Research Article

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www.imedpub.com

Journal of Hospital & Medical Management
ISSN 2471-9781

2017
Vol.3 No.3:24

DOI: 10.4172/2471-9781.100043

# Measuring Healthcare Quality in Big Public Hospital in Vietnam Country

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**Citation:** Dung Chu S, Quoc Nguyen A, Sin Khong T (2017) Measuring Healthcare Quality in Big Public Hospital in Vietnam Country. J Hosp Med Manage Vol.3 No.3:24

## Abstract

**Objective:** Measuring healthcare quality of the big public hospital in developing countries by the functional quality by servequal instruments and technical quality of healthcare by eight dimensions

**Subject and Method:** The study obtained feedback from patients, measure consumers' perceptions of healthcare quality in both functional and technical quality including, using the SERVQUAL instrument with five generic dimensions (the original 22 item instruments) for functional quality to combination with the 8 dimensions for technical quality for General clinic department at Bachmai Hospital in Vietnam country. The study refers to the period from December 2013 to Jan 2014.

**Result:** Altogether 550 persons were interviewed and 513 patients were identified by stratified random sampling. Most outpatients whose length of stay in general clinic department in the Bachmai hospital. Measuring healthcare quality by functional and technical quality. The functional quality by SERQUAL instrument with 5 items (22 score) and Technical quality item (8 score). Servqual instrument had 5 items are the "Tangible", "Reliability", "Responsiveness", "Assurance", "Empathy" including and Technical quality item's Technical Quality; There items have highly patient satisfaction (PS) mean are 3.9196 ± 0.59615, 3.8104 ± 0.73355, 3.9532 ± 0.67188, 3.8998 ± 0.58325, 3.9513 ± 0.61043, 3.9671 ± 0.59481, respectively, and Cronbach alpha for the first construct of public are 0.824, 0.869, 0.860, 0.808, 0.847, and 0.927, respectively. After performing factor analysis, we have four elements are drawn: Factor 1 (Responsiveness) with 8 variables, factor 2 (Reliability) with 6 variables, factor 3 (Tangible) with 5 variables, factor 4 (Technical quality) with 8 variables with highly Corrected Item-Total Correlation of PS and reliability coefficient.

**Conclusion:** Adjusted research model for the public hospital have four construct from levels of customer satisfaction about service quality is influenced by the SERVQUAL (3 items are responsivenes, reliability and tangibles with 19 scores) and Technical Quality instrument (8 scores) with total of 27 scores. The model provides feedback on the quality of a public hospital experience from the adult outpatient's perspective at the developing nation as Vietnam country.

**Keywords:** Measuring healthcare quality; Servqual; Functional quality; Technical quality

**Received:** December 15, 2017; **Accepted:** December 27, 2017; **Published:** December 30, 2017

# Background

Bachmai General Hospital is the significant Public hospital in Vietnam Country as one developing country: The Hospital is a big hospital with multi-field medical department in Hanoi and is considered one of the largest in Vietnam [1,2]. Measurement of patients' satisfaction with services provided by the concerned hospital is important from two angles. Firstly, patients constitute the hospital's direct client [3,4].

Measures healthcare by SERVQUAL instrument has been the predominant method used to measure consumers; perceptions of service quality; It has five generic dimensions or factors (the original 22-item instrument) and are stated as follows: (1) Tangibles: Physical facilities, equipment and appearance of personnel; (2) Reliability: Ability to perform the promised service dependably and accurately; (3) Responsiveness: Willingness to help customers and provide prompt service; (4) Assurance (including competence, courtesy, credibility and security). Knowledge and courtesy of employees and their ability to inspire trust and confidence; (5) Empathy (including access, communication, understanding the customer) [5]. Caring and individualized attention that the firm provides to its customers.

In the SERVQUAL instrument, 22 statements measure the performance across these five dimensions, using a seven point Likert the scale measuring both customer expectation on both the quality of services expected and perceptions of services received then feedback from customer surveys can be highly misleading from both a policy and an operational perspective. In the following, the application of SERVQUAL approach is more specified with example in a catering hospital [6-8]. In addition, we refer to the John E. Ware model to measure for technical quality of healthcare (Questionnaire items refer to eight dimension are: Ability, accuracy, experience, throughness, and training of providers as well as the extent to which they pay attention to details, avoid mistakes, give good examinations, and clearly explain what is expected of their patients) [9].

Therefore, this study report to findings of this survey is an overview of the Index and item scores for The SERVQUAL indices combiner to technical quality index in widen developing countries, about the outpatient Satisfaction and concerns with respect to first referral public hospitals in Vietnam's developing countries and over the worlds. Thereby proposed some suggestions to improve the quality of health care, ensure patient satisfaction for general clinic department at Bach Mai Hospital.

# Research Methodology

## Selection of study area

General clinic department, Bachmai Hospital

## Selection of respondents

Selection of study set and sampling of patients: BachMai hospital were taken up for the study. To build up the sampling frame of patients, the number of outpatients whose length of stay in the hospital. Measures examination medical when they outcome hospital.

## Method

**Interval measurement for service quality and patient satisfaction:** This measurement has the power to measure the distance between any two points on the scale. Respondents are to provide answers on their expectations and perceptions based on the 5 point Likert scale Number 1 implies SD - Strongly Disagree, Number 2 implies D - Disagree, Number 3 implies N – Neither disagree or agree, Number 4 implies A – Agree, Number 5 implies SA – Strongly Agree [5].

