

Research Article

Cost-Effectiveness Analysis of Inpatient Rehabilitation Centers versus Home Care Services in Bangalore, India*Samuel Paul Isaac^{1*}, Manish Kumar²*¹Shri Venkateshwara University, Uttar Pradesh, India.

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Corresponding Author: *Samuel Paul Isaac* Email: *sampaul77@gmail.com***ABSTRACT**

Introduction: The changing healthcare profile in India, characterized by increasing chronic diseases, trauma, and age-related disabilities, has intensified the demand for effective post-hospitalisation rehabilitation services.

Aim: This study examined the strategic establishment of Inpatient Rehabilitation Centres (IRCs) in India and assessed their cost-effectiveness relative to home care services, with a focus on Bangalore.

Materials and Methods: A cross-sectional survey was conducted among patients receiving rehabilitation services in Bangalore. A total of 432 patients recovering from surgery, trauma, or chronic illness were included. Sociodemographic, clinical, cost, and outcome data were collected using structured questionnaires. Cost-effectiveness was evaluated using the Incremental Cost-Effectiveness Ratio (ICER).

Results: Patients in inpatient rehabilitation centres (IRCs) incurred a higher mean total cost than those receiving home care (INR 69,004 vs. INR 54,380; $p < 0.001$) but achieved significantly greater functional outcome improvement (20.29 vs. 15.43; $p < 0.001$). The Incremental Cost-Effectiveness Ratio (ICER) was INR 3,008.89 per additional 1-point gain in functional outcome.

Conclusion: Inpatient rehabilitation centres produced superior rehabilitation outcomes despite higher costs, indicating favourable value for money for patients requiring intensive rehabilitation. An integrated model combining inpatient rehabilitation, home care, and tele-rehabilitation may enhance both effectiveness and resource efficiency within the Indian healthcare system.

Keywords: inpatient rehabilitation centres; home care services; cost-effectiveness; rehabilitation outcomes

1. INTRODUCTION

India's healthcare system is undergoing a significant transformation in response to demographic changes, increasing life expectancy, and the growing burden of chronic diseases and disability. As the prevalence of non-communicable diseases, age-related functional impairments, traumatic injuries, and neurological conditions continues to rise, the demand for comprehensive rehabilitation services has increased substantially [1]. Rehabilitation plays a critical role in restoring functional independence, improving quality of life, and reducing long-term disability among individuals recovering from acute illness or injury. Within this context, Inpatient Rehabilitation Centres (IRCs) have

emerged as essential healthcare institutions that provide specialized, multidisciplinary rehabilitation services for patients requiring intensive physical, occupational, and speech therapy interventions. Despite the growing need for such facilities, limited evidence exists regarding the optimal management, sustainability, and economic efficiency of IRCs in India, particularly in relation to resource allocation and cost containment.

The healthcare landscape in India is highly heterogeneous, characterized by variations in infrastructure, accessibility, and service delivery across regions. Urban centers such as Bangalore have experienced rapid growth in healthcare facilities, including specialized rehabilitation

institutions. These centres cater to patients recovering from conditions such as stroke, traumatic brain injury, spinal cord injury, musculoskeletal disorders, and other disabling health conditions. By providing structured rehabilitation programs and continuous medical supervision, IRCs support long-term recovery and facilitate patients' return to independent living. However, despite the expansion of rehabilitation services, there remains a considerable gap in understanding how IRCs can be effectively developed, managed, and scaled within the broader healthcare system. The establishment of a robust strategic business model is therefore crucial to ensure operational efficiency, financial sustainability, and improved patient outcomes while maximizing the value of rehabilitation services within existing healthcare frameworks.

An important consideration in evaluating rehabilitation service delivery is the cost-effectiveness of inpatient rehabilitation compared with alternative models of care, particularly home-based rehabilitation services [2]. Home care services have gained increasing acceptance in India as a flexible and potentially cost-effective option for long-term rehabilitation [3]. Home-based rehabilitation allows healthcare professionals to deliver personalized therapeutic interventions within the patient's home environment, potentially enhancing patient comfort, family involvement, and psychological well-being. Such services may also reduce travel-related burdens and improve adherence to rehabilitation programs. However, despite the growing popularity of home-based care, there is limited evidence evaluating its comparative effectiveness and economic value relative to inpatient rehabilitation centres within the Indian context.

