spinal cord injury UPDATE

Department of Rehabilitation Medicine

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INSIDE:

UW Medicine
SCHOOL OF MEDICINE

Life After SCI

A Mother's Story

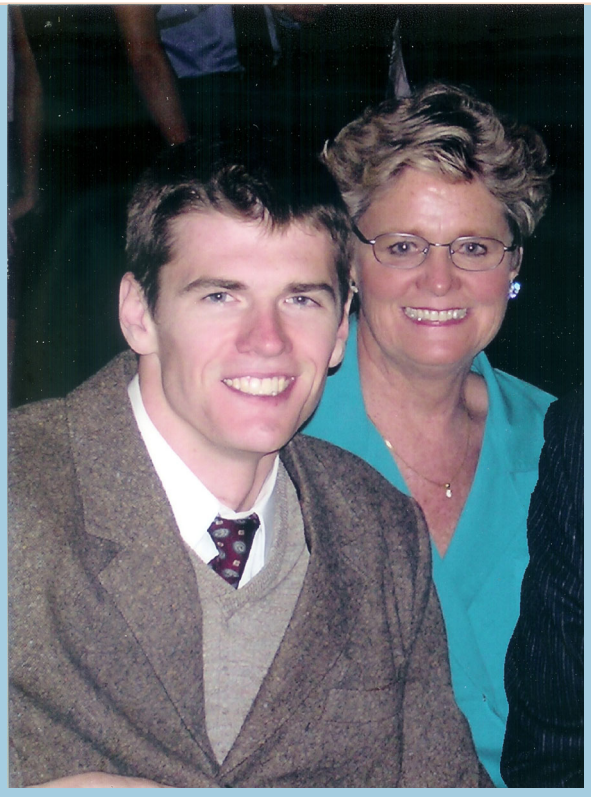
This is the first in a series of profiles featuring members of the Northwest Regional SCI System's Consumer Advisory Board.

A week after her son, Billy, started his freshmen year at the University of Washington, Jill Price got the kind of call every parent dreads: Billy had fallen from a third floor sleeping porch at his fraternity and was now at Harborview Medical Center, critically injured. The fall broke his neck at the sixth cervical vertebrae, rendering him a quadriplegic. He was 18, an athlete, and beginning what should have been the best time of his life. At that moment—nearly 10 years ago—his life changed forever, and Jill began her own difficult journey as the mother of a young man with spinal cord injury.

"I still get very emotional about it," the Eastside mother says now. "It was overwhelming—the fear, the anger, the loss. The grieving never goes away completely." Catastrophic injuries such as SCI throw the entire family into turmoil. Shocked, grieving and anxious parents are suddenly thrust into a bewildering new world of medical care, hospital personnel, health insurance and financial strain. Having once launched their child, they often must resume, at least temporarily, the role of caregiver. It can take an emotional toll on parents. "You're stunned," Jill recalls. "You just can't believe it's happening."

Billy was in the hospital for six months. During rehab at the UW, hospital staff connected him with the UW's Disabled Student Services so he could return to school after discharge. These services ensured that he could access all his classes and provided a note taker. When one of his classes turned out to be on an upper floor of a building without an elevator, the entire class was moved. "They (Disabled Student Services) were so helpful. The services were great," Jill says. "I'm so grateful to all the people before us who fought for these rights, because we have benefited from it."

When Billy came home from the hospital, Jill was his personal caregiver and chauffeur during the week, and Billy's father took over on weekends so Jill could continue her job as a flight attendant. Life was moving forward and the family was coping, but the depression that Jill had developed after



Jill Price with her son, Billy, who has quadriplegia. As a member of the UW's SCI Consumer Advisory Board, Jill Price helps other families who are coping with SCI. "I feel I get more out of it than I give," she says. "I call (the Board) my support group."

Billy's injury continued to intensify. "All my friends and family were watching me," she recalls. "They told me to get professional help, but I was in denial. It's like post-partum depression—if you can't cope, it must mean you're an inadequate mother. So I put on a phony front." Billy was getting counseling when needed from UW psychologists, but Jill declined help.

