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RESEARCH ARTICLE

PRIORITIZING THE PRECURSORS OF PATIENTS' EXPERIENCE IN INDIAN CORPORATE HOSPITALS: APPLICATION OF HYBRID RIDIT-GRA APPROACH

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ABSTRACT

OBJECTIVE

This study aims to identify, understand, and prioritize the influence of distinct patient experience (PX) antecedents that have substantial evidence in shaping the patients' preferences and experiences in Indian corporate hospitals. The study is expected to assist healthcare managers in the personalization and alignment of clinical services with consumer expectations and demands.

DESIGN/ METHODOLOGY

A cross-sectional study was conducted across eight corporate hospitals to collect 220 patient data samples. A recent measurement model, titled 'Patient Experience Questionnaire', was adopted to harness pre-validated PX factors and related items. Further, two independent prioritization techniques, Relative to an Identified distribution (RIDIT) analysis and Grey Relational Analysis (GRA), were executed to render item precedence of the precursors of PX.

RESULTS

Through RIDIT, items belonging to factors 'doctor services' and 'nursing services' secured favorable performance ratings, whereas items under 'information' and 'next-of-kin' obtained comparatively less favorable responses. There was evidence of minimal deviations when the results were verified through GRA, but the ranks obtained in both the independent techniques (RIDIT & GRA) revealed a robust correlation of 99.5%. Moreover, the applicability of two independent prioritization techniques enhances the rigor and reliability of findings.

CONCLUSIONS

Although the respondents were mostly satisfied with their care providers, an effective provider-patient communication was not evident in the care system. Patients seemed to be overly dependent on their physicians and showed limited intention to participate in a collaborative process. Lack of patient-centric culture, deficit infrastructure, excessive workload on healthcare providers, and restricted translation of patient-centric concepts into practice deterred organizations from fully benefiting from patients' involvement in clinical facets.

KEYWORDS

Patient experience, Indian corporate hospitals, RIDIT analysis, grey relational analysis

INTRODUCTION

The endeavours to explore patient experience (PX) concepts have been gaining momentum since 2001 when the Institute of Medicine (IOM) identified 'Patient-centeredness' as one of the central pillars for achieving quality in the healthcare industry. However, 20% of identified patient-reported experience measures (PREMs) surfaced from 2015 onwards [1], thus reflecting increased adoption of PX measures across contemporary healthcare settings. Providing an optimum experience is steadily becoming a priority in many healthcare facilities. Improving PX can have numerous benefits for both patients and healthcare organizations, such as patients who have a positive experience are more likely to be satisfied with their care, comply with treatment recommendations, and report better health outcomes [1,2]. For healthcare organizations, improving PX can lead to increased patient satisfaction, which can, in turn, lead to higher patient retention rates, improved reputation, and financial benefits [3]. The notion behind implementing such concepts into healthcare is that the intended health outcomes are not only governed by the paternalistic provider-centric approach but can be redefined by patients' individual preferences and engagements in a shared care process. For such reasons, past studies have defined the patient-centeredness approach as a sustainable and multifaceted long-term strategy [4,5]. Previous studies have also shown that PX is an important factor closely related to clinical quality and satisfaction with care [1,6,7].

Despite recognizing PX as a determinant of healthcare quality (alongside patient effectiveness and safety), healthcare systems continue to face challenges in adopting and implementing patient-centric programs [20]. Since there is no universally accepted definition to pursue PX, many organizations fail to allocate resources to deliver an optimal healthcare experience [21,7]. Moreover, with multiple parameters of PX existing in the system, small- or medium-category hospitals may not have enough resources to account for all possible factors affecting PX. Hence, it is essential to identify relatively sensitive dimensions that have substantial impacts on patient well-being and experience. Identifying key enablers will help organizations strategize and focus their limited resources on selected aspects of the service design. The challenges related to healthcare resources, particularly in developing economies, are frequently discussed in the extant literature. For instance, Chauhan et al. [11] highlighted patients' autonomy as a crucial factor that enhances healthcare literacy and service experience in the Indian context. However, such initiatives are severely hindered due to infrastructural barriers and an overburdened healthcare system [21]. This viewpoint aligns with the findings of Ng et al. [22], who suggest that people in the East, especially in Asia, lack a clear understanding of how to establish a patient-centric ecosystem.