Understanding the relative costs and outcomes associated with these two rehabilitation models is critical for policymakers, healthcare providers, insurers, and healthcare planners. Evidence-based comparisons can inform decisions regarding resource allocation, healthcare financing, and the design of rehabilitation service delivery systems. Furlan *et al.* emphasize that well-designed business models can improve the

sustainability, accessibility, and scalability of rehabilitation services, particularly in low- and middle-income countries where healthcare resources are constrained [4]. Similarly, research by Velez *et al.* suggests that comparative cost-effectiveness analyses between inpatient rehabilitation and home-based services can help identify strategies for optimizing healthcare resource utilization while ensuring that patients receive appropriate and high-quality care at the lowest feasible cost [5]. Consequently, there is a clear need to address existing knowledge gaps concerning the development and management of IRCs in India while simultaneously evaluating their economic performance relative to home care services.

Recent India-specific studies have further highlighted the increasing demand for post-acute rehabilitation services driven by population ageing, the growing prevalence of non-communicable diseases, stroke, musculoskeletal disorders, and trauma-related disabilities. Although rehabilitation services are expanding across the country, particularly in metropolitan and urban regions, formal economic evaluations comparing inpatient rehabilitation with home-based rehabilitation remain scarce. Existing research has largely focused on service utilization patterns, access to care, and clinical outcomes rather than comprehensive assessments of comparative cost-effectiveness [6-8]. As a result, healthcare stakeholders continue to face challenges in determining the most efficient and sustainable models of rehabilitation service delivery.

The financing and delivery context of rehabilitation services in India further underscores the importance of conducting rigorous economic evaluations. Government-funded initiatives such as Ayushman Bharat–Pradhan Mantri Jan Arogya Yojana (PM-JAY) and various state-level health insurance programs have expanded healthcare access for millions of individuals. However, coverage for rehabilitation services remains inconsistent across schemes and providers. Furthermore, insurance penetration continues to vary significantly across socioeconomic groups, while rehabilitation care is predominantly delivered through private

healthcare providers in metropolitan regions such as Bangalore. These financial and structural realities influence patient affordability, provider incentives, treatment adherence, and continuity of care. Consequently, there is a growing need for evidence that can guide decisions regarding the integration of different rehabilitation delivery models and identify approaches that maximize both accessibility and value for money. An integrated model combining inpatient rehabilitation centres, home-based care, and telehealth services may offer a promising solution to these challenges [9, 10].

Bangalore provides an especially relevant setting for examining these issues. As one of India's leading healthcare hubs and a prominent destination for medical tourism, the city attracts patients from across the country as well as neighbouring nations seeking advanced medical and surgical treatment. These patient inflows contribute to increased demand for post-acute rehabilitation services and influence rehabilitation utilization patterns, payer mix, and service delivery structures. At the same time, telemedicine has emerged as an increasingly important component of rehabilitation care, enabling remote follow-up, monitoring, consultation, and continuity of care following hospital discharge. In the present study, telemedicine is considered a complementary component of home-based rehabilitation and is evaluated within the broader framework of integrated rehabilitation service delivery. Therefore, both medical tourism and telehealth represent important contextual factors that influence the accessibility, utilization, and cost-effectiveness of rehabilitation services in Bangalore.

Given these considerations, this study seeks to evaluate the cost-effectiveness of inpatient rehabilitation centres relative to home-based rehabilitation services in Bangalore. It also examines whether an integrated rehabilitation model that combines inpatient care, home-based rehabilitation, and telehealth services may provide a more accessible, sustainable, and economically efficient approach to post-acute rehabilitation in India. While recent evidence highlights the growing demand for rehabilitation

services and the influence of healthcare financing structures on access to care, comparative economic evaluations remain limited. This study aims to contribute to the existing body of knowledge by providing evidence that can support healthcare planning, policy development, and strategic decision-making regarding rehabilitation service delivery in India. For the purposes of this study, post-hospitalisation rehabilitation refers to multidisciplinary therapeutic services, including physiotherapy, occupational therapy, and ongoing medical oversight, initiated immediately following discharge from an acute care hospital setting.

2. MATERIALS AND METHODS

Study Design and Setting

A cross-sectional study was conducted in Bangalore, Karnataka, India, between July 2022 and December 2022. The study population consisted of patients receiving post-hospitalisation rehabilitation services through various inpatient rehabilitation centres (IRCs) in Bangalore. Participants included individuals who had either completed rehabilitation or were actively undergoing rehabilitation during the study period.

