

## **TRAINING CASES FOR THE INTERNATIONAL SPINAL CORD INJURY ENDOCRINOLOGY AND METABOLISM BASIC DATA SET**

The 5 cases included were prepared by Drs. William A. Bauman, Fin Biering-Sørensen, and Marinela Galea. The cases were reviewed and adjusted for inconsistencies by the others in the working group for the International Spinal Cord Injury Endocrinology and Metabolism Basic Data Set, and by two external reviewers, Drs. Steven C. Kirshblum and Chester Ho, to whom we are indebted for their careful review and expert comments. If the readers find specific issues requiring clarification, or any other issues related to the International Spinal Cord Injury Endocrinology and Metabolism Basic Data Set that may be improved, please inform the working group for this Data Set.

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### **INTERNATIONAL SPINAL CORD INJURY ENDOCRINOLOGY AND METABOLISM BASIC DATA SET – TRAINING CASES CASE 1**

This previously healthy 28 years old man plummeted 1.5 meters from a ramp while training on a BMX cycle. His lower extremities were paralyzed immediately, and then a few minutes later, he lost consciousness. A C6/C7 vertebral fracture with anterior dislocation of vertebra C6 was diagnosed. An anterior and posterior fixation was performed on his first day of injury, and he was identified as having an AIS B C6 lesion.

During the acute phase of injury, he was diagnosed to have atelectasis and a pulmonary embolus, despite the daily low molecular heparin therapy and the application of thigh-high lower limb compression stockings. He learned to perform intermittent urinary bladder self-catheterization, but, due to several episodes with autonomic dysreflexia and hematuria, a suprapubic tube for bladder care was placed.

Four months after the injury, a routine blood sample revealed a serum total cholesterol = 254 mg/dL, LDL cholesterol = 183 mg/dL, HDL cholesterol = 43 mg/dL, and triglycerides = 207 mg/dL. His body mass index (BMI) remained stable at 21.6 kg/m<sup>2</sup>, and his height was 175 cm and his weight, 66 kg. He received dietary counseling and was begun on simvastatin 40 mg once daily.

At his physical examination one year after injury, on April 4, 2010, no intercurrent disease was reported; the serum lipid profile revealed a serum total cholesterol = 140 mg/dL, LDL cholesterol = 78 mg/dL, HDL cholesterol = 43 mg/dL, and triglycerides = 78 mg/dL. His BMI has remained stable.

**INTERNATIONAL SPINAL CORD INJURY ENDOCRINOLOGY & METABOLISM BASIC  
DATA SET - FORM (Version 1.0)  
CASE 1**

**Date performed: 2010/04/04**

**Endocrine & metabolic conditions diagnosed before spinal cord lesion (collected once):**

None

- |   |  |                                 |
|---|--|---------------------------------|
| <input type="checkbox"/> Diabetes mellitus    | <input type="checkbox"/> Type 1  | <input type="checkbox"/> Type 2 |
| <input type="checkbox"/> Lipid disorder       | Specify diagnosis: _____   |                                 |
| <input type="checkbox"/> Osteoporosis         | Method: <input type="checkbox"/> Routine radiograph <input type="checkbox"/> DXA <input type="checkbox"/> CT |                                 |
| <input type="checkbox"/> Thyroid disease      | Specify diagnosis: _____   |                                 |
| <input type="checkbox"/> Adrenal disease      | Specify diagnosis: _____   |                                 |
| <input type="checkbox"/> Gonadal disease      | Specify diagnosis: _____   |                                 |
| <input type="