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APPENDIX

Additional Details on Common Conditions Affecting Persons with Spinal Cord Injury

Note: See main text for reference list.

***Autonomic Dysreflexia*.** Typical manifestations are bradycardia, hypertension, headache, worsening spasms or spasticity, perspiration, goose bumps, nasal congestion, and pallor or flushing [13, 50]. Subsequent complications include arrhythmias, myocardial infarction, pulmonary edema, seizures, cerebrovascular events, and coma [14]. Immediate care includes loosening constricting clothes and shoes. Nitroglycerine 2% paste should be applied as a 2.5-cm strip above the level of the SCI.

Bladder, Neurogenic. The two most common problems with catheters are failure of external (also known as "condom" or "Texas") catheters to remain properly in place and leakage between catheterizations and around indwelling catheters. Medication or procedures to facilitate storage or emptying can be used to prevent bladder leakage and decrease urinary stasis. A procedure of choice for inability to empty the bladder is intermittent catheterization every 4 to 6 hours with clean technique or with a sterile kit [51–53]. This, however, requires either adequate hand function or a caregiver.

Bowel, Neurogenic. Common medical complications from neurogenic bowel due to SCI include bleeding, impaction, obstruction, and hemorrhoids. Hemorrhoids, in turn, can cause AD, bleeding, or pain. Time needed to complete a bowel care program can range from 15 minutes to several hours and may be required more than once a day. Therefore, RTW requires careful planning to coordinate work and bowel management schedules. While colostomy is an option, the bags require periodic emptying, which may bear on work schedule. Also, employees with limited hand function would require assistance with this task. Bowel care routine warrants important and sometimes complex considerations for vocational planning.

***Depression*.** According to one longitudinal study of SCI patients, probable major depressive disorder occurred at 1 year after injury in 21 percent, 5 years after in 18 percent, and at both 1 and 5 years in 8.7 percent [54]. Perhaps counter-intuitively, the level of SCI does not predict depression, though suicide risk

is higher for those with SCI than for the general population: 3.6 percent compared with 1 percent, respectively [55]. Men with complete paraplegia have the highest risk of suicide [56].

Dual Diagnosis of Traumatic Brain Injury and Spinal Cord Injury. Studies suggest that 16 to 59 percent of people with traumatic SCI sustain a TBI as well, particularly after trauma caused by motor vehicle accidents involving acceleration-deceleration forces to the head and neck [57–58]. Using a structured interview called the Ohio State TBI Identification Method, which quantifies lifetime exposure to TBI, researchers found lifetime exposure correlated with cognitive and behavioral sequelae [59]. This state-of-the-art TBI screening method has important applicability for persons with SCI, some of whom may not attempt vocational re-entry for many years after the injury [60]. Similar to employment challenges associated with TBI as a primary injury [5], challenges with co-occurring SCI and TBI require a concerted and coordinated effort by patient, healthcare providers, vocational staff, family, and even employers.

Limb Impairment, Lower. Guidelines and general information on functional capacity evaluations and fall prevention are available from organizations such as the World Health Organization, which posts information about the International Classification of Functioning, Disability and Health (ICF) on the web at http://www.who.int/classifications/icf/en, and from the Center for Disease Control, which has a fall check list and other information on the web at http://www.cdc.gov/ncipc/pub-res/toolkit/CheckListForSafety.htm.

Limb Impairment, Upper. A universal cuff on the wrist may help with writing, typing, or using the telephone. A tenodesis splint, by means of active wrist extension, may help with pinch and release, which is needed for tasks such as turning pages. Adaptive aids to access a computer at work include voice recognition software, eye control scanning systems, mouth sticks, trackballs, and word prediction software [31]. Some with severe upper limb dysfunction may need computer assistance to control lights, use telephones, open doors, and manipulate office equipment. In these instances, an option to consider is an environmental control unit, which interfaces with various applications via radio frequency, infrared, or Bluetooth technology [31]. Dependence on the upper limb for mobility in 30 to 60 percent of persons

with paraplegia and tetraplegia causes shoulder problems such as capsulitis, impingement syndrome, myofascial pain syndrome, and rotator cuff tears [27].

Heterotopic Ossification (HO). Reduced range of motion caused by HO affects mobility and ability to transfer from one position to another. The multidisciplinary rehabilitation team can identify equipment adjustments to accommodate loss of motion. If equipment modifications do not result in proper positioning, then surgery may be required, but HO may recur despite optimal medical and surgical management. Also, following corrective surgery, additional adjustments to wheelchair seating can be needed.

***Osteoporosis and Fractures*.** In contrast to persons without SCI who develop osteoporosis, bone mineral density in the lumbar spine with SCI typically appears normal, although this might be a false appearance due to bone spurs. Due to loss of sensation and a high risk for complications such as hardware failure or infection, most non-displaced fractures are treated without surgery [61–62]. The goal of treatment is to restore function and prevent complications, including pressure ulcers and infection. When the leg is braced, it may also need to be kept in extension in the wheelchair, which may require adjustments at work due to space limitations.

***Pain*.** Severe pain is reported by 50 to 60 percent and pain interfering with sleep by 40 percent. With chronic pain syndrome, inability to work can result from multiple associated issues: Alcohol/medication abuse, catastrophizing, depression, insomnia, social isolation, and withdrawal from and fear of activity. Rotator cuff syndrome and upper limb nerve entrapment are examples of nociceptive/musculoskeletal and neuropathic pains that can interfere with employment. While the prevalence of rotator cuff syndrome relates to unmodifiable factors such as age and completeness of and time since SCI, modifiable parameters also contribute, such as wheelchair configuration, body mass index, propulsion and posture, and an imbalance of shoulder girdle muscles [63]. Nerve entrapment is associated with some of the same risk factors as rotator cuff syndrome, but also with glucose intolerance and use of crutches [64]. Regarding pharmacologic options, seeking the least-sedating, longest-acting, and effective option, either opioid or non-opioid, may facilitate adherence and lower the risk of side effects.

***Pressure Ulcers*.** In addition to increasing healthcare utilization, pressure ulcers negatively impact psychosocial adjustment after SCI [65–69]. Persons with a history of pressure ulcers must be extra vigilant due to increased susceptibility. Conservative treatment can take months, whereas flap surgery only takes several weeks to heal but requires remobilization therapy, which adds weeks to months to recovery. Thus both require extended time away from work. Frequent rest breaks at work allow for adequate bladder and bowel care and for weight shifts. Some people use timers or alarms as reminders. Standing wheelchairs can also reduce the risk of skin injury by providing periods of offloading.

***Spasticity*.** Involuntary twitching of the extremities can be distracting to both the employee and co-workers, and forceful hip extensor spasms while a person is sitting in a wheelchair can tip it backwards, which risks injury. Power seating and standing wheelchairs can support return to work, but a standing wheelchair may risk shear, friction, and focal pressure. Botulinum toxin can be injected into specific muscles if tightness interferes with a particular task, for example, tight wrist flexors interfering with grasp. Intrathecal baclofen pump placement is an effective option when medications are inadequate or cause excess sedation.