Bol. Soc. Paran. Mat.
©SPM – E-ISSN-2175-1188
SPM: www.spm.uem.br/bspm

(3s.) **v. 2025 (43) 3** : 1–11.
ISSN-0037-8712
doi:10.5269/bspm.78407

Modeling Patient Satisfaction in Healthcare: A Statistical Approach to Economic Growth Drivers

Shailesh Tripathi and Anju Khandelwal

ABSTRACT: The study makes an effort to understand the patient perception and satisfaction regarding quality healthcare. The paper also connects the relationship between enhancing healthcare services and economic growth. This is a primary data-based study. The endeavour is to analyze the relation between patient satisfaction and economic growth. The literature review shall provide the requisite gaps in the quality care services by hospitals for patients and available facilities. India's healthcare delivery remains a challenge to deliver and fulfil the requisite gaps in healthcare delivery. There are challenges of medical infrastructure, deficit of doctors, awareness, and healthcare delivery process. The study also attempts to correlate the value addition to India's economy through the efficiency and efficacy of healthcare delivery.

Key Words: Patients perception, patients satisfaction, quality healthcare, accelerating growth.

Contents

1. Introduction

Patient perception indicates how patients view and experience of real time delivery healthcare service quality delivery and quality of care and concern they received. It is influenced by multiple factors, behavior of staff and communication, the efficiency of medical processes and personnel, the cleanliness and overall outcome. Patient perception is directed by expectations, previous experiences, and individual concerns.

Patient satisfaction is a distinct and imminent concern, where outcome of services is in focus. It reflects the patient's overall satisfaction with healthcare services offered. It encompasses their judgment on how well their needs were met, the quality of interpersonal interactions, time and efficiency. High patient satisfaction typically indicates that a healthcare service has met or exceeded the patient's expectations

2010 *Mathematics Subject Classification:* 62H20, 62P10, 92C50.
Submitted August 14, 2025. Published October 16, 2025

[14]. The Indian healthcare sector is witnessing unprecedented growth, with private equity and venture capital investments surpassing US$ 1 billion in the first five months of 2024, marking a 220% increase from the previous year (IBEF) [18]. Healthcare consists of healthcare providers, medical equipment's, clinical testing, outsourcing, medical staff etc. Indian healthcare delivery system can be categorized into two components - public and private.

The government healthcare system includes secondary and tertiary care providers.

