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Development of a Short Version of ICF Core Set for Stroke Adapted for Rehabilitation in Korea: a Preliminary Study

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HIGHLIGHTS

- This study demonstrated the Korean short version of the International Classification of Functioning, Disability, and Health (ICF) core set for stroke patients.
- Through this study, we know the differences of functioning and contextual factors in stroke between several countries.
- This short version of ICF core set for stroke patients could give you a universal frame to study stroke rehabilitation in Korea, especially in acute and subacute stage.

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Development of a Short Version of ICF Core Set for Stroke Adapted for Rehabilitation in Korea: a Preliminary Study

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ABSTRACT

This study aimed to develop a short version of the International Classification of Functioning, Disability, and Health (ICF) core set and verify functioning levels of patients for stroke rehabilitation in Korea. Using the Delphi technique, a 3-round consensus process was conducted. Thirty multidisciplinary rehabilitation experts from different hospitals completed the consensus study. The questionnaire for this study adopted the comprehensive ICF core set for stroke developed by the Geyh group. A 7-point Likert-type scale was used by participants to weigh the impact of each category on activities of daily living or rehabilitation after a stroke. The consensus of ratings was assessed with Spearman's rho and inter-quartile range indices. A core set to assess functioning levels of patients with stroke was developed from those categories. A short version of ICF core set to assess and verify functioning levels of patients with stroke was developed for 12 categories, including 3 categories (consciousness, muscle power, and attention) from body functions, 1 (structure of brain) from body structures, 5 (eating, walking, moving around, changing basic body position, and carrying out daily routine) from activities and participation, and 3 (individual attitudes of immediate family members, immediate family, and personal care providers/personal assistants) from environmental factors. This preliminary study developed a Delphi consensus process, gathering statistical evidence and expert commands based on the short version of ICF core set for rehabilitation of stroke patients in Korea.

Keywords: Stroke; ICF; Consensus; Rehabilitation; Korean

INTRODUCTION

Stroke is the cause of acquired disabilities in adults and a major public burden [1]. The prevalence of stroke is increasing gradually in Korea [2]. In Asian populations including Koreans, the average annual stroke incidence rate ranges from 185 to 638 per 100,000 people [3]. In addition, 50%–70% of patients have some functional impairments such as hemiplegia,

cognitive deficit, dysphagia, speech disorders, and pain that often restrict their activities of daily living (ADL) and interfere with social participation.

In 2001, the World Health Organization (WHO) announced a framework called the International Classification of Functioning, Disability, and Health (ICF) to document the functioning and disability of individuals in national or international populations [4]. The ICF frame provides a universal language to identify individual functioning and disability levels. It also can be used to compare international health-related data.

The concept of the ICF is based on a holistic framework involving interactions of body function, body structure, activity, and participation related to environmental and individual factors. As such, the ICF provides a scientific tool for collecting reliable statistics on functioning or disabilities of populations [5]. Many countries have developed and verified their own ICF core set for subjects with stroke [6-8]. However, we do not have an ICF core set for subjects with stroke, especially for stroke rehabilitation, in Korea. An operational definition of Korean short version of ICF core set is to develop a guideline for stroke disability assessment and for comprehensive stroke rehabilitation in the clinical field. Thus, the purpose of this study was to develop and verify a short version of ICF core set for stroke adapted for rehabilitation in Korea.

MATERIALS AND METHODS

A consensus process with 3 rounds of Delphi procedures was carried out with multidisciplinary stroke rehabilitation experts from May 1, 2019 to August 10, 2019. The mean ± standard deviation (SD) time period of these practices was 112.0 (15.1) days. Initially, 56 stroke rehabilitation experts were invited to participate in this study. Finally, 35 experts including 26 physiatrists, 2 physical therapists, 3 occupational therapists, and 4 social workers at 25 different university institutions participated in all 3 rounds. The same structured questionnaire was sent to all participants by e-mail. The initial list of items in Questionnaire 1 was comprised of 130 two-level categories from the comprehensive ICF core set for stroke developed by Geyh et al. [6]. These 130 categories included 41 items from body function components, 5 from body structure components, 51 from activities and participation components, and 33 from environmental factor components.