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Life after SCI

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By September, almost a year after the injury, "I hit a wall," she says. "I was sobbing constantly, and angry, and just fell apart emotionally." She remembers two things that finally convinced her to get counseling: one was Billy entreating her to "please, mom, get help;" the other was a questionnaire for people in crisis that someone had dropped in her mailbox. "It had five questions. If you said 'yes' to one of them, you were in trouble. I said 'yes' to all five," indicating she was at risk of suicide.

Jill found a psychiatrist—"I insisted on seeing someone who was a woman and a mother!"—and started taking anti-depressants. "I always tell people—'thank God I got therapy!'" she says now. "When you're so severely depressed, medication helps you function and focus." Now when she meets families of newly injured patients, she tells them her own story, and advises them to pay attention to possible symptoms of severe depression, and "not wait as long as I did to get help."

A year after his injury Billy moved back to his fraternity, which had been remodeled for wheelchair accessibility. A nursing student was hired to be his caregiver, paid for by the State Division of Vocational Rehabilitation. Billy has since moved back home, graduated, and now works full-time as a mechanical engineer for the Federal Aviation Administration (FAA). He has an adapted van and drives himself to work. His parents continue to be his primary caregivers, but Billy plans to move to his own place and hire daily care attendants.

Part of Jill's journey of healing has been her ongoing connection with the SCI community. Both she and Billy serve as resources to newly injured patients and their families by visiting them in the hospital, answering their cascade of questions, and sharing information and experiences. Billy benefited from similar visits from SCI peers when he was first injured. "Billy saw what they could do, with the same injury level and same function as him, and realized he could do that, too," Jill remembers. One of these SCI peers not only had a job, a wife and kids, and drove a car, but he even played quad rugby. "It encouraged him," she says.

Jill heard about the SCI Forums—the UW's monthly presentations on SCI-related topics— while Billy was still an inpatient. Since then, she has continued to attend the forums, "because I always learn something new and important. We went to the forum on pressure mapping,* and it opened up a whole new world," she recalls. Billy, an avid skier before his injury, got back into skiing afterward using an adaptive bi-ski setup. "But every time we took Billy skiing he got a pressure sore." At the forum they learned about pressure mapping technology that identifies seating problems that might lead to skin problems. After getting an assessment for the bucket seat on Billy's bi-ski, "we got a new cushion, and he hasn't had a pressure sore since," she says.

At another SCI Forum, Billy learned about the Access Job Fair for people with disabilities. "Billy went to the Fair, and that's how he got his job at the FAA," she says.

Six years ago, Jill joined the UW's SCI Consumer Advisory Board, which helps organize the SCI Forums and gives input into the UW's SCI programs and research activities. Because such a large percentage of injuries occur among young single males, who often must move back to their parents' home and go through a period of dependency after discharge, Jill's perspective as a parent is valuable on the Board.

But Jill downplays the importance of her contribution. "I feel I get more out of (serving on the Board) than I give," she says. "I learn so much (from the SCI Forums), and find out about new therapies and resources. I consider it my support group."

* "Pressure Mapping Assessment for Wheelchair Users," by Kendra Betz, PT, June 8, 2004. Read about it at *http://depts.washington.edu/rehab/sci/pressure_map.html.*

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RESEARCH REPORT:

Hydrophilic catheters for prevention of UTIs: A randomized clinical trialin chronic SCI

Diana D. Cardenas, MD, MHA, and Jeanne Hoffman, PhD

The Northwest Regional Spinal Cord Injury System receives funding from NIDRR (National Institute on Disability and Rehabilitation Research) to conduct research in different areas of SCI diagnosis and treatment. This study was conducted during the most recent 2000-2005 funding cycle.