Therefore, the lower participation and engagement rate of Asian healthcare consumers—compared to European countries—raises concerns about the replicability of Western PX models [23]. There is a growing need for a micro-level assessment, specifically in contexts where healthcare decisions are significantly influenced by societal groups and users' awareness levels [23]. This gap in research calls for further investigation into the fundamental factors of PX, which will empower patients to understand their roles and activities during a clinical process. Acknowledging patients' experiences and preferences provides a comprehensive evaluation of healthcare systems, which expands organizational capability and reach [21,25]. This work serves as an initial step in raising awareness about the importance of PX within various private healthcare systems—in a developing economy context. It explores the factors that impact in-patient service experience, aiming to familiarize individuals with the significance of PX and its role in shaping healthcare quality. The concept of PX provides a guided focus on the interpersonal transactions happening between a provider and a patient. Such transactions include communication, evaluation, participation and flow of information in a patient-centric manner. Therefore, PX is considered a novel measure of healthcare service quality and has been extensively studied under the concept of 'Healthcare Experience Quality (HCXQ)' [24]. PX factors are important determinants of HCXQ, and so far, individual assessment of PX factors from a consumer perspective is sparse. So, by focusing on the antecedents of PX, this study provides an incremental contribution to the patient-autonomy literature with a special reference to a developing economy context. Recent literature also supports HCXQ as an emerging indicator of healthcare service quality. For example, Ponsignon et al. [24] utilized HCXQ to indicate how cancer patients perceive healthcare service quality. Similarly, Park et al. [30] showed that PX could be used as an indicator to measure patient satisfaction and loyalty. Cadel et al. [26] conducted a literature review that emphasized the positive impact of PX programs on healthcare outcomes and overall service quality. However,

PX is a context-specific phenomenon [24,26] that needs to be applied across different hospital settings to improve its generalizability. Against this backdrop, it can be concluded that PX is increasingly employed to address various healthcare agendas from a consumer perspective. It provides a better understanding of healthcare quality and has been integrated into multiple frameworks to depict the expectations of both internal [27] and external healthcare consumers [30].

INDIAN HEALTHCARE SCENARIO AND PROBLEM IDENTIFICATION

The healthcare sector in India is the fourth largest employer, with the government and private sectors both playing significant roles. The government ensures access to basic healthcare needs mostly in rural and semi-urban regions through a network of public hospitals and primary healthcare centers, while the private sector operates hospitals, clinics, and diagnostic centers catering to the quality healthcare needs of urban and metropolitan consumers [8]. The private healthcare sector is a complex yet rapidly growing system owing to the demands derived from middle-class and foreign consumers for clinical experts, high-quality prognosis, modern infrastructures, and state-of-the-art clinical facilities. 80% of healthcare resources and professionals are concentrated in metropolitan areas, where only 31% of the total population resides. By 2025, the industry is set on a trend to achieve a market cap of US$ 372 billion by 22% CAGR, with public health expenditure increasing to 2.5% of the country's current GDP [9].

Despite such impressive figures, the unavailability of a generally accepted PX definition and fragmented studies on patient-centric approaches have kept the frontiers unexplored [10]. Also, patient-centric research in most developing countries—including India—has suffered massive backlash due to a lack of employee motivation, ineffective translation of conceptual interventions into practice, and poor practitioner-patient ratio [8,11]. Private parties have equally struggled to balance service personalization and sophistication while trying to bind clinical outcomes with patients rather than results. The existing studies display over-extensive usage of patient satisfaction parameters to assess clinical quality and have faced complications because satisfaction scores are subjective and can be influenced by a variety of factors that are not necessarily related to the clinical quality of care. Previous literature also affirmed that there was no consistent relationship between patient satisfaction and clinical quality or patient outcomes [6,7]. Therefore, when assessing consumer choices, PX scores better explain consumer preferences than satisfaction measures [6].

AN OVERVIEW OF PX MEASUREMENT SCALES AND RESEARCH APPROACH

Various scales have been developed in the process to quantify PX scores. However, most of the measurement scales have now existed for over a decade and warrant statistical modifications. In the process of doing so, many developing as well as developed countries have established PX scales of their own. For example: in the US, one commonly used tool is the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, which asks patients about their experiences with various aspects of care. It is integrated across 90% of acute care hospitals and is used as a determinant of value-based care and financial reimbursements [12]. Likewise, The Hong Kong in-patient experience questionnaire (HKIEQ) has been widely used in Hong Kong hospitals and has been shown to be a reliable and valid measure of the PX [13]. Recently, Hu et al. [14] developed a PX questionnaire for both in-patient and outpatient care clinics in China. The questionnaire consisted of 23 items that assessed quality domains and were organized into five major factors.

In this study, the authors have highlighted the perceptual importance of PX measures in apprehending clinical quality and put forth a PX framework for Indian corporate hospitals, which may assist healthcare managers to detect relatively important dimensions that positively influence patients' experiential evaluation. After considering various grey literature and measurement scales, a recent PX questionnaire was adopted to render a precedence analysis of PX dimensions and related items. A statistical hybrid approach was adopted for methodological execution that combines two analytical procedures: Relative to an identified distribution (RIDIT) analysis and Grey Relational Analysis (GRA). The techniques are acknowledged for their non-parametric nature [15,16] and the results display how consumers perceive the relative importance of PX items and prefer them accordingly. Collectively, the objective of this work is to identify and rank the factors influencing the healthcare experience as perceived by patients. Additionally, this research highlights relatively sensitive dimensions of PX to assist healthcare managers in the personalization and alignment of clinical services according to patients' preferences.

