Rehabilitation of Traumatic Spinal Cord Injury
Mercy Trauma Conference 2019
Spencer Cotterell DO
Director- Spinal Cord Specialty Services
Mercy Rehabilitation Hospital
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Or...

What happens after *PT/OT Eval and Treat*
Conflicts

• None
Learning Objectives

• Review traumatic spinal cord injury rehabilitation principles
• Overview of the rehabilitation process
• Discuss life with chronic spinal cord injury
Outline

• Introduction to traumatic SCI
• Management of acute traumatic SCI
• Acute rehabilitation of SCI
• Medical issues encountered in rehab
• Return to the community
• Complications of chronic SCI
Introduction
Introduction

- There are estimated to be 236,000 and 327,000 people in the US living with SCI
- Approximately 12,000 new cases per year.
- Median age of injury is 35 and 80% male
Introduction-Etiology

- MVC: 37%
- Falls: 29%
- Violence: 14%
- Sports: 9%
- Unknown: 11%
Recent trends have seen an increase in incomplete tetraplegia and corresponding decrease in complete injuries.
Introduction

• In Traumatic Spinal Cord Injuries, **primary injury** to the spinal cord results from **compression** or **laceration** of the cord that results in disruption of axons and neuronal membranes.
  • This can occur with fractures, dislocations, stab wounds, and gunshot wounds

• **Secondary injury** can occur within 8-24 hours and are a result of a cascade of events that leads to **hemorrhage, edema, infarction, and necrosis**.

• **Late secondary injury** can be seen weeks, months, or years after injury and include **neuroma formation, Wallerian degeneration, arachnoidopathy, and syringomyelia**.
Introduction

• In most adults, the spinal cord terminates between the first and second lumbar vertebral bodies.
  • Spinal injuries at and above L1 are at risk for SCI with Upper Motor Neuron (UMN) symptoms
    • Increased tone and/or spasm
  • Spinal injuries at and below L2 are at risk for SCI with Lower Motor Neuron (LMN) symptoms
    • Areflexia, hypotonia, muscle atrophy, flaccid bowel/bladder
Introduction

• Hyperextension of the cervical spine can result in Central Cord Syndrome where the upper extremities are weaker than the lower extremities
  • C4-5 is the most common level at which cervical hyperextension injuries occur

• Compression fractures of the cervical spine result from cervical flexion or axial loading
  • C5 is the most common level at which cervical compression fracture occurs
Introduction

• Facet joint dislocation
  • Unilateral facet joint dislocation occurs from cervical flexion-rotation injury
  • Bilateral facet joint dislocation occur with cervical flexion injuries
  • C5-6 is the most common level of both unilateral and bilateral facet joint dislocation injuries
Introduction

• Less than 1% of affected individuals experience full neurologic recovery by discharge from the hospital
Introduction

• We will follow the path of William Smith, a fictional patient.

• Bill is a composite of different patient experiences.
Introduction

• Bill is a 32yo male who enjoys motor sports. He has raced dirt bikes since he was 13 years old.

• One day in July he was riding on a friend’s dirt track and lost control of his motorcycle.

• He crashed and immediately experienced severe low back pain and couldn’t get up off the ground.
Introduction

• The primary goal of rehabilitation is functional enhancement by maximizing the independence, lifestyle, and dignity of the patient

• Should initiate immediately to maximize functional recovery
  • Rehab can start in the ICU with passive ROM exercises, bowel and bladder training initiation, and positioning to prevent skin breakdown or contractures
  • In the ICU, a member of Bill’s treatment team is an intern who is going into PM&R. This intern cleverly orders “PT/OT eval and treat” and pats himself on the back

• The multidimensional nature of SCI and sequella demand a multidisciplinary approach to treat the patient
Function is the operative word in rehab
  - The goal of inpatient rehab is to maximize function
  - What can they do?
  - What do they need to be able to do?
  - How can the gap be bridged?
### Introduction

