

Progressive intervention strategy for the gait of sub-acute stroke patient using the International Classification of Functioning, Disability, and Health tool

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Abstract.

BACKGROUND: The International Classification of Functioning, Disability, and Health (ICF) provides models for functions and disabilities. The ICF is presented as a frame that enables organizing physical therapists' clinical practice for application.

OBJECTIVE: The purpose of the present study was to describe processes through which stroke patients are assessed and treated based on the ICF model.

METHODS: The patient was a 65-year-old female diagnosed with right cerebral artery infarction with left hemiparesis. Progressive interventions were applied, such as those aiming at sitting and standing for the first two weeks, gait intervention for the third and fourth weeks, and those aiming at sitting from a standing position for the fifth and sixth weeks.

RESULTS: The ICF model provides rehabilitation experts with a frame that enables them to accurately identify and understand their patients' problems. The ICF model helps the experts understand not only their patients' body structure, function, activity, and participation, but also their problems related to personal and environmental factors.

CONCLUSIONS: The experts could efficiently make decisions and provide optimum treatment at clinics using the ICF model.

Keywords: Stroke, ICF model, progressive intervention, case study

1. Introduction

Physical therapists make great efforts to maximize their patients' functional and motor abilities at clinics. Physical therapists should not only collect and analyze pieces of information related to identifying their

patients' problems, but also make decisions on what problems they should solve and how to solve them to plan the most effective intervention. Therefore, the therapists' decision-making ability about evaluation and intervention is the most important attribute that affects intervention results. Decision making means the critical thinking necessary for therapists to provide the most effective intervention and problem-solving processes (Wainwright, Shepard Harman, & Stephens, 2011). Therefore, the treatment and intervention in physical therapy are problem-solving processes and not acts of applying treatment meth-

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41 ods known by therapists. Clinical reasoning processes
42 are necessary for therapists to make wise decisions in
43 these processes.

44 Clinical reasoning is clinical practice related to
45 therapists' thinking and decision-making that enable
46 them to perform the wisest acts (Jones & Rivett,
47 2004). Clinical reasoning processes enable therapists
48 to prepare problem lists, decide problem priorities,
49 and set meaningful goals and purposes to pro-
50 vide the most efficient intervention. A conceptual
51 framework is necessary as a logical tool to imple-
52 ment clinical practices concretely and systematically.
53 The conceptual framework provides therapists with
54 guidelines on how to proceed with interventions at
55 clinics and is composed of practice and disability
56 models, hypothesis-oriented clinical practices, and
57 motor control theories (Shumway-Cook & Woolla-
58 cott, 2007). The World Health Organization presented
59 the International Classification of Functioning, Dis-
60 ability, and Health (ICF) to describe health-related
61 conditions (WHO, 2001). The ICF has been recently
62 reported as being applicable as a framework to
63 direct and organize treatments of patients and clients
64 (Coffin-Zadai, 2007; Jette, 2006). In addition, the
65 ICF well integrated evidence-based principles of
66 practices, multidisciplinary circulation, and other
67 models such as clinical reasoning models (Run-
68 dell, Davenport, & Wagner, 2009). This means that
69 the ICF is used as a useful tool at clinics. The
70 present study describes intervention strategies for
71 gaits of patients with sub-acute stroke using the
72 tool ICF.

73 Stroke patients' gait difficulties appear as dif-
74 ficulties in balance and postural control due to
75 damage to the central nervous system and dis-
76 abilities in symmetrical motor control (Dijkerman,
77 Letswaart, Johnston, & MacWalter, 2004). Two thirds
78 of stroke survivors have gait disabilities, and the most
79 common gait characteristics compared with normal
80 persons are decreased gait velocity and stride lengths
81 and asymmetry between the two lower extremities
82 (Shaughnessy, Michael, Sorkin, & Macko, 2005;
83 Brunt, Vander Linden, & Behrman, 1995; Roerdink
84 et al., 2007). In addition, compensatory acts of the
85 non-paretic side that tended to compensate inade-
86 quate paretic extremity motor control are mainly
87 observed (Brunt, Vander Linden, & Behrman, 1995;
88 Bensoussan, Mesure, Viton, & Delarque, 2006). The
89 consequent abnormal gaits show adverse effects on
90 stroke patients' ability to perform independent daily
91 living activities and the prognosis (Barbeau & Vis-
92 intin, 2003; Hesse, Schroeder, Heller & Kroll, 2000).

