

Safety and Feasibility of the 6-Minute Walk Test in Patients with Acute Stroke

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Background: Our objective was to investigate the safety and feasibility of the 6-minute walk test in patients with acute stroke. *Materials and Methods:* Consecutive patients with acute stroke, admitted to the Itami Kosei Neurosurgical Hospital from September 2016 to April 2017 were enrolled. Walking capacity was assessed by a physical therapist using the 6-minute walk test in 94 patients with acute stroke within 14 days of hospital admission. The primary outcomes were safety (i.e., the prevalence of new adverse events during and after the test) and feasibility (i.e., test completion rate) of the 6-minute walk test. *Results:* The 6-minute walk test was performed for a mean duration of 5.1 days (standard deviation, 2.6 days) after hospital admission. Seventy patients (74.5%) could walk without standby assistance or a walking aid, and 24 patients (25.5%) could walk without standby assistance but with a walking aid. The average distance walked by patients during the 6-minute walk test was 331 m (standard deviation, 107.2 m). Adverse events following the 6-minute walk test occurred in 6 patients (6.4%) and included stroke progression, stroke recurrence, seizures, and neurological deterioration. Heart rate increase (>120 beats/min) occurred in 3 patients (3.2%) during the test. Lastly, 6 patients (6.4%) were unable to complete the 6-minute walk test. *Conclusions:* Although performance in the 6-minute walk test was decreased in patients with acute stroke, the test itself appears to be safe and feasible in this patient population. **Key Words:** Stroke—6-minute walk test—safety—feasibility.

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Introduction

Stroke is a leading cause of disability¹ and results in neurological deficits in most patients.² Walking disability

is a major example of these deficits. Patients with chronic stroke exhibit extremely low ambulatory activity and cardiovascular fitness.³ This is a concern, as cardiovascular fitness can predict functional recovery in patients with subacute stroke.⁴ Stroke rehabilitation programs therefore often aim to improve walking ability by targeting factors such as walking velocity, cardiovascular fitness, and balance. For these programs to be effective, an accurate and reliable means of assessing walking capacity in these patients is needed.

The 6-minute walk test (6MWT) is a measurement tool used to assess walking capacity in a clinical environment.⁵ It is commonly used in a wide range of populations, and is shown to be valid and reliable in healthy children,⁶ those undergoing cardiovascular rehabilitation,⁷ as well as in patients with schizophrenia,⁸ fibromyalgia,⁹ cancer,¹⁰ and trans-tibial amputation.¹¹ Moreover, the 6MWT is now widely used to assess aspects of walking-related performance in patients with stroke¹² and is the strongest

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individual predictor of community walking activity in these patients.¹³

Despite the prevalence of studies that have conducted the 6MWT in patients with chronic stroke,¹⁴⁻¹⁹ no studies, to the best of our knowledge, have evaluated the test in patients with acute stroke. By the time patients with mild and moderate stroke reach the sub-acute phase (average ~30 days after stroke onset), walking endurance and cardiorespiratory fitness decline by approximately 50% compared with age-matched healthy controls, as measured using the 6MWT.²⁰ To prevent this decline, it is necessary to evaluate walking capacity using a test, such as the 6MWT, during the acute phase. This could allow the early prediction of the functional recovery and community walking ability of patients with acute stroke.

However, it is important that the 6MWT be conducted safely without causing neurological deterioration due to early mobilization. This is complicated by the fact that early neurological deterioration can occur in approximately 13% of patients with ischemic stroke and approximately 23% of patients with intracerebral hemorrhage during the acute stage.²¹⁻²⁴ However, the 6MWT elicits a maximal to submaximal exercise response that can progress to mild heart failure.²⁵ Therefore, performing the 6MWT may be risky in patients with acute stroke, making it necessary to determine whether administering the test is safe and feasible in these patients. The purpose of the present study was to investigate the safety and feasibility of 6MWT in patients with acute stroke.

Materials and Methods

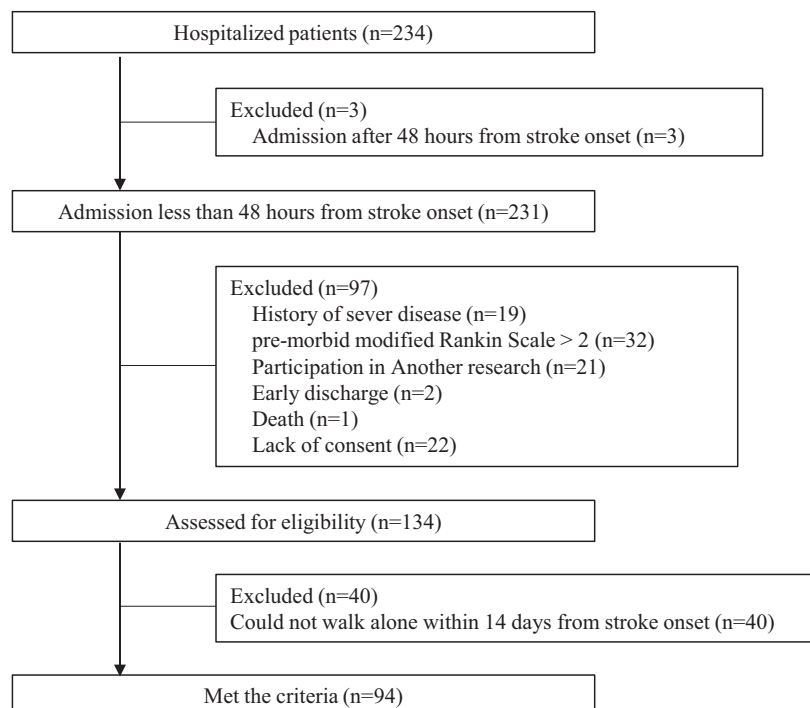
Study Design and Subjects

We conducted a cross-sectional study. Consecutive patients with stroke who were admitted to Itami Kosei Neurosurgical Hospital less than 48 hours after stroke onset between September 2016 and April 2017 were enrolled. All patients used antithrombotics or antihypertensive agents for treatment. All patients underwent rehabilitation from the day of admission or in the succeeding days. Exclusion criteria were as follows: a history of severe musculoskeletal disease; severe cardiopulmonary disease; dementia and psychiatric diseases; a pre-morbid modified Rankin Scale score above 2; participation in another research study; early discharge; death; and lack of consent. Patients who could walk without standby assistance regardless of whether a walking aid was needed within 14 days from stroke onset, and who had a Functional Ambulation Category score above 2 (ambulator, dependent on supervision, or independent) (see Appendix)²⁶ were included in the study (Fig 1). This study was approved by the Konan Women's University Research Committee, and all participants gave informed consent.

Patient Demographics and Clinical Characteristics

We recorded the following patient characteristics upon admission: age, sex, height, weight, stroke type (cerebral infarction, intracerebral hemorrhage, or subarachnoid hemorrhage), and disease history. Patient scores using the

Figure 1. Flowchart of the study participants.



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