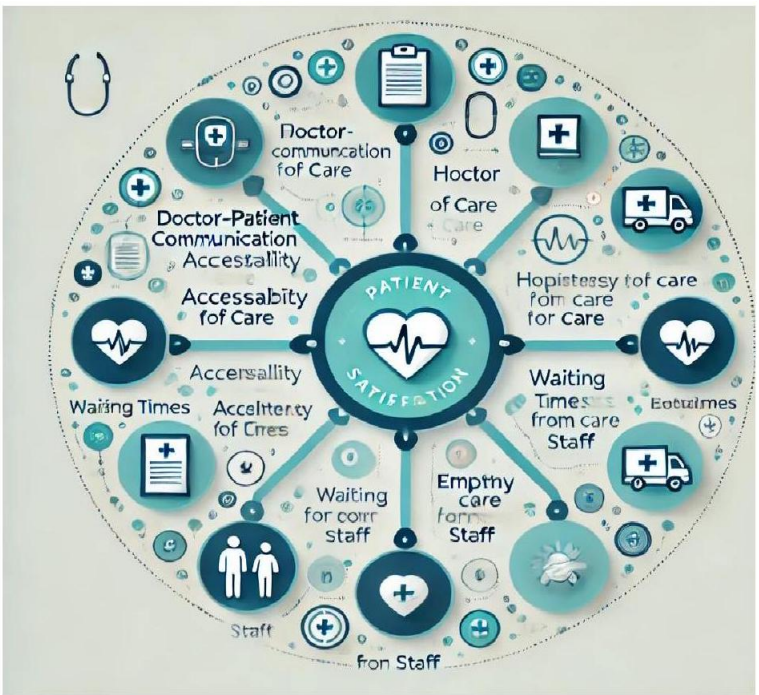

Figure 1: Patients satisfaction diagram in Healthcare services

These services are available in major cities. The private healthcare providers in India are secondary, tertiary, and quaternary care hospitals with a major concentration in metro cities. Major competitive advantage of Indian healthcare lies in its large number of skilled medical professionals [15, 17]. Comparative study of Indian and global healthcare services overall experience goes in favour of India. Indian healthcare is quite cost-competitive compared to its peers in Asia and western countries. Healthcare in India is complex and spread across urban and rural demography and characterized by mix of public and private healthcare providers.

Healthcare industry growth is driven by several factors:

- Aging population
- Growing middle class
- An increase in lifestyle diseases
- Increased adoption of digital technologies
- Increased investment on healthcare by common people
- Increased public-private partnerships

1.1. Importance of Patient's Satisfaction in Healthcare

1. **It helps in building loyalty:** In modern cutthroat competition the loyalty has become challenging. Hence having concern and taking measures to improve satisfaction shall support to build your goodwill and loyalty?

2. **Creates appeal for new patients:** The word of mouth is very important for a long lasting business. When patients find happiness and care in healthcare, they share with others. Therefore, a chain is created.

3. **It improves the outcome:** The patient's satisfaction shall impatient satisfaction and rove the direct correlation between patient satisfaction and treatment effectiveness.

4. **Minimizing the litigation:** The good care and concern for the patient shall make them feel connected to the hospital and dissatisfaction leading to litigation can be minimized.

1.2. Challenges of Indian Healthcare:

1. **Workforce shortage:** No of doctors to population ratio is very discouraging. There is a single doctor per 834 populations.

2. **Medical Infrastructure:** In the rural in particular there is a lack of adequate medical facilities.

3. **Concern of public health spending by the Govt.:** India spends 3.3 % of GDP (2022) on healthcare. This is not appreciable looking at the larger population coverage.

4. **Lack of focus on preventive Health care:** Largely people report to health care provider when it becomes serious and difficult to live a normal life.

5. Awareness and Healthcare delivery: Larger population lives in rural India hence facilitating the common mass with messaging for awareness becomes challenging.

2. Review of Literature

It might be challenging to define quality, particularly when it comes to the health industry and the services offered there. Therefore, obtaining a high degree of excellence and attractiveness may be used to describe quality in general [2]. The delivery technique in which the service is provided and the way the client is served can be all considered major aspects of service quality in health sector. American Medical Institute described healthcare quality asthe degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge [3]. The continuous evaluation and planning for quality improvement are very crucial given the significant relevance of quality within healthcare systems. As it influences illness incidence, expenditures of primary and clinical care and public mistrust of health system [9, 10] Patients' quality of life might have been improved by measuring and improving the quality of healthcare services. Several issues and issues with health centres and hospitals may be resolved by monitoring and enhancing the level of service provided with in health system [8, 11]. Patient perception is built on whether services provided by healthcare meet the standards. Satisfaction is a multidimensional construct within hospitality organizations because it involves different interactions and consumption periods [7, 16].

Patient perceptions of a healthcare experience are the sum of communication across the continuum of care [1]. Unlike other consumer product-service experiences, healthcare requires not only a service but also doctors knowledge, nursing staff commitment to patient satisfaction. Patients are committed to showing up to appointments, taking responsibility for managing their health issues (i.e., medicine and treatment), improving their health conditions (i.e., exercising and dieting), and taking an active role in their own healthcare. While evaluating a healthcare experience, there is a social relationship where patients judge the outcome for both parties, the healthcare provider and them, considering equity within their interpersonal interactions [6].

