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Current Awareness Bulletin – Spinal Cord Injuries
June 2015

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Guidelines

National Institute for Health and Care Excellence (NICE)

Pressure ulcers
NICE quality standard [QS89] Published date: June 2015

New and Updated Cochrane Systematic Reviews

New Reviews – June 2015

Massage therapy for preventing pressure ulcers

Journal Articles

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1. Title: A review and update on the guidelines for the acute non-operative management of cervical spinal cord injury.
Citation: Journal of neurosurgical sciences, Jun 2015, vol. 59, no. 2, p. 119-128, 0390-5616 (June 2015)
Author(s): Readdy, W J, Chan, A K, Matijakovich, D J, Dhall, S D
Abstract: Acute traumatic spinal cord injury (SCI) is an important cause of impairment globally with estimates of incidence varying from 10.4 to 83 million inhabitants annually. These injuries typically impact younger individuals, reduce quality of life years, and are costly to patients, with lifetime costs estimated to exceed $4 million. Given the lifetime impact of SCI, establishing clear practice guidelines for the acute non-operative management of these injuries remains important. In 2013 the Joint Section on Disorders of the Spine and Peripheral Nerves of the American Association of Neurological Surgeons (AANS) and the Congress of Neurological Surgeons (CNS) released revised guidelines on the topic of Cervical Spinal Cord Injury (SCI). In the present article, we explore the seven general management subsections of the cervical SCI guidelines, review the key literature supporting each recommendation, and review the additional literature since the publication of the 2013 guidelines. Our review found a paucity of significant updates within several of the SCI guideline sections. As a result of our findings we propose a collaborative, multi-institutional prospective study to evaluate many pressing limitations of the current literature. In particular, the development of common data elements that allow consistent, reproducible data collection should be made a priority.

Source: Medline

2. Title: Acute Spinal Cord Injury
Citation: Journal of spinal disorders & techniques, Jul 2015, vol. 28, no. 6, p. 202-210 (July 2015)
Author(s): Witiw, Christopher D, Fehlings, Michael G
Abstract: Our understanding of the pathophysiological processes that comprise the early secondary phases of spinal cord injury such as spinal cord ischemia, cellular excitotoxicity, ionic dysregulation, and free-radical mediated peroxidation is far greater now than ever before, thanks to substantial laboratory research efforts. These discoveries are now being translated into the clinical realm and have led to targeted upfront medical management with a focus on tissue oxygenation and perfusion and include avoidance of hypotension, induction of hypertension, early transfer to specialized centers, and close monitoring in a critical care setting. There is also active exploration of neuroprotective and neuroregenerative agents; a number of which are currently in late stage clinical trials including minocycline, riluzole, AC-105, SUN13837, and Cethrin. Furthermore, new data have emerged demonstrating that the timing of spinal cord decompression after injury impacts recovery and that early decompression leads to significant improvements in neurological recovery. With this review we aim to provide a concise, clinically relevant and up-to-date summary of the topic of acute spinal cord injury, highlighting recent advancements and areas where further study is needed.

Source: Medline

3. Title: Advances in regenerative therapies for spinal cord injury: A biomaterials approach
Citation: Neural Regeneration Research, May 2015, vol./is. 10/5(726-742), 1673-5374;1876-7958 (01 May 2015)
Author(s): Tsintou M., Dalamagkas K., Seifalian A.M.
Language: English
Abstract: Spinal cord injury results in the permanent loss of function, causing enormous personal, social and economic problems. Even though neural regeneration has been proven to be a natural mechanism, central nervous system repair mechanisms are ineffective due to the imbalance of the inhibitory and excitatory factors implicated in neuroregeneration. Therefore, there is growing research interest on discovering a novel therapeutic strategy for effective spinal cord injury repair. To this direction, cell-based delivery strategies, biomolecule delivery strategies as well as scaffold-based therapeutic strategies have been developed with a tendency to seek for the answer to a combinatorial approach of all the above. Here we review the recent advances on regenerative/ neural engineering therapies for spinal cord injury, aiming at providing an insight to the most promising repair strategies, in order to facilitate future research conduction.
Publication Type: Journal: Article
Source: EMBASE

4. Title: Assistive technologies for self-managed pressure ulcer prevention in spinal cord injury: A scoping review
Citation: Journal of Rehabilitation Research and Development, 2015, vol./is. 52/2(131-146), 0748-7711;1938-1352 (2015)
Author(s): Tung J.Y., Stead B., Mann W., Ba'Pham, Popovic M.R.
Language: English
Abstract: Pressure ulcers (PUs) in individuals with spinal cord injury (SCI) present a persistent and costly problem. Continuing effort in developing new technologies that support self-managed care is an important prevention strategy. Specifically, the aims of this scoping review are to review the key concepts and factors related to self-managed prevention of PUs in individuals with SCI and appraise the technologies available to assist patients in self-
management of PU prevention practices. There is broad consensus that sustaining long-term adherence to prevention regimens is a major concern. Recent literature highlights the interactions between behavioral and physiological risk factors. We identify four technology categories that support self-management: computer-based educational technologies demonstrated improved short-term gains in knowledge (2 studies), interface pressure mapping technologies demonstrated improved adherence to pressure-relief schedules up to 3 mo (5 studies), electrical stimulation confirmed improvements in tissue tolerance after 8 wk of training (3 studies), and telemedicine programs demonstrated improvements in independence and reduced hospital visits over 6 mo (2 studies). Overall, self-management technologies demonstrated low-to-moderate effectiveness in addressing a subset of risk factors. However, the effectiveness of technologies in preventing PUs is limited due to a lack of incidence reporting. In light of the key findings, we recommend developing integrated technologies that address multiple risk factors.

**Publication Type:** Journal: Review

**Source:** EMBASE

**Full Text:** Available from EBSCoHost in *Journal of Rehabilitation Research & Development*

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5. **Title:** Can combined aerobic and muscle strength training improve aerobic fitness, muscle strength, function and quality of life in people with spinal cord injury? A systematic review

**Citation:** Spinal Cord, June 2015, vol./is. 53/6(418-431), 1362-4393;1476-5624 (08 Jun 2015)

**Author(s):** Bochkezanian V., Raymond J., De Oliveira C.Q., Davis G.M.

**Language:** English

**Abstract:** Study design: A systematic review. Objectives: The aim of this systematic review was to establish whether combined aerobic training and muscle strength training is effective in improving aerobic fitness, muscle strength, function and/or quality of life (QoL) in people with spinal cord injury (SCI). Settings: Faculty of Health Sciences, University of Sydney, NSW, Australia. Methods: A search was conducted for randomized controlled trials (RCTs), controlled trials, uncontrolled clinical trials, case series and cross-over studies involving exercise interventions that included a combination of aerobic and strength components, either in circuit-mode or in sequence for people with SCI. Methodological quality was independently rated using the PEDro scale and key findings were extracted from trials by two reviewers. Results: The search identified 7981 abstracts, from which nine trials met the inclusion criteria. From the nine selected trials, seven reported aerobic outcomes, two of which showed a statistically significant within-group difference in aerobic fitness. Five studies reported muscle strength outcomes, four of them showed a statistically significant within-group mean difference on at least one outcome measure. Two studies looked at QoL, one of them found a statistically significant between-group difference on one outcome measure. Conclusion: Our systematic review showed that literature on SCI population is scarce, of low quality and findings of existing studies are inconsistent. Thus, further RCTs with larger number of participants are needed to make a definite conclusion about the influence of combined aerobic and muscle strength training on aerobic fitness, muscle strength and QoL in people with SCI.

**Publication Type:** Journal: Review

**Source:** EMBASE

**Full Text:** Available from *Nature Publishing Group* in *Spinal Cord*

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6. **Title:** Contoured Foam Cushions Cannot Provide Long-term Protection Against Pressure-Ulcers for Individuals with a Spinal Cord Injury: Modeling Studies.

**Citation:** Advances in skin & wound care, Jul 2015, vol. 28, no. 7, p. 303-316 (July 2015)

**Author(s):** Shoham, Naama, Levy, Ayelit, Kopplin, Kara, Gefen, Amit

**Abstract:** To determine changes in internal soft-tissue loads in the buttocks of individuals with a spinal cord injury (SCI), who undergo pathoanatomical changes during the first months and years following the occurrence of the SCI, while sitting on a contoured foam cushion (CFC) that has been fitted close to the time of the injury but has not been replaced in subsequent years. Internal tissue loads in variant buttocks anatomies on a CFC were analyzed by means of finite element computer simulations. The pathoanatomical changes that are characteristic to SCI and were simulated here are: increase in fat tissue mass, intramuscular fat infiltration, muscle atrophy, and combinations of these conditions. Computational biomechanical modeling. Simulating the aforementioned pathoanatomical changes consistently resulted in greater mechanical strain and stress magnitudes and more inhomogeneity in the loading state of muscle and fat tissues, with a more profound effect in fat. The simulations further indicated a clear trend of exacerbation in tissue exposure to loads as the pathoanatomical changes progress chronologically and the CFC is not replaced. A CFC that has been fitted at a time close to the SCI, but has not been replaced in subsequent years, substantially loses its efficacy in protecting patients from developing pressure ulcers and deep tissue injury in particular.