Sampling Strategy and Participant Selection

A multistage sampling approach was employed. Initially, a list of all registered inpatient rehabilitation centres in Bangalore was obtained from the local health authorities. A purposive sample of IRCs was then selected to ensure representation across different facility sizes and service types. Eligible patients from the selected facilities were invited to participate in the study. The inclusion criteria comprised adults aged 18 years and above who were recovering from surgery, trauma, or chronic illness, had been referred for post-hospitalisation rehabilitation, and had received or were receiving rehabilitation services within the preceding three months. Individuals with a primary psychiatric diagnosis that could interfere with rehabilitation or those unable to provide informed consent were excluded from the study.

Sample Size Determination

The minimum required sample size was calculated as 383 participants using a 95% confidence level, a 5% margin of error, and an assumed population variability of 50% ($p = 0.5$). To compensate for potential non-response and incomplete data, the target sample size was increased to 500 participants. A study flow diagram (Figure 1) illustrates the selection of inpatient rehabilitation centres (IRCs), patient screening, eligibility assessment, exclusions, refusals, and the final analytic sample included in the study. We utilized only those patients whose data were fully captured for the study.

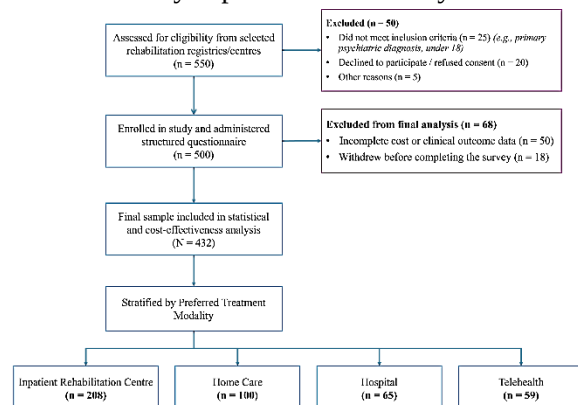


Figure 1: CONSORT flow diagram of patient recruitment and selection.

Ethical Considerations

This study utilized a voluntary and anonymous survey administered to patients undergoing post-hospitalization rehabilitation services. No invasive procedures or clinical interventions were involved. The study posed minimal risk, as participants were only required to complete a structured questionnaire assessing their rehabilitation preferences and perceived barriers to care. Written informed consent was obtained from all participants after they were adequately informed about the study objectives, confidentiality safeguards, and their right to withdraw at any point without any consequences. Ethical approval for the study was granted by the Research Ethics Principles & Committee of Sri Venkateshwara University (IRB reference no. SVU/DOC/MBA/2022-23/09/145, dated 15 June 2022). All data were anonymized prior to analysis, with no collection of personally identifiable information. Participation in the

study did not influence access to rehabilitation services or ongoing clinical care.

Representativeness Assessment

To assess the representativeness of the study sample, key sociodemographic and clinical characteristics were compared with aggregate administrative data for rehabilitation patients in Bangalore obtained from the Department of Health (2021–2022). Chi-square tests were used for categorical variables and independent-samples t-tests for continuous variables. A significance level of $p < 0.05$ was used to identify statistically significant differences. No significant differences were observed between the study sample and the reference population, indicating that the sample was broadly representative of rehabilitation patients in Bangalore.

Costing Methodology

A micro-costing (bottom-up) approach was used to estimate patient-level costs. Direct medical costs included bed charges, consultation fees, medications, diagnostic procedures, and rehabilitation services. Direct non-medical costs included transportation and accommodation expenses incurred during rehabilitation. Provider-side operational costs were estimated using a top-down allocation approach based on facility financial accounts and operational expenditure records. All costs were reported in 2022 Indian Rupees (INR).

Data Collection Procedures

Data were collected using a structured questionnaire administered by trained research assistants. The questionnaire was developed through a review of relevant literature and consultation with rehabilitation and healthcare management experts. Prior to implementation, the instrument was pilot tested to ensure clarity, relevance, and comprehensibility.

Information collected included sociodemographic characteristics such as age, sex, marital status, residence type, income, and employment status. Cost-related information included direct medical costs, direct non-medical costs, and provider operational costs. Outcome data included length of stay, functional improvement, and patient satisfaction.

