

Directed rehabilitation reduces pain and depression while increasing independence and satisfaction with life for patients with paraplegia due to epidural metastatic spinal cord compression

Robert L. Ruff, MD, PhD, et al.



We determined whether directed rehabilitation affected the survival, pain, depression, independence, and satisfaction with life of veterans who were nonambulatory after spinal epidural metastasis (SEM) treatment. Specialized

rehabilitation is usually provided to patients with traumatic spinal cord injury (SCI) but not to patients who develop SCI due to systemic cancer. Patients who received 2 weeks of rehabilitation had longer median survival and fewer deaths from myelopathic complications than the control patients who did not receive rehabilitation. Two weeks after SEM treatment, the rehabilitated patients also had less pain, lower depression scores, and higher satisfaction with life scores.

Effect of ankle-foot orthosis on roll-over shape in adults with hemiplegia

Stefania Fatone, PhD, BPO (Hons); Andrew H. Hanson, PhD



We investigated the effect of an ankle-foot orthosis (AFO) on roll-over shape (ROS) in adults with hemiplegia following stroke. Changes that lead to improved ankle-foot kinematics may result in a more biometric ROS. The AFO we tested significantly improved ROS compared with no AFO, in particular increasing arc radius and length (two ROS characteristics), but did not completely normalize it for subjects, since the first contact point

(between the foot and the floor) with respect to the ankle center was further posterior than normal. For hemiplegic subjects, using an AFO may increase center of pressure excursion and also improve ROS, i.e., make it more closely resemble that of nondisabled subjects.

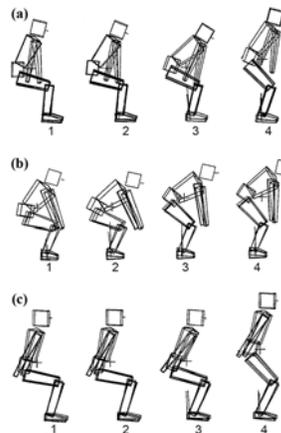
Randomized clinical trial: Group counseling based on tinnitus retraining therapy

James A. Henry, PhD, et al.

We conducted a randomized clinical trial to test the hypothesis that group educational counseling based on principles of tinnitus retraining therapy would effectively treat veterans who have clinically significant tinnitus. The veterans were randomized into three groups: (1) educational counseling, (2) traditional support, and (3) no treatment. Statistical analysis showed that educational counseling benefited veterans significantly more than either traditional support or no treatment, as measured by the Tinnitus Severity Index. These results suggest that group educational counseling can benefit many tinnitus patients and could be integral to a “progressive intervention” approach to tinnitus clinical management.

Chair rise strategies in older adults with functional limitations

Donna Moxley Scarborough, MS, PT, et al.

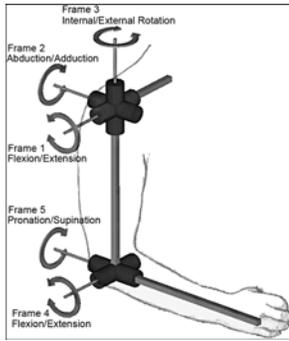


We present new findings on biomechanical measures that discriminate movement strategies performed by older adults during chair rise (CR). We observed the momentum transfer (MT), exaggerated trunk flexion (ETF), and dominant vertical rise (DVR) CR strategies in a group of older adults with functional limitations. The DVR strategy required the greatest knee torque, while maximum knee torque occurred significantly earlier during the ETF

strategy. Peak trunk flexion was the primary distinguishing biomechanical measure for classifying CR strategy. This finding may offer clinicians an easy method of identifying CR strategies during evaluation. We conclude that the MT strategy is the safest and most preferable CR strategy.

Dynamic biomechanical model for assessing and monitoring robot-assisted upper-limb therapy

Hussein A. Abdullah, PhD, PEng, et al.