**Source:** Medline
7. Title: Development and initial evaluation of the SCI-FI/AT.
Citation: Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(409-418), 10790268
Author(s): Jette, Alan M, Slavin, Mary D, Ni, Pengsheng, Kisala, Pamela A, Tulsky, David S, Heinemann, Allen W, Charlfue, Susie, Tate, Denise G, Fyffe, Denise, Morse, Leslie, Marino, Ralph, Smith, Ian, Williams, Steve
Language: English
Abstract: Objectives To describe the domain structure and calibration of the Spinal Cord Injury Functional Index for samples using Assistive Technology (SCI-FI/AT) and report the initial psychometric properties of each domain. Design Cross sectional survey followed by computerized adaptive test (CAT) simulations. Setting Inpatient and community settings. Participants A sample of 460 adults with traumatic spinal cord injury (SCI) stratified by level of injury, completeness of injury, and time since injury. Interventions None Main outcome measure SCI-FI/AT Results Confirmatory factor analysis (CFA) and Item response theory (IRT) analyses identified 4 unidimensional SCI-FI/AT domains: Basic Mobility (41 items) Self-care (71 items), Fine Motor Function (35 items), and Ambulation (29 items). High correlations of full item banks with 10-item simulated CATs indicated high accuracy of each CAT in estimating a person's function, and there was high measurement reliability for the simulated CAT scales compared with the full item bank. SCI-FI/AT item difficulties in the domains of Self-care, Fine Motor Function, and Ambulation were less difficult than the same items in the original SCI-FI item banks. Conclusion With the development of the SCI-FI/AT, clinicians and investigators have available multidimensional assessment scales that evaluate function for users of AT to complement the scales available in the original SCI-FI.
Publication Type: journal article
Source: CINAHL

8. Title: Development and psychometric characteristics of the SCI-QOL Ability to Participate and Satisfaction with Social Roles and Activities item banks and short forms.
Citation: Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(397-408), 10790268
Author(s): Heinemann, Allen W, Kisala, Pamela A, Hahn, Elizabeth A, Tulsky, David S
Language: English
Abstract: Objective To develop a spinal cord injury (SCI)-focused version of PROMIS and Neuro-QOL social domain item banks; evaluate the psychometric properties of items developed for adults with SCI; and report information to facilitate clinical and research use. Design We used a mixed-methods design to develop and evaluate Ability to Participate in Social Roles and Activities and Satisfaction with Social Roles and Activities items. Focus groups helped define the constructs; cognitive interviews helped revise items; and confirmatory factor analysis and item response theory methods helped calibrate item banks and evaluate differential item functioning related to demographic and injury characteristics. Setting Five SCI Model System sites and one Veterans Administration medical center. Participants The calibration sample consisted of 641 individuals; a reliability sample consisted of 245 individuals residing in the community. Results A subset of 27 Ability to Participate and 35 Satisfaction items demonstrated good measurement properties and negligible differential item functioning related to demographic and injury characteristics. The SCI-specific measures correlate strongly with the PROMIS and Neuro-QOL versions. Ten item short forms correlate >0.96 with the full banks. Variable-length CATs with a minimum of 4 items, variable-length CATs with a minimum of 8 items, fixed-length CATs of 10 items, and the 10-item short forms demonstrate construct coverage and measurement error that is comparable to the full item bank. Conclusion The Ability to Participate and Satisfaction with Social Roles and Activities CATs and short forms demonstrate excellent psychometric properties and are suitable for clinical and research applications.
Publication Type: journal article
Source: CINAHL

9. Title: Development and psychometric characteristics of the SCI-QOL Bladder Management Difficulties and Bowel Management Difficulties item banks and short forms and the SCI-QOL Bladder Complications scale.
Citation: Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(288-302), 10790268
Author(s): Tulsky, David S, Kisala, Pamela A, Tate, Denise G, Spungen, Ann M, Kirshblum, Steven C
Language: English
Abstract: Objective To describe the development and psychometric properties of the Spinal Cord Injury - Quality of Life (SCI-QOL) Bladder Management Difficulties and Bowel Management Difficulties item banks and Bladder Complications scale. Design Using a mixed-methods design, a pool of items assessing bladder and bowel-related concerns were developed using focus groups with individuals with spinal cord injury (SCI) and SCI clinicians, cognitive
Diagnosis and management of traumatic cervical central spinal cord injury: A review

Citation: Surgical Neurology International, October 2015, vol./is. 6/5 Supplement 4(S140-S153), 2152-7806 (01 Oct 2015)

Author(s): Epstein N., Hollingsworth R.

Language: English

Abstract: Background: The classical clinical presentation, neuroradiographic features, and conservative vs. surgical management of traumatic cervical central spinal cord (CSS) injury remain controversial. Methods: CSS injuries, occurring in approximately 9.2% of all cord injuries, are usually attributed to significant hyperextension trauma combined with congenital/acquired cervical stenosis/spondylosis. Patients typically present with greater motor deficits in the upper vs. lower extremities accompanied by patchy sensory loss. T2-weighted magnetic resonance (MR) scans usually show hyperintense T2 intramedullary signals reflecting acute edema along with ligamentous injury, while noncontrast computed tomography (CT) studies typically show no attendant bony pathology (e.g. no fracture, dislocation). Results: CSS constitute only a small percentage of all traumatic spinal cord injuries. Aarabi et al. found CSS patients averaged 58.3 years of age, 83% were male and 52.4% involved accidents/falls in patients with narrowed spinal canals (average 5.6 mm); their average American Spinal Injury Association (ASIA) motor score was 63.8, and most pathology was at the C3-C4 and C4-C5 levels (71%). Surgery was performed within 24 h (9 patients), 24-48 h (10 patients), or after 48 h (23 patients). In the Brodell et al. study of 16,134 patients with CSS, 39.7% had surgery. In the Gu et al. series, those with CSS and stenosis/ossification of the posterior longitudinal ligament (OPLL) exhibited better outcomes following laminoplasty. Conclusions: Recognizing the unique features of CSS is critical, as...
the clinical, neuroradiological, and management strategies (e.g. conservative vs. surgical management: early vs. late) differ from those utilized for other spinal cord trauma. Increased T2-weighted MR images best document CSS, while CT studies confirm the absence of fracture/dislocation.

**Publication Type:** Journal: Article  
**Source:** EMBASE  
**Full Text:** Available from *National Library of Medicine* in *Surgical Neurology International*

### 12. Title: Does locomotor training improve pulmonary function in patients with spinal cord injury?

**Citation:** Spinal Cord, June 2015, vol./is. 53/6(467-470), 1362-4393;1476-5624 (08 Jun 2015)  
**Author(s):** Tiftik T., Gokkaya N.K.O., Malas F.U., Tunc H., Yalçın S., Ekiz T., Erden E., Akkus S.  
**Language:** English  
**Abstract:** Objectives: The aim of this study was to compare the effects of a locomotor training (LT) combined rehabilitation program with a rehabilitation-only program on pulmonary function in spinal cord injury (SCI) patients by investigating spirometric analyses of the patients. Setting: Rehabilitation center in Ankara, Turkey. Methods: Fifty-two patients (40 male, 12 female) with SCI enrolled in the study. The subjects were divided into two groups: the first group (group A) received both LT and a rehabilitation program and the second group (group B) received only the rehabilitation program for 4 weeks. The LT program was prescribed as three 30-min sessions per week. Pulmonary function was evaluated spirometrically in both groups before and after the rehabilitation program. Results: The spirometric values of the SCI patients, including forced vital capacity, forced expiratory volume in 1 second, forced expiratory flow rate and vital capacity (VC) and VC%, increased significantly with LT in the first group (all P<0.05). Maximum voluntary ventilation values increased significantly in both groups (both P<0.05). Conclusion: These findings suggest that LT is effective for improving pulmonary function in SCI patients. We also highlight the useful effects of LT, which are likely the result of erect posture, gait and neuroplastic changes that prevent potential complications in SCI patients.

**Publication Type:** Journal: Article  
**Source:** EMBASE  
**Full Text:** Available from *Nature Publishing Group* in *Spinal Cord*

### 13. Title: Effect of intravesical botulinum neurotoxin-A injection on detrusor hyperreflexia in spinal cord injured patients

**Citation:** Drug Research, October 2015, vol./is. 65/6(327-331), 2194-9379;2194-9387 (28 Oct 2014)  
**Author(s):** Ge X.-T., Li Y.-F., Wang Q., Zhao J.-N.  
**Language:** English  
**Abstract:** Purpose: To evaluate the effects of Botulinum Toxin A injection into the detrusor muscle on various voiding parameters in spinal cord injured patients with neurogenic detrusor hyperreflexia Materials and methods: 24 patients with spinal cord injuries who had detrusor overactivity and urinary incontinence and were refractory to oral medications, were injected 300 IU of BTX-A into the detrusor muscle. The pre-and post-treatment evaluations included determination of bladder urinary continence status, frequency/volume chart of CIC, Incontinence Quality of Life questionnaire (I-QOL) and patient satisfaction. The urodynamic parameters measured included maximum cystometric capacity (MCC), reflex detrusor volume (RDV) and maximum detrusor pressure during bladder contraction (MDP) were analyzed at the outset and during the follow-up (2, 6, and 24 weeks) examinations. Results: The evaluation of urodynamic parameters during follow-up examinations (2, 6 and 24 weeks) revealed significant increase in mean reflex volume (p<0.05) and cystometric capacity (p<0.05), on the other detrusor pressure decreased significantly (p<0.05). In majority of patients there was considerable reduction in incontinence episodes and no complications or side effects were reported. Most of the patents were satisfied with the treatment. Conclusion: The use of Botulinum toxin type A for treatment of neurogenic detrusor overactivity in spinal cord injured patients is safe and efficacious. In our 24-week study period, there was significant improvement in most urodynamic parameters with consistence and subjective satisfaction indicated by the treated patients.