93 Therefore, stroke patients' independent gait ability is
94 one of factors that are considered most intensively in
95 functional recovery (Mauritz, 2002).

96 The ICF is a tool that can help therapists not
97 only to understand information on patients' health
98 and health-related conditions and assess patients'
99 functional problems, but also to provide interven-
100 tions at clinics that can be effectively used in
101 clinical-reasoning processes. However, most thera-
102 pists not only do not comprehend patients' problems
103 using standardized term at clinics, but also do not
104 prepare intervention strategies necessary for prob-
105 lem solving. Therefore, the purpose of the present
106 study is to present processes to examine and assess
107 patients' functional problems, measure the results
108 using the ICF tool, and prepare intervention strate-
109 gies, thereby contributing to future changes in clinical
110 practices.

111 2. Case description

112 The patient was a 65-year-old female who was a
113 full-time homemaker. Her height and weight were
114 167 cm and 67 kg, respectively. She was diagnosed
115 with right lower cerebral artery infarction and showed
116 left hemiparesis. She directly came to the hospital
117 acute care. She was showing general muscle weak-
118 ness since the onset of stroke five months prior. She
119 was being treated at the rehabilitation center of W
120 University Hospital as an inpatient and had no par-
121 ticular past medical history. She was taken care of
122 by a caregiver in the morning and by her husband
123 and son in the afternoon during her hospital stay. The
124 husband came only during afternoons because he was
125 working, and sometimes her son, who was a univer-
126 sity student, came to care for her. As for the patient's
127 demands and perspective, the patient said, "I want to
128 recover as soon as possible and cook and do house-
129 keeping work at my home" and advised that she was
130 performing self-exercise for at least two hours per
131 day together with the caregiver to improve her sit-
132 uation. She was highly adaptable to treatment and
133 performed all tasks related to self-exercise given to
134 her. The goal that she wanted to achieve the most was
135 "walking without being helped," and she said that she
136 felt the best when she was walking. As for the sup-
137 port and attitudes of the patient's family members,
138 their economic level had a positive effect on reha-
139 bilitation processes, support was active, and family
140 relations were harmonious. The patient was taking
141 drugs for depression, liver, intestine, and urogenital

Medical diagnosis : Stroke		
Patient's perspective	I can not sleep in peace. I do not have strength in the left limbs. I do not feel my left arm and leg. I have a pain in joints.	I want to recover as soon as possible and cook and do housekeeping work at my home. I want to walk without being helped. I want to independently stand up.
	Body Function & Structure	Activities Participation
Health professional's perspective	b134.2 Sleep function b260.1 Proprioceptive function b28016.2 Pain in joints b4200.1 Increased blood pressure b4550.1 General physical endurance b7302.3 Power of muscles of one side of the body (left) b740.2 Muscle endurance functions b7603.3 Supportive functions of leg b770.2 Gait Pattern functions s110.291 Structure of brain	d1.00 Learning and applying knowledge d2.33 General tasks and demands d3.00 Communication d4101.33 Squatting d4103.23 Sitting d4104.22 Standing d4105.44 Bending d4106.12 Shifting the body's center of gravity (to left) d420. 23 Transferring oneself d4500.23 Walking short distance d4501.44 Walking long distance d4502.33 Walking on different surfaces d4503.33 Walking around obstacles d4551.34 Climbing d4552.44 Running d460.33 Moving around in different locations
	Personal Factors	Contextual Factors Environmental Factors
	e310.+3 Immediate family	Mind full of will

Fig. 1. ICF assessment sheet.

organ diseases. This study received approval from the Yonsei University Wonju Institutional Review Board and the study obeys the relevant regulations including Bioethics and Safety Act (Registration number: 1041849-201604-BM-019-02).

3. Clinical Impression

The patient's detailed information was classified using an ICF model (Fig. 1). Physical function and structural disabilities and participation restriction in activities were recorded, and the correlations among individual factors were calculated.

4. Examination

Diverse assessment tools were used to objectively assess the information on the subject using the ICF model.

1) Measurement of difficulties and confidence

The patient's difficulties and confidence were measured using the outpatient physical therapy improvement in movement assessment log (OPTIMAL), and based on the results, the degrees of difficulties and the confidence were 96 and 108 points, respectively (Guccione et al., 2005). The assessment was conducted by interviewing the patient. Higher scores indicate lower degrees of difficulties and confidence felt by the patient, and lower scores indicate higher degrees of difficulties and confidence in performing actions.