Functional quality had 5 items with 22 scores [5-8] and Technical quality had 8 scores [9]:

**H1a: reliability (IVA):** When hospital promises to do something by a certain time, they do it (A1). Hospital/staff have notification to avoid mistakes (A2). Hospital performs the services for me right at the first time (A3). Doctors are clearly explained and reference to comments patients before appoints medical tests (A4). When customer has a problem, Doctors/staff exhibits sincere interest in solving patients' problems (A5).

**H1b: Responsiveness (IVB):** Hospital staff make information easily obtainable in explanation of procedures or services provided (B1). Doctors/staffs give prompt services to customers (B2). Doctors/staffs are always willing to help patients (B3). The Doctors are never too busy to respond to customers' requests (B4).

**H1c: Assurance (IVC):** Attitude and behavior of Doctors/staff make confidence in customers (C1). Patients feel secure in receiving medical care (C2). Hospital staffs are polite to customers (C3). Doctors/staff have knowledge to answer customers' questions (C4).

**H1d: Empathy (IVD):** Hospital make sure choice individualized of patients (D1). Operating hours of hospital are convenient to Customers (D2). Doctors focus attention what most worried patients (D3). Employees of hospital understand the specific needs of their customers (D4). Hospital staff guide patients where to go and what to do (D5).

**H1e: Tangibles (IVE):** The hospital's equipment is modern equipment's and well maintained (E1). Physical facilities are virtually appealing (E2). Doctors and staff are well dressed and appear neat (E3). Clean, comfortable and visually attractive environment (E4).

**H1f: Technical quality (IVF):** Doctor's office has everything needed to provide complete care (F1). Doctor makes me confidence that their diagnosis is correct (F2). In results tests of machines system, technology at the hospital is accurate (F3). I have seen Doctors/staff very experience with my medical problems (F4). Cooperation between doctors, nurses and other hospital staff about your treatment (F5). My doctors are very competent and well-trained (F6). When I go for medical care, they are careful to check everything when treating and examining me (F7). Doctors/staff have explained thoroughly medical conditions to patients (F8).

**Independent variables (IV) and dependent variables (DV):** In the case, Service quality can be Independent variable (IV) and

Dependent variable (DV). Patients Satisfaction (PS), Functional quality (FQ) and Technical quality (TQ) can be Independent variable or Dependent variable:

1) First, Dependent variable (DV) is Service Quality (SQ). Independent variables (DV) are Reliability, Responsiveness, Assurance, Empathy, Tangibles and Technical Quality.
2) Second, Dependent variable (DV) is Functional Quality (FQ). Independent variables (IV) are Reliability, Responsiveness, Assurance, Empathy and Tangibles.
3) Third, Dependent variable (DV) is Technical Quality. Independent variable (IV) is one dimension with 8 items of Technical quality of care.

**Research hypotheses:** As a result, for the purpose of this research, we argue the SERVQUAL indices is reliable and that all the five dimensions of patient satisfaction in functional quality by the SERVQUAL instrument and eight dimensions of patient satisfaction in technical quality are significant in the setting of health care.

- H1a (Hypothesis 1a): There is relationship between Reliability and Service Quality.
- H1b (Hypothesis 1b): There is a relationship between Responsiveness and Service Quality.
- H1c (Hypothesis 1c): There is a relationship between Assurance and Service Quality.
- H1d (Hypothesis 1d): There is a relationship between Empathy and Service Quality.
- H1e (Hypothesis 1e): There is a relationship between Tangibles and Service Quality.
- H1f (Hypothesis 1f): There is a relationship between Technical quality and Service Quality.

Thereby proposed some suggestions to improve the quality of health care, ensure patient satisfaction for general clinic department at Bach Mai Hospital

**Questionnaire administration:** Questionnaire were completed by outpatients at Bachmai Hospital hospital (n=513) over a period of one month.

All Data analysis has been carried out with the Statistical Package for the Social Sciences (IBM SPSS 21.0) [10,11].

# Results

From the samples characteristics in Public hospital: 550 questionnaires were distributed, the rate of completion is 93.27% (n=513). There is a 513 questionnaire are completed, frequency distribution of gender in the hospital are 220 male (42.9%) and 293 female (57.1%).

## Descriptive statistics for healthcare quality variables

Descriptive Statistics of healthcare quality constructs of the public:

Patients feel that the quality of medical services at the public hospital model is pretty good, but still not really good for the perception of the patients using the service at this hospital **(Table 1)**.

## Reliability (Cronbach Alpha) of variable and average of healthcare service quality variables

**Reliability (IVA):** Reliability is the first service quality construct consists of 5 items in this study (IVA1, IVA2, IVA3, IVA4, IVA5). These five items with the reliability coefficient, Cronbach Alpha for the firth construct of public hospital is 0.824.

**Responsiveness (IVB):** The second service quality construct comprised of 4 items which includes: IVB1, IVB2, IVB3, IVB4. These four items with the reliability coefficient, Cronbach Alpha for the second construct of public hospitals is 0.869.

**Assurance (IVC):** The Third service quality construct consists of 4 items which include IVC1, IVC2, IVC3, IVC4. These six items with the reliability coefficient, Cronbach Alpha for the third construct for public hospitals is 0.860.

**Empathy (IVD):** Fourth service quality construct of 5 items which actually represents the IVD1, IVD2, IVD3, IVD4, IVD5. It includes 5 items with the reliability coefficient Cronbach Alpha, for the first construct for public hospitals is 0.808.