**Publication Type:** Journal: Article  
**Source:** EMBASE


**Citation:** Journal of rehabilitation medicine, Jun 2015, vol. 47, no. 6, p. 523-530 (June 24, 2015)  
Abstract: To examine the effects of a 16-week exercise programme, using either a hybrid cycle or a handcycle, on cardiovascular disease risk factors in people with spinal cord injury. Nineteen individuals with spinal cord injury ≥ 8 years. Multicentre randomized controlled trial. Both the hybrid cycle group (n = 9) and the handcycle group (n = 10) trained twice a week for 16 weeks on the specific cycle. Outcome measures obtained pre and post the programme were: metabolic syndrome components (waist circumference, systolic and diastolic blood pressure, high-density lipoprotein cholesterol, triglycerides and insulin resistance), inflammatory status (C-reactive protein (CRP), interleukin (IL)-6 and -10), and visceral adiposity (trunk and android fat). For all outcome measures, there were no significant differences over time between the 2 training groups. Overall significant reductions were found for waist circumference (p = 0.001), diastolic blood pressure (p = 0.03), insulin resistance (p = 0.006), CRP (p = 0.05), IL-6 (p = 0.04), IL-6/IL-10 ratio (p = 0.03), and trunk (p = 0.04) and android (p = 0.02) fat percentage. No significant main effects for time were observed for systolic blood pressure, triglycerides, high-density lipoprotein cholesterol, IL-10, and trunk and android fat mass. The 16-week exercise programme, using either a hybrid cycle or a handcycle, found similar beneficial effects on metabolic syndrome components, inflammatory status and visceral adiposity, indicating that there were no additional benefits of functional electrical stimulation-induced leg exercise over handcycle exercise alone.

Source: Medline

15. Title: Effects of transplantation of olfactory ensheathing cells in chronic spinal cord injury: a systematic review and meta-analysis.

Citation: European spine journal : official publication of the European Spine Society, the European Spinal Deformity Society, and the European Section of the Cervical Spine Research Society, May 2015, vol. 24, no. 5, p. 919-930 (May 2015)

Author(s): Li, Lei, Adnan, Hafeez, Xu, Benchen, Wang, Jianmin, Wang, Chengke, Li, Fang, Tang, Kai

Abstract: The debate on the effects and outcome of olfactory ensheathing cell (OEC) transplantation for the treatment of spinal cord injury (SCI) has remained unresolved for nearly 20 years. This study aimed to evaluate the safety and efficacy of OEC transplantation in chronic SCI patients. Electronic databases, including PubMed, the Cochrane Library, EMBASE, and MEDLINE, were searched to identify clinical therapeutic trials studying the use of OEC transplantation for SCI in humans. Each trial was analyzed in accordance with the criteria of the Cochrane Handbook 5.1.0 and MOOSE. Data were analyzed with Review Manager 5.2 and Meta-Analyst Beta 3.13 software. Eleven articles concerning 10 studies of 1,193 patients with chronic SCI treated with OEC transplantation were selected for review. All the articles had low methodological quality. Studies reported their outcomes using the American Spinal Injury Association (ASIA) Impairment Scale; the AISA motor, light touch, pinprick score; the Functional Independence Measure and (or) other measure methods. According to the available relevant data, the incidences of total adverse events and mortality were 7.68 % (n = 742) and 0.35 % (n = 566), respectively. The most frequently reported adverse events were fever, mild anemia, and syringomyelia; however, the statistical adverse events occurring in different studies were cerebrospinal fluid leakage (7.00 %, n = 586, 2 trials), sensory deterioration (0.70 %, n = 573, 2 trials), and both motor and sensory deterioration (0.68 %, n = 586, 2 trials). Given the results from our study, we conclude that OEC transplantation appears to be safe, although the evidence for efficacy is modest and requires the support of prospective, randomized trials in larger cohorts of patients. Further randomized controlled trials utilizing strict therapy programs and implanted cell selections are needed to confirm these findings.

Source: Medline

16. Title: Examining the Time to Therapeutic Effect of Pregabalin in Spinal Cord Injury Patients With Neuropathic Pain

Citation: Clinical Therapeutics, June 2015, vol./is. 37/5(1081-1090), 0149-2918;1879-114X (03 Jun 2015)

Author(s): Cardenas D.D., Emir B., Parsons B.

Language: English

Abstract: Purpose: In 2 large-scale, placebo-controlled trials, pregabalin improved both pain and pain-related sleep interference in patients with neuropathic pain due to spinal cord injury (SCI). In both trials, pregabalin found statistically significant improvement compared with placebo after 1 week of treatment. However, the effects of pregabalin in the days immediately after initiation of treatment are unknown. The purpose of the present analysis was to determine timing of pregabalin's therapeutic effect in the days after initiation of treatment. Methods: Data were derived from 2 trials of pregabalin in patients with SCI-related neuropathic pain. Each day patients rated severity of pain and pain-related sleep interference over the past 24 hours on a scale from 0 to 10, with higher scores indicating greater severity. To quantify timing of therapeutic effect, we compared (pregabalin [vs] placebo) daily average pain and pain-related sleep interference scores over the first 14 days of treatment. Significant improvement was defined as the first day, of >2 consecutive days, that pregabalin significantly (P < 0.05) reduced...
mean scores compared with placebo. To further quantify timing of therapeutic effect, each treatment group was examined to determine the time required to achieve a >1-point improvement in pain and pain-related sleep interference score among patients with a clinically meaningful and sustained response (>30% improvement from baseline to end point) by using a time-to-event analysis method. Kaplan-Meier analyses were used to estimate the median (or 25th quartile) time (in days) required to achieve a >1-point improvement, among these responders, in pain and pain-related sleep interference scores. Comparisons between pregabalin and placebo were made with a log-rank test. Findings: In both trials, significant improvement of pain and pain-related sleep interference occurred within 2 days of initiating treatment with pregabalin. Among patients reporting a clinically meaningful and sustained response to treatment (patients with >30% improvement from baseline to end point), the time to a >1-point improvement of pain and pain-related sleep interference occurred significantly earlier among pregabalin-treated patients than among placebo-treated patients. Finally, the timing of pregabalin’s effect on pain and pain-related sleep interference was unaffected by the use of concomitant medications that were allowed for treatment of neuropathic pain in both trials. Implications: Treatment with pregabalin results in rapid time to significant improvement in both pain and pain-related sleep interference in patients with neuropathic pain due to SCI. These findings should only be used as a guide to physicians and patients as to when clinical response to pregabalin may be expected.

**Publication Type:** Journal: Article

**Source:** EMBASE

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**Citation:** Journal of neurotrauma, Jun 2015, vol. 32, no. 12, p. 865-874 (June 15, 2015)

**Author(s):** Phang, Isaac, Werndle, Melissa C, Saadoun, Samira, Varsos, Georgios, Czosnyka, Marek, Zoumprouli, Argyro, Papadopoulos, Marios C

**Abstract:** We recently showed that, after traumatic spinal cord injury (TSCI), laminectomy does not improve intraspinal pressure (ISP), spinal cord perfusion pressure (SCPP), or the vascular pressure reactivity index (sPRx) at the injury site sufficiently because of dural compression. This is an open label, prospective trial comparing combined bony and dural decompression versus laminectomy. Twenty-one patients with acute severe TSCI had re-alignment of the fracture and surgical fixation; 11 had laminectomy alone (laminectomy group) and 10 had laminectomy and duroplasty (laminectomy+duroplasty group). Primary outcomes were magnetic resonance imaging evidence of spinal cord decompression (increase in intradural space, cerebrospinal fluid around the injured cord) and spinal cord physiology (ISP, SCPP, sPRx). The laminectomy and laminectomy+duroplasty groups were well matched. Compared with the laminectomy group, the laminectomy+duroplasty group had greater increase in intradural space at the injury site and more effective decompression of the injured cord. In the laminectomy+duroplasty group, ISP was lower, SCPP higher, and sPRx lower, (i.e., improved vascular pressure reactivity), compared with the laminectomy group. Laminectomy+duroplasty caused cerebrospinal fluid leak that settled with lumbar drain in one patient and pseudomeningocele that resolved completely in five patients. We conclude that, after TSCI, laminectomy+duroplasty improves spinal cord radiological and physiological parameters more effectively than laminectomy alone.