Definition of Rehabilitation Services

For the purpose of this study, post-hospitalisation rehabilitation was defined as multidisciplinary therapeutic services initiated following discharge from an acute care hospital and aimed at restoring functional ability, improving quality of life, and promoting patient independence. These services included physiotherapy, occupational therapy, speech and language therapy where required, nursing care, and medical supervision. Rehabilitation was delivered either through inpatient rehabilitation centres or through home-based rehabilitation supported by allied health professional visits and telehealth follow-up. Common conditions requiring rehabilitation included stroke, major orthopaedic surgery, traumatic injuries, neurological disorders, and other chronic disabling conditions.

Medical Tourism and Telemedicine Context

Medical tourism was defined as travel across state or national boundaries to obtain healthcare services. Within the context of this study, it referred to patients travelling to Bangalore from other Indian states or neighbouring countries to access specialised healthcare and rehabilitation services. Telemedicine was defined as the provision of healthcare services through telecommunications technologies and was used primarily for remote rehabilitation monitoring, consultation, and follow-up care.

Outcome Measures

The primary outcome for the cost-effectiveness analysis was functional outcome improvement following rehabilitation. Secondary outcomes included patient satisfaction, length of stay, total patient costs, direct medical costs, and direct non-medical costs. These measures were used to compare the effectiveness and economic impact of inpatient rehabilitation centres and home-based rehabilitation services.

Statistical Analysis

All statistical analyses were performed using SPSS version 28.0. Descriptive statistics were used to summarise participant characteristics and rehabilitation outcomes. Continuous variables were presented as means and standard deviations, whereas categorical variables were reported as frequencies and percentages. Chi-square tests were used to examine associations between

categorical variables, while Pearson correlation analysis was used to assess relationships among continuous variables. Comparisons across treatment modalities were conducted using analysis of variance (ANOVA), with Kruskal–Wallis tests used where assumptions of homogeneity of variance were violated. Statistical significance was established at $p < 0.05$.

A cost-effectiveness analysis was undertaken from both patient and provider perspectives. The incremental cost-effectiveness ratio (ICER) was calculated by dividing the difference in costs between treatment alternatives by the difference in functional outcomes. Multiple regression analysis was performed to examine the influence of sociodemographic and clinical factors, including duration of illness, marital status, education level, income, employment status, and payment method, on treatment preferences and rehabilitation outcomes. Model assumptions were assessed using histograms and Normal P–P plots of standardised residuals. Variables identified as significantly different during the representativeness assessment were included as covariates in multivariable models to minimise potential residual selection bias.

3. RESULTS

Patient Characteristics

The descriptive characteristics of the 432 participants included in the study is presented in Table 1. The mean age of the participants was 56.17 years (SD = 18.07), with ages ranging from 20 to 88 years. The average monthly income was ₹72,023.15 (SD = ₹37,151.65), with values ranging from ₹9,000 to ₹149,000. Participants had a mean length of stay of 31.31 days (SD = 8.70), with hospital stays varying between 12 and 60 days. The mean total patient cost was ₹57,212.54 (SD = ₹20,423.03), ranging from ₹16,359 to ₹92,476. Of this amount, the average direct medical cost was ₹43,711.51 (SD = ₹19,778.32), while the mean direct non-medical cost was ₹13,501.03 (SD = ₹1,377.88). Functional outcomes improved considerably among participants, with a mean functional outcome change score of 16.79 (SD = 4.59), ranging from 7.3 to 25.9. Patient satisfaction

levels were generally high, as reflected by a mean satisfaction score of 4.08 (SD = 0.91) on a scale ranging from 1.2 to 5.0. Overall, the results indicated a diverse patient population with substantial variation in age, income, healthcare costs, and rehabilitation outcomes.

Table 1. Participant characteristics

Descriptive Statistics					
Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age	432	20	88	56.17	18.07
Income	432	9000	149000	72023.15	37151.65
Length of Stay	432	12	60	31.31	8.70
Total Patient Cost	432	16359	92476	57212.54	20423.03
Direct Medical Cost	432	4009	79484	43711.51	19778.32
Direct Non-medical Cost	432	10384	16816	13501.03	1377.88
Functional Outcome Change	432	7.3	25.9	16.794	4.59
Satisfaction Score	432	1.2	5.0	4.076	0.91

Table 2. Descriptive statistics for continuous variables overall and by preferred treatment