For the Delphi survey, all participants were asked to evaluate the importance of each item using a 7-point Likert-type scale. A score of 7 indicated that the item was extremely important to do ADL for stroke patients with disabilities. Scores of 6, 5, 4, 3, 2, and 1 represented very important, moderately important, neither important nor unimportant, slightly unimportant, low importance, and no importance, respectively. According to the general rule of the Delphi survey [9], a total of 3 Delphi processes were conducted. All participants were provided with information such as measurement of central tendency (mean and median scores) and level of dispersion (SD, interquartile range [IQR]) that was implemented just before Delphi survey. We used IQR values calculated based on the difference between the first (25th percentile) and the third (75th percentile) quartiles of experts' Likert scores. These procedures were repeated for all 3 rounds in this study. Generally, a level of good consensus between experts was indicated by an IQR below 1.0. Finally, the weight of each item was assessed by the mean score of experts.

With reference to results of round 1 questionnaire, all participants were required to rate each item in round II. Similarly, all participants were required to reevaluate their ratings for each item in round III by providing responses to round II questionnaire. Based on general Delphi survey analysis methods [10], content consistency rate of each item using IQR, Kendall's coefficient of concordance, and Spearman's rank correlation coefficient representing the level of consensus between participants, were also analyzed.

In the expert consensus meeting after each round of Delphi process, we had a plan to select items in 4 categories with IQR scores below 1 and Likert mean scores above 6 for a short version of ICF core set (short ICF core set) and Likert mean score above 5.5 for an extended version of ICF core set (extended ICF core set) for stroke rehabilitation simultaneously. Differences in Spearman's rho values and Kendall's coefficient of concordance for all experts between each pair of 3 Delphi rounds were evaluated using Statistical Package for Social Sciences (SPSS, ver. 21, Chicago, IL, USA). Differences were considered significant if p values were less than 0.05.

RESULTS

Response rates for each Delphi exercise in the first, second, and third Delphi rounds were 71.4%, 92.5%, and 94.5%, respectively. This indicated that 35 (62.5%) out of 56 experts responded in all 3 rounds (Fig. 1).

For total and 4 components of the ICF, all experts had mean Spearman's rho values and Kendall's tau_b values of 0.144 (p = 0.101) and 0.088 (p = 0.138) for the first Delphi round, 0.974 (p < 0.001) and 0.875 (p < 0.001) for the second round, and 0.990 (p < 0.001) and 0.926 (p < 0.001) for the third round, respectively. The correlation between the mean Spearman's rho and Kendall's coefficient of concordance (tau_b) for all experts for each pair of these 3 Delphi rounds was significant for all 4 components except in the first round (Table 1).

The number of categories that achieved good consensus increased from 30 in the first round to 98 in the third round when classified according to researchers' IQR standards (Fig. 1). These 98 categories with good consensus consisted of 34 categories for components of body functions, 4 for body structures, 37 for activities and participations, and 23 for environmental factors (Fig. 1). Of these 98 categories with a good consensus, a total of 12 categories had group mean scores ≥ 6.0, 25 categories had scores ≥ 5.5 but < 6.0, and 18 categories had scores ≥ 5.0 but < 5.5 on a 7-point Likert system, representing a short ICF core sets for stroke rehabilitation in Korea (Fig. 1).

This short ICF core set included 12 ICF second-level categories representing 9.2% of 130 comprehensive ICF core set for stroke developed by Geyh et al. [6] (Fig. 1). Among them, 3 categories were pertained to body function, one to body structure, 5 to activity and participation, and 3 to environmental components.

