Original Article

# Developing an Index to Measure the Value of Health Care Provided to Stroke Patients

**Halil Şengül, Sabahattin Aydın[1], Emrah Önder[2], Arzu Bulut[3]**

Department of Health Management, Istanbul Sabahattin Zaim University, Turkiye, [1]Department of Health Management, Istanbul Medipol University, Istanbul, Turkiye, [2]Department of Business Administration, Istanbul University, Istanbul, Turkiye, [3]Department of Health Management, Bandırma Onyedi Eylul University, Balıkesir, Turkiye

## Abstract

**Background and Objectives:** It is possible to evaluate health services for stroke patients based on clinical benefits. However, in recent years, questions about responsiveness and outcomes have also emerged. Currently, there is no index that can assess health-care services for stroke patients along these three dimensions. This study introduces the first index designed to measure the value generated by health-care services for stroke patients. **Methods:** The Case-Mix Variables Data Collection Reference Guide, developed through a review of national and international stroke guidelines, underwent content validation by 10 neurologists and 10 interventional radiologists. Questions with a content validity index exceeding 0.80, along with the World Health Organization responsiveness questionnaire and the Patient-Reported Outcomes Measurement Information System Global-10 short form, were subjected to pairwise comparison by two neurologists, two interventional radiologists, and two public health physicians using the analytic hierarchy process (AHP) method. **Results:** In the comprehensive ranking of questions formulated using the AHP method and assessed by experts for importance and global weights, new stroke follow-up emerged as the most crucial, garnering an index score of 0.09. Conversely, questioning patients about their alcohol use status was deemed the least significant by experts, registering an index score of 0.00021. **Conclusions:** Our AHP analyses have furnished an index for gauging the factors that contribute to the value of health-care services rendered to stroke patients.

**Keywords:** Stroke, responsiveness, PROMİS-10, value-based medicine

## Introduction

In an evolving and dynamic world, the expectations of society regarding health-care services have undergone a transformation. This transformation has instigated a shift in the fundamental philosophy of health-care services, and more broadly, in health systems, toward the paradigm of "patient-oriented health services." Within this innovative approach that centers around the patient, new concepts have emerged, with "value-based health services" being a noteworthy inclusion. Value-based health services articulate a vision for health systems that prioritize the needs of the patient. Value-based health services refer to a health-care delivery model that focuses on improving patient outcomes while controlling costs. In this model, the value delivered to patients is the primary focus, rather than the volume of services provided.

By identifying the components of health systems associated with patient needs, a shared focal point and goal are established for various facets of the health system. Once this objective is delineated, it becomes feasible to evaluate the areas where the health system falls short in performing the necessary functions to enhance patient outcomes optimally. This assessment provides direction to health systems on restructuring for greater efficiency and effectiveness, guiding them in delivering outcomes more resourcefully. A pivotal consideration in this context is the framework used to measure value. If the emphasis is on value for patients, the measurement should focus on the value generated in patients, rather than merely assessing the activities of the health-care system.

Gray[1] defines value in health care as "the difference between the benefits and harms of a service, given the number of resources invested." Gray[2] reclassified value for the entire population as the equitable distribution of resources in a way that maximizes value; that is, value in allocation, value in service delivery, increased value resulting from quality and safety improvements, technical value, and personal value; best evidence is produced with patient values. Putera[3] argues that value-based health care (VBHC) is compatible with patient-centered care and humanizes people, rather than viewing health as a commodity. Andersson et al.[4] identify three principles that guide the practice of VBHC. First, the focus should be on what creates

**Address for correspondence:** Assoc Prof. Dr. Halil Şengül, Istanbul Sabahattin Zaim University, Faculty of Health Sciences, Department of Health Management, Istanbul, Turkiye.
E-mail: halil.sengul@izu.edu.tr

**Submitted:** 13-Dec-2023 **Revised:** 25-Jul-2024 **Accepted:** 11-Aug-2024
**Published:** 19-Nov-2024



**DOI:** 10.4103/aian.aian_1084_23

value for patients. Second, patient care should be organized around patients' medical conditions and their full care cycle. Third, medical outcomes should be measured by improving population health and cost-effectiveness.

The "triple value" approach, adopted in England and Italy and called the value model, has three different aspects.[5] These are personal, allocative, and technical or clinical value.

The European Commission Council of Experts proposes to define VBHC as a comprehensive concept built on four value pillars.[6] These concepts are as follows:

- Appropriate care for patients to achieve their personal goals (personal value)
- Achieving the best possible results with available resources (technical value)
- Fair resource distribution among all patient groups (allocated value)
- Contribution of health services to social inclusion (Social value)

This study aims to examine the health-care services provided to stroke patients through three value pillars with a value-based modeling approach. The aim is to develop an index that measures the value created by health care provided to individuals affected by stroke.

### Stroke and value-based medicine

Stroke represents a substantial public health challenge characterized by elevated mortality and morbidity rates, resulting in considerable treatment expenditures. Its global significance is underscored by the growing elderly population in developing nations and demographic shifts. Notably, stroke is the third leading cause of disability-adjusted life years loss in developing countries, trailing only ischemic heart disease.[7] In the context of Türkiye, stroke ranks second among causes of mortality.[8] The 2017 Global Burden of Disease Study reported a worldwide age-standardized stroke incidence rate of 150 per 100,000, contrasting with Türkiye's higher rate of 177.[8,9] As of 2017, approximately 132,000 new stroke cases emerge annually in Türkiye.[10] Globally, 25.7 million individuals are diagnosed with stroke, 6.5 million succumb to stroke-related complications, and an average of 10.3 million new stroke cases are reported annually.[7]

Moreover, 5.2 million individuals under the age of 65 experience their first stroke, worsening the prevalence of stroke-related complications and imposing a long-term burden on affected individuals. Young stroke patients, dealing with complications, face challenges such as social isolation and decreased quality of life, further exacerbating the economic burden on the nation.[11-13]

Stroke stands as a pervasive global health issue, carrying the potential for severe consequences and disability and contributing significantly to the global burden of disease. Substantial evidence indicates that treatment within well-coordinated multidisciplinary stroke units enhances outcomes. Consequently, any intervention for stroke patients should be grounded in this evidence, with a concurrent emphasis on creating value. The management of stroke encompasses hyperacute and acute phases, followed by an extensive chronic phase necessitating prolonged rehabilitation efforts.

The escalating prevalence of stroke patients globally places a disproportionate burden, particularly on low-income countries.[14] Urgent efforts are warranted to devise improved strategies that ensure effective care delivery while mitigating disparities between nations. One suggested strategy for enhancing care quality involves assessing health care based on the value provided to patients.[15] Within this framework, value is conceptualized as the overall benefit received by a patient relative to the cost incurred for that benefit, essentially encapsulating health outcomes.[16] The formulation of situation-specific, measurable outcomes that hold significance for patients is pivotal within this equation. Outcomes encompass a spectrum of categories such as survival, disease control, treatment complications, and long-term quality of life, each carrying varying degrees of importance for individual patients.[17]

The notion of value and value-based medicine (VBM) has gained global acceptance. In this context, analyzing the global application of value-based management (VBM) principles to stroke provides valuable insights. It offers a comprehensive perspective on current trends and introduces an innovative macroeconomic viewpoint regarding the potential benefits of VBM practices in modern societies.

