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RESEARCH

# VALIDATION OF THE COMPREHENSIVE ICF CORE SET FOR STROKE IN TURKISH STROKE PATIENTS

## ABSTRACT

***Introduction:*** This study investigates the content and construct validity of the Comprehensive International Classification of Functioning,Disability and Health (ICF) Core Set in connection with stroke patients in Turkey.

***Materials and Method:*** Brunnstrom Stages, Barthel index (BI) and Ashworth scale scores of the patients were recorded, and the SF-36 was completed by each patient. ICF data were collected via patient interviews and medical records. Content validity was evaluated using the frequency and percentage of patients who had a problem within each category. Spearman correlations were calculated to evaluate the construct validity.

***Results:*** In body functions 32 categories were reported as a problem, of which 22 correlated with the BI and 23 with the SF-36 physical component summary (PCS) score. In body structures all categories were problematic; all (except for structures of the cardiovascular system) were correlated with the BI and the SF-36 PCS score. In activities and participation 47 categories were problematic of which 32 correlated with the BI and 37 with the SF-36 PCS score. In environmental factors 7 categories were identified as a barrier and 26 as a facilitator; of these, 2 barriers and 5 facilitators correlated with the BI and the SF-36.

***Conclusion:*** In Turkish stroke patients, the components body functions, body structures and activities and participation demonstrated good content and construct validity. Environmental factors need to be further evaluated in different sociocultural environments.

***Key Words:*** Activities of Daily Living/Classification; Disabled Persons/Classification; Health Status Indicators; Questionnaires; Stroke/Classification.

ARAŞTIRMA

# İNMELİ TÜRK HASTALARDA KAPSAMLI ICF İNME ÇEKİRDEK SETİ GEÇERLİLİK ÇALIŞMASI

## ÖZ

***Giriş:*** Bu çalışmada, Türkiye'de inmeli hasta perspektifinden, kapsamlı ICF inme çekirdek setinin içsel ve yapısal geçerliliğinin araştırılması amaçlanmıştır.

***Gereç ve Yöntem:*** Hastaların Brunnstrom evrelemesi, Barthel indeksi (BI) ve Ashworth skalasına ait skorları kaydedildi. Short form-36 (SF-36) her hasta tarafından tamamlandı. ICF verileri, hastalarla yapılan görüşmelerden ve tıbbi kayıtlardan elde edildi. İçsel geçerlilik, her ICF kategorisi için hastalar tarafından rapor edilen problemlerin frekans ve yüzde hesaplamaları ile değerlendirildi. Yapısal geçerliliğin değerlendirilmesi için ise, spearman korelasyon düzeyi hesaplandı.

***Bulgular:*** Vücut fonksiyonlarında 32 kategori problemli olarak rapor edildi. 22 kategori BI ile 23 kategori SF-36 fiziksel bileşen alt skoru (FBA) ile korele idi. Vücut yapılarında tüm kategoriler problemli olarak dökümante edildi. Kardiyovasküler yapılar dışında, tümü ile BI ve SF-36 FBA arasında korelasyon tespit edildi. Aktivite ve katılımda 47 kategori problemli olarak rapor edildi. 32 kategori BI ile, 37 kategori SF-36 ile korele idi. Çevresel faktörlerden 7 kategori engelleyici, 25 kategori ise kolaylaştırıcı olarak belirlendi. 2 engelleyici ve 5 kolaylaştırıcı faktör ile BI ve SF-36 arasında korelasyon bulundu.

***Sonuç:*** Vücut fonksiyonları ve yapıları ile aktivite ve katılım bileşenleri, inmeli Türk hastalarda iyi düzeyde içsel ve yapısal geçerlilik göstermişlerdir. Çevresel faktörlerin ise farklı sosyokültürel ortamlarda değerlendirilmesine ihtiyaç vardır.

***Anahtar Sözcükler:*** Günlük Yaşam Aktivitesi/Sınıflama; Engelli/Sınıflama; Sağlık Durumu Göstergeleri; Anket; İnme/Sınıflama.

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## Introduction

Stroke is a neurologic syndrome caused by a heterogeneous group of vascular etiologies, mainly hemorrhagic or ischemic. In the USA, stroke is the third leading cause of death after heart disease and cancer. The rate of stroke in Asian countries is higher than in the USA (1,2). Overall, stroke is a significant cause of morbidity, mortality and disability in persons aged ≥ 65 years.

There is considerable heterogeneity in patient presentation because stroke can affect various physical, cognitive, communicative, emotional, social and vocational domains, as well as economic status (1). The main aim of a stroke rehabilitation program is to reduce ultimate disability, and achieve and maintain optimal functioning. Therefore, identification and assessment of different aspects of the patient's disability status at a particular end point is the key outcome from a rehabilitation perspective.

Many outcome measurements have been developed to assess the health and functioning of patients with stroke, including the Brunnstrom stages, the Barthel Index and the Medical Outcomes Study 36-item Short-Form Health Survey (SF-36), all of which are used in clinical studies worldwide (3,4).

Although many life areas are restricted due to stroke, and a complex interaction exists between the disease and the environmental and personal factors, these widely-used outcome measures are scarcely taken into account in a multi-perspective approach to the classification of functioning and disability. The International Classification of Functioning, Disability and Health (ICF) is a comprehensive model established by the World Health Organization (WHO). To use the ICF in clinical practice and research, ICF Core Sets have been developed. These Core Sets serve as a guide to comprehensively assess and describe functioning in the rehabilitation cycle, and facilitate the structuring, organization and documentation of the rehabilitation process (5). The ICF Comprehensive Core Set for stroke is the largest of the sets developed for the 12 most burdensome chronic conditions. It represents the characteristic spectrum of problems in the functional health of patients with stroke and contains 130 second level categories comprised of 4 components from the categories 1) *body functions, 2) body structures, 3) activities and participation*, and 4) *environmental factors*.

The present study investigates the content and construct validity of the ICF Core Set for Stroke in connection with stroke patients in Turkey.

## Materials and Method

### Subjects

A total of 101 patients with stroke (45 male, 56 female) were recruited from the inpatient rehabilitation department of the Ankara Physical Medicine and Rehabilitation, Education and Research Hospital. The criteria for recruitment were: Stroke due to cerebrovascular disease; first episode of unilateral stroke with hemiparesis during the previous 12 months; and the ability to understand and follow verbal instructions.

The exclusion criteria included nonvascular conditions that can present with stroke- like symptoms, impaired level of consciousness, and evidence of gross cognitive impairment. Stroke was determined by a neurologist and confirmed by CT scan performed within the first week of the acute event. The study was approved by the hospital's Ethical Committee and all patients gave informed consent.