In accordance with experts' consensus opinion, a total of 32 categories (adding another 21 categories) with IQR of ≤ 1 and group mean scores of ≥ 5.5 but < 6.0 were added as an extended ICF core set in the same situation. Since the total number of categories in the short ICF core set in this study was a little bit small compared to those of brief ICF core sets in other researchers [6,8]. An extended ICF core set with the next ranking categories
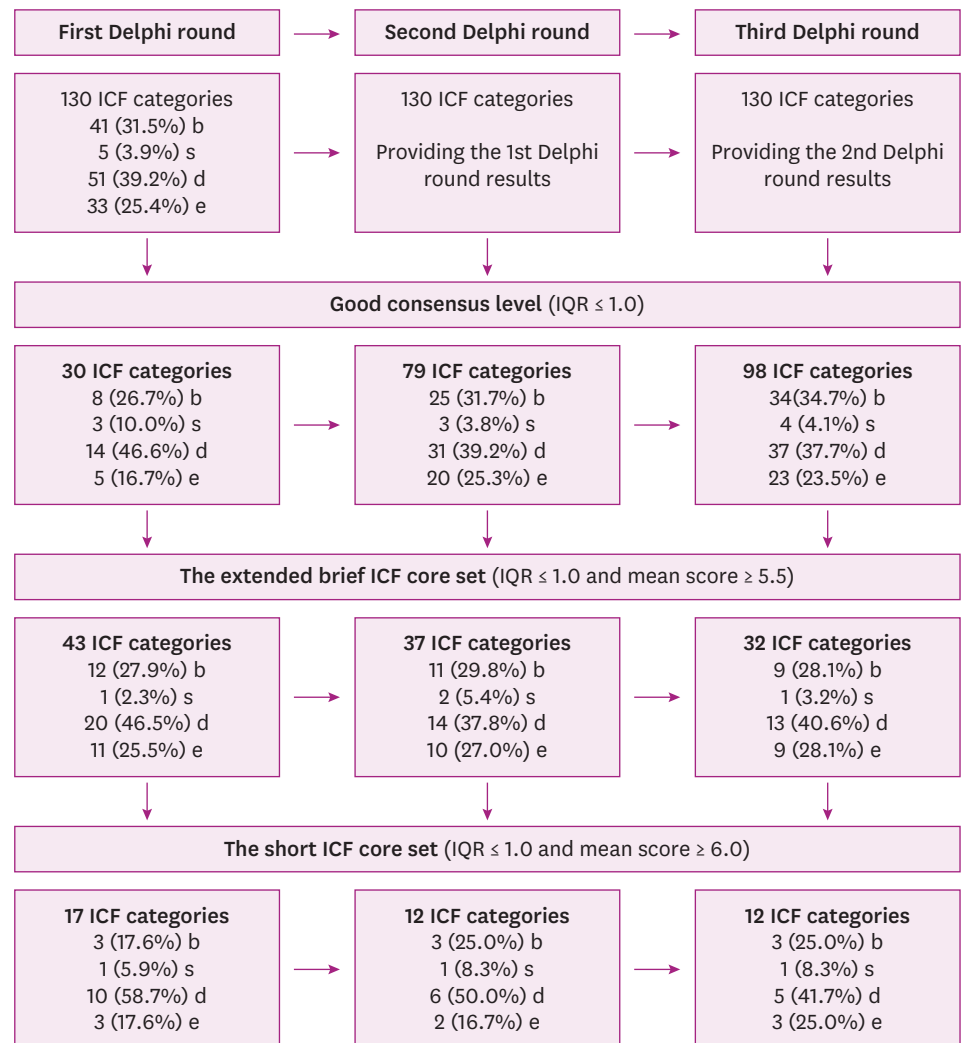
Fig. 1. The Delphi study process of the development of ICF brief core set for stroke patients rehabilitation. ICF, the International Classification of Functioning, Disability and Health; IQR, interquartile range; b, body function; s, body structure; d, activity and participation; e, environment.

statistically was additionally presented. This meant that a series of values with an IQR of ≤ 1 and mean scores of ≥ 5.5 but < 6.0 were used to create the extended version of ICF core set for stroke rehabilitation (Fig. 1). The short ICF core set for stroke rehabilitation consisted of categories verified in the third round of the Delphi study. These short and extended ICF core sets contained 12 and 32 second-level categories represented 9.2% and 24.6% of 130 original categories from the comprehensive ICF core set for stroke, respectively [6].

Of 12 categories finally selected in the short ICF core set for stroke rehabilitation, 3 categories in body function components were found: b110 consciousness, b730 muscle power function, and b140 attention function. The one category in the body structure was s110 structure of the brain (Table 2). Its activity and participation components included 5 categories: d550, eating; d450, walking; d455, moving around; d410, changing basic body position; and d230, carrying out daily routine (Table 3). Three categories in environment were e310, immediate family; e410, individual attitudes of immediate family members; and e340, personal care providers and personal assistants (Table 4).

Table 1. Correlation between each expert score and the group mean score in 3 Delphi survey

Components	The first round	The second round	The third round
All			
Kendall's tau_b	0.088	0.875	0.926
p value	0.138	< 0.001	< 0.001
Spearman's rho	0.144	0.974	0.990
p value	0.101	< 0.001	< 0.001
Body function			
Kendall's tau_b	0.054	0.860	0.955
p value	0.621	< 0.001	< 0.001
Spearman's rho	0.104	0.965	0.995
p value	0.519	< 0.001	< 0.001
Body structure			
Kendall's tau_b	0.200	0.800	1.000
p value	0.624	0.050	0.000
Spearman's rho	0.300	0.900	1.000
p value	0.624	0.037	0.000
Activity limitation			
Kendall's tau_b	0.167	0.909	0.924
p value	0.086	< 0.001	< 0.001
Spearman's rho	0.245	0.987	0.989
p value	0.084	< 0.001	< 0.001
Environment			
Kendall's tau_b	0.006	0.878	0.902
p value	0.963	< 0.001	< 0.001
Spearman's rho	0.027	0.972	0.983
p value	0.880	< 0.001	< 0.001