METHODOLOGY

SURVEY TOOL

The psychometric tools used to validate the statistical significance of PX scores have evolved over the years and yield better results [17]. In this study, the scale adopted for statistical analysis is the patient experience questionnaire (PEQ), which was originally developed in 2004 and modified by Addo et al. [17] in 2021. Unlike other measurement scales, the adjusted PEQ has undergone multiple statistical and psychometric validations before arriving at a final form of scaling. For instance, apart from traditional EFA, the scale has been tested for measurement invariance, composite reliability, convergent validity, discriminant validity, construct validity, and criterion-related validity. Each item of the survey questionnaire was rated on a seven-point Likert scale, ranging from 1 (Not at all) to 7 (A very large extent). A total of 6 pre-validated dimensions and 27 items were adopted from the PEQ (Addo et al., 2021), and each of the dimensions had the following items: nursing services (NS1-NS7), doctor services (DS1-DS7), information (INF1-INF3), organization (ORG1, ORG3-ORG4), next of kin (NOK1-NOK2), and standard (SD1-SD4, SD6) (See Appendix).

SAMPLE AND SURVEY OVERVIEW

The study used a cross-sectional survey in eight corporate hospitals—private, for-profit hospitals with more than 150 beds—operating in the southern and eastern regions of India. The patient data were collected through a self-administered questionnaire survey technique. The geographic vicinities were selected by keeping a dense concentration of corporate hospitals in view. The data collection took approximately three months (August-October 2022), and a total of 358 patients were approached, out of which 267 patients responded (72.5% response rate). The survey targeted inpatients only and the responses were obtained just before their discharge schedule. A traditional pen and paper method was used to collect data from the target audience. All of the patients were approached while they were in the hospital and their verbal consent was obtained before commencing the survey procedures. After removing a few incomplete and faulty responses, 220 valid questionnaires were considered for the data analysis. For eligibility criteria, patients must be 18 years of age or older and undergoing in-patient treatment for a minimum duration of 24 hours. In order to minimize participation bias, this study excluded respondents who had received emergency clinical treatments or were transferred from other hospitals due to critical conditions. Therefore, the overall sampling unit comprised in-patients seeking medical assistance for various morbid and co-morbid conditions, including cardiovascular, pulmonary, neurological, hematological, and other related diseases. Several extraneous variables like comorbidities and duration of illness can influence the perception of experience. Therefore, this study has considered such parameters as control variables alongside patients' age, sex, and income levels. The English language-based questionnaires were presented before the patients at the time of their discharge. In some sensitive cases such as for patients being temporarily incapable of filling up the form, the family member or acquaintances verbally transcribed the patient's responses to fill up the questionnaire.

ANALYSIS AND FINDINGS

Prioritizing PX precursors by executing RIDIT analysis

RIDIT analysis is a widely used statistical method because it is robust to outliers, easy to implement, and can handle discrete and non-normal data. These advantages make RIDIT analysis a convenient choice for researchers evaluating the effectiveness of a treatment or intervention. The technique proves to be effective for scale rating of three-or more-point scales and items based on universal standards, and usually, the RIDIT values range from 0.00 to 1.00 [16]. According to the algorithms of RIDIT, when the population cannot be specified, the total responses obtained through the survey become the reference dataset [18]. If there are m items and n ordered categories listed from the most favored to the least favored on a Likert scale, then the algorithm is explained below:

The total frequency value (Fj) for each response category is computed (where j =1…, n). Further, mid-point accumulated frequency Mj was determined by:

$$Mj=1/2Fj + \sum_{k=1}^{j-1} Fk \text{ (where j= 2…, n).}$$

Next, RIDIT values R_j for the reference data set were calculated:

$$R_j = \frac{Mj}{N}$$ where j = 1..., n, and N = total frequency of responses.

Using the RIDIT values of the reference data set (see Table 1), RIDIT values for the comparison data set were determined as illustrated in Table 2. The RIDIT value for each category was evaluated by the formula:

$r_{ij} = R_j * \pi_{ij}/\pi_i$, (where i = 1…, m, j = 1…, n, and π = response frequency for each item)

$\text{RIDIT value}_{(NS1,7)}$ = (0.0725*24/220 = 0.0079),

$\text{RIDIT value}_{(NS2,6)}$ = (0.2535*60/200 = 0.0691), and so on.

Subsequently, the mean RIDIT (ρ_i) for the comparison data set was calculated by the formula:

$$\rho_i = \sum_{k=1}^{n} r_{ik} \text{ (Where i = 1…, m).}$$

$$\rho_1 = 0.0079 + 0.0553 + 0.1414 + 0.1261 + 0.0844 + 0.0748 + 0.0089 = 0.4989,$$

ρ_2 = 0.0092 + 0.0691 + 0.1414 + 0.1198 + 0.0461 + 0.0499 + 0.0177 = 0.4533, and so on.

