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# Management of spinal cord injury in general practice – Part 2

## Background

People with spinal cord injury (SCI) are at risk of developing complications specific to the condition. As the incidence of SCI is low, general practitioners may not be familiar with these complications.

## Objective

This article completes the overview of common problems associated with SCI, highlighting specific points to be aware of when managing pressure areas, pain, spasticity, musculoskeletal disorders, neurological complications, sexual dysfunction, fertility, and psychological wellbeing. It aims to give readers a broad understanding of SCI issues, thereby increasing their confidence and ability to provide first line assessment and management.

## Discussion

General practitioners are well placed to recognise and manage some conditions associated with SCI. Systematically addressing the issues can also serve as the springboard for health promotion, thus pre-empting and potentially avoiding morbidity for the patient with SCI.

■ **Skin breakdown from pressure, friction, or shear forces is a common, potentially serious complication impacting on quality of life.<sup>1,2</sup> Pressure area (PA) incidence ranges from 20–80% in the spinal cord injury (SCI) population, with many developing PAs within 5 years of injury,<sup>3</sup> and consuming a disproportionately large number of rehospitalisation bed days (~30%) and resources.<sup>4</sup> Aggressive treatment of PAs can prevent further disability, such as decreased mobility and loss of independence, unemployment, fatal infections and amputations.<sup>5</sup>**

People with SCI are at increased risk of developing PAs due to physiological consequences of their injury, as well as functional, medical, mechanical and psychosocial factors (*Table 1*). Areas at greatest risk are those overlying bony prominences, such as ischial tuberosities, sacrum, heels, greater trochanter, medial aspect of knee and lateral malleolus.

Education for people with SCI and their carers is essential, with regular reassessment and further explanation to improve adherence. Lifelong preventive strategies include regular pressure relief (ie. lifting, leaning forward or tilting back in motorised wheelchair), meticulous hygiene and skin care, daily visual inspection of skin, and checking of equipment before use.<sup>2,6,7</sup>

If a PA does develop, all pressure must be relieved from the affected area for 24 hours per day, usually by bed rest, until healed. Severity should be staged at outset,<sup>8</sup> with appropriate wound management instituted and monitored by a community nurse. If the PA is not resolving (grade 1 and 2), deteriorating or severe at presentation (grade 3 and 4), specialist Statewide SCI Pressure Care Services should be contacted (see *Resources*). Contributing factors (eg. poor transfer technique, incontinence, poor nutrition) must be addressed. Investigations may be necessary depending on health status, wound characteristics and management plan (*Table 2*). Equipment review of all weight bearing surfaces is recommended and expert opinion may be required to support clinical decision making.

Table 1. Risk factors for skin breakdown

<p><b>Physiological factors</b></p> <ul style="list-style-type: none"> <li>• Motor and sensory deficits</li> <li>• Alteration to vascular supply</li> <li>• Alteration to temperature control and autonomic response</li> <li>• Nutritional status, weight gain or loss</li> <li>• Hydration status</li> <li>• Aging</li> <li>• Scar tissue or altered tissue viability</li> <li>• Previous history of skin breakdown</li> </ul>	<p><b>Functional factors</b></p> <ul style="list-style-type: none"> <li>• Level of injury and degree of injury incompleteness</li> <li>• Degree of functional independence – limitation in activity and mobility</li> <li>• Change in neurological status</li> <li>• Musculoskeletal deterioration</li> <li>• Immobility</li> <li>• Falls</li> <li>• Inadequate hygiene</li> </ul>
<p><b>Coexistent medical factors</b></p> <ul style="list-style-type: none"> <li>• Moisture from bladder or bowel incontinence</li> <li>• Infection</li> <li>• Spasm/spasticity</li> <li>• Autonomic dysreflexia</li> <li>• Number of comorbidities (especially renal, cardiovascular, pulmonary disease and diabetes)</li> <li>• Anaemia and hypoalbuminaemia</li> <li>• Pregnancy</li> <li>• Any surgical procedure</li> </ul>	<p><b>Psychological and cognitive factors</b></p> <ul style="list-style-type: none"> <li>• Psychological distress (major depression, anxiety disorders, negative self concept or poorly managed anger and frustration)</li> <li>• Cognitive impairment (eg. coexistent traumatic brain injury)</li> <li>• Lack of knowledge or specific education</li> <li>• Inability to apply knowledge</li> </ul>
<p><b>Mechanical factors</b></p> <ul style="list-style-type: none"> <li>• Incorrect posture, postural deformities</li> <li>• Transfer technique</li> <li>• Equipment type, use and maintenance</li> <li>• Unrelieved pressure</li> <li>• Friction/shearing during physical activity</li> </ul>	<p><b>Social factors</b></p> <ul style="list-style-type: none"> <li>• Lack of carers/care services</li> <li>• Substance use</li> <li>• Smoking</li> <li>• Male gender, lower levels of education, unemployed</li> </ul>