**Tangibles (IVE):** Fifth service quality construct comprised of 4 items which includes IVE1, IVE2, IVE3, IVE4. These four items with the reliability coefficient, Cronbach Alpha of the fifth construct for public hospitals is 0.847.

**Technical quality (IVF):** This dimension, sixth service quality construct comprised of 8 items which includes: IVF1, IVF2, IVF3, IVF4, IVF5, IVF6, IVF7, IVF8. These eighth items with the reliability coefficient, Cronbach Alpha of the sixth construct for public hospitals are 0.927.

**Table 1:** Descriptive Statistics of service quality constructs in public hospital.

| Dimensions | | N | Mean | SD (Std. Deviation) |
|---|---|---|---|---|
| Reliability (IVA) | Public | 513 | 3.9096 | 0.59615 |
| Responsiveness (IVB) | Public | 513 | 3.8104 | 0.73355 |
| Assurance (IVC) | Public | 513 | 3.9532 | 0.67188 |
| Empathy (IVD) | Public | 513 | 3.8998 | 0.58325 |
| Tangible (IVE) | Public | 513 | 3.9513 | 0.61043 |
| Technical Quality (IVF) | Public | 513 | 3.9671 | 0.59481 |

## Exploratory factor analysis (EFA) for public hospital

**Cycle of factor analysis (CEA) for functional quality (servqual) of public hospital:** *Factor analysis discovered 5 EFA with quality components (1st cycle of factor analysis):* After performing Factor analysis discovered 5 EFA with quality components (1st Cycle of Factor Analysis) by Rotated Component Matrix: Extraction Method's Principal Component Analysis. Rotation Method's Varimax with Kaiser Normalization. Rotation Component Matrix's only one component was extracted, the solution cannot be rotated. There are 19 variables had load factor coefficient (factor loading) is greater than 0.5 were accepted, and there are 3 variables which IVA1 (0.331, 0.422, 0.417, 0.119), IVD2 (0.223, 0.390, 0.451, 0.327) and IVD3 (0.479, 0.235, 0.314, 0.489) with load factor coefficient (Factor loading) is less than 0.5 will be remove.

Continues to performing factor analysis with 19 variables (removed 3 variables were IVA1, IVD2 and IVD3) obtained results: KMO=0.894 (>0.5), sig.=0.000 (<0.05) in Bartlett's test of sphericity. Therefore suitable to conditions of factor analysis. 3 factors are drawn with variance extracted is 66.365%.

The variable transfer factor values are in two different factors as IVC2 variable in factor 1 (0.555) and factor 2 (0.614), which shows the correlation of these variables with two factors that are not really explicit. After performing factor rotation, variable coefficients in the larger factors proved it mainly correlated with factors that, therefore, it belongs to that factor. IVC2 variable belongs to factor 2. After performing factor analysis with 19 variables as above, we have three elements are drawn:

Factor 1 (FQA1 - Responsiveness) includes the following 8 variables: IVA5, IVB1, IVB2, IVB3, IVB4, IVC1, IVC3 and IVD4.

Factor 2 (FQA2 - Reliability) includes the following 6 variables: IVA2, IVA3, IVA4, IVC2, IVC4 and IVD1.

Factor 3 (FQA3 - Tangibles) includes the following 5 variables: IVD5, IVE1, IVE2, IVE3 and IVE4.

After performing factor analysis discovered 4 EFA with functional quality components (2nd Cycle of Factor Analysis) with 19 variables as above. Continues to related component matrix, Extraction Method's Principal Component Analysis, Rotation Method's Varimax with Kaiser Normalization, Rotation converged in 6 iterations. Rotated Component Matrix's only one component was extracted. The solution cannot be rotated.

## EFA for the first functional quality (FQA1) of public hospital

**Factor analysis discovered 8 EFA with quality components***:* After performing FQA1 factor analysis of 8 variables as above (IVA5, IVB1, IVB2, IVB3, IVB4, IVC1, IVC3, IVD4), we have 1 elements are drawn and obtained results: KMO=0.913 (>0.5), sig.=0.000 (<0.05) in Bartlett's test of sphericity. Therefore suitable to conditions of factor analysis. One factor (Only one component was extracted) is drawn with variance extracted is 66.958%. They explained almost 66.958% only of the variance. The rest could not be explained by the variables included in the analysis.

## EFA for second functional quality (FQA2) of public hospital

**Factor analysis discovered 6 EFA with quality components:** Continues to performing FQA2 factor analysis of 6 variables as above (IVA2, IVA3, IVA4, IVC2, IVC4 and IVD1), we have 1 elements are drawn and obtained results: KMO=0.881 (>0.5), sig.=0.000 (<0.05) in Bartlett's test of sphericity. Therefore suitable to conditions of factor analysis. One factor (Only one component was extracted) is drawn with variance extracted is 62.139%. They explained almost 62.139% only of the variance. The rest could not be explained by the variables included in the analysis.

## EFA for the third functional quality (FQA3) of public hospital

**Factor analysis discovered 6 EFA with quality components:** Continues to performing FQA3 factor analysis of 6 variables as above (IVD5, IVE1, IVE2, IVE3 and IVE4), we have 1 elements are drawn and obtained results: KMO=0.804 (>0.5), sig.=0.000 (<0.05) in Bartlett's test of sphericity. Therefore suitable to conditions of factor analysis. One factor (Only one component was extracted) is drawn with variance extracted is 63.130%. They explained almost 63.130% only of the variance. The rest could not be explained by the variables included in the analysis.

