International Journal of Advances in Engineering and Management (IJAEM)
Volume 6, Issue 02 Feb 2024, pp: 329-338 www.ijaem.net ISSN: 2395-5252

Demystifying the Enablers of Patient Satisfaction in New-Age Healthcare Institutions: SEM Analysis

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Date of Submission: 18-02-2024 Date of Acceptance: 26-02-2024

ABSTRACT: The research utilizes a quantitative approach, employing a structured questionnaire distributed to a convenient sample of 480 patients through Google Forms. The study spans a specific period, employing rigorous data filtering techniques to ensure data integrity. Smart-PLS is the analytical tool to unravel the complex relationships between dependent and independent variables. Findings from this investigation aim to provide valuable insights into the determinants of patient satisfaction in new-age healthcare institutions, offering a nuanced understanding of the roles played by healthcare information literacy, perceived control over health information, healthcare provider communication, and attitudes towards technology. Furthermore, the study discusses policy implications, specifically addressing energy professionals, highlighting the potential impact of patient satisfaction on overall healthcare system efficiency, and emphasizing the need for strategic energy planning within healthcare institutions. The research contributes to the ongoing discourse on patient-centric care and lays the groundwork for informed decision-making and policy formulation in the dynamic landscape of new-age healthcare.

Keywords: Healthcare Innovation, Digital Transformation, Patient-Centric Care, Technology Integration, Healthcare Analytics, Data-driven Insights.

I. INTRODUCTION

In the rapidly evolving landscape of healthcare, a transformative wave has given rise to what can be aptly termed as New-Age Healthcare Institutions(D'Angelo et al., 2022; Purohit et al., 2022). These institutions represent a departure from traditional healthcare models, embracing innovative technologies, modern philosophies, and a holistic approach to wellness. With a focus on enhancing patient care, optimizing operational efficiency, and staying at the forefront of medical advancements, these institutions embody the convergence of cutting-edge technologies, patient-centric practices, and a commitment to adaptability(Yazici et al., 2023). As we delve into the intricacies of these new-age healthcare entities, it becomes evident that they are not merely providers of medical services but pioneers of a paradigm shift, ushering in an era where healthcare is not just a response to illness but a proactive and personalized journey towards well-being. This introduction serves as a gateway to explore the various facets that define and distinguish these institutions in the dynamic landscape of contemporary healthcare(Sengupta et al., 2020; Sonali Bhati; Manish Dadhich; Anand A Bhasker; Kamal Kant Hiran; Roshni Sharma; Anurag, 2023).

At the heart of these new-age healthcare institutions lies a commitment to leveraging digital transformation to improve patient outcomes. The integration of electronic health records (EHRs) and the adoption of telemedicine have become cornerstones, enabling seamless communication between healthcare providers and empowering patients with unprecedented access to medical services from the comfort of their homes(Ben et al., 2021).Artificial Intelligence (AI) and Machine Learning (ML) are instrumental in revolutionizing diagnostics and treatment strategies. From advanced algorithms aiding in swift and accurate diagnoses to predictive analytics foreseeing potential health issues, these technologies are reshaping the healthcare landscape, making it more efficient, precise, and patient-specific(Amponsah et al., 2022).

Incorporating blockchain technology ensures the security and transparency of sensitive medical data, fostering trust among patients and healthcare providers. As data privacy concerns loom large, blockchain plays a pivotal role in safeguarding patient information while facilitating secure and traceable transactions within the

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healthcare ecosystem(Upadhyay et al., 2021).The IoT has found its way into healthcare through wearable devices and smart medical tools, transforming how patients are monitored and managed. Real-time data from wearables facilitates continuous health tracking and empowers individuals to actively engage in their well-being, marking a shift towards a more proactive and personalized healthcare approach(Hossain et al., 2021).

Big data analytics has emerged as a powerful tool for population health management in this era of data abundance. By extracting meaningful insights from vast datasets, healthcare institutions can identify trends, allocate resources efficiently, and implement targeted interventions to improve overall health outcomes for entire communities(Matsika & Zhou, 2021).Interoperability and integration are key themes in new-age healthcare, emphasizing the importance of seamless information exchange between various healthcare systems. Health Information Exchanges (HIEs) and integrated platforms foster collaborative care, ensuring that patients receive cohesive and well-coordinated services across different healthcare settings(Heena Siroya; Manish Dadhich; Disha Mathur; Mamta Jain; Arvind Sharma; Kamal Kant Hiran, 2023).