- Functional goals after spinal cord injury

<table>
<thead>
<tr>
<th>Level of Injury</th>
<th>Functional Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1-3</td>
<td>Dependent for ADLs, mobility. Dependent on ventilator. Operate PWC with head/chin control</td>
</tr>
<tr>
<td>C4</td>
<td>Dependent for ADLs, mobility. Not dependent on ventilator.</td>
</tr>
<tr>
<td>C5</td>
<td>Independent with feeding after setup using adaptive equipment</td>
</tr>
<tr>
<td>C7</td>
<td>Independent with bed mobility and transfers; independent at wheelchair level of mobility; can drive with hand controls</td>
</tr>
<tr>
<td>C8-T1</td>
<td>Independent with all self-care using adaptive equipment</td>
</tr>
<tr>
<td>T12-L4</td>
<td>Ambulation with bilateral LE orthotics and assistive device</td>
</tr>
<tr>
<td>L4-5</td>
<td>Ambulating with bilateral LE orthotic and no assistive device</td>
</tr>
</tbody>
</table>
Management of acute traumatic spinal cord injury
Once SCI is diagnosed, definitive treatment of disrupted spinal column must be determined

- Operative vs nonoperative
- Surgery indicated for spinal cord decompression, spinal column stabilization
- Bracing options depend on the level of injury
  - Halo bracing
  - Miami J
  - Minerva
  - TLSO

Treatment of other concurring injuries occurred in trauma and subsequent hospital complications
Acute SCI

- Severe SCI is associated with immediate rise in blood pressure briefly
- It is followed by **Spinal Shock**, with hypotension, bradycardia, and hypothermia
  - Watch for and treat other potential causes of shock
- Spinal shock is caused by an initial decrease in tone and lack of reflexes below the level of SCI
  - Drop in blood pressure is a result of changes to **sympathetic vascular tone**
- Spinal shock can last anywhere from 24hr to 3 months after injury
  - Emergence from spinal shock includes the return of deep tendon reflexes
Acute SCI

• Spinal shock phases
  • Phase 1 (day 0-1) – areflexia or hyporeflexia due to loss of descending nervous stimulation
  • Phase 2 (starts on days 1-3) – initial return of reflexes, attributed to supersensitivity of spinal cord tissue below the level of injury
  • Phase 3 (spans weeks 1-4) – hyperreflexia, attributed to new synaptic growth. Autonomic function improves. Hypotension improves but autonomic dysreflexia emerges
  • Phase 4 (occurs over months 1-12) – more hyperreflexia attributed to growth of long axons. Detrusor tone improves but may not correlate clinically to improved bladder function
Acute SCI – Evaluation

- Neurologic assessment completed with standardized exam
  - Testing both motor and sensory nerves at key points to determine the **Neurologic Level of Injury** (NLI)
  - NLI is the most caudal level with both sensory and motor intact bilaterally
## Acute SCI - Evaluation

- Key muscles graded on a 1-5/5 scale

<table>
<thead>
<tr>
<th>Root Level</th>
<th>Muscle Group</th>
<th>Key Muscles</th>
</tr>
</thead>
<tbody>
<tr>
<td>C5</td>
<td>Elbow flexors</td>
<td>Biceps, brachialis</td>
</tr>
<tr>
<td>C6</td>
<td>Wrist extensors</td>
<td>Extensor carpi</td>
</tr>
<tr>
<td>C7</td>
<td>Elbow extensors</td>
<td>Triceps</td>
</tr>
<tr>
<td>C8</td>
<td>Long finger flexors</td>
<td>Flexor digitorum profundus</td>
</tr>
<tr>
<td>T1</td>
<td>Finger abductors</td>
<td>Abductor digiti minimi</td>
</tr>
<tr>
<td>L2</td>
<td>Hip flexors</td>
<td>Iliopsoas</td>
</tr>
<tr>
<td>L3</td>
<td>Knee extensors</td>
<td>Quadriceps</td>
</tr>
<tr>
<td>L4</td>
<td>Ankle dorsiflexors</td>
<td>Tibialis anterior</td>
</tr>
<tr>
<td>L5</td>
<td>Long toe extensor</td>
<td>Extensor hallucis longus</td>
</tr>
<tr>
<td>S1</td>
<td>Ankle plantar flexors</td>
<td>Gastrocnemius, soleus</td>
</tr>
</tbody>
</table>
## Acute SCI - Evaluation