2.1. Service Quality in Healthcare Sector

Though it is a challenge to assess service quality of healthcare service providers. It is important and complex to understand patient perception and satisfaction [12]. The logical explanation may be that while several healthcare providers offer the same services, but they do not offer them similar service quality standard. In the internet era customers are much more aware of the choices available across the globe. The awareness level of customer has enhanced their expectations [4]. The significance of strict control in service quality and the efficacy of medical treatment has enhanced in the recent past. The competitive market's scenario and challenging customer delight, globalization and making services pleasing for patients [13]. To address these problems, SERVQUAL (SQ) measures have become widely applicable in healthcare research to measure consumers' perceptions of SQ across a range of service. It is including patient satisfaction, skilled nursing hospitals, etc. [4]. Its application in healthcare delivery has yielded a variety of results, indicating that it need refinement [5]. Apart from the SERVQUAL's widespread use, some writers have created their original instrument to evaluate service quality in healthcare.

3. Research Methodology

Research conducted based on primary data collected with structured questionnaire. The various responded were contacted through the google sheet and their responses were recorded on a sheet for analysis. We have received 182 responses from through respondents from PAN India. The responses recorded on excel sheet were made to run through SPSS 14.0 and data was analyzed further for understand the patient's satisfaction with various factors.

3.1. Reliability Analysis

Cronbach's Alpha is a measure of internal consistency or reliability of a set of scale or test items. A Cronbach's Alpha of 0.872 indicates a high level of internal consistency among the items in the scale. A value of 0.872 suggests that the items in the scale are closely related and measure the same underlying concept. In general, values of Cronbach's Alpha above 0.7 are considered acceptable, and values above 0.8 are considered good. The items in the scale likely provide consistent responses across different participants, which indicates that the scale is reliable for measuring the intended construct.

Table 1: Reliability Statistic

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.872	.871	11

3.2. Factor Analysis

The KMO measure indicates the proportion of variance among the variables that might be common variance. It ranges from 0 to 1 . A KMO value of 0.724 is considered "middling" according to Kaiser's classification. This means that the sample is adequate for factor analysis, though it is not ideal. Generally, a KMO value above 0.6 is acceptable, and values above 0.8 are considered good.

Table 2: Factor Analysis

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		. 724
Bartlett's Test of Sphericity	Approx. Chi-Square	1391.326
	Df	55
	Sig.	. 000

Bartlett's Test checks whether the correlation matrix is significantly different from an identity matrix (where all correlations are zero except the diagonal). A significant result (p ¡ 0.05) suggests that there are significant correlations among the variables, indicating that factor analysis may be appropriate. If the test is not significant, it suggests that factor analysis might not be suitable. KMO of 0.724 suggests that the data is moderately suitable for factor analysis, indicating that there is a fair amount of common variance. Bartlett's Test (assuming it's significant) would confirm that there are significant correlations among variables, making factor analysis a good choice for your data. Together, these results suggest that your data is suitable for factor analysis, though the adequacy is moderate rather than strong.

Friedman's Test is a non-parametric alternative to the repeated measures ANOVA, typically used when the assumptions of the parametric ANOVA (such as normality and sphericity) are violated. It is applied when you have more than two related groups and want to test whether their distributions differ from each other. The alternative hypothesis there is a difference in the distributions of at least one pair of groups/conditions.

Table 3: ANOVA with Friedman's Test Analysis

ANOVA with Friedman's Test						
		Sum of Squares	Df	Mean Square	Friedman's Chi-Square	Sig
Between People		534.570	181	2.953		
Within People	Between Items	143.231[a]	10	14.323	314.624	.000
	Residual	685.315	1810	.379		
	Total	828.545	1820	.455		
Total		1363.115	2001	.681		
Grand Mean = 3.65						
a. Kendall's coefficient of concordance W = .105.						

Friedman's Test is a valuable tool when dealing with non-parametric, repeated measures data, allowing researchers to assess differences across multiple conditions without assuming a normal distribution.