### Cardiovascular system

Mortality from cardiovascular disease is over 200% higher in the SCI population than age and gender matched able bodied controls,<sup>9</sup> with ischaemic heart disease being the leading cause of death after SCI.<sup>10</sup> Altered lipid metabolism (low HDL, increased LDL), type 2 diabetes mellitus (insulin resistance, hyperinsulinaemia) and changes in body composition (reduced lean muscle/increased relative fat mass) influence the progression and severity of cardiovascular disease. *Table 3* summarises possible cardiovascular problems.<sup>11</sup>

Early identification and control of modifiable risk factors can improve longevity and quality of life in people with SCI. Blood pressure (in relaxed lying and sitting positions) should be checked at least annually. In the SCI population, screening of lipids and fasting blood sugar level should start earlier (at age 45 years) and be done more frequently (every 1–2 years). People with additional risk factors, including diabetes, established cardiovascular or cerebrovascular disease, an absolute cardiovascular risk >15% over next 5 years, hypercholesterolaemia and chronic kidney disease, should be

Table 2. Investigations for pressure areas

<p><b>Blood tests</b></p> <ul style="list-style-type: none"> <li>• Full blood count</li> <li>• Albumin and pre-albumin levels</li> <li>• Inflammatory markers (CRP, ESR) BSL/LFT/EUC</li> </ul>	<p><b>Imaging</b></p> <ul style="list-style-type: none"> <li>• Sinogram</li> <li>• X-ray</li> <li>• CT scan (soft tissue and bony windows)</li> <li>• Bone scan (if osteomyelitis suspected)</li> </ul>
<p><b>Microbiology</b></p> <ul style="list-style-type: none"> <li>• Wound swab – MCS</li> <li>• Blood cultures (if patient is febrile)</li> </ul>	<p><b>Clinical assessment</b></p> <ul style="list-style-type: none"> <li>• Digital photos (with indicator of scale to monitor progress of wound)</li> <li>• Height/weight (body mass index)</li> </ul>
<p>CRP = C-reactive protein; ESR = erythrocyte sedimentation rate; BSL = blood sugar levels; LFT = liver function tests; EUC = electrolytes, urea, creatinine; MCS = microscopy, culture and sensitivity</p>	

screened yearly. Weight control, exercise and cessation of smoking should be encouraged.

### Respiratory system

Respiratory complications such as respiratory failure, atelectasis, pneumonia and pulmonary embolus are leading causes of death in people with higher level, complete lesions. Factors such as age, pre-existing cardiopulmonary disease and delayed recognition

**Table 3. Cardiovascular problems in SCI**

- Orthostatic hypotension (with low baseline blood pressure)
- Autonomic dysreflexia
- Bradycardia, cardiac arrest
- Increased risk of coronary heart disease, possible atypical presentation
- Reduced exercise capacity and cardiovascular fitness
- Peripheral vascular disease (lack of claudication, delayed presentation)
- Drug related cardiovascular side effects
- Venous thromboembolism

**Table 4. Red flags for respiratory complications**

- Increased frequency of respiratory tract infections (RTIs)
  - person with tetraplegia >2 RTIs per year
  - person with paraplegia below T8 level >3 RTIs per year
- Shortness of breath and/or tightness in chest
- Decline in function or fatigue from shortness of breath
- Decreased ability to clear secretions – patient may report ‘wet cough’ or hacking, nonproductive cough
- Coughing up blood and recent weight loss
- Snoring with early morning headache and/or excessive day time fatigue/sleepiness
- New leg swelling

Note: Consider respiratory insufficiency (particularly sleep apnoea) if vital capacity is trending downward or there are symptoms of tiredness and sleepiness during the day or elevated waking blood pressure

of, and attention to, pulmonary problems can adversely affect mortality.<sup>12</sup> It is important to monitor for warning signs or symptoms (‘red flags’) (*Table 4*) by monitoring resting respiratory rate and vital capacity annually and maintaining vaccination against influenza, pneumococcus and pertussis.

