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## **DETERMINANTS OF PATIENT'S SATISFACTION ON SERVICE QUALITY DIMENSIONS IN THE NIGERIA TEACHING HOSPITALS**

**Summary.** This study investigates the use of Analytic Hierarchy Process (AHP) in estimating the determinants of patients' satisfaction towards service delivery in six public teaching hospitals located in southwest Nigeria.

**Keywords:** Analytic Hierarchy Process, healthcare delivery, service quality, dimensions, patients.

## **UWARUNKOWANIA SATYSFAKCJI PACJENTA W ZAKRESIE WYMIARÓW JAKOŚCI W SZPITALACH W NIGERII**

**Streszczenie.** Celem badań jest wykorzystanie Analitycznego Procesu Hierarchii (AHP) w szacowaniu wyznaczników satysfakcji pacjentów w zakresie świadczenia usług w sześciu publicznych szpitalach klinicznych, znajdujących się w południowo-zachodniej Nigerii.

**Słowa kluczowe:** analityczna hierarchia procesów, opieka zdrowotna, jakość usług, wymiary, pacjenci.

## 1. Introduction

The hospitals in the developed countries are aware of the importance of delivering patient satisfaction as a strategic variable and a crucial determinant of long-term viability and success (Davies and Ware, 1988; Makoul, Arnston and Schofield, 1995; Royal Pharmaceutical Society, 1997). It is in relation to this that Donabedian (1988) contended that ‘patients’ satisfaction may be considered to be one of the desired outcomes of care, information about patient satisfaction should be as indispensable to assessments of quality as to the design and management of health care systems’.

The provision of health care services is indispensable, yet healthcare services in Nigeria are characterized by endemic inefficiency. Despite a sizable budgetary allocation for the improvement of healthcare service delivery, particularly at the interface of health workers and the patients, the sector’s objectives are still largely unmet (Harrison, 2001).

Patient satisfaction is considered as one of the most important quality dimensions and key success indicators in health care (Pakdil and Harwood, 2005). Satisfaction during a health care encounter is related to the relationship between patients’ expectations and experiences of the treatment received from health facilities and professionals. Patients’ satisfaction can be improved when health workers meet their expectations and decrease the total time spent in a clinic by the patients yearning for quality health care (Levesque, Bogoch, Cooney and Johnston, 2000). Moreover, experience with a health care service can have a direct impact on the patient’s expectations of the services (Parasuraman, Berry and Zeithaml, 1991). Even so, expectations refer to what patients think they will receive when going for health care services; their desires and what they consider important or what they think they are entitled to in the course of seeking healthcare (Williams, 1994). The relationship between expectation and experience is not always direct, but when there is a disconnect between the latter and former what results is patients’ dissatisfaction (Weinberger, Greene and Mamlin, 1981). When this occurs, it can be taken as ineffective and inefficient health care system which has neither achieved what it ought to achieve as a system nor with minimal resources.

Furthermore, patients’ satisfaction, in terms of healthcare, is important because it has been observed to have significant influence on patients’ attitudes towards health care services (Thompson and Sunol, 1995; Donabedian, 1980). Patients who are satisfied are more likely to seek more medical advice, adhere to treatment recommendations, keep appointments, cooperate with health professionals in service delivery and even refer other patients to their physicians (Donabedian, 1980; Ferris, Williams, Llewellyn-Thomas, Basinski, Cohen and Naylor, 1992).

Quality of health care can be conceived in various ways. In fact, during the last decade, health care managers, politicians, and other decision-makers have emphasised the importance of patients’ perspective as an indicator of the quality of health care. In many countries,

surveys of patients' satisfaction and patients' experiences with hospitals are carried out regularly and the results are made available to the public, together with other indicators of health care quality (Crow, Gage, Hampson, Hart, Kimber, Storey and Thomas, 2002). As a result, a number of studies investigating patient satisfaction employ a wide range of measurements depending on their patient satisfaction definition (Al Qatari and Haran, 1999). Multi-criteria Decision Analysis (MCDA) can be used to support these complex and multifaceted decisions. It helps decision-makers to evaluate a finite number of alternative health care interventions under a finite number of performance criteria. One validated technique for MCDA is Saaty's Analytic Hierarchy Process (AHP) (Saaty, 1994). Other popular tools used for multi-criteria or multi-attribute decision analysis in health care are the elimination and choice translating reality (ELECTRE), the simple multi-attribute rating technique (SMART), multi-attribute utility theory (MAUT), and conjoint analysis. Experimental comparisons have been made and revealed that each of the methods of MCDA has its own advantages over other methods. For example, in two studies comparing AHP and conjoint analysis, it was concluded that the former has clear advantages in case of complex decisions (Mulye, 1998; Scholl, Manthey, Helm and Steiner, 2005). Although, most works on the AHP have been done outside the healthcare sector, some empirical applications suggest that the model can be a potent tool to explain health care decision-making, particularly the coverage and application of health care interventions (Dolan and Bordley, 1993; Hummel, Rossum, and Verkerke, 2000). Further, this area of study is limited in developing countries like Nigeria, Therefore this study tends to investigate the determinant of patients' satisfaction towards service quality dimensions of public teaching hospitals in southwest Nigeria using the Analytic Hierarchy Process technique.

### **1.1. Objectives of the study**

The aim of this study is to investigate the use of Analytic Hierarchy Process in estimating determinants of patient satisfaction towards service quality delivery of public teaching hospitals in Southwest Nigeria. While the specific objectives are to:

- Examine the influence of hospitals service quality on patients' satisfaction using Analytic Hierarchy Process
- Determine priority weight for service quality dimensions in the southwestern Nigeria teaching hospitals.

## 1.2. Research questions

- What influence does hospitals service quality dimensions have on patients' satisfaction when Analytic Hierarchy Process is applied?
- What are the priority weights for service quality dimensions in the southwestern Nigeria teaching hospitals?