## EFA for functional quality (FQA) of public hospital

**Factor analysis discovered EFA with functional quality components group:** Continues to performing FQA factor group analysis of 3 factor as above (FQA1, FQA2 and FQA3), we have 1 elements are drawn and obtained results: KMO=0.699 (>0.5), sig.=0.000 (<0.05) in Bartlett's test of sphericity. Therefore suitable to conditions of factor analysis. One factor (Only one component was extracted) is drawn with variance extracted is 75.584%. They explained almost 75.584% only of the variance. The rest could not be explained by the variables included in the analysis. The result showed that the rotation converged in 3 iterations that were consistent with the framework the researchers had formulated in the current research thus this model was proven to be the most appropriate measurement for functional quality for the current field of research. There are 3 variables which IVA1, IVD2 and IVD3 with load factor coefficient (Factor loading) is less than 0.5 will be remove.

## CEA for technical quality (technical quality care) of public hospital

**Factor analysis discovered 8 EFA with quality components:** After performing factor analysis of 8 variables as above, we have 1 elements are drawn as follows: KMO=0.914 is >0.5, meaning that the sample size was adequate for the factor analysis technique. Bartlett's measure tested the null hypothesis that the original correlation matrix is an identity matrix. In order to be able to use

Bartlett test of sphericity should be significant=0.000 < 0.05. They explained almost 66.490% only of the variance. The rest could not be explained by the variables included in the analysis.

## CEA for service quality

KMO=0.810 is >0.5, meaning that the sample size was adequate for the factor analysis technique. Bartlett's measure tested the null hypothesis that the original correlation matrix is an identity matrix. In order to be able to use Bartlett test of sphericity should be significant=0.000 < 0.05 (**Table 2 and Figure 1**).

Extraction Method's Principal Component Analysis, 1 components extracted with FQA1 (0.883), FQA2 (0.871), FQA3 (0.820), TQA (0.922). Rotated Component Matrix's only one component was extracted. The solution cannot be rotated.

Factor analysis discovered 4 EFA with quality service components: After performing factor analysis of Service quality (FQA1, FQA2, FQA3, TQA) with 27 variables as above (19 items of functional quality and 8 items of technical quality), we have 4 elements are drawn as follows: KMO=0.810 is >0.5, meaning that the sample size was adequate for the factor analysis technique. Bartlett's measure tested the null hypothesis that the original correlation matrix is an identity matrix. In order to be able to use Bartlett test of sphericity should be significant=0.000 < 0.05. Therefore suitable to conditions of factor analysis. Factors (FQA1, FQA2, FQA3, TQA) explained almost 76.484% with variance extracted. The rest could not be explained by the variables included in the analysis. The rotation converged in 4 iterations that were consistent with the framework the researchers had formulated in the current research thus this model was proven to be the most appropriate measurement for service quality for the current field of research. Thus factor analysis has demonstrated that the model is constructed form 4 major constructs defined as below (Demonstrating Rotated Component Matrix and Constructs of the Research): There are 3 variables which IVA1, IVD2 and IVD3 with load factor coefficient (Factor loading) is less than 0.5 will be removing.

- After performing factor analysis, we have four elements are drawn:

Factor 1 (FQA1 - Responsiveness) includes the following 8 variables: IVA5, IVB1, IVB2, IVB3, IVB4, IVC1, IVC3, IVD4.

Factor 2 (FQA2 – Reliability) includes the following 6 variables: IVA2, IVA3, IVA4, IVC2, IVC4, IVD1.

Factor 3 (FQA3 - Tangibles) includes the following 5 variables: IVD5, IVE1, IVE2, IVE3, IVE4.

**Table 2:** CEA for Service quality.

| Total Variance Explained | | | | | | |
|---|---|---|---|---|---|---|
| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
| | Total | % of Variance | Cumulative% | Total | % of Variance | Cumulative% |
| 1 | 3.059 | 76.484 | 76.484 | 3.059 | 76.484 | 76.484 |
| 2 | 0.474 | 11.848 | 88.331 | | | |
| 3 | 0.265 | 6.618 | 94.950 | | | |
| 4 | 0.202 | 5.050 | 100.000 | | | |
| Extraction Method: Principal Component Analysis. | | | | | | |

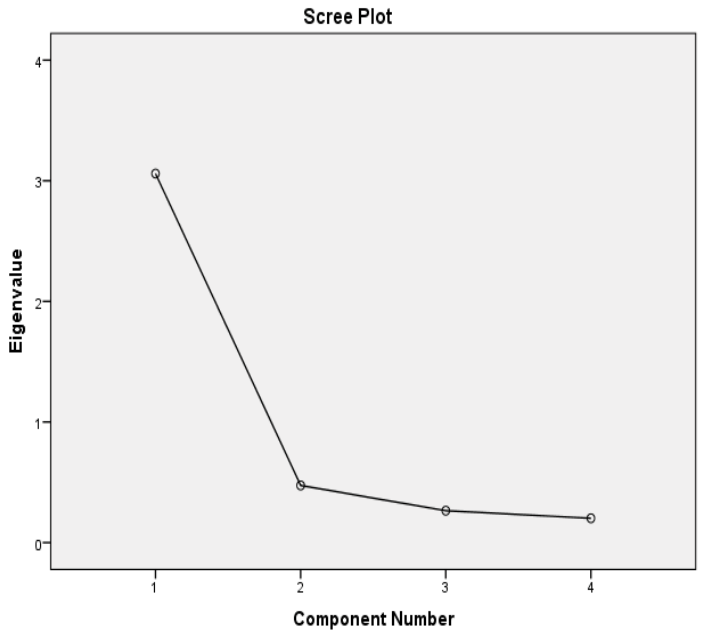


**Figure 1** Component number of the service quality.

Factor 4 (TQA – Technical Quality) includes the following 8 variables: IVF1, IVF2, IVF3, IVF4, IVF5, IVF6, IVF7, IVF8.