### Variables and Instruments

#### *Stages of Motor Recovery*

The Brunnstrom Stages are six sequential stages of motor recovery; they describe how the hemiplegic upper and lower extremities progress through these stages as a method of assessing recovery (6).

#### *Severity of Spasticity*

The Ashworth scale was used to measure the severity of spasticity (7).

#### *Activities of Daily Living*

The Barthel Index consists of 10 items that measure a person's daily functioning, i.e. the activities of daily living and mobility. The items include feeding, bathing, grooming, dressing, toileting, transferring, walking on level surface, going up and down stairs, and continence of bowels and bladder. A patient with a maximum score of 100 points is defined as continent, able to eat and dress independently, walk at least a block, and go up and down stairs (8).

#### *Health-Related Quality of Life*

The SF-36 questionnaire (Turkish version) was used to measure quality of life. The SF-36 is a frequently used generic instrument for the measurement of health-related quality of life that has been validated in stroke patients. It includes one multi-item scale that assesses eight health concepts; Physical functioning (PF), Role limitations-physical (RP), Bodily pain (BP), General health (GH), Vitality (V), Social functioning (SF), Role limitations-emotional (RE), and Mental health (MH).

The SF-36 scales are standardized to a range of 0-100, with a higher score indicating better health status. The validity and reliability study of the Turkish version of the SF-36 is well documented (9).

### ICF Core Set for Stroke

The 130 second-level categories of the Comprehensive ICF Core Set for stroke consists of 41 categories from the component *body functions*, 5 from *body structures*, 51 from *activities and participation*, and 33 categories from the component *environmental factors*.

To score the Core Set, a qualifier scale is used for each ICF category. Qualifiers denote the magnitude of the level of health or severity of the problem in patients with a specific disease. The qualifier scale of the components *body functions, body structures,* and *activities and participation* has 5 response options, each option ranging from 0-4 (indicating: no difficulty, mild, moderate, severe and complete problem, respectively). The same 0-4 scale is used for *environmental factors*; however, a specific environmental factor can be a barrier (negative effect on a patient's life: -1 to -4) or a facilitator (positive effect on a patient's life:1 to 4), or can have no influence (0) on the patient. Therefore, the qualifier scale of the component *environmental factors* has a total of 9 responses. The response option 8 ('not specified') is used if the available information is insufficient to specify the severity of the problem, and 9 ('not applicable') is used if it is inappropriate or not possible to apply the code.

### Data Collection

Sociodemographic characteristics and domain-specific measures (such as the Brunnstrom Stages, Barthel Index and Ashworth scale) were recorded within the first week after admission to the hospital. The SF-36 was also completed at that time by each patient.

Most of the ICF data were collected via patient interviews and from the medical record. All interviews were conducted by the same physician, trained in the application and principles of the ICF (Turkish Goverment–WHO collaboration, 2008) . Data collection was carried out in a quiet room and lasted approximately 2 h.

### Statistical Analysis

Descriptive statistics were used to define the clinical and demographic characteristics of the study population, and to describe general health status based on the SF-36. Data are reported as mean ± SD. The Chi-square test was used to define categorical data.

The ICF qualifiers 1-4 were recorded as 1 ('a problem') and the qualifier 0 was recorded as 'no problem'. The response option 9 'not applicable' was recorded as 0 ('no problem'), and 8 'not specified' was accepted as 'missing'.

Content validity of the comprehensive ICF core set was evaluated using the frequency and percentage of patients who had a problem for each category. For the categories of the ICF component *environmental factors*, we calculated the frequency and percentage of persons who regarded a specific category as constituting either a barrier or a facilitator. A threshold of 10% was applied to evaluate the content validity based on the protocol developed by the WHO ICF research branch.

Spearman correlation coefficients were calculated between the categories in the ICF Comprehensive Core Set and the SF-36, Brunnstrom Stages, Barthel Index and Ashworth scale scores, to evaluate the construct validity of the Core Set.

All statistical analyses were performed using SPSS 15.0 statistical software (SPSSFW, SPSS, Chicago, IL, USA).

## RESULTS

The present study included a consecutive sample of 101 patients who had suffered a stroke: their mean age was 64.2±12.2 years and 55% was female. Mean duration of stroke before admission to the rehabilitation ward was 120.3±20.3 days. The main cause of the diagnosed stroke was cerebral infarction (70%). Clinical and demographic features of the patients are presented in Table 1. Brunnstrom stages of motor recovery were between 2 to 3 in the extremities. The average score on the Barthel Index score was 53.32±18.97. On the SF-36 the lowest mean score was for the Physical functioning scale and the highest was for the Bodily pain scale. In the summary scores, patients reported more significant limitations in their physical health than in their mental health (Table 1).

**In the *body functions* component** a significant problem (at least 10% of participants) was reported in 32 of the 41categories of body functions. The most impaired categories (≥59% of the participants) were: b770 Gait pattern functions, b730 Muscle power functions, b740 Muscle endurance functions, b715 Stability of joint functions, b760 Control of voluntary movement functions, b710 Mobility of joint functions, b176 Mental function of sequencing complex movements, and b280 Sensation of pain. In this component 22 cat-

**Table 1—** Sociodemographic and Clinical Characteristics of the Study Population

| Characteristics | |
|---|---|
| Mean age in years (SD) | 65.2±12.2 |
| Sex (male/female) | 45/56 |
| Duration of disease (days) | 120.3±20.3 |
| Type of lesion (ischemia/hemorrhage) | 71/30 |
| Affected side (right/left) | 34/67 |
| ***Brunnstrom Motor Stages*** | |
| Upper extremity | 2.86±1.5 |
| Hand | 2.59±1.6 |
| Lower extremity | 3.22±1.3 |
| ***Ashworth Scale*** | |
| Upper extremity | 0.76±0.9 |
| Hand | 0.79±0.9 |
| Lower extremity | 0.65±0.8 |
| Barthel Score | 53.32±18.97 |
| ***SF-36 Scale Score: mean (SD)*** | |
| Physical functioning | 9.55±16.66 |
| Role-physical | 14.10±30.98 |
| Bodily pain | 60.94 26.90 |
| General Health | 25.42±12.53 |
| Vitality | 33.06±13.89 |
| Social functioning | 24.75±29.64 |
| Role-emotional | 21.33±37.17 |
| Mental health | 47.23±13.07 |
| Physical component summary Score | 28.09±6.57 |
| Mental component summary Score | 35.46±9.09 |

egories showed a significant correlattion with the Barthel Index and 23 categories with the SF-36 PSC scores (Table 2).

The following ICF categories had a strong correlation with the Barthel Index: b140 Attention functions, b144 Memory functions, b164 Higher-level cognitive functions, b172 Calculation functions, b176 Mental function of sequencing complex movements, b525 Defecation functions, b620 Urination functions, b710 Mobility of joint functions, b715 Stability of joint functions, b730 Muscle power functions, b740 Muscle endurance functions, b750 Motor reflex functions, b760 Control of voluntary movement functions, and b770 Gait pattern functions.

