Minimal Clinically Important Difference for Comfortable Speed as a Measure of Gait Performance in Patients Undergoing Inpatient Rehabilitation after Stroke

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Abstract. [Purpose] The purpose of this retrospective study was to determine the minimal clinically important difference for comfortable gait speed for patients with stroke. [Subjects] Data were analyzed from 35 patients undergoing inpatient rehabilitation. [Methods] Two characteristics of gait were measured, assistance required and comfortable gait speed. Patients were grouped as either experiencing or not experiencing a decrease of 2 or more levels of assistance required over the course of rehabilitation. Receiver operating characteristic curve analysis was used to identify the change in gait speed that best differentiated between patients who did and did not experience the requisite decrease in assistance required for gait. [Results] Twenty-one patients decreased 2 or more levels of assistance whereas 14 did not. Walking speed increased significantly more in the group who experienced a decrease in assistance of at least 2 levels. The receiver operating characteristic curve analysis showed a change in walking speed of 0.13 m/s best distinguished between patients who did versus did not experience a reduction in assistance required. [Conclusion] An improvement in gait speed of 0.13 m/s or more is clinically important in patients with stroke.
Key words: Stroke, Gait speed, Responsiveness

INTRODUCTION

Restoration of gait is a priority for patients who have experienced a stroke[1]. While speed is not as important to such patients as other aspects of gait[2], it does have implication for their managing in the community[3] and is predictive of important outcomes such as mortality, morbidity, and incident health events[4–6]. Consequently, it behooves clinicians to know whether gait speed is improving as patients undergo rehabilitation interventions. Whether such improvements are meaningful should also be known. One indicator of meaningful improvement is the minimal clinically important difference (MCID)[7]. This indicator, which pegs improvement in a measure of interest against another deemed important (an anchor), is considered superior to distribution-based measures of responsiveness such as the minimum detectable change[8]. Two research groups have previously presented MCIDs for gait speed after stroke[9, 10]. The first group used the modified Rankin Scale as an anchor to determine the MCID for patients between 20 and 60 days post stroke. They reported an MCID of 0.16 m/s. The second group employed a Global Rating of Change scale as an anchor to determine the MCID of patients undergoing outpatient rehabilitation. They reported an MCID of 0.18 m/s for patients' perceived change and an MCID of 0.19 m/s for therapists' perceived change.

Whether previously determined MCIDs generalize to changes realized over a course of inpatient rehabilitation is unknown. The purpose of this retrospective study, therefore, was to determine the MCID for comfortable gait speed for patients with stroke undergoing inpatient rehabilitation after discharge from an acute care hospital.

SUBJECTS AND METHODS

Subjects

This study was approved by the Institutional Review Board of the University of Connecticut. The Board waived the requirement for informed consent as the study involved the secondary analysis of archived records. To be included a patient had to have an admitting diagnosis of a first stroke, have been ambulatory before the stroke, and have walking speed recorded on both admission and discharge assessments.

Thirty-seven patients fulfilled these inclusion criteria. Two of these were excluded as they were already walking without personal assistance or supervision at the time of

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their admission. Of the 35 remaining patients 18 (51.4%) were male and 17 (48.6%) were female. Twenty-one patients were weak primarily on their left side, whereas 14 patients were weak primarily on their right side. The mean (SD) age of the patients was 62.0 (13.7) years. On admission to rehabilitation their mean (SD) time since onset was 11.3 (10.5) days. Their mean (SD) length of stay, during which they underwent interventions focused primarily on function, was 15.9 (9.8) days.

Methods

Gait performance was described in 2 ways. First, performance was graded on the basis of personal assistance required. Definitions compatible with the Functional Independence Measure[11] were used for this purpose. Specifically, patients were described as being totally dependent (or unable to walk 50 feet) or as requiring maximum assistance, moderate assistance, minimum assistance, supervision, no physical assistance (device required), or no physical assistance (device not required). As an improvement in 2 or more levels (e.g., minimum assistance to no assistance [device required]) served as the anchor, patients walking with no assistance were excluded (see above). Gait speed was measured with a digital stopwatch as patients walked at their own comfortable speed. Timing occurred over a 20-foot distance after patients had an opportunity to accelerate.