**Source:** Medline

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18. **Title:** Improving self-perception and self-efficacy in patients with spinal cord injury: the efficacy of DVD-based instructions.

**Citation:** Journal of Clinical Nursing, 01 June 2015, vol./is. 24/11/12(1666-1675), 09621067

**Author(s):** Chen, Hsiao-Yu, Wu, Tzu-Jung, Lin, Chiu-Chu

**Language:** English

**Abstract:** Aims and objectives We assessed the effects of a spinal cord injury home rehabilitation DVD on patients with spinal cord injury. Background Multimedia have been used widely in health care in the digital age. The provision of rehabilitation instructions is a major responsibility of the rehabilitation staff. Design This study adopted a quasi-experimental pretest-posttest control group design. Methods We collected data from a rehabilitation nursing ward at a medical centre between October 2011-April 2012. The participants were recruited before being discharged from the hospital. The experimental group (n = 28) received multimedia DVD instructions for three months, in addition to teaching sessions conducted by the researcher, whereas the control group (n = 31) received instructions without a DVD. Both groups completed the self-perception and self-efficacy scales used in this study before and after the intervention. Results The results indicated that, after the multimedia DVD intervention, the experimental group exhibited a considerably greater improvement in self-perception than did the control group. Although we recorded increased scores for both self-perception and self-efficacy for both groups, no marked differences emerged between
the control and the intervention groups by using a generalised estimating equation. Conclusion These results suggest that the home rehabilitation DVD is an effective instrument for improving self-perception and self-efficacy in patients with spinal cord injury. However, monitoring these patients over the long term is necessary. Relevance to clinical practice Our study results confirmed that the spinal cord injury home rehabilitation DVD is a practical health education tool. We plan to use the proposed DVD intervention with a larger number of hospitalised patients, and to continuously monitor their improvement.

**Publication Type:** journal article

**Source:** CINAHL

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19. **Title:** Incidence of acute care adverse events and long-term health-related quality of life in patients with TSCI.

**Citation:** The spine journal : official journal of the North American Spine Society, May 2015, vol. 15, no. 5, p. 923-932 (May 1, 2015)

**Author(s):** Street, John T, Noonan, Vanessa K, Cheung, Antoinette, Fisher, Charles G, Dvorak, Marcel F

**Abstract:** Adverse events (AEs) with significant resultant morbidity are common during the acute hospital care of patients with traumatic spinal cord injury (TSCI). The Rick Hansen SCI Registry (RHSCIR) collects Canada-wide data on patients with TSCI, such as sociodemographic, injury, diagnosis, intervention, and health outcome details. These data contribute to an evidence base for informing best practice and improving SCI care. As the RHSCIR captures data on patients from prehospital to community phases of care, it is an invaluable resource for providing information on health outcomes resulting from TSCI, including outcomes related to AEs. To determine the incidence and types of AEs occurring in patients with TSCI during acute care and the impact on length of stay (LOS) and health-related quality of life (HRQOL). Prospective cohort study at an academic quaternary referral center. Patients with TSCI discharged from our institution between 2008 and 2010 were identified using the RHSCIR. The RHSCIR includes patients admitted to one of the participating centers across Canada, who have been clinically diagnosed with an acute TSCI or classified as AIS A, B, C, D, or cauda equina. Acute-phase LOS and HRQOL were assessed for impact resulting from the number and type of AEs experienced. Health-related quality of life was determined using the short-form 36 (SF-36) physical and mental component summary scores and functional independence measure. Data related to patients’ injury, diagnoses, hospital admission, and SF-36 scores were obtained from the local RHSCIR. Data on intra-, pre-, and postoperative AEs were collected prospectively using the Spine Adverse Events Severity System data collection system, documenting all AEs experienced by each patient. Multivariable analyses were performed to determine whether patient and injury characteristics were associated with the number and type of AEs experienced and whether these were associated with LOS and HRQOL determined on follow-up. One hundred seventy-one patients with TSCI were included, 81.3% were men and mean age at injury was 47.2±20.3 years. Adverse events occurred in 77.2% of patients, 14.6% experienced an intraoperative and 73.7% experienced a pre/postoperative event. The most frequent pre/postoperative AEs were urinary tract infections (UTIs) (32.2%), pneumonias (32.8%), neuropathic pain (15.2%), decubitus ulcers (14.6%), and delirium (18.7%). Length of stay was significantly affected by decubitus ulcers, delirium, pneumonias, and UTIs (p<.01), increasing 1.7 (UTIs) to 2.2 (decubitus ulcers) times compared with patients without the specific AEs. Health-related quality of life was not affected by acute care AEs but rather those identified at 1-year follow-up. This prospective study found that more than 77% of patients with TSCI sustain an AE during acute hospital care, significantly higher than previously reported. We demonstrate the utility of a dedicated AE collection system and the effect of these events on health status.

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**Source:** Medline

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20. **Title:** Management of Neuropathic Pain Associated with Spinal Cord Injury.

**Citation:** Pain and therapy, Jun 2015, vol. 4, no. 1, p. 51-65, 2193-8237 (June 2015)

**Author(s):** Hagen, Ellen M, Rekand, Tiina

**Abstract:** Spinal cord injury (SCI) is an injury to the spinal cord that leads to varying degrees of motor and/or sensory deficits and paralysis. Chronic pain of both neuropathic and nociceptive type is common and contributes to reduced quality of life. The aim of the review is to provide current clinical understanding as well as discuss and evaluate efficacy of pharmacological interventions demonstrated in the clinical studies. The review was based on literature search in PubMed and Medline with words "neuropathic pain" and "spinal cord injury". The review included clinical studies and not experimental data nor case reports. A limited number of randomized and placebo-controlled studies concerning treatment options of neuropathic pain after SCI were identified. Amitriptyline, a tricyclic antidepressant and the antiepileptic drugs, gabapentin and pregabalin, are most studied with demonstrated efficacy, and considered to be the primary choice. Opioids have demonstrated conflicting results in the clinical studies. In addition, administration route used in the studies as well as reported side effects restrict everyday use of opioids as well as ketamine and lidocaine. Topical applications of capsaicin or lidocaine as well as intradermal injections of
Botulinum toxin are new treatment modalities that are so far not studied on SCI population and need further studies. Non-pharmacological approaches may have additional effect on neuropathic pain. Management of pain should always be preceded by thorough clinical assessment of the type of pain. Patients need a follow-up to evaluate individual effect of applied measures. However, the applied management does not necessarily achieve satisfactory pain reduction. Further clinical studies are needed to evaluate the effect of both established and novel management options.

Source: Medline

21.Title: Measuring anxiety after spinal cord injury: Development and psychometric characteristics of the SCI-QOL Anxiety item bank and linkage with GAD-7.
Citation: Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(315-325), 10790268
Author(s): Kisala, Pamela A, Tulsky, David S, Kalpakjian, Claire Z, Heinemann, Allen W, Pohlig, Ryan T, Carle, Adam, Choi, Seung W
Language: English
Abstract: Objective To develop a calibrated item bank and computer adaptive test to assess anxiety symptoms in individuals with spinal cord injury (SCI), transform scores to the Patient Reported Outcomes Measurement Information System (PROMIS) metric, and create a statistical linkage with the Generalized Anxiety Disorder (GAD)-7, a widely used anxiety measure. Design Grounded-theory based qualitative item development methods; large-scale item calibration field testing; confirmatory factor analysis; graded response model item response theory analyses; statistical linking techniques to transform scores to a PROMIS metric; and linkage with the GAD-7. Setting Five SCI Model System centers and one Department of Veterans Affairs medical center in the United States. Participants Adults with traumatic SCI. Main Outcome Measures Spinal Cord Injury-Quality of Life (SCI-QOL) Anxiety Item Bank Results Seven hundred sixteen individuals with traumatic SCI completed 38 items assessing anxiety, 17 of which were PROMIS items. After 13 items (including 2 PROMIS items) were removed, factor analyses confirmed unidimensionality. Item response theory analyses were used to estimate slopes and thresholds for the final 25 items (15 from PROMIS). The observed Pearson correlation between the SCI-QOL Anxiety and GAD-7 scores was 0.67. Conclusions The SCI-QOL Anxiety item bank demonstrates excellent psychometric properties and is available as a computer adaptive test or short form for research and clinical applications. SCI-QOL Anxiety scores have been transformed to the PROMIS metric and we provide a method to link SCI-QOL Anxiety scores with those of the GAD-7.
Publication Type: journal article
Source: CINAHL

