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**STRUCTURAL
EQUATION
MODELLING IN
RELATIONSHIP
STUDY BETWEEN
THE QUALITY OF
MEDICAL
SERVICES AND
PATIENT
SATISFACTION
AND LOYALTY**

Abstract

The authors developed an algorithm for studying the relationship between the quality of healthcare services, patient satisfaction and their intentions of loyalty. It is proved that patient satisfaction mediates the perceived quality of healthcare services and the intentions of customers' loyalty. The authors improved the methodology for assessing the healthcare services quality for healthcare organizations based on the SERVPERF method, identified three constructs that shape the perception of quality of healthcare services by the patient (staff, communications and physical evidence), built a model "Perceived patient quality of healthcare services", which establishes correlations and covariance relationships between model constructs. A "Structural model of the relationship between the perceived quality of health care, its components and loyalty, mediated by patient satisfaction" has been built.

Keywords: *healthcare organization, healthcare services quality, structural equation modelling (SEM), patient satisfaction, loyalty.*

Introduction

Consumer satisfaction with the medical service is a key factor and a prerequisite for the formation of effective marketing competitive strategies of health care facilities, which is substantiated by conducting marketing research based on a survey using the SERVPERF methodology, structural equation modelling (SEM), methodology and modern information technologies for collecting and processing statistical data: Google-forms, SPSS STATISTICS 17.0 and LISREL 8.80 packages.

The purpose of the study is to improve theoretical and methodological principles and develop scientific and practical recommendations for the formation of a competitive marketing strategy of institutions in the market of medical services. In order to achieve this goal, we conducted a survey of respondents to find out the degree of consumer satisfaction with the medical services of health care institutions, carried out a comprehensive assessment of the perceived quality of medical services, established relationships between quality, patient satisfaction and loyalty, and built a corresponding model.

Materials and Methods

There are the following methods of measuring the degree of consumer satisfaction: a system for collecting complaints and suggestions; survey on the degree of consumer satisfaction; “mystery shopper” method; analysis of the reasons for the reduction of customers.

Results and Discussion

In the field of health care, studying the opinion of patients regarding the provided medical service is a component of the quality control of medical care (clause 7 of the Order of the Ministry of Health of September 28, 2012 No. 752 "On the procedure for quality control of medical care") (Order of the Ministry of Health, 2012). The satisfaction of patients with medical services determines their consumer behaviour: expressing positive feedback about health care facilities, the preference of this medical facility in case of need for

help, increasing the frequency of visits to the hospital, willingness to pay for higher-cost services. At the same time, dissatisfaction with the medical service leads to negative behavioural reactions (negative feedback about the Health Care Organisation, reducing the cost of receiving a service at this institution or receiving it from other service providers).

The survey of patients of private and communal health care facilities was conducted by us using a questionnaire developed using the SERVPERF method and was devoted to studying the relationship between the actual (perceived by the patient) quality of the provided medical service, satisfaction with this service and intentions of loyalty to the institution (Mishchuk, 2021). The research algorithm is shown in Figure 5.1.

For scientific research, we chose the SERVPERF (SERVICE PERFORMANCE) method proposed by Cronin J.J., Taylor S.A. (1994). The main conclusions made by the authors are that the study of the nature of the attitude of consumers to various characteristics of services allows, even at the initial stage of planning, to evaluate the most important and valuable characteristics of the service from the point of consumer satisfaction view, as well as to determine those characteristics, the improvement of which will give the greatest result.

The questionnaire we developed for the study consisted of three blocks of questions: the first block – to find out the patients' assessment of the quality of medical services; the second – to determine the level of satisfaction; the third – to identify loyalty intentions. Accordingly, 22 statements were proposed for quality assessment, to each of which the respondents had to give an answer on a seven-point Likert scale (1 – strongly disagree, 7 – completely agree).

The statements were grouped into five stimuli: Tangibles – questions Q5_tangib, Q15_tangib, Q17_tangib, Q19_tangib, Q22_tangib; Reliability – questions Q3_relyab, Q7_relyab, Q8_relyab, Q9_relyab, Q12_relyab; Responsiveness – questions Q6_respons, Q11_respons, Q13_respons, Q14_respons; Assurance – questions Q10_assur, Q18_assur, Q20_assur, Q21_assur, Empathy – questions Q1_empath, Q2_empath, Q4_empath, Q16_empath.