3.3. Objective Hypothesis

The three different objective hypothesis is analysed between parameters patient satisfaction, cost, quality of care, perceived value, staff competence and patient trust.

3.3.1. Patient Satisfaction vs. Quality of Care. H0: There is no significant relation between cleanliness and hygiene of the health care facility to availability of medical equipment and facilities provided that overall quality of healthcare services factored out (Controlled).
H1: There is significant relation between cleanliness and hygiene of the health care facility to availability of medical equipment and facilities provided that overall quality of healthcare services factored out (Controlled).

3.3.2. Cost vs. Perceived Value. H0: There is no significant relation between healthcare services and value for money of the healthcare services received provided that referring others to use the same healthcare facility again considering the cost (Controlled).
H1: There is significant relation between healthcare services and value for money of the healthcare services received provided that referring others to use the same healthcare facility again considering the cost (Controlled).

3.3.3. Staff Competence vs. Patient Trust. H0: There is no significant relation between skill level demonstrated during medical inspection and trust the healthcare provider to recommend right kind of investigation and treatment provided that knowledge and expertise of the healthcare providers (Controlled).
H1: There is no significant relation between skill level demonstrated during medical inspection and trust the healthcare provider to recommend right kind of investigation and treatment provided that knowledge and expertise of the healthcare providers (Controlled).

4. Result Analysis and Discussion

The descriptive statistics in the below table used here is for Age, Highest Education, Employment status, Monthly Expenditure and health care service taken for. Here we find the highest mean for current employment status of the respondent and then highest level of education.

Table 4: Demographic Data Presentation

Statistics					
	What is your Age?	What is the Highest Level of Education you have Completed?	What is your Current Employment Status?	What is your Approximate Monthly Expenditure (overall)?	Health Care Services taken from
Mean	3.19	3.46	4.08	3.27	2.62
Std. Deviation	.395	.500	1.144	2.369	.790
Variance	.156	.250	1.309	5.612	.625