Obstructive sleep apnoea is also very common. Therapy may improve health outcomes and quality of life. Monitoring for suggestive signs and symptoms (eg. snoring, obesity, witnessed apnoeas, headache on waking, day time sleepiness) and where indicated further testing (overnight oximetry or polysomnography) is recommended.<sup>13</sup>

### Neurological complications, spasticity and pain

Post-traumatic syringomyelia – cystic cavitation extending rostrally or caudally from site of original cord injury – occurring in about 17–20% of persons with SCI, is a common cause of worsening myelopathy.<sup>14</sup> It is often heralded by pain, ascending (dissociated) sensory loss, increased spasticity, weakness and loss of function. Magnetic resonance imaging (MRI) is required to confirm diagnosis. The natural history of syrinxes is variable and referral to a

neurosurgeon is indicated. Generally, neurologic monitoring guides treatment, which may be conservative or surgical (by shunting and/or detethering of arachnoid scarring) to arrest progressive deterioration.

Chronic pain is common after SCI and may impact negatively on mood, sleep, activities of daily living, community participation and quality of life. Classification into nociceptive (musculoskeletal or visceral) and neuropathic (above, at and below level) types of SCI pain, based on location, descriptors and relation to activity, position or other aggravating and relieving factors, can help guide treatment.<sup>15</sup>

Medical investigation may be necessary to exclude underlying and treatable pathology, particularly when there is a change in intensity, quality or distribution of the pain or new onset. Medical practitioners may inadvertently reinforce the disease model of pain by focusing predominantly on pain complaints and drug treatment, paying insufficient attention to psychological and contextual factors. Medications are partially effective in only 50%, and cognitive side effects can impact adversely on function, so dosages should be rationalised with a biopsychosocial approach adopted (*Table 5*).

Spasticity associated with high tone, spasms, loss of dexterity and hyperreflexia may be problematic. When the degree of spasticity increases significantly without obvious explanation, look for aggravating factors such as urinary tract infection or calculi, constipation, skin ulceration, ingrown toenails and less commonly, intra-abdominal or pelvic problems. Treatment should be instituted if spasticity interferes with functional independence, endangers transfers, causes pain or places skin at risk. Management is hierarchical beginning with regular stretching to maintain muscle length, particularly for hip and plantar flexors, and use of medications such as baclofen (10–25 mg four times per day) and diazepam (5.0–7.5 mg 3–4 times per day). Less common adjunctive medications include dantrolene sodium and clonidine. Motor point injections with botulinum toxin, phenol or alcohol or more definitive surgical approaches (eg. tendon lengthening, tenotomy and/or neurectomy) may be considered for localised spasticity, while intrathecal management with baclofen may be used for difficult to manage generalised spasticity.

### Musculoskeletal complications

Upper limb overuse syndromes occur commonly due to the physical demands and stresses placed on the upper limbs during daily wheelchair propulsion and transfer activities. Prevalence and severity increases with age and duration postinjury, with approximately 70% of wheelchair users experiencing pain in the shoulders and wrists. Postural deformity associated with paralytic scoliosis is also common and may contribute

to development of neck and back pain and/or skin and seating problems.

Upper limb joints should be examined annually for range of motion and signs of overuse, such as bicipital tendonitis, rotator cuff tears, impingement, subacromial bursitis and capsulitis.

Referral for further assessment may be required if there is

significant pain or limitation of movement is interfering with function. Most problems can be managed conservatively by activity modification, addressing muscular imbalance, improving suboptimal posture, and correcting ergonomic factors.