Urinary tract infections (UTIs) in SCI

In spite of improvements in bladder management methods over the years, urinary tract infections (UTIs) continue to be a significant problem in the SCI population and the most frequent cause of rehospitalization for all neurologic levels, said Dr. Diana D. Cardenas, who recently left the UW as professor of rehabilitation medicine and director of the Northwest Regional Spinal Cord Injury System. Reports from the Model SCI System indicate that 56.6% of patients acquire a UTI between discharge and one year follow-up, and 28% - 37% are hospitalized for these problems for an average of 14 days.[1,2]

For these reasons, "prevention of UTI remains a primary goal of neurogenic bladder management in SCI" said Cardenas. "Intermittent catheterization (IC) has become the standard of care, particularly if there is adequate manual dexterity to do self-IC, because evidence shows there is less chance of UTIs, less damage to the urethra, and decreased risk of bladder stones, bladder cancer and fistulas than using an indwelling catheter."

IC techniques and equipment varies widely and new catheter systems are continually being developed to try to reduce the frequency of UTIs. The hydrophilic catheter is a relatively new product designed to reduce friction. Its features include:

- An outer layer of a hydrophilic compound called polyvinylpyrrolidone that binds with water to create a liquid surface that reduces friction.

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Research Report: UTI prevention

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• A thin film of water glides along the urethra with less friction than an ordinary catheter with lubricant.

• Uses ordinary tap water (some newer systems already have water in the packaging).

"The rationale behind this catheter is that less friction causes less urethral tissue trauma, which may reduce the chances of invasion by UTI-causing bacteria," Cardenas explained. "Hence, the hydrophilic catheter may help reduce incidence of UTIs."

Study objectives and methods

To test this proposition, Cardenas conducted a randomized controlled trial of the Lofric hydrophilic catheter versus standard catheters in chronic (long-standing) SCI patients who have recurrent symptomatic UTIs. Subjects randomly assigned to the control group continued to use their usual catheters, and the treatment group used the LoFric hydrophilic catheter. Urine was collected and tested for bacteria on each subject monthly for the first three months, then every three months up to one year, as well as any time there were symptoms of UTI. Subjects periodically completed a UTI Symptom Inventory and a bladder management questionnaire.

Findings

Forty-four subjects completed the study, with 21 randomly assigned to the treatment group and 23 to the control group. Using as the main outcome measure the number of times a subject was treated for UTI with antibiotics, Cardenas found that there were significantly fewer antibiotic treatment episodes (.86) in subjects using the hydrophilic catheter than in controls (1.69). She also found that this difference disappeared when looking at females only.

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Recent SCI-related publications by UW faculty

- Avellino AM, Mann, FA, Grady MS, **Chapman JR**, Ellenbogen RG, Alden TD, and **Mirza SK**. The misdiagnosis of acute cervical spine injuries and fractures in infants and children: the 12-year experience of a level I pediatric and adult trauma center. *Childs Nerv Syst.* 2005 Feb;21(2):122-7. Epub 2004 Dec 18.
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- Britton D, **Goldstein B**, Jones-Redmond J, **Esselman P**. Baclofen pump intervention for spasticity affecting pulmonary function. *J Spinal Cord Med* 2005; 28(4):343-347.
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- **Burns SP**, Nelson AL, Bosshart HT, Goetz LL, Harrow JJ, Gerhart KD et al. Implementation of clinical practice guidelines for prevention of thromboembolism in spinal cord injury. *J Spinal Cord Med* 2005; 28(1):33-42.
- **Burns SP**, Yavari Rad M, Bryant S, Kapur V. Long-term treatment of sleep apnea in persons with spinal cord injury. *Am J Phys Med Rehabil* 2005;84(8):20-6.
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- Kendall RW, Jacquemin G, Frost R, **Burns SP**. Creatine supplementation for weak muscles in persons with chronic tetraplegia: a randomized double-blind placebo-controlled crossover trial. *J Spinal Cord Med* 2005; 28(3):208-213.
- Ragnarsson KT, Wuermser LA, **Cardenas DD**, Marino RJ. Spinal cord injury clinical trials for neurologic restoration: improving care through clinical research. *Am J Phys Med Rehabil* 2005; 84(11 Suppl):S77-S97.
- Stroud B, Turner J, **Jensen M**, **Cardenas D**. Partner responses to pain behaviors are associated with depression and activity interference among persons with chronic pain and spinal cord injury. *J Pain*. 2006 Feb;7(2):91-9.