- **ASIA Impairment scale**

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Complete: No motor or sensory function is preserved in sacral segments S4-5</td>
</tr>
<tr>
<td>B</td>
<td>Incomplete: Sensory but not motor function is preserved below the NLI</td>
</tr>
<tr>
<td>C</td>
<td>Incomplete: Motor function is preserved below NLI but most of the key muscles below NLI are &lt;3/5</td>
</tr>
<tr>
<td>D</td>
<td>Incomplete: Motor function preserved below NLI and at least half key muscles below NLI are &gt;3/5</td>
</tr>
<tr>
<td>E</td>
<td>Normal: Full recovery, motor and sensory function are intact</td>
</tr>
</tbody>
</table>
Acute SCI - Incomplete SCI syndromes

- **Central cord syndrome** - 50% of incomplete injuries and 9% of all traumatic SCI. Characterized by UE weaker than LE

- **Brown-Sequard syndrome** — 2-4% of SCI. Hemisection of spinal cord from a knife or bullet wound. 75-90% walk independently and 70% perform ADLs independently after DC.

- **Cauda equine syndrome** — affecting nerve roots below L1/2 vertebral level and presenting in LMN symptoms (areflexic and flaccid)
### Chronic SCI - Goals

#### TABLE 7-3 Functional Potential Outcomes for Cervical SCI (Complete) Patients

<table>
<thead>
<tr>
<th>Activity</th>
<th>C1-C4</th>
<th>C5</th>
<th>C6</th>
<th>C7</th>
<th>C8-T1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeding</td>
<td>Dependent</td>
<td>Independent with adaptive equipment after setup</td>
<td>Independent with or w/o adaptive equipment</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td>Grooming</td>
<td>Dependent</td>
<td>Min assist with equip. after set up</td>
<td>Some assist to Ind. with adaptive equipment</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td>UE Dressing</td>
<td>Dependent</td>
<td>Requires assistance</td>
<td>Independent</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td>LE Dressing</td>
<td>Dependent</td>
<td>Dependent</td>
<td>Requires assistance</td>
<td>Some assist to Ind. with adaptive equipment</td>
<td>Usually Independent</td>
</tr>
<tr>
<td>Bathing</td>
<td>Dependent</td>
<td>Dependent</td>
<td>Some assist to independent with equipment</td>
<td>Some assist to Ind. with equipment</td>
<td>Independent with equipment</td>
</tr>
<tr>
<td>Bed Mobility</td>
<td>Dependent</td>
<td>Requires assistance</td>
<td>Requires assistance</td>
<td>Independent to some assist</td>
<td>Independent</td>
</tr>
</tbody>
</table>

#### Activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>C1-C4</th>
<th>C5</th>
<th>C6</th>
<th>C7</th>
<th>C8-T1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Shifts</td>
<td>Ind. in power WC</td>
<td>Requires assistance unless in manual WC</td>
<td>Independent</td>
<td>Independent</td>
<td>Independent</td>
</tr>
<tr>
<td>Transfers</td>
<td>Dependent</td>
<td>Maximum assist</td>
<td>Some assist to Ind. on level surfaces</td>
<td>Independent with or without board for level surfaces</td>
<td>Independent</td>
</tr>
<tr>
<td>WC Propulsion</td>
<td>Independent with power WC</td>
<td>Dependent in manual</td>
<td>Independent in power; independent to some assist in manual with adaptations on level surfaces</td>
<td>Independent using manual WC with coated rims on level surfaces</td>
<td>Independent except for curbs and uneven terrain</td>
</tr>
<tr>
<td>Driving</td>
<td>Unable</td>
<td>Ind. with adaptations</td>
<td>Independent with adaptations</td>
<td>Car with hand controls or adapted van</td>
<td>Car with hand control or adapted van</td>
</tr>
</tbody>
</table>
Chronic SCI