In addition, there was a strong correlation between the SF-36 PSC score and the following categories: b130 Energy and drive functions, b134 Sleep functions, b140 Attention functions, b144 Memory functions, b152 Emotional functions, b164 Higher-level cognitive functions, b172 Calculation functions, b176 Mental function of sequencing complex movements, b265 Touch function, b280 Sensation of pain, b620 Urination functions, b715 Stability of joint functions, b730 Muscle power functions, b740 Muscle endurance functions, and b770 Gait pattern functions.

**In the *body structures* component** all categories were reported to be a problem. Four of these categories were a problem in ≥ 80% of the patients, while cardiovascular category was identified as a problem by ±39% of the patients. In this component there was a significant correlation between four of the five categories (with the exception of the cardiovascular structure) and the Barthel Index and the SF-36 PSC score. Table 3 shows the correlations between the categories in the Comprehensive ICF Core Set for stroke and the outcome measurements.

**In the *activities and participation* component** 47 of the 51 categories were reported as a significant problem. Of all four components, problems occurred most frequently in the *activities and participation* category: i.e. (in ≥ 80% of the patients) in d155 Acquiring skills, d210 Undertaking a single task, d220 Undertaking multiple tasks, d230 Carrying out daily routine, d410 Changing basic body position, d415 Maintaining a body position, d420 Transferring oneself, d430 Lifting and carrying objects, d440 Fine hand use, d445 Hand and arm use, d450 Walking, d455 Moving around, d460 Moving around in different locations, d465 Moving around using equipment, d470 Using transportation, d475 Driving, d510 Washing oneself, d520 Caring for body parts, d530 Toileting, d540 Dressing, d550 Eating, d620 Acquisition of goods and services, d630 Preparing meals, d640 Doing housework, d860 Basic economic transactions, d870 Economic self-sufficiency, d910 Community life, and d920 Recreation and leisure.

In the *activities and participation* component there was a significant correlation between 32 categories and the Barthel İndex, and between 37 categories and the SF-36 (Table 4).

**In the *environmental factors* component** in at least 10% of the patients, 7 categories were identified as a barrier and 26 categories as a facilitator. The most commonly occurring facilitator categories were: e110 Products and substances for personal consumption, e115 Products and technology for personal use in daily living, e125 Products and technology for communication, e310 Immediate family, e355 Health professionals, e410 Individual attitudes of immediate family members, e450 Individual attitudes of health professionals, and e580 Health services, systems and policies.

The most frequent barriers in this category were: e135 Products and technology for employment, e150 Design, con-

**Table 2—** Correlations Between the Categories of the Component Body Functions in the Comprehensive ICF Core Set for Stroke and the Barthel Index, SF-36 And Disease-Specific Measurements.

| | | | SF-36 | | Brunnstrom | | | Ashworth | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Components** | **No. (%)** | **Barthel** | **PCS** | **MCS** | **UE** | **H** | **LE** | **UE** | **H** | **LE** |
| **Body Functions** | | | | | | | | | | |
| b110 Consciousness functions | 5 (5) | -0.18 | -0.21* | 0.04 | -0.16 | -0.14 | -0.18 | 0.01 | 0.01 | - 0.02 |
| b114 Orientation* | 2 (2) | -0.18 | -0.13 | -0.10 | -0.03 | -0.10 | -0.12 | -0.12 | -0.12 | - 0.12 |
| b117 Intellectual* | 9 (8.9) | -0.13 | -0.11 | -0.03 | -0.05 | -0.04 | -0.05 | -0.02 | -0.02 | 0.01 |
| b126 Temperament and personality* | 30 (29.7) | -0.20* | -0.24* | -0.53 | -0.017 | -0.22* | -0.10 | 0.02 | -0.02 | -0.07 |
| b130 Energy and drive* | 27 (26.7) | -0.24* | -0.33** | -0.03 | -0.29** | -0.29** | -0.16 | -0.01 | -0.01 | -0.02 |
| b134 Sleep* | 24 (23.8) | -0.24* | -0.29** | 0.10 | -0.21* | -0.21* | -0.16 | -0.01 | -0.01 | -0.07 |
| b140 Attention* | 45 (44.6) | -0.31** | -0.37** | 0.14 | -0.30** | -0.32** | -0.21* | -0.01 | -0.03 | -0.02 |
| b144 Memory* | 53 (52.5) | -0.36** | -0.34** | 0.04 | -0.23* | -0.25** | -0.24* | -0.10 | -0.14 | -0.09 |
| b152 Emotional* | 51 (50.5) | -0.23* | -0.27** | -0.06 | -0.32** | -0.33** | -0.18 | -0.06 | -0.09 | -0.15 |
| b156 Perceptual* | 6 (6) | -0.16 | -0.21* | -0.12 | -0.11 | -0.07 | -0.14 | -0.13 | -0.13 | - 0.06 |
| b164 Higher-level cognitive* | 43 (42.6) | -0.39** | -0.38** | 0.06 | -0.32** | -0.32** | -0.28** | | -0.03 | -0.03 |
| b167 Mental functions of language | 15 (14.9) | -0.13 | -0.14 | 0.18 | -0.19* | -0.19 | -0.15 | 0.10 | 0.10 | -0.11 |
| b172 Calculation* | 45 (44.6) | -0.33** | -0.34** | 0.05 | -0.26* | -0.21** | -0.23* | -0.13 | -0.14 | -0.12 |
| b176 Mental function of sequencing complex movements | 62 (61.5) | -0.34** | -0.26** | 0.06 | -0.32** | -0.32** | -0.22* | -0.05 | -0.07 | -0.03 |
| b180 Experience of self and time* | 6 (6) | -0.11 | -0.18 | -0.01 | -0.06 | -0.06 | -0.01 | -0.07 | -0.07 | -0.05 |
| b210 Seeing* | 11 (11) | -0.07 | -0.04 | 0.09 | -0.04 | -0.04 | -0.03 | -0.03 | -0.03 | -0.06 |
| b215 Functions of structures adjoining the eye | 4 (4) | -0.12 | -0.12 | -0.01 | -0.17 | -0.20* | -0.06 | -0.03 | -0.03 | 0.19 |
| b260 Proprioceptive* | 14 (14) | -0.09 | -0.13 | -0.02 | -0.15 | 0.11 | -0.24* | -0.07 | -0.05 | 0.01 |
| b265 Touch* | 8 (7.9) | -0.20* | -0.21** | -0.04 | -0.15 | -0.08 | -0.14 | -0.07 | -0.05 | 0.01 |
| b270 Sensory functions related to temperature and other stimuli | 2 (2) | -0.16 | -0.19* | 0.12 | -0.03 | -0.01 | -0.12 | -0.13 | -0.13 | -0.15 |
| b280 Sensation of pain | 60 (59.4) | -0.18 | -0.36** | 0.18 | -0.25** | -0.26** | -0.19 | -0.12 | -0.12 | -0.12 |
| b310 Voice* | 3 (3) | -0.11 | -0.04 | 0.10 | 0.13 | 0.18 | -0.20* | -0.04 | -0.05 | -0.01 |
| b320 Articulation* | 14 (13.9) | -0.17 | -0.02 | 0.16 | 0.37 | -0.02 | -0.01 | -0.07 | -0.07 | -0.08 |
| b330 Fluency and rhythm of speech* | 32 (31.7) | -0.02 | -0.04 | 0.14 | -0.04 | -0.08 | -0.02 | -0.02 | -0.02 | -0.05 |
| b410 Heart* | 20 (19.8) | -0.19* | -0.23* | 0.19 | -0.05 | -0.12 | -0.13 | -0.05 | -0.05 | -0.19 |
| b415 Blood vessel* | 22 (21.8) | -0.09 | -0.13 | 0.19 | -0.02 | -0.05 | -0.01 | 0.10 | 0.11 | 0.06 |
| b420 Blood pressure* | 59 (58.5) | -0.01 | -0.12 | 0.01 | -0.11 | -0.21* | -0.02 | -0.08 | -0.06 | -0.15 |
| b455 Exercise tolerance* | 28 (27.8) | -0.13 | -0.21* | 0.09 | -0.08 | -0.06 | -0.13 | 0,14 | 0.13 | 0.05 |
| b510 Ingestion* | 15 (14.9) | -0.24* | -0.11 | -0.12 | -0.20* | -0.11 | -0.20* | -0.04 | -0.04 | -0.03 |
| b525 Defecation* | 48 (47.5) | -0.49** | -0.18 | -0.14 | -0.33** | -0.28** | -0.31** | -0.05 | -0.06 | -0.06 |
| b620 Urination* | 47 (46.7) | -0.62** | -0.35** | -0.02 | -0.32** | -0.23* | -0.39** | -0.12 | -0.11 | -0.12 |
| b640 Sexual* | 44 (43.6) | -0.23* | -0.14 | -0.03 | 0.02 | -0.01 | -0.04 | -0.06 | -0.05 | 0.01 |
| b710 Mobility of joint* | 79 (78.2) | -0.35** | -0.21* | -0.12 | -0.40** | -0.39** | -0.32** | 0.08 | 0.09 | 0.11 |
| b715 Stability of joint* | 89 (88.2) | -0.42** | -0.29** | -0.17 | -0.44** | -0.42** | -0.36** | 0.11 | 0.13 | 0.16 |
| b730 Muscle power* | 98 (99.1) | -0.67** | -0.45** | -0.05 | -0.57** | -0.61** | -0.52** | 0.17 | 0.17 | 0.20* |
| b735 Muscle tone* | 47 (46.6) | -0.06 | -0.03 | 0.15 | -0.14 | -0.24** | -0.13 | 0.95** | 0.95** | 0.84** |
| b740 Muscle endurance* | 98 (99.1) | -0.51** | -0.26** | -0.07 | -0.42** | -0.46** | -0.41** | 0.19 | 0.18 | 0.20* |
| b750 Motor reflex* | 19 (18.8) | -0.26** | -0.20* | 0.07 | -0.29** | -0.27** | -0.31** | 0.14 | 0.13 | -0.05 |