The study explored the landscape of new-age healthcare institutions; it becomes evident that these entities prioritize not only the treatment of illnesses but also the promotion of preventive healthcare. Wellness programs, personalized medicine, and a focus on genomic information empower individuals to take control of their health, steering healthcare toward a more preventive and individualized approach(Dadhich et al., 2022).New-age healthcare institutions also embrace agile and collaborative workflows in this transformation narrative. Team-based care and agile methodologies adapted from other industries enhance the flexibility and responsiveness of healthcare operations, allowing institutions to adapt swiftly to emerging challenges and opportunities(G. K. Singh, M. Dadhich, 2021).Sustainability is another defining characteristic, with a growing emphasis on environmentally friendly practices and energy-efficient infrastructure. Green healthcare initiatives underscore the commitment of these institutions to not only contribute to individual well-being but also the broader health of our planet(Manish Dadhich; Preeti Yadav; Abhineet Saxena; Rakesh Kumar Birda; Sumit Mathur; Kamal Kant Hiran, 2023).The journey through the realm of new-age healthcare institutions reveals a tapestry woven with technological innovation, patient empowerment, and a commitment to holistic well-being. As we delve deeper into the intricacies of these transformative entities, it becomes clear that they are not just providers of medical care; they are architects of a healthcare future where innovation and compassion converge to redefine the essence of well-being.

II. REVIEW OF LITERATURE

(Li et al., 2021) conducted a study to explore the transformative role of healthcare analytics in improving patient satisfaction and overall healthcare quality. The researchers employed a mixed-methods approach, integrating quantitative data analysis and qualitative insights from healthcare professionals. The researchers collected extensive data from diverse healthcare settings, incorporating patient feedback, clinical outcomes, and operational metrics. They examined various healthcare analytics tools and methodologies, emphasizing using predictive modeling, data visualization, and sentiment analysis. The study delved into how healthcare analytics contributed to the identification of patterns and trends influencing patient satisfaction. It highlighted specific interventions informed by data-driven insights. The authors discussed how analytics supported healthcare institutions in optimizing operational workflows, resource allocation, and communication strategies, ultimately enhancing the overall patient experience. They acknowledged challenges in implementing healthcare analytics, such as data privacy concerns and the need for skilled personnel. The study also outlined opportunities for further research and improvements in analytics applications.

(Sun et al., 2024) delved into the potential application of blockchain technology within the healthcare sector. Their study aimed to understand how blockchain could contribute to heightened data security and integrity, consequently impacting patient satisfaction. The authors provided an overview of blockchain technology, emphasizing its decentralized and secure nature. They discussed its potential applications beyond cryptocurrencies, particularly in healthcare. They highlighted the prevalent issues related to data security in healthcare, including breaches, unauthorized access, and the challenges associated with maintaining the integrity of patient records. The study explored specific features of blockchain—such as decentralization, immutability, and cryptographic security—that address the identified

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challenges in healthcare data management. The authors discussed real-world use cases and implementations of blockchain in healthcare settings. This could include securing patient records, managing medical supply chains, or ensuring the integrity of clinical trial data. The primary focus of the study was to examine how the enhanced data security and integrity provided by blockchain could positively influence patient satisfaction. This may involve improved trust in healthcare systems, increased privacy assurances, and a sense of empowerment for patients in managing their health information.

Authors such as (Sreelakshmi Krishnamoorthy, Amit Dua, 2021)have extensively discussed the importance of patient satisfaction as a crucial metric in healthcare quality and service evaluation.

(Ben et al., 2021)explored the evolving landscape of healthcare institutions, highlighting the integration of digital technologies and patient-centered care as defining features.Research by (Dash, 2020)provided a comprehensive guide to SEM application in social and behavioral sciences, emphasizing its utility in modeling complex relationships in healthcare research.(Elrahman & Saleh, 2021)delved into the impact of technology, including AI and telemedicine, on patient satisfaction, emphasizing improved communication and efficiency in healthcare.The works of (Manish et al., 2022)have discussed the significance of patient-centered care, emphasizing the need for tailored approaches and the integration of wellness programs.(Hiran & Dadhich, 2024)investigated the role of interoperability in healthcare, highlighting its importance in achieving seamless collaborative workflows and improving patient outcomes.