2) Balance ability test

Balance ability tests were conducted using a balance ability motor treatment system (TETRAX, Sunlight Medical Ltd, Israel) and the Berg balance scale. The fall index of TETRAX is distributed between 0 and 100 points, and higher scores indicate higher fall incidence rates (low fall risk, 0–35; moderate fall risk, 36–57; high fall risk, 58–100) (Akkaya et al., 2015). The patient showed a fall risk score of 100 points at the initial assessment. The sensitivity and specificity of fall risks were .76 and .60, respectively

(Laufer, Sivan, Schwarzmann, & Sprecher, 2003). The Berg balance scale gives individual item scores ranging from 0 to 4 points. The total score is 56 points, and higher scores indicate better balance ability (Berg, Wood-Dauphinee, & Williams, 1995). Points 0–20, 21–40, and 41–56 indicate high, moderate, and low fall risks, respectively. The subject showed high fall risks with a score of 17 points at the beginning (Badke, Shea, Miedaner, & Grove, 2004).

3) Gait ability test

The subject's gait ability was assessed using the 10-m walk test (Dean, Richards, & Malouin, 2001). The 10-m walk test was composed of a 14-m gait path made by connecting two points linearly using two 10-cm-wide tapes. Marked lines were made at points 2 m away medially from the two ends of the 14-m gait path. The 2-m distance at the beginning and end was set for acceleration and deceleration, and the walking time for 10 m in the middle of the gait path was measured using a stopwatch and used as a measurement variable for functional gaits.

5. Application of the ICF Model

1) Comprehending functional problems

To collect the patient's functional problems, the patient's ability and performance capability were comprehended during activities and in the area of participation using ICF core set, and environmental and personal factors that affected the ability and performance capability were codified using the ICF, and the correlations between the factors were comprehended.

(1) Limited activities and restrictions on participation

- The patient had no limitation or restriction in the areas of learning or knowledge application (d1.00).
- he patient had serious restrictions on performance and ability in the areas of general duties and demands (d2.33).
- The patient had no limitation or restriction in the area of communication (d3.00).
- The patient could not take a squatting position (d4101.33).
- The patient could not sit and stand up (d4103.23).
- The patient had difficulties in standing (d4104.22).

- The patient had difficulties in bending (d4105.44).
- The patient could not shift her weight (d4106.12). –The patient could not move from her wheelchair to a mat (d420.23).
- Although she could not independently walk, she could walk with the assistance of a walker and being assisted (d4500.23).
- She could not walk a long distance (d4501.44).
- She had difficulties in walking on uneven grounds (d4502.33).
- She had difficulties in walking around a barrier (d4503.33).
- She had difficulties in ascending (d4551.34).
- She could not run (d4552.44).
- She could not move to a different place (d460.33).

(2) Environmental and personal factors

As for environmental factors, the patient was being actively supported by her family members (e310.+3). In addition, as for personal factors, she actively participated in treatment and wanted to return to society as soon as possible with her mind full of will.

2) Decision-making process

(1) Patient's demands and selection of priorities of problem solving

The patient reported, "I want to recover as soon as possible and cook and do housekeeping work at my home" and said that she should be able to walk fast. Among others, she wanted to walk without assistance. Based on these patient demands, a problem to be solved was independent gait with agreement from the patient. In addition, short-term problems to be solved for independent gait were forward weight shifts, independent sitting and standing, and independent walking with the assistance of a walker.

(2) Preparation of a problem list and priority selection

A list of problems to be solved related to the long-term goal "independent gait" was prepared, and information from the ICF assessment sheet and videos from patient's movements were observed and analyzed to determine priorities. The list of problems related to independent gait included the inability to sit and stand, to walk independently, and to sit safely on a chair, and their priorities and whether related tasks were performed were comprehended. Based on the results, the first, second, and third priorities were the inability to sit and stand up, walk independently, and sit safely on a chair, respectively, and no tasks related to the items could be performed.

(3) Goal setting

Goals were set to solve the long-term and related short-term problems agreed with the patient. The goals were set before the commencement of interventions for individual short-term problems through agreement with the patient. Problems that were judged as solvable in a short period were selected based on the prepared problem list to achieve the short-term goals agreed with the patient in setting the detailed goals and purposes as follows.

To achieve the first goal of “independent sitting to standing”, a detailed goal was set as “when trying to stand up, bend the upper body forward so that the hip can be lifted from the chair,” and related purposes were set as “bring the feet backward,” “bend the trunk forward stably,” and “shift the weight forward.”