## 2. Literature Review

### Review of studies on patients' satisfaction

Umeano-Enemuoh, Onwujekwe, Uzochukwu and Ezeoke (2014) examined patients' satisfaction and quality of care in tertiary institution in Southeast Nigeria. In their contribution, they aim to determine the factors which enhance and deter patients' satisfaction in a tertiary institution and the quality of care. To do this, the study used a cross sectional survey design in which 360 carefully selected participants completed self-administered questionnaire to rate their satisfaction level, quality of services provided, as well as factors of importance where best service was provided. Overall, participants were quite satisfied (Mean score = 3.75) with the services provided by the different service providers. Equally, respondents also noted that the overall quality of care of the health facility was good (mean score = 3.45). Pharmacy received the highest satisfaction level with a mean rating of 4.1. Over a third participants (38%) rated the services provided by the doctors as best despite giving the highest quality ratings with a mean of 3.9 to pharmacy compared to mean ratings of 3.4 for the doctors. In the same vein, respondents' greatest displeasure was with the time spent at the facility as 63.9% of them were displeased. More than a third (36.9%) of the patient was most pleased with information given to them as a factor of importance. Moreover, participants were quite satisfied with the services provided as well as the quality of care by the different service providers of the health facility. As a consequence, it was concluded that there is need for interventions in terms of time spent at the facility which would promote good customer focused service delivery.

Gavran, Jašarević and Hasanica (2013) explored patients' satisfaction with primary health care in Zenica. They examined patients' satisfaction against the back drop of health care services in primary care and determined the difference in attitudes towards the work of general and family medicine offices. For this reason, descriptive analytical study was conducted among patients of the Primary Health Care, Zenica, who had recent experience with the work of family or general medicine. Similarly, the questionnaire for the evaluation of general and family medicine by patients was made on the basis of standardised European Project on Patient Evaluation of General Practice Care questionnaires (EUROPEP). Random

sampling technique was used, and the population of the patients was divided into two clusters: patients treated in general and family practice. In all, 100 questionnaires were distributed, 50 for general and 50 for family medicine. They found out that there were 56 (56.0%) males, and the most common age group was 41-60 years with 42 (42.0%) respondents. Differences in patients' satisfaction in favour of family medicine were statistically most significant when it came to scheduling examinations at times convenient to the patient ( $p = 16.28$ ), the possibility of telephone links with the office ( $p = 32.55$ ) and long waiting in waiting room ( $p = 30.42$ ). They concluded that there is high level of patients' satisfaction with the family medicine units of primary health care. Elaborate EUROPEP questionnaire seems to be a useful tool for the study of patients' satisfaction with health care services.

However, Sreenivas and Babu (2012) explored patients' satisfaction in hospitals using three urban hospitals in South India. They studied the satisfaction levels of the patient in sample hospitals and suggested measures to strengthen the administrative practices that improve patients' satisfaction in hospitals in India. The hospitals used are Government General Hospital (GGH), St. Joseph General Hospital (SJGH) and NRI Hospital (NRI) in the state of Andhra Pradesh in South India. According to the result obtained, 38 – items scales having good reliability and validity was developed. In the same vein, seven dimensions of perceived quality were identified - admission procedure, physical facilities, diagnostic services, behaviour of the staff, cleanliness, dietary services and discharge procedure. In this it was observed that patients' satisfaction is high in the case of SJGH, followed by NRI and GGH. Based on the outcomes, the developed scale is used to measure perceived quality at a range of facility types for patients. Perceived quality at public facilities is only marginally favourable, leaving much scope for improvement. Better staff and physician relations, interpersonal skills, infrastructure, and availability of drugs have the largest effect in improving patients' satisfaction.

Ogunfowokan and Mora (2012) focused on the experiences of patients on time, expectation and satisfaction. They determined the time spent by patients at the service points in the general Outpatient Departments (OPD) at the National Hospital Abuja (NHA), to establish the perception of patients regarding the patient–clinic encounter time, and to describe their level of satisfaction with the services received. A cross-sectional study was conducted at the general OPD of the NHA. Information which relate to the time spent at the various service points amongst others were obtained from 320 randomly selected patients, using a patient administered validated questionnaire. Eighty four per cent (84%) of the patients who responded adequately were identified and analysed. There was a significant relationship between a short waiting time as perceived by patients, clinic visit encounters where patients' expectations were met or surpassed, and overall patients' satisfaction with the clinic visit encounters. Based on the outcome of their results, they concluded that reduction in patient–clinic encounter time and meeting patients' pre-visit expectations may significantly improve patient satisfaction after clinic visit encounter at the general OPD of NHA.

Tateke, Woldie and Ololo (2012) discussed what determines patients' satisfaction. They identified the levels and determinants of patients' satisfaction with out-patient health services provided at public and private hospitals in Addis Ababa, Central Ethiopia. A comparative cross-sectional study was also conducted using 5 private and public hospitals each as their samples. In the same vein, participants were selected using systematic random sampling. Also a pre-tested and contextually prepared structured questionnaire was used to conduct interviews. Descriptive statistics, analysis of variance, factor analysis and multiple linear regressions were performed using computer software (SPSS 16.0).

They observed that 18.0% of the patients at the public hospitals were very satisfied, while 47.9% were just satisfied with the corresponding proportions a bit higher at private hospitals. Self-judged health status, expectation about the services, perceived adequacy of consultation duration, perceived providers' technical competency, perceived welcoming approach, and perceived body signaling were determinants of satisfaction at both public and private hospitals. They therefore, submitted that although patients at the private hospitals were more satisfied than those at the public ones, in terms of the health care they received, five of the determinants of patient satisfaction in this study were common to both settings. Thus, hospitals in both categories should work to improve the competencies of their employees, particularly health professionals, so as to gain the interests of clients and have a physical structure that fits well the expectations of the patients.

Sharifi, Baraz, Mohammadi, Ramezani and Vardanjani (2012) researched on patients' perception and satisfaction of Ambulance service (115) in Iran. They investigated the satisfaction of patients with Ambulance Service (115) in Shahrekord in the first half of (2012). To do this, simple random sampling method was used to choose the patients that were transferred to the hospital by pre-hospital emergency center. Similarly, data was collected using satisfaction evaluation questionnaire and was analysed using SPSS software version 16. The findings showed that satisfaction level with pre-hospital emergency services in men, low educated people, married people, those with the record of using emergency services and those with emergency problems were significantly higher than others. Satisfaction level in all fields was above 50% and was totally 71.12. The highest level of satisfaction was for the efficiency of emergency center and the lowest level of satisfaction in the questions was for the performance of technicians. Patients' satisfaction with emergency services and their quality is considered as one of the main concepts in pre-hospital emergency procedures. This is in the manner in which the results of this study showed that patients' satisfaction in different fields were high and satisfactory and the technicians should allocate much more time to interact with patients in order to improve their satisfaction.