TABLE 1: RIDITS FOR THE REFERENCE DATA SERIES

Items	7	6	5	4	3	2	1	π
NS1	24	48	66	40	22	18	2	220
NS2	28	60	66	38	12	12	4	220
NS3	60	58	36	26	18	12	10	220
NS4	32	50	70	36	18	12	2	220
NS5	48	22	28	100	8	6	8	220
NS6	10	36	70	94	2	4	4	220
NS7	58	78	36	22	10	8	8	220
DS1	10	22	74	82	18	10	4	220
DS2	78	78	42	12	4	4	2	220
DS3	34	66	40	56	12	8	4	220
DS4	50	48	56	34	16	4	12	220
DS5	14	60	48	72	6	5	15	220
DS6	41	66	40	49	12	8	4	220
DS7	38	42	56	44	12	4	24	220
IF1	12	10	20	28	24	68	58	220
IF2	14	18	28	56	56	28	20	220
IF3	16	12	26	52	46	52	16	220
ORG1	16	46	42	74	20	14	8	220
ORG3	48	58	60	18	28	4	4	220
ORG4	16	44	70	54	18	8	10	220
NOK1	14	8	28	36	38	48	48	220
NOK2	14	60	48	71	6	4	17	220
SD1	38	36	70	56	8	6	6	220
SD2	36	76	34	46	4	16	8	220
SD3	22	84	48	50	6	4	6	220
SD4	40	38	54	48	14	20	6	220
SD6	50	66	42	50	6	4	2	220
Fj	861	1290	1298	1344	444	391	312	5940
1/2Fj	430.5	645	649	672	222	195.5	156	
Mj	430.5	1506	2800	4121	5015	5432.5	5784	
R_j	0.0725	0.2535	0.4714	0.6938	0.8443	0.9146	0.9737	

Note: The results are limited to 4 decimal spaces with rounding errors.

NS = Nursing services; DS = Doctor services; INF = Information; ORG = Organization; NOK = Next of kin; SD = Standard.

If the mean RIDIT score is lesser and closer to 0.5, the respondents have chosen the favorable performance option, or in our case, 'To a very large extent (7)' point. Similarly, if the mean RIDIT score is more than 0.5, the responses are more inclined toward the least favorable, or 'Not at all (1)' [16]. The final column of Table 2 assorts the items based on their respective RIDIT values.

To validate the claim that the sample responses obtained from the Likert survey belong to the same distribution, a

Kruskal-Wallis Test (K) was performed on the overall data set.

K = 12 $\sum_{i=1}^{m} \pi_i (\rho_i - 0.5)^2$; the result obtained from the calculation is shown below:

K = 12 * [220{$(0.4989 - 0.5)^2$ + $(0.4553 - 0.5)^2$ +...+ $(0.3887 - 0.5)^2$}] = 907.2663.

