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Clinical Reasoning of Physical Therapists regarding In-hospital Walking Independence of Patients with Hemiplegia

Junpei Takahashi[1, 2], Akiyoshi Takami[2], Saichi Wakayama[2]*

[1] *Department of Rehabilitation, Faculty of Medical Science and Welfare, Tohoku Bunka Gakuen University, Japan*
[2] *Hirosaki University Graduate School of Health Sciences: Hirosaki-shi, Aomori, Japan*

Abstract. [Purpose] Physical therapists must often determine whether hemiparetic patients can walk independently. However, there are no criteria, so decisions are often left to individual physical therapists. The purpose of this study was to explore how physical therapists determine whether a patient with hemiplegia can walk independently in a ward. [Methods] The subjects were 15 physical therapists with experience of stroke patients' rehabilitation. We interviewed them using semi-structured interviews related to the criteria of the states of walking in the ward of hemiparetic patients. The interviews were transcribed in full, and the texts were analyzed by coding and grouping. [Results] From the results of the interviews, PTs determined patients' independence of walking in hospital by observation of behavior during walking or treatment. The majority of PTs focused on the patients' state during walking, higher brain function, and their ability to balance. In addition, they often asked ward staff about patients' daily life, and self-determination. [Conclusions] We identified the items examined by physical therapists when determining the in-hospital walking independence of stroke patients. Further investigation is required to examine which of these items are truly necessary.
Key words: Hemiplegia, Walking, Independence

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INTRODUCTION

An important goal of physical therapy for patients with hemiplegia is to restore their walking function. Many studies have used the Functional Ambulation Category (FAC)[1] or Functional Independence Measure (FIM) to assess the walking independence of patients with hemiplegia. Previous studies have reported correlations between walking independence and factors such as walking speed, unilateral spatial agnosia, depression, balance, and/or physical ability[2–8]. However, the inclusion and exclusion criteria of these studies are inconsistent. Patients with a higher brain dysfunction who find it difficult to understand instructions are at a greater disadvantage if performance is the primary focus of therapy. When higher brain function is emphasized, patients with higher brain dysfunction are still at a disadvantage because they find it difficult to understand instructions; thus, quantitative assessment is nearly always impossible. Furthermore, because FAC and FIM primarily assess the amount of assistance required, these scales only categorize, rather than determine, the level of walking independence. We are unaware of previous reports that describe the criteria for determining walking independence while assessing both physical and higher brain functions.

It was reported that many physical therapists (PTs) rarely use assessment batteries to evaluate the walking function of patients with hemiplegia[9]. However, Matsugi et al.[10] examined walking independence using a quantitative assessment, and suggested a cut-off time for determining impairment of 11.7 s for the 10-m walk, and 13.7 s for the Timed Up & Go test (TUG). Therefore, it appears that the currently accepted criteria of determining walking independence are used at the discretion of individual PTs. Against this background, the exact method used by the PTs to evaluate walking independence needs to be better understood.

The purpose of this study was to determine the types of movements and conditions that PTs focus on when they determine the in-hospital walking independence of patients with hemiplegia. Through this study, we hope to determine the reasoning process of PTs evaluating walking independence, in order to reduce the risk of falls by hemiparetic patients due to assessment by PTs.

SUBJECTS AND METHODS

The subjects were 15 PTs [10 males, and 5 females; mean age: 32.5 ± 4.5 years; mean years of experience: 8.0 ± 3.2 years (minimum: 5 years, maximum: 16 years)]. The inclusion criteria were experience of determining walking

*Corresponding author. Saichi Wakayama (E-mail: swaka@cc.hirosaki-u.ac.jp)

independence of patients with hemiplegia and having at least five years of experience as a PT.