Solayappan, Jayakrishnan and Velmani (2011) explored the perception and expectation of patients regarding hospital services by using the service quality gap model. The study was conducted in one of the leading hospitals in Chennai, Tamilnadu, India. A purposive sample of 300 respondents was selected who already have experience in the hospital as in-patients.

The major emphasis of the study, therefore, is to identify the service quality gap. By so doing, It was found that there is a huge gap in the hospital services like physical appearance, lack of interest in solving problems, and personal care.

Umar, Oche and Umar (2011) researched the patient waiting time in tertiary institution; through a study conducted in the Northern part of Nigeria. They observed that the amount of time a patient waits to be attended to is one factor which affects the utilisation of health care services. Patient satisfaction has emerged as an increasingly important parameter for assessing the quality of health care; therefore, health care facility performance can be best assessed by measuring the level of patient's satisfaction. In this study also, a cross-sectional descriptive study was carried out at the outpatients' departments of the Uthman Danfodio University, Sokoto. Here a total of 384 new patients were randomly selected. Furthermore, a set of pre-tested questionnaires was used to extract information from the respondents while descriptive statistics was used for analysis. In all, a total of 118 (31%) of the patients waited for less than an hour in the waiting room, while 371 (96.6%) spent less than 30 minutes with the doctor. More than half, 211 (55%) of the respondents were satisfied with the service delivery in the hospital, while only 63 (16%) of the respondents admitted to being given health talks while waiting to be attended to by the doctor. Although majority of the patients waited for more than one hour before being attended to, more than half of them were, however, satisfied with the services rendered to them. It is imperative, therefore that health care institutions and providers put in place measures aimed at reducing waiting time and ensuring patients' satisfaction.

Muhondwa, Leshabari, Mwangi, Mbembati and Ezekiel (2008) examined patients' satisfaction at the Muhimbili National Hospital in Dar Es Salaam, Tanzania. The study reveals the extent to which patients at the Muhimbili National Hospital (MNH) were satisfied with the services and care they received. The research method used was exit interview to determine patient satisfaction. What this means is that patients were interviewed as they were leaving the OPD clinics, laboratory, X-ray, pharmacy and in-patient wards. The study also observed that most patients were satisfied with the services and care they received. This high level of satisfaction must be viewed within the context of a hierarchical public health care delivery system, with MNH at the apex. The services and care MNH provides can only be excellent compared to that provided by lower level health facilities. Indeed, patients covered by this study perceived the services provided by MNH as superior, and this was reflected in the high level of satisfaction indicated by them. Some patients also expressed dissatisfaction with specific aspects of the services that they received. In fact, they were particularly dissatisfied with long waiting times before receiving services, the high costs of treatment, and consultation charges at MNH, poor levels of hygiene in the wards, and unprofessional conducts/attitudes of staff towards patients.

The study concluded that although only a small proportion of patients expressed dissatisfaction with these aspects of the services provided, they are significant. They called on the MNH management to take appropriate action and encourage health personnel to embrace a new staff patient relationship ethos, in which the patients` are viewed as customer.

Ofilu and Ofovwu (2005) wrote on the patients' assessment of efficiency of services in teaching hospital in a developing country. Both scholars examined patients' assessment of services rendered at a University Teaching Hospital. The study was cross-sectional carried out between July 2002 and September 2002 at the University of Benin Teaching Hospital, Benin – City, Edo – State, Nigeria. All patients (255) on admission were included in the study. They observed that the average waiting time of patients was 2 hours 53 minutes (173 minutes) and the range was 2 minutes to 2 days. Two hundred and ten (84%) of the patients were satisfied with time spent with the doctor (consultation time). Services at the pharmacy were little above average satisfactory to patients while greater percentage of patients were satisfied with services rendered at the laboratories. Eight–five percent and 76.8% of patients were satisfied with the X–ray and catering departments respectively. However, patients' rating of the level of sanitation was poor (46%). Based on their findings they were able to identify the area of need which include, waiting time prior to consultation, sanitation of the hospital and pharmacy department. Although patients expressed a high level of satisfaction with the laboratories, X–ray and catering departments, there is need to work towards achieving total satisfaction with all facilities.

Similarly, Gotlieb, Grewal, and Brown (1994) explored patient discharge, perceived hospital service quality and satisfaction, and identified evidence of a clear distinction between perceived service quality and patients' satisfaction. In this way, they found that patients' satisfaction mediated the effect of perceived service quality on behavioural intentions, which include adherence to treatment regimes and following provider's advice. However, Cleary and Edgman-Levitan (1997) pointed out that satisfaction surveys in the health care sector did not measure quality of care, as they did not include important aspects of care items such as being treated with respect and being involved in treatment decisions. In addition, Taylor (1999) noted that confusion continued in the sector regarding the difficulty in differentiation of service quality from satisfaction and reported that some authors, like Kleinsorge and Koenig (1991), referred to them as synonymous terms. Despite this, patients' satisfaction continues to be measured as a proxy for patient's assessment of service quality (Turriss, 2005).

Although, numerous studies has been done in assessing patients satisfaction in developed and developing countries, but to the best of the researchers knowledge there is limited studies that has explored the use of Analytic Hierarchy Process technique in investigating the determinant of patients satisfaction towards service quality delivery of hospitals in Nigeria. This study sets out to explore the use of AHP to investigate the determinant of patients' satisfaction towards service quality delivery of the public teaching hospitals in Southwest Nigeria.