This study represents the inaugural attempt in Türkiye to establish a framework for implementing a value-based care model in health-care services for stroke patients. Despite associated challenges, value-based care models present an innovative paradigm by transferring the responsibility for fair and quality care from individual clinicians to the entire system. Consequently, it is anticipated that more equitable and efficient stroke care can be realized through the adoption of a well-defined set of standardized outcome measures. The measurement of value-based outcomes for stroke care, along with the publication of measurement results, may serve as a positive catalyst for health-care providers striving to enhance patient care.

## Methods

### Type of research

The study was carried out as a retrospective and descriptive study to measure the clinical value, patient outcome, and responsiveness of the health system based on VBHC services provided to patients diagnosed with stroke and discharged after treatment and to develop a model and an index to reveal the value created by comparing the measurement results with the scores obtained by the hospital. The study was approved by Ethics committee decision number 996 was obtained from Istanbul Medipol University.

### Population and sample of the study

Since the research is a model and index development study, it does not have a population and sample. In this study, an index was developed by taking expert opinions.

## Data collection tools

In the study, data were collected using three different tools: Case-mix variables data collection reference guide prepared by the researcher, Patient-Reported Outcomes Measurement Information System (PROMIS) Global-10 question set, and World Health Organization (WHO) responsiveness questionnaire.

### *Case-mix variables data collection reference guide*

It is a set of 56 questions, curated by reviewing both national and international guidelines, designed to gauge patient outcomes resulting from value-based clinical practices within the health-care services provided to patients. The formulation of this question set drew upon questions found in the Republic of Türkiye Ministry of Health Clinical Quality Stroke Guide[18] from national sources, as well as the International Consortium for Health Outcomes Measurement (ICHOM) and Stroke Reference Guide from international sources.[19] Despite lacking a scale feature, content validity was conducted to assess the validity and reliability of the questions included in the set.

Within our study, content validity for determining the usability of questions within the "Case-Mix Variables Data Collection Reference Guide" was established using the Davis technique. This guide, prepared by emulating both international and national guidelines, served as a reference. In the expert opinion form, fashioned based on Davis technique (1992), experts were prompted to express their opinions for each question as follows: (a) "Appropriate," (b) "Item should be slightly revised," (c) "Item should be seriously revised," and (d) "Item is not appropriate."[20]

### *PROMIS Global-10 form*

PROMIS Global-10 is a questionnaire devised by David Cella, affiliated with the Feinberg School of Medicine in 2004. This instrument comprises inquiries pertaining to individuals' overall physical, mental, and social well-being. Comprising 10 succinct items, the questionnaire assesses respondents' perceptions of pain, fatigue, and quality of life. For the purposes of this study, the PROMIS Global-10 form underwent translation into the Turkish language using the English–Turkish, Turkish–English translation/retranslation method. The adaptation utilized in this research drew upon the work of Bulut,[21] who incorporated the form into his doctoral thesis. It is noteworthy that a higher numerical value derived from this form corresponds to a more favorable patient outcome.

### *Responsiveness questionnaire*

The significance of individuals' experiences within the health-care system is underscored by the WHO. To operationalize the concept of health system experience and garner meaningful results through question–answer measurements in diverse settings and countries, a questionnaire applicable to outpatients, inpatients, or those receiving health-care services has been developed. In the creation of this module, insights were sought from health-care professionals, biostatisticians, and ethics experts.[22]

The WHO-developed responsiveness questionnaire comprises a total of 74 items, encompassing 34 items related to demographic data and hospital experiences and 40 items employing short stories. Patient experience questions cover various aspects, including the reason for hospitalization, duration of hospitalization, waiting time for admission, room occupancy, satisfaction with the hospital's medication support, health personnel, and health services. Other factors such as the duration and means of transportation to the hospital, as well as reasons for experiencing ill-treatment, are also addressed. In the Turkish context, Akalın[22] translated the responsiveness questionnaire into Turkish using the translation/retranslation method, and it was subsequently employed in his doctoral thesis.

Within the scope of this study, the researcher utilized the responsiveness questionnaire by categorizing questions into Perception of Hospital Adequacy/Health Personnel Quality, Access to Health Services, Patient Rights and Responsibilities, and Health Facility Comfort and Quality. This categorization, based on the content of the questions, aimed to facilitate pairwise comparisons using the analytic hierarchy process (AHP) method.[23]

## Data collection

The data collection process occurred in two stages. Initially, a Case-Mix Variables Data Collection Reference Guide, comprising 56 questions, was distributed. This guide was prepared by the researcher using the Turkish Ministry of Health Clinical Quality Stroke Guideline as a national reference and drawing from the ICHOM and Stroke Reference Guide as international resources. The distribution was made to 10 neurology specialists (one professor, two associate professors, and seven specialists) and 10 interventional radiology specialists (one professor, three associate professors, and six specialists).

The evaluations from these experts were computed on a question-by-question basis, and 51 questions with a score of 0.80 and above were deemed to have content validity [Table 1]. The fact that the calculated values surpassed the minimum suggested value indicates a concordance among the experts.

In the second stage, data analysis employed simple number and percentage ratios along with the AHP method. Following the expert evaluations of WHO responsiveness questions, PROMIS10 questions, and Case-Mix Variables Data Collection Reference Guide questions, 51 questions providing content validity were reorganized. Pairwise comparison tables, generated using the AHP method, were scored by two neurology specialists, two interventional radiology specialists, and two public health specialists.