Table 2. The categories of the component body functions and body structures in the extended brief ICF core set for stroke including interquartile range > 1.0, and mean Likert score $\geq$ 5.5 over the 3 rounds of the Delphi study

ICF code	ICF categories	Round I	Round II	Round III
Components	Body functions and structure			
b110	Consciousness functions	6.80 ± 0.56	6.91 ± 0.28	**6.97 ± 0.16**
b730	Muscle power functions	6.03 ± 1.00	6.14 ± 0.88	**6.08 ± 1.06**
b140	Attention functions	5.90 ± 1.08	6.03 ± 0.57	**6.04 ± 0.81**
b144	Memory functions	5.70 ± 0.94	5.86 ± 0.73	5.76 ± 0.83
b760	Control of voluntary movement functions	5.75 ± 0.90	5.69 ± 0.83	5.70 ± 0.81
b114	Orientation functions	5.83 ± 0.98	5.77 ± 0.88	5.68 ± 0.85
b510	Ingestion function	5.60 ± 1.26	5.69 ± 0.93	5.62 ± 1.11
b164	Higher level cognitive functions	5.58 ± 0.84	5.54 ± 0.89	5.57 ± 0.77
b156	Perceptual functions	5.55 ± 0.90	5.54 ± 0.70	5.57 ± 0.69
s110	Structure of brain	6.90 ± 0.31	6.89 ± 0.46	**7.00 ± 0.00**

Data are shown as mean ± standard deviation. The bold values mean Likert score > 6.0 by 7.0 point.
ICF, the International Classification of Functioning, Disability, and Health.

Three ICF core sets were compared to the WHO brief ICF core set [6], the Taiwan ICF core set [8], and the authors' short ICF core set for stroke rehabilitation. Results are presented in Table 5. These main core sets of body function and body structure consisted of the same component (b110, consciousness and structure of the brain) in 3 different studies. However, activity/participation and environmental components for ICF core sets in 3 different countries were different. Main components of the ICF core set for activity/participation and environmental factors were d450 (walking) and e410 (individual attitudes of immediate family members) in the study of Geyh et al. [6]. However, d550 (eating) and e410 (individual attitudes of immediate family members) were found in the study of Chang et al. [8] and this study, respectively (Table 5).

Table 3. The categories of the component activity limitation in the extended brief ICF core set for stroke including interquartile range > 1.0, and mean Likert score ≥ 5.5 over the 3 rounds of the Delphi study

ICF code	ICF categories	Round I	Round II	Round III
Components	Activity and participation			
d550	Eating	6.43 ± 0.87	6.60 ± 0.69	**6.49 ± 0.93**
d450	Walking	6.38 ± 0.98	6.37 ± 1.03	**6.32 ± 0.88**
d455	Moving around	6.18 ± 0.84	6.20 ± 0.72	**6.14 ± 0.71**
d410	Changing basic body position	6.18 ± 0.96	6.17 ± 0.95	**6.14 ± 0.86**
d230	Carrying out daily routine	6.08 ± 0.94	6.14 ± 0.73	**6.03 ± 0.73**
d530	Toileting	6.13 ± 1.11	6.14 ± 0.69	5.92 ± 0.89
d330	Speaking	5.95 ± 1.01	5.77 ± 0.91	5.89 ± 0.84
d415	Maintaining a body position	6.08 ± 1.07	5.80 ± 0.96	5.81 ± 1.02
d160	Focusing attention	6.08 ± 0.97	5.77 ± 1.03	5.84 ± 1.09
d310	Communicating with–receiving–spoken messages	5.70 ± 0.94	5.71 ± 0.79	5.65 ± 0.68
d350	Conversation	5.70 ± 1.11	5.80 ± 0.76	5.62 ± 1.16
d460	Moving around in different locations	5.85 ± 0.92	5.51 ± 0.82	5.51 ± 0.80
d115	Listening	5.38 ± 1.35	5.49 ± 0.61	5.51 ± 0.69

Data are shown as mean ± standard deviation. The bold values mean Likert score > 6.0 by 7.0 point.
ICF, the International Classification of Functioning, Disability, and Health.