22.Title: Measuring depression after spinal cord injury: Development and psychometric characteristics of the SCI-QOL Depression item bank and linkage with PHQ-9.
Citation: Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(335-346), 10790268
Author(s): Tulsky, David S, Kisala, Pamela A, Kalpakjian, Claire Z, Bombardier, Charles H, Pohlig, Ryan T, Heinemann, Allen W, Carle, Adam, Choi, Seung W
Language: English
Abstract: Objective To develop a calibrated spinal cord injury-quality of life (SCI-QOL) item bank, computer adaptive test (CAT), and short form to assess depressive symptoms experienced by individuals with SCI, transform scores to the Patient Reported Outcomes Measurement Information System (PROMIS) metric, and create a crosswalk to the PHQ-9. Design We used grounded-theory based qualitative item development methods, large-scale item calibration field testing, confirmatory factor analysis, item response theory (IRT) analyses, and statistical linking techniques to transform scores to a PROMIS metric and to provide a crosswalk with the PHQ-9. Setting Five SCI Model System centers and one Department of Veterans Affairs medical center in the United States. Participants Adults with traumatic SCI. Main Outcome Measures Spinal Cord Injury - Quality of Life (SCI-QOL) Depression Item Bank Results Individuals with SCI were involved in all phases of SCI-QOL development. A sample of 716 individuals with traumatic SCI completed 35 items assessing depression, 18 of which were PROMIS items. After removing 7 non-PROMIS items, factor analyses confirmed a unidimensional pool of items. We used a graded response IRT model to estimate slopes and thresholds for the 28 retained items. The SCI-QOL Depression measure correlated 0.76 with the PHQ-9. Conclusions The SCI-QOL Depression item bank provides a reliable and sensitive measure of depressive symptoms with scores reported in terms of general population norms. We provide a crosswalk to the PHQ-9 to facilitate comparisons between measures. The item bank may be administered as a CAT or as a short form and is suitable for research and clinical applications.
Publication Type: journal article
Source: CINAHL
23. Title: Measuring grief and loss after spinal cord injury: Development, validation and psychometric characteristics of the SCI-QOL Grief and Loss item bank and short form.
Citation: Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(347-355), 10790268
Author(s): Kalpakjian, Claire Z, Tulsky, David S, Kisala, Pamela A, Bombardier, Charles H
Language: English
Abstract: Objective To develop an item response theory (IRT) calibrated Grief and Loss item bank as part of the Spinal Cord Injury - Quality of Life (SCI-QOL) measurement system. Design A literature review guided framework development of grief/loss. New items were created from focus groups. Items were revised based on expert review and patient feedback and were then field tested. Analyses included confirmatory factor analysis (CFA), graded response IRT modeling and evaluation of differential item functioning (DIF). Setting We tested a 20-item pool at several rehabilitation centers across the United States, including the University of Michigan, Kessler Foundation, Rehabilitation Institute of Chicago, the University of Washington, Craig Hospital and the James J. Peters/Bronx Department of Veterans Affairs hospital. Participants A total of 717 individuals with SCI answered the grief and loss questions. Results The final calibrated item bank resulted in 17 retained items. A unidimensional model was observed (CFI = 0.976; RMSEA = 0.078) and measurement precision was good (theta range between -1.48 to 2.48). Ten items were flagged for DIF, however, after examination of effect sizes found this to be negligible with little practical impact on score estimates. Conclusions This study indicates that the SCI-QOL Grief and Loss item bank represents a psychometrically robust measurement tool. Short form items are also suggested and computer adaptive tests are available.
Publication Type: journal article
Source: CINAHL

24. Title: Measuring positive affect and well-being after spinal cord injury: Development and psychometric characteristics of the SCI-QOL Positive Affect and Well-being bank and short form.
Citation: Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(356-365), 10790268
Author(s): Bertisch, Hilary, Kalpakjian, Claire Z, Kisala, Pamela A, Tulsky, David S
Language: English
Abstract: Objective To develop an item response theory (IRT)-calibrated spinal cord injury (SCI)-specific Positive Affect and Well-being (PAWB) item bank with flexible options for administration. Design Qualitative feedback from patient and provider focus groups was used to expand on the Neurological Disorders and Quality of Life (Neuro-QOL) positive affect & well-being item bank for use in SCI. New items were created and revised based on expert review and patient feedback and were then field tested. Analyses included confirmatory factor analysis, graded response IRT modeling and evaluation of differential item functioning (DIF). Setting We tested a 32-item pool at several rehabilitation centers across the United States, including the University of Michigan, Kessler Foundation, Rehabilitation Institute of Chicago, the University of Washington, Craig Hospital and the James J. Peters/Bronx Department of Veterans Affairs hospital. Participants A total of 717 individuals with SCI answered the PAWB questions. Results A unidimensional model was observed (Confirmatory Fit Index = 0.947; Root Mean Square Error of Approximation = 0.094) and measurement precision was good (reliability in theta of 0.976; RMSEA = 0.078) and measurement precision was good (theta range between -1.48 to 2.48). Twelve items were flagged for DIF, however, after examination of effect sizes found this to be negligible with little practical impact on score estimates. The final calibrated item bank resulted in 28 retained items. Conclusions This study indicates that the Spinal Cord Injury - Quality of Life PAWB bank represents a psychometrically robust measurement tool. Short form items are also suggested and a computer adaptive test is available.
Publication Type: journal article
Source: CINAHL

25. Title: Measuring psychological trauma after spinal cord injury: Development and psychometric characteristics of the SCI-QOL Psychological Trauma item bank and short form.
Citation: Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(326-334), 10790268
Author(s): Kisala, Pamela A, Victorson, David, Pace, Natalie, Heinemann, Allen W, Choi, Seung W, Tulsky, David S
Language: English
Abstract: Objective To describe the development and psychometric properties of the SCI-QOL Psychological Trauma item bank and short form. Design Using a mixed-methods design, we developed and tested a Psychological Trauma
item bank with patient and provider focus groups, cognitive interviews, and item response theory based analytic approaches, including tests of model fit, differential item functioning (DIF) and precision. Setting We tested a 31-item pool at several medical institutions across the United States, including the University of Michigan, Kessler Foundation, Rehabilitation Institute of Chicago, the University of Washington, Craig Hospital and the James J. Peters/Bronx Veterans Administration hospital. Participants A total of 716 individuals with SCI completed the trauma items Results The 31 items fit a unidimensional model (CFI=0.952; RMSEA=0.061) and demonstrated good precision (theta range between 0.6 and 2.5). Nine items demonstrated negligible DIF with little impact on score estimates. The final calibrated item bank contains 19 items Conclusion The SCI-QOL Psychological Trauma item bank is a psychometrically robust measurement tool from which a short form and a computer adaptive test (CAT) version are available.

**Publication Type:** journal article  
**Source:** CINAHL  
**Full Text:** Available from Salisbury EJournals in Journal of Spinal Cord Medicine

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26. Title: Measuring resilience after spinal cord injury: Development, validation and psychometric characteristics of the SCI-QOL Resilience item bank and short form.  
**Citation:** Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(366-376), 10790268  
**Author(s):** Victorsen, David, Tulsky, David S, Kisala, Pamela A, Kalpakjian, Claire Z, Weiland, Brian, Choi, Seung W  
**Language:** English  
**Abstract:** Objective To describe the development and psychometric properties of the Spinal Cord Injury - Quality of Life (SCI-QOL) Resilience item bank and short form. Design Using a mixed-methods design, we developed and tested a resilience item bank through the use of focus groups with individuals with SCI and clinicians with expertise in SCI, cognitive interviews, and item-response theory based analytic approaches, including tests of model fit and differential item functioning (DIF). Setting We tested a 32-item pool at several medical institutions across the United States, including the University of Michigan, Kessler Foundation, the Rehabilitation Institute of Chicago, the University of Washington, Craig Hospital and the James J. Peters/Bronx Department of Veterans Affairs medical center. Participants A total of 717 individuals with SCI completed the Resilience items. Results A unidimensional model was observed (CFI = 0.968; RMSEA = 0.074) and measurement precision was good (theta range between -3.1 and 0.9). Ten items were flagged for DIF, however, after examination of effect sizes we found this to be negligible with little practical impact on score estimates. The final calibrated item bank resulted in 21 retained items. Conclusion This study indicates that the SCI-QOL Resilience item bank represents a psychometrically robust measurement tool. Short form items are also suggested and computer adaptive tests are available.

**Publication Type:** journal article  
**Source:** CINAHL  
**Full Text:** Available from Salisbury EJournals in Journal of Spinal Cord Medicine

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27. Title: Measuring self-esteem after spinal cord injury: Development, validation and psychometric characteristics of the SCI-QOL Self-esteem item bank and short form.  
**Citation:** Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(377-385), 10790268  
**Author(s):** Kalpakjian, Claire Z, Tate, Denise G, Kisala, Pamela A, Tulsky, David S  
**Language:** English  
**Abstract:** Objective To describe the development and psychometric properties of the Spinal Cord Injury-Quality of Life (SCI-QOL) Self-esteem item bank. Design Using a mixed-methods design, we developed and tested a self-esteem item bank through the use of focus groups with individuals with SCI and clinicians with expertise in SCI, cognitive interviews, and item-response theory- (IRT) based analytic approaches, including tests of model fit, differential item functioning (DIF) and precision. Setting We tested a pool of 30 items at several medical institutions across the United States, including the University of Michigan, Kessler Foundation, the Rehabilitation Institute of Chicago, the University of Washington, Craig Hospital, and the James J. Peters/Bronx Department of Veterans Affairs hospital. Participants A total of 717 individuals with SCI completed the self-esteem items. Results A unidimensional model was observed (CFI = 0.946; RMSEA = 0.087) and measurement precision was good (theta range between -2.7 and 0.7). Eleven items were flagged for DIF; however, effect sizes were negligible with little practical impact on score estimates. The final calibrated item bank resulted in 23 retained items. Conclusion This study indicates that the SCI-QOL Self-esteem item bank represents a psychometrically robust measurement tool. Short form items are also suggested and computer adaptive tests are available.