Variable		Mean $\pm$ SD	ANOVA statistic	p value	Levene value	p Kruskal-Wallis H	p value
Age	Home	39.90 $\pm$ 10.50	F(3,428)=81.643	<0.001	<0.001	160.053	<0.001
	Hospital	51.46 $\pm$ 20.78					
	Telehealth	52.31 $\pm$ 19.51					
	Rehabilitation Centre	66.55 $\pm$ 11.81					
Income	Home	73,160.00 $\pm$ 39,684.04	F(3,428)=0.157	0.925	0.143	0.259	0.968
	Hospital	69,307.69 $\pm$ 35,155.87					
	Telehealth	72,898.31 $\pm$ 36,187.58					
	Rehabilitation Centre	72,076.92 $\pm$ 36,992.67					
Length of Stay	Home	23.50 $\pm$ 6.88	F(3,428)=186.496	<0.001	<0.001	177.792	<0.001
	Hospital	29.69 $\pm$ 6.28					
	Telehealth	45.69 $\pm$ 9.47					
	Rehabilitation Centre	31.50 $\pm$ 2.87					
Total Patient Cost	Home	54380.77 $\pm$ 16191.46	F(3,428)=257.305	<0.001	<0.001	202.151	<0.001
	Hospital	58455.88 $\pm$ 3322.51					
	Telehealth	19072.46 $\pm$ 1869.22					
	Rehabilitation Centre	69004.01 $\pm$ 13416.27					
Direct Medical Cost	Home	40999.44 $\pm$ 15326.84	F(3,428)=245.110	<0.001	<0.001	192.408	<0.001
	Hospital	46779.15 $\pm$ 3332.2					
	Telehealth	6709.95 $\pm$ 1860.79					
	Rehabilitation Centre	54552.38 $\pm$ 13524.29					
Direct Non-medical Cost	Home	13381.33 $\pm$ 1173.2	F(3,428)=204.691	<0.001	<0.001	256.3	<0.001
	Hospital	11676.72 $\pm$ 653.99					
	Telehealth	12362.51 $\pm$ 222.86					
	Rehabilitation Centre	14451.63 $\pm$ 905.07					
Functional Outcome Change	Home	15.43 $\pm$ 4.6	F(3,428)=223.331	<0.001	<0.001	246.531	<0.001
	Hospital	12.05 $\pm$ 1.72					
	Telehealth	11.99 $\pm$ 1.62					
	Rehabilitation Centre	20.29 $\pm$ 2.32					
Satisfaction Score	Home	4.24 $\pm$ 0.42	F(3,428)=1116.274	<0.001	<0.001	248.746	<0.001
	Hospital	4.01 $\pm$ 0.31					
	Telehealth	1.99 $\pm$ 0.31					
	Rehabilitation Centre	4.61 $\pm$ 0.23					

Comparison of Patient Characteristics, Costs, and Outcomes Across Treatment Modalities

Significant differences were observed among the four treatment modalities for most continuous variables. Participants who preferred rehabilitation centres were older (66.55 ± 11.81 years) and incurred the highest total patient costs ($\text{₹}69,004.01 \pm \text{₹}13,416.27$), direct medical costs ($\text{₹}54,552.38 \pm \text{₹}13,524.29$), functional outcome improvements (20.29 ± 2.32), and satisfaction scores (4.61 ± 0.23). Telehealth users experienced the lowest total and medical costs but also reported the lowest functional outcome improvements and satisfaction levels. Home care users were generally younger and demonstrated moderate costs and outcomes, while hospital care showed intermediate results across most measures.

Income did not differ significantly across treatment groups ($p = 0.925$), whereas age, length of stay, costs, functional outcomes, and satisfaction scores differed significantly between the treatment modalities (all $p < 0.001$). The Kruskal–Wallis test confirmed these findings, indicating consistent differences across groups for all variables except income (Table 2).

Cost-Effectiveness Analysis of Inpatient Rehabilitation Centres & Home Care Services

The cost-effectiveness analysis revealed notable differences between inpatient rehabilitation centres and home care services. Patients receiving care in inpatient rehabilitation centres incurred significantly higher total patient costs (₹69,004.01 vs. ₹54,380.77), direct medical costs (₹54,552.38 vs. ₹40,999.44), and direct non-medical costs (₹14,451.63 vs. ₹13,381.33) compared with those receiving home care.

Inpatient rehabilitation centre patients also experienced a longer average length of stay (31.50 vs. 23.50 days). Despite the higher costs, inpatient rehabilitation centres achieved significantly better outcomes, with greater improvements in functional outcome scores (20.29 vs. 15.43) and higher patient satisfaction scores (4.61 vs. 4.24). All observed differences were statistically significant ($p < 0.001$), with confidence intervals indicating consistent advantages in outcomes for inpatient rehabilitation centres. The incremental cost-effectiveness ratio (ICER) was calculated at ₹3,008.89 per additional one-point gain in functional outcome, suggesting that the additional expenditure associated with inpatient rehabilitation centres resulted in measurable improvements in patient recovery and satisfaction (Table 3).