Table 4. The categories of the component environment in the extended brief ICF core set for stroke including interquartile range > 1.0, and mean Likert score ≥ 5.5 over the 3 rounds of the Delphi study

ICF code	ICF categories	Round I	Round II	Round III
Components	Environment			
e410	Individual attitudes of immediate family members	6.28 ± 0.99	6.63 ± 0.60	**6.46 ± 0.84**
e310	Immediate family	6.28 ± 1.09	6.54 ± 0.82	**6.41 ± 1.01**
e340	Personal care providers and personal assistants	5.88 ± 1.32	5.97 ± 0.79	**6.00 ± 1.11**
e440	Individual attitudes of personal care providers & personal assistants	5.80 ± 1.11	5.80 ± 1.02	5.76 ± 0.89
e580	Health services, systems and policies	5.65 ± 1.27	5.71 ± 0.83	5.73 ± 1.10
e570	Social security services, systems & policies	5.53 ± 1.40	5.60 ± 1.03	5.73 ± 1.19
e120	Products and technology for personal indoor and outdoor mobility and transportation	5.83 ± 1.01	5.71 ± 0.79	5.70 ± 0.88
e450	Individual attitudes of health professionals	5.60 ± 1.08	5.51 ± 0.78	5.65 ± 0.82
e355	Health professionals	5.65 ± 1.03	5.63 ± 0.77	5.51 ± 0.87

Data are shown as mean ± standard deviation. The bold values mean Likert score > 6.0 by 7.0 point.
ICF, the International Classification of Functioning, Disability, and Health.

DISCUSSION

This study was conducted through 3 rounds of Delphi surveys with a multidisciplinary stroke rehabilitation panel and expert consensus meeting to develop a short version of ICF core set for stroke rehabilitation in Korea. Delphi panels consisted of a multidisciplinary team including physiatrists, physical therapists, occupational therapists, and social workers working in university hospitals' stroke rehabilitation units. Therefore, we expected to overcome the disease perspective of acute stroke and choose categories that could emphasize functioning levels of subacute stroke patients with disabilities. As a rule, termination criterion for consensus in the Delphi study was achieved with a strong consensus level, with a Spearman's rho value of ≥ 0.6 and Kendall's coefficient of concordance ≥ 0.7 [10]. In our study, we had a very strong consensus level, with a Spearman's rho value of 0.990 and Kendall's coefficient of concordance of 0.926 in the final round. We also measured a range of 7-point Likert scales graded using high levels of mean value ≥ 6.0. We also gathered components if the IQR of panels' score was ≤ 1. Results showed well controlled levels of dispersion among panels' rating scores.

Table 5. Comparison of 3 different ICF brief core sets among WHO ICF groups, Taiwan and Korean version

ICF components	WHO (Geyh et al. [6])			Taiwan (Chang et al. [8])			Korea (current study)		
	ICF code	ICF categories	%	ICF code	ICF categories	Likert scale	ICF code	ICF categories	Likert scale
Body function	b110	Consciousness functions	100	b110	Consciousness functions	5.0	b110	Consciousness functions	6.97
	b114	Orientation functions	86	b114	Orientation functions	4.6	b730	Muscle power functions	6.08
	b730	Muscle power functions	82	b770	Gait pattern functions	4.5	b140	Attention functions	6.04
	b167	Mental functions of language	75	b210	Seeing functions	4.5			
	b140	Attention functions	50	b730	Muscle power functions	4.5			
Body structure	s110	Structure of brain	100	s110	Structure of brain	5.0	s110	Structure of brain	7.00
Activity & participation	d450	Walking	100	d550	Eating	5.0	d550	Eating	6.49
	d330	Speaking	100	d420	Transferring oneself	4.9	d450	Walking	6.32
	d530	Toileting	93	d330	Speaking	4.8	d465	Moving around	6.14
	d550	Eating	68	d440	Fine hand use	4.8	d410	Changing basic body position	6.14
				d445	Hand & arm use	4.8	d530	Carrying out daily routine	6.03
				d530	Toileting	4.8			
				d560	Drinking	4.8			
				d450	Walking	4.7			
				d310	Communicating with-receiving-spoken massage	4.7			
				d410	Changing basic body position	4.6			
				d540	Dressing	4.5			
Environment	e310	Immediate family	93	e410	Individual attitudes of immediate family members	4.7	e410	Individual attitudes of immediate family members	6.46
				e580	Health services, systems and policies	4.6	e310	Immediate family	6.41
				e310	Immediate family	4.5	e340	Personal care providers and personal assistants	6.00

The selected each brief ICF core set components were expressed with ≥ 50% in WHO [6], with ≥ 4.5 by 5.0 point Likert scale in Taiwan [8], and with ≥ 6.0 by 7.0 point Likert scale in Korean.
ICF, the International Classification of Functioning, Disability, and Health; WHO, World Health Organization.