We conducted semi-structured interviews with the PTs regarding the criteria they used to determine the in-hospital walking independence of patients with hemiplegia who had progressed from the level of supervised walking. We interviewed the PTs regarding patients who could walk unaided or with a walking aid such as a cane and those whose symptoms had plateaued. The in-hospital walking independence was defined as "being able to move about alone within the hospital ward, perform an objective action, and then return safely to the room." This definition was based on the definition of independence presented by Jackson et al[6], which includes patients who are able to stand up from sitting in a chair, walk for at least 5 m, and negotiate obstacles and doors to access the toilet.

During the interview, PTs were asked, "When determining in-hospital walking independence for the supervision level of patients with hemiplegia, what leads you to determine their independence?" The PTs were asked to respond according to the following four categories: physical function; walking ability; balance and performance; and psychological, cognitive, or higher brain function. We emphasized these categories because we previously found that they could be effectively used to evaluate walking independence[11].

We recorded the interviews with an IC recorder and then transcribed these recordings. These recordings were analyzed with reference to the modified grounded theory approach[12]. In our analysis, we examined the transcribed interviews for meaningful phrases and assigned codes to these phrases. In order to maintain the reliability of these codes, an experienced researcher examined the coded content for consistency. Phrases with similar codes were then grouped and subjected to further analysis. In addition, we identified specific items among these codes associated with the evaluation item or movement the codes indicated.

Participants were provided written and verbal explanations of the content of this study, and only those who gave their consent were enrolled. The Tohoku Bunka Gakuen University ethical review board approved this study.

RESULTS

From the transcribed interviews, we identified 552 phrases that were assigned codes. Phrases with identical codes were grouped together, producing 124 unique codes. We then analyzed these 124 codes for each interview question type. From these 124 codes, we examined the 35 codes that were associated with specific items that were solely used for determining walking independence. These 35 codes are presented in Table 1. In addition, we excluded those codes that represented the response "don't consider this important/don't evaluate this." The classification process flow chart is shown in Fig. 1.

The 124 codes were analyzed according to each of the four question types, and 13 codes were identified for physical function. Regarding the specific content, opinions such as "No, I don't specifically evaluate physical functions."

Table 1. Items used by PTs for assessing walking isndependence

No.	Walking motions
1.	Does not fall while walking along a straight line
2.	Can walk along a straight line for a distance (from room to target location) without losing breath
3.	Walking speed is sufficient to perform target movements (making it to the toilet in time)
4.	Can walk at a normal walking speed that is not their maximum speed
5.	Can walk in a crowd
6.	Can cope with surface changes (mats, carpets etc.)
7.	Can deal with obstacles
8.	Can walk along curved and narrow paths
9.	Can navigate intersections and corners in the hospital
10.	Can walk over different levels
11.	Can walk without stumbling or tripping Can self-correct if stumbling or tripping occurs
12.	Can initiate walking using either leg (step motions)
13.	No unforeseen knee buckling occurs Can self-correct if buckling occurs
14.	Gait does not induce pain Even if pain occurs, this is of a level that the patient can deal with
15.	Can walk without lightheadedness Lightheadedness may occur but the patient can self-correct
16.	Gait is constant with no variation
17.	Patient starts walking steadily
18.	The patient can continue walking while being spoken to
	Balance ability and performance motions
19.	Can maintain a standing posture
20.	Can change direction
21.	Has a stable posture in sitting
22.	Can independently stand up from a chair
23.	Can crouch
	Psychological and higher brain functions evaluation
24.	No risk of restlessness (leaving the ward or hospital and night walking)
25.	Understands target location regardless of changes in the environment
26.	No attention impairment Attention impairment present but able to adapt to the environment (notices other people, steps, and ramps etc.)
27.	No unilateral spatial neglect Unilateral spatial neglect present but can adapt to the environment
28.	Has enough cognitive ability to follow instructions
29.	Not afraid of walking / Does not over-estimate own walking ability
	Other
30.	Can independently use the toilet
31.	Can groom self and get changed
32.	Can manage walking with a cane or a walking device
33.	Can independently put on and take off shoes
34.	Not affected by sleeping pills / Day and night not reversed
35.	Walking not dangerous according to the ward staff