## Cronbach alpha of factor and model for public hospital

**Reliability for functional quality (SERVQUAL) of public hospital:** The reliability coefficient, FQA1 is bring to checks in the Cronbach alpha coefficient for the eighth construct of Functional Quality 1 (FQA1), Test results: Cronbach alpha coefficient=0.929 and all the variable in functional quality have coefficients of Corrected item - Total Correlation are greater than 0.3 (Coefficients Corrected Item-Total Correlation of eighth construct of FQA1 are IVA5=0.742, IVB1=0.724, IVB2=0.785, IVB3=0.816, IVB4=0.732, IVC1=0.815, IVC3=0.776 and IVD4=0.658), satisfactory inspection, ensure conditions for inclusion in the next model analysis.

The reliability coefficient, FQA2 is bring to checks in the Cronbach alpha coefficient for the sixth construct of Functional Quality 2, Test results 9: Cronbach alpha coefficient=0.876 and all the variable in FQA2 have coefficients of Corrected item - Total Correlation are greater than 0.3 (Coefficients Corrected Item-Total Correlation of sixth construct of Functional Quality 2 are IVA2=0.582, IVA3=0.746, IVA4=0.684, IVC2=0.720, IVC4=0.713 and IVD1=0.649), satisfactory inspection, ensure conditions for inclusion in the next model analysis.

The reliability coefficient, FQA3 is bring to checks in the Cronbach alpha coefficient for the five construct of Functional Quality 3, Test results: Cronbach alpha coefficient=0.848 and all the variable in FQA3 have coefficients of Corrected item - Total Correlation are greater than 0.3 (Coefficients Corrected Item-Total Correlation of eighth construct of Technical Quality are IVD5=0.546, IVE1=0.614, IVE2=0.698, IVE3=0.720 and IVE4=0.751), satisfactory inspection, ensure conditions for inclusion in the next model analysis.

The reliability coefficient, Functional Quality (FQA) is bring to checks in the Cronbach alpha coefficient for the three construct of Functional quality (FQA), Test results: Cronbach alpha coefficient=0.834 and all the variable in service quality have coefficients of Corrected item - Total Correlation are greater than 0.3 (Coefficients Corrected Item-Total Correlation of three construct of Functional quality are FQA1=0.754; FQA2=0.721; FQA3=0.623), satisfactory inspection, ensure conditions for inclusion in the next model analysis.

## Reliability for technical quality of public hospital

The reliability coefficient, Technical Quality is bring to checks in the Cronbach alpha coefficient for the eighth construct of Technical Quality, Test results: Cronbach alpha coefficient=0.927 and all the variable in service quality have coefficients of Corrected item - Total Correlation are greater than 0.3 (Coefficients Corrected Item-Total Correlation of eighth construct of Technical Quality are IVF1=0.669, IVF2=0.824, IVF3=0.783, IVF4=0.764, IVF5=0.753, IVF6=0.732, IVF7=0.781 and IVF8=0.712), satisfactory inspection, ensure conditions for inclusion in the next model analysis.

## Reliability for service quality (SQ) of public hospital

The reliability coefficient, Quality service is bring to checks in the Cronbach alpha coefficient for the fourth construct of Service Quality (SQ), Test results: Cronbach alpha coefficient=0.895 and all the variable in service quality have coefficients of Corrected item - Total Correlation are greater than 0.3 (FQA1=0.847, FQA2=0.783, FQA3=0.767 and TQA=0.690), satisfactory inspection, ensure conditions for inclusion in the next model analysis.

## Adjusted research model for public hospital

Through the above analysis results showed that 6 factors (components) of the original scale service quality after performing factor analysis, 02 factors not achieve that distinction is worth understanding and guarantee, worth four factors distinguish drawn, which were:

Factor 1 (FQA1 - Responsiveness) includes the following 8 variables: IVA5, IVB1, IVB2, IVB3, IVB4, IVC1, IVC3, IVD4.

Factor 2 (FQA2 – Reliability) includes the following 6 variables: IVA2, IVA3, IVA4, IVC2, IVC4, IVD1.

Factor 3 (FQA3 - Tangibles) includes the following 5 variables: IVD5, IVE1, IVE2, IVE3, IVE4.

Two factor are Assurance factor and Sympathy factor can theoretically exist, but when applied to the analysis of Outpatient Department at Bach Mai Hospital achieved the distinction is not clear (it looks almost the same), did not become a separate element should be removed from the model.

Technical quality factor (TQA) after factor analysis, a component is drawn with 8 variables (IVF1, IVF2, IVF3, IVF4, IVF5, IVF6, IVF7, IVF8):

Factor 4 (TQA – Technical Quality) includes the following 8 variables: IVF1, IVF2, IVF3, IVF4, IVF5, IVF6, IVF7, IVF8.

Thus, the initial research model through factor analysis results are adjusted as follows (**Table 3**).