• The highest COMPLETE SCI level that can live independently without the aid of an attendant is **C6**
  • Person would have to be *extremely motivated*
  • Use of adaptive equipment for feeding, grooming, dressing, bowel care

• **C7** level is the typical level for achieving independence
Acute rehabilitation
Goal of acute and post-acute rehabilitation:
- Maximize function and independence
- It is important to determine whether goals are realistic
  - Bill is married, his wife works but can get FMLA. He has 3 children, ages 8, 3, and 1
  - Frail, elderly patient with no home support with profound deficits will likely not be successful with a discharge home alone
  - 78 yo childless widow, “Eleanor Rigby,” lived alone prior to her injury. Plan was to go home with support of her 75 yo neighbor, but once at rehab, her deficits proved too severe and she ended up in a nursing home
Acute rehabilitation

• Initiating acute rehabilitation
  • Starts with the acute care therapists.
    • PT/OT eval and treat...
    • Patient must require at minimum 2 of the therapy disciplines
    • Upon evaluation, Bill presents with L1 burst fracture requiring fusion, complete T12 paraplegia, neurogenic bowel, neurogenic bladder, pain
  • Do they have a clear disposition? Bill’s looks pretty solid. Family and church support is there and he lives in a single-story home with 4 steps to enter
  • Do they meet medical necessity?
    • 60% rule -60% of acute inpatient patients must have at least one of 13 diagnoses
Acute rehabilitation

• Initiating acute rehabilitation
  • Referral made to Acute Rehab liaisons
    • Kim is an RN who works for the local rehabilitation hospital as a liaison. She reviews Bill’s case and gathers information regarding his history, hospital course, current and prior functional levels, disposition and presents it to the assigned physiatrist at the rehab hospital
  • Acceptance by the rehab physician (or not)
    • Bill’s info is sent to Dr Smith for review who can see that Bill has suffered an obvious decline in function. Bill is then accepted to the rehab hospital and is transferred
  • Transfer to acute rehab when medically stable
  • Studies show that comprehensive treatment in acute rehab hospital leads to, on average, greater functional improvement and more frequent discharges to community
Acute rehabilitation

• Alternatives to acute inpatient rehab
  • Places for patients who are not able to tolerate higher levels of therapy
    • Once medically stable, can transfer to acute rehab for intensive therapies
  • Subacute care
    • Medicare has 5 levels of skilled nursing facility where a patient can receive rehab
    • The 2 most intensive are deemed Subacute and the patient can get 1.5-2.5 hours of therapy per day, 5 days a week
  • LTAC
    • Medically complex patients who require an extended stay in a hospital
    • Often involves vent weaning, wound healing, non-weight bearing
Rehabilitation Phase of SCI

- Rehab goals include maximizing physical independence, becoming independent in direction of care, and preventing secondary complications
  - Even for complete high cervical SCI patients, rehab can be a time for the patient to learn how to direct their care and for family/caregiver training

- Therapists address mobility, self-care skills, and other Activities of Daily Living (ADLs)
  - Sometimes problem solving is necessary to achieve a modified independent level of function. Tools, universal cuff, grabbers

- Transfer training
  - Mechanical lift, slide board, with assistance of walker, with no AD

- Gait training
  - Orthotics, braces, walkers
Rehabilitation Phase of SCI

- **Wheelchair skills**
  - Propelling with proper form to minimize strain on shoulders
  - Therapists help select proper seating systems
  - Patients learn about all components of wheelchair
    - Brakes, armrests, footrests, wheels, and cushions

- **SCI education**
  - Helps with adjustment to disability and return to community
  - Prevention of potential complications

- **Home and Environmental Modifications**
  - Ramps, grab bars, showers, etc
  - Home evaluation with therapists
Acute rehabilitation

• Bill arrives in the evening to rehab. He meets his nurse and settles down for the night
The next day he is evaluated by his physical therapist, occupational therapist, speech therapist, and physiatrist. He is in therapies 3 hours/day for 5 days/week. Weekly team conference to review progress, goals, and DC plan.