TABLE 2: RIDITS FOR THE COMPARISON DATA SERIES

Items	7	6	5	4	3	2	1	ρ_i	LB	UB	Rank
NS1	0.0079	0.0553	0.1414	0.1261	0.0844	0.0748	0.0089	0.4989	0.4600	0.5378	16
NS2	0.0092	0.0691	0.1414	0.1198	0.0461	0.0499	0.0177	0.4533	0.4143	0.4922	11
NS3	0.0198	0.0668	0.0771	0.0820	0.0691	0.0499	0.0443	0.4090	0.3700	0.4479	4
NS4	0.0105	0.0576	0.1500	0.1135	0.0691	0.0499	0.0089	0.4595	0.4206	0.4984	12
NS5	0.0158	0.0254	0.0600	0.3154	0.0307	0.0249	0.0354	0.5076	0.4686	0.5465	17
NS6	0.0033	0.0415	0.1500	0.2964	0.0077	0.0166	0.0177	0.5332	0.4943	0.5721	21
NS7	0.0191	0.0899	0.0771	0.0694	0.0384	0.0333	0.0354	0.3626	0.3236	0.4015	2
DS1	0.0033	0.0254	0.1586	0.2586	0.0691	0.0416	0.0177	0.5741	0.5352	0.6131	23
DS2	0.0257	0.0899	0.0900	0.0378	0.0154	0.0166	0.0089	0.2842	0.2453	0.3232	1
DS3	0.0112	0.0761	0.0857	0.1766	0.0461	0.0333	0.0177	0.4466	0.4077	0.4855	10
DS4	0.0165	0.0553	0.1200	0.1072	0.0614	0.0166	0.0531	0.4301	0.3912	0.4691	7
DS5	0.0046	0.0691	0.1028	0.2271	0.0230	0.0208	0.0664	0.5139	0.4749	0.5528	18
DS6	0.0135	0.0761	0.0857	0.1545	0.0461	0.0333	0.0177	0.4268	0.3879	0.4657	6
DS7	0.0125	0.0484	0.1200	0.1388	0.0461	0.0166	0.1062	0.4886	0.4496	0.5275	15
IF1	0.0040	0.0115	0.0429	0.0883	0.0921	0.2827	0.2567	0.7781	0.7392	0.8171	27
IF2	0.0046	0.0207	0.0600	0.1766	0.2149	0.1164	0.0885	0.6818	0.6428	0.7207	24
IF3	0.0053	0.0138	0.0557	0.1640	0.1765	0.2162	0.0708	0.7023	0.6634	0.7412	25
ORG1	0.0053	0.0530	0.0900	0.2334	0.0768	0.0582	0.0354	0.5520	0.5131	0.5909	22
ORG3	0.0158	0.0668	0.1286	0.0568	0.1075	0.0166	0.0177	0.4098	0.3708	0.4487	5
ORG4	0.0053	0.0507	0.1500	0.1703	0.0691	0.0333	0.0443	0.5228	0.4839	0.5618	20
NOK1	0.0046	0.0092	0.0600	0.1135	0.1458	0.1995	0.2125	0.7452	0.7062	0.7841	26
NOK2	0.0046	0.0691	0.1028	0.2239	0.0230	0.0166	0.0752	0.5154	0.4765	0.5543	19
SD1	0.0125	0.0415	0.1500	0.1766	0.0307	0.0249	0.0266	0.4628	0.239	0.5017	13
SD2	0.0119	0.0876	0.0728	0.1451	0.0154	0.0665	0.0354	0.4346	0.3957	0.4736	9
SD3	0.0072	0.0968	0.1028	0.1577	0.0230	0.0166	0.0266	0.4308	0.3919	0.4697	8
SD4	0.0132	0.0438	0.1157	0.1514	0.0537	0.0831	0.0266	0.4875	0.4485	0.5264	14
SD6	0.0165	0.0761	0.0900	0.1577	0.0230	0.0166	0.0089	0.3887	0.3498	0.4276	3

Notes 1: Lower bound and upper bound denotes the confidence interval of the mean RIDIT value at 95% significance level.
Notes 2: The results are limited to 4 decimal spaces with rounding errors.
. NS = Nursing services; DS = Doctor services; INF = Information; ORG = Organization; NOK = Next of kin; SD = Standard.

The finalized value of the K is significantly greater than the critical value of 〖 X 〗^2 (Chi-square) = 25.336 (at 26 degree of freedom and 95% confidence interval), which suggests that the pattern of responses of scale items in both the reference data set and the comparison data set are dissimilar and differ among various respondents.

Prioritization of PX precursors by executing Grey Relational Analysis (GRA)

The grey relational analysis can be seen as a part of grey system theory for analyzing discrete sets or data series. It imitates a single grey relational grade from complex multi-factor attributes, allowing comparison with a reference data set [18]. To deal with obscure practical situations, the grey system theory is extremely helpful for diverse decision making solutions. GRA analysis is utilized to cross-verify the rankings of RIDIT and detect any execution-related errors during the procedural progress of the algorithm. GRA algorithms demand a reference data set (S_0) equivalent to the 'most favorable' point of the employed Likert scale. For the comparison data set, all 27 scale items are represented as S_1 to S_27 and each contains a value equivalent to the original survey response.

Procedural steps for GRA

The difference data series (D_i) was computed by using the formula: $D_i = (|S_{01} - S_{i1}|, |S_{02} - S_{i2}|, \ldots\ldots, |S_{0m} - S_{im}|)$ (where the i = 1…, k, k = total number of scale items, m = total number of respondents, and n = total ordered categories).

For example,

D_1 = (|7 - 6| = 1),

D_2 = (|7 - 5| = 2), and so on.

From Table 3, the identified maximum global value (D_{max}) = 6 and minimum value (D_{min}) = 0. Then by using the above values, the grey relational coefficient (α) was calculated for each element, as shown in Table 4.

The particular equation can be denoted as $\alpha_{im} = (D_{min} + \mu * D_{max}) / (D_{im} + \mu * D_{max})$ (where i = 1…, k, k = total number of scale items). Usually, the value of μ is fixated at 0.5. This specific coefficient is used to adjust the effect of D_{max} and argues whether D_{max} should indicate the extreme value in the data series.

$\alpha_{11} = (0 + (0.5 * 6)) / (1 + (0.5 * 6)) = 0.75$,

$\alpha_{12} = (0 + (0.5 * 6)) / (2 + (0.5 * 6)) = 0.60$, and so on.

In the proceeding steps, grey relational grade values (β) for each different scale item are computed by using the formula: $\beta_i = 1/m * (\sum_{n=1}^{m} \alpha_{in})$ (where i = 1…, k, and k = total number of scale items, and m = total number of respondents).