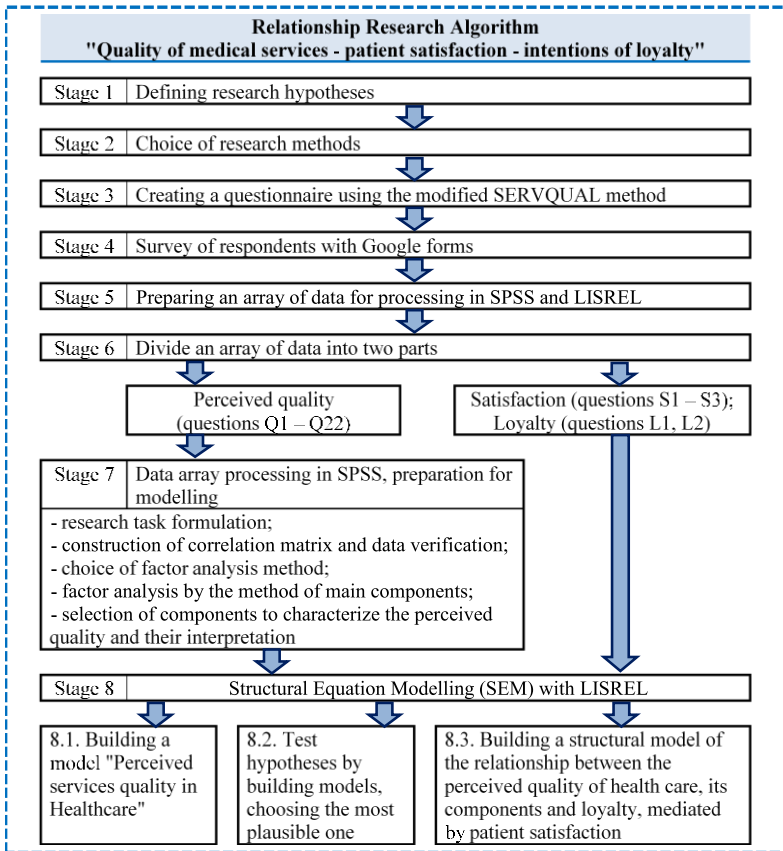


Figure 5.1 Research conducting algorithm for relationship between the Healthcare services quality, Patient satisfaction and their Loyalty intentions

Source: compiled by the authors

Patient satisfaction was measured using an overall satisfaction score. Three questions were used: S1 “How would you rate the overall quality of services provided by your hospital / doctor”; S2 “Thinking about the hospital (doctor) in general, please evaluate the benefits you received for the money spent”; S3 “In general, how satisfied are you with the chosen institution”. They were measured on a ten-point semantic differential scale from 1 to 10 (1 – completely satisfied, 10 – completely dissatisfied).

The structural element of the “Loyalty Intentions” questionnaire was measured by two questions using a seven-point Likert scale: L1 “Would you recommend this institution (doctor) to other people if such a need arose” and L2 “Did you feel safe enough while receiving the service so that later recommend the institution (doctor) to others” (1 – categorically do not recommend, 7 – definitely recommend).

The stages of analysis of the collected data included: problem formulation, construction of a correlation matrix, selection of the method of factor analysis, determination of the number of factors, rotation of factors, interpretation of factors, and evaluation of the suitability of the model.

To find the relationship between the three blocks of the questionnaire, a model was built using structural equation modelling (SEM) using SPSS STATISTICS 17.0 and LISREL8.80.

It is important for the model building process to process data using the method of principal components and identify those variables that are most closely correlated with each other, that is, have the smallest variance relative to the selected vector in multidimensional space.

So, three components were identified that characterize the concept of “quality of medical service in the perception of the patient”, based on the content of the questionnaire developed by us: 1) staff characterized by the following qualities: kindness, care, willingness and desire to help, empathy, responsibility, reliability, politeness; 2) communications: the obligation to inform patients, in advance, at the appropriate level, in an accessible form about the methods and methods of providing medical services and their cost; availability of informative materials at the place of service provision; 3) physical evidence: the sanitary and hygienic condition of the premises, the visual appeal of the interior, the pleasant appearance of the staff, the convenience of the work schedule.