To achieve the second goal of “making independent gait possible”, a detailed goal was set as “walk without assistance,” and related purposes were set as “thrust forward during walking,” “shift the weight toward the affected side,” and “improve the balance ability.”

To achieve the third goal of “sitting on a chair independently,” a detailed goal was set as “sit safely on a chair independently,” and related purposes were set as “increase the ability to control the lower extremities and muscle strength” and “improve the balance ability”.

(4) Hypothesis setting

Based on the problem-centered learning method for achievement of the set goals, the problems that would be subjected to interventions were recorded. In addition, knowledge related to the comprehended information was obtained first through many studies

and books, and hypotheses were set thereafter. The problem-based learning processes were implemented three times based on the short-term goals set to achieve the long-term goals. The set hypotheses were detailed intervention methods based on individual detailed goals, considering correlations and the possibility to solve problems (Tables 1–3).

6. Intervention

Interventions were progressively applied for sitting to standing, gait, and sitting, considering the relationships of the set goals. The interventions for sitting and standing, gait, and sitting were not applied one by one, but another intervention was added when one intervention was being implemented according to the degree of improvement of the patient’s functions. The overall exercises applied were task-oriented approach-based treatments and treatments obtained through therapists’ experiences. When the patient felt severe fatigue, rests were given between different exercises. Attention was paid during exercises not to cause pain or danger. The intervention methods implemented in the present study are presented in Tables 1–3. We developed new problem-based learning notes for intervention of physical therapy based on Hmelo-Silver (2004)’s study. The facts column provides information that the physical therapists gathered from the patient such as functional movement and posture. The hypothesis column provides information, wherein the physical therapists place their questions for solving problems in different ways. The intervention column keeps track of plans

Table 1
Problem-based learning: Sitting to standing

Fact	Hypothesis	Intervention	Need to know
1. Cannot bring the feet sufficiently backward	1. The feet cannot be brought backward due to calf stiffness	1. Passive stretching using an edge board and patient’s active stretching	To perform sitting to standing, the subject should be able to bring the feet backward. In addition, the anterior tibialis and the hamstring should enable 75° dorsiflexion and backward movement of the ankle.
2. Cannot extend the body to bend the trunk forward	1. Weakening of the hip flexor and the ankle dorsiflexor strength 2. Trunk muscle weakening	1. Shifting the weight forward to pick up balls from the floor 2. Ball giving and receiving training	The hip flexor and the ankle dorsiflexor should bring the trunk forward. Knee joint and hip joint extensors exert the largest force when the thigh takes off from the chair. The trunk should be bent while being maintained straight.
3. No coordinated movement of the trunk and the lower extremity	1. Lack of coordination and lower extremity muscle weakening	1. Lower extremity muscle strengthening exercise using pneumatic training equipment 2. Sitting-to-standing exercise with the fingers locked together and the arms being moved up and down	

Table 2
Problem-based learning: Gait

Fact	Hypothesis	Intervention	Need to know
1. The trunk is shaken and bent backward during gait	<ol style="list-style-type: none"> 1. Lack of the ability to support the body using the lower extremity 2. Lack of the ability to push the body forward 3. Lack of balance ability 4. Lack of trunk stability 	<ol style="list-style-type: none"> 1. Improve gait ability by treadmill training 2. Improve thrust by ankle plantar flexor strengthening training 	<p>For successful gait, the lower extremity can support the body, thrust enabling movements in the desired direction, production of basic gait rhythms, balance control during trunk movements, and the adaptation for walking in diverse environments.</p> <p>Asymmetric postures appear because the subject prefers standing on the non-paretic leg due to the lack of the production and control of bearing force by the parietic lower extremity.</p>
2. The stance phase of the left foot is short, and the weight is leaning to the right	<ol style="list-style-type: none"> 1. Paretic lower extremity's bearing force is weakened. 2. Lower extremity muscle strengthening exercise 	<ol style="list-style-type: none"> 1. Paretic lower extremity's bearing force is weakened. 2. Weight shifting training toward the parietic side 3. Lower extremity muscle strengthening exercise 	<p>Interventions for these problems are improving bearing force with muscle strengthening training and bearing the weight mainly by the parietic lower extremity during standing positions.</p> <p>During the pushing stance and entire swing phases, the ground reaction force should face forward, and the feet should face backward for forward thrust, and the force should be applied backward.</p>