**Publication Type:** journal article  
**Source:** CINAHL  
**Full Text:** Available from Salisbury EJournals in Journal of Spinal Cord Medicine
28. Title: Measuring stigma after spinal cord injury: Development and psychometric characteristics of the SCI-QOL Stigma item bank and short form.

Citation: Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(386-396), 10790268
Author(s): Kisala, Pamela A, Tulsky, David S, Pace, Natalie, Victorson, David, Choi, Seung W, Heinemann, Allen W
Language: English

Abstract: Objective To develop a calibrated item bank and computer adaptive test (CAT) to assess the effects of stigma on health-related quality of life in individuals with spinal cord injury (SCI). Design Grounded-theory based qualitative item development methods, large-scale item calibration field testing, confirmatory factor analysis, and item response theory (IRT)-based psychometric analyses. Setting Five SCI Model System centers and one Department of Veterans Affairs medical center in the United States. Participants Adults with traumatic SCI. Main Outcome Measures SCI-QOL Stigma Item Bank Results A sample of 611 individuals with traumatic SCI completed 30 items assessing SCI-related stigma. After 7 items were iteratively removed, factor analyses confirmed a unidimensional pool of items. Graded Response Model IRT analyses were used to estimate slopes and thresholds for the final 23 items. Conclusions The SCI-QOL Stigma item bank is unique not only in the assessment of SCI-related stigma but also in the inclusion of individuals with SCI in all phases of its development. Use of confirmatory factor analytic and IRT methods provide flexibility and precision of measurement. The item bank may be administered as a CAT or as a 10-item fixed-length short form and can be used for research and clinical applications.

Publication Type: journal article
Source: CINAHL

29. Title: Methodology for the development and calibration of the SCI-QOL item banks.

Citation: Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(270-287), 10790268
Author(s): Tulsky, David S, Kisala, Pamela A, Victorson, David, Choi, Seung W, Gershon, Richard, Heinemann, Allen W, Cella, David
Language: English

Abstract: Objective To develop a comprehensive, psychometrically sound, and conceptually grounded patient reported outcomes (PRO) measurement system for individuals with spinal cord injury (SCI). Methods Individual interviews (n = 44) and focus groups (n = 65 individuals with SCI and n = 42 SCI clinicians) were used to select key domains for inclusion and to develop PRO items. Verbatim items from other cutting-edge measurement systems (i.e. PROMIS, Neuro-QOL) were included to facilitate linkage and cross-population comparison. Items were field tested in a large sample of individuals with traumatic SCI (n = 877). Dimensionality was assessed with confirmatory factor analysis. Local item dependence and differential item functioning were assessed, and items were calibrated using the item response theory (IRT) graded response model. Finally, computer adaptive tests (CATs) and short forms were administered in a new sample (n = 245) to assess test-retest reliability and stability. Participants and Procedures A calibration sample of 877 individuals with traumatic SCI across five SCI Model Systems sites and one Department of Veterans Affairs medical center completed SCI-QOL items in interview format. Results We developed 14 unidimensional calibrated item banks and 3 calibrated scales across physical, emotional, and social health domains. When combined with the five Spinal Cord Injury - Functional Index physical function banks, the final SCI-QOL system consists of 22 IRT-calibrated item banks/scales. Item banks may be administered as CATs or short forms. Scales may be administered in a fixed-length format only. Conclusions The SCI-QOL measurement system provides SCI researchers and clinicians with a comprehensive, relevant and psychometrically robust system for measurement of physical-medical, physical-functional, emotional, and social outcomes. All SCI-QOL instruments are freely available on Assessment Center(SM).

Publication Type: journal article
Source: CINAHL

30. Title: Mortality and longevity after a spinal cord injury: Systematic review and meta-analysis

Citation: Neuroepidemiology, June 2015, vol./is. 44/3(182-198), 0251-5350;1423-0208 (09 Jun 2015)
Author(s): Chamberlain J.D., Meier S., Mader L., Von Groote P.M., Brinkhof M.W.G.
Language: English

Abstract: Background/Aims: Mortality and longevity studies of spinal cord injury (SCI) are essential for informing healthcare systems and policies. This review evaluates the current evidence among people with SCIs worldwide in relation to the WHO region and country income level; demographic and lesion characteristics; and in comparison with the general population. Methods: A systematic review of relevant databases for original studies. Pooled
estimates were derived using random effects meta-analysis, restricted to traumatic SCI. Results: Seventy-four studies were included. In-hospital mortality varied, with pooled estimates of 24.1% (95% confidence interval (CI) 14.1-38.0), 7.6% (95% CI 6.3-9.0), 7.0% (95% CI 1.5-27.4), and 2.1% (95% CI 0.9-5.0) in the WHO regions of Africa, the Americas, Europe and Western Pacific. The combined estimate for low- and middle-income countries was nearly three times higher than for high-income countries. Pooled estimates of first-year survival were 86.5% (95% CI 75.3-93.1), 95.6% (95% CI 81.0-99.1), and 94.0% (95% CI 93.3-94.6) in the Americas, Europe and Western Pacific. Pooled estimates of standardized mortality ratios in tetraplegics were 2.53 (2.00-3.21) and 2.07 (1.47-2.92) in paraplegics. Conclusion: This study found substantial variation in mortality and longevity within the SCI population, compared to the general population, and between WHO regions and country income level. Improved standardization and quality of reporting is needed to improve inferences regarding the extent to which mortality outcomes following an SCI are related to healthcare systems, services and policies.

Publication Type: Journal: Article
Source: EMBASE

31. Title: Neuroprotection, Plasticity Manipulation, and Regenerative Strategies to Improve Cardiovascular Function following Spinal Cord Injury
Citation: Journal of Neurotrauma, May 2015, vol./is. 32/9(609-621), 0897-7151;1557-9042 (01 May 2015)
Author(s): Squair J.W., West C.R., Krassioukov A.V.
Language: English
Abstract: Damage to the central nervous system, as in the case of spinal cord injury (SCI), results in disrupted supraspinal sympathetic influence and subsequent cardiovascular control impairments. Consequently, people with SCI suffer from disordered basal hemodynamics and devastating fluctuations in blood pressure, as in the case of autonomic dysreflexia (AD), which likely contribute to this population's leading cause of mortality: cardiovascular disease. The development of AD is related, at least in part, to neuroanatomical changes that include disrupted descending supraspinal sympathetic control, changes in propriospinal circuitry, and inappropriate afferent sprouting in the dorsal horn. These anatomical mechanisms may thus be targeted by neural regenerative and protective therapies to improve cardiovascular control and reduce AD. Here, we discuss the relationship between abnormal cardiovascular control and its underlying neuroanatomy. We then review current studies investigating biochemical strategies to reduce the severity of AD through: 1) reducing aberrant calcitonin gene-related peptide immunoreactive afferent sprouting; 2) inhibiting inflammatory processes; and 3) re-establishing descending supraspinal sympathetic control. Finally, we discuss why additional biochemical agents and combinational approaches may be needed to completely ameliorate this condition.

Publication Type: Journal: Review
Source: EMBASE

32. Title: Overview of the Spinal Cord Injury - Quality of Life (SCI-QOL) measurement system.
Citation: Journal of Spinal Cord Medicine, 01 May 2015, vol./is. 38/3(257-269), 10790268
Language: English
Abstract: Context/Objective The Spinal Cord Injury - Quality of Life (SCI-QOL) measurement system was developed to address the shortage of relevant and psychometrically sound patient reported outcome (PRO) measures available for clinical care and research in spinal cord injury (SCI) rehabilitation. Using a computer adaptive testing (CAT) approach, the SCI-QOL builds on the Patient Reported Outcomes Measurement Information System (PROMIS) and the Quality of Life in Neurological Disorders (Neuro-QOL) initiative. This initial manuscript introduces the background and development of the SCI-QOL measurement system. Greater detail is presented in the additional manuscripts of this special issue. Design Classical and contemporary test development methodologies were employed. Qualitative input was obtained from individuals with SCI and clinicians through interviews, focus groups, and cognitive debriefing. Item pools were field tested in a multi-site sample (n = 877) and calibrated using item response theory methods. Initial reliability and validity testing was performed in a new sample of individuals with traumatic SCI (n = 245). Setting Five Model SCI System centers and one Department of Veterans Affairs Medical Center across the United States. Participants Adults with traumatic SCI. Interventions n/a Outcome Measures n/a Results The SCI-QOL consists of 19 item banks, including the SCI-Functional Index banks, and 3 fixed-length scales measuring physical, emotional, and social aspects of health-related QOL (HRQOL). Conclusion The SCI-QOL measurement system consists of psychometrically sound measures for individuals with SCI. The manuscripts in this special issue provide evidence of
the reliability and initial validity of this measurement system. The SCI-QOL also links to other measures designed for a general medical population.