Osteoporosis occurs rapidly in the first 12–18 months, but continues for several years, reaching fracture thresholds in

Table 5. Oral pharmacologic interventions in pain management

Medication class	Notes on use	Precautions and side effects
<p><b>Simple analgesics</b></p> <p>Paracetamol 1 g three to four times per day</p> <p>Nonsteroidal anti-inflammatory drugs (NSAIDs)</p>	<p>For nociceptive pain</p> <p>For nociceptive pain but may have some effect on neuropathic pain</p>	<p>Be cautious of use in sodium restriction, phenylketonuria, hepatic and renal impairment</p> <p>Be cautious of use in heart failure, uncontrolled hypertension, asthma, surgical procedures, history of peptic ulcer, G6PD deficiency, renal or hepatic impairment, bleeding diathesis, and in the elderly</p>
<p><b>Tricyclic antidepressants</b></p> <p>Nortriptyline 10–75 mg per day</p> <p>Amirtryptiline 10–75 mg per night</p>	<p>Adjunctive medication partially effective in dysaesthetic neuropathic pain</p> <p>Speak to spinal specialist or urologist before prescribing for pain in persons voiding by reflex</p>	<p>Can provoke cardiac dysrhythmias and are contraindicated in persons with significant conduction abnormalities</p> <p>Be cautious of use in coronary heart disease, orthostatic hypotension, prostatic hypertrophy, closed angle glaucoma, suicidal ideation, hyperthyroidism, epilepsy, bipolar disorder, use of other serotonergic drugs, hepatic impairment, the elderly</p> <p>Anticholinergic side effects are common and include dry mouth, blurred vision, orthostatic hypotension, urinary retention, constipation, and sedation</p>
<p><b>Anticonvulsants</b></p> <p>Carbamazepine (Tegretol) 200 mg twice per day 400 mg three times per day</p> <p>Gabapentin 300–1200 mg three times per day</p> <p>Pregabalin 75–300 mg twice per day</p>	<p>Effective in trigeminal neuralgia but controlled studies in SCI pain are lacking</p> <p>Regarded as first line treatment of neuropathic pain following SCI</p> <p>RCT has shown it is effective in treatment of neuropathic pain following SCI</p>	<p>Be cautious of use if taking clozapine, hepatic impairment</p> <p>Common side effects include drowsiness, ataxia, dizziness, blurred vision, diplopia, headache, rash, dry mouth, abdominal pain, nausea, vomiting, anorexia, diarrhoea, constipation, hyponatraemia, leucopenia, thrombocytopenia, increased liver enzymes</p> <p>Be cautious of use in renal impairment</p> <p>Common side effects include fatigue, sedation, dizziness, ataxia, tremor, diplopia, nystagmus, amblyopia, amnesia, abnormal thinking, hypertension, vasodilatation, peripheral oedema, dry mouth, weight increase, rash</p> <p>Renal impairment requires dosage reduction</p> <p>Common side effects include dizziness, drowsiness, visual disturbance (including blurred vision, diplopia), ataxia, dysarthria, lethargy, memory impairment, euphoria, tremor, weight gain, constipation, dry mouth, peripheral oedema, facial and tongue oedema</p>
<p><b>Opioids</b></p> <p>Tramadol, Oxycontin, methadone, fentanyl, buprenorphine</p>	<p>There are no studies on opioid analgesics in post-SCI pain specifically</p>	<p>Careful consideration of issues such as sedation, constipation, abuse, dependence, and tolerance before prescribing</p>

Source: Australian Medicines Handbook. Please refer to medication product information for full details, including contraindications, before prescribing

the proximal femur between 1–9 years after SCI.<sup>16</sup> There is no current consensus guideline for managing osteoporosis in SCI and consultation with an endocrinologist or spinal specialist is helpful when considering treatment or prophylaxis with bisphosphonates. Fracture risk due to falls and minimal impact daily activities is around 2% per year,<sup>17</sup> most frequently in lower extremities where a fracture may go unnoticed because of sensory loss. If present, symptoms may include localised swelling, increased spasms and autonomic dysreflexia. Management may be conservative or surgical depending on type of fracture. There can be considerable impact on the person's function, including hospitalisation, reduced independence, time lost from work or school and increased care needs during fracture recovery.<sup>18</sup>