*Names of UW faculty are in **boldface** type.*

The SCI Forum is an evening presentation and discussion series on topics of interest to persons with spinal cord injury and their family members, friends, and caregivers, held monthly at the University of Washington Medical Center during the fall, winter and spring. To learn about upcoming SCI Forums or read reports of past forums, consult our Web site at *http://depts.washington.edu/rehab/sci/forum.html*. Contact Cynthia Salzman (email: *csalzman@u.washington.edu*; phone: 206-685-3999) if you wish to be added to the SCI Forum mailing list.

Women and Spinal Cord Injury

Note: This is excerpted from the report of the SCI Forum that took place on November 8, 2005. Read the complete report online at *http://depts.washington.edu/rehab/sci/women_sci.html.*

"There are approximately 27 million women with a physical disability living in U.S. today," said **Dr. Maria Reyes,** acting assistant professor of rehabilitation medicine at the University of Washington. Of these, an estimated 39,000 have a spinal cord injury. Because many more men sustain spinal cord injuries than do women, at a ratio of about four to one, most research has been conducted within the male SCI population, and there are few studies on the differences between males and females with SCI.

Reproductive Health

As in the non-disabled female population, more is known about reproductive health in women with SCI than any other health area. "We know there are barriers to reproductive and preventive health care for SCI women," Reyes noted, "including inaccessible facilities and equipment and a lack of resources and information." This is especially troubling since the majority of women who sustain SCI are in the childbearing years.

Thirty percent of women with disabilities responding to a Center for Research on Women With Disabilities (CROWD) survey believed they were given inaccurate birth control information (versus 9% of the non-disabled).[1]

What about sex?

Both physical intimacy (hugging, kissing, sexual intercourse) and emotional intimacy (the emotional bond, closeness and understanding) are important in sexuality, Reyes said. After SCI, women may struggle with:

• Body image issues—learning how to deal with a body that looks and functions differently. It takes time to get comfortable with your changed body.

• Relationship issues—do you have a partner who is willing to adjust to these changes? What are the opportunities for meeting potential mates?

• Sexual function issues—what is typical in terms of sex drive and the sex act for women with SCI?

Women with SCI continue to have a normal sexual response excitation phase that includes vaginal lubrication, clitoral swelling, and increased heart rate, blood pressure and respiratory rate.[2] The excitation phase is caused by sexual arousal, which can be either psychogenic (mental) or reflexive (physical) arousal. "Psychogenic arousal is the excitation you receive from thought, visual input, and fantasy," Reyes explained. "Physical arousal has to do with stimulation of physical areas that we find to be exciting or erogenous. The location and severity of impairment affects how closely your own response cycle mimics the usual cycle," as follows:

• Most women with upper motor neuron (UMN) injury (above the level of the nerve roots) will retain the ability to have reflexive arousal, but not necessarily the neurological connections between the brain and organs for psychogenic arousal.

• If you have intact light touch/pinprick sensation above the waist (T11-L2), some of the sympathetic nervous tract is intact, increasing your likelihood of experiencing psychogenic arousal.

• Most women with lower motor neuron (LMN) injury (injury to nerve roots or *cauda equina*—the paired nerve fibers at the end of the spinal cord) may have psychogenic arousal but are unlikely to have reflexive arousal. This is an uncommon injury, however.

• "Women with SCI need to find new erogenous zones, and you do this through sexual exploration," Reyes continued. "You, by yourself or with a partner, need to determine where and how you can be aroused." The erogenous zones or areas of greatest sexual arousal reported by women with SCI were mouth and lips, followed by neck and shoulder, stomach, clitoris, thigh, feet, ears, breast, and buttocks.[2]

"There may be a need for a prolonged period of foreplay before orgasm," Reyes noted. "Studies done in a lab environment found the average time to orgasm was 15-16 minutes for women without SCI and 26 minutes for women with SCI."[3] If there is insufficient vaginal lubrication, artificial water-based lubricants are recommended (avoid petroleum products such as Vaseline if using condoms).

"There is often a loss of vaginal sensation and muscle control that can affect the pleasure you and your partner experience," Reyes said, "so you need to experiment with different sexual positions to try to increase friction."