We described the design, validation, and application of a dynamic biomechanical model for assessing and monitoring trajectory, position, orientation, force, and torque generated by movements of the whole upper limb (UL) during robot-assisted therapy. The model, a useful tool for enhancing the functionality of

poststroke robot-assisted UL therapy, performs inverse dynamic analyses of the recorded arm's movements to calculate reaction forces and moments acting about the 3 degrees of freedom (DOF) shoulder and 2 DOF elbow joints. We assigned 20 nondisabled subjects three different therapeutic exercises to test and validate the biomechanical model. We found that when the biomechanical model is taught an exercise, it can accurately predict a subject's actual UL joint angles and torques.

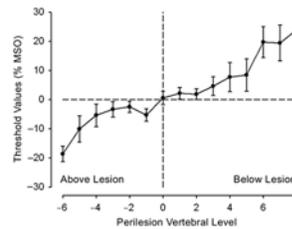
Spinal Cord Independence Measure: Comprehensive ability rating scale for the spinal cord lesion patient

Amiram Catz, MD, PhD; Malka Itzkovic, MA, OT

We describe the Spinal Cord Independence Measure (SCIM) and its scoring techniques, purpose, and advantages for measuring the ability of patients with spinal cord lesions (SCLs) to perform everyday tasks. SCIM can be used in patients with SCLs for ability assessment, as a compact guide for determining certain treatment goals, and for outcome assessment following interventions designed to promote recovery. An international multi-center study supported the validity and reliability of the SCIM despite intercultural differences and demonstrated its superior sensitivity to changes in patient function.

Review of physiological motor outcome measures in spinal cord injury using transcranial magnetic stimulation and spinal reflexes

Peter H. Ellaway, PhD, et al.

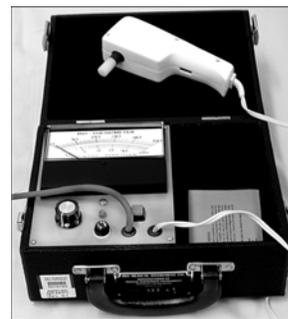


This article reviews methods developed as part of a clinical initiative on improving outcome measures for assessment of motor function in subjects with spinal cord injury (SCI). Physiological motor outcome measures

originally developed for limbs—transcranial magnetic stimulation (TMS) of the motor cortex to elicit motor-evoked potentials (MEPs) and mechanical stimulation to elicit spinal reflexes—have been extended to trunk muscles. The impetus for this development was the lack of a motor component assessment for the thoracic myotomes in the American Spinal Injury Association examination. Application of TMS to assessment of limb muscles is reviewed, followed by consideration of its application to assessment of paravertebral and intercostal muscles. Spinal reflex testing of paravertebral muscles is also described. The principal markers for the thoracic SCI motor level that have emerged from this clinical initiative are (1) the threshold of MEPs in paravertebral muscles in response to TMS of the motor cortex, (2) the facilitation pattern and latency of MEPs in intercostal muscles during voluntary expiratory effort, and (3) the absence of long-latency reflex responses and exaggeration of short-latency reflex responses in paraspinal muscles.

Quantitative sensory tests (perceptual thresholds) in patients with spinal cord injury

Gordana Savic, MD, MSc, et al.



We summarize preliminary findings of three quantitative sensory tests for spinal cord injury (SCI) evaluated as part of the International Spinal Research Trust Clinical Initiative study: perceptual thresholds to electrical, vibration, and thermal stimulation. The goal of the wider Clinical Initiative is development

of a battery of tests that could be used for monitoring efficacy of new therapeutic interventions. Results suggest that

the three quantitative sensory tests are simple, reproducible, and applicable in a clinical setting. They seem to add resolution and sensitivity to standard clinical testing and could be useful adjuncts in longitudinal monitoring of SCI for research.

Development of international standards to document sexual and reproductive functions after spinal cord injury: Preliminary report

Marcallee Sipski Alexander, MD, et al.

Generally, the American Spinal Injury Association's International Standards are used to communicate the effects of spinal cord injury (SCI) on motor and sensory functions. However, these standards fall short at documenting the degree of preservation of autonomic function post-SCI. Standard nomenclature is necessary to communicate effectively about remaining autonomic function after SCI. We developed standard terminology to explain the effect of SCI on sexual functioning. In this article, we illustrate a standard anatomic diagnosis and secondary means of describing the presence of male and female sexual dysfunctions, genital arousal, and orgasmic function.

