



Original Research—CME

Physical Activity Level Among Stroke Patients Hospitalized in a Rehabilitation Unit

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Abstract

Background: The current literature contains little information about the level of physical activity of hospitalized patients who have had a stroke. Improving knowledge in the area could help optimize rehabilitation.

Objectives: To determine the level of physical activity of hospitalized patients who have had a stroke to discover if they achieved the recommended 30 minutes of physical activity per day (equivalent to 142 kcal) during sessions of 10 consecutive minutes.

Setting: Physical and Rehabilitation Medicine Unit of the Jean Rebeyrol Hospital, Limoges, France.

Participants: All patients (N = 88) who had sustained a stroke within the previous 6 months were included over a period of 7 months.

Main Outcome Measures: The duration of physical activity and related energy expenditure were estimated using a SenseWear armband (BodyMedia [Jawbone]). Subjects wore the sensor on the nonparetic arm for 2 consecutive days from 9 AM to 4:30 PM, corresponding to the period spent daily on rehabilitation. The Fisher simple correlation test and Mann-Whitney nonparametric test were performed.

Results: A total of 88 patients aged 66 ± 17 years with a mean poststroke period of 43 ± 34 days and a mean Barthel Index of $61 \pm 25/100$ were enrolled in the study. Between 9 AM and 4:30 PM, patients took part in an average of 23 ± 30 minutes of physical activity (equivalent to 91 ± 122 kcal). Correlations were found between physical activity time in the hospital and physical activity before the stroke occurred ($r = 0.345$, $P < .0001$), the Barthel Index ($r = 0.284$, $P = .0002$), body mass index ($r = -0.440$, $P < .0001$), and time to hospital release ($r = -0.183$, $P = .0194$).

Conclusion: It was found that 62% of patients did not achieve the recommended amount of physical activity. Sessions dedicated to physical activity could motivate patients who have had a stroke and help them meet recommendations before leaving the rehabilitation unit.

Introduction

Recommendations are available for the promotion of physical activity (PA) to maintain health and reduce relapses after stroke [1,2]. In 2004, Gordon et al [3] focused on 4 types of exercise: endurance, strength, stretching, and neuromuscular work. Intensity, frequency, and duration were reported for each type, along with advice on the appropriate equipment. In 2007, a French organization (Haute Autorité de Santé) reported that the recommendations should be more compatible with the daily lifestyle, age, and general condition of the patient [4]. The literature advocates that at least 30 minutes of PA be performed per day [4]

in sessions lasting 10 consecutive minutes [5]. PA should be started early after a stroke occurs if the medical parameters of the subject are stable [6]. However, these recommendations may not be feasible for a patient who is at home without qualified supervision. This situation may lead to less than optimal performance of various aspects of PA, from effort management to the utilization of the equipment. In short, there is a gap between what is safely achieved during hospitalization with the help of health professionals and what people really do at home. Indeed, Touillet et al [7] showed that 3 months after completing an exercise training program including PA education, 8 of 9 patients did not maintain their activity level after being sent home. In addition,

still in the context of the recommendations, Rand et al [8] showed that 58% of poststroke patients at home were not completing 30 minutes of PA per day. This PA duration corresponds to an active energy expenditure of 142 kcal, which is ≥ 3 metabolic equivalent of task (METs).

The question of whether patients actually reach PA recommendations during the hospitalization period has arisen. Some studies [9,10] aimed to assess the PA level of hospitalized patients who had sustained a stroke fewer than 14 days earlier. The method used, based on a technical analysis of patient behavior (behavioral mapping), was to observe the patient from 8 AM to 5 PM and to record the observed PA level and duration every 10 minutes on a grid reference. Patients spent on average 12.8% [9] and 22.7% [10] of their time in moderate- and high-level activity, respectively, corresponding to more than 1 hour of PA per day. However, the presence of the observer may have influenced the behavior of subjects, and the determination of the intensity of PA was very subjective [11]. Although the method has been validated [12], this type of analysis is specific to activities of daily living [9] and does not allow for quantification of PA >3 METs as recommended in the literature. In comparison with direct means of measuring active energy expenditure, studies have shown that other methods, such as actigraphy, are more reliable and easy to use in ecological situations [11,13,14].

Based on this observation, we decided to determine the PA level of patients in the subacute phase of stroke during hospitalization in a physical and rehabilitation medicine (PRM) unit. In France, inpatients who require prolonged rehabilitation after neurologic care are discharged to such units, where a rehabilitation program is determined, taking into account the severity of the patient's impairments [15]. We assessed PA level using actigraphy because it shows good measurement reliability [16] and is commonly used in ecological situations [17], especially in the stroke population [8,18-21]. The main objective of our study was to determine the PA level of hospitalized patients who had sustained a stroke and discover if they reached the recommended 30 minutes per day of PA during sessions of 10 consecutive minutes. Secondary objectives were to investigate the characteristics of the population that did achieve the recommended PA and to determine the PA level in each rehabilitation session.

Methods

Participants

All patients in the PRM unit of the Jean Rebeyrol Hospital in Limoges, France, who had sustained a stroke fewer than 6 months earlier (range, 9-171 days) were included over a period of 7 months. Before inclusion, each patient was informed about the study procedure, and

after a period of discussion and reflection, gave written informed consent. The procedures conformed to the World Medical Association Declaration of Helsinki [22].

Evaluations

The primary outcome of the study was the PA time, which was estimated using a triaxial accelerometer, the SenseWear armband (BodyMedia [Jawbone], San Francisco, CA). In previous studies, this tool has been used with patients who have a spinal cord injury [23] and with walking hemiplegic patients [24,25]. Although an overestimation of energy expenditure was reported, the armband device achieved good measurement reliability compared with the measurement of oxygen using a gas analyzer ($r = 0.787$ [23]; $r = 0.715$ [24]). Data were transferred with SenseWear Professional 7.0 software and recorded with patient characteristics (age, height, weight, gender, smoking status, and right or left handedness). Activity was recorded as the energy expenditure (in kcal) and PA duration (in minutes) and calculated using a sensor software algorithm. Four activity levels were identified: sedentary activity (<3 METs), moderate activity (between 3 and 6 METs), vigorous activity (between 6 and 9 METs) and very vigorous activity (≥ 9 METs). PA includes all activities ≥ 3 METs.

The prestroke PA of patients was estimated with the activity questionnaire developed by Ricci and Gagnon, which is commonly used in healthy subjects and in patients with cardiovascular disease [26,27]. This questionnaire is divided into 8 questions, and the score assigned to each response ranges from 1 to 5, giving a global score between 8 and 40. The first 4 questions relate to daily activities and the other 4 questions relate to sports and recreational activities. The final score allowed us to determine whether the patient was inactive (<16), active (≥ 16) or very active (≥ 32) before the stroke event. This score also allowed us to study potential correlations between activity before and during the hospitalization.

For all the hospitalized patients, the degree of autonomy during activities of daily life after the stroke occurred was calculated using the Barthel Index (BI) on a scale of 0-100, with 100 representing complete autonomy [28]. An experienced medical specialist determined the BI score at study inclusion and upon discharge. We also expressed the degree of autonomy of the patients at inclusion of the study as a percentage of the BI determined at the end of hospitalization, using the following formula: % BI = (BI at the time of registration/BI at discharge) \times 100.

Procedure

Subjects were instructed to wear the armband on the nonparetic arm for 2 consecutive days. The device was

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