



# Structural Equation Modelling for Patient-Centered Medication Selection: A Decision Support Framework

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## ARTICLE INFO

## ABSTRACT

The objective of this research was to investigate the key elements that shape patient-centric pharmaceutical care in India, particularly examining how the ease of obtaining medications, their cost, and the attitudes of healthcare providers towards prescribing impact the health outcomes of patients.

Employing Structural Equation Modeling (SEM), this study scrutinized the interplay among these elements. Data encompassing various factors such as the therapeutic impact, economic efficiency, safety profiles, and satisfaction levels of prescribers were analyzed to gauge their effects on both patient adherence and health outcomes.

Findings from the SEM analysis indicated that the ease of medication access and their cost-effectiveness are critical determinants of patient health outcomes. Moreover, the attitudes held by healthcare providers regarding medication efficacy emerged as a significant factor influencing patient adherence to prescribed treatment plans.

The results highlight the urgent need to enhance the accessibility and affordability of medications to foster patient-centered care. The study also sheds light on the crucial influence of healthcare provider attitudes in the process of healthcare delivery. While advocating for focused policy interventions, the research also recognizes the importance of addressing systemic obstacles and formulating comprehensive policy strategies.

The research concludes that strategic policy changes aimed at improving the accessibility and affordability of medications, along with targeted educational initiatives for healthcare providers, are vital for the advancement of patient-centric pharmaceutical care in India. The insights gleaned from this study contribute to the broader dialogue on healthcare enhancement and lay the groundwork for informed policy-making in the future.

**Keywords:** Pharmaceutical Care, Structural Equation Modeling, Healthcare Determinants, Patient-Centered Approach, Medication Accessibility, Healthcare Provider Attitudes

## Introduction

India's vast and varied socio-economic fabric presents distinct challenges in delivering pharmaceutical care that is both centered around the patient and within their financial reach [1]. This investigation probes deep into these issues, scrutinizing the intricate aspects of drug accessibility, cost, and the resultant effects on health outcomes [2], [3].

Navigating the Indian healthcare landscape reveals a stark contrast—there exists a plentiful supply of medicines, yet their reach and affordability are unevenly distributed among the populace [4], [5], [6]. The inequities in healthcare funding, the weight of direct payments, and the complex healthcare system architecture pose insurmountable hurdles for many. This research endeavors to decode these challenges through meticulous policy scrutiny and a comprehensive review of existing literature, all within a solid methodological structure.

It aims to shed light on the connections between drug access, affordability, and patient outcomes, thereby charting a course towards enhanced patient-focused care [1], [7].

The pivotal role of drug access and affordability in shaping patient outcomes and the efficacy of healthcare delivery in India cannot be overstated. In a nation where economic barriers are commonplace, the expense of medications often impedes the acquisition of essential treatments [8]. Moreover, the presence of medications and the knowledge about them are critical in making healthcare choices [9].

This study seeks to unravel the delicate interplay of these elements and their collective impact on patient-centric pharmaceutical care. Incorporating factors such as therapeutic benefits, economic considerations, safety profiles, and the mindset of prescribers, the research constructs an all-encompassing framework of the elements that underpin patient-focused care [10], [11], [12].

The hypotheses driving this inquiry are based on the notion that improved drug access and affordability will naturally lead to enhanced health outcomes. Existing literature indicates that the attitudes of prescribers and the practices of pharmaceutical companies significantly sway medication selection and patient commitment to treatment, while systemic impediments within the healthcare framework negatively impact the provision of patient-centric pharmaceutical care [13], [14].

As India advances towards healthcare pre-eminence, it is crucial to rectify the current deficiencies in pharmaceutical care. This study aims not only to enrich scholarly debate but also to guide policy recommendations that could reshape the terrain of drug access and affordability across India. Through this scholarly pursuit, we seek to pave the way for a healthcare system that is more just, effective, and attuned to the needs of its patients.

Employing Structural Equation Modeling (SEM), this document dissects the complex interrelations to highlight the routes through which drug accessibility and affordability influence patient outcomes. The insights are anticipated to equip stakeholders, including policymakers, healthcare practitioners, and patients, with the essential tools to enhance healthcare services and patient contentment in India [15], [16], [17].

A literature review has pinpointed a lacuna in this domain, emphasizing the need to systematize and define the pharmaceutical selection process, which could be applied in health initiatives, at the policy-making echelon, or even within drug formularies. The objectives of this study are delineated as follows:

### **Objectives:**

- To investigate the effects of drug accessibility and cost on health outcomes for patients in India.
- To analyze the impact of healthcare providers' perspectives and pharmaceutical industry practices on the choice of medication and patient compliance.