AHP stands as a method enabling the translation of experts' subjective ideations and judgments into quantifiable metrics. Widely acknowledged as a prominent approach within the realm of multi-criteria decision-making, AHP assumes precedence in group deliberations. Its ubiquity in scholarly discourse lies in its unparalleled efficacy in determining the hierarchical weights of decision-critical criteria. The

**Table 1: CVI expert opinions**

| Variable | Score |
|---|---|
| Patient ID | 0.89 |
| Age | 1.00 |
| Gender | 0.94 |
| Case-Mixture Variables Data Collection Reference Guidelines | |
| The place of residence before stroke should be asked | 0.78[a] |
| Place of residence after stroke should be asked | 0.57[a] |
| Before stroke, it should be asked whether he/she lives alone or not | 0.73[a] |
| After a stroke, it should be asked whether he/she lives alone or not | 0.78[a] |
| Functional status before stroke – walking, moving around should be asked | 0.89 |
| Functional status before stroke – toilet should be asked | 0.94 |
| Functional status before stroke – dressing should be asked | 0.94 |
| Stroke type and severity | |
| Stroke type must be specified | 0.89 |
| Stroke severity, score should be specified | 0.94 |
| Estimated stroke severity category must be specified | 0.94 |
| Stroke severity: state of consciousness should be specified | 0.89 |
| Duration of stroke symptoms should be specified | 0.94 |
| Previous stroke should be indicated | 0.94 |
| Previous transient ischemic attack should be questioned | 0.94 |
| Previous MI must be questioned | 0.94 |
| Coronary artery disease should be questioned | 0.94 |
| Atrial fibrillation should be questioned | 0.94 |
| Diabetes mellitus should be questioned | 1.00 |
| Hypertension should be questioned | 1.00 |
| The presence of hyperlipidemia should be questioned | 1.00 |
| Smoking status should be questioned | 1.00 |
| Alcohol intake should be questioned | 0.94 |
| Related to treatment/care | |
| Diagnostic evidence base should be specified | 1.00 |
| Date of case acceptance should be specified | 1.00 |
| Date of discharge must be specified | 1.00 |
| Inpatient rehabilitation care should be done | 0.89 |
| Rehabilitation should be done after emergency care | 0.94 |
| Place of discharge after emergency hospitalization | 0,83 |
| Thrombolytic therapy should be applied | 0,94 |
| Thrombolytic therapy date to be specified | 0,94 |
| Thrombectomy should be performed | 0,94 |
| Thrombectomy date to be specified | 1.00 |
| Hemicraniectomy should be performed | 0.89 |
| Hemicraniectomy date to be specified | 0.94 |
| ECHO or TEE examination should be performed | 1.00 |
| Carotid–vertebral Doppler USG should be performed | 1.00 |
| Whether pulmonary infection develops should be indicated | 0.84 |
| It should be stated whether urinary infection develops | 0.78[a] |
| It must be stated whether a pressure sore has developed | 0.89 |
| It should be stated whether deep vein thrombosis develops | 0.89 |
| It should be stated whether carotid endarterectomy was performed | 0.89 |
| Whether or not a supra-aortic stent is applied should be indicated | 0.94 |
| Complications of acute treatment | |
| Monitor for symptomatic intracranial hemorrhage after IV thrombolysis | 0.94 |
| Symptomatic intracranial hemorrhage should be monitored after thrombectomy | 1.00 |
| Question whether the patient is alive or not | 0.94 |
| Date of death must be questioned | 0.89 |
| New stroke should be followed up within 90 days after stroke treatment | 1.00 |
| Smoking cessation should be questioned | 0.89 |
| Patient outcome | |
| Functional status after stroke ambulation should be questioned | 0.89 |
| Functional status after stroke – toilet should be questioned | 0.84 |
| Functional status after stroke – dressing should be questioned | 0.84 |
| Nutrition should be questioned | 0.84 |
| Ability to communicate should be questioned | 0.94 |

[a]<0.80 criteria. CVI: content validity index, ECHO: echocardiogram, MI: myocardial infarction, TEE: transesophageal echocardiogram, USG: ultrasound

selection of the AHP methodology in this study stems from the imperative to amalgamate divergent medical expertise, thereby fostering a cohesive platform for collective decision-making among health-care professionals. Since the 1970s, it has been a method under the subject of decision theory. Group decision-making, converting qualitative judgments into quantitative form, and inconsistency detection are among the notable strengths of AHP. As it does not rely on estimating the population based on the sample, there is no lower limit on the number of experts required.[24]

Before the AHP method pairwise comparisons, each expert involved in the comparisons received detailed face-to-face information about the contents of the question sets and the methodology for making pairwise comparisons in the AHP method. To streamline the evaluation process due to the extensive number of criteria, the questions in the Case-Mix Variables Data Collection Reference Guide were categorized into subcategories. These subcategories encompass functional status, stroke type and severity, patient background, patient admission and rehabilitation, treatment/interventional procedures, diagnosis/testing, inpatient care complications, acute treatment complications, and patient fate. Similarly, the WHO responsiveness questionnaire was subcategorized under perception of hospital adequacy/health personnel quality, access to health care, patient rights and responsibilities, and health facility comfort and quality. While the PROMIS10 question set did not have a high number of criteria, it was evaluated as a single set. The AHP pairwise comparisons unveiled distinct importance levels for all criteria, ultimately revealing an index applicable to the concept of "value" in the services provided to stroke patients.

## Data analysis

In the AHP method, the calculations were conducted through four distinct stages.[24] In the initial stage, the model was

formulated, and the factors to be incorporated into the model were identified through expert opinions (judgments). Subsequently, a hierarchical structure was established by delineating the purpose, criteria, and subcriteria based on the acquired data. In the second stage, pairwise comparison matrices were generated. Following the creation of the hierarchical structure, information was gathered using pairwise comparison tables, resulting in the formulation of a pairwise comparison matrix.

Moving on to the third stage, the weight of each decision alternative was computed by employing the results derived from the pairwise comparison matrices, determining the weights of the criteria, and evaluating the scores of the alternatives. Throughout this process, the value of each column in the pairwise comparison matrix was divided by the sum of the respective column, normalizing the matrix. Post-normalization, it was ensured that the total value of each column in the matrix equaled one. In addition, the averages of the values in the rows were calculated, yielding the eigenvectors.

In the fourth and concluding stage of the AHP method, the consistency index (CI) was calculated. The formula utilized for this computation is as follows:

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

Here, CI denotes the consistency index, $\lambda_{max}$ represents the largest eigenvalue in the matrix, and $n$ signifies the number of elements forming each matrix. Subsequently, the consistency ratio (CR) was determined by comparing the CI to the random index (RI), corresponding to a matrix of the same size.

$$CR = CI/RI$$

A CR less than 0.10 indicates that the matrix is consistent.[24] In our study, CR calculations were performed using this methodology. In the study, the geometric mean of expert judgments was taken when calculating the group decision.

## Results

The questions within the Case-Mix Variables Data Collection Reference Guide, comprising 56 items and formulated through a review of national and international guidelines, underwent evaluation by experts. The content validity index (CVI) was computed using the technique proposed by Davis (1992), wherein the number of experts designating an item as either (a) "Appropriate" or (b) "The item should be slightly revised" was divided by the total number of experts (CVI = a + b/total number of experts). Rather than comparing the obtained CVI value against a statistical criterion, a threshold of 0.80 was set as the criterion.[25] In the calculation based on expert opinions, questions with a score exceeding 0.80 were deemed to possess content validity. The outcomes derived from expert evaluations are presented in Table 1.

Based on the calculation of expert opinions, among the questions in the Case-Mix Variables Data Collection Reference Guide, the following questions were excluded from the question set since they were below 0.80: place of residence before stroke, place of residence after stroke, whether living alone before stroke, whether living alone after stroke, and whether urinary infection developed or not. Evaluations were made on the remaining 51 questions.

