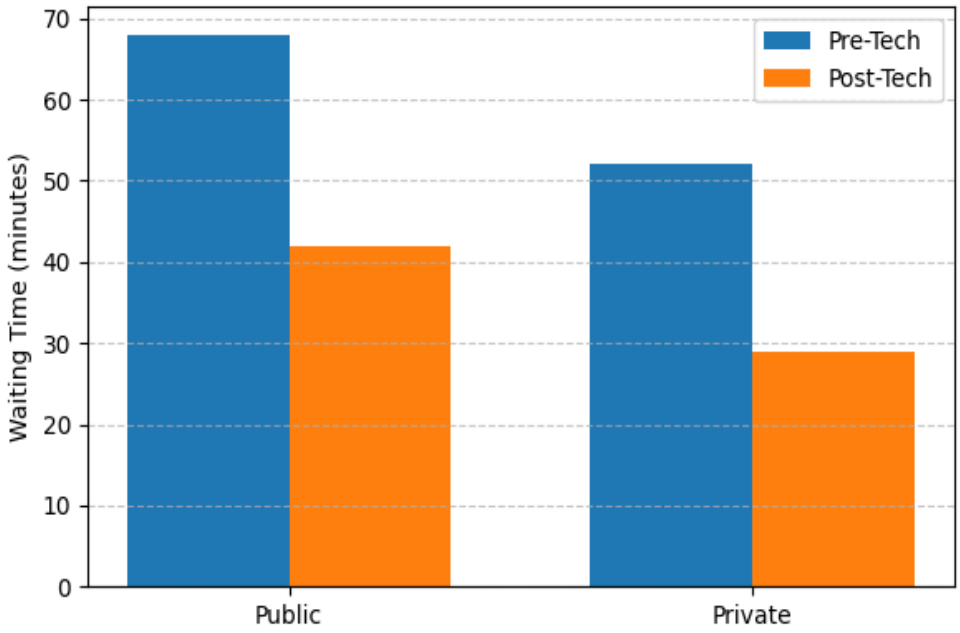

Figure 1. ***Patient waiting time before and after technology implementation in the public and private sectors.***

Patient Satisfaction

After using health technologies, both sectors saw increased patient satisfaction scores using the standard 10-point scale. The public industry moved from an average of 6.1 to 7.9 points, but private sector institutions increased from 6.8 to 8.5 points in Figure 2 and Table 2. Telemedicine and AI have helped patients achieve better communication and service quality from their healthcare providers.

Table 2. Patient Satisfaction Scores Before and After Technology Use

Sector	Pre-Tech Score	Post-Tech Score
Public	6.1	7.9
Private	6.8	8.5

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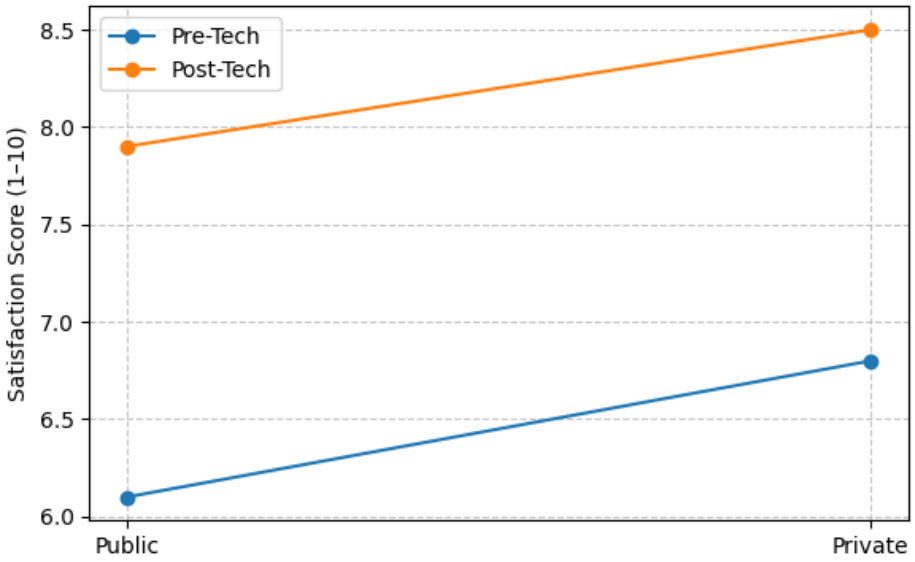

Figure 2. *Comparison of average patient satisfaction scores before and after technology adoption.*

Staff Workload

After introducing technology and automation, healthcare workers faced less daily work. In Table 3, public hospitals showed a drop in patient visits per physician per day from 28 to 22, as did private hospitals, which dropped from 24 to 18. Because of these reductions, it seemed that improved time management and administrative support could be achieved through technology.

Table 3. Staff Workload Reduction

Sector	Pre-Tech (patients/day)	Post-Tech (patients/day)	% Change
Public	28	22	-21.4%
Private	24	18	-25.0%

Technology Adoption Rates

The study also assessed the adoption rates of key technologies across institutions. In Figure 3, private hospitals demonstrated higher levels of adoption across all technologies. For example, 100% of private hospitals had implemented EHR systems compared to 80% of public hospitals in Table 4. Similarly, AI-powered diagnostics and robotic surgeries were more commonly used in private institutions.