### **Hypotheses:**

- H1: There is a positive correlation between the ease of obtaining medications and the improvement of health outcomes for patients.
- H2: The affordability of medications is positively correlated with better health outcomes for patients.
- H3: The attitudes of healthcare providers regarding the choice of medication significantly affect patient compliance with treatment plans.

### **Data Collection:**

A thorough survey was conducted to measure a range of factors essential to patient-focused pharmaceutical care. This survey included various items to assess therapeutic benefits, economic factors, safety concerns, informational sources, drug accessibility, determinants of adherence, viewpoints of healthcare providers, drug features, the influence of the pharmaceutical industry, and decision-making processes.

The survey featured scoring variables relevant to the selection of medications, informed by the expertise of 828 healthcare professionals involved in medication selection, responsible for formulary management, integration into health systems, clinical operations, or pharmacy services.

Healthcare professionals rated each item, indicating their practical application and understanding of the variables. A semi-structured questionnaire was utilized for the survey, which reached out to healthcare professionals in Tier 1, Tier 2, and Tier 3 cities across India. Trained interviewers conducted the survey, ensuring the accuracy and reliability of the data collected. After the data was digitized and cleansed, it was subjected to analysis to derive results from Structural Equation Modelling (SEM) using various models.

**Measurement Model:** The measurement model was assessed using Confirmatory Factor Analysis (CFA) within the SEM framework [18]. Multiple items measured each construct, and the following criteria were applied to evaluate the constructs' reliability and validity [19]:

**Structural Model:** The structural model was examined to test the interrelations among constructs. Standardized path coefficients were calculated to assess the strength and direction of these relationships. The significance of the paths was ascertained using p-values, with a threshold of  $p < 0.001$  denoting statistical significance.

**Hypothesis:** Hypotheses identify the influence of efficacy, safety, cost, information, patient factors, adherence, healthcare providers' attitudes, drug attributes, and the pharmaceutical industry's impact on patient-focused and system-focused decision making for medication selection processes.

## Results

The analysis revealed that the majority of pathways within the model were statistically significant, indicating robust connections among the constructs. However, the influence of pharmaceutical companies on system-focused outcomes did not show significance, suggesting a minimal impact on these aspects of patient-centered pharmaceutical selection.

Through Structural Equation Modeling (SEM), a thorough comprehension of the interrelations among constructs pertinent to patient-centered pharmaceutical care was achieved. The standardized path coefficients reflect the magnitude and significance of these connections.

- Efficacy: Predicted significantly by 'Therapeutic effect' (Beta coefficient = 0.865), 'Onset of action' (Beta coefficient = 0.807), and 'Dose frequency' (Beta coefficient = 0.77).
- Cost: Influenced significantly by 'Cost-effectiveness' (Beta coefficient = 1.081), 'Discussion of medication cost' (Beta coefficient = 0.693), and again 'Cost-effectiveness' (Beta coefficient = 0.843).
- Safety: Associated significantly with 'Challenges for selecting medication' (Beta coefficient = 0.648), 'Adverse effects from the medication' (Beta coefficient = 0.586), and 'Pharmacology of the medication' (Beta coefficient = 0.766).

Figure Error! No text of specified style in document.1: Result for reliability and validity.

Factors	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Efficacy	0.855	0.855	0.664
Cost	0.846	1.035	0.845
Safety	0.743	0.696	0.461
Information	0.822	0.749	0.583
Patient	0.794	0.795	0.565
Adherence	0.808	0.789	0.560
Prescriber	0.778	1.680	1.279
Drug	0.739	0.612	0.402
DM	0.680	0.690	0.433

The study's analysis of various factors related to patient-centered pharmaceutical care revealed several peculiarities in the reliability and validity statistics. Majority of factors show good reliability, some, particularly Safety, Drug, and Decision Making, indicate areas that may require further investigation or refinement of the measurement instruments

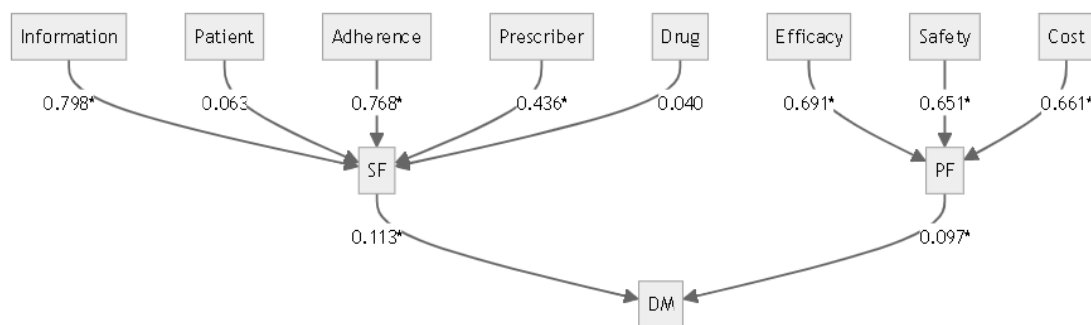
### The structural model disclosed significant interactions among constructs:

- Patient Factors: The outcomes focused on patients were significantly influenced by 'Medication Availability' (Beta = 0.747), 'Factors Influencing Prescribing' (Beta = 0.812), and 'Affordability for Patients' (Beta = 0.697), indicating a strong impact on patient-centric outcomes.
- Adherence: The model predicted adherence with significant contributions from 'Satisfaction with Efficacy' (Beta = 0.758), 'Risk of Allergic Reactions' (Beta = 0.546), and 'Risk of Dependence/Addiction' (Beta = 0.488).

### Results of Hypothesis Testing:

- Patient-focused (PF) Outcomes: These were significantly affected by 'Efficacy' (Beta = 0.691), 'Safety' (Beta = 0.651), and 'Cost' (Beta = 0.661), as per the standardized estimates from the model.
- System-Focused (SF) Outcomes: 'Information' (Beta = 0.798) and 'Adherence' (Beta = 0.768) had a significant effect on system-focused outcomes, while the impact of 'Drug' characteristics was not significant (Beta = 0.040).

These results suggest that enhancing the accessibility and affordability of medications, along with improving information for prescribers and patients, can foster better patient-centered outcomes. The insignificant pathway from 'Drug' characteristics to system-focused outcomes implies that other elements may be more influential in these regards.

**Figure 1: SEM Model for medication selection**

Our study elucidates the intricate relationships among variables involved in medication selection. The application of standardized path coefficients provides an intuitive grasp of the strength of these relationships. Discussion: The insights from the SEM analysis shed light on the dynamics of patient-centered pharmaceutical care in India. This discussion contextualizes the findings within the framework of the study's goals and hypotheses, weaving together empirical data and its wider implications for healthcare policy and practice.

**Impact of Medication Accessibility and Affordability:** The significant correlations between the ease of obtaining medications and their cost with patient health outcomes highlight the essential role these factors play within the healthcare system. The positive path coefficients for 'Medication availability' (Beta coefficient = 0.747) and 'Affordability for patients' (Beta coefficient = 0.697) corroborate the hypothesis that improved access to medications is conducive to better health outcomes. This aligns with existing research that emphasizes the obstacles encountered by patients in regions with limited resources, where medication costs and availability often present significant challenges.

#### Influence of Prescriber Attitudes

The study also revealed that prescriber attitudes significantly influence patient adherence to treatment regimens, supporting the third hypothesis. The constructs related to 'Prescriber' attitudes, such as 'Satisfaction with efficacy' = 1.654, indicate that prescribers who are satisfied with the efficacy of medications are more likely to influence patient adherence positively. This suggests that prescribers' beliefs and perceptions are pivotal in shaping treatment outcomes.

#### Systemic Barriers and Policy Recommendations

While the study did not directly address systemic barriers or propose specific policy recommendations, the results imply that such barriers exist and need to be addressed. The significant path coefficients point to areas where policy interventions could be beneficial. For instance, enhancing medication affordability could be achieved through subsidies or price controls, while improving accessibility may require changes in distribution networks or healthcare infrastructure.

**Limitations and Directions for Future Research:** This research acknowledges certain limitations. The SEM analysis, while revealing, offers only a glimpse into the complex interplay of factors within the healthcare system and may not fully encapsulate its intricacies. Moreover, the findings, based on data from India, might not be universally applicable. Future studies are encouraged to delve deeper into systemic obstacles and formulate extensive policy recommendations.

### Conclusion:

The research underscores the critical role of drug accessibility and affordability in patient-centric pharmaceutical care in India, with prescriber attitudes also playing a significant part in patient compliance. The study confirmed the substantial influence of 'Medication availability' and 'Affordability for patients' on health outcomes, validating these aspects as key determinants in the Indian context.

The impact of prescriber attitudes on both the selection of medication and patient adherence was evident, with satisfaction regarding medication efficacy notably affecting adherence, thus emphasizing the importance of prescriber perspectives in therapeutic success. The necessity for policy measures to enhance drug accessibility and affordability is clear, as is the need for prescriber education and support for informed pharmaceutical decision-making.

Although the study has made notable progress toward its goals, it recognizes unaddressed systemic barriers. These, along with the call for evidence-backed policy suggestions, are identified as avenues for further investigation.

The insights gained offer a roadmap for policy interventions that could markedly enhance healthcare outcomes in India. Contributing to the expanding knowledge base, this study informs ongoing efforts to reform healthcare delivery in India. It lays a foundation for stakeholders to develop a more just and efficient healthcare system,

advocating for the integration of these critical factors into strategies that optimize pharmaceutical care for all Indian patients.

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