To evaluate the Case-Mix Variables Data Collection Reference Guide question set, the WHO responsiveness question set, and PROMIS10 question sets as a whole, pairwise comparison tables were made for the AHP method and two neurology specialists, two interventional radiology specialists, and two public health specialists were asked to prioritize these main criteria according to the AHP method described to them. The scores given by the experts to the main criteria pairwise comparison tables are shown in Table 2.

Upon evaluating the comparison matrix, normalized matrix, all-priorities matrix, and the fit index resulting from the expert ratings, the fit index reveals that the outcomes of these pairwise comparisons are both compatible and consistent. The index scores (AHP weights) of the main criteria were thoroughly examined using calculations to assess the compatibility and consistency of the fit index. The resulting index scores for the main criteria are illustrated in Figure 1.

Upon evaluating the expert opinions, the Case-Mix Variables Data Collection Reference Guide, predominantly encompassing criteria related to clinical practice, emerged as the foremost priority with an index score of 0.6. In contrast, the WHO responsiveness and PROMIS10 main criteria received identical scores, both registering an index score of 0.2.

To streamline the pairwise comparisons and enhance efficiency, the questions within the Case Mix Variables Data Collection Reference Guide were categorized into nine subcriteria based on question content. These subcriteria encompass pre-stroke functional status, stroke type and severity, patient background, patient admission and rehabilitation, treatment/interventional procedures, diagnosis/investigation, inpatient care complications, and acute treatment complications.

An examination of the comparison matrix, normalized matrix, all-priorities matrix, and the agreement index revealed a high degree of compatibility and consistency among the outcomes derived from these pairwise comparisons. The concordance index further supported the alignment of results. Employing calculations to assess the compatibility and consistency of the fit index, the Case Mix Variables Data Collection Reference Manual Sub criteria index scoring was thoroughly examined, and the resulting index scores are presented in Figure 2.

Upon scrutinizing the index scores, it becomes apparent that acute treatment indications emerge as a particularly significant criterion, boasting an index score of 0.344. Subsequently, patient outcome follows with an index score of 0.143, while patient admission and rehabilitation, along

with patient background, exhibit lower index scores of 0.041 and 0.028, respectively. Notably, the aggregate local weights of the subcriteria and the corresponding questions within the Case-Mix Variables Data Collection Reference Guide amount to 0.600.

An assessment of the comparison matrix, normalized matrix, all-priorities matrix, and the concordance index, resulting from expert ratings, underscores the compatibility and consistency of the outcomes derived from these pairwise comparisons. The concordance index, indicative of alignment, demonstrates both compatibility and consistency. Turning attention to the PROMIS10 index scoring, a meticulous examination was undertaken, considering the calculations related to the compatibility and consistency of the fit index. The index scores of PROMIS10 are visually represented in Figure 3.

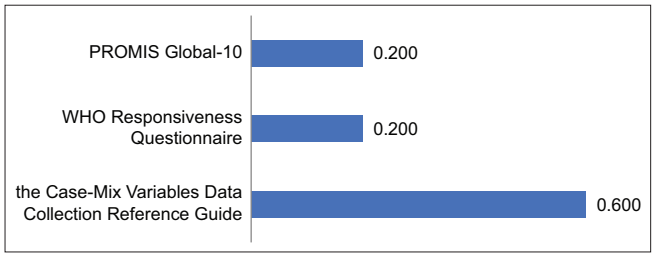


**Figure 1:** Main criteria index scores (weight). PROMIS: Patient-Reported Outcomes Measurement Information System, WHO: World Health Organization

On examining the index scores derived from PROMIS10, it is evident that experts accorded significant importance to the quality-of-life question, as reflected in an index score of 0.287. This was followed by the question addressing overall health, with an index score of 0.136, while the assessments of pain and fatigue over the last 7 days received lower index scores of 0.034 and 0.024, respectively.

The responsiveness questionnaire developed by the WHO consisted of a total of 74 items, comprising 34 items regarding demographic data and hospital experiences and 40 items containing vignettes. In this study, we utilized only the 34 items related to demographic data and hospital experiences. Due to the extensive number of questions within the WHO responsiveness questionnaire, an effort was made to streamline the pairwise comparisons by categorizing the questions into subcategories. These subcategories included perception of hospital adequacy/health personnel quality, access to health care, patient rights and responsibilities, and hospital/health facility comfort and quality, based on the content of the questions. Subsequent pairwise comparisons were conducted within these subcategories.

The comparison matrix, normalized matrix, and all-priorities matrix, along with the concordance index, were scrutinized to assess the compatibility and consistency of the results obtained from these pairwise comparisons. The concordance index, indicative of the alignment between the results, demonstrated compatibility and consistency.

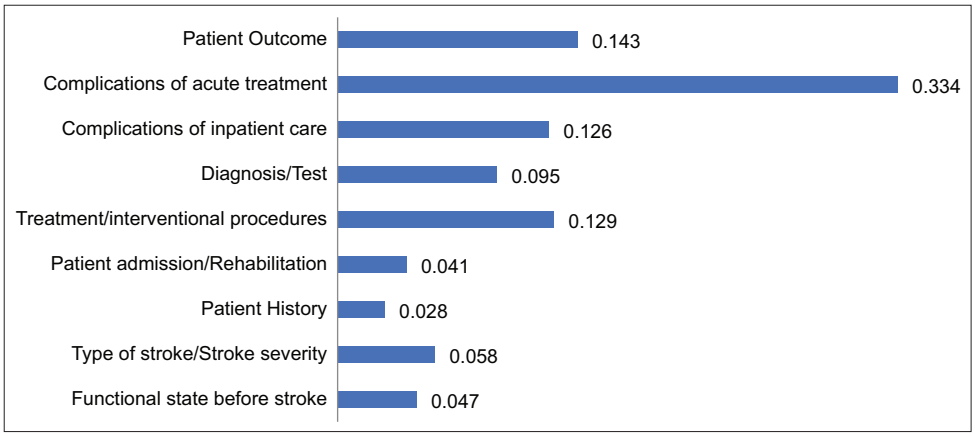


**Figure 2:** Index scores of Case-Mix Variables Data Collection Reference Guide subcriteria

**Table 2: Main criteria pairwise comparison showing expert judgments**

| Main criteria | Main criteria | Expert 1 | Expert 2 | Expert 3 | Expert 4 | Expert 5 | Expert 6 |
|---|---|---|---|---|---|---|---|
| Case-Mix Variables Data Collection Reference Guide | PROMIS10 Patient-Reported Outcomes Measurement Information System | 7.00 | 5.00 | 5.00 | 2.00 | 9.00 | 5.00 |
| Case-Mix Variables Data Collection Reference Guide | WHO Responsiveness Survey | 7.00 | 8.00 | 2.00 | 4.00 | 5.00 | 3.00 |
| PROMIS10 Patient-Reported Outcomes Measurement Information System | WHO Responsiveness Survey | 5.00 | 3.00 | 5.00 | 4.00 | 0.14 | 0.20 |