### 3. Methodology

This study adopted a cross sectional survey design. It covers six public teaching hospitals in Southwest Nigeria. The questionnaires were distributed only to those who are qualified (patients who had received service from any of the selected teaching hospital in the last one year) and voluntarily agreed to participate in the study. Seventy patients were randomly selected from each of six public teaching hospitals in South-west, Nigeria to arrive at four hundred and twenty (420).

The primary data were obtained through the use of AHP based questionnaire. This is important for patients to do pairwise comparison of their satisfaction with service quality dimensions in relation to the goal and the alternatives as advanced from the literature and the preliminary interview for some who had experienced hospital services over time. Thus, information from the patients is to evaluate the services rendered by the hospitals.

A survey was conducted with the aid of an AHP based questionnaire to measure service quality dimensions of teaching hospitals in Southwest Nigeria. The survey instrument was a modified version of SERVQUAL, as recommended by Parasuraman, Zeithaml and Berry (1991). After an initial evaluation by academics, medical and health practitioners, as well as some patients discharged after treatment from the hospitals revealed that a pair of dimension outside the original SERVQUAL (tangibility, responsiveness, reliability, assurance, and empathy) was relevant to hospital services in relation to patients' satisfaction which includes: effective communication and waiting time for services. The seven dimensions were the criteria upon which alternatives were elicited and incorporated in the questionnaire for pairwise comparison by patients. Thus, the questionnaire was designed in accordance with the hierarchical structure described below into three sections and was administered to outpatients of the various sections/departments in the selected teaching hospitals.

#### Using the Analytical Hierarchy Process (AHP) model

In conducting the AHP questionnaire survey, literature was reviewed on patients' satisfaction in terms of the quality of service rendered by the hospitals. Special attention was given to the measures of service quality dimension that were postulated by Parasuraman et al. (1991) and with another two additional dimensions that were described as ideal, practical, and germane for identifying the appropriate service quality dimension.

An AHP-based approach to measure the quality of service rendered by the hospitals from the patient's perspectives involve the following steps:

- Identification of service quality dimensions
- Identification of alternatives, their ratings and constructing the hierarchical model

- Comparison of service quality dimensions and the alternatives in a pairwise fashion to derive their importance and assigning weights for the individual ratings
- Derivation of the weights of ratings for the hospital service quality dimensions.

Before using this model for this study, identify the **goal** (Determinant of patients' satisfaction with service quality dimensions); the **criteria** (the five generic dimension of service quality as propounded by Parasuraman *et al.*, (1991) but extended by two additional important dimensions; communication and waiting time which were equally important to patients in determining their satisfaction with hospitals services), the **sub-criteria**: for tangibility dimension we have (Cleanliness of the hospital environment (CHE), hospital's personnel appears neat (HPAN), up-to-date medical equipment (UDME), physical facilities (PF); for reliability dimension, these are (accuracy of medical report (AMR), accuracy of medical expenses (AME), employees respect for patients' privacy (ERPP), provision of adequate information about patient medical condition (PAIPMC); for responsiveness these are ( prompt service (PS), willingness of administrative staff to attend to patients' queries (WASPQ), hospital staff informs patient exactly when services will be performed (STPE); assurance dimension have three alternatives which are patient feel safe in the interaction with employees (PFSE), proficient medical staff (PMF), Hospital employees are polite (HEAP); empathy dimension has three alternatives which are warm and caring attitude (WCA), understanding towards feelings to discomfort (UTFD), employees keep patient best interest at heart (EPBIH); effective communication has three alternatives which are (adequate information for patient (AIP), doctors give adequate instruction (DAI), and taking patient opinion into consideration in treatment (TPICT); while waiting time dimension has three alternatives which are (waiting time is important to patient (WTIP), waiting time at the hospital is predictable (WTHP), and Hospital try to keep waiting time to a minimum (HTWM).

The Analytic Hierarchy Process (AHP) model which was introduced by Saaty (1980) was adopted because it has been successfully applied to solve multi-criteria decision-making problems (Vadya and Kumar, 2006). This method combines the opinions and evaluations of experts and turns a complex decision-making system into a hierarchical one. It has been accepted by the international scientific community as a robust and flexible multi-criteria decision-making model (MCDM) to deal with complex problems (Pecchia, Batch and Pendleton, 2010; Liu, Wen and Tsai, 2009).

A major advantage of AHP is in the formalisation of the structuring and assessment of all the factors and their interaction in a decision domain. AHP has three underlying concepts: structuring the complex problems as a hierarchy of goal, criteria, and alternatives pairwise comparison of the element at each level of the hierarchy, with respect to each criterion of the preceding level and vertically synthesising the judgments over different levels of hierarchy (Garcia-Cascales and Lamata, 2009). The fundamental scales for pairwise comparison ranged from 1(equal intensity) to 9 (extremely high intensity). The comparison matrix which is based

on specialist preferences provides an eigenvector (weight) and eigenvalue (maximum eigenvalue,  $\lambda_{\max}$ ), the consistency of which can be checked. The consistency index (CI =  $(\lambda_{\max} - n) / (n - 1)$  where  $n$  = number of items compared) and the consistency ratio (CR = CI/ RI, random index (RI) should be less than 0.1. The matrix is not calculated if CI or CR is greater than 0.1. The overall priority for the indicators would be obtained by combining the weighted decision elements as AHP method finally provides a priority ranking of all the alternatives in terms of the overall patients preferences on service quality dimension of the hospitals.

The Random Consistency Index (RI) can be observed in Table 3.1 as follows:

Table 3.1

		Random Index														
N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
R.I.	0	0	0.58	0.90	1.12	1.25	1.32	1.41	1.45	1.49	1.54	1.48	1.56	1.57	1.59	

Adapted from Saaty (2000).

Out of the 420 copies of questionnaire distributed among the patients, 348 copies of questionnaire were returned showing 82.9% response rate and only 326 copies of questionnaire were found useful for the AHP analysis.

## 4. Results and Discussion

The descriptive statistics of the socio-economic characteristics of the respondents, the responses in the questionnaire revealed that majority of the respondents (patients) were female. They bore their mind on how satisfied they were regarding the services rendered by the teaching hospitals.