## Inspection of model service quality research

**Correlation analysis (Pearson coefficient):** *Cronbach alpha of service quality (SQ) of the results in the Bachmai hospital analysed and the* reliability statistics of Cronbach's Alpha's was0.895 as shown in (Table 4).

Multivariate regression analysis was performed to examine the relationship between the independent variable (Factors) with the dependent variable (Service quality) in research model. Before conducting linear regression analysis, the consideration of linear correlation between the independent variables and the dependent variable between the independent variables together is work to be done and the Pearson correlation coefficient in the matrix system correlation is appropriate to consider this relationship.

The value of the dependent variable and the independent variable is the factor (factor score) was calculated through SPSS factor analysis, is the linear combination of the observed variables in the service quality scale standardized.

Correlation analysis (Pearson coefficient) for public hospital based on the independent variable Reliability (FQA1), Empathy (FQA2), Tangible (FQA3) and Technical quality (TQ) are not correlated with each other because they are the factors that are estimated through factor analysis process.

The Dependent variables of Service Quality (SQ) for each independent variable are correlation with each other independent variables, through specific expressions of correlation coefficient as follows: FQA1 (0.892), FQA2 (0.868), FQA3 (0.819) and TQA (0.916) is calibrated (2-tailed) was statistically significant at the 0.01 level (2-tailed). Preliminarily we can conclude the independent variables included in the model can to explain the dependent variable of Patient satisfaction (PS).

**Multiple Linear Regression analysis (Pearsom coefficient):** Thus, summary of Hypotheses Findings in Public hospital is the initial research model through factor analysis results were adjusted as below (**Table 5**).

# Discussion

## Descriptive statistics for healthcare quality variables

The result show that patients feel that the quality of medical services at the hospital model is pretty good, but still not really good for the reception of the patients using the service at this hospital.

## Reliability (Cronbach alpha) of variable

As reliability of the instrument helps to provides consistency in the results and the Cronbach alpha is used to measure the reliability of the data. Overall Cronbach alpha of public data along with service quality construct provides values greater than 0.60, as the values of Cronbach alpha greater than 0.60 is acceptable [10,11].

## Exploratory factor analysis (EFA) for public hospital (Bachmai hospital)

**CEA for Functional quality (SERVQUAL) of public hospital:** *Factor analysis discovered 5 EFA with quality components (1st cycle of factor analysis):* After performing factor analysis of 22 variables as above, we have 5 elements are drawn with KMO>0.5 and Significant <0.0001. They explained almost 68.315% only of the variance. There are 3 variables which IVA1, IVD2 and IVD3 with load factor coefficient (Factor loading) is less than 0.5 will be remove; Therefore, we Thus factor analysis has demonstrated that the model is constructed form 4 major constructs defined in **Table 2** [10,11].

***Factor analysis discovered 4 EFA with quality components (2nt cycle of factor analysis):*** Continues to performing factor analysis with 19 variables (removed 3 variables were IVA1, IVD2 and IVD3) obtained results had KMO >0.5, sig. <0.0001 (**Table 2**). Therefore

**Table 3:** Summary of hypotheses findings in public hospital.

| Hypothesis | Result |
|---|---|
| (H1): There is a relationship between Responsiveness factor (FQA1) and Service quality (SQ) | Supported |
| (H2): There is a relationship between Reliability factor (FQA2) and Service quality (SQ). | Supported |
| (H3): There is a relationship between Tangibles factor (FQA3) and Service quality (SQ). | Supported |
| (H4): There is a relationship Technical Quality factor (TQA) and Service quality (SQ). | Supported |

**Table 4:** Cronbach Alpha of Service Quality (SQ) of the Results in the public hospital.

| Item-Total Statistics | | | | |
|---|---|---|---|---|
| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
| TQA | 11.7419 | 2.676 | 0.847 | 0.836 |
| FQA1 | 11.9162 | 2.474 | 0.783 | 0.863 |
| FQA2 | 11.7175 | 2.799 | 0.767 | 0.865 |
| FQA3 | 11.7515 | 2.947 | 0.690 | 0.892 |

**Table 5:** Linear regression of Service Quality (SQ) of the Results in the BachMai hospital.

| Coefficients[a] | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized coefficients | | Standardized coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | Constant | -1.011E-013 | 0.000 | | 0.0 | 0.0 |
| | FQA1 | 0.250 | 0.000 | 0.323 | 0.0 | 0.0 |
| | FQA2 | 0.250 | 0.000 | 0.275 | 0.0 | 0.0 |
| | FQA3 | 0.250 | 0.000 | 0.271 | 0.0 | 0.0 |
| | TQA | 0.250 | 0.000 | 0.275 | 0.0 | 0.0 |

(Y=-1.011E-013 + 0.250 * FQA1 + 0.250 * FQA2 + 0.250 * FQA3 + 0.250 * TQA)
[a]Dependent Variable: SQ.

suitable to conditions of factor analysis. 3 factors are drawn with variance extracted is 66.365%. After performing factor analysis with 19 variables as above, we have three elements are drawn: Factor 1 (FQA1 - Responsiveness) had 8 variables: IVA5, IVB1, IVB2, IVB3, IVB4, IVC1, IVC3 and IVD4. Factor 2 (FQA2 – Reliability) had 6 variables: IVA2, IVA3, IVA4, IVC2, IVC4 and IVD1. Factor 3 (FQA3 - Tangibles) had 5 variables: IVD5, IVE1, IVE2, IVE3 and IVE4.