**Publication Type:** journal article  
**Source:** CINAHL  
**Full Text:** Available from *Salisbury EJournals* in *Journal of Spinal Cord Medicine*

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**33. Title:** Pathophysiology, presentation and management of spinal cord injury  
**Citation:** Surgery (United Kingdom), June 2015, vol./is. 33/6(238-247), 0263-9319;1878-1764 (01 Jun 2015)  
**Author(s):** Lee J., Thumbikat P.  
**Language:** English  
**Abstract:** Spinal cord impairment (SCI) may arise from traumatic and non-traumatic causes. Traumatic causes include blunt trauma and penetrating injury. Examples of non-traumatic causes include cord compression from disc prolapse or bone metastasis from a primary cancer. SCI leads to complete loss or altered motor function and sensation, and disruption of autonomic function. SCI can be described by level of vertebral column injury and by level and severity of neurological deficit using the International Standards for Neurological Classification of Spinal Cord Injury developed by the American Spinal Injury Association as a universal classification tool for SCI. This classification tool involves sensory and motor examination to determine neurological level of injury and whether the injury is complete or incomplete. Acute SCI patients have a complex and evolving pathophysiology and it is important to appreciate the altered physiology particularly in the acute stages of management. Intensive care monitoring and surgical intervention are likely to be required to manage the altered physiology and vertebral column injuries respectively. A multidisciplinary approach with specialist SCI centre input ensures optimal management from time of diagnosis and has been shown to have a significant effect on long-term functional outcome for patients. Since August 2013 a national pathway has been in place to facilitate rapid referral from a major trauma centre to an SCI Centre. The pathway sets out key goals and objectives to be achieved within defined time frames as the patient moves from the acute phase of injury into the rehabilitation and reintegration phase.  
**Publication Type:** Journal: Article  
**Source:** EMBASE

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**34. Title:** Postural control during gait initiation and termination of adults with incomplete spinal cord injury.  
**Citation:** Human movement science, Jun 2015, vol. 41, p. 20-31 (June 2015)  
**Author(s):** Lemay, Jean-François, Duclos, Cyril, Nadeau, Sylvie, Gagnon, Dany H  
**Abstract:** Gait initiation and termination are potentially challenging tasks for balance due to the transition from a quasi-static bipedal phase to a dynamic single-support phase. The purpose of this study was to compare the bipedal and single-support phases of gait initiation and termination in individuals with incomplete spinal cord injury (ISCI). Twelve individuals with ISCI were evaluated on the dynamic and postural components of balance using the stabilizing and destabilizing forces during gait initiation, termination and natural gait. Phase comparisons were made using non-parametric tests. Visual inspection of the force profile of the factors explaining the forces was also conducted. Gait termination challenged more the postural control during the single-support phase than the bipedal phase for the dynamic component of the stabilizing/destabilizing forces model (p=.002). For gait initiation, the most challenging phase varied with the components analyzed (single-support phase for the dynamic component, bipedal phase for the postural component) (p<.008). The single support phase is more challenged during gait termination (both components) (p<.015) while the bipedal phase is more challenged during gait initiation (dynamic components) (p=.012). The stabilizing force and the speed of the center of mass on the one hand, and destabilizing force and the distance between the center of pressure and the base of support on the other hand, had a similar profile. The single-support phase of gait termination was the most challenging among all phases evaluated, being as challenging as the single-support phase of level natural gait. This phase should be targeted in rehabilitation in order to improve balance and decrease the risk of falling in this population. Copyright © 2015 Elsevier B.V. All rights reserved.  
**Source:** Medline

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**35. Title:** Prevention of Pressure Ulcers Among People With Spinal Cord Injury: A Systematic Review  
**Citation:** PM and R, June 2015, vol./is. 7/6(613-636), 1934-1482 (01 Jun 2015)  
**Author(s):** Groah S.L., Schladen M., Pineda C.G., Hsieh C.H.J.  
**Language:** English  
**Abstract:** Objectives: To evaluate the literature on the effectiveness of bed and wheelchair positioning and repositioning in the prevention of pressure ulcers (PUs) in both the spinal cord injury (SCI) and non-SCI populations. Design: Systematic review. Methods: PubMed, CINAHL, PsycINFO, and EMBASE were queried with the subject heading terms "pressure sore," "pressure ulcer," "position or turn in bed, wheelchair," "pressure relief," and
"pressure release." All study design types that assessed the effectiveness of bed and wheelchair positioning and pressure relief maneuvers in any patient group and in any setting were sought. Three independent reviewers extracted and summarized details of eligible trials using a standardized method. Two independent reviewers assessed the methodological quality of each trial using the American Academy of Neurology guidelines. When reviewers were not able to reach consensus, a third independent reviewer served as tiebreaker. Results: We identified 2820 publications, of which 49 met inclusion criteria. Of these publications, the subject population was 2834 (923 persons with SCI, 717 persons without SCI, and 1194 healthy control subjects). Among studies examining pressure related to position or repositioning in bed or sitting, procedures for measuring skin pressure and metabolism were highly variable by anatomic location, measurement technique, outcome measure, study site, participant characteristics, and description of position/turning for bed and seated interventions. Numerous factors can influence tissue interface pressures, and no prospective studies had been performed to determine a causal relationship between interface pressure and skin breakdown. Several studies suggest that skin response to pressure differs between subjects with and without SCI. Conflicting results and insufficient evidence for optimal bed and seated positioning and turning and pressure relief maneuvers to prevent PUs in both SCI and non-SCI populations were limiting factors. Conclusions: Although there is no clear optimal positioning or turning frequency in bed, the evidence suggests avoiding the 90-degree lateral position because of high pressures and PU risk over the trochanters. During sitting, pressures are linearly redistributed from the sitting area during recline and tilt, however, reclining carries with it an increased risk of shear forces on this skin. The evidence does not support conclusive guidelines on positioning or repositioning techniques for PU prevention in bed or during sitting. We conclude that PU risk is highly individualized, with the SCI population at a higher risk, which demands flexible PU prevention strategies for bed/seated positioning and pressure relief maneuvers. Education has and will remain our most powerful ally to thwart this pervasive public health problem.

Publication Type: Journal: Article

Source: EMBASE

36. Title: Psychological factors and mental health in persons with spinal cord injury: An exploration of change or stability.
Citation: Journal of rehabilitation medicine, Jun 2015, vol. 47, no. 6, p. 531-537 (June 24, 2015)
Author(s): van Leeuwen, Christel M C, Edelaar-Peeters, Yvette, Peter, Claudio, Stiggelbout, Anne M, Post, Marcel W M

Abstract: To examine the course of mental health and psychological factors over time in persons with a recent spinal cord injury and to determine whether change in psychological factors is associated with change in mental health. Prospective cohort study in the Netherlands with 3 measurement time-points. A total of 60 persons with recently acquired spinal cord injury. Standardized validated measurement instruments were used to assess mental health, self-efficacy, mastery, optimism, illness cognitions, purpose in life, and social comparison. Descriptive statistics and multilevel analysis were used. Multilevel regression analyses showed that neither mental health nor psychological factors, except for social comparison-upward identification, showed statistically significant change over time. However, increasing scores for self-efficacy, mastery, acceptance cognitions, and purpose in life were significantly associated with increasing mental health. In contrast, increasing scores for optimism, social comparison, helplessness cognitions, and disease benefits cognitions were not significantly associated with increasing mental health in persons with spinal cord injury. Most psychological factors showed stability up to 6 months post-discharge. Purpose in life, acceptance cognitions, self-efficacy, and mastery showed more variability and seem to be most promising as targets for interventions, which may lead to an improvement in mental health in persons with spinal cord injury.
Source: Medline

37. Title: Spinal cord injury induced neuropathic pain: Molecular targets and therapeutic approaches.
Citation: Metabolic brain disease, Jun 2015, vol. 30, no. 3, p. 645-658 (June 2015)
Author(s): Schomberg, Dominic, Miranpuri, Gurwattan, Duellman, Tyler, Crowell, Andrew, Vemuganti, Raghu, Resnick, Daniel

Abstract: Neuropathic pain, especially that resulting from spinal cord injury, is a tremendous clinical challenge. A myriad of biological changes have been implicated in producing these pain states including cellular interactions, extracellular proteins, ion channel expression, and epigenetic influences. Physiological consequences of these changes are varied and include functional deficits and pain responses. Developing therapies that effectively address the cause of these symptoms require a deeper knowledge of alterations in the molecular pathways. Matrix metalloproteinases and tissue inhibitors of metalloproteinases are two promising therapeutic targets. Matrix metalloproteinases interact with and influence many of the studied pain pathways. Gene expression of ion channels...
and inflammatory mediators clearly contributes to neuropathic pain. Localized and time dependent targeting of these proteins could alleviate and even prevent neuropathic pain from developing. Current therapeutic options for neuropathic pain are limited primarily to analgesics targeting the opioid pathway. Therapies directed at molecular targets are highly desirable and in early stages of development. These include transplantation of exogenously engineered cell populations and targeted gene manipulation. This review describes specific molecular targets amenable to therapeutic intervention using currently available delivery systems.