WHO: World Health Organization

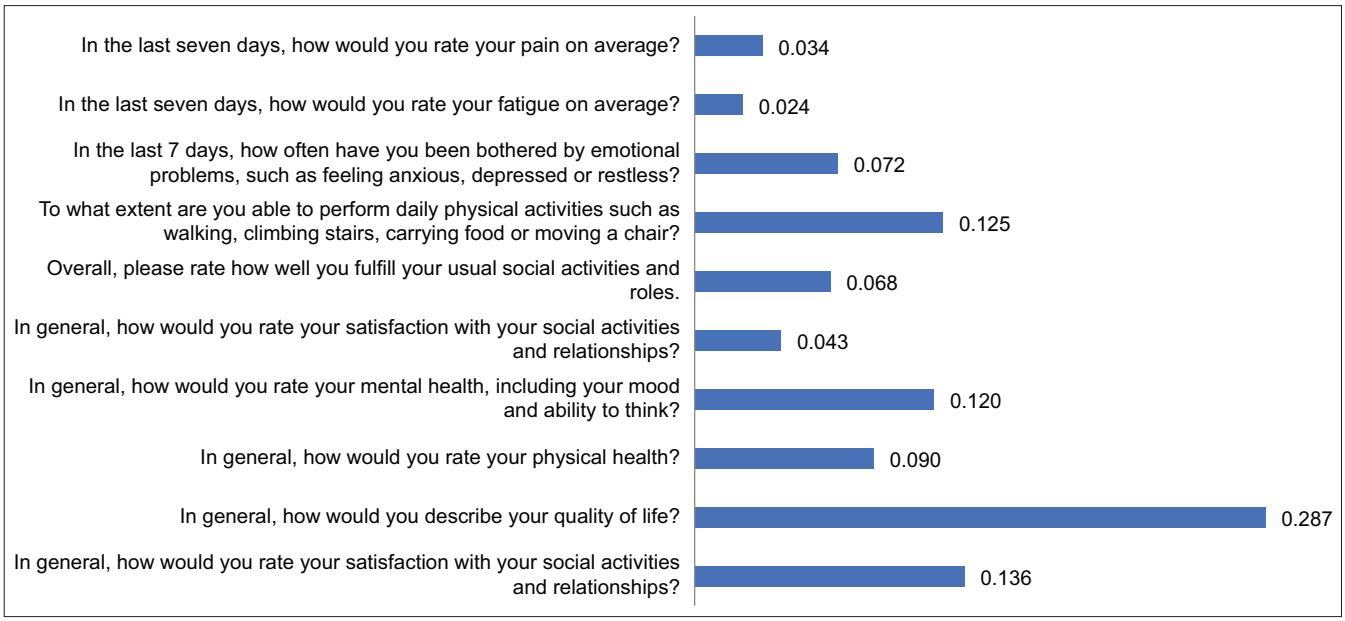


**Figure 3:** Index scores of PROMIS10. PROMIS: Patient-Reported Outcomes Measurement Information System

Utilizing these compatibility and consistency assessments, the index scoring of the subcategories within the WHO responsiveness questionnaire was analyzed, as depicted in Figure 4.

Upon analyzing the index scores derived from the WHO responsiveness questionnaire subcategories, it became apparent that the experts accorded high importance to patients' perception of hospital/health personnel competence, evident in an index score of 0.564. Following closely were the subcategories of access to health-care services (index score of 0.223), Hospital/health facility comfort and quality (index score of 0.150), And patient rights and responsibilities (index score of 0.063), with the latter recording the lowest index scores.

The prioritization of questions, as determined by the AHP method and expert assessments, revealed a paramount emphasis on the importance of a new stroke follow-up, securing the highest index score of 0.09173. Subsequently, the question addressing the adequacy of health-care staff skills for treatment ranked second, with an index score of 0.08474. Conversely, queries regarding the smoking status of patients (with an index score of 0.00027) and the alcohol use status (with an index score of 0.00021) were deemed least significant by the experts. The application of AHP analyses furnished an index, encapsulated in Table 3, which serves as a tool for gauging the factors contributing to value in health-care services provided to stroke patients.

## Discussion and Conclusion

In numerous countries, assessments are conducted regarding the value of health-care services extended to patients. For instance, in USA, hospital reimbursements are linked to the value of health-care services provided to patients, and payments are increasingly contingent on the outcomes of such evaluations. This approach entails the measurement of "Clinical Processes," "Patient Experiences," and "Patient Fate" to gauge the value generated in the patient.[26] In Türkiye, the concept of value is a recently discussed notion, and there exists a need for disease-specific indices to gauge the value engendered by health-care services offered to patients. This study endeavors to devise an index specifically tailored to measure the value of health-care services furnished to stroke patients. The index comprises three criteria, with the Case-Mix Variables Data Collection Reference Guide, encompassing clinically relevant criteria, holding the highest weight with an index score of 0.6. The remaining two criteria were deemed of equal importance by experts, each receiving an index score of 0.2. It is worth noting that the exclusive inclusion of physicians among the experts may have influenced this outcome. Conducting similar studies with a multidisciplinary approach involving experts from diverse social fields may yield disparate results.

In addition, it is essential to acknowledge that while physical health traditionally takes precedence in health considerations, psychological health and social well-being are integral components, as emphasized by the WHO's definition of health. Research indicates the interconnectedness of these three health components.[27,28]

Furthermore, from the patients' standpoint, their prioritization lies in the experiences encountered within health-care services and the human aspect of these interactions, rather than the formalities and costs associated with the treatment received.[29] Consequently, it is crucial to recognize that meeting patient expectations and enhancing patient outcomes constitute integral facets of health-care service provision. Policymakers, when formulating health service plans, should take cognizance of this reality, and

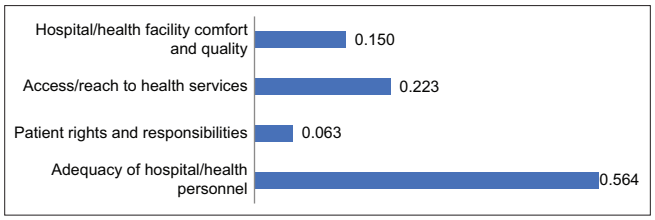


**Figure 4:** Index scores of WHO responsiveness questionnaire subcategories. WHO: World Health Organization

health-care providers, along with health-care professionals, should acknowledge and address this aspect. Notably, studies demonstrate that patient outcomes and satisfaction contribute significantly to the moral satisfaction of health-care professionals.[30]

We can summarize the comprehensive analysis of the stroke care assessment tool for various stakeholders in the health system as follows;

For neurologists and clinicians, the findings underscore the critical importance of acute treatment indications and patient outcomes in stroke care. The high prioritization of new stroke follow-up (index score 0.09173) emphasizes the need for consistent post-stroke monitoring and care continuity. Clinicians should focus on enhancing their skills and competencies, as the adequacy of health-care staff skills for treatment ranked second in importance (index score 0.08474).