β_1 = (0.75 + 0.76 + 0.50 + … + 0.38 + 1.00) / 220 = 0.6202,

β_2 = (0.60 + 1.00 + 0.50 + … + 0.43 + 1.00) / 220 = 0.6481, and so on.

TABLE 3: DIFFERENCE DATA SERIES FOR GRA

Respondents	NS1	NS2	NS3	NS4	.	.	.	SD2	SD3	SD4	SD6
D_1	1	2	2	2	-	-	-	1	1	5	0
D_2	2	0	1	0	-	-	-	2	3	0	0
D_3	3	3	4	5	-	-	-	5	4	4	2
D_4	5	1	1	1	-	-	-	5	2	5	3
D_5	1	1	0	1	-	-	-	1	1	0	1
D_6	4	1	0	1	-	-	-	1	1	3	1
D_N	-	-	-	-	-	-	-	-	-	-	-
D_O	-	-	-	-	-	-	-	-	-	-	-
D_{200}	6	6	3	6	-	-	-	6	6	6	3
D_{201}	2	1	1	3	-	-	-	1	2	4	2
D_P	-	-	-	-	-	-	-	-	-	-	-
D_a	-	-	-	-	-	-	-	-	-	-	-
D_{219}	5	4	3	1	-	-	-	2	1	1	3
D_{220}	0	0	0	1	-	-	-	0	1	2	1

TABLE 4: GREY RELATIONAL COEFFICIENT (A)

Respondents	NS1	NS2	NS3	NS4	.	.	.	SD2	SD3	SD4	SD6
1	0.7500	0.6000	0.6000	0.6000	-	-	-	0.7500	0.7500	0.3750	1.0000
2	0.6000	1.0000	0.7500	1.0000	-	-	-	0.6000	0.5000	1.0000	1.0000
3	0.5000	0.5000	0.4286	0.3750	-	-	-	0.3750	0.4286	0.4286	0.6000
4	0.3750	0.7500	0.7500	0.7500	-	-	-	0.3750	0.6000	0.3750	0.5000
5	0.7500	0.7500	1.0000	0.7500	-	-	-	0.7500	0.7500	1.0000	0.7500
6	0.4286	0.7500	1.0000	0.7500	-	-	-	0.7500	0.7500	0.5000	0.7500
.	-	-	-	-	-	-	-	-	-	-	-
.	-	-	-	-	-	-	-	-	-	-	-
200	0.3333	0.3333	0.5000	0.3333	-	-	-	0.3333	0.3333	0.3333	0.5000
201	0.6000	0.7500	0.7500	0.5000	-	-	-	0.7500	0.6000	0.4286	0.6000
.	-	-	-	-	-	-	-	-	-	-	-
.	-	-	-	-	-	-	-	-	-	-	-
219	0.3750	0.4286	0.5000	0.7500	-	-	-	0.6000	0.7500	0.7500	0.5000
220	1.0000	1.0000	1.0000	0.7500	-	-	-	1.0000	0.7500	0.6000	0.7500

Note: The results are limited up to 4 decimal spaces with rounding errors.

The final β value has been arranged and sorted to rank the items under GRA. The results and rankings under GRA are represented in Table 5. A higher β value signifies a favorable and higher priority inclination for a specific item, whereas a lower β value denotes a comparatively less favorable tendency of respondents.

TABLE 5: GREY RELATIONAL GRADE VALUES, GRA RANKING, AND COMPARISON

Scale serial	Item Name	GRA Grades	GRA Rank	RIDIT Rank	Remarks
1	NS1	0.6202	17	16	Deviation
2	NS2	0.6481	12	11	Deviation
3	NS3	0.6984	4	4	No deviation
4	NS4	0.6472	13	12	Deviation
5	NS5	0.6348	16	17	Deviation
6	NS6	0.5895	21	21	No deviation
7	NS7	0.7230	2	2	No deviation
8	DS1	0.5668	23	23	No deviation
9	DS2	0.7799	1	1	No deviation
10	DS3	0.6590	9	10	Deviation
11	DS4	0.6771	6	7	Deviation
12	DS5	0.6057	18	18	No deviation
13	DS6	0.6749	7	6	Deviation
14	DS7	0.6352	15	15	No deviation
15	IF1	0.4574	27	27	No deviation
16	IF2	0.5158	24	24	No deviation
17	IF3	0.5052	25	25	No deviation
18	ORG1	0.5872	22	22	No deviation

19	ORG3	0.6879	5	5	No deviation
20	ORG4	0.6002	20	20	No deviation
21	NOK1	0.4777	26	26	No deviation
22	NOK2	0.6047	19	19	No deviation
23	SD1	0.6485	11	13	Deviation
24	SD2	0.6672	8	9	Deviation
25	SD3	0.6585	10	8	Deviation
26	SD4	0.6382	14	14	No deviation
27	SD6	0.7020	3	3	No deviation

Note: The results are limited to 4 decimal spaces with rounding errors.

