



# Spasticity over time during acute rehabilitation: a study of patient and clinician scores



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## ABSTRACT

**Aims:** The aims of this study were to describe spasticity trajectories as a function of time, gender, and diagnosis and to explore the correspondence between patient and clinician scores of spasticity.

**Background:** Discrepancy between examiner assessment and patient rating of spasticity exists. Assessments that include the patient perspective are critical for patient safety. This mixed-method study provided patient descriptors of spasticity integrated with clinical scales.

**Method:** Twenty-three participants provided spasticity descriptors and rated their spasticity based on Numeric Rating Scale (NRS) scores. A clinician evaluated spasticity daily using the Modified Ashworth Scale (MAS). This resulted in 1976 points of data for analysis.

**Results:** Spasticity was highly variable over time. The empirical correspondence between the clinician-rated MAS and the patient-rated NRS revealed that patient and examiner understanding of spasticity were diverged considerably.

**Conclusions:** Clinical evaluation protocols should include patient reports on spasticity. Knowledge about patient word choice can enhance patient–provider communication.

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## 1. Introduction

Spasticity is a symptom associated with upper motor neuron disorders that manifest as tight or stiff muscles. Spasticity interferes with activities of daily living (ADLs) and often causes pain, and insomnia (Bhimani, 2008; Huang, Lin, Chen, Yeh, & Chung, 2013). The spasticity may also complicate daily hygiene, mobility, transfers and have negative consequences for quality of life (Bhimani, 2008; Bhimani, Anderson, Henly, & Stoddard, 2011; Bhimani, Peden-McAlpine, & Henly, 2012; Mahoney et al., 2007). Spasticity is a chronic symptom that patients must manage over time. Nurses often provide consultations and care for this population across multiple clinical settings; therefore, understanding the spasticity trajectory based on the ebb and flow of symptom experiences is crucial to achieve patient-centered care.

Although a large body of literature summarizes clinicians' reports of spasticity, this literature is several years old and very little is available that indicate patients' perspectives. For example, the majority of the spasticity measurement literature is focused on inter-rater reliability, with less attention paid to the MAS' utility in practice (Mahoney et al.,

2007; Bhimani et al., 2012; Lechner, Frotzler, & Eser, 2006; Priebe, Sherwood, Thornby, Kharas, & Markowski, 1996; Skold, 2000; Skold, Levi, & Seiger, 1999).

Data on spasticity over time and how trajectories of spasticity are aligned with patient descriptions of spasticity are also lacking. Therefore, the purpose of this research was to describe the nature of spasticity from patient and examiner perspectives over time. The goals were to understand spasticity as a function of time, gender, and diagnosis; discover the temporal nature of spasticity; explore the correspondence between patient and examiner ratings of spasticity; and integrate the spasticity vocabularies with patient and examiner ratings.

## 2. Conceptual framework

Symptom experiences embedded in temporality guided this research. According to the symptom experience theory (Henly, Kallas, Klatt, & Swenson, 2003), a precipitating event such as illness/trauma (e.g., spinal cord injury) can lead to the onset of symptoms (e.g., spasticity). At the time of symptom awareness, cognition and emotional appraisal prompts an individual to seek treatment based on symptom perception, timing, distress, intensity, and quality. The symptom characteristics of seriousness, unpleasantness, and inexplicability often lead to clinical diagnosis and treatment of symptoms that are experienced by the individual (Henly et al., 2003).

A change in symptom experiences implies the notion of time. Timing in the occurrence, frequency, duration, and intensity of symptoms is

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core to the patient experience and is crucial for nurses to understand when devising care plans or strategies to resolve or manage the symptom experience for patients. Since spasticity is a sequela of biological illness and is experienced in a social environment, consideration of time from multiple perspectives (e.g., patients and clinical providers) is needed for a comprehensive understanding of the spastic symptom experience.

### 3. Clinical context

Clinicians often use the MAS to assess spasticity (Kheder & Nair, 2012). A MAS score is assigned based on the clinician's subjective interpretation of the resistance or "catch" present in limbs when a passive range of motion is performed. In addition, patients are asked to indicate their subjective perception of spasticity by providing a score from 0 to 10 on the NRS (see Appendix A). Clinicians use both scores for delivering interventions and adjusting medications. However, in clinical practice, patient descriptions of spasticity can be perplexing as they often do not align with the empirical data collected from MAS or NRS assessments. For these reasons, clinicians must listen to the cues from the patient lexicon so other neurological sensations can be separated from specific spasticity experiences.

Clinical examinations reveal an important but limited aspect of spasticity. Unlike pain, spasticity is partially detectable through range of motion (ROM) and posture. However, the patient also perceives sensory aspects of spasticity. This means care providers must rely on patient reports as a critical complement to clinical observations to ensure more effective management and treatment of spasticity. For example, omitting patient reports can have serious consequences, including inappropriate delivery of spasticity therapy, and administration of invasive and unnecessary therapies. Therefore, this study is necessary because it captures the unique life experience of spasticity from patient perspectives, and attempt to align these reports with clinical appraisals to determine if there is concordance. If there is discrepancy between clinician assessments and patient reports then nurses must become familiar with the language used by patients to describe their own spasticity so that symptom management is effective.