A total of 12 second-level ICF categories were identified through these processes. They were selected from 130 categories in the ICF comprehensive core set for stroke developed by Geyh et al. [6]. These consisted of 3 categories from body functions, one from body structures, 5 from activities and participation, and 3 from environmental factors for the short ICF core set for stroke rehabilitation in Korea. Twelve categories for the short ICF core set developed by authors might seem to be too small compared to previous studies such as the study by Geyh et al. [6] or Chang et al. [8]. Therefore, in the consensus meeting of experts, we decided to include an extended ICF core set for more information about stroke rehabilitation, adding another 21 categories.

For stroke rehabilitation, selected categories on body function areas were very important due to the effect of stroke on health functions including consciousness, muscle power functions, and attention, similar to previous studies [6,7]. In contrast, of all nervous system structures, the structure of the brain was the only body structure component identified, showing 100% agreement (mean value 7.0). Changes in body function and structure, namely impairment, are important to stroke experts because these are closely related to the loss of function or ADL. Restoration of body function and/or structural changes is the purpose of stroke rehabilitation.

From the perspective of stroke patients, activities and participation in ICF components for stroke rehabilitation are also the most relevant categories. There are representatives of older concepts of disabilities and handicaps that affect real-life situations at home and work.

Of all components for activity and participation, eating function was perceived as the most important domain as well as walking, moving around, changing basic positions, and carrying

out daily routines. These results are reasonable because eating and walking are the most essential functions for humans to maintain life. For environmental factors, 3 domains were selected, individual attitudes of immediate family members, immediate family and personal care providers, and personal assistants rather than healthcare services, systems, and policies.

Table 5 shows comparison of several ICF core sets in 3 different countries, Switzerland (Europe), Taiwan (Asia), and Korea. Of all ICF components, domains selected that showed associations with body function and body structure were similar in these 3 countries. This means that impairments caused by body function and/or structural changes are universal in stroke rehabilitation. However, domains selected from activity/participation and environmental factors were somewhat similar. They showed differences among the 3 countries. In Korean and Taiwan studies [8], eating was the most important category in activity/participation components. However, it was walking or speaking in the Swiss study. For environmental factors, individual attitudes of immediate family members were the most important domain in Korea and Taiwan. However, immediate family was the most important one in the Swiss study. Secondly, selected domains were different among the 3 countries (toileting in the Swiss study, transferring oneself in the Taiwan study, and walking in the Korean study). These differences were interesting. They might involve many factors. First of all, Korea and Taiwan have similar oriental cultural backgrounds. Second, there were some differences in national health systems and social security systems. Presumably, Switzerland has well-organized medical, Medicare, and health politics. Thus, Swiss citizens do not worry about the medical system or the quality of caregivers for persons with disabilities. The existence of an immediate family may be important. However, Korea and Taiwan seem to be in the process of establishing a national medical/rehabilitation system and nursing system to manage patients with strokes. Therefore, they seem to rely heavily on the ability of immediate family members because the government does not fully guarantee their care.

This study has some limitations. First, we used the comprehensive ICF core set developed by Geyh et al. [6], which had 130 well-organized domains. It was a representative study for the WHO ICF core set [6]. However, developing and adding domains might be necessary for Korean circumstances. Second, although the purpose of this study was to develop a short version of ICF core set for stroke rehabilitation in Korea, we only invited experts working in the field of stroke rehabilitation without including neurologists, neurosurgeons, nurses, or clinical psychologists. Third, all invited stoke rehabilitation panel members were working in university-level hospitals for acute or subacute stroke rehabilitation. Therefore, this work might have limitations in applying results to rehabilitation of chronic stroke patients [11]. Fourth, a feasibility study for each category of 4 components in this short ICF core set extracted by Delphi process should be conducted.

In the meantime, many studies have been conducted for each segmented area such as pathophysiology, impairment, disability, environment, and policy of stroke. Using the brief ICF core set, a comprehensive and multidisciplinary study that links diseases, impairment, activity limitation, participation restriction, and environment needs to be conducted in the future.

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