What about orgasm? "When polled, 52% of women with SCI reported orgasm.[3] The ability to have an orgasm was unrelated to severity of injury and there were no predictive factors, except that women who achieved orgasm scored higher in sexual information and sex drive," Reyes said. This study also found that the sensations of orgasm were similar between the two groups of women (with and without SCI) and that some women achieved orgasm after stimulation of the breasts or upper body only. Some women reported headache or autonomic dysreflexia during orgasm.

In this same study, women with SCI identified bladder and bowel accidents as their biggest sexual activity concerns Other worries included feeling sexually unattractive; not being satisfied; preparation too much trouble; fear of being hurt; and loss of interest. In another study, women reported concerns about spasticity, autonomic dysreflexia, insufficient vaginal lubrication, and contractures.[4] Reyes offered this advice:

• Bladder: Limit fluid intake and empty your bladder prior to intercourse. You may remove your Foley

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catheter, but replace it right after sexual activity to drain the bladder.

• Bowel: Maintain as consistent a bowel program as possible. Some people report that avoiding meals prior to sex helps avoid bowel accidents.

• Sexual satisfaction: Gain experience through self-exploration. "You're better able to tell your partner how you can be pleasured. It builds your self-confidence and increases the chances you'll be satisfied."

• If there is true sexual dysfunction, medications such as sildenafil may be helpful. "But there are few studies in women regarding these medications. You need to discuss this very openly with your physician."

• If you have an autonomic dysreflexia (AD) episode during sex, "you must stop immediately. You'll need to discuss this with your provider to determine if you need medications for this. Usually AD happens in women with T6 injuries or higher, although there have been reports of AD during sex in women with lower thoracic injuries. You need to be aware and cautious about this possibility."

Pregnancy

After a period of amenorrhea (no menstrual periods) for 3-12 months following injury, fertility usually returns and "is much better in women than men," Reyes stated. "So you need to use birth control." There is no evidence that women with SCI have higher rates of miscarriage or stillbirth.

Prenatal complications associated with SCI shouldn't discourage pregnancy, but do require awareness and preventive measures:

• A substantially higher rate of urinary tract infections (UTIs) and kidney infections.

• Bladder spasms may increase.

• It may be necessary to stop spasm medications during pregnancy, which can be a problem if increased spasticity affects mobility and function.

• There is a higher risk for pressure ulcers, so seating and cushions should be re-evaluated during pregnancy.

• There is a higher risk for gestational diabetes.

• There is usually an increase in edema (swelling) in the lower limbs, and some increased risk for DVT (blood clots). This should be discussed with the rehab physician.

• Weight gain.

• Mobility, equipment needs, and functional capabilities may change.

• "Constipation and hemorrhoids are a fact of life with (any) pregnancy, including SCI."

• There may be a higher risk of developing anemia during pregnancy.

• Women with cervical or higher thoracic injuries may have a slightly higher risk for respiratory and pulmonary dysfunction as the baby grows and pushes up on the diaphragm. This may require monitoring ventilatory status and adjusting positioning and/or abdominal binders.

• In order to optimize blood flow to the uterus and maintain optimal fetal cardiac output, bed positioning must generally be adjusted to create a lateral tilt (head raised).[5]

There is typically a decrease in blood pressure by the 2nd trimester, more commonly in high lesions. If your blood pressure is normally low, this should be discussed in advance with your OB or rehab physician.

This report is continued online at *http://depts.washington.edu/rehab/sci/women_sci.html.*

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5. Baker E and Cardenas D. *Arch Phys Med Rehabil.* May 1996 (77) 501-507

Read more SCI Forum reports on our Web site at *http://depts.washington.edu/rehab/sci/forum_reports.html.*

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Thank you to our SCI Forum Sponsors

The Northwest Regional Spinal Cord Injury System thanks the following companies and organizations for their support in making the October 2005 - July 2006 SCI Forum series possible:

- **Care Medical Equipment, Inc.**
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literature review

The articles previewed below were selected from a recent screening of the National Library of Medicine database for articles on spinal cord injury. In the judgment of the editors, they include potentially useful information on the diagnosis or management of spinal cord injury. You may obtain copies of the complete articles through your local medical library or from UW Health Sciences Library Document Delivery Service (call 206-543-3436 for fee schedule).