### 4. Literature review

Patient-reported spasticity is highly variable. Clinical factors that may increase spasticity, such as urinary tract infections and pressure ulcers, are assumed as noxious stimuli to the central nervous system (Kheder & Nair, 2012; Martins et al., 2013). Some spasticity may even be beneficial for motor function, such as when bearing weight (Rekand, 2010). Outcome measures such as the Ashworth Scale (AS), the Modified Ashworth Scale (MAS), the Spasm Scale (SS), and the Numeric Rating Scale (NRS) are routinely used in clinical practice. These scales are easy to use at the bedside to assess spasticity but their reliability and validity are less clear (Craven & Morris, 2010; Fleuren et al., 2010; Malhotra & Pandyan, 2009). The AS was developed in 1964 to evaluate the clinical efficacy of the antispasticity medication "carisoprodol" in multiple sclerosis patients (Ashworth, 1964). In 1987, Bohannon and Smith added an additional grade between 1 and 2 and termed it as 1+ to enhance sensitivity of the clinical measurement of spasticity (Bohannon and Smith, 1987). However, Bhimani et al. (2012) point out that the addition of 1+ has changed this scale from ordinal to nominal, which may create confusion in clinical practice. Another common scale, the NRS, is used to report pain but has also been used to report patient ratings of spasticity (see Appendix A). Neurophysiological and biomechanical examinations using dynamometry or electromyography are time consuming and not easy to use in clinical practice to evaluate spasticity (Kohan, Abootalebi, Khoshnevisan, & Rahgozar, 2010; Sorinola, White, Rushton, & Newham, 2009). Thus, clinicians are often left with their own observational assessments and patient reports when attempting to manage spasticity.

#### 4.1. Patient and examiner evaluation of spasticity

Discrepancy exists between clinician assessments and patients' spasticity reports (Bhimani et al., 2012; Francis et al., 2004). Miscommunication because of this discrepancy may lead to spasticity mismanagement, which can compromise patient safety. For example, Skold et al. (1999) found that examiners using the MAS missed 40% of patients who reported spasticity. Self-reports of spasm frequency were also weakly correlated ( $r = .31$ ) with Achilles tendon tap (Priebe et al., 1996). Because patients may use different terms than clinicians to describe spasticity, patient reports are needed to enrich the accuracy of clinical assessment and improve patient care (Bhimani et al., 2012; Burridge et al., 2005).

#### 4.2. Clinical issues

Clinician assessment and a patient's response to interventions are often supplemented with other information, such as a patient's diagnosis and co-morbidities. For example, the pathophysiological mechanism for spasticity is similar for spinal cord injury (SCI), multiple sclerosis (MS), cerebral palsy (CP) and traumatic brain injury (TBI) but may vary for stroke (Bhimani et al., 2012; Woolacott & Burne, 2006). In addition, the gender variations in spasticity are currently unknown in the scientific literature. The rate, rhythm, and frequency of spasticity may also fluctuate based on external factors such as the season or weather, and the patient's internal sense of well-being (Lechner et al., 2006; Rekand, 2010).

### 5. The study

#### 5.1. Aims

The purpose of this research was to understand and compare patient and clinician perspectives of spasticity over time. The specific aims were to (1) describe spasticity trajectories during acute rehabilitation as a function of time, gender, and diagnosis, (2) explore the correspondence between patient and clinician scores of spasticity, and (3) integrate the spasticity lexicon provided by patients with self and clinician scores using the Numeric Rating Scale (NRS) and the Modified Ashworth Scale (MAS).

#### 5.2. Design

This study used a concurrent mixed methods design where qualitative and quantitative data collection occurred at the same time, and findings were integrated at the data analysis stage. This study was also exploratory, observational and longitudinal in design.

#### 5.3. Sample and setting

The study setting was two acute rehabilitation units in a large Midwestern metropolitan area. Twenty-three patients were enrolled from 2008 to 2009. Patients were (a) adults with neurological disorders who were experiencing lower extremity spasticity, (b) admitted to a rehabilitation unit, (c) able to independently consent for various tests during the hospitalization, if needed, and (d) able to read, speak, and understand the English language.

#### 5.4. Ethical consideration and protocol

Institutional review board and HIPAA approvals were obtained from the clinical sites where the study was conducted. The enrollment procedure was adapted for physically disabled patients who were competent to consent but were not physically able to sign the consent form.

First, demographic information along with medication records were collected. Patients rated spasticity on the NRS every hour while awake. The patients were followed for 7 days in their acute rehabilitation

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