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Table 4. Adoption Rates of Selected Health Technologies

Technology	Public Hospitals (%)	Private Hospitals (%)
Electronic Health Records	80	100
Telemedicine	55	85
AI Diagnostics	35	65
Robotic Surgery	10	50
Hospital Management Sys	70	95

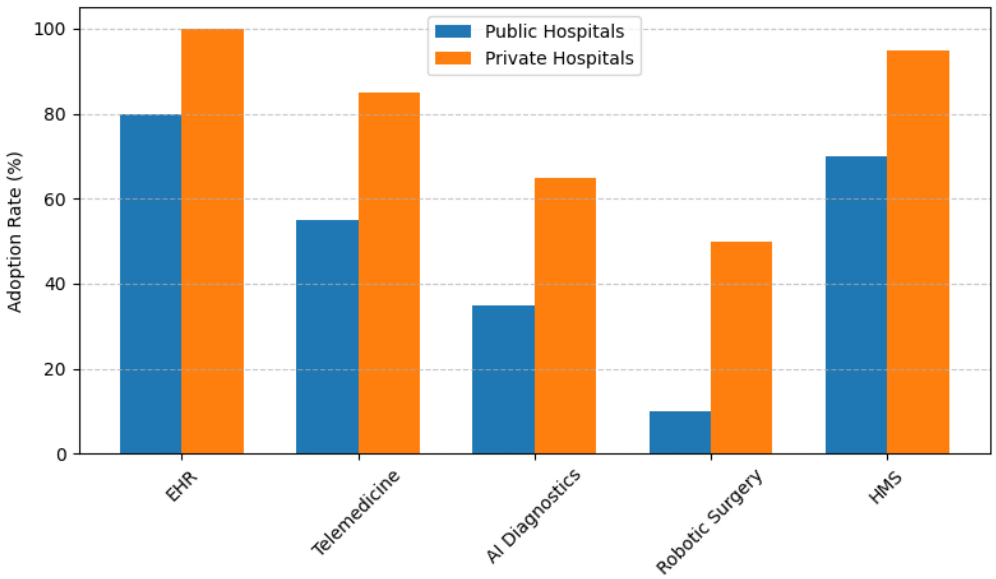

Figure 3. ***Technology adoption rates in public vs. private hospitals.***

Discussion

The primary objective of this study was to evaluate the impact of modern technology on the effectiveness and efficiency of healthcare delivery within public and private institutions. The study demonstrated that EHR, Telemedicine, AI for diagnostics, and HMS significantly improved patient care. In both sectors, patients experienced shorter wait times, reported higher satisfaction, and workers had reduced workloads. While hospitals of all types saw progress from integrating technology, private institutions advanced further, likely due to greater technology utilization and stronger infrastructure.

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The results match what has been observed in earlier literature about the benefits of health information technologies for operations. A study by Agha (2014) discovered that EHRs help coordinate care and lower the number of medical errors [17]. In addition, Kruse et al. (2017) found that using telemedicine increases patient access and makes them happier, mainly in cities [18]. The lower workload for healthcare staff also backs earlier work showing that technology makes some administrative tasks easier and helps prevent physician burnout [19]. Their results are further confirmed by the observed differences in IT and digital readiness between public and private institutions.

The findings of this study will guide future studies and help shape healthcare policy. According to them, investing in digital healthcare resources, especially for public health, could significantly improve patient results and how the system runs [20]. Future studies might analyze the lasting effects of these technologies on clinical results and cost savings, not only on operational statistics. Besides, looking into what users go through during implementation and what stops them from adopting technology can offer extra guidance for its deployment.

Despite its contributions, the study has several limitations. The cross-sectional design limits causal inferences, and the sample was restricted to urban hospitals in three metropolitan Indian cities, which may not be generalizable to rural settings or other regions [21]. Additionally, the reliance on self-reported data from healthcare professionals and administrators may introduce response biases. Finally, while several key technologies were examined, emerging tools such as blockchain for health data security or wearable health monitoring devices were not included and should be considered in future research.

Conclusion

The study results show that modern technology makes healthcare delivery more effective and efficient in the public and private healthcare sectors. Following the introduction of EHR, Telemedicine, AI diagnostics and HMS, waiting periods decreased, satisfaction rose, and staff better managed workloads. Private hospitals improved more because more were adopted and had better infrastructure. Waiting for patients at public hospitals fell by nearly 38% and 44% in private hospitals, while satisfaction levels rose significantly. With better time management, the company saw less work for its staff. Looking at how different sectors use technology revealed that private health institutions are ahead in using robotic surgery and AI in diagnosis. The findings prove that digital transformation is essential in healthcare. At the same time, the report points out that extra investment and training in digital systems are necessary to help public hospitals catch up. Spreading technology evenly is essential to achieving better health results in every healthcare environment.

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