GENITOURINARY

■ Urolithiasis in patients with spinal cord injuries: risk factors, management, and outcomes.
Despite major advances in the urological care of SCI patients, the incidence of urolithiasis (kidney stones) has not changed. Risk factors include recurrent urinary tract infections, indwelling catheters, vesicoureteral reflux, and immobilization hypercalcuria. Retrograde endourologic techniques are often not a viable treatment for stone disease due to lower extremity contractures, spinal curvature, and pelvic tilt. Extracorporeal shockwave lithotripsy success rates vary from 50 to 90%, but clearance rates are often delayed. Success rates for percutaneous nephrolithotomy match those quoted in the general population (> 90%), but have a higher rate of complications (6-20%). Appropriate prophylactic antibiotics and body position can improve chances of successful outcomes. Routine genitourinary imaging of SCI patients is recommended in order to identify and treat those individuals at highest risk, with the goal of preserving renal function and minimizing associated complications.
Ost MC, Lee BR.
Curr Opin Urol. 2006 Mar;16(2):93-9.

■ Penile prosthetic surgery in neurologically impaired patients: long-term followup.
Between 1980 and 1996, 245 neurologically impaired men between age 16 and 75 (mean age 40.8) were treated for erectile dysfunction and/or urinary incontinence with penile prosthesis implantation. The subjects had been paralyzed an average of 11.2 years (range 1 to 52 years). Over 17 years, surgical implantations in this population consisted of 147 semirigid (Jonas), 113 self-contained inflatable (Dynaflex) and 33 inflatable 3-piece (AMS 700) prostheses. Reasons for implants were: urinary management only (134 patients); erectile dysfunction only (60 patients); and urinary management and erectile dysfunction (51 patients). At a mean followup of 7.2 years (maximum 17) 195 patients were reevaluated in clinic. In 122 patients (90.3%) urinary management problems were resolved. Erectile dysfunction treatment was successful in 76 patients (82.6%). There were 43 revisions for technical reasons and infections. The infection rate was 5% (12 patients). The perforation rate differed depending on the specific device implanted. The implantation of a penile prosthesis was found to be a safe procedure for erectile dysfunction and/or urinary incontinence in neurologically impaired patients. Based on technical advances the complication rates significantly decreased during the years of the study.
Zermann DH, Kutzenberger J, Sauerwein D, et al.
J Urol. 2006 Mar;175(3 Pt 1):1041-4; discussion 1044.

FEMALES WITH SCI

■ Disease prevalence and use of preventive services: comparison of female veterans in general and those with spinal cord injuries and disorders.
A cross-sectional survey was conducted among female veterans with (n = 115) and without (n = 478) SCI&D. Female veterans with SCI&D were similar in age and race but were better educated and less likely to be employed than female veterans in general. Coronary heart disease prevalence was higher (17% vs. 8%) and health status was lower (27% vs. 41%) in those with SCI&D than those without. Fewer women with SCI&D reported having received recommended dental care (56% vs. 69%), colon screening in prior 5 years (59% vs. 72%) or prior 10 years (67% vs. 92%), mammogram (84% vs. 91%), and Pap smear (88% vs. 98%). There were no differences in receipt of respiratory vaccinations or cholesterol screening. The researchers concluded that women with SCI&D were less likely to receive services requiring the use of equipment, body adjustments, and potential discomfort due to disability than the general group. Efforts to increase preventive care in women with SCI&D should address equipment and access barriers and patient and provider education.
Lavela SL, Weaver FM, Smith B, Chen K.
JWomens Health (Larchmt). 2006 Apr;15(3):301-311.