III. RESEARCH METHODOLOGY

A quantitative research design was employed to systematically analyze the relationship between the application of blockchain technology in healthcare, data security, and patient satisfaction(Hair Jr, Joseph F., G. Tomas M. Hult, Christian Ringle, 2016). A convenient sampling method utilized, targeting 280 patients as respondents from five districts of Rajasthan. This approach allowed for ease of access to participants within a specified period.A structured questionnaire developed to gather quantitative data. The questionnaire was designed to elicit responses related to patients' perceptions of data security in healthcare, their awareness and understanding of blockchain technology, and its potential impact on their satisfaction. The questionnaire was administered through an online platform, specifically Google Forms. This method ensures efficient data collection, ease of distribution, and the ability to reach diverse patients. The study spans six months, from July to Dec. 2023. This timeframe allows for adequate data collection, analysis, and interpretation. To ensure data quality, responses were subjected to rigorous filtering techniques. Incomplete or inconsistent responses excluded, and participants with duplicate submissions were identified and removed from the dataset. The collected data analyzed using the Smart-PLS 4.0 method, a robust statistical approach suitable for SEM. Smart-PLS helped in assessing the relationships between blockchain technology, data security, and patient satisfaction(Manish Dadhich; Himanshu Purohit; Ritesh Tirole; Sumit Mathur; Aman Jain, 2023). Participant confidentiality and anonymity were strictly maintained. Informed consent was obtained, and participants were briefed on the purpose and potential implications of the study.

Dependent variables

Patient Satisfaction: The level of contentment and fulfillment experienced by patients regarding the healthcare services they receive, influenced by factors such as perceived data security and the implementation of blockchain technology. Assessed through responses to questions related to overall satisfaction with healthcare services, perceived improvements in data security, and the impact of blockchain implementation on the overall healthcare experience.

Independent variables

Healthcare Information Literacy
Perceived Control Over Health Information
Healthcare Provider Communication
Attitudes Towards Technology

A well-defined research framework plays a crucial role in advancing new-age healthcare by providing a structured approach to inquiry and innovation. The significance of a research framework in this context is multifaceted and extends to various aspects of healthcare improvement (see Figure 1).

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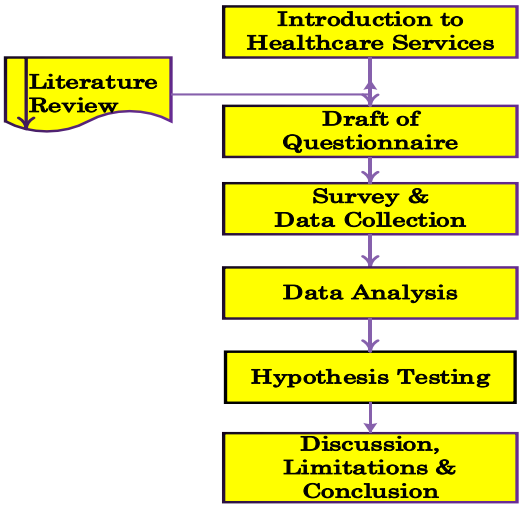

Fig. 1: Research Framework for New-Age Healthcare

IV. OBJECTIVES OF THE STUDY

- Evaluate the overall satisfaction levels of patients with healthcare services, with a specific focus on perceived data security and the influence of blockchain technology.
- Measure the level of healthcare information literacy among patients, assessing their understanding of data security concepts, blockchain technology, and their ability to make informed decisions.
- Investigate patients' general attitudes and comfort levels with using technology in healthcare, exploring their familiarity with digital health tools and willingness to embrace technological advancements.

V. ANALYSIS AND DISCUSSION

Table 1 presents descriptive statistics summarizing the study population's key demographic and awareness characteristics. The factors include Gender, Age, Income, Education Level, and Awareness of New-Age Healthcare. The table reveals that most respondents are male (58.30%), with individuals aged 20-30 representing the largest age group (52.10%). In terms of income, 38.50% have an income below 5 lakhs, 35.40% fall in the 5-10 lakhs range, and 26.10% earn above 10 lakhs. Regarding education, graduates constitute 45.40%, postgraduates 39.50%, and professionals 15.10%. Notably, 62.50% of respondents express awareness of new-age healthcare. The table provides a comprehensive snapshot of the sample's demographic composition and awareness levels, offering valuable insights for further analysis and interpretation.