### 4.1. Comparison Matrices

This section of the study presents information on the comparison matrix derived from the questionnaires administered to the respondents. A total of 2608 comparison matrices were obtained from the 326 respondents (patients) in the six selected teaching hospital. This includes the matrix for each level of the hierarchy and the reversed judgment matrices when consistency ratio (CR) >10%.

Table 4.1

Reduced matrix for the determinant of patient satisfaction  
with service quality dimensions of hospitals

Criteria	Tangibility	Reliability	Responsiveness	Assurance	Empathy	Effective communication	Waiting time	Weight
Tangibility	1.0000	1.3870	1.5203	1.3196	0.8215	0.8178	1.4765	0.1619
Reliability	0.7210	1.0000	1.4341	1.3661	0.8434	1.0050	2.0400	0.1560
Responsiveness	0.6578	0.6973	1.0000	1.4357	1.3079	1.0468	2.4905	0.1562
Assurance	0.7578	0.7320	0.6965	1.0000	1.0672	1.2470	2.5590	0.1435
Empathy	1.2173	1.1857	0.7646	0.9371	1.0000	1.3851	2.4740	0.1646
Effective communication	1.2228	0.9950	0.9553	0.8019	0.7220	1.0000	2.5281	0.1480
Waiting time	0.6773	0.4902	0.4015	0.3908	0.4042	0.3955	1.0000	0.0698
$\lambda_{\max} = 7.1754$		CI = 0.0292			CR = 0.0220			

#### 4.2. Reduced matrices

For AHP analysis, each comparison matrix must be reduced to 1 for each level of the hierarchy. Therefore, the 2608 matrices were later reduced to eight (8) comparison matrices (as shown below) using 1/326 ratio, since it is assumed that patients are equally knowledgeable about the quality of services being rendered by the teaching hospitals selected for this study.

The values found in the last column of this table denoted by weight are also known as eigenvector. They have a direct physical meaning in AHP. The values determine the participation or weight of those criteria relative to the total results of the goal. Based on the hospital service quality dimension stated, the empathy dimension criterion has a weight of 16.46% relative to the total goal. A positive evaluation on this factor contributes approximately twice more than a positive evaluation on the waiting time criterion (6.98%). Following the procedure of AHP, there is need to check for data inconsistencies. The main objective is to capture enough information to determine whether the patients have been consistent in their choices. The inconsistency index is based on maximum lambda which is calculated by summing the product of each element in the eigenvector (weight) by the respective column total of the original comparison matrix. Table 4.2 below demonstrates the calculation of the maximum eigenvalue also called maximum lambda denoted as ( $\lambda_{\max}$ ).

Table 4.2

Calculation of the maximum eigenvalue of the seven criteria with respect to goal which states determinant of patients' satisfaction with service quality dimension

Criteria	Tangibility	Reliability	Respon- siveness	Assurance	Empathy	Effective communi- cation	Waiting time
Eigen vector /weight	0.1619	0.1560	0.1562	0.1435	0.1646	0.1480	0.0698
Total(sum)	6.2540	6.4872	6.7723	7.2512	6.1662	6.8972	14.5681
Maximum eigenvalue ( $\lambda_{Max}$ )	$\{(0.1619*6.2540) + (6.4872*0.1560) + (6.7723*0.1562) + (7.2512*0.1435) + (6.1662*0.1646) + (6.8972*0.1480) + (14.5681*0.0698)\} =$ $\{1.0125 + 1.0120 + 1.0578 + 1.0405 + 1.0150 + 1.0208 + 1.0168\} = 7.1754$						

The test of consistency is done using the formula:

$$CI = (\lambda_{Max} - n) / (n - 1)$$

$$CI = (7.1754 - 7) / 7 - 1$$

$$= 0.1754 / 6 = 0.0292$$

In order to verify the consistency index (CI), Saaty (2000) prescribes what is called consistency ratio (CR) which is determined by dividing the consistency index (CI) by random index (RI). The matrix will be considered consistent if the resulting ratio is less than 10%. The random index value is fixed and based on the number of evaluated criteria as shown in Table 3.1 in the previous section of the study.

In the case of the hospital service quality dimension criteria, the consistency ratio for the initial group criteria is

$$CR = \frac{CI}{RI} = 0.0292 / 1.32$$

$$= 0.0221 = 2\%$$

Since its value is less than 10%, the matrix is considered to be consistent.

Therefore, looking at the eigenvector values/priority weight of the hospital service quality dimension criteria, it is evident that the empathy dimension criterion has contributed 16.46% to the goal, whereas waiting time dimension contributes 6.98% to the goal which is the determinant of patient's satisfaction with hospital service quality.

Table 4.3

Reduced matrix for tangibility dimension

Tangible	CHE	HPN	UDME	PF	Weight
CHE	1.0000	1.3349	0.5795	1.9689	0.2525
HPAN	0.7491	1.0000	0.8934	1.4129	0.2300
UDME	1.7257	1.1194	1.0000	4.4242	0.3938
PF	0.5079	0.7078	0.2260	1.0000	0.1237
$\lambda_{max} = 4.115$	CI = 0.0383			CR = 0.0425	

Considering the decision alternatives of the tangibility criterion, eigenvector priority weight has computed, shows the contribution of each decision alternatives in relation to the tangibility dimension criteria. Based on the decision alternatives of the tangibility dimension stated, the up-to-date medical equipment alternative has a weight of 39.38% relative to the tangibility criterion. A positive evaluation of this factor contributes approximately 3 (three) times more than a positive evaluation of the physical facilities alternative (12.37%). Following the procedure of AHP, there is need to consider data inconsistencies. The main objective is to capture enough information in order to determine whether the patients have been consistent in their choices. The inconsistency index is based on maximum lambda which is calculated by summing the product of each element in the eigenvector (weight) by the respective column total of the original comparison matrix. Table 4.4 demonstrates the calculation of the maximum eigenvalue also called maximum lambda, denoted as ( $\lambda_{Max}$ ).