Assessment of upper limb in tetraplegia: Considerations in evaluation and outcomes research

MJ Mulcahey, PhD, OTR/L, et al.

ICSHT (Grade 4 MMT)	ISCSCI (Grade 3 MMT)
Group 0 - No Muscles for Transfer	C6 - Elbow Flexors
Group 1 - Brachioradialis	
Group 2 - Extensor Carpi Radialis Longus	C6 - Wrist Extensors
Group 3 - Extensor Carpi Radialis Brevis	
Group 4 - Pronator Teres	C7 - Elbow Extensors
Group 5 - Flexor Carpi Radialis	
Group 6 - Extensor Digitorum Communis	C8 - Finger Flexors
Group 7 - Extensor Pollicis Longus	
Group 8 - Partial Digital Flexors	
Group 9 - Lacks Only Intrinsic	
Group X - Exceptions	

We discuss several measurement tools for evaluating the upper limb of persons with tetraplegia. Muscle strength testing and electrodiagnostics are discussed as they relate to technique and usefulness for clinical trials.

Recommendations are set forth for incorporating the International Classification for Surgery of the Hand in Tetraplegia motor and sensory examinations as adjuncts to the International Standards for Neurological Classification of Spinal Cord Injury motor and sensory examinations to further develop electrodiagnostic techniques as measurement tools for acute clinical trials. We also note that much work remains in the development, validation, and clinical deployment of an assessment for upper-limb function after spinal cord injury.

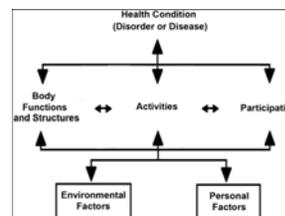
Assessment of autonomic dysfunction following spinal cord injury: Rationale for additions to International Standards for Neurological Assessment

Andrei V. Krassioukov, MD, PhD, et al.

The International Standards for Neurological Assessment, commonly referred to as the American Spinal Injury Association (ASIA) examination, only evaluate motor and sensory functions following spinal cord injury (SCI). We present a preliminary report of the discussion of the joint committee of the ASIA and International Spinal Cord Society on developing assessment criteria for autonomic function testing following SCI. To improve neurological function evaluation in individuals with SCI and better assess the effects of therapies in the future, we propose a comprehensive set of definitions of general autonomic nervous system dysfunction following SCI that clinicians should address. Presently, we recommend the recognition and assessment of the following conditions: neurogenic shock, orthostatic hypotension, autonomic dysreflexia, cardiac dysrhythmias, temperature dysregulation, and hyperhidrosis.

Domains of outcomes in spinal cord injury for clinical trials to improve neurological function

Ralph J. Marino, MD, MSCE



In clinical trials for improving spinal cord function, one must show that the treatment not only directly affects neurological function but also results in meaningful improvement for the patient. However, function can be improved with equipment or new techniques without any change in spinal cord function. This article reviews domains or types of outcome measures relevant to clinical trials in spinal cord injury. The World Health Organization's model of functioning was modified to include impairment (strength and sensation), capability/functional limitation (actions such as grasping and reaching), and activity (capacity, ability to perform an activity in a standard environment; and performance, ability to perform an activity in one's usual environment). An understanding of different types of functional outcomes will improve selection of appropriate instruments for determining clinical trials outcomes.

Dynamometry testing in spinal cord injury

Sue Ann Sisto, PT, MA, PhD; Trevor Dyson-Hudson, MD



Persons with spinal cord injury (SCI) demonstrate strength deficits that can limit their functional ability to perform activities of daily living. For a specific lesion level, performance of functional activities is related to the level of muscle strength. Consequently, in clinical practice, we need reliable measures of muscle strength

to determine mobility capacity. Muscle-strength testing is used to document recovery or loss of motor function in SCI measure improvements in strength. Several methods are available for testing muscle strength, such as handheld, handgrip, and isokinetic dynamometers. We provide an overview of muscle-contraction definitions and testing methodologies and discuss the reliability of these testing methods.