PEDIATRICS

■ Stability of transition to adulthood among individuals with pediatric-onset spinal cord injuries.
One hundred sixty-six individuals who had sustained an SCI at age 18 years or younger were interviewed at age 24 years or older in 3 consecutive annual interviews using the Functional Independence Measure, Craig Handicap Assessment and Recording Technique (CHART), Short-Form 12 measure of perceived health, and the Satisfaction with Life Scale. Of this group, 64% were living independently at the first interview, and 90% of those continued to live independently; 64% were employed at first interview, of which 83% continued to be employed; and 48% reported life satisfaction at the first interview, and 84% of these continued to be satisfied. Factors most closely associated with stable independent living were physical independence, mobility, and occupation. Factors associated with stable employment were sex, race, independent living, mobility, and cognitive independence. Factors associated with stable life satisfaction were occupation and fewer pressure ulcers. Understanding the factors associated with successful adult outcomes can help us improve rehabilitation for future patients.
Anderson CJ, Vogel LC, Willis KM, Betz RR.
J Spinal Cord Med. 2006;29(1):46-56.

RESPIRATORY

■ Effect of neuromuscular electrical stimulation on cough capacity and pulmonary function in patients with acute cervical cord injury.
Twenty-six patients with complete SCI between C4 and C7 and within three months of injury were randomly assigned to receive a conventional program of SCI rehabilitation, either with or without the addition of neuromuscular electrical stimulation (NMES) therapy (13 control subjects, 13 NMES subjects). NMES was applied to the clavicular portion of the pectoralis major and abdominal muscle over a 30-minute period daily, five days a week, for four weeks. Pulmonary function tests were performed before and after therapy, and at 3 months and 6 months follow-up, and pulmonary complications during this 6-month follow-up period were also recorded. After the 4-week therapy, and at 3 months and 6 months follow-up testing, patients in the NMES therapy

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group displayed significant improvement in their peak expiratory flow, forced expiratory volume in 1 second, forced vital capacity, maximal expiratory pressure and maximal inspiratory pressure, compared with those in the control group. In addition, patients in the NMES therapy group had fewer pulmonary complications in the follow-up period than controls.
Cheng PT, Chen CL, Wang CM, Chung CY.
J Rehabil Med. 2006 Jan;38(1):32-6.

REVIEW ARTICLE ON CANNABIS

■ **Cannabinoids in medicine: A review of their therapeutic potential.**
A review and meta-analysis of research on the therapeutic potential of cannabinoids (marijuana chemicals), published to July 1, 2005, in three languages, identified 72 controlled studies evaluating cannabinoids as a treatment for pain, spasticity and nausea, in several disease and disability categories. Three controlled studies on SCI were identified, all on five or fewer patients. These found that cannabinoids administered in sublingual (under the tongue) spray may, in some patients, lead to an improvement in spasticity, pain, vesical dysfunction and sleep quality. New formulations for administering and delivering cannabinoids are currently under investigation to reduce undesirable side effects and maximize benefits.
Ben Amar M.
J Ethnopharmacol. 2006 Apr 21;105(1-2):1-25. Epub 2006 Mar 15.

OSTEOPOROSIS

■ **Electrically induced muscle contractions influence bone density decline after spinal cord injury.**
Six individuals with complete SCI between C5 and T12 and within 4.5 months of injury participated in a training program consisting of electrical stimulation applied to the plantar flexor (tibia) muscles of one leg only, four times per day for three years. The opposite leg served as a within-subject control. Compliance with the training program was very good (> 80%). Compressive force on the tibia from the protocol was > 140% of body weight. Dual Energy X-ray Absorptiometry scans before, during and at the end of training revealed that bone mineral density (BMD) declined significantly less in the trained tibia (approx. 10%) than in the untrained limb (approx. 25%) and both hips. Lumbar spine BMD showed minimal change. Important features of this program were the early start date (less than 4.5 months after injury), high compressive force (more than 150% of body weight), high dose (about 1,680 contractions per week), and long duration (average 2.5 years of training). Weight bearing slows but doesn't eliminate bone loss.
Shields RK, Dudley-Javoroski S, Law LA.
Spine. 2006 Mar 1;31(5):548-53.