Table 3
Problem-based learning: Sitting

Fact	Hypothesis	Intervention	Need to know
1. The subject cannot support the trunk and sits on the ground	<ol style="list-style-type: none"> 1. Lack of the ability to support the body using the lower extremity 2. Lack of balance ability 	<ol style="list-style-type: none"> 1. Slow-sitting training 2. Slow-sitting training with the hand placed on a ball 	<p>Although sitting motions look the same as sitting to standing, it has a different mechanism. In general, when sitting, the body is moved toward the rear lower side of the chair when the balance ability is maintained. Sitting disabilities usually appear in persons with pain or sitting on a wheelchair. Sitting movements cause the bearing surface of the heel and the muscles to undergo efferent contraction and can be performed regardless of visual information. Furthermore, joint coordination, body center stabilization, and high control ability in vertical movements are required.</p>
2. The trunk shakes severely before sitting on the chair	<ol style="list-style-type: none"> 1. Lack of the ability to control the parietic lower extremity 2. Lack of the ability to support the body using the lower extremity 3. Lack of trunk stability 	<ol style="list-style-type: none"> 1. Weight shift to the parietic side and trunk stabilization training using the Space balance 3D equipment 2. Paretic lower extremity bearing ability training using unstable bearing surfaces 3. Exercise to bend and extend the trunk in standing position 	

for resolving the problems. The need-to-know column provides pieces of information for establishing hypothesis and planning intervention.

7. Outcomes

Information was collected from the patient using observation and analysis of the ICF core set and videos. In addition, problems were analyzed to set intervention goals and implement interventions based on the collected information. Instead of intensively

treating one problem, interventions were progressively applied according to the improvement of the patient's functional ability. In addition, the patient's functions were assessed before implementing the interventions using the ICF evaluation display (Kirschneck, Rauch, Stucki, & Cieza, 2011). This way, the overall degree of functional improvement could be identified (Fig. 2).

1) Measurement of difficulties and confidence

Based on the results of measurement using OPTIMAL, the degrees of difficulties and confidence were improved by 41 and 69 points from 96 and 108 points

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Assessment (21 weeks post-stroke)	Evaluation (23 weeks post-stroke)					Evaluation (25 weeks post-stroke)					Evaluation (27 weeks post-stroke)														
	Problem	0	1	2	3	4	Problem	0	1	2	3	4	Problem	0	1	2	3	4	Problem	0	1	2	3	4	
Global goal: House keeping																									
Service-program-goal: Independent sitting-to-standing																									
Cycle goal 1: d4103 Sitting																									
Cycle goal 2: d4105 Bending																									
Cycle goal 3: d4106 Shifting the body's center of gravity																									
ICF Categorical-Intervention Targets	ICF Qualifier					Goal	ICF Qualifier					Goal	ICF Qualifier					Goal	ICF Qualifier					Goal	
b134 Sleep function																									
b260 Proprioceptive function																									
b28016 Pain in joint																									
b4200 Increased blood pressure																									
b4500 General physical endurance																									
b7302 Power of muscles of one side of the body																									
b740 Muscle endurance functions																									
b7603 Supportive functions of leg																									
b770 Gait pattern functions																									
s110 Structure of brain																									
d4101 Squatting																									
d4103 Sitting																									
d4104 Standing																									
d4105 Bending																									
d4106 Shifting the body's center of gravity																									
d420 Transferring oneself																									
d4500 Walking short distance																									
d4501 Walking long distance																									
d4503 Walking around obstacles																									
d4551 Climbing																									
d4552 Running																									
d460 Moving around in different locations																									
	ICF Qualifier					Goal Relation	ICF Qualifier					Goal Relation	ICF Qualifier					Goal Relation	ICF Qualifier					Goal Relation	
e310 Immediate family																									
	Influence						Influence						Influence						Influence						
pf Motivation																									

Fig. 2. ICF evaluation display: sitting to standing, gait and sitting. Qualifier ranges from 0 = no problem to 4 = complete problem in the components of body functions (b), body structure (s), activity and participation (d), and from 4 = complete barrier to +4 = complete facilitator in the environmental factors. In personal factors, the signs + and - indicates to what extent a determined personal factor (pf) has on the positive or negative influence on the individual's functioning. 1, 2, and 3 show the relation to cycle goals 1, 2, and 3; G is related to the global goal.

before intervention to 55 and 39 points after intervention, respectively.

2) Balance ability test

Balance ability was measured in two ways before intervention. In fall risk measurement using TETRIX, a high fall risk was shown with a score of 100 points, and the fall risk was decreased to moderate with a score of 42 points after intervention. The fall risk improved from high to moderate, in the Berg balance scale from 17 to 25 points.