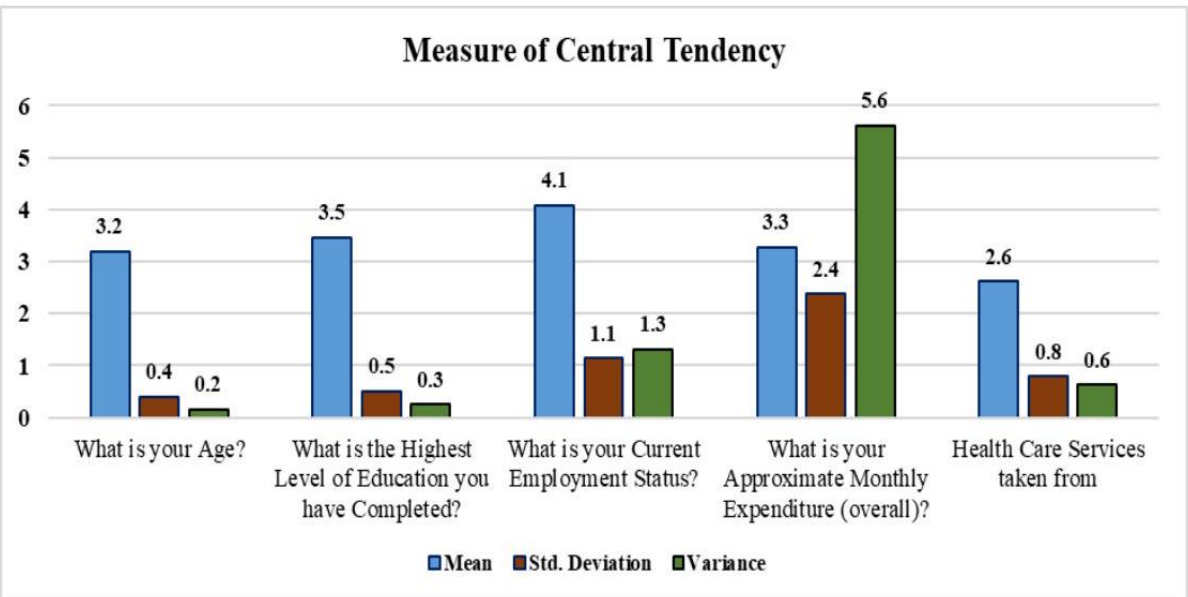

Figure 2: Measures of Central Tendency

For a correlation analysis, the goal is to identify the strength and direction of relationships between different variables. Here the three-correlation analysis analysed for the finding of correlation between different dependent and independent variables.
(i) Patient Satisfaction vs. Quality of Care
(ii) Cost vs. Perceived Value
(iii) Staff Competence vs. Patient Trust

4.1. Patient Satisfaction vs. Quality of Care

H0: There is no significant relation between cleanliness and hygiene of the health care facility to availability of medical equipment and facilities provided that overall quality of healthcare services factored out (Controlled).
H1: There is significant relation between cleanliness and hygiene of the health care facility to availabil-

ity of medical equipment and facilities provided that overall quality of healthcare services factored out (Controlled).

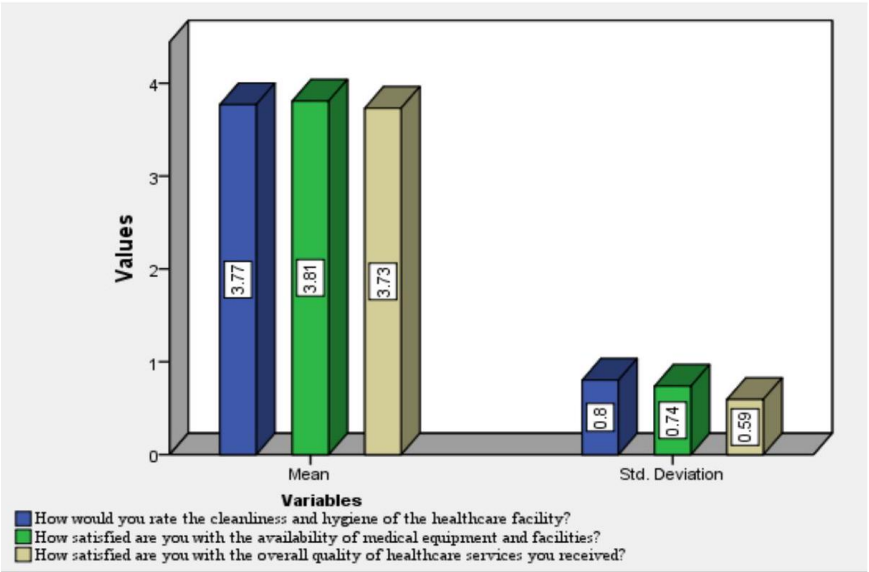

Figure 3: Mean and Standard Deviation for Patient Satisfaction vs. Quality of Care

Table 5: Correlation Analysis for Patient Satisfaction vs. Quality of Care

Correlations				
Control Variables		How would you rate the cleanliness and hygiene of the healthcare facility?		How satisfied are you with the availability of medical equipment and facilities?
How satisfied are you with the overall quality of healthcare services you received?	How would you rate the cleanliness and hygiene of the healthcare facility?	Correlation	1.000	.727
		Significance (2-tailed)	.	.000
		Df	0	179
	How satisfied are you with the availability of medical equipment and facilities?	Correlation	.727	1.000
		Significance (2-tailed)	.000	.
		Df	179	0

As the p-value of Pearson Correlation is 0.000 which is less than 5% level of significance we reject null hypothesis which means that there is a significant relation between cleanliness and hygiene of healthcare facility and availability of medical equipment and facilities when quality of healthcare services is controlled. Moreover, Pearson Correlation is 0.727 which suggest a strong positive relationship between cleanliness and hygiene of healthcare facility and availability of medical equipment and facilities even if controlling the variable quality of healthcare services.

