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Impairment versus activity limitation after incident ischemic stroke

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Activity limitation scales, such as the Barthel index (BI) and modified Rankin scale (MRS), may fail to identify residual neurological deficits (impairment) in patients without activity limitation, leaving unresolved the question whether improvement in ADLs over time is due to restitution of impairments or compensation for unchanged deficits.

We sought to determine the degree of impairment among ischemic stroke patients who have no activity limitation at 3 months. As part of the Performance and Recovery in Stroke registry, patients with first-time ischemic stroke confirmed on MRI were enrolled during acute admission between May 2002 and January 2008. All patients received inpatient and outpatient physical and occupational therapy according to standard of care.

Three impairment measures were assessed 3 months after stroke: hand dynamometry in the affected hand (HD), the Fugl-Meyer scale (FM),¹ and 9-hole peg test (9HPT). For HD and 9HPT, z-scores were calculated to correct for gender, age and hand dominance.² The motor score of the FM scale was used (maximum 100). All patients had 3-month BI and MRS assessments.

An individual was deemed meaningfully impaired on HD and 9HPT tasks if he or she had a z-score more than 1.5 SD from established population norms, corresponding to a probability of 93.3% that the score was truly worse than population norms. For FM, since population norms do not exist, an individual was deemed meaningfully impaired if he or she had a total score less than 90.4. If an individual scored BI $\geq$ 95 or MRS $\leq$ 1, he or she was deemed “not limited in activity.”⁵

Among 66 patients, mean age was 61.2 $\pm$ 10.4 years and 59.1% were male. Seventy-three percent of patients (48/66) were “not limited in activity” (BI $\geq$ 95) at 3 months. Forty-seven percent of patients (31/66) were “not limited in activity” by MRS (MRS $\leq$ 1). Of these patients, significant residual deficits were seen in all three impairment measures (Figure).

In summary, we found little activity limitation at 3 months, but significant residual impairment. Reasons for this lack of correlation between impairment and disability scores may include insensitivity of disability scores to changes in impairment, the use of compensatory strategies such as learning to brush one’s teeth with the non-paretic hand, and

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the use of assistive devices. Further research is needed to clarify the relationship between impairment and ADL performance.

Stroke trials that employ activity limitation scales as outcome measures may be missing significant changes in impairment. Scales that assess neurological impairments, such as the Fugl-Meyer scale, the Jebsen hand test, and Berg gait exam, may be more appropriate as outcome measures. From a clinical perspective, classifying a patient to be without activity limitation when significant impairment persists may limit opportunities for additional, targeted rehabilitation interventions that could enhance functional abilities and improve quality of life.

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References

1. Fugl-Meyer AR, Jaasko L, Leyman I, Olsson S, Steglind S. The post-stroke hemiplegic patient. 1. a method for evaluation of physical performance. *Scand J Rehabil Med.* 1975; 7:13–31. [PubMed: 1135616]
2. Strauss, E.; Sherman, EMS.; Spreen, O. A compendium of neuropsychological tests: administration, norms, and commentary. New York: Oxford University Press; 2006.
3. Oxford Grice K, Vogel KA, Le V, Mitchell A, Muniz S, Vollmer MA. Adult norms for a commercially available Nine Hole Peg Test for finger dexterity. *Am J Occup Ther.* 2003; 57:570–3. [PubMed: 14527120]
4. Duncan PW, Lai SM, Keighley J. Defining post-stroke recovery: implications for design and interpretation of drug trials. *Neuropharmacology.* 2000; 39:835–41. [PubMed: 10699448]
5. Sulter G, Steen C, De Keyser J. Use of the Barthel index and modified Rankin scale in acute stroke trials. *Stroke.* 1999; 30:1538–41. [PubMed: 10436097]

Figure. Percentage of patients not limited in activity who qualify as impaired

NOTES: FM-TOT=Fugl-Meyer total score; HD=hand dynamometry; 9HPT=9-hole peg test; BI=Barthel index; MRS=modified Rankin scale. See text for definitions of impairment.