3) Gait ability test

The gait ability of the patient could not be measured at the beginning because the patient could not walk. However, the patient could walk with a Q-cane after the intervention for approximately two months, and a 10-m walk test was completed in 48 s.

8. Discussion

In the present study, the stroke patient's functional problems were identified using an ICF core set and after intervention were comprehended using the ICF evaluation display and objective assessments. Therapists in the clinics should be able to accurately comprehend patients' functional problems and present the most efficient methods of solving these problems. Comprehending patients' functional abilities is finding out changes in the patients' body function and structure, the level of

their capacity for activities and participation, and how they perform the activities and participation. In addition, therapists should comprehend promoting and impeding factors that affect functional ability, considering the environmental and personal factors. Patient's problems can be identified at the holistic level based on the patient's health conditions and personal and environmental factors by applying the ICF to clinical practices (Helgeson & Smith, 2008).

The ICF model is useful for rehabilitation experts to assess patients' functions and disabilities and interactions between individual factors (WHO, 2001). The purpose of the ICF core set is to provide brief ICF core set that is the minimum standard made by extracting appropriate items out of all ICF items for common use in clinical studies and treatment and comprehensive ICF core set that can be used by many experts for comprehensive assessment and reporting of health and functions (Geyh et al., 2004). In addition, the ICF assessment sheet assists diagnostic processes to identify the relationships between problems set as hypotheses and the causes of these problems in clinical-reasoning processes (Rauch et al., 2010). The evaluation display can be used as data for discussion with experts in multiple areas because it includes goals and intervention targets and can clearly present changes in functional conditions before and after intervention (Rentsch et al., 2009).

In the present study, interventions with different targets in relation to patient's problems were progressively applied at intervals of approximately 2 weeks. A top priority problem to be solved was set as "independent sitting to standing" because it was judged to be a prerequisite target that was indispensable to achieve "independent walking," which is the ultimate and long-term goal of the patient. "Walking", and "sitting" tasks were set and applied after "independent sitting to standing" was achieved. The pieces of information necessary to solve the patient's problems were organized based on the ICF core set, and the comprehended problems and goals that must be achieved were organized using the evaluation display. In addition, balance ability and gait ability were assessed using the Berg balance scale and TETRAX and 10-m walk tests, respectively. The patient's improvement could be quantitatively compared using these assessment tools.

The interventions applied in the present study were treatment methods based on therapists' experiences and task-oriented approaches. Task-oriented approaches are training methods that help functional organization by repeated training on activity tasks related to daily living based on motor learning, which can draw functional movements more easily by motivation (Blundell et al., 2003). In addition, interventions were applied based on therapists' experiences and diverse kinds of evidence. Because interventions were aimed at sitting to standing, interventions related to the evidence indicates that the subject should be able to sufficiently bring the feet backward, extend the trunk and move it forward, and make coordinated movements (Busse, 2003; Janssen, Bussmann & Stam, 2002). Because sufficient lower extremity muscle strength, thrust necessary for movements in the desired direction, basic gait rhythm generation, balance control during trunk movements, and flexibility are necessary, these were considered for interventions aimed at walking (Barbeau & Vinstin, 2003; Busse, 2003; Forssberg & Nashner, 1982; Kilbreath, Perkins, Crosbie, & McConnell, 2006). Because balance and coordinating abilities and trunk stabilization are necessary, these were considered for interventions aimed at sitting (Kralji, Jaeger, & Muni, 1990).

In the present study, hypotheses were set and verified based on such knowledge. Based on such knowledge and evidence, the priorities of problems that could be solved were determined, and related intervention purposes and goals were set to apply the interventions. In the present study, short-term

purposes and goals were set for long-term goals and interventions, unlike general intervention reports where many interventions are applied to one purpose or goal, were progressively applied, which is quite meaningful.

A limitation of the present study was that this is a case study; thus, the findings of this study cannot be generalized. However, the authors contend that the present study is quite significant because this study progressively presented diverse interventions in accordance with concrete goals after analyzing correlations among patient's functional problems instead of general intervention processes that have been implemented traditionally for stroke patients.

9. Summary

In the present study, functional problems of the sub-acute stroke patient were identified using the ICF core set, and the priorities of the problems were determined to progressively apply interventions. The use of the ICF model enabled general functional assessment of the patient and the application of appropriate goals and interventions. These interventions for patients using the ICF model were advantageous in that diverse functional problems and their correlations could be accurately addressed.

Conflict of interest

The authors have no conflict of interest to report.

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