Acute rehabilitation
Acute rehabilitation

• The next day he is evaluated by his physical therapist, occupational therapist, and physiatrist
Acute rehabilitation

- Bill is in therapies 3 hours/day for 5 days/week
- PT addresses his transfers, range of motion, balance, wheelchair measurements, and strengthening
- OT addresses his ADLs, including toileting, dressing, and managing his brace
- The therapists go with him on a home evaluation visit to practice getting around the home
Acute rehabilitation

• Weekly team conference to review progress, goals and DC plan

• Team consists of:
  • Physiatrist
  • Therapists
  • Nurse
  • Case Manager
In rehab, Bill works on skills he will need in order to go home successfully.

He learns that in rehab, we avoid bedpans and eat meals outside the hospital room where possible.

His equipment needs are evaluated and orders are placed for his wheelchair, shower bench, reacher, sock aid, and other assistive tools.
Medical issues in acute rehabilitation
Medical issues commonly seen in acute rehabilitation

• Respiratory care
  • ASPIRATION PNEUMONIA IS THE MOST COMMONLY SEEN MEDICAL COMPLICATION IN REHAB GENERALLY
  • Tracheostomy

• Premorbid medical issues
  • A new spinal cord injury does not care about your old CHF and diabetes
Medical issues commonly seen in acute rehabilitation – Autonomic Dysfunction

- SCI at **T6 and above** are at risk for Orthostatic Hypotension and Autonomic Dysreflexia

- **Orthostatic Hypotension**
  - Lack of sympathetic outflow impedes the body’s ability to maintain BP when sitting up
  - Does improve with time
  - Treat with abdominal binders, TED hose, medications such as midodrine and florinef

- **Autonomic Dysreflexia**
  - Massive imbalanced reflex results in increased sympathetic discharge
  - Noxious stimuli -> Increased BP, Cardiac output with no signal from brainstem through the cord to turn it off
  - Treat with sitting up (turn on the OH), loosening clothing, and identify/treat noxious stimulus
    - 1 Bladder, 2 Bowel, 3 Skin, 4 Clothing
Medical issues commonly seen in acute rehabilitation – Neurogenic bladder

- LMN lesions result in failure to empty
  - Flaccid bladder and/or spastic sphincter
  - Treatment is intermittent catheterization, cholinergic stimulators, alpha adrenergic blockers

- UMN lesions result in failure to store
  - Spastic bladder and/or incompetent sphincter
  - Anticholinergics, smooth muscle relaxers

- UTI
  - Asymptomatic UTIs are not treated with antibiotics
  - Bacteria culture to guide antibiotic choice
Medical issues commonly seen in acute rehabilitation – Neurogenic bowel

• Goal is continent bowel movements (wear normal underwear)

• **UMN lesion** – disruption of cortical control of bowels with decreased ability to sense the urge to defecate. Reflex bowel evacuation possible as connection between colon and spinal cord is intact
  • Bowel routine with **daily suppository** and digital stimulation can cause reflexive bowel movements.

• **LMN lesion** – disruption of connection between bowels and spinal cord. Results in flaccid, areflexic colon and rectum with no sphincter tone
  • **Bulking agent** (fiber supplement) and digital disimpaction

• Complications include constipation, hemorrhoids, skin breakdown, social
• Surgical intervention (colostomy) if more conservative measures fail
Medical issues commonly seen in acute rehabilitation – DVT/PE

• DVT is most common during first 2 weeks after SCI
  • Incidences decrease after 8-12 weeks post injury

• Pulmonary Embolism is the leading cause of death in acute SCI
  • A 50 yo patient transfers to acute rehab right before the resident is supposed to go home. The resident evaluates the patient, writes his admission note and heads out. The next day he found out she collapsed and coded after using the bedside commode. Autopsy revealed a pulmonary embolus. There had been no physical exam finding of DVT

• DVT prophylaxis
  • Incomplete SCI – continue until DC from hospital
  • Complete SCI – continue for 8 weeks post injury if uncomplicated
  • Complete SCI – continue for 12 weeks post injury if complicated by lower limb fracture, Hx of clot, CHF, obesity, age > 70
Medical issues commonly seen in acute rehabilitation - Pain

- Prevalence in SCI 60-80%. 18-44% is functionally disabling.