Table 4.4

Calculation of the maximum eigenvalue of the decision alternative with respect to tangibility criterion

Decision alternative of tangibility	CHE	HPN	UDME	PF
Eigenvector/ priority weight	0.2525	0.2300	0.3938	0.1237
Total(sum)	3.9827	4.1621	2.6989	8.806
Maximum eigenvalue ( $\lambda_{Max}$ )	{3.9827*0.2525} + (4.1621*0.2300) +(2.6989*0.3938) + (8.806*0.1237) = 4.115			

The test of consistency is done using the formula below:

$$CI = (\lambda_{Max}-n)/(n-1)$$

$$CI = (4.115-4) / 4-1$$

$$= 0.115/3 = 0.0383$$

In the case of the dimension criterion, the consistency ratio for the initial group criterion is

$$CR = \frac{CI}{RI} = 0.0383/ 0.9$$

$$= 0.0425 = 4\%$$

Since its value is less than 10%, the matrix is considered to be consistent.

Therefore, considering the eigen vector values/priority weight of decision alternatives of tangibility dimension, it is obvious that up-to-date medical equipment decision alternative has contributed 39.38% to the tangibility dimension criteria, while physical facilities decision alternative contributes 12.37% to the tangibility dimension criteria.

Table 4.5

## Reduced matrix for reliability dimension

Reliability	AMR	AME	ERPP	PAIPMC	Weight
AMR	1.0000	4.1272	1.4761	1.1424	0.3843
AME	0.2423	1.0000	1.0217	0.9236	0.1685
ERPP	0.6775	0.9788	1.0000	1.4622	0.2351
PAIPMC	0.8754	1.0828	0.6839	1.0000	0.2120
$\lambda_{\max} = 4.2285$	CI = 0.0761		CR = 0.0846		

In view of the decision alternatives of the reliability criterion, the eigenvector priority weight has been calculated. It shows the contribution of each decision alternatives in relation to the reliability dimension criterion. Based on the decision alternatives of the reliability dimension stated, the accuracy of medical report alternative has a weight of 38.43% relative to the reliability criterion. A positive evaluation on this factor contributes approximately twice more than a positive evaluation of the physical facilities alternative (12.37%). Following the procedure of AHP, there is need to check for data inconsistencies. The main objective is to capture enough information so as to determine whether the patients have been consistent in their choices. The inconsistency index is based on maximum lambda which is calculated by summing the product of each element in the eigenvector (weight) by the respective column total of the original comparison matrix. Table 4.6 demonstrates the calculation of the maximum eigenvalue also known as maximum lambda, denoted as ( $\lambda_{\text{Max}}$ ).

Table 4.6

## Calculation of the maximum eigenvalue of the decision alternative with respect to reliability criteria

Decision alternative of reliability criteria	AMR	AME	ERPP	PAIPMC
Eigenvector/ priority weight	0.3843	0.1685	0.2351	0.2120
Total(sum)	2.7952	7.1888	4.1817	4.5282
Maximum eigenvalue ( $\lambda_{\text{Max}}$ )	{2.7952*0.3843} + {7.1888*0.1685} + {4.1817*0.2351} + {4.5282*0.2120} = 4.2285			

The test of consistency is done using the formula:

$$CI = (\lambda_{\text{Max}} - n) / (n - 1)$$

$$CI = (4.2285 - 4) / 4 - 1 \\ = 0.2285 / 3 = 0.0761$$

In the case of the dimension criterion, the consistency ratio for the reliability criterion is

$$CR = \frac{CI}{RI} = 0.0761 / 0.9 \\ = 0.0846 = 8\%$$

Since its value is less than 10%, the matrix is considered to be consistent.

Therefore, looking at the eigen vector values/priority weight of decision alternatives of reliability dimension, it is clear that accuracy of medical report decision alternative have contributed 38.43% to the reliability dimension criterion, whereas accuracy of medical expenses decision alternative contributes 21.20% to the reliability dimension criterion.

Table 4.7

Reduced matrix for responsiveness dimension

Responsiveness	PS	WASPQ	STPE	weight
PS	1.0000	2.2249	2.9578	0.5411
WASPQ	0.4495	1.0000	2.6805	0.3111
STPE	0.3381	0.3731	1.0000	0.1478
$\lambda_{\max} = 3.0743$	CI = 0.0372			CR = 0.0641

Taking into consideration the decision alternatives of the responsiveness criterion, the eigenvector/priority weight has been computed, which shows the contribution of each of decision alternatives in relation to the responsiveness dimension criterion. The decision alternatives of the responsiveness dimension indicate that, the prompt service alternative has a weight of 54.11% relative to the responsiveness criterion. A positive evaluation of this factor which contributes approximately 4 (four) times more than a positive evaluation of the hospital staff informing the patient(s) exactly when services is performed alternative (14.78%). Next, it is required to check for data inconsistencies. The main objective is to capture enough information to determine whether the patients have been consistent in their choices. The inconsistency index is based on maximum lambda which is calculated by summing the product of each element in the eigenvector (weight) by the respective column total of the original comparison matrix. Table 4.8 demonstrates the calculation of the maximum eigenvalue also called maximum lambda, denoted as ( $\lambda_{\max}$ ).

Table 4.8

Calculation of the maximum eigenvalue of the decision alternative with respect to responsiveness criteria

Decision alternative of responsiveness criteria	PS	WASPQ	STPE
Eigenvector/ priority weight	0.5411	0.3111	0.1478
Total (sum)	1.7876	3.598	6.6383
Maximum eigenvalue ( $\lambda_{\max}$ )	{(0.5411*1.7876) + (0.3111*3.598) + (0.1478*6.6383)} = 3.0743		

The test of consistency is done using the formula:

$$CI = (\lambda_{\max} - n) / (n - 1)$$

$$CI = (3.0743 - 3) / 3 - 1$$

$$= 0.0743 / 2 = 0.0372$$



In the case of the dimension criterion, the consistency ratio for the responsiveness criteria is

$$\text{CR} = \frac{\text{CI}}{\text{RI}} = 0.0372 / 0.58 \\ = 0.0641 = 6\%$$

Since its value is less than 10% the matrix is considered to be consistent.

Therefore, looking at the eigen vector values/priority weight of decision alternatives of responsiveness dimension, it is clear that prompt service decision alternative has contributed 54.11% to the responsiveness dimension criterion, while the decision alternative of hospital staff informs patient exactly when services is performed contributes 14.78% to the responsiveness dimension criterion.