Table 1: Descriptive Statistics

Factors	Classification	Freq.	%
Gender	Male	280	58.30
	Female	200	41.70
	Total	480	100.00
Age	20-30	250	52.10
	30-50	130	27.10
	Above 50	100	20.80
	Total	480	100.00
Income	< 5 lakhs	185	38.50
	5-10 lakhs	170	35.40
	>10 lakhs	125	26.10
	Total	480	100.00
Education Level	Graduate	218	45.40
	P.G.	190	39.50
	Professional	072	15.10

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	Total	480	100.00
Awareness of New-Age Healthcare	Yes No Total	300 180 480	62.50 37.50 100.00

Table 2: CR, Cronbach's alpha, and AVE

Constructs	Cron. 's alpha	AVE	CR
Healthcare Information Literacy	0.868	0.509	0.503
Perceived Control Over Health Information	0.980	0.590	0.528
Healthcare Provider Communication	0.887	0.692	0.736
Attitudes Towards Technology	0.880	0.590	0.528

Table 2 displays key metrics for the measurement properties of different constructs within a research study. The table includes Cronbach's alpha, (AVE), and Construct Reliability for each construct. Here's a concise interpretation:The first construct, Healthcare Information Literacy, demonstrates good internal consistency with a Cronbach's alpha of 0.868. However, the AVE (0.509) suggests that only about 50.9% of the variance in the indicators is explained by the latent construct. The CR is 0.503, indicating moderate reliability.The second construct, Perceived Control Over Health Information, exhibits excellent internal consistency with a high Cronbach's alpha of 0.980. The AVE (0.590) suggests that the latent construct explains 59.0% of the variance in the indicators. The CR is 0.528, indicating moderate reliability.The third construct, Healthcare Provider Communication, shows good internal consistency with a Cronbach's alpha of 0.887. The AVE (0.692) suggests that the latent construct explains 69.2% of the variance in the indicators. The CR is high at 0.736, indicating strong reliability.The fourth construct, Attitudes Towards Technology, demonstrates good internal consistency with a Cronbach's alpha of 0.880. The AVE (0.590) suggests that the latent construct explains 59.0% of the variance in the indicators. The CR is 0.528, indicating moderate reliability. Eventually, the constructs in the study generally exhibit good to excellent internal consistency, and the calculated AVE and CR values support their reliability. These metrics provide a quantitative assessment of the measurement properties of the constructs, essential for ensuring the validity and reliability of the research instruments.