- Nociceptive pain
  - Bone, ligaments, muscle, skin
  - More common than neuropathic
  - Shoulder is most commonly affected joint due to overuse

- Neuropathic pain
  - From damage to peripheral or central neural tissues, occurs in 60-70% of patients
  - More severe than nociceptive pain
  - Carpal tunnel syndrome common in those who propel a wheelchair
Medical issues commonly seen in acute rehabilitation

- **Pressure ulcer**
  - Stages I, II, III, IV
  - Prolonged pressure over bony prominences that exceed the pressure in the capillaries of the dermis results in tissue ischemia
  - Pressure relief every 2 hours when lying down, every 30 minutes when sitting

- **Friction**
  - A shearing force that mechanically separates layers of the skin
Medical issues commonly seen in acute rehabilitation

- Pressure ulcer risk areas
Medical issues commonly seen in acute rehabilitation

• Spasticity
  • An abnormal increase in muscle tone that occurs when spinal shock resolves
  • Treat when clinically significant
    • Therapies, oral medications, botulinum toxin injections, intrathecal baclofen

• Mood
  • Depression occurs in 20-45% and usually occurs within a month
  • Anxiety and PTSD occurs in up to 20%
  • Substance abuse is frequently encountered in SCI
  • Suicide rate is approximately 5x higher and is leading cause of death in individuals with SCI in the youngest age groups
Medical issues commonly seen in acute rehabilitation

• While in rehab, Bill works with both the physiatrist and internist overseeing his care. He had borderline HTN before the accident but went home without any HTN medications
  • Often, a patient’s baseline medical issues become exacerbated during acute or rehab hospital course

• He was started on an intermittent catheterization program and self-catheterizes every 4 hours

• His bowel routine was a little rough at first due to constipation issues following surgery, but he was able to start achieve mostly continent bowel movements by the time he went home

• Nociceptive and neuropathic pain were present but mostly tolerable with medications
Return to the community
Return to the community

• Discharge planning & Discharge from rehab
  • Process is initiated before the patient is even accepted into rehab
  • Coordinated by a case manager (RN or SW)
  • Caregiver training **while in rehab**
    • They will have a more realistic outlook on the patient’s function and needs
  • Outpatient follow-up with PCP, neurosurgery, physiatry
  • As discharge approached, it was apparent that Bill would need a ramp to get into his home. A fundraiser was put on by his church and a ramp was built
  • He was measured for a custom wheelchair and it was ordered while he was in rehab –he uses a loaner until it is delivered in about a month
  • By the time of discharge, Bill could transfer to and from his wheelchair with a slide board. He could dress with the assistance of adaptive equipment and could manage his bowel and bladder by himself
  • Bill was discharged to home with his wife and kids
Return to the community

- Bill started outpatient physical and occupation therapies about a week after getting home.
- In not too long, he is able to transfer without a slide board and is discharged from therapies after a few weeks.
- He eventually gets his custom ultralight manual wheelchair.
Return to the community – Social isolation and driving

- It is important for patients to integrate back into their social circle as soon as able to combat feelings of isolation, worthlessness and over-dependence on others
  - 77 yo stroke survivor was able to make it to Opening Day, maintaining a tradition he has long kept with his sons
- A patient’s capacity to return to driving is dependent on motor, sensory, visual, and cognitive function
- Input from therapists helpful
- Vehicle adaptations
  - Spinner knobs for one-handed control of steering wheel
  - Hand control gas/brake
  - Right to left gas pedal adaptations
- Formal driving evaluation done by a therapist
- Bill quickly adapted to driving with hand controls
Return to the community – Back to work

• Negative prognostic indicators for return to work include:
  • Living alone
  • Severe functional impairment

• Positive prognostic indicators:
  • Professional support
  • Early involvement of treatment team
  • Supportive work environment

• Little to no correlation
  • Premorbid income level

• Bill worked as a foreman for a local construction company before his accident. While he could get to many of his job sites, he had a hard time adjusting to the new level of hands-off work. He eventually left the company and got a job as a heavy equipment salesman.
Return to the community – Sexuality and Reproduction