4.2. Cost vs. Perceived Value

H0: There is no significant relation between healthcare services and value for money of the healthcare services received provided that referring others to use the same healthcare facility again considering the cost (Controlled).
H1: There is significant relation between healthcare services and value for money of the healthcare services received provided that referring others to use the same healthcare facility again considering the cost (Controlled).

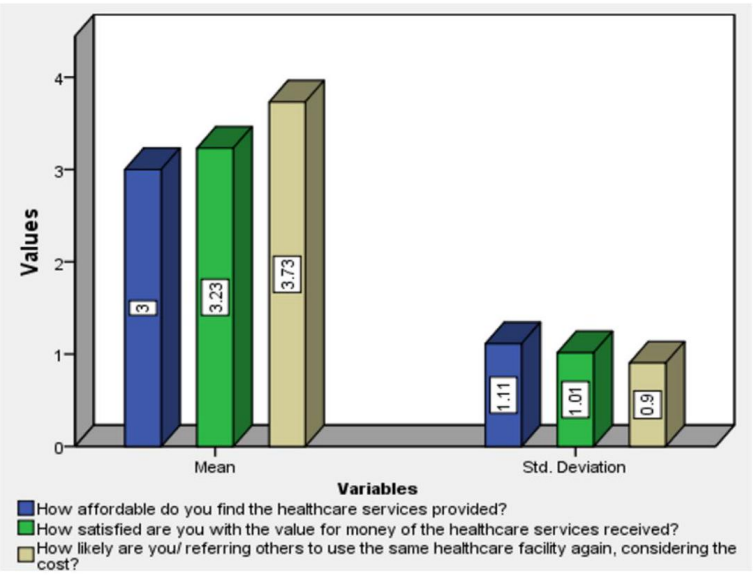

Figure 4: Mean and Standard Deviation for Cost vs. perceived value

Table 6: Correlation Analysis for Cost vs. Perceived Value

Correlations				
Control Variables			How affordable do you find the healthcare services provided?	How satisfied are you with the value for money of the healthcare services received?
How likely are you/ referring others to use the same healthcare facility again, considering the cost?	How affordable do you find the healthcare services provided?	Correlation	1.000	.775
		Significance (2-tailed)	.	.000
		df	0	179
	How satisfied are you with the value for money of the healthcare services received?	Correlation	.775	1.000
		Significance (2-tailed)	.000	.
		df	179	0

As the p-value of Pearson Correlation is 0.000 which is less than 5% level of significance we reject null hypothesis which means that there is a significant relation between healthcare services and value for money of the healthcare services received provided that referring others to use the same healthcare facility again considering the cost (Controlled). Moreover, Pearson Correlation is 0.775 which suggest a

strong positive relationship between healthcare services and value for money of the healthcare services received even if controlling the variable referring others to use the same healthcare facility.

4.3. Staff Competence vs. Patient Trust

H0: There is no significant relation between skill level demonstrated during medical inspection and trust the healthcare provider to recommend right kind of investigation and treatment provided that knowledge and expertise of the healthcare providers (Controlled).
H1: There is no significant relation between skill level demonstrated during medical inspection and trust the healthcare provider to recommend right kind of investigation and treatment provided that knowledge and expertise of the healthcare providers (Controlled).