The isolation of three components made it possible to proceed to the testing of hypotheses regarding the possible relationships between the three parts of the questionnaire, the construction of intermediate and main models (the 8th stage of the algorithm), the assessment of their suitability and plausibility using SEM. For this, we used one of the available software packages – LISREL from Scientific Software International Inc., which is compatible with the

SPSS Statistics package. The applied version of LISREL 8.80 (Student) has limitations on the number of explicit (measured) variables (up to 12) and the number of characters in their names (up to 8).

We chose the simplified and pragmatic approach outlined by Malhotra N., Lopes E., Veiga R. (2014). The procedure proposed by the authors consists of five stages: development of a schematic diagram of the model, preparation of a graphic illustration of the model, analysis of measurements of the structural model, verification of indicators of conformity of the model, interpretation of the structural model. Because models tested by SEM rely on theoretical considerations, their fit with empirical data is tested by the researcher.

It is worth noting that SEM in LISREL allows for the simultaneous estimation of a number of separate but interdependent equations, including in the calculation both latent (graphically represented as an oval) and manifest variables (in the form of rectangles) and measurement error (values are displayed without figures), checking direct, indirect and total relationships, although there are variables in the model that act as both dependent and independent variables. Each relationship between variables is indicated in the program by two types of arrows and is derived from previously proposed hypotheses: unidirectional ones mean a causal or causal influence – it is also called “effect”, and bidirectional ones, which reflect correlation between variables or covariance between residuals unexplained variances of manifest variables.

The model is statistically tested based on the simultaneous analysis of all variable matrices, which makes it possible to assess the quality of correspondence between the theoretical models and the data used in the analysis.

The quality and plausibility of the model is repeatedly tested by gradually making changes suggested by the program: including or removing relationships between variables. Adding correlations reduces the number of degrees of freedom (df) of the model, and the p-value and RMSEA indicators are normalized and allow a quick assessment of the changes made, in addition, it is possible to review the goodness-of-fit indicators of the model by selecting the appropriate menu command. Convergent validity and discriminant

validity are checked according to the parameters of the obtained structural model.

A high loading (>0.60) of explicit variables within the limits demonstrates the convergent validity of the constructs, the presence of sufficient discriminant validity is evidenced by the coefficients of covariance between the latent variables, which should not exceed 0.85.

So, the model "The quality of the medical service perceived by the patient" included 4 latent variables and 12 predictors, taking into account the content of which it can be verbally formulated as follows: "The quality of the medical service perceived by the patient is formed by three main components, each of which, in turn, is perceived a service consumer due to a certain set of characteristics: staff – should be polite, friendly, show care and desire to help, inspire trust, understand needs and provide service on time; communications – patients should be properly and in advance informed about the options for providing services and their cost, a complete, clear and comprehensive price list should be available; physical evidence – the work schedule of the health centre should be convenient, the premises should be visually attractive and clean, and the equipment should be modern".

The indicators of the intermediate model "The patient's perceived quality of the medical service" were within the normal range, which made it possible to include it in the structural model of the relationships between the perceived quality, the medical service, its components and loyalty, mediated by patient satisfaction, built in the next step of the study. To summarize, the results of the patient survey proved the importance of consideration on healthcare service characteristics that we have highlighted, their impact on patient satisfaction and loyalty.

Since the LISREL program requires the researcher to be parsimonious about the number of variables (no more than 12), five predictors of the construct "Perceived quality by the patient". The final model includes 7 manifest variables characterizing the latent variable Q, 3 manifest variables for characteristic S, and 2 for L. The authors of the SEM guidelines in LISREL suggest eliminating manifest variables that show the lowest loadings, but we used the analysis of the questionnaire questions themselves, checking, so that

the selected questions are not similar in content and that the indicators of conformity of the simplified model are within the norm. The process of testing hypotheses of relationships was carried out according to a similar algorithm for building models and checking their quality and plausibility, as a result, it was proved that patient satisfaction mediates the perceived quality of medical services and the loyalty intentions of their consumers, the model “Structural model of relationships between the perceived quality of medical services” was formed, its components and loyalty, mediated by patient satisfaction” (Figure 5.2). Quality indicators of model fit are within the normative values (Table 5.1).