Assistance required to walk and gait speed were summarized using standard descriptive statistics. Patients were grouped as either experiencing or not experiencing a decrease of 2 or more levels of assistance over the course of rehabilitation. Changes in gait speed in the 2 groups were compared using a t-test. Receiver operating characteristic (ROC) curve analysis was used to identify the MCID. Specifically, it was used to identify the change in gait speed that best differentiated between patients who did and patients who did not experience the requisite decrease in assistance required for gait.

RESULTS

Table 1 summarizes the level of personal assistance required by the patients to walk on admission and discharge. All but 1 patient required less assistance at discharge than on admission. Twenty-one patients decreased 2 or more levels whereas 14 did not. Walking speed increased between admission and discharge (Table 2), but the increase was significantly greater (T=3.286, p=0.002) in the group who experienced a decrease in assistance of at least 2 levels. The ROC analysis showed a change in walking speed of 0.13 m/s to best distinguished between patients who did or did not experience a reduction in required assistance. This cut-point had a sensitivity of 0.810 and a specificity of 0.714. The area under the curve was 0.772.

DISCUSSION

The importance of gait speed notwithstanding[3–6], clinicians need to know if changes in speed accompanying interventions are meaningful. This retrospective study of patients undergoing inpatient rehabilitation after stroke showed that an improvement of 0.13 m/s or more is important. This threshold is slightly less than the MCIDs reported in 2 earlier studies of patients with stroke (0.16–0.19)[9, 10] However, both of those studies involved patients who were less acute and therefore less likely to be experiencing as much spontaneous recovery following stroke. Moreover, neither used the same anchor as we did in our study.

Our study has several limitations. First, the sample was small. That said, the results of the t-test suggest the study was adequately powered. Second, the data came from a single inpatient setting. Findings from a multisite study might be more generalizable. Third, our MCIDs were for a relatively circumscribed period of time after stroke. Given the natural course of recovery after stroke, it would be more informative if MCIDs were determined for multiple specific periods over a longer period of time (e.g., acute, subacute, chronic). Fourth, a single anchor was used. While we believe that our anchor of decreases in required assistance are intrinsically important, additional anchors could have been used- perhaps those used by others in previous studies. As our study was retrospective, alternative anchors were not available.

Our study showed that an improvement in gait speed of 0.13 m/s over the course of inpatient rehabilitation is clinically important in patients with stroke. Combined with the

Table 1. Summary of assistance required for walking at admission and discharge from rehabilitation (n=35)

Assistance	Admission n (%)	Discharge n (%)
Totally dependent	2 (5.7)	1 (2.9)
Maximum	1 (2.9)	0 (0.0)
Moderate	12 (34.3)	0 (0.0)
Minimum	17 (48.6)	6 (17.1)
Supervision	3 (8.6)	11 (31.4)
None (device required)	0 (0.0)	13 (37.1)
None (no device required)	0 (0.0)	4 (11.4)

Table 2. Comparison of walking speeds (m/s) at admission and discharge from rehabilitation (n=35)

Patients	Admission Mean (SD)	Discharge Mean (SD)	Discharge- Admission Mean (SD)
All	0.18 (0.18)	0.41 (0.30)	0.23 (0.23)
Assistance not decreased	0.17 (0.13)	0.27 (0.21)	0.11 (0.15)
Assistance decreased	0.19 (0.21)	0.51 (0.32)	0.32 (0.23)

findings of 2 other studies, clinicians are provided with thresholds that can guide their interpretation of changes in gait speed over successive measurements in patients who have experienced a stroke.

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