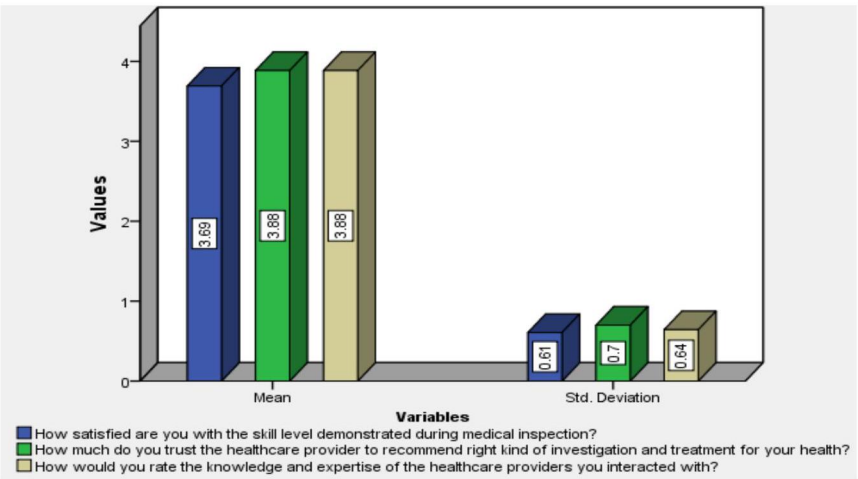

Figure 5: Mean and Standard Deviation for Staff Competence vs. Patient Trust

Table 7: Correlation Analysis for Staff Competence vs. Patient Trust

Correlations				
Control Variables			How satisfied are you with the skill level demonstrated during medical inspection?	How much do you trust the healthcare provider to recommend right kind of investigation and treatment for your health?
How would you rate the knowledge and expertise of the healthcare providers you interacted with?	How satisfied are you with the skill level demonstrated during medical inspection?	Correlation	1.000	.559
		Significance (2-tailed)	.	.000
		df	0	179
	How much do you trust the healthcare provider to recommend right kind of investigation and treatment for your health?	Correlation	.559	1.000
		Significance (2-tailed)	.000	.
		Df	179	0

As the p-value of Pearson Correlation is 0.000 which is less than 5% level of significance we reject

null hypothesis which means that there is a significant relation between skill level demonstrated during medical inspection and the trust on healthcare provider to recommend right kind of investigation and treatment of health if knowledge and expertise of the healthcare providers (Controlled). Moreover, Pearson Correlation is 0.559 which suggest a mild positive relationship between skill level demonstrated during medical inspection and the trust on healthcare provider to recommend right kind of investigation even if controlling the variable knowledge and expertise of the healthcare providers.

5. Future Direction for the Healthcare Study

There is remarkable scope to improve the healthcare in a great way. A combination of personal and public health care has ensured that people can now live up to an average of 71 years, while it was only 30 to 35 years at the time of our independence. We are now also a power in the world of pharma and vaccine development and countries across the globe look to us to share this medical expertise. We are also a popular destination for medical tourism and people from all over the world visiting India for health treatment, unimaginable in the immediate years after independence. India also needs to make its healthcare more accessible and affordable for its rural population and it is expected that with breakthrough that will emerge in the future, Healthcare in India will be affordable.

The future of the healthcare is oriented with technology. The arrival AI has lot of scope for improving the patient experience as well as faster diagnosis. Digital health and Telemedicine shall be enhancing the scalability and accessibility. With the passage of time low-cost technology shall help to reduce the rural-urban rift. There will be focus on primary and preventive healthcare research. The Government of India medical scheme Ayushman Bharat effectives and scalability can be under study to improve upon the system for larger
benefits. The future Study can be focused to find out gaps in public health infrastructure, logistics, and supply chains for improving the delivery efficiency.

Declaration- All Authors declare that they have no conflicts of interest.

Acknowledgement- We thank the organizers of the "International Conference on Mathematical Sciences and Computing Innovations and Applications (ICMSC-2025)" jointly organized by Department of Mathematics, North-Eastern Regional Institute of Science and Technology (NERIST) and Department of Mathematics, National Institute of Technology (NIT), Uttarakhand held over June 26-28, 2025.