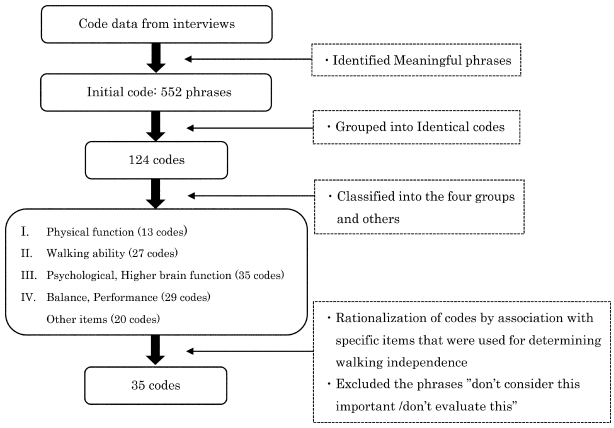

Fig. 1. The classification process flow chart

"I do conduct functional evaluation to some extent, but I primarily concentrate on the patient's movements, for example, even if they are at an early Brunnstrom stage, I still check their movement first." were commonly encountered.

Thus, most PTs did not place much importance on physical function items as criteria for determining walking independence. In addition, because "non-paralyzed side ability of MMT4 or greater," "sensory examination not affecting walking," and "Brunnstrom stage IV or greater" were cited, none of the PTs determined walking independence using only physical function items.

We identified 27 codes for walking ability. Items related to "falls," "speed," "endurance," "responding to the environment," and "gait" were identified as criteria for determining walking independence. For "falls," not falling over was cited (Table 1-1; T1). For "speed," one PT suggested specific numerical values, but only used these as indicators saying, "I can't really say how much credibility 10-m walking has for specifying whether a patient needs to be supervised or is independent." Rather, many PTs stated that "being able to walk to a target location," "being able to walk without losing breath or resting for a certain distance in a straight line (T2)," and "being able to walk quickly enough to execute target movements such as going to the toilet (T3)" were important. Many PTs also used " ability to change walking speed according to instructions" and "normal walking speed not being the patient's maximum walking speed (T4)" as standards. "Responding to the environment" included being able to walk within crowded hospital ward (T5); being able to cope with changes in floor surface (floor mats, carpets etc.) and obstacles while walking (T6, 7); and being able to navigate turns, intersections, and changes in level, rather than just flat ground (T8, 9, 10). Opinions regarding "gait" were subdivided into those describing, "stumbling, tripping," "starting point," "buckling," "pain," "lightheadedness," and "gait stability." First, for "stumbling/tripping," two standards of being able to walk without tripping and being able to self-correct and recover from tripping or stumbling (T11). For "starting point," PTs stated that patients needed to be able to initiate walking with either leg (T12). For "buckling," standards were no unforeseen buckling and being able to respond to buckling (T13). For "pain," criteria were being able to walk without experiencing pain, or if pain was present, being able to walk without restrictions for a certain distance or a certain number of steps (T14). "Lightheadedness" was divided based on patients' independence and if they could walk without lightheadedness, and whether they could self-correct if they experienced lightheadedness (T15). Regarding "gait stability," many PTs stated that they did not mind if gait included some compensatory movements (T16). In addition, the PTs suggested initial walking movements that were stable (T17), making few changes in gait while walking, and being able to simultaneously walk and talk (T18).

We identified 29 codes associated with balance performance evaluation. Most PTs associated balance ability with patients' performance of the required movements, or ability to make independent judgments while walking, rather than using a specific evaluation battery. One subject was using the standard value of the Berg Balance Scale, TUG, and the rate of loading on the paralyzed side, but stated that even if a patient scored lower than the cut-off point, they would give them further consideration if they exhibited stable walking movements. When the 29 codes were grouped together, qualities of "standing motion," "step motion" and "directional change" were further identified. "Standing motion" indicated that the patient was able to stand and cope if he/she experienced lightheadedness (T19). "Step motion" indicated linking steps with a starting point while walking and being able to step in multiple directions to cope with the loss of balance (T11). Regarding "directional change," many subjects answered that this was the patient's ability to change direction while standing (T20), whereas others referred to this as the ability to maintain a stable seated position (T21), to independently stand up (T22), and to crouch (T23).