*(Devam Ediyor)*

**Table 2—** Correlations Between the Categories of the Component Body Functions in the Comprehensive ICF Core Set for Stroke and the Barthel Index, SF-36 And Disease-Specific Measurements. *(Continued)*

| | | | SF-36 | | Brunnstrom | | | Ashworth | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Components** | **No. (%)** | **Barthel** | **PCS** | **MCS** | **UE** | **H** | **LE** | **UE** | **H** | **LE** |
| b755 Involuntary movement reaction* | 10 (10) | -0.17 | -0.07 | -0.04 | -0.08 | -0.14 | -0.14 | 0.20* | 0.18 | 0.21* |
| b760 Control of voluntary movement | 85 (84.2) | -0.43** | -0.18 | -0.09 | -0.32** | -0.32** | -0.25** | 0.03 | 0.03 | 0.05 |
| b770 Gait pattern* | 99 (98.1) | -0.67** | -0.43** | -0.09 | -0.50** | -0.47** | -0.56** | -0.01 | -0.01 | -0.01 |

*No. (%): number of patients reporting the impairment for the corresponding ICF category, *p<0.05, **p<0.01, PCS: Physical component summary, MCS: Mental component summary; UE: upper extremity, H: Hand, LE: lower extremity.

struction and building products and technology of buildings for public use, e210 Physical geography, e515 Architecture and construction services, systems and policies.

Two barriers (e150 and e210) and five facilitators (e115, e125, e515, e535, e580) showed a significant correlation with the Barthel Index and the SF-36, respectively. Table 5 shows the correlations between the ICF categories of *environmental factors* in the Comprehensive Core Set for stroke and outcome measurements.

## Discussion

This study in a Turkish stroke population shows that 32 of the 41 categories of *body functions*, all categories of *body structure,* and 47 of the 51 categories of *activities and participation* were experienced as a significant problem, and that 7 categories of *environmental factors* were identified as a barrier and 26 as a facilitator.

Among these patients, in the categories *body functions, body structures* and *activities and limitations*, most of the problematic categories had a significant correlation with the generic and disease-specific measures.

After stroke, limitations in mobility and voluntary movement are characteristics having a major negative effect on a patient's daily life. Also, walking ability is commonly impaired due to muscle weakness, disordered movement control and, in some individuals, elevated muscle tone or hypertonicity (1,2,10,11).

Accordingly, in the present study, it was expected that the most frequently reported impairments would be in chapter b7 Neuromusculoskeletal and movement-related functions. In nearly all stroke survivors, b770 Gait pattern functions, b730 Muscle power functions and b740 Muscle endurance functions were reported as a problem. In addition, ≥78% of these Turkish patients had impairments in b715 Stability of joint functions, b760 Control of voluntary movement functions, and b710 Mobility of joint functions.