SYRINGOMYELIA

■ **Cordectomy for the treatment of posttraumatic syringomyelia. Report of four cases and review of the literature.**
Cordectomy (cutting the spinal cord) is an effective treatment option in patients with complete SCI who develop posttraumatic syringomyelia. While newer developments have drawn the attention of surgeons and researchers away from cordectomy, the authors encourage a reconsideration of cordectomy for the treatment of posttraumatic syringomyelia in this population. They describe four patients who, after cordectomy, exhibited improvements in their preoperative neurological deficits and remained stable at follow-up examinations between two and ten years later. A literature review indicated that neurological improvement or stabilization occurred in 88% of patients in published reports of posttraumatic syringomyelia treated with cordectomy.
Laxton AW, Perrin RG.
J Neurosurg Spine. 2006 Feb;4(2):174-8.

WEIGHT-SUPPORTED TREADMILL TRAINING

■ **Weight-supported treadmill vs over-ground training for walking after acute incomplete SCI.**
A total of 146 subjects within 8 weeks of SCI from six regional centers were entered in a single-blinded, multicenter, randomized clinical trial to receive 12 weeks of either step training with body weight support on a treadmill (BWSTT) with over-ground practice or a defined over-ground mobility therapy (control). Subjects had incomplete (ASIA B, C, or D) injuries between C5 and L3, and a Functional Independence Measure for locomotion (FIM-L) score less than 4 (i.e., unable to walk without assistance). Primary outcome measures were FIM-L (for ASIA B and C subjects) and walking speed (for ASIA C and D subjects) 6 months after SCI. No significant differences in these outcomes were observed between those who received BWSTT versus controls. This finding was partly due to the unexpectedly high percentage of ASIA C subjects who achieved functional walking speeds, irrespective of treatment. The results did not support the expectation that BWSTT would be more effective than the defined over-ground mobility therapy.
Dobkin B, Apple D, Barbeau H, et al.
Neurology. 2006 Feb 28;66(4):484-93.

COMPARING RESEARCHER AND CONSUMER PERSPECTIVES

■ **A Web-based systematic review on traumatic spinal cord injury comparing the "citation classics" with the consumers' perspectives.**
The number of times an article is cited in the medical literature is an indication of its impact on the scientific community. The 100 top-cited articles on traumatic SCI published between 1986 and 2003 were identified using the Internet database of the Science Citation Index Expanded and the Web of Science were analyzed and compared to the areas of greatest interest among people with SCI based on surveys. At least 51% of the top 100 top-cited articles were focused on motor function, which was of concern in 62.7% of the survey responses. Other concerns reported by SCI consumers were bladder (44.9%), bowel (43.5%), sexual (42.1%) and pain (37.2%) problems, while only 8% of the 100 top scientific articles were focused on these areas of interest. The 100 top-cited SCI articles have been predominantly focused on basic science SCI research, indicating a need for greater bench-to-bedside translational studies. Although the majority (63%) of this literature matches with the consumers' perspective, most of this research has been focused on motor function assessment and recovery following SCI.
Furlan JC, Fehlings MG.
J Neurotrauma. 2006 Feb;23(2):156-69.

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Northwest Regional SCI System Web site: *http://depts.washington.edu/rehab/sci*

Research Report: UTI prevention

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Cardenas concluded, "Hydrophilic catheter use for self-IC was associated with reduced numbers of treated UTIs compared to standard non-hydrophilic catheters. And women on self-IC were more likely to develop UTIs regardless of the catheter type, suggesting that the benefits of the lubrication may be more important in males." Cardenas recommends that further research on hydrophilic catheters be conducted with larger numbers of women and with catheters designed for women.

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1. M. DeVivo, G.G. Whiteneck and E.D. Charles, The economic impact of spinal cord injury. In: S.L. Stover, J.A. DeLisa and G.G. Whiteneck, Editors, *Spinal cord injury: clinical outcomes from the model systems*, Aspen, Gaithersburg (1995), pp. 234–271.

2. Cardenas DD, Hoffman JM, Kirshblum S, McKinley W. Etiology and incidence of rehospitalization after traumatic spinal cord injury: a multicenter analysis. *Arch Phys Med Rehabil*. 2004 Nov;85(11):1757-63.

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