Table 4.9

Reduced matrix for assurance dimension

Assurance	PFSE	HEAP	PMF	Weight
PFSE	1.0000	3.6441	3.5039	0.6329
HEAP	0.2744	1.0000	1.7797	0.2171
PMF	0.2854	0.5619	1.0000	0.1500
$\lambda_{\max} = 3.0599$		CI = 0.0299		CR = 0.0516

Considering the decision alternatives of the assurance criteria, the eigenvector/priority weight has been computed, and shows the contribution of each of decision alternatives in relation to the assurance dimension criterion. The decision alternative of patient feel safe in the interaction with employees has a weight of 63.29% relative to the assurance dimension criterion. A positive evaluation of this factor contributes approximately 4 (four) times more than a positive evaluation of the proficient medical staff alternative (15%). Following the procedure of AHP, it is necessary to check for data inconsistencies. The main objective is to capture enough information to determine whether the patients have been consistent in their choices. The inconsistency index is based on maximum lambda which is calculated by summing the product of each element in the eigenvector (weight) by the respective column total of the original comparison matrix. Table 4.10 demonstrates the calculation of the maximum eigenvalue also called maximum lambda, denoted as ( $\lambda_{\text{Max}}$ ).

Table 4.10

Calculation of the maximum eigenvalue of the decision alternative with respect to assurance criteria

Decision alternative of responsiveness criteria	PFSE	HEAP	PMF
Eigenvector/ priority weight	0.6329	0.2171	0.1500
Total(sum)	1.5598	5.206	6.2836
Maximum eigenvalue ( $\lambda_{\text{Max}}$ )	{(0.6329*1.5598) + (0.2171*5.206) + (0.1500*6.2836)} = 3.0599		

The test of consistency is done using the formula:

$$CI = (\lambda_{\text{Max}} - n) / (n - 1)$$

$$CI = (3.0599 - 3) / 3 - 1$$

$$= 0.0599 / 2 = 0.0299$$

In the case of the dimension criterion, the consistency rate for the assurance criterion is

$$CR = \frac{CI}{RI} = 0.0299 / 0.58$$

$$= 0.0516 = 5\%$$

Since its value is less than 10%, the matrix is considered to be consistent.

Therefore, looking at the eigen vector values/priority weight of decision alternatives of assurance dimension, it is obvious that patient feel safe in the interaction with employee decision alternative have contributed 63.29% to the assurance dimension criteria, whereas the proficient medical staff decision alternative of contributes with 15% to the assurance dimension criterion.

Table 4.11

Reduced matrix for empathy dimension

Empathy	WCA	UTFD	EPBIH	Weight
WCA	1.0000	2.3005	2.4005	0.5287
UTFD	0.4347	1.0000	2.0878	0.2933
EPBIH	0.4166	0.4790	1.0000	0.1780
$\lambda_{\text{max}} = 3.0641$		CI = 0.0321		CR = 0.0553

Considering the decision alternatives of the empathy dimension criterion, the eigenvector/priority weight has been computed, and shows the contribution of each of decision alternatives in relation to the empathy dimension criteria. Based on the decision alternatives of the empathy dimension stated, the decision alternative of warm and caring attitude has a weight of 52.87% relative to the empathy dimension criteria. A positive evaluation of this factor contributes approximately 3 (three) times more than a positive evaluation on the employee keep patient best interest at heart (EPBIH) alternative (17.8%). Following the procedure of AHP, it is necessary to check for data inconsistencies. The main objective is to capture enough information so as to determine whether the patients' have been consistent in their choices. The inconsistency index is based on maximum lambda which is calculated by summing the product of each element in the eigenvector (weight) by the respective column total of the original comparison matrix. Table 4.12 demonstrates the calculation of the maximum eigenvalue also called maximum lambda, denoted as ( $\lambda_{\text{Max}}$ ).

Table 4.12

Calculation of the maximum eigenvalue of the decision alternative with respect to empathy dimension criteria

Decision alternative of empathy criteria	WCA	UTFD	EPBIH
Eigenvector/ priority weight	0.5287	0.2933	0.1780
Total(sum)	1.8513	3.7795	5.4883
Maximum eigenvalue ( $\lambda_{Max}$ )	$(0.5287*1.8513) + (0.2933*3.7795) + (0.1780*5.4883) = 3.0641$		

The test of consistency is done using the formula:

$$CI = (\lambda_{Max}-n)/(n-1)$$

$$CI = (3.0641-3) / 3-1$$

$$= 0.0641/2 = 0.0321$$

In the case of the dimension criterion, the consistency rate for the empathy criterion is

$$CR = \frac{CI}{RI} = 0.0321/ 0.58 = 0.0553 = 5\%$$

Since its value is less than 10% the matrix is considered to be consistent.

Therefore, considering the eigen vector values/priority weight of decision alternatives of empathy dimension, it is evident that warm and caring attitude decision alternative have contributed 52.87% to the empathy dimension criterion, while employee keep patient best interest at heart (EPBIH) decision alternative contributes 17.8% to the empathy dimension criterion.

Table 4.13

Reduced matrix for effective communication

Effective Communication	AIP	DAI	TPICT	Weight
AIP	1.0000	1.5280	2.4877	0.4662
DAI	0.6544	1.0000	3.1334	0.3809
TPICT	0.4020	0.3191	1.0000	0.1529
$\lambda_{max} = 3.0555$	CI = 0.0277		CR = 0.0478	

Taking into consideration the decision alternatives of the effective communication dimension criterion, the eigenvector/priority weight has been computed, and shows the contribution of each of decision alternatives in relation to the effective communication dimension criteria. Based on the decision alternatives of the effective communication dimension stated, the decision alternative of adequate information to patient (AIP) has a weight of 46.62% relative to the effective communication dimension criteria. A positive evaluation of this factor contributes approximately 3 (three) times more than a positive evaluation on the taking patient opinion into consideration in treatment (TPICT) alternative (15.29%). Following the procedure of AHP, there is need to consider data inconsistencies. The main objective is to capture enough information and determine whether the patients have

been consistent in their choices. The inconsistency index is based on maximum lambda which is calculated by summing the product of each element in the eigenvector (weight) by the respective column total of the original comparison matrix. Table 4.14 demonstrates the calculation of the maximum eigenvalue also called maximum lambda, denoted as ( $\lambda_{Max}$ ).