From chapter 1 *mental functions*, the following *body functions* were reported as a problem in 40-60% of our patients: b140

**Table 3—** Correlations Between the Categories of the Component Body Structures in the Comprehensive ICF Core Set for Stroke and the Barthel Index, SF-36 and the Disease-Specific Measurements

| | | | SF-36 | | Brunnstrom | | | Ashworth | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Components** | **No. (%)** | **Barthel** | **PCS** | **MCS** | **UE** | **H** | **LE** | **UE** | **H** | **LE** |
| **Body Structures** | | | | | | | | | | |
| s110 Structure of brain | 82 (81.2) | -0.33** | -0.22* | -0.02 | -0.41** | -0.38** | -0.25** | 0.08 | 0.11 | 0.15 |
| s410 Structure of cardiovascular system | 40 (39.6) | -0.12 | -0.21* | 0.14 | -0.58** | -0.26** | -0.56** | -0.01 | -0.01 | -0.09 |
| s720 Structure of shoulder region | 86 (85) | -0.46** | -0.26** | -0.13 | -0.54** | -0.53** | -0.47** | 0.16 | 0.17 | 0.16 |
| s730 Structure of upper extremity | 97 (96) | -0.64** | -0.51** | -0.07 | -0.66** | -0.70** | -0.51** | 0.20* | 0.20* | 0.21* |
| s750 Structure of lower extremity | 98 (97) | -0.69** | -0.54** | -0.01 | -0.51** | -0.48** | -0.48** | 0.05 | 0.06 | 0.13 |

†No. (%): number of patients reporting the impairment for the corresponding ICF category
*P<0.05, **p<0.01, PCS: Physical component summary, MCS: Mental component summary; UE: upper extremity, H: Hand, LE: lower extremity,

**Table 4—** Correlations Between the Categories of the Component Activities and Participation in the Comprehensive ICF Core Set for Stroke and the Barthel Index, SF-36 and the Disease-Specific Measurements

| | | | SF-36 | | Brunnstrom | | | Ashworth | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Components** | **No. (%)** | **Barthel** | **PCS** | **MCS** | **UE** | **H** | **LE** | **UE** | **H** | **LE** |
| **Activities and participation** | | | | | | | | | | |
| d115 Listening | 9 (8.9) | -0.11 | 0.10 | 0.09 | 0.05 | 0.10 | 0.07 | -0.15 | -0.15 | -0.17 |
| d155 Acquiring skills | 97 (96.1) | -0.54** | -0.48** | -0.04 | -0.41** | -0.43** | -0.42** | 0.23 | 0.23 | 0.23 |
| d160 Focusing attention | 58 (57.5) | -0.41** | -0.33** | 0.04 | -0.27** | -0.24** | -0.25** | -0.09 | -0.12 | -0.08 |
| d166 Reading | 19 (18.9) | -0.14 | -0.23* | 0.05 | -0.01 | 0.03 | 0.06 | -0.11 | -0.10 | -0.08 |
| d170 Writing | 34 (33.6) | -0.07 | -0.14 | 0.07 | 0.10 | 0.14 | 0.15 | -0.20 | -0.19 | -0.19 |
| d172 Calculating | 59 (58.4) | -0.40** | -0.33** | -0.02 | -0.29** | -0.27** | -0.24** | -0.06 | -0.08 | -0.02 |
| d175 Solving Problems | 63 (62.4) | -0.38** | -0.34** | 0.11 | -0.30** | -0.34** | -0.24** | 0.02 | 0.01 | 0.01 |
| d210 Undertaking a single task | 94 (93.1) | -0.47** | -0.33** | 0.08 | -0.40** | -0.36** | -0.42** | 0.07 | 0.09 | 0.05 |
| d220 Undertaking multiple tasks | 96 (95.1) | -0.41** | -0.39** | -0.10 | -0.39** | -0.44** | -0.32** | 0.16 | 0.16 | 0.16 |
| d230 Carrying out daily routine | 100 (99.1) | -0.57** | -0.49** | -0.01 | -0.50** | -0.55** | -0.32** | 0.16 | 0.16 | 0.17 |
| d240 Handling stress and other psychological demands | 53 (52.5) | -0.11 | -0.14 | -0.05 | -0.19 | -0.20** | -0.11 | 0.08 | 0.04 | 0.01 |
| d310 Communicating with–receiving-spoken messages | 16 (15.9) | -0.01 | -0.02 | 0.15 | 0.01 | 0.02 | 0.01 | -0.13 | -0.13 | -0.11 |
| d315 Communicating with-receiving-non-verbal messages | 10 (10) | -0.17 | -0.21* | -0.69 | -0.12 | -0.04 | -0.02 | -0.15 | -0.15 | -0.13 |
| d325 Communicating with–receiving-written messages | 35 (34.7) | -0.06 | -0.11 | -0.10 | 0.09 | 0.12 | 0.17 | -0.15 | -0.15 | -0.15 |
| d330 Speaking | 16 (15.9) | -0.08 | -0.11 | 0.14 | -0.08 | -0.11 | -0.08 | 0.01 | 0.01 | 0.02 |
| d335 Producing non-verbal messages | 7 (79 | -0.10 | -0.07 | -0.03 | -0.13 | -0.05 | -0.07 | -0.13 | -0.13 | -0.12 |
| d345 Writing messages | 37 (36.7) | -0.06 | -0.11 | -0.11 | 0.10 | 0.16 | 0.15 | -0.20* | -0.20* | -0.19 |
| d350 Conversation | 12 (11.9) | -0.02 | -0.23* | 0.04 | -0.24** | -0.29** | -0.19 | 0.06 | 0.06 | 0.03 |
| d360 Using communication devices and techniques | 45 (44.6) | -0.37** | -0.42** | -0.01 | -0.35** | -0.32** | -0.27** | -0.03 | -0.04 | -0.07 |
| d410 Changing basic body position | 86 (85.1) | -0.58** | -0.38** | -0.19* | -0.41** | -0.41** | -0.46** | -0.01 | -0.01 | -0.07 |
| d415 Maintaining a body position | 94 (93) | -0.57** | -0.23* | -0.11 | -0.30** | -0.29** | -0.33** | -0.03 | -0.01 | -0.08 |
| d420 Transferring oneself | 96 (95.1) | -0.68** | -0.44** | -0.13 | -0.56** | -0.57** | -0.61** | 0.05 | 0.06 | 0.12 |
| d430 Lifting and carrying objects | 98 (97) | -0.60** | -0.47** | -0.01 | -0.60** | -0.63** | -0.51** | 0.12 | 0.12 | 0.12 |
| d440 Fine Hand Use | 99 (98.1) | -0.30** | -0.24** | -0.04 | -0.29** | -0.27** | -0.08 | 0.07 | 0.10 | 0.05 |
| d445 Hand and arm use | 100 (99.1) | -0.51** | -0.38** | 0.05 | -0.61** | -0.62** | -0.42** | 0.20* | 0.20* | 0.20* |
| d450 Walking | 100 (99.1) | -0.69** | -0.50** | -0.05 | -0.50** | -0.46** | -0.62** | 0.06 | 0.06 | 0.07 |
| d455 Moving around | 99 (98) | -0.71** | -0.57** | 0.01 | -0.55** | -0.53** | -0.58** | 0.18 | 0.19 | 0.17 |
| d460 Moving around in different locations | 100 (99.1) | -0.55** | -0.50** | 0.03 | -0.37** | -0.36** | -0.45** | 0.05 | 0.07 | 0.10 |
| d465 Moving around using equipment | 95 (94) | -0.67** | -0.50** | -0.16 | -0.56** | -0.53** | -0.60** | 0.10 | 0.10 | 0.12 |
| d470 Using transportation | 100 (99.1) | -0.32** | -0.20* | 0.09 | -0.15 | -0.18 | -0.22* | 0.13 | 0.13 | 0.14 |
| d475 Driving | 101(100) | -0.13 | -0.07 | 0.13 | -0.01 | -0.03 | -0.04 | 0.02 | 0.07 | 0.01 |
| d510 Washing oneself | 99 (98) | -0.57** | -0.34** | -0.10 | -0.50** | -0.54** | -0.38** | 0.14 | 0.14 | 0.23* |
| d520 Caring for body parts | 101(100) | -0.66** | -0.39** | -0.08 | -0.60** | -0.61** | -0.51** | 0.16 | 0.15 | 0.25** |
| d530 Toileting | 83 (82.2) | -0.60** | -0.33** | -0.01 | -0.42** | -0.46** | -0.43** | 0.13 | 0.13 | 0.18 |
| d540 Dressing | 95 (94) | -0.65** | -0.43** | -0.06 | -0.68** | -0.67** | -0.55** | 0.22* | 0.21* | 0.20* |