Table 3. Comparison of costs and outcomes between inpatient rehabilitation centres and home care services

Variable	Inpatient rehabilitation centres (mean)	Home care (mean)	Mean difference	95% CI	p-value
Total patient cost (INR)	69004.01	54380.77	14623.24	11181.67 to 18064.81	<0.001
Direct medical cost (INR)	54552.38	40999.44	13552.94	10168.89 to 16936.99	<0.001
Direct non-medical cost (INR)	14451.63	13381.33	1070.30	830.92 to 1309.68	<0.001
Length of stay (days)	31.50	23.50	8.00	6.90 to 9.10	<0.001
Functional outcome change	20.29	15.43	4.86	4.09 to 5.64	<0.001
Satisfaction score (out of 5)	4.61	4.24	0.36	0.29 to 0.44	<0.001

Note: CI = confidence interval. Mean differences are from independent-samples t-tests. ICER = INR 3,008.89 per additional 1-point gain in functional outcome

As the objective of the present study was to evaluate the cost-effectiveness of inpatient rehabilitation centres compared with home care services in Bangalore, India, the comparison of hospital- and telehealth-based services was an exploratory analysis to provide broader context regarding rehabilitation service delivery. The findings indicated that telehealth was the least costly option, with the lowest total patient cost (₹19,072.46) and direct medical cost (₹6,709.95); however, it was also associated with the poorest functional outcomes (11.99) and the lowest patient satisfaction score (1.98). Hospital care incurred higher costs and demonstrated moderate outcomes and satisfaction levels. In contrast, rehabilitation centres achieved the best clinical outcomes and highest patient satisfaction, while home care offered a favourable balance between cost and effectiveness, providing the second-best

outcomes at a lower cost than both hospital and rehabilitation centre services. Home care also had the shortest average length of stay (23.5 days), whereas telehealth required the longest duration of care (45.69 days)

Regression Analysis

Regression analysis was performed to examine the influence of selected sociodemographic variables, including income, employment type, residence type, and marital status, as well as the clinical factor of duration of stay, on participants' preferred treatment type. Before interpreting the regression results, diagnostic tests were conducted to assess whether the assumptions underlying the regression model were adequately satisfied.

Assessment of Regression Assumptions: Histogram of Standardized Residuals

The normality of residuals was first assessed using a histogram of standardized residuals. The

histogram demonstrated that the residuals were approximately normally distributed and centered around zero (mean = -5.85×10^{-16} , SD = 0.986). The observed distribution closely followed the superimposed normal curve, with only minor deviations at the extreme tails. Furthermore, the majority of residual values were concentrated within the range of -2 to $+2$ standard deviations, indicating the absence of substantial outliers. Based on the analysis of 432 observations, these findings suggested that the residuals were reasonably normally distributed and that the regression model adequately satisfied the normality assumption (Figure 2).

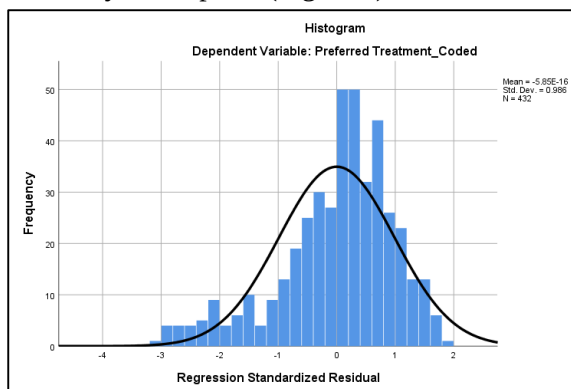


Figure 2: Histogram of regression analysis of preferred treatment type with sociodemographic factors and clinical characteristics.

Assessment of Regression Assumptions: Normal P-P Plot of Standardized Residuals

To further evaluate the normality assumption, a Normal P-P Plot of the regression standardized residuals was examined. The plot illustrated the relationship between the observed cumulative probabilities and the expected cumulative probabilities of the standardized residuals generated from the regression model. The plotted points generally followed the diagonal reference line, indicating a close agreement between the observed and expected distributions. Although minor deviations from the reference line were evident in certain sections of the plot, these departures were not substantial and remained within acceptable limits. Overall, the alignment of the points with the diagonal line indicated that the residuals were approximately normally distributed, thereby supporting the validity and reliability of the regression analysis (Figure 3).