Hospital administrators should take note of the high emphasis placed on patients' perception of hospital and health personnel competence (index score 0.564 on the WHO responsiveness questionnaire). This highlights the need to invest in staff training and development to improve actual and perceived care quality. In addition, the importance given to access to health-care services (index score 0.223) suggests that administrators should work on optimizing patient pathways and reducing barriers to care.

The findings for health-care systems indicate a need for a balanced approach to stroke care evaluation. While clinical factors remain paramount (Case-Mix Variables Data Collection Reference Guide scoring 0.6), patient-reported outcomes and system responsiveness are also significant (WHO responsiveness and PROMIS10 scoring 0.2 each). This suggests that health-care systems should implement comprehensive evaluation frameworks encompassing clinical outcomes, quality-of-life measures, and system performance indicators.

The relatively low importance assigned to factors like smoking status (index score 0.00027) and alcohol use (index score 0.00021) implies that while these are important for prevention, they may be less crucial in acute care settings. Health-care systems might consider reallocating resources from extensive data collection on these factors to areas deemed more critical by experts.

In conclusion, this analysis provides a valuable framework for prioritizing efforts in stroke care. It emphasizes the need for a patient-centered approach that balances clinical excellence with system responsiveness and quality-of-life considerations. Future initiatives in stroke care should aim to align with these priorities to maximize value in health-care delivery.

While this study provides valuable insights, it is essential to acknowledge its limitations and potential contextual variations, which are as follows: First, the study's findings are based on expert opinions from a specific context, which may not fully represent global perspectives on stroke care. The priorities identified could vary significantly in different health-care systems, cultures, or regions. The limited sample size of experts consulted, while providing focused insights, may not capture the full spectrum of views within the field. A broader, more diverse panel of experts might yield different prioritizations. The study's methodology, while rigorous, relies heavily on AHP. Other methodological approaches might lead to different conclusions, and the inherent subjectivity in pairwise comparisons should be considered.

Translating these findings to other health-care contexts requires careful consideration. Factors such as resource availability, health-care system structure, cultural norms, and population health profiles could significantly alter the applicability of these priorities.

The low importance assigned to factors like smoking and alcohol use in this acute care context should not be misinterpreted. These factors remain crucial in prevention and long-term management, areas not fully explored in this study.

Health-care systems considering adopting this framework should view it as a starting point for local adaptation rather than a definitive guide. Local validation studies and stakeholder consultations would be essential to ensure relevance and effectiveness in different settings.

The dynamic nature of health care and evolving stroke management practices mean that these priorities may shift over time. Regular reassessment would be necessary to maintain the relevance of any derived evaluation system.

In conclusion, while this study offers valuable insights into prioritizing aspects of stroke care evaluation, its findings should be interpreted and applied cautiously. Health-care leaders and policymakers should use these results as a foundation for further investigation and adaptation to their specific contexts, always remaining open to alternative perspectives and emerging evidence in stroke care.

## Acknowledgement

We thank all participants for their support.

## Financial support and sponsorship

Nil.

**Table 3: Importance ranking and score weights of all questions according to expert evaluations**

| Priority ranking | Level 3 criteria | Weights |
|---|---|---|
| 1 | 1.8.5 After stroke treatment, new strokes should be monitored within 90 days. Coverage criteria: All patients | 0.09173 |
| 2 | 3.1.1 Do you think the skills of the health-care personnel were sufficient for your treatment? | 0.08474 |
| 3 | 2.2 Can you tell me about your overall quality of life? | 0.05740 |
| 4 | 1.7.3 Has the development of deep vein thrombosis been indicated? Coverage criteria: Ischemic stroke patients | 0.04524 |
| 5 | 1.9.4 Has nutrition been questioned? Coverage criteria: All patients | 0.03659 |
| 6 | 1.6.1 The diagnostic evidence base should be stated. How the diagnosis was made should be indicated. clinical findings+CT, clinical+MRI | 0.03412 |
| 7 | 1.8.1 Has symptomatic intracranial hemorrhage occurred after IV thrombolysis? Whether symptomatic intracerebral hemorrhage has developed after ischemic stroke treatment with IV thrombolysis should be indicated. Coverage criteria: Patients treated with thrombolysis | 0.03379 |
| 8 | 1.8.2 Has symptomatic intracranial hemorrhage occurred after thrombectomy? Whether symptomatic intracranial hemorrhage has developed after thrombectomy should be indicated. Coverage criteria: Patients who underwent thrombectomy | 0.03379 |
| 9 | 1.8.3 Has the patient's survival been queried? Coverage criteria: All patients | 0.03379 |
| 10 | 2.1 Can you tell me about your overall health? | 0.02713 |
| 11 | 2.7 How well are you able to perform daily physical activities such as walking, climbing stairs, carrying groceries, or lifting chairs? | 0.02498 |
| 12 | 2.4 How would you evaluate your mental health, including your mood and cognitive abilities, overall? | 0.02408 |
| 13 | 1.9.5 Has the ability to communicate been questioned? Coverage criteria: All patients | 0.02379 |
| 14 | 3.1.3 Do you think the hospital's medication support was sufficient for your treatment? | 0.01894 |
| 15 | 2.3 How would you assess your overall physical health? | 0.01801 |
| 16 | 1.2.4 Stroke severity: level of consciousness should be indicated | 0.01760 |
| 17 | 3.3.4 How many people were you sharing the room with during your hospital stay? | 0.01696 |
| 18 | 3.4.1 How would you rate the cleanliness of the hospital rooms and bathrooms during your stay? | 0.01683 |
| 19 | 1.1.1 Pre-stroke functional status – walking, mobility should be asked | 0.01608 |
| 20 | 1.7.1 Has pulmonary infection developed? Coverage criteria: Ischemic stroke patients | 0.01508 |
| 21 | 1.7.2 Has pressure ulcer developed? Whether pressure ulcer has developed within the first 4 weeks should be indicated. Coverage criteria: Ischemic stroke patients | 0.01508 |
| 22 | 2.8 In the past 7 days, how often have you been bothered by emotional problems such as feeling anxious, depressed, or restless? | 0.01439 |
| 23 | 1.5.3 Whether a thrombectomy has been performed should be indicated. Specify whether the patient underwent a thrombectomy. Coverage criteria: Ischemic stroke patients | 0.01415 |
| 24 | 1.5.5 Whether hemispheric decompression (hemicraniectomy) has been performed should be indicated. Coverage criteria: All patients | 0.01415 |
| 25 | 1.5.7 Whether carotid endarterectomy has been performed should be indicated. Specify whether carotid endarterectomy was performed within 1 year following discharge from the hospital. Coverage criteria: Ischemic stroke patients | 0.01415 |
| 26 | 1.5.8 Whether supra-aortic stent placement has been performed should be indicated. Specify whether supra-aortic stent placement was performed within 1 year following discharge from the hospital. Coverage criteria: Ischemic stroke patients | 0.01415 |
| 27 | 2.6 Please rate how well you have been able to perform your usual social activities and roles. (This includes activities at home, work, and in your community, as well as responsibilities such as parent, child, spouse, employee, friend, etc.) | 0.01365 |
| 28 | 1.5.1 Whether thrombolytic therapy has been administered should be indicated. Specify whether the patient received IV thrombolytic (IV tissue plasminogen activator) treatment. Coverage criteria: Ischemic stroke patients | 0.01361 |
| 29 | 1.4.4 Rehabilitation should be conducted after emergency care | 0.01278 |
| 30 | 3.2.3 For this admission, how long did you wait to be hospitalized after the admission diagnosis? Same day ( ) Less than 1 week ( ) Less than 1 month ( ) Less than 3 months ( ) More than 3 months ( ) | 0.01193 |
| 31 | 1.9.1 Post-stroke functional status, specifically ambulation, has been queried. Coverage criteria: All patients | 0.01188 |
| 32 | 1.6.2 Whether an ECHO or TEE has been performed should be indicated. Specify whether the patient underwent an ECHO or TEE examination. Coverage criteria: Ischemic stroke patients | 0.01137 |
| 33 | 1.6.3 Whether carotid–vertebral Doppler USG has been performed should be indicated. Specify whether the patient underwent carotid–vertebral Doppler USG examination. Coverage criteria: Ischemic stroke patients | 0.01137 |
| 34 | 3.3.6 How would you evaluate the waiting time before you visited the hospital for this admission? | 0.00949 |
| 35 | 1.9.2 Post-stroke functional status – toilet should be queried. Coverage criteria: All patients | 0.00916 |
| 36 | 3.1.2 In your opinion, was the hospital equipment sufficient for your treatment? | 0.00910 |
| 37 | 2.5 How would you evaluate your satisfaction with your social activities and relationships overall? | 0.00869 |
| 38 | 1.1.2 Pre-stroke functional status – toilet should be asked | 0.00803 |
| 39 | 1.8.4 Has the date of death been queried? The date of death should be asked. Coverage criteria: Deceased patients | 0.00760 |