Psychological and higher brain function codes were the most common, with 35 codes identified. These were grouped into "understand and respond to the environment," "presence of attention impairment," "cognitive ability" and "mental stability." "Understand and respond to the environment" included not leaving the hospital or ward (T24), patients' understanding of where their room and target locations were regardless of changes to the environment (T25), and the ability to notice changes in their environment and the presence of other people (T26). "Presence of attention impairment" indicated either no attention impairment caused by unilateral spatial agnosia or attention impairment in which the patients had sufficient attention ability to adapt to their environment (T26). The presence or absence of unilateral spatial agnosia was also divided into the same two categories (T27). "Cognitive ability" indicated patients had cognitive abilities appropriate for their age and sufficient for understanding instructions and target movements (T28). "Mental stability" indicated that patients had little fear of walking or did not overestimate their walking ability (T29). However, some subjects made statements such as, "I don't give that much consideration to the psychological aspects. I can't really evaluate these things," or "If they have dementia, I do take this into account when judging independence, but I don't allocate a certain number of points." Thus, the

results indicate that PTs were not evaluating cognitive or higher brain functions on paper. Rather, they were making subjective judgments regarding normal actions or referencing evaluations made by occupational therapists or speech therapists.

Other items identified included using the bathroom, changing clothes and grooming unassisted (T30, 31), not forgetting to use necessary walking canes and orthosis (T32), independently changing shoes (T33), no daytime drowsiness (T34), and no danger associated with walking during daily lifestyle as perceived by the ward staff (T35).

Walking independence was not determined by independently evaluating each motion, since higher brain functions and balance ability were also assessed. For example, higher brain functions were evaluated according to observations of walking motions during rehabilitation, as indicated by the comment, "We don't really perform higher brain function evaluations such as those performed by occupational therapists, but we do make subjective assessments by watching the patients walk."

DISCUSSION

The results of this study suggest that when determining the walking independence of patients with hemiplegia, PTs rarely assess the walking speed[2, 8] or balance[5, 6] in numerical terms. Instead, many PTs subjectively assess walking independence on the basis of whether patients can perform movements such as those shown in Table 1. These results are consistent with those in a previous report that few PTs use assessment batteries to evaluate walking[9].

Looking at each item independently, few PTs focused on physical function. This suggests that even if decreased physical function inhibits walking independence, the evaluation itself will involve analyzing the walking function.

Walking ability and balance performance were assessed according to whether patients had the abilities necessary for walking. For example, patients' ability to initiate walking with the lower limbs, change direction, or endurance to reach their target location were used as the standards, rather than specific figures such as walking speed or balance assessment battery scores. Previous studies have reported numerical differences in the walking speeds of independent and dependent patients[2]. However, it appears that in clinical settings, walking independence is evaluated according to the extent of a patient's walking ability and in accordance with the requirements of each patient.

For psychological and higher brain functions, many PTs cited patients' attention and ability to understand their environment. However, the PTs did not use specific evaluation methods for these items, rather they made assessments on the basis of the patients' walking ability and condition throughout rehabilitation. Previous studies have reported that the presence of unilateral spatial agnosia, depression, and a sense of self-efficacy regarding walking affect walking ability[3, 4, 13]. While theoretical tests are not used, it appears that independence is assessed by gathering data from consultations with other professionals or through motion analysis. In addition, while "putting on and taking off shoes" is necessary for walking, it has not been cited as a factor of independent walking in previous studies. It is possible that sleeping pills may influence the level of consciousness and cause a reverse in the sleep-wake cycles. Furthermore, by examining how PTs observe their patients in the wards, we discovered that judgments are often made while placing great importance on the opinions of other professionals. This is a novel aspect that would not have been revealed by examining rehabilitation in the physical therapy department alone.