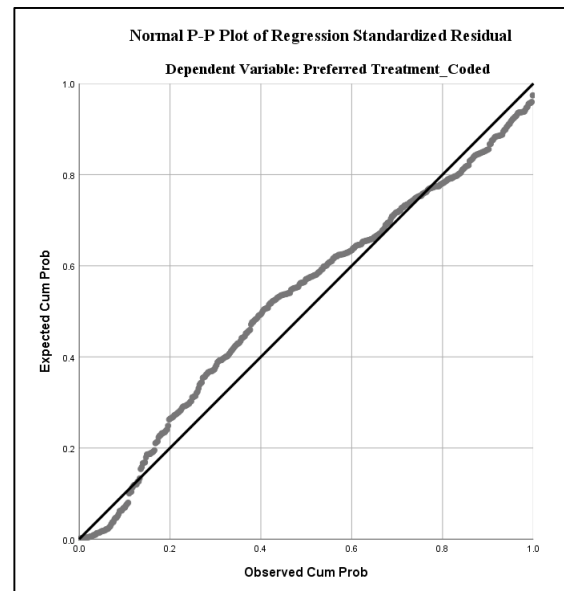


Figure 3: Normal P-P plot of regression analysis of preferred type of treatment with socio-demographic factor and clinical characteristics

Contextual Trends in Healthcare, Medical Tourism, and Telemedicine in India

The broader healthcare environment in India provides important context for understanding treatment preferences and rehabilitation service utilization. India's healthcare sector has experienced substantial growth, expanding from approximately US\$45 billion in 2008 to a projected US\$471 billion by 2030. This growth has been driven by increasing healthcare demand, technological advancements, and economic development. In parallel, medical tourism has emerged as a rapidly expanding segment, with medical visa arrivals projected to reach 1.36 million by 2025. Telemedicine has also witnessed significant expansion, with the market expected to grow from approximately US\$85 million in 2010 to US\$5.5 billion by 2030. These developments highlight the increasing importance of diverse healthcare delivery models, including inpatient rehabilitation, home-based care, and telehealth services, within the evolving Indian healthcare landscape.

4. DISCUSSION

Cost-Effectiveness of Inpatient Rehabilitation Centres Compared with Home Care

The primary objective of this study was to evaluate the cost-effectiveness of inpatient

rehabilitation centres (IRCs) compared with home care services in Bangalore, India. The findings demonstrated that patients receiving care in IRCs achieved significantly greater improvements in functional outcomes and reported higher levels of satisfaction than those receiving home-based rehabilitation. However, these benefits were accompanied by substantially higher costs and longer lengths of stay. Patients treated in IRCs incurred higher total patient costs, direct medical costs, and direct non-medical costs than patients receiving home care. Despite these increased expenditures, the superior clinical outcomes observed among IRC patients suggest that the additional resources invested in intensive rehabilitation services translated into meaningful gains in patient recovery and overall rehabilitation success. These findings indicate that IRCs may be particularly suitable for individuals requiring comprehensive multidisciplinary rehabilitation, whereas home care may represent a more efficient alternative for patients with less complex rehabilitation needs [11, 12].

The incremental cost-effectiveness ratio (ICER) of INR 3,008.89 per additional one-point gain in functional outcome provides an important benchmark for assessing value for money within the rehabilitation sector. Although the interpretation of cost-effectiveness should be considered in relation to local willingness-to-pay thresholds and patient severity levels, the findings suggest that the additional costs associated with inpatient rehabilitation can be justified by the improvements achieved in patient functioning and satisfaction. Consequently, the results support a differentiated rehabilitation strategy rather than a uniform approach to service delivery, allowing patients to receive care that is aligned with the intensity of their rehabilitation requirement [13].

Resource Requirements and Operational Considerations for Inpatient Rehabilitation Centres

The higher costs observed among IRC patients can be attributed to the substantial infrastructure and workforce investments required to establish and maintain such facilities. Inpatient rehabilitation centres depend on

multidisciplinary teams comprising physiotherapists, occupational therapists, speech therapists, rehabilitation physicians, nurses, and support staff, as well as specialised rehabilitation equipment and dedicated infrastructure. These requirements contribute directly to the higher direct medical costs identified in the present study, where the mean direct medical cost for IRCs was INR 54,552 compared with INR 40,999 for home care services. Although these investments increase operational expenditures, they also enable the delivery of intensive and coordinated rehabilitation interventions that may not be feasible in home-based settings. Therefore, the higher cost structure of IRCs should be viewed within the context of the enhanced outcomes they provide [14, 15].