EFA for the first functional quality (FQA1), second functional quality (FQA2), EFA for the third funtional quality (FQA3) had KMO >0.5, sig. <0.0001, and they explained almost 66.958% only of the variance, 62.139% only of the variance, 63.130% only of the variance, respectevely. The rest could not be explained by the variables included in the analysis [10,11].

**EFA for functional quality (FQA) of public hospital:** Factor analysis discovered EFA with Functional quality components Group: Continues to performing FQA factor group analysis of 3 factor as above (FQA1, FQA2, FQA3), we have 1 elements are drawn and obtained results with KMO >0.5, sig. <0.0001. Therefore suitable to conditions of factor analysis. One factor (Only one component was extracted) is drawn with variance extracted is 75.584%. They explained almost 75.584% only of the variance. The rest could not be explained by the variables included in the analysis. As can be seen as below, the rotation converged in 3 iterations that were consistent with the framework the researchers had formulated in the current research thus this model was proven to be the most appropriate measurement for functional quality for the current field of research. There are 3 variables which IVA1, IVD2 and IVD3 with load factor coefficient (Factor loading) is less than 0.5 will be remove [10,11].

**CEA for technical quality (technical quality care) of public hospital:** Factor analysis discovered 8 EFA with quality components: After performing factor analysis of 8 variables as above, we have 1 elements are drawn with KMO is >0.5, meaning that the sample size was adequate for the factor analysis technique, significant <0.0001. They explained almost 66.490% only of the variance. The rest could not be explained by the variables included in the analysis [10,11].

**CEA for service quality:** Factor analysis discovered 4 EFA with quality service components: After performing factor analysis of Service quality (FQA1, FQA2, FQA3, TQA) with 27 variables as above (19 items of functional quality and 8 items of technical quality), we have 4 elements are drawn with KMO is > 0.5, meaning that the sample size was adequate for the factor analysis technique, significant < 0.0001. Therefore suitable to conditions of factor analysis. Factors (FQA1, FQA2, FQA3, TQA) explained almost 76.484% with variance extracted. The rest could not be explained by the variables included in the analysis [10,11].

As can be seen as below, the rotation converged in 4 iterations that were consistent with the framework the researchers had formulated in the current research thus this model was proven to be the most appropriate measurement for service quality for the current field of research. Thus factor analysis has demonstrated that the model is constructed form 4 major constructs defined as below (Demonstrating Rotated Component Matrix and Constructs of the Research): There are 4 variables which IVA1, IVD2 and IVD3 with load factor coefficient (Factor loading) is less than 0.5 will be removing.

❖ After performing factor analysis, we have four elements are drawn:

Factor 1 (FQA1 - Responsiveness) includes the following 8 variables: IVA5, IVB1, IVB2, IVB3, IVB4, IVC1, IVC3, IVD4.

Factor 2 (FQA2 – Reliability) includes the following 6 variables: IVA2, IVA3, IVA4, IVC2, IVC4, IVD1.

Factor 3 (FQA3 - Tangibles) includes the following 5 variables: IVD5, IVE1, IVE2, IVE3, IVE4.

Factor 4 (TQA – Technical Quality) includes the following 8 variables: IVF1, IVF2, IVF3, IVF4, IVF5, IVF6, IVF7, IVF8.

**Correlation analysis (Pearson coefficient):** Multivariate regression analysis was performed to examine the relationship between the independent variable (Pearson correlation of the FQA1, FQA2, FQA3, and TQA factors are 0.892, 0.868, 0.819, 0.916, respectively) with the dependent variable (Service quality) in research model. Before conducting linear regression analysis, the consideration of linear correlation between the independent variables and the dependent variables together is work to be done and the Pearson correlation coefficient in the matrix system correlation is appropriate to consider this relationship [10,11].

The value of the dependent variable and the independent variable is the factor (factor score) was calculated through SPSS factor analysis, is the linear combination of the observed variables in the service quality scale standardized.

**Correlation analysis (Pearson coefficient) for Public hospital:** The independent variable Reliability (FQA1), Empathy (FQA2), Tangible (FQA3) and Technical quality (SQ) are not correlated with each other because they are the factors that are estimated through factor analysis process.

The Dependent variables of Service Quality (SQ) for each independent variable are correlation with each other independent variables, through specific expressions of correlation coefficient as follows: FQA1 (0.853), FQA2 (0.633), FQA3 (0.806) and TQA (0.968) is calibrated (2-tailed) was statistically significant at 1%. Preliminarily we can conclude the independent variables included in the model can to explain the dependent variable of Patient satisfaction (PS) [10,11].

**Multiple linear regression analysis (Pearson coefficient)**

***Multiple linear regression analysis for public hospital:*** Performed multivariate regression analysis to examine each specific independent variables: The Responsiveness (FQA1), Reliability (FQA2), Tangible (IVA3), Technical quality (TQA) affects the quality of service (dependent variable) how.

The model of multivariate linear regression describing the quality of service is:

Service quality=B0 + B1 * Reliability + B2 * Responsiveness + B3 * tangible service quality + B4 * Technical quality.

With B1, B2, B3, B4: is the partial regression coefficients [10,11].

Responsiveness (FQA1), Reliability (FQA2), Tangible (FQA3), Technical quality (TQA) is the independent variable and the service quality is the dependent variable.