### Sexuality and fertility

Sexuality is an important aspect of life for all people, including those with disability. After SCI, there are changes in genital sensation, arousal and orgasm. Erectile dysfunction with anejaculation or retrograde emission occurs commonly in men, while women may experience decreased labial/clitoral engorgement and lubrication with altered orgasm. Other concerns include altered physique ('attractiveness'), dependency, role reversal, positioning difficulties, interference by spasms, bladder or bowel accidents, pain/hyeraesthesia and risk of autonomic dysreflexia.<sup>19</sup> Various medications (eg. anticholinergics, tricyclics, antispasmodics) can further impair erection, lubrication and ejaculation/retrograde emission.

PDE5 inhibitors are effective for maintaining erection in 70–85% of men (mean duration ~30 minutes).<sup>20</sup> Other techniques include intracavernosal injections (eg. prostaglandin E1, papaverine HCl or combinations), vacuum tumescence devices, sacral stimulators or penile implants.<sup>21</sup> Expression of sexuality is a very private and personal matter, and skilled counselling is often necessary. Sexual satisfaction is closely linked to the psychological and social consequences of SCI and adjustment after injury. Hence, successful management should include exploring alternatives in sexual expression, emphasising the importance of communication, addressing adjustment issues and education of the patient's partner.

Reproductive capacity is usually severely impaired in men after SCI due to poor semen quality and/or absent or retrograde ejaculation, requiring specialised semen retrieval, ie. vibration, electro-ejaculation and assisted reproduction techniques (eg. in vitro fertilisation, intracytoplasmic semen insemination).<sup>22</sup> In women, menstruation typically ceases due to stress but returns after 4–12 months, with fertility being unaffected. Pregnancy and delivery may pose problems, with increased risks of urinary tract infection, thrombosis and leg oedema, pressure areas and autonomic dysreflexia. Impact on mobility, transfers and care needs should be anticipated and require forward planning. In terms of contraception, progesterone only preparations (mini-pill, Implanon, Depo-Provera, Mirena) offer less risk of thrombosis. Intrauterine devices are generally not advisable where

sensation is absent, while diaphragms/caps may prove unreliable with impaired dexterity.

### General health and psychological wellbeing

Spinal cord injury is a devastating event with far reaching psychological and social effects. The process of psychosocial adaptation after SCI is complex with appraisal, coping and acceptance reflecting a dynamic interaction between intrapersonal, impairment and environment factors at any one time.<sup>23</sup>

Psychiatric disease is prevalent in about 40% of the SCI population, with depression, adjustment disorders and substance abuse most common.<sup>24</sup> Coexistent traumatic brain injury is also common in people with SCI, which may manifest in personality, behavioural and cognitive changes.<sup>25</sup> Psychological issues can impact significantly upon a person's ability for effective self management and contribute to poorer long term outcomes, with increased risk of secondary health complications, self neglect and death. Risk of suicide is increased (about five-fold), particularly during the first 5–6 years postinjury, which is responsible for 6–10% of all SCI deaths.<sup>26,27</sup>

Key management principles include early recognition of symptoms and prompt referral to an experienced mental health clinician. It is important to identify and facilitate sources of support for the patient.

### Conclusion

People with SCI experience specific SCI related complications and general health problems. The general practitioner's role in early detection cannot be overstated as prompt management not only avoids long term morbidity and mortality but also improves independence and quality of life in this population.

### Resources

- SSCIS skin referral pathway
- Clinical information booklets, listed below, are available at [www.ciap.health.nsw.gov.au](http://www.ciap.health.nsw.gov.au) by following the specialties link:
  - Rutkowski S. Sexuality and fertility following spinal cord injury
  - Statewide Spinal Cord Injury Service Skin Management Taskforce Committee. An overview of skin and pressure area management
  - Engel S. Health maintenance for adults with spinal cord injuries
  - Siddall P, Middleton J. Managing pain for adults with spinal cord injuries
  - Dezaraulds A, Ilchef R. Psychological adjustment after spinal cord injury. Rural Spinal Cord Injury Project

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