DISCUSSIONS AND CONCLUSIONS

To date, several PX-related works have focused on its interactions with healthcare quality and patient welfare domains in various developing countries, like India [11] and China [14], as well as in developed nations, like the USA [12] and Australia [19]. However, very few studies have focused on the individual dimensions of PX and their unique degree of impact on the construct of PX as a whole. To bridge this acute gap, the present study attempted to assimilate typical antecedents of PX employed in multi-dimensional scales and adapted a recently developed measurement model to quantify the perceptual importance of PX dimensions from the perspectives of patients.

Both the GRA and RIDIT prioritization techniques reflect the relative importance of PX items from a patient's standpoint. From the results, the comparatively poor performing item was IF1 from the 'information' factor, which evaluated the patients' know-how aspect of clinical tests and examinations. From the same factor, all the items, including IF2 and IF3, also secured lower ranks. Item IF2 evaluated patients' initial awareness regarding clinical tests and examination and item IF3 inquired whether the patients had received sufficient prior information about their diagnosis or complaints. Likewise, comparatively positive responses were associated with items DS2, NS7, and SD6, respectively. Item DS2 belongs to the factor 'doctor services', which probed whether the doctor took proper care of the concerned patient or not. Item NS7 is associated with the dimension 'nursing services' and investigates nurses' timely care in proportion to the patient's needs. Item SD6 undergoes the factor 'standard', which enquired about the cleanliness of the whole establishment and treatment spaces.

The above findings suggest that most of the patients were satisfied with their peripheral hygiene and care provided by doctors and nurses as well. Patients perceived their overall treatment as timely, effective, and empathetic. However, patients seemed to be overly dependent on providers' professional competency, restricting the flexibility of communication in a shared-care system. The lower rankings of the information factors validate the argument that patients did not receive ample information regarding their clinical examinations and did not feel included in their treatment processes. Despite higher ratings of personnel services, multiple items representing provider-patient interaction (items like DS1 and NS6) obtained relatively poor ratings. Through literature, the reasons behind such poor ratings can be attributed to two perspectives: organizational and personal. From the provider's perspective, Sun et al. [28] conducted an interview and discovered that physicians struggle to establish effective communication with patients due to a lack of organizational training. They also suggested that physicians rely more on their personality and experience rather than their knowledge while practicing patient-centricity. This indicates that doctor-patient communication, as a set of learned skills, needs to be improved by training. Liu et al. [29] further support this opinion by emphasizing the need for communication skill training for Chinese physicians in order to improve their interpersonal and knowledge-sharing abilities.

From a personal perspective, factors such as patient's self-awareness, psychological beliefs, and cultural communities have been found to significantly influence their involvement in a shared-care process [23]. However, patient participation in Asian countries has been greatly hindered by an overburdened healthcare system and limited implementation of patient-centric programs [11,21,22]. As a result, patients fail to realize the importance

of collaborative tactics and are vulnerable to information loss caused by communicational deficiency [4]. Also, the lack of clinical infrastructure and hospital support prevents healthcare systems from fully benefitting from consumer-centric practices [11]. It is essential to rethink the roles of healthcare providers in bringing more inclusivity, transparency, and specificity to the communication they share with their patients. Lastly, the results justify the rank disparity and indicate that effective patient-provider communication generates a significant influence on consumers' perceived experiences [1,2,4].

From Table 5, it is evident that the GRA ranking based on the GRA grade scores is almost similar to the RIDIT rankings. While there were occurrences of rank deviation with items NS1, NS2, NS4, NS5, DS3, DS4, DS6, SD1, SD2, and SD3, these variations were marginal. In most cases, the difference between these rank variations was no more than one, except for SD1 and SD3. Statistically, a few deviations were expected as both the techniques (RIDIT and GRA) are independent and follow their unique algorithm to compute the results. These deviations can be conceptually explained by looking into the nature of the questions asked to participants. For instance, the items NS1, NS, NS4, and NS5 contained overlapping terms such as 'talk', 'tell', 'description', etc. Although these items examine distinct areas of nursing care, they mutually share a common theme. Similarly, items DS3, DS4, and DS6 contained terms like 'trust', 'time', 'interest' etc., which are subjective and vary depending upon the patient and provider involved. Lastly, items SD1, SD2, and SD3 addressed the infrastructural conditions through terms like 'equipment', 'condition', 'room', etc. Thus, when subjected to two different methods, the similarities between items within specific factors accounts for minor deviations. Since no major deviations were found in the results of both methods, it can be inferred that the prioritization values are conclusive and suitable for decision-making [18]. The prioritizations ranking in both scales showed a 99.5% correlation, ascertaining the precision of the analysis.