Regression analysis was performed by the method selected by step (stepwise selection). Stepwise regression method turns to another independent variable in the model, step by step. Independent variables or inversely correlated with the dependent variable most will be put into the first equation. If this variable does not satisfy the conditions in this procedure will terminate and no independent variables in the model. If it satisfies the criteria in the following independent variables (the second variable) is inserted, the variables explain most of the change in the dependent variable when combined with the first variable. And so continues. After the first variable is inserted, the computer will consider whether to remove it from the equation based on the standard. After each step, the variables in the equation to be considered for exclusion. The variables are excluded until no variables that satisfy the conditions again. Variable selection procedure will terminate when no longer eligible variables in and out again.

Results of stepwise regression analysis with the standard is the standard PIN=0.05 and out is Pout=0.10 that:

Four independents standards to ensure to be included in the study model. Four independent variables remaining responsiveness, reliability, tangible and technical quality are satisfactory, included in the model to consider.

Multiple regression equations are estimated stepwise method shows the model (**Figure 2**), with the independent variables Responsibility, reliability, tangible and technical quality is the most suitable model to express satisfaction with service quality (**Figure 2)**.

Adjusted R2 coefficient (Adjusted R square)=1.000. This suggests that the variance between 100.0% satisfaction on service quality is explained by four independent variables, other variables remaining impacts is very low [10,11].

The regression equation best satisfaction of quality of service:

Y=-1.011-013 + 0.250 * Responsiveness (FQA1) + 0.250 * Reliability (FQA2) + 0.250 * Tangible (FQA3) + 0.250 * Technical quality (TQA).

Results of regression models tested showed no multicollinearity phenomenon occurs because the magnification factor variance (Variance Inflation Factor - VIF) of the variables in the model are very low, ranging from 0.275 to 0.323 less than 10 [10,11].

Results of testing statistical F value, the value of sig.=0.000 shows a linear regression model fit multiple data sets, are used [10,11].

Value sig. (**Table 3**) of the independent variables assurance, reliability, tangible media and technical quality are less than 0.05 in the model mean [10,11].

Results of regression models tested (**Table 3**) showed no multicollinearity phenomenon occurs because the magnification factor variance (Variance Inflation Factor - VIF) of the variables in the model are very low, is less than 10 [10,11].

The study results show that (**Table 3**); sig. value of Variables are Responsiveness, Reliability, Tangible, Technical quality with the absolute value of residuals respectively. Thus linear regression model building above can be used.

Test scatter plot between the normalized residuals (Standardized Residual) and standardized predicted values (Standardized predicted value) indicates residues randomly distributed, not form a specific shape (**Table 3**). Thus, the linear contact and equal variance were met.

Check the histogram of residuals (**Table 3**) show approximate distribution of standardized residuals (Average mean=3.93 and standard deviation Std. Dev.=0.541 i.e. close to 1). Therefore, it can be concluded that the normal distribution assumption was not violated [10,11].

Thus, the regression equation is presented as appropriate. Four factors with regression coefficient as the same=0.250, Is the same influential part satisfaction of the Service quality. The following factors influence the same level of satisfaction about the quality service that in turn respond to the regression coefficient is Responsiveness is 0.250, Reliability is the regression coefficient=0.250, Tangible of regression coefficient and the technical quality of the regression coefficient is 0.250 [10,11].

**Summary of hypotheses findings in public hospital:** Thus, the initial research model through factor analysis results are adjusted as showed in **Table 3 and Figure 2.**

***Recommendations:*** Practical implication of this Based on the findings of this study, hospital managers have an overview to recognize the patients' perceptions of health care quality and the level of their satisfaction. Consequently, managers can design the marketing strategies that improve the quality of services for increasing patients' satisfaction and propensity to recommend the services of particular healthcare providers to others. This study investigates the health care quality in a developing country.

## Conclusion

The results of the measurement model shows, and after additional adjustment, the scale will achieve reliability and enable value (the result of this model is SERVQUAL scale of the functional quality and scale of the technical quality of service quality). The models of service quality in public hospitals are strongly affected by four different factors (one factor's technical quality and three factors are functional quality), in public hospitals is composed of 4 main factors: Reliability, Responsiveness, Tangible and Technical quality. Levels of customer satisfaction about service quality is influenced by technical quality is influenced by 8 items (8 scores) and functional quality is influenced by the SERVQUAL intrument with 3 dimention (19 scores).

To summarize, the expected contributions of this dissertation will include a fully tested and applicable model for healthcare service quality highlighting all the constructs and sub-constructs that patient's use for evaluation of healthcare service quality for

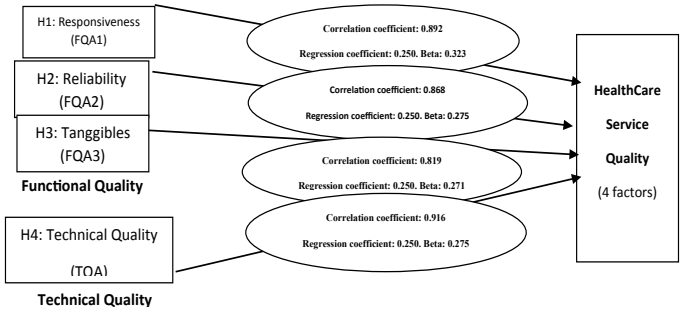


**Figure 2** Model summary of service quality in public hospital.

public hospitals. The provision of a valid and reliable scale with which healthcare marketers can deploy for measurement of the service quality in their organizations will be able be done and this tool will prove invaluable for improving the level of services in areas deemed defective by the consumers of the service. This will be the first application in the healthcare field in Developing countries as Vietnam and the World.

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