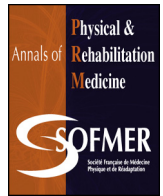




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Original article

## Effect of subtypes of neglect on functional outcome in stroke patients

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### ABSTRACT

**Objective:** Because of the loss of autonomy in daily-life activities, spatial neglect after stroke is one of the main causes of disability. According to the spatial domains, neglect can be divided into personal (body), peripersonal (reaching) and extrapersonal (far) space. We evaluated the effect of these subtypes of neglect on functional outcome of rehabilitation in stroke patients.

**Methods:** A total of 1350 stroke patients were consecutively admitted into our neurorehabilitation unit from 2002 to 2016. We analyzed data for patients with a first ischemic or hemorrhagic right-hemispheric stroke in this observational retrospective study. The presence of neglect was evaluated by using structured tests for specific spatial domains. Patients underwent individual physical and occupational therapy, and those with neglect received specific therapy for 8 consecutive weeks consisting of visual scanning, reading and copying, copying line drawings on a dot matrix and describing scenes. The Functional Independence Measure (FIM) instrument was administered at both admission and discharge to assess functional autonomy. Rehabilitation effectiveness for FIM (percentage of potential improvement achieved) was calculated. Multiple regression analyses were performed.

**Results:** Among 359 patients with right-brain damage, 130 showed left neglect, or unilateral spatial neglect (USN), and 229 only left hemiparesis, without neglect. Overall, 90 patients (69%) with USN showed peripersonal neglect, 89 (68%) extrapersonal neglect and 60 (46%) personal neglect. Functional motor and cognitive impairment was greater with than without USN as measured by FIM at admission and discharge and the rehabilitation hospital stay was longer. USN affected functional status at admission and rehabilitation effectiveness for FIM. Extrapersonal and peripersonal neglect significantly affected both function at admission and effectiveness.

**Conclusions:** Our data confirm the negative prognostic effect of neglect on functional outcome in a large sample. We also show the importance of evaluating and training according to neglect subtype to improve functional independence.

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### 1. Introduction

Unilateral spatial neglect (USN) is a neuropsychological syndrome that frequently follows right-hemispheric lesions. It consists of the inability of the patient to respond, orient, and attend to stimuli on the left side of a space [1,2]. Although more frequent in patients with right-hemispheric lesions [3], the neglect can also occur with left-hemispheric lesions [4]. Left neglect after a right-hemispheric lesion is more severe and more long-lasting, chronically affecting activities of daily living [5].

Neglect is a heterogeneous syndrome with many subtypes. According to spatial domains, it can be divided into personal (body space), peripersonal (reaching space) and extrapersonal (far space) neglect. Moreover, it can be classified as allocentric

neglect (object-centered), characterized by a failure to perceive the contralesional side of an individual stimulus regardless of its position or location in space [6], and egocentric (viewer-centered) neglect, characterized by inattention to any stimuli located in the space contralesional to the individual's midline [7,8]. Representational neglect [9] concerns imaginary space. According to sensory or motor modalities, USN can be visual, defined as the inability to detect stimuli presented in the contralesional visual field, or auditory, defined by an attention deficit for sounds or verbal stimuli from the contralateral space. Motor neglect is defined as the inability to spontaneously use the contralesional limb but without primary motor or sensory deficits [10].

Because of the loss of autonomy in daily-life activities, neglect is one of the main causes of disability after stroke. The person does not eat food on the left side of the plate, collides with obstacles on the left side of the space, skips the initial part of sentences when reading newspapers or does not dress on the left side of the body. Neglect is associated with poor functional outcome because it