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**Table 4—** Correlations Between the Categories of the Component Activities and Participation in the Comprehensive ICF Core Set for Stroke and the Barthel Index, SF-36 and the Disease-Specific Measurements *(Continued)*

| | | | SF-36 | | Brunnstrom | | | Ashworth | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Components** | **No. (%)** | **Barthel** | **PCS** | **MCS** | **UE** | **H** | **LE** | **UE** | **H** | **LE** |
| d550 Eating | 66 (65.4) | -0.55** | -0.31** | -0.13 | -0.46** | -0.47** | -0.37** | 0.11 | 0.08 | 0.05 |
| d570 Looking after one's health | 54 (53.5) | -0.66** | -0.34** | -0.27** | -0.58** | -0.53** | -0.49** | 0.12 | 0.11 | 0.12 |
| d620 Acquisition of goods and services | 99 (98.1) | -0.51** | -0.36** | -0.05 | -0.43** | -0.45** | -0.38** | 0.22* | 0.22* | 0.23* |
| d630 Preparing meals | 99 (98.1) | -0.40** | -0.30** | -0.01 | -0.41** | -0.42** | -0.33** | 0.29** | 0.28** | 0.28** |
| d640 Doing housework | 100 (99.1) | -0.42** | -0.25** | -0.05 | -0.34** | -0.38** | -0.31** | 0.18 | 0.18 | 0.17 |
| d710 Basic interpersonal interactions | 18 (17.8) | -0.26** | -0.27** | -0.02 | -0.21** | -0.27** | -0.20** | 0.13 | 0.09 | 0.07 |
| d750 Informal social relationships | 24 (23.8) | -0.24* | -0.19 | -0.12 | -0.11 | -0.18 | -0.14 | 0.22* | 0.18 | 0.22* |
| d760 Family relationships | 4 (4) | -0.11 | -0.15 | -0.02 | -0.18 | -0.14 | -0.17 | 0.10 | 0.08 | 0.17 |
| d770 Intimate relationships | 16 (15.9) | -0.09 | -0.18 | -0.13 | -0.09 | -0.08 | -0.08 | -0.10 | -0.08 | -0.05 |
| d845 Acquiring, keeping and terminating a job | 11 (10.9) | -0.42 | -0.24* | 0.18 | -0.11 | -0.01 | -0.05 | -0.10 | -0.09 | -0.05 |
| d850 Remunerative employment | 10 (9.9) | -0.07 | -0.20 | 0.14 | -0.07 | -0.01 | -0.01 | -0.13 | -0.12 | -0.08 |
| d855 Non-remunerative employment | 10 (9.9) | -0.07 | 0.04 | 0.14 | -0.07 | -0.01 | -0.01 | -0.13 | -0.12 | -0.08 |
| d860 Basic economic transactions | 100 (99.1) | -0.04 | 0.14 | -0.18 | 0.09 | 0.01 | 0.05 | 0.01 | 0.01 | 0.01 |
| d870 Economic self-sufficiency | 100 (99.1) | -0.12 | 0.04 | -0.05 | 0.05 | 0.08 | 0.07 | 0.09 | 0.09 | 0.09 |
| d910 Community life | 97 (96.1) | -0.53** | -0.42** | -0.05 | -0.45** | -0.43** | -0.46** | 0.15 | 0.16 | 0.17 |
| d920 Recreation and leisure | 96 (95) | -0.46** | -0.44** | -0.15 | -0.50** | -0.52** | -0.48** | 0.13 | 0.14 | 0.13 |

†No. (%): number of patients reporting the impairment for the corresponding ICF category, *P<0.05, **p<0.01, PCS: Physical component summary, MCS: Mental component summary; UE: upper extremity, H: Hand, LE: lower extremity.

Attention functions, b144 Memory functions, b152 Emotional functions, b164 Higher level cognitive functions, b172 Calculation functions, and b176 Mental function of sequencing complex movements. These results are similar to those reported in the literature. Stroke is known to impair emotional intelligence and is associated with apathy, disinhibition and executive functioning (12). Focal brain lesions associated with a stroke frequently produce measurable impairments in higher mental function. Memory loss, neglect, constructional apraxia, poor attention, perceptual impairments and emotional lability may be observed in patients after stroke (1,2). Also, cognitive dysfunction and dementia are present in 16.8-31.8% of stroke patients and such disorders can range from slight memory impairment or temporal orientation impairment to irreversible dementia (13).

Improvement in a stroke patient's motor skills is often directly related to cognitive ability, such as better memory, thinking, reasoning, and planning/problem solving skills (14). Because cognitive and emotional impairments can influence the rehabilitation program and affect the performance of functional activities, it is important to use a guide that comprehensively assesses and describes these functions.

In ≥45% of our patients, b525 Defecation function and b620 Urination function were impaired. This finding is in accordance with many studies on the prevalence of impairments in stroke patients. Urinary incontinence and fecal incontinence is common after acute stroke: One study showed that 32-79% of patients after stroke experienced urinary incontinence on admission, reducing to 25-28% at discharge (15).