*Contd...*

**Table 3: Contd...**

| Priority ranking | Level 3 criteria | Weights |
|---|---|---|
| 40 | 1.4.3 The hospitalized patient should receive rehabilitation care | 0.00713 |
| 41 | 3.4.2 How would you evaluate the spaciousness of the area where you were during this admission? | 0.00687 |
| 42 | 2.10 How would you rate your average pain level over the past 7 days?<br>No pain 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9 – 10 - worst pain imaginable | 0.00681 |
| 43 | 1.2.3 The estimated stroke severity category should be indicated | 0.00580 |
| 44 | 1.2.2 Stroke severity should be specified with a score | 0.00523 |
| 45 | 2.9 How would you rate your average fatigue level over the past 7 days? | 0.00484 |
| 46 | 1.3.1 Previous stroke should be indicated | 0.00462 |
| 47 | 3.4.3 How would you evaluate the ease of visitation for your family and friends during this admission? | 0.00448 |
| 48 | 1.9.3 Post-stroke functional status – dressing should be queried. Coverage criteria: All patients | 0.00444 |
| 49 | 1.1.3 Pre-stroke functional status – dressing should be asked | 0.00392 |
| 50 | 1.2.5 The duration of stroke symptoms should be specified | 0.00329 |
| 51 | 3.2.1 How many minutes did it take you on average to travel from your home to this hospital? | 0.00314 |
| 52 | 1.3.2 Previous TIA should be queried | 0.00313 |
| 53 | 3.3.1 How would you evaluate the attention, respect, and manner of reception you received when you arrived at the hospital for this admission? | 0.00295 |
| 54 | 1.2.1 The type of stroke should be specified | 0.00284 |
| 55 | 3.3.3 How would you evaluate the explanations given by the health-care personnel regarding your condition during this admission? | 0.00273 |
| 56 | 1.5.2 The date of thrombolytic therapy should be indicated. Coverage criteria: Ischemic stroke patients | 0.00262 |
| 57 | 1.4.5 Discharge destination after emergency hospitalization | 0.00261 |
| 58 | 1.3.3 Previous MI should be queried | 0.00257 |
| 59 | 3.2.9 During this admission, were you subjected to ill-treatment by hospital staff for any of the following reasons? Gender ( ) Age ( ) Money ( ) Social class ( ) Ethnicity ( ) Type of illness ( ) Nationality ( ) | 0.00222 |
| 60 | 1.5.4 The date of thrombectomy should be indicated | 0.00222 |
| 61 | 1.5.6 The date of hemicraniectomy should be indicated. Coverage criteria: All patients | 0.00212 |
| 62 | 3.4.4 How would you evaluate your experience of staying connected with the outside world while you were in the hospital for this admission? | 0.00180 |
| 63 | 1.3.4 Coronary artery disease should be queried | 0.00176 |
| 64 | 1.3.7 Hypertension should be queried | 0.00163 |
| 65 | 3.2.2 Which mode of transportation did you use to get to the hospital?<br>Private car or motorcycle ( ) Public transportation ( ) Ambulance ( )<br>Bicycle ( ) On foot ( ) Other ( ) | 0.00158 |
| 66 | 3.3.5 How would you evaluate your travel time to the hospital for this admission? | 0.00154 |
| 67 | 1.3.5 Atrial fibrillation should be queried | 0.00148 |
| 68 | 3.3.4 How would you evaluate your experience with having enough time to ask questions about your health problem or treatment during this admission? | 0.00128 |
| 69 | 1.4.2 The discharge date should be indicated | 0.00124 |
| 70 | 3.3.7 How would you evaluate your ability to comfortably discuss private matters with the health-care personnel during this admission? | 0.00118 |
| 71 | 3.3.6 How would you evaluate being asked for your opinions when decisions about your care were being made during this admission? | 0.00085 |
| 72 | 1.4.1 The date of admission should be indicated | 0,.00074 |
| 73 | 3.3.5 How would you evaluate your experience with obtaining information about alternative treatments or types of tests during this admission? | 0.00061 |
| 74 | 1.3.6 Diabetes mellitus should be queried | 0.00057 |
| 75 | 1.3.8 The presence of hyperlipidemia should be queried | 0.00051 |
| 76 | 3.3.2 How would you evaluate the care taken to maintain your privacy during physical examinations and treatments during this admission? | 0.00049 |
| 77 | 3.3.8 How would you evaluate your freedom to choose the health-care personnel serving you during this admission? | 0.00029 |
| 78 | 1.3.9 The smoking status should be queried | 0.00027 |
| 79 | 1.3.10 Alcohol consumption status should be queried | 0.00021 |

ECHO: echocardiogram, IV: intravenous, MI: myocardial infarction, TEE: transesophageal echocardiogram, TIA: transient ischemic attack, USG: ultrasound

## Conflicts of interest

There are no conflicts of interest.