When the overall results were considered, we found that in the assessment of in-hospital walking independence of patients with hemiplegia, PTs did not base their decisions on quantitative evaluations. Moreover, many PTs were making decisions on the basis of whether or not patients could perform movements such as those shown in Table 1, as well as the presence or absence of higher brain dysfunction. However, this does not mean that all PTs are evaluating all the items shown in Table 1. The items in Table 1 suggest that walking independence as assessed by PTs requires that patients are able to prepare for in-hospital walking (using a cane and putting on/taking off shoes), can stably walk, and have the higher brain function required to be able to walk in their daily lives. This suggests that in their evaluations PTs were prioritizing whether patients could understand their environment and situation while walking over strong walking ability alone. Primarily, they were evaluating whether patients' walking ability functioned as a means of transport by evaluating whether patients could safely navigate walking paths that were uneven, differing levels, and other patients walking in the area.

Limitations of this study included the years of experience of PTs were small, and the places of work of the PTs might have affected the result. Future investigations should employ larger sample sizes, and examine which of the items we have identified are truly necessary and to what extent they are required.

REFERENCES

1) Holden MK, Gill KM, Magliozzi MR, et al.: Clinical gait assessment in the neurologically impaired. Reliability and meaningfulness. Phys Ther, 1984, 64: 35–40. [Medline]
2) Kollen B, Kwakkel G, Lindeman E: Time dependency of walking classification in stroke. Phys Ther, 2006, 86: 618–625. [Medline]
3) Paolucci S, Bragoni M, Coiro P, et al.: Quantification of the probability of reaching mobility independence at discharge from a rehabilitation hospital in nonwalking early ischemic stroke patients: a multivariate study. Cerebrovasc Dis, 2008, 26: 16–22. [Medline] [CrossRef]
4) Lennon OC, Carey A, Creed A, et al.: Reliability and validity of COOP/WONCA functional health status charts for stroke patients in primary care. J Stroke Cerebrovasc Dis, 2011, 20: 465–473. [Medline] [CrossRef]
5) Au-Yeung SS, Ng JT, Lo SK: Does balance or motor impairment of limbs discriminate the ambulatory status of stroke survivors? Am J Phys Med Rehabil, 2003, 82: 279–283. [Medline] [CrossRef]
6) Jackson D, Thornton H, Turner-Stokes L: Can young severely disabled stroke patients regain the ability to walk independently more than three months post stroke? Clin Rehabil, 2000, 14: 538–547. [Medline] [CrossRef]
7) Simondson JA, Goldie P, Greenwood KM: The Mobility scale for acute stroke patients: concurrent validity. Clin Rehabil, 2003, 17: 558–564. [Medline] [CrossRef]
8) Mehrholz J, Wagner K, Rutte K, et al.: Predictive validity and responsiveness of the functional ambulation category in hemiparetic patients after stroke. Arch Phys Med Rehabil, 2007, 88: 1314–1319. [Medline] [Cross-

Ref]
9) Salbach NM, Guilcher SJ, Jaglal SB: Physical therapists' perceptions and use of standardized assessments of walking ability post-stroke. J Rehabil Med, 2011, 43: 543–549. [Medline] [CrossRef]
10) Matsugi R, Ikeda M, Nishino Y, et al.: Degree of independence in walking of patients with hemiplegia. Ishikawa Rigakuryoho Zassi, 2009, 9: 17–21 (in Japanese).
11) Takahashi J, Takami A, Wakayama S: Review of determination of walking independence in hemiparetic stroke patients. Rigakuryoho Kagaku, 2012, 27: 731–736 (in Japanese).
12) Kinoshita Y: Modified grounded Theory Approach. Tokyo: KOUBUN-DOU, 2003.
13) Jones F, Partridge C, Reid F: The Stroke Self-Efficacy Questionnaire: measuring individual confidence in functional performance after stroke. J Clin Nurs, 2008, 17: 244–252. [Medline] [CrossRef]