The findings provide key insight into consumer preferences and choice domains by using the dimensions of consumer experience. The results will be helpful for healthcare managers and practitioners to identify relatively stronger as well as weaker performing domains of clinical experiences and prioritize the solutions accordingly. The dual-hybrid technique is replicable across various healthcare platforms such as e-health, telehealth, public policies, m-health etc., to measure the orientation of modern consumers toward novel healthcare trends. Also, the results will assist healthcare professionals to focus on the relatively weaker dimensions and devise a more effective patient-centric culture in their respective departments.

LIMITATIONS AND FUTURE RESEARCH

This precedence analysis delivers some limitations. First, the rank reversal phenomenon is a common attribute in decision-making analyses, where the addition or deletion of some variables causes significant deviations among the rankings. Although neither of the above techniques assumes the nature of the data distribution, they heavily rely on the sample size and the number of dimensions included in the study. It is also important to mention that the term 'distribution' means whether the data dispersion follows a normal (bell-shaped curve) or non-normal (skewed) pattern. The results of both RIDIT and GRA showed rank deviations. However, these deviations were minimal and did not indicate any possibilities for rank reversal. When reassessing the ranks, future studies could enhance their methodology by experimenting with a wider range of indicators and employing a larger sample size to ensure more stable outcomes.

Second, a cross-sectional study was undertaken in a certain frame of time, which fails to capture the ongoing variations that occur over a long period of time. To establish generalizability, future studies can experiment with longitudinal sampling techniques to validate and extrapolate the current findings.

Third, the analytical tools used here focus only on patient-side assessment, whereas the gap between management perception and consumer expectation has been a long-discussed problem. Implementing shared decision-making policies is a dyadic process that demands additional efforts from both management and providers. Thus, to gain deeper insights, future studies should aim to integrate management perceptions with consumer expectations.

Lastly, the analysis presented in this study only presents a hierarchical structure of factors influencing PX. It is recommended that causal analysis and examination of interrelationships between these factors be conducted. This approach will enable the generation of a broader understanding of the associativity and outcomes related to PX. Furthermore, practitioners are encouraged to explore other fundamental PX dimensions, such as pain management [21], healthcare awareness/ literacy [21], and self-perceived health [7]. These fundamental factors,

as antecedents of PX, can be examined through structural modeling techniques to verify their linkages with important service outcomes like patient satisfaction and loyalty intentions. Also, it is crucial to recognize that PX programs and cultures are highly context-specific [24]. Therefore, in order to ensure the replicability of this experiment, it is necessary to verify the findings by considering a broader population base. For example, researchers can extend their focus beyond corporate hospitals and include patients seeking treatment in public hospitals, nursing homes, and non-profit hospitals. By incorporating diverse healthcare settings, a more representative picture of PX can be obtained.

ETHICS APPROVAL

This research was approved by the National Institute of Technology Rourkela, India. The application for the survey was approved in July 2022. We obtained verbal consents of patients before considering them as participants of this survey.

COMPETING INTERESTS

The Authors declare that there is no conflict of interest.

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APPENDIX - SURVEY QUESTIONNAIRE WHICH WAS RATED ON A SEVEN-POINT LIKERT SCALE

Item	Variable
NS1	"Did the nursing staff talk to you so you understood them?"
NS2	"Did you find that the nursing staff cared for you?"
NS3	"Do you have confidence in the professional skills of the nursing staff?"
NS4	"Did you tell the nursing staff everything you thought was important about your condition?"
NS5	"Did you find that the nursing staffs were interested in your description of your own situation?"
NS6	"Were you included in the advice on questions regarding your care?"
NS7	"Did the nursing staff have time for you when you needed it?"
DS1	"Did the doctors talk to you so you understood them?"
DS2	"Did you find that the doctors took care of you?"
DS3	"Do you trust the doctors' professional skills?"
DS4	"Did the doctors have time for you when you needed it?"
DS5	"Did you tell the doctors everything you thought was important about your condition?"
DS6	"Did you find that the doctors were interested in your description of your own situation?"
DS7	"Did you find that the treatment was adapted to your situation?"
IF1	"Did you know what you thought was necessary about how tests and examinations should take place?"
IF2	"Did you know what you thought was necessary about the results of tests and examinations?"
IF3	"Did you receive sufficient information about your diagnosis or your complaints?"
ORG1	"Did you find that there was a permanent group of nursing staff that took care of you?"
ORG3	"Did you find that the hospital's work was well organized?"
ORG4	"Did you find that important information about you had come to the right person?"
NOK1	"Were your relatives well received by the hospital staff?"
NOK2	"Was it easy for your relatives to get information about you while you were in the hospital?"
SD1	"Did you get the impression that the hospital equipment was in good condition?"
SD2	"Did you get the impression that the hospital was in good condition?"
SD3	"Was the room you were in satisfactory?"
SD4	"Was the opportunity for rest and rest satisfactory?"
SD6	"Was the cleaning satisfactory?"