Source: Medline

38. Title: Synergistic impact of acute kidney injury and high level of cervical spinal cord injury on the weaning outcome of patients with acute traumatic cervical spinal cord injury.

Citation: Injury, Jul 2015, vol. 46, no. 7, p. 1317-1323 (July 2015)

Author(s): Yu, Wen-Kuang, Ko, Hsin-Kuo, Ho, Li-Ing, Wang, Jia-Horng, Kou, Yu Ru

Abstract: Respiratory neuromuscular impairment severity is known to predict weaning outcome among patients with cervical spinal cord injury; however, the impact of non-neuromuscular complications remains unexplored. This study was to evaluate possible neuromuscular and non-neuromuscular factors that may negatively impact weaning outcome. From September 2002 to October 2012, acute traumatic cervical spinal cord injury patients who had received mechanical ventilation for >48h were enrolled and divided into successful (n=54) and unsuccessful weaning groups (n=19). Various neuromuscular, non-neuromuscular factors and events during the intensive care unit stay were extracted from medical charts and electronic medical records. Variables presenting with a significant difference (p<0.2) between these two groups were included in the univariate analysis. Following univariate analysis, those significantly different variables (p<0.05) were subjected to multivariate logistic regression to identify independent predictors of unsuccessful weaning. Compared to successful weaning patients, unsuccessful weaning patients were older; more often had high level of cervical spinal cord injury (C1-3), lower pulse rates, and lower Glasgow Coma Scale score on admission, higher peak blood urea nitrogen, lower trough albumin, and lower trough blood leukocyte counts. Furthermore, unsuccessful weaning patients had a higher incidence of pneumonia, acute respiratory distress syndrome, shock and acute kidney injury during the intensive care unit stay. Multivariate logistic regression analysis revealed acute kidney injury and high level of cervical spinal cord injury were independent risk factors for failure of weaning. Importantly, patients with both risk factors showed a large increase in odds ratio for unsuccessful weaning from mechanical ventilation (p<0.001). The presence of acute kidney injury during the intensive care unit stay and high level of cervical spinal injury are two independent risk factors that synergistically work together producing a negative impact on weaning outcome. Copyright © 2015 Elsevier Ltd. All rights reserved.

Source: Medline

39. Title: The Influence of Time from Injury to Surgery on Motor Recovery and Length of Hospital Stay in Acute Traumatic Spinal Cord Injury: An Observational Canadian Cohort Study

Citation: Journal of Neurotrauma, May 2015, vol./is. 32/9(645-654), 0897-7151;1557-9042 (01 May 2015)


Language: English

Abstract: To determine the influence of time from injury to surgery on neurological recovery and length of stay (LOS) in an observational cohort of individuals with traumatic spinal cord injury (tSCI), we analyzed the baseline and follow-up motor scores of participants in the Rick Hansen Spinal Cord Injury Registry to specifically assess the effect of an early (less than 24h from injury) surgical procedure on motor recovery and on LOS. One thousand four hundred and ten patients who sustained acute tSCIs with baseline American Spinal Injury Association Impairment Scale (AIS) grades A, B, C, or D and were treated surgically were analyzed to determine the effect of the timing of surgery (24, 48, or 72h from injury) on motor recovery and LOS. Depending on the distribution of data, we used different types of generalized linear models, including multiple linear regression, gamma regression, and negative binomial regression. Persons with incomplete AIS B, C, and D injuries from C2 to L2 demonstrated motor recovery improvement of an additional 6.3 motor points (SE=2.8 p<0.03) when they underwent surgical treatment within 24h from the time of injury, compared with those who had surgery later than 24h post-injury. This beneficial effect of early surgery on motor recovery was not seen in the patients with AIS A complete SCI. AIS A and B patients who received early surgery experienced shorter hospital LOS. While the issues of when to perform surgery and what specific operation to perform remain controversial, this work provides evidence that for an incomplete acute tSCI in the cervical, thoracic, or thoracolumbar spine, surgery performed within 24h from injury improves motor neurological recovery. Early surgery also reduces LOS.

Publication Type: Journal: Article
40. Title: The influence of cardiac autonomic activity on the QT-variability index in able-bodied and incomplete spinal cord injured individuals.

Citation: Autonomic neuroscience : basic & clinical, Jul 2015, vol. 190, p. 46-52 (July 2015)

Author(s): Sharif, Hisham, Cotie, Lisa M, La Fountaine, Michael F, Ditor, David S

Abstract: To investigate, via autonomic blockade, if the QT-variability index (QTVI) is a measure of cardiac autonomic regulation in able-bodied (AB) and incomplete spinal cord injured (SCI) individuals. Four SCI (41.6±13.4years; C4-C7, AIS B-D, 13.4±13.4years post injury) and 4 AB (33.0±7.8years) individuals were tested. QTVI was determined from electrocardiographic readings obtained during supine rest and cardiovascular (CV) stress, with and without autonomic blockade. CV stress was induced by 40° head-up tilt, the hand submerged in 10°C water and the jaw clenched. Autonomic blockade was achieved with metoprolol (β-blockade) and atropine (cholinergic blockade).

There was no group×condition interaction for QTVI, although there was a significant main effect for condition. After collapsing across groups, QTVI increased with CV stress (p=0.01) and decreased with subsequent β-blockade (p=0.04), suggesting that during CV stress, QTVI is reflective of cardiac sympathetic activity. During supine rest, β-blockade did not change QTVI (p=0.24), however, cholinergic blockade increased QTVI (p<0.001), suggesting that during rest, QTVI is inversely related to cardiac parasympathetic regulation. During times of CV stress, QTVI reflects cardiac sympathetic activity, while during resting conditions, QTVI is inversely related to cardiac parasympathetic activity. These relationships persist after autonomically incomplete SCI. Copyright © 2015 Elsevier B.V. All rights reserved.

Source: Medline

41. Title: Traumatic spinal cord injury in the United States, 1993-2012

Citation: JAMA - Journal of the American Medical Association, June 2015, vol./is. 313/22(2236-2243), 0098-7484;1538-3598 (09 Jun 2015)

Author(s): Jain N.B., Ayers G.D., Peterson E.N., Harris M.B., Morse L., O'Connor K.C., Garshick E.

Language: English

Abstract: IMPORTANCE: Acute traumatic spinal cord injury results in disability and use of health care resources, yet data on contemporary national trends of traumatic spinal cord injury incidence and etiology are limited. OBJECTIVE: To assess trends in acute traumatic spinal cord injury incidence, etiology, mortality, and associated surgical procedures in the United States from 1993 to 2012. DESIGN, SETTING, AND PARTICIPANTS: Analysis of survey data from the US Nationwide Inpatient Sample databases for 1993-2012, including a total of 63 109 patients with acute traumatic spinal cord injury. MAIN OUTCOMES AND MEASURES: Age- and sex-stratified incidence of acute traumatic spinal cord injury; trends in etiology and in-hospital mortality of acute traumatic spinal cord injury. RESULTS: In 1993, the estimated incidence of acute spinal cord injury was 53 cases (95% CI, 52-54 cases) per 1 million persons based on 2659 actual cases. In 2012, the estimated incidence was 54 cases (95% CI, 53-55 cases) per 1 million population based on 3393 cases (average annual percentage change, 0.2%; 95% CI, -0.5% to 0.9%). Incidence rates among the younger male population declined from 1993 to 2012: for age 16 to 24 years, from 144 cases/million (2405 cases) to 87 cases/million (1770 cases) (average annual percentage change, -2.5%; 95% CI, -3.3% to -1.8%); for age 25 to 44 years, from 96 cases/million (3959 cases) to 71 cases/million persons (2930 cases), (average annual percentage change, -1.2%; 95% CI, -2.1% to -0.3%). A high rate of increase was observed in men aged 65 to 74 years (from 84 cases/million in 1993 [695 cases] to 131 cases/million [1465 cases]; average annual percentage change, 2.7%; 95% CI, 2.0%-3.5%). The percentage of spinal cord injury associated with falls increased significantly from 28% (95% CI, 26%-30%) in 1997-2000 to 66% (95% CI, 64%-68%) in 2010-2012 in those aged 65 years or older (P < .001). Although overall in-hospital mortality increased from 6.6% (95% CI, 6.1%-7.0%) in 1993-1996 to 7.5% (95% CI, 7.0%-8.0%) in 2010-2012 (P < .001), mortality decreased significantly from 24.2% (95% CI, 19.7%-28.7%) in 1993-1996 to 20.1% (95% CI, 17.0%-23.2%) in 2010-2012 (P = .003) among persons aged 85 years or older. CONCLUSIONS AND RELEVANCE: Between 1993 and 2012, the incidence rate of acute traumatic spinal cord injury remained relatively stable but, reflecting an increasing population, the total number of cases increased. The largest increase in incidence was observed in older patients, largely associated with an increase in falls, and in-hospital mortality remained high, especially among elderly persons.

Source: EMBASE

Full Text: Available from American Medical Association in JAMA
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