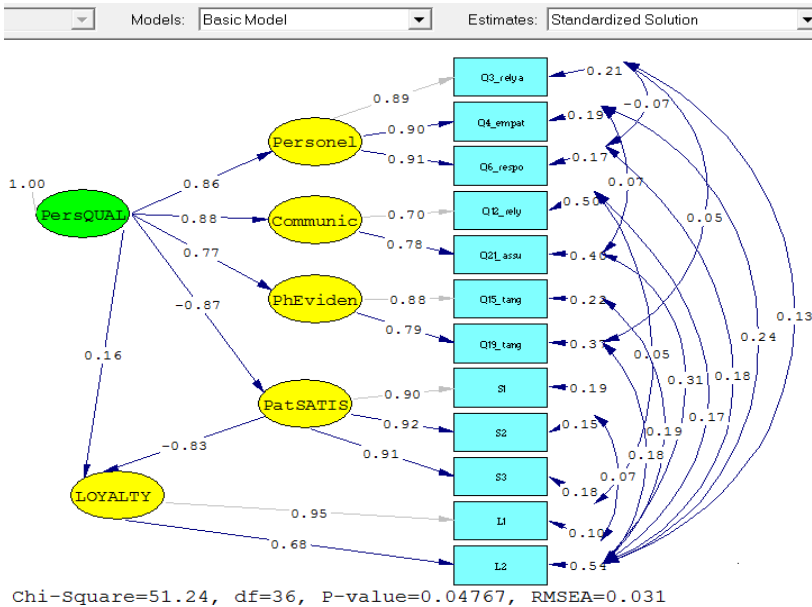


Figure 5.2 Model “Structural model of relationships between the perceived quality of the medical service, its components and loyalty, mediated by patient satisfaction”

We offer to verbally formulate the obtained model, which contains six latent variables and twelve predictors, as follows: “The quality of the medical service is perceived by its consumers due to

the reliability, responsibility, responsiveness of the staff, under the conditions of proper information about possible methods of treatment and its cost and the presence of modern, in the proper sanitary-hygienic and technical condition, material base, indirectly - through patients' satisfaction with the service received - affects their loyalty intentions”.

Table 5.1

Model Goodness of Fit Indicators

Indicator	Reference values	Actual values
Chi-Square (X^2)	-	51,24
df	-	36
Chi-Square / df	<5,00	1,42
p- value	<0,05	0,048
Root Mean Square Error of Approximation (RMSEA)	<0,08	0,031
Non-Normed Fit Index (NNFI)	$\geq 0,90$	1,00
Comparative Fit Index (CFI)	$\geq 0,90$	1,0
Root Mean Square Residual (RMR)	$\leq 0,05$	0,071
Goodness of Fit Index (GFI)	$\geq 0,90$	0,98
Adjusted Goodness of Fit Index (AGFI)	$\geq 0,90$	0,96
Parsimony Goodness of Fit Index (PGFI)	$\leq 0,67$	0,45

Therefore, we have developed an algorithm for conducting a study of the relationships between the quality of medical services, patient satisfaction and their loyalty intentions. The assessment of the quality of medical services for health care facilities was carried out using the SERVPERF method, and the model “Perceived quality of medical service by the patient” was built, which establishes correlation and covariance relationships between the constructs. The methodology for assessing the quality of medical services for Health Care Organisations based on the SERVPERF method has been improved, three characteristics (constructs) that shape the patient’s perception of the quality of a medical service (staff, communications, and physical evidence) have been identified, the corresponding model “The quality of a medical service perceived by the patient”

has been built, which establishes correlational and covariance relationships between model constructs.

A “Structural model of relationships between the perceived quality of the medical service, its components and loyalty, mediated by patient satisfaction” was formed. It has been proven that patient satisfaction mediates the perceived quality of medical services and the loyalty intentions of their consumers.

Conclusions

Consumer satisfaction with healthcare services is determined by a key factor and a prerequisite for the formation of effective marketing competitive strategies of HCO, which is justified by conducting marketing research based on surveys using SERVPERF, Structural Equation Modelling methodology and modern information technologies for collecting and processing statistics: Google-forms, SPSS STATISTICS 17.0 and LISREL8.80 packages. The authors developed an algorithm for studying the relationship between the quality of healthcare services, patient satisfaction and their intentions of loyalty. It is proved that patient satisfaction mediates the perceived quality of healthcare services and the intentions of customers' loyalty. The authors improved the methodology for assessing the healthcare services quality for HCO based on the SERVPERF method, identified three constructs that shape the perception of quality of healthcare services by the patient (staff, communications and physical evidence), built a model “Perceived patient quality of healthcare services”, which establishes correlations and covariance relationships between model constructs. A “Structural model of the relationship between the perceived quality of health care, its components and loyalty, mediated by patient satisfaction” has been built.

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