## References


1. Gray JAM, How to Get Better Value Healthcare (How to Handbooks Book 1). 2nd ed. Kindle Edition. Offox Press; 2011, p. 371-2.
2. Gray M. The 'triple value agenda' must be our focus this century. 2015. Available from: www.nhsconfed.org/blog/2015/05/the-triple-value-agenda-should-be-our-focus-for-this-century. [Last accessed on 2021 Sep 16].
3. Putera I. Redefining health: Implication for value-based healthcare reform. Cureus 2017;9:e1067.
4. Andersson AE, Baathe F, Wikstrom E, Nilsson K. Understanding value-based healthcare – An interview study with Project team members at a Swedish University Hospital. J Hosp Adm 2015;4:64-72.
5. Martens MH. Incorporating value in investment decisions in health across Europe. sustainable development, 2015;386:1165-210.
6. Gray M, How to Get Better Value Healthcare. 3rd ed. Oxford Press; 2017.
7. Feigin VL, Krishnamurthi RV, Parmar P, Norrving B, Mensah GA, Bennett DA, et al. Update on the global burden of ischemic and hemorrhagic stroke in 1990-2013: The GBD 2013 study. Neuroepidemiology 2015;45:161-76.
8. Arsava M. Ulusal hastalık yükü çalışması sonuçları ve çözüm önerileri. Hacettepe Üniversitesi Tıp Fakültesi; 2017. Available from: http://fs.hacettepe.edu.tr/tip/ekler/pdf/ulusal_program.pdf. [Last accessed on 2022 Sep 10].
9. Krishnamurthi RV, Ikeda T, Feigin VL. Global, regional and country-specific burden of ischaemic stroke, intra cerebral haemorrhage and subarachnoid haemorrhage: A systematic analysis of the global burden of disease study 2017. Neuroepidemiology 2020;54:171-9.
10. Türkiye Hanehalkı Sağlık Araştırması: Bulaşıcı olmayan hastalıkların risk faktörleri prevalansı 2017. Dünya Sağlık Örgütü Avrupa Bölge Ofisi. Available from: https://data.who.int/countries/792 [Last accessed on 2022 Sep 21].
11. Benjamin EJ, Virani SS, Callaway CW, Chamberlain AM, Chang AR, Cheng S, et al. Heart disease and stroke statistics—2018 update: A report from the American Heart Association. Circulation 2018;137:e67-492.
12. Kang HY, Lim SJ, Suh HS, Liew D. Estimating the life time economic burden of stroke according to the age of onset in South Korea: A cost of illness study. BMC Public Health 2011;11:646.
13. Mukherjee D, Patil CG. Epidemiology and the global burden of stroke. World Neurosurg 2021;76:S85-90.
14. Feigin VL, Forouzanfar MH, Krishnamurthi R, Mensah GA, Connor M, Bennett DA, et al. Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010) and the GBD Stroke Experts Group. Global and regional burden of stroke during 1990-2010: Findings from the global burden of disease study 2010. Lancet 2014;383:245-54.
15. Lee T, Porter M. The strategy that will fix healthcare. Harv Bus Rev 2013;911-9.
16. Porter ME. What is value in healthcare. N Engl J Med 2010;363:2477-81.
17. Solomon NA, Glick HA, Russo CJ, Lee J, Schulman KA. Patient preferences for stroke outcomes. Stroke 1994;25:1721-5.
18. TC Sağlık Bakanlığı, Akut İskemik İnme Rehberi. Available from: https://ekutuphane.saglik.gov.tr/Home/GetDocument/566 [Last accessed on 2022 Sep 11].
19. ICHOM, STROKE Ability to communicate Measuring results that matter Stroke Data Collectıon Reference Guıde. Available from: https://ichom.org/files/medical-conditions/stroke/stroke-reference-guide.pdf. [Last accessed on 2022 Sep 11].
20. Gozum S, Aksayan S. Kulturlerarası olcek uyarlaması icin rehber II-olcek psikometrik ozellikler ve kulturlerarası karşılaştırma. Hemşirelik Araştırma Geliştirme Dergisi 2003;5:3-14.
21. Bulut A. Evaluation of the Services Provided to Ischemic Heart Patients Who Underwent Coronary Angiography in Terms of Value-Basedness and Responsiveness: The Case of Dr. Siyami Ersek Training and Research Hospital (Unpublished Doctoral Dissertation). Istanbul Üsküdar University, Institute of Health Sciences, Department of Health Management, Department of Health Management, PhD Thesis, 2021.
22. Akalin B. Responsiveness of Inpatient Services in the Case of a Training and Research Hospital (Thesis). Istanbul Medipol University, Institute of Health Sciences, Department of Health Management, Department of Health Management, PhD Thesis, 2017.
23. Saaty TL. How to make a decision: The analytic hierarchy process. Eur J Oper Res1990;48:9-26.
24. Önder, G. ve Önder, E. (2015). Analitik Hiyerarşi Süreci, Editörler Yıldırım, BF., ve. Önder, E., İşletmeciler, Mühendisler ve Yöneticiler İçin Operasyonel, Yönetsel ve Stratejik Problemlerin Çözümünde Çok Kriterli Karar Verme Yöntemleri içinde (ss.21-74). Bursa: Dora Yayıncılık.
25. Yurdugül H. Ölçek geliştirme çalışmalarında kapsam geçerliği için kapsam geçerlik indekslerinin kullanılması. XIV. Ulusal Eğitim Bilimleri Kongresi 2005;1:771-4.
26. GAO (US Government Accountability Office). Hospital Value-Based Purchasing: Initial Results Show Modest Effects on Medicare Payments and No 171 Apparent Change in Quality-of-Care Trends. Washington, DC: US Congress; 2015.
27. Llanwarne NR, Abel GA, Elliott MN, Paddison CA, Lyratzopoulos G, Campbell JL, Roland M. Relationship between clinical quality and patient experience: Analysis of data from the english quality and outcomes framework and the National GP Patient Survey. Ann Fam Med 2013;11:467-72.
28. Congiusta S, Solomon P, Conigliaro J, O'Gara-Shubinsky R, Kohn N, Nash IS. Clinical quality and patient experience in the adult ambulatory setting. Am J Med Qual 2019;34:87-91.
29. Shale S. "Patient experience as an indicator of clinical quality in emergency care", Clinical Governance: An International Journal 2013;18:285-92.
30. Golda N, Beeson S, Kohli N, Merrill B. Analysis of the patient experience measure. J Am Acad Dermatol 2018;78:645-51.