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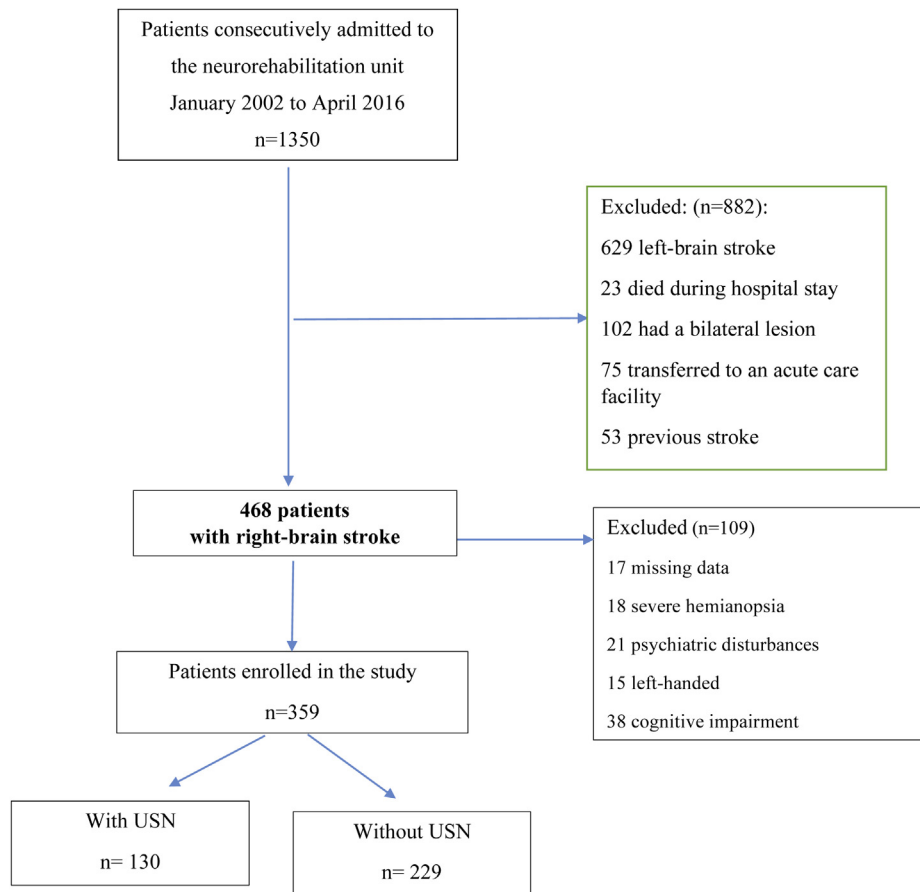


Fig. 1. Flowchart of selection of participants. USN: unilateral spatial neglect.

interferes with rehabilitation aimed at improving other symptoms, such as hemiparesis [11–13]. In a recent study, USN was found a negative prognostic factor for motor recovery and for independence in daily living activities [14]. The authors showed that together with the severity of stroke at admission and older age, neglect recovery was a negative significant predictor of daily living activity because worst USN recovery corresponded to worst functional outcome. Therefore, the outcome of the whole rehabilitation process was affected by the outcome of neuropsychological therapy in patients with USN.

Here we aimed to evaluate the role of a specific form of neglect according to spatial domains on outcome in stroke patients.

## 2. Materials and methods

We investigated the role of subtypes of neglect on functional outcome in this observational retrospective study, comparing 2 groups of patients by the presence or absence of neglect.

We considered a sample of 1350 patients consecutively admitted to the Neurorehabilitation Unit of the S. Maugeri Foundation Istituto di Ricovero e Cura a Carattere Scientifico from January 2002 to April 2016 (Fig. 1). All patients had been admitted after their first stroke. We excluded patients with a previous brain injury, lesions in the left cerebral hemisphere, aphasia, previous substance abuse or dependence, a history of psychiatric disturbance, presence of cognitive impairment and dementia before the stroke, severe hemianopsia and visual impairment, and left handedness. We included patients with ischemic or hemorrhagic right-hemispheric stroke documented by neuroradiological examination (CT or MRI).

Demographic, clinical and functional data collected included age, gender, onset to admission interval (OAI), length of stay (LOS) in a rehabilitation unit, marital status, employment status, type of stroke, presence of neglect, motor and cognitive effectiveness and efficiency.

The study was approved by the S. Maugeri Foundation ethics committee on May 2016. All patients gave informed consent for the use of their data.

### 2.1. Functional Independence Measure (FIM)

The FIM instrument [15] was used to evaluate the functional status of all participants. The FIM rates independence in daily life and includes 13 motor items (eating, grooming, bathing, upper- and lower-body dressing, toileting, bladder and bowel management, bed-to-chair transfer, toilet transfer, shower transfer, locomotion, stairs) and 5 cognitive items (comprehension, expression, social interaction, problem solving and memory). The score for each item ranges from 1 (total dependence) to 7 (total independence). The maximum scores for the total scale and for the motor and cognitive subscales are 126, 91 and 35, respectively.

### 2.2. Neglect assessment

We evaluated the presence of USN by using structured tests for specific spatial domains.

For personal neglect, we administered the semi-structured scale for functional evaluation of personal neglect [16]. The patient was asked to demonstrate the use of 3 common objects: comb, eyeglasses, and razor for men or powder for women. The examiner evaluates the subject's performance with each object and assigns a score from 0 to 3 according to the degree of symmetry of the

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