Comparison of Rehabilitation Service Modalities

The exploratory comparison of treatment modalities revealed important differences in cost, effectiveness, and patient satisfaction across rehabilitation settings. Telehealth emerged as the most affordable treatment option, demonstrating the lowest total patient and direct medical costs. However, it also produced the lowest functional outcome improvements and patient satisfaction scores. In contrast, rehabilitation centres achieved the highest levels of clinical improvement and patient satisfaction, although at the highest cost. Home care occupied an intermediate position, offering favourable outcomes and satisfaction levels at a lower cost than hospital-based and inpatient rehabilitation services. These findings suggest that no single rehabilitation model is optimal for all patients and that treatment effectiveness must be considered alongside economic efficiency and patient preferences [16, 17].

Implications for a Hybrid Rehabilitation Model

The observed differences across treatment modalities provide strong support for the development of a hybrid rehabilitation model within the Indian healthcare system. The findings suggest that patients with severe impairments or complex rehabilitation needs may benefit most from an initial period of intensive rehabilitation within an IRC, where multidisciplinary care can

maximize functional recovery. Following stabilization and improvement, patients could transition to home-based rehabilitation services supplemented by telehealth monitoring and follow-up consultations. Such a step-down approach would enable healthcare providers to maintain continuity of care while reducing long-term costs and optimizing resource utilization. Furthermore, the rapid expansion of telemedicine in India offers opportunities to extend rehabilitation services beyond urban centres and improve access for patients residing in underserved regions. By combining the strengths of inpatient rehabilitation, home care, and telehealth, an integrated rehabilitation pathway has the potential to enhance both clinical outcomes and economic efficiency [18, 19].

Implications for Healthcare Policy and Service Planning

The growth of India's healthcare sector, the expansion of medical tourism, and the increasing adoption of telemedicine underscore the importance of developing sustainable rehabilitation service models. As demand for post-acute rehabilitation continues to increase due to population ageing and the growing burden of chronic disease and disability, healthcare planners must balance the need for high-quality rehabilitation with financial sustainability. The findings of this study provide evidence that IRCs deliver superior outcomes but at higher cost, while home care and telehealth offer more economical alternatives with varying levels of effectiveness. Policymakers should therefore consider investing in integrated rehabilitation systems that allocate patients to the most appropriate level of care according to clinical need, thereby maximizing both patient outcomes and the efficient use of healthcare resources [9, 10].

5. LIMITATIONS

The cross-sectional nature of the study restricted the assessment of long-term rehabilitation outcomes and cost-effectiveness, as costs and clinical outcomes were measured at a single point in time. Consequently, the findings may not fully capture the long-term economic and functional benefits associated with different rehabilitation

modalities. Direct non-medical costs were derived from participants' self-reported information, which may have been influenced by recall bias or inaccuracies in reporting. In addition, the study was conducted in Bangalore, a metropolitan centre with relatively advanced healthcare and rehabilitation infrastructure, which may limit the generalizability of the findings to rural settings and other regions of India with different healthcare delivery systems. Future longitudinal and multicentre studies would provide a more comprehensive understanding of the long-term cost-effectiveness and applicability of rehabilitation models across diverse healthcare contexts.

6. CONCLUSION

This study highlights that inpatient rehabilitation centres provided superior functional outcomes and higher patient satisfaction compared with home care services in Bangalore, India, although these benefits were associated with significantly higher costs and longer lengths of stay. The estimated incremental cost-effectiveness ratio indicated that the additional expenditure required for inpatient rehabilitation resulted in meaningful improvements in patient recovery. Home care emerged as a viable and more affordable alternative for patients with less intensive rehabilitation needs, while exploratory findings suggested that telehealth offered substantial cost savings but was associated with poorer outcomes and satisfaction. Overall, the findings support a differentiated and integrated rehabilitation model that combines inpatient rehabilitation, home-based care, and telehealth services according to patient needs. Such an approach may optimize clinical outcomes, improve accessibility, and enhance the efficient utilization of healthcare resources in India.

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CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

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