Regarding fecal incontinence, prevalences of 23-56% have been noted in acute patients after stroke, 11-21% after 3 months or at discharge, and 9-22% at 6 months (16,17). Because the presence of incontinence is a strong predictor of stroke functional outcome (18) this problem should also be addressed and corrected.

In 59.4% of this group of Turkish patients, b280 Sensation of pain was also identified as a problem: this finding is also reported in the literature.The prevalence of pain after stroke is reported to range from 19 to 74%.The prevalence of shoulder pain (a very common site of pain after stroke) ranges from 11-40% (19), and of central poststroke pain from 8-14% (20). In most cases, shoulder pain is moderate to severe and significantly limits acitivies of daily living (21).

**Table 5—** Correlations Between the Categories of the Component Environmental Factors in the Comprehensive ICF Core Set for Stroke and the Barthel Index, SF-36 and Disease-Specific Measurements

| | No. (%) | | | SF-36 | | Brunnstrom | | | Ashworth | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Components** | **B** | **F** | **Barthel** | **PCS** | **MCS** | **UE** | **H** | **LE** | **UE** | **H** | **LE** |
| **Environmental factors** | | | | | | | | | | | |
| e110 Products or substances for personal consumption | 0 (0) | 100 (99) | 0.14 | 0.14 | -0.06 | 0.12 | 0.08 | 0.20* | 0.07 | 0.04 | 0.11 |
| e115 Products and technology for personal use in daily living | 0 (0) | 95 (94.1) | 0.16 | 0.31** | -0.09 | 0.24* | 0.21* | 0.14 | 0.10 | 0.14 | 0.10 |
| e120 Products and technology for personal indoor and outdoor mobility and transportation | 14 (13.9) | 81 (80.2) | 0.15 | 0.11 | 0.21* | 0.14 | 0.16 | 0.10 | 0.18 | 0.20* | 0.16 |
| e125 Products and technology for communication | 0 (0) | 94 (93.2) | 0.12 | 0.29** | -0.02 | 0.20* | 0.18 | 0.17 | -0.05 | -0.04 | -0.10 |
| e135 Products and technology for employment | 94 (93) | 4 (4) | 0.02 | -0.08 | 0.12 | 0.04 | -0.01 | 0.03 | 0.06 | 0.04 | 0.10 |
| e150 Design, construction and building products and technology of buildings for public use | 94 (93) | 4 (4) | 0.24* | 0.07 | 0.14 | 0.21* | 0.24* | 0.19 | -0.05 | -0.05 | -0.06 |
| e155 Design, construction and building products and technology of buildings for private use | 0 (0) | 0 (0) | — | — | — | — | — | — | — | — | — |
| e165 Assets | 1 (1) | 86 (85.2) | 0.03 | 0.18 | -0.13 | 0.03 | 0.01 | 0.01 | -0.02 | -0.01 | 0.01 |
| e210 Physical geography | 99 (98.1) | 1 (1) | 0.48** | 0.17 | 0.16 | 0.40* | 0.44** | 0.43** | -0.17 | -0.17 | 0.19 |
| e310 Immediate family | 0 (0) | 97 (96.1) | -0.03 | 0.15 | -0.10 | -0.07 | -0.09 | -0.09 | 0.08 | 0.08 | 0.08 |
| e315 Extended family | 1 (1) | 73 (72.3) | -0.08 | 0.29 | 0.05 | 0.13 | -0.22* | -0.14 | 0.11 | 0.10 | 0.05 |
| e320 Friends | 0 (0) | 47 (46.6) | 0.05 | 0.03 | 0.01 | 0.06 | 0.16 | 0.10 | -0.06 | -0.06 | -0.07 |
| e325 Acquaintances, pers, collaques, neighbours and community members | 0 (0) | 42 (41.6) | 0.01 | 0.10 | -0.02 | 0.01 | -0.03 | 0.17 | -0.06 | -0.06 | -0.09 |
| e340 Personal care providers and personal assistants | 0 (0) | 13 (12.9) | -0.04 | 0.12 | -0.06 | 0.08 | -0.11 | -0.06 | -0.11 | -0.10 | -0.04 |
| e355 Health professionals | 0 (0) | 100 (99) | 0.13 | 0.06 | 0.02 | 0.13 | 0.10 | 0.10 | 0.09 | 0.11 | 0.01 |
| e360 Health-related professionals | 0 (0) | 86 (85.1) | -0.02 | 0.14 | -0.11 | 0.08 | 0.26 | -0.28 | 0.19 | 0.20* | 0.17 |
| e410 Individual attitudes of immediate family members | 2 (2) | 94 (93.2) | 0.01 | 0.14 | -0.08 | -0.01 | -0.04 | -0.06 | 0.07 | 0.07 | 0.14 |
| e420 Individual attitudes of friends | 0 (0) | 53 (52.5) | 0.03 | 0.04 | 0.01 | -0.01 | -0.03 | 0.06 | -0.07 | -0.05 | -0.10 |
| e425 Individual attitudes of acquaintaces, pers, colleagues, neighbours and community members | 0 (0) | 43 (42.6) | -0.03 | 0.04 | 0.01 | -0.01 | -0.03 | -0.03 | -0.04 | -0.05 | -0.06 |
| e440 Individual attitudes of personal care providers and personal assistants | 0 (0) | 13 (12.9) | -0.03 | 0.12 | -0.07 | -0.08 | -0.11 | -0.04 | -0.11 | -0.11 | -0.14 |
| e450 Individual attitudes of health professionals | 0 (0) | 100 (99) | 0.09 | 0.07 | 0.09 | 0.01 | -0.08 | -0.07 | 0.12 | 0.14 | 0.03 |
| e455 Individual attitudes of health-related professionals | 0 (0) | 86 (85.1) | 0.09 | 0.05 | -0.07 | -0.09 | -0.10 | -0.05 | 0.10 | 0.11 | 0.04 |

*(Devam Ediyor)*

**Table 5—** Correlations Between the Categories of the Component Environmental Factors in the Comprehensive ICF Core Set for Stroke and the Barthel Index, SF-36 and Disease-Specific Measurements *(Continued)*

| | No. (%) | | | SF-36 | | Brunnstrom | | | Ashworth | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Components** | **B** | **F** | **Barthel** | **PCS** | **MCS** | **UE** | **H** | **LE** | **UE** | **H** | **LE** |
| e460 Societal attitudes | 2 (2) | 75 (74.3) | -0.12 | 0.05 | 0.16 | -0.09 | -0.12 | 0.01 | 0.04 | 0.07 | 0.07 |
| e515 Architecture and construction services, systems and policies | 94 (92.1) | 3 (3) | 0.01 | 0.21* | 0.15 | 0.05 | 0.06 | -0.03 | -0.01 | -0.02 | -0.01 |
| e525 Housing services, systems and policies | – (–) | – (–) | — | – | – | – | – | – | – | – | – |
| e535 Communication services, systems and policies | 1 (1) | 65 ( 64.4) | 0.07 | 0.26** | 0.19 | 0.06 | 0.06 | 0.12 | -0.09 | -0.06 | -0.07 |
| e540 Transportation services, systems and policies | 61 (60.4) | 21 (20.8) | 0.02 | 0.02 | 0.13 | 0.09 | 0.06 | 0.16 | -0.06 | -0.05 | -0.13 |
| e550 Legal services, systems and policies | 20 (19.9) | 61 (60.4) | 0.08 | 0.16 | -0.10 | 0.06 | 0.03 | 0.11 | 0.03 | 0.04 | 0.02 |
| e555 Associations and organizational services, systems and policies | 0 (0) | 17 (16.9) | 0.08 | 0.10 | 0.12 | 0.26** | 0.25* | 0.16 | -0.04 | -0.04 | -0.01 |
| e570 Social security services, systems and policies | 5 (5) | 84 (83.2) | 0.01 | 0.18 | -0.02 | 0.08 | 0.03 | 0.03 | 0.14 | 0.14 | 0.13 |
| e575 General social support services, systems and policies | 2 (2) | 75 (74.3) | 0.15 | 0.19 | -0.02 | 0.07 | 0.07 | 0.05 | 0.03 | 0.05 | 0.07 |
| e580 Health services, systems and policies | 9 (9) | 91 (90.2) | 0.13 | 0.21* | -0.02 | 0.08 | 0.06 | 0.12 | 0.01 | 0.02 | 0.09 |
| e590 Labour and employment services, systems and policies | 2 (2) | 1 (1) | 0.04 | -0.06 | 0.13 | 0.03 | -0.01 | 0.11 | -0.01 | -0.01 | -0.04 |

†No. (%): number of patients reporting the barrier or facilitator for the corresponding ICF category, *p<0.05, **p<0.01, B: Barrier, F: Facilitator PCS: Physical component summary, MCS: Mental component summary , UE: upper extremity, H: Hand, LE: lower extremity.

The prevalence of pain after stroke decreases with time. It is reported that late pain after stroke is (on average) more severe and profoundly affects wellbeing and physical activity (22). Therefore, the evaluation and modification of pain must be an essential part of any motor rehabilitation program.

Consistent with the main organ systems involved after stroke, in ≥80% of our Turkish patients *Structure of brain* was reported as a problem. Cardiovascular diseases are the main risk factors for stroke and recurrent stroke (1,2). In most patients heart disease is often associated with cerebrovascular disease. *Structure of cardiovascular system* was reported as a problem in 39% of our patients.

Stroke can also affect many structures related to movement (shoulder, upper and lower extremities) (11,23,24); these items were also impaired in ≥ 85% of our patients.

In the *activities and participation component*, the main problem was seen in chapter d4 *mobility* (changing basic body position, maintaining a body position, transferring oneself, lifting and carrying objects, fine hand use, hand and arm use , walking, moving around, moving around in different locations, moving around using equipment, using transportation, d475 driving) and d5 self-care (washing oneself, caring for body parts, toileting, dressing, eating), which were reported by ≥82% of our participants. In the present study, limitations in mobility and in self-care emerged as the main problematic items for this group of patients.

Most stroke patients with significant neurologic impairment are dependent on basic activities such as bathing ,dressing, feeding, toileting, grooming, transfers and mobilizing (1,2,4,10,25).

Personal activities of daily living are a major component of treatment after stroke. Rehabilitation interventions have the greatest beneficial effect on personal care skills, mobility activities and ambulation. The level of dependence in such

activities is an important measure of the success of stroke rehabilitation and a commonly used outcome in stroke trials. Because stroke patients can achieve significant functional improvement from rehabilitation (1,2), these problems should be investigated and systematically identified. A reason why few of our patients reported problems in the family/intimate relationships categories is probably due to the strong family ties that are characteristic of Turkish culture.

In the present study, because the majority of patients are older and/or retired, the categories of driving, acquiring/keeping/terminating a job, and remunerative/non-remunerative employment may not be relevant.

In the environmental component, most of the categories of the *environmental factors* were reported by our patients as facilitators. The most frequent facilitators (specifed by ≥90% of the patients) were Products and substances for personal consumption, Products and technology for personal use in daily living, Products and technology for communication, Immediate family, Health professionals, Individual attitudes of immediate family members, Individual attitudes of Health professionals, and Health services, systems and policies.

The most frequently reported barriers were Products and technology for employment, Design, construction and building products and technology of buildings for public use, Physical geography, and Architecture and construction services, systems and policies. More than 90% of our patients identified these categories as barriers. Although it is rapidly developing, urban planning in Turkey is far from optimal for disabled people, especially in small cities, towns and villages. It is therefore understandable that the most frequently reported barriers are in these categories, as most of our patients live in smaller communities (where some are farmers).

No patient reported that any important area related to health and functioning was missing or absent in this Core Set.

In the present study, the *body functions, body structures* and *activities and participation* categories of ICF Comprehensive Core Set for stroke demonstrated good content validity and construct validity in Turkish patients with stroke. To our knowledge, this is the first study to quantitatively validate the ICF Comprehensive Core Set for Stroke.

The study shows that 22 of the 41 ICF categories of *body functions*, 4 of the 5 categories of *body structure*, and 32 categories of the 51 categories of *activities and participation* are significantly correlated with the Barthel Index. Also, 23 categories in the *body function* component, 4 categories in the *body structure* component and 37 categories in the *activities and participation* component are correlated with the SF-36 PCS score. These findings may imply that disease-specific and generic measures in rehabilitation medicine have value in order to assess and determine all aspects of disability and health in a stroke population.

Correlations between the categories in the *environmental factors* component with the Barthel Index and the SF-36 score were very low. This stresses the value of the *environmental factors* category in the ICF, which is one of the factors that cannot be evaluated by the traditional measures in rehabilitation medicine. Our results suggest that, in this Turkish stroke population, the ICF categories can measure all aspects of disability, functioning and health that cannot necessarily be determined by disease-specific and generic outcome measures.

The study has some methodological limitations. First, because we recruited the participants in a university/research rehabilitation hospital, our sample cannot be considered representative of the general Turkish population of patients with stroke. However, because our hospital is the largest rehabilitation hospital in Turkey (receiving patients from all over the country), we believe that the current sample is highly representative of the Turkish spectrum of the stroke population. Finally, there is some selection bias. Because it is difficult to elicit information from non-responsive patients, patients with an impaired level of consciousness and/or evidence of gross cognitive impairment were excluded; this may be another limitation regarding the generalizability of these results.

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