Table 4.14

Calculation of the maximum eigenvalue of the decision alternative with respect to effective communication dimension criteria

Decision alternative of effective communication criteria	AIP	DAI	TPICT
Eigenvector/ priority weight	0.4662	0.3809	0.1529
Total(sum)	2.0564	2.8471	6.6211
Maximum eigenvalue ( $\lambda_{Max}$ )	{(0.4662*2.0564) + (0.3809*2.8471) + (0.1529*6.6211)} = 3.0555		

The test of consistency is done using the formula:

$$CI = (\lambda_{Max}-n)/(n-1)$$

$$CI = (3.0555-3) / 3-1$$

$$= 0.0555/2 = 0.0277$$

In the case of the dimension criterion, the consistency rate for the empathy criterion is

$$CR = \frac{CI}{RI} = 0.0277/ 0.58$$

$$= 0.0478 = 5\%$$

Since its value is less than 10% the matrix is considered to be consistent.

Therefore, looking at the eigen vector values/priority weight of decision alternatives of effective communication dimension, it is clear that giving adequate information to patient as an alternative have contributed 46.62% to the effective communication dimension criterion, while taking patient opinion into consideration in treatment (TPICT) decision alternative contributed 15.29% to the effective communication dimension criterion.

Table 4.15

Reduced matrix for waiting time

Waiting time	WTIP	WTHP	HTWM	Weight
WTIP	1.0000	3.9385	2.0029	0.5755
WTHP	0.2539	1.0000	1.2824	0.2063
HTWM	0.4993	0.7798	1.0000	0.2182
$\lambda_{max} = 3.1237$	CI = 0.0618			CR = 0.1066

Considering the decision alternatives of waiting time dimension criterion, the eigenvector/priority weight has been calculated, and shows the contribution of each of decision alternatives in relation to the waiting time dimension criterion. The decision alternative of waiting time is important to patient (WTIP) has a weight of 57.55% relative to the waiting time dimension criteria. A positive evaluation on this factor contributes approximately 3 (three) times more than a positive evaluation on the waiting time at the

hospital is predictable (WTHP) alternative (20.63%). Following the procedure of AHP, it is important to check for data inconsistencies. The main objective is to capture enough information to determine whether the patients have been consistent in their choices. The inconsistency index is based on maximum lambda which is calculated by summing the product of each element in the eigenvector (weight) by the respective column total of the original comparison matrix. Table 4.16 demonstrates the calculation of the maximum eigenvalue also called maximum lambda, denoted as ( $\lambda_{Max}$ ).

Table 4.16

Calculation of the maximum eigenvalue of the decision alternative with respect to waiting time dimension criteria

Decision alternative of waiting time criteria	WTIP	WTHP	HTWM
Eigenvector/ priority weight	0.5755	0.2063	0.2182
Total(sum)	1.7532	5.7183	4.2853
Maximum eigenvalue ( $\lambda_{Max}$ )	{(0.5755*1.7532) + (0.2063*5.7183) + (0.2182*4.2853)} = 3.1237		

The test of consistency is done using the formula:

$$CI = (\lambda_{Max}-n)/(n-1)$$

$$CI = (3.1237-3) / 3-1$$

$$= 0.1237/2 = 0.0618$$

In the case of the dimension criterion, the consistency rate for the waiting time criterion is

$$CR = \frac{CI}{RI} = 0.0618/ 0.58$$

$$= 0.1066 = 10\%$$

Since its value is 10%, the matrix is considered to be consistent.

Therefore, looking at the eigen vector values/priority weight of decision alternatives of waiting time dimension, it is apparent that waiting time is important to patient(WTIP) decision alternative have contributed 57.55% to the waiting time dimension criterion, while waiting time at the hospital is predictable (WTHP) decision alternative of contributes with 20.63% to the waiting time dimension criterion.

## 5. Conclusion and Recommendations

The AHP evaluates the patients' satisfaction towards service quality dimensions of hospitals for effective health care delivery. The descriptive statistics of the socio-economic characteristics of the respondents, the responses in the questionnaire revealed that majority of the respondents (patients) were female. They bore their mind on how satisfied they were regarding the services rendered by the teaching hospitals. The analysis of the AHP has helped

to show the individual contribution of each of the service quality dimensions criteria in relation to the main goal which was the determinant of patients satisfaction towards service quality of teaching hospitals and also the individual contribution of each of the decision alternatives with respect to the various service quality dimension criteria identified in this study. That is empathy dimension of service quality has the greatest impact of 16.46% on determinant of patients satisfaction towards hospitals services, followed by the tangibility dimension of 16.19%, followed by responsiveness dimension with 15.62% and waiting time dimension had the least impact of 6.9% on determinant of patients satisfaction towards teaching hospital services in southwest Nigeria.

This study has successfully applied the AHP approach in finding the most suitable determinant of patients' satisfaction of service quality dimension (Empathy dimension). Therefore, the approach has proved to be an effective tool for policy selection in the entire health care system. This study has provided a standard procedure to follow in order to improve the quality of services rendered by the hospitals and significantly enhance patients' satisfaction.

The result presents managers of government hospitals with feedback on service quality dimensions that can be improved upon to enhance competitiveness, thus improving the entire service delivery in the Nigerian health sector.

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## **Omówienie**

Wyniki modelu AHP wykazały, że pacjenci mają największą preferencję dla wymiaru empatii jakości usług w szpitalach klinicznych. Najmniej korzystny był czas oczekiwania. Opierając się na tych ustaleniach, można stwierdzić, że metoda AHP może być z powodzeniem stosowana do ustalenia wyznaczników satysfakcji pacjentów w zakresie wymiarów jakości usług. Zatem badanie to może mieć wpływ na decyzje w kwestii skutecznego monitorowania całego systemu opieki zdrowotnej, w celu podniesienia jakości świadczonych usług.