References

1. M. Godovykh and A. Pizam, Measuring Patient Experience in Healthcare, Int. J. Hosp. Manag., 2023.
2. A. K. Aggarwal, et al., Impact of patient choice and hospital competition on patient outcomes after prostate cancer surgery: A national population-based study, Cancer, 2019.
3. G. Flodgren, External inspection of compliance with standards for improved healthcare outcomes, Cochrane Database of Systematic Reviews, 2016, DOI: 10.1002/14651858.CD008992.pub3. Available at: https://pubmed.ncbi.nlm.nih.gov/27911487/
4. P. C. Lim and N. Tang, A study of patients' expectations and satisfaction in Singapore hospitals, 2000, DOI: 10.1108/09526860010378735. Available at: https://pubmed.ncbi.nlm.nih.gov/11484647/
5. M. Duggirala, et al., Patient-perceived dimensions of total quality service in healthcare, 2008.
6. H. Vinagre and J. Neves, Emotional predictors of consumer's satisfaction with healthcare public services, 2010, DOI: 10.1108/09526861011017111. Available at: https://pubmed.ncbi.nlm.nih.gov/21388101/
7. D. A. Ellis, Missed appointments in Healthcare and its impact on satisfaction, 2019, DOI: 10.1186/s12916-018-1234-0. Available at: https://pubmed.ncbi.nlm.nih.gov/30630493/
8. D. Baker, Globalizing healthcare: A prescription with benefits, OECD Observer, Oct. 2010. Available at: https://cepr.net/publications/globalizing-healthcare-a-prescription-with-benefits/
9. OECD, Improving Value in Healthcare, OECD Publishing, 2010. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2010/10/improving-value-in-health-care_g1g11966/9789264094819-en.pdf
10. P. M. Carrera and J. F. P. Bridges, Globalization and healthcare: Understanding health and medical tourism, Expert Rev. Pharmacoecon. Outcomes Res., vol. 6, no. 4, pp. 447-454, 2006. https://doi.org/10.1586/14737167.6.4.447
11. McKinsey & Company, India healthcare: Inspiring possibilities, challenging journey, 2012. Available at: https://www.mckinsey.com/featured-insights/india/india-healthcare-inspiring-possibilities-challenging-journey

12. S. Padma, et al., A conceptual framework of quality of hospital services using SERVPERF model, 2009. Available at: https://www.researchgate.net/publication/318479912_Measuring_the_quality_of_health_services_provided_at_a_Greek_Public_Hospital_through_patient_satisfaction_Case_Study_The_General_Hospital_of_Kavala

13. Federation of Indian Chambers of Commerce and Industry (FICCI), Indian healthcare FICCI HEAL 2011: Recommendations, FICCI Report, Sept. 2011. Available at: https://www.ficci.in/sector/health-services/policyrecommendations

14. India Brand Equity Foundation (IBEF), Healthcare sector - India, 2023. Available at: http://www.ibef.org/industry/healthcare-india

15. S. Chakraborty and P. Majumdar, Service quality in healthcare establishment: A study in India, Int. J. Behav. Healthc. Res., vol. 1, no. 3, pp. 253-267, 2015. https://doi.org/10.1504/IJBHR.2015.071465

16. Confederation of Indian Industry (CII), Healthcare in India poised for leap - report on Healthcare, 2023. Available at: https://www.cii.in/PublicationDetail.aspx?enc=LiiRGe4jY6fiI2o/fOzGHJbO7J2xqZuuy1C3I6Y8TjY=

17. NITI Aayog, Investment Opportunities in India's Healthcare Sector, 2021. Available at: https://www.niti.gov.in/sites/default/files/202103/InvestmentOpportunities_HealthcareSector_0.pdf

18. Ernst & Young, Decoding India's Healthcare Landscape, EY Report, 2024. Available at: https://assets.ey.com/content/dam/ey-sites/ey-m/en_in/topics/health/2024/ey-decoding-india-s-healthcare-landscape.pdf

Shailesh Tripathi,
Balaji Institute of Management & HRD,
Sri Balaji University, Pune, India.
E-mail address: motivationtripathi@gmail.com

and

Anju Khandelwal (Corresponding author),
School of Actuarial Science,
Sri Balaji University, Pune, India.
E-mail address: dranju20khandelwal@gmail.com