- Male
  - Erection is possible in >90% of men with complete and incomplete UMN lesions and up to 12% of men with complete LMN lesions
  - Ejaculation is less common, 5% in complete UMN lesions and 18% in complete LMN lesions
  - Decreased sperm count and decreased sperm motility
    - Sperm retrieval possible for fertility

- 59yo male with complete injury since age 9 – “it’s not like the way normal bodied people do it, but I can manage.” “Sometimes I am able to get an erection and sometimes I can’t.” “There is something intimate about just being with your partner.”
Return to the community – Sexuality and Reproduction

• Female
  • Amenorrhea occurs in 85% of women with cervical and high thoracic injuries, and 50-60% of women overall
    • 50% of cervical/high thoracic, and 90% overall have a return of menstruation within 6-12 months
  • SCI does not affect fertility – birth control needs to be addressed
  • Pregnancy can result in pressure ulcers, recurrent UTI, increased spasticity, decreased pulmonary function
  • Autonomic Dysreflexia may be the only sign of labor (Uterine innervation is from the T10-12 level)
    • Epidural anesthesia can prevent AD complications. Must remain in place for 12 hours after delivery
Complications of chronic SCI
Complications of chronic SCI

- Pulmonary – SCI can lead to alterations in lung, chest wall, and airway mechanics. C3-C5 level nerves innervate the diaphragm.
- Cardiovascular – SCI often leads to sedentary lifestyle and increased risk of cardiovascular disease
- Autonomic dysfunction
- Thermal regulation
- Calcium Metabolism and Osteoporosis
- Neurogenic bowel and bladder
  - Yearly follow-up with urology for renal US and urodynamics
- Pain
Living with Chronic SCI

• Not every story is a clean as Bill’s

• 59yo male with complete injury since age 9 when he was hit by a car on the freeway.
  • “Your life is what you make of it.”
  • “I didn’t know what I was missing.”
  • “I still wish I could ride my bike again.”
  • “You have 2 choices and I chose to live my life.”
• He reports he has lived a full (and sometimes wild) 50 years since his injury. He once went 20 years without seeing a doctor. Among other things, he hitchhiked around the country.
Living with Chronic SCI

• 45 yo male with incomplete cervical SCI due to GSW. Social stress with a fiancé with psyche issues and a 5yo daughter. State social services called on behalf patient and daughter when fiancé was soliciting Xanax on facebook.

• 35 yo female with complete lumbar SCI due to GSW. Good social support. Ongoing pain issues due to retained bullet. Saving money for a car to drive with hand controls.

• 25 yo male with incomplete lumbar SCI due to fall. Voiding and stooling normally after a time. Working on walking in therapies. Living with parents but has hopes of living independently and going back to work in the future.
Living with Chronic SCI

• 60yo male with T2 complete SCI suffered in fall from deer stand 20+ years ago. Worked in construction before eventually going on disability. Lives alone and uses a power scooter off road. Still likes to go deer hunting.

• 50yo male with C4 incomplete SCI from MVA. Worked previously as a hospital executive who traveled extensively and now is back at work as a hospital administrator where he does not need to travel. Has ongoing issues with spasticity but manages with botulinum toxin and a baclofen pump. Reluctantly getting a power scooter for longer days at the hospital.
Living with Chronic SCI

• 60yo male with incomplete cervical SCI. Back to work full time. Walks without a cane. Has some neropathic pain and spasticity that is mostly managed with oral medications. Recently played 9 holes of golf for the first time since his injury. 2 of the foursome were not aware of his injury

• 65yo male with complete C5 SCI due to a faulty airbag deployment. He is dependent for his care, chronic tracheostomy utilizing a ventilator at night. He requires 24hr care provided by his wife and a nurse. Both patient and wife are depressed.
Conclusion

• Traumatic SCI can be considered a chronic disease rather than a single event
• Early initiation of rehabilitation is key in recovery/maximization of function and regaining independence or training family for going home
• Level of function and independence varies with the level of SCI
Questions?