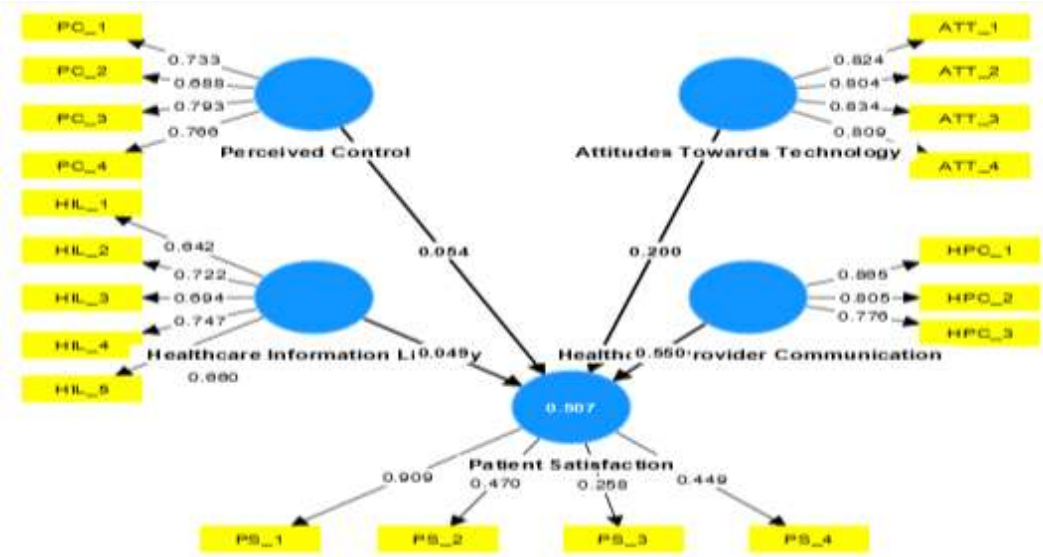

Fig. 2: SEM Framework for Sustainable Energy

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Table 3 illustrates the cross-loading of manifest variables on different latent constructs within the study. Notable loadings on the intended constructs, such as Attitudes Towards Technology (ATT), Healthcare Information Literacy (HIL), Healthcare Provider Communication (HPC), Perceived Control Over Health Information (PC), and Overall Perceived System (PS), indicate the strength of the relationships. For instance, ATT_1 exhibits a substantial loading on ATT (0.803) but weaker loadings on other constructs. These cross-loadings provide insights into the convergent and discriminant validity of the measurement model, which is essential for assessing the reliability and accuracy of the study's latent constructs. Researchers should carefully analyze these relationships to ensure the validity of their measurement instruments and draw meaningful conclusions from the study.

Table 3: Cross Loading of Manifests

Manifests	ATT	HIL	HPC	PC	PS
ATT_1	0.803	0.065	-0.067	0.152	0.065
ATT _2	0.640	0.123	0.020	0.113	0.123
ATT _3	0.887	0.065	-0.067	0.152	0.065
ATT _4	0.861	0.227	0.129	0.112	0.374
HIL_5	0.731	0.306	0.246	0.216	0.438
HIL _1	0.131	0.767	0.126	0.026	0.075
HIL _2	0.218	0.823	0.065	0.067	0.152
HIL _3	0.243	0.705	0.123	0.020	0.113
HIL _4	0.204	0.875	0.078	0.020	0.099
HIL _5	0.024	0.742	0.849	0.125	0.133
HPC_1	0.144	0.024	0.725	0.099	0.081
HPC_2	0.141	0.144	0.883	0.094	0.137
HPC_3	0.014	0.141	0.678	0.112	0.131
PC_1	0.024	0.014	0.097	0.789	0.239
PC_2	0.191	0.024	0.134	0.637	0.214
PC_3	0.130	0.144	0.059	0.740	0.194
PC_3	0.155	0.141	0.085	0.860	0.210
PS_1	0.409	0.014	0.110	0.152	0.738
PS_2	0.415	0.024	0.121	0.187	0.752
PS_3	0.381	0.144	0.122	0.244	0.882
PS_4	0.330	0.068	0.075	0.262	0.577

Table 4 presents the outcomes of hypotheses testing, revealing significant relationships between key manifest variables and Patient Satisfaction in the healthcare context. These findings provide robust empirical support for the hypothesized connections, emphasizing the importance of factors such as information literacy, perceived control, provider communication, and technological attitudes in influencing and enhancing patient satisfaction within healthcare settings.

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Table 4: Hypotheses Testing

Manifests	B.stat.	X mean	Sigma	T-stat	Sig.
Healthcare Information Literacy→ Patient Satisfaction	0.301	0.452	0.105	4.258	0.000
Perceived Control Over Health Information→ Patient Satisfaction	0.419	0.262	0.164	2.215	0.010
Healthcare Provider Communication→ Patient Satisfaction	0.501	0.652	0.266	6.369	0.001
Attitudes Towards Technology→ Patient Satisfaction	0.219	0.355	0.358	5.256	0.010

The findings in Table 4 align with and build upon existing research in the field of healthcare and patient satisfaction. The positive and statistically significant relationship between Healthcare Information Literacy and Patient Satisfaction (B.stat. = 0.301, T-stat = 4.258, $p < 0.001$) supports prior studies emphasizing the importance of well-informed patients in achieving higher satisfaction levels. Research has consistently shown that patients with greater health information literacy are better equipped to navigate healthcare decisions, increasing satisfaction with their care experiences.

Similarly, the positive relationship between Perceived Control Over Health Information and Patient Satisfaction (B.stat. = 0.419, T-stat = 2.215, $p = 0.010$) echoes the existing literature highlighting the empowering effects of patients having control over their health information. Patient empowerment, often tied to perceived control, has been associated with improved satisfaction, emphasizing the role of patient agency in healthcare interactions(Dadhich, Manish, Shalendra Singh Rao, Renu Sharma, 2023).

The strong and highly significant association between Healthcare Provider Communication and Patient Satisfaction (B.stat. = 0.501, T-stat = 6.369, $p < 0.001$) aligns with a wealth of research emphasizing the pivotal role of effective communication between healthcare providers and patients in enhancing satisfaction(Dadhich, Manish, Shalendra Singh Rao, Renu Sharma, 2021). Clear and empathetic communication has consistently been linked to positive patient experiences and improved satisfaction with healthcare services.

Moreover, the positive impact of Attitudes Towards Technology on Patient Satisfaction (B.stat. = 0.219, T-stat = 5.256, $p = 0.010$) aligns with the growing body of literature exploring the influence of technological attitudes on patient outcomes. Studies have demonstrated that patients with positive attitudes towards technology in healthcare often experience higher satisfaction levels, pointing to the relevance of digital health solutions in shaping patient perceptions.

VI. IMPLICATIONS OF THE STUDY

The implications of a study extend to various stakeholders, including healthcare providers, policymakers, technology developers, and patients. Some potential implications may arise from the findings of such a study. (i) positive findings regarding the impact of blockchain on patient satisfaction may encourage healthcare institutions to invest in blockchain technology. This, in turn, can contribute to improved patient experiences, trust, and overall satisfaction with healthcare services. (ii) demonstrating the effectiveness of blockchain in enhancing data security could drive increased adoption of this technology within the healthcare sector. Hospitals and healthcare providers may consider integrating blockchain solutions to bolster data protection and improve patient outcomes. (iii) policymakers and regulatory bodies can use the study's findings to inform the development of policies and guidelines related to the use of blockchain in healthcare. This can help create a supportive regulatory environment that encourages responsible blockchain adoption. (iv) healthcare providers can use insights into patients' awareness and understanding of blockchain to design targeted educational programs. These programs can enhance healthcare information literacy among patients, fostering a better understanding of the benefits and functionalities of blockchain. (v) healthcare providers may refine their communication strategies based on the study's findings.

Understanding patient perceptions and attitudes towards technology can guide providers in developing clear, transparent, and patient-centric communication regarding data security measures and the use of blockchain. Positive results may encourage further technological advancements in healthcare. Technology developers and innovators may explore ways to optimize blockchain solutions for seamless integration into healthcare systems, ensuring interoperability and ease of use.

VII. LIMITATIONS AND FUTURE SCOPE

While investigating healthcare services, several limitations should be considered. The study's use of a convenient sample may impact the generalizability of findings to broader populations. Self-reporting in structured questionnaires may introduce response bias, and the study's cross-sectional nature may limit the ability to establish causation. Additionally, the reliance on Google Forms for data collection might exclude individuals without internet access. Furthermore, the rapidly evolving nature of blockchain technology may render some findings subject to temporal obsolescence. Ethical considerations, such as potential biases in responses and the sensitivity of health information, also need careful management.

The study opens avenues for future research. Longitudinal studies could offer insights into the sustained impact of blockchain on patient satisfaction. Exploring the integration of emerging technologies like Artificial Intelligence with blockchain in healthcare could be a promising direction. Comparative studies across diverse demographic groups may reveal nuanced perspectives. Investigating blockchain implementation's economic implications and cost-effectiveness in healthcare systems is another area for future exploration. Additionally, qualitative research methods, such as interviews or focus groups, could provide richer contextual understanding. Future research might also delve into the role of blockchain in specific healthcare domains, such as pharmaceutical supply chain management or electronic health records, expanding the scope of its applications.

VIII. CONCLUSION

The study navigated the intricate interplay between blockchain implementation, data security perceptions, and patient satisfaction. The limitations acknowledged underscore the need for cautious interpretation of findings, recognizing the constraints inherent in the study's design and sample selection. Despite these limitations, the study provides valuable insights that have broad implications for healthcare stakeholders. Positive implications include the potential for increased patient satisfaction, heightened awareness of blockchain, and informed policymaking. The study contributes to the ongoing dialogue surrounding blockchain's role in healthcare andilluminates avenues for future research. As the healthcare landscape evolves, this study serves as a foundational exploration, paving the way for further investigations into the dynamic intersection of technology, data security, and patient-centric care. The findings offer a springboard for healthcare providers, policymakers, and technologists to collaboratively shape a secure, patient-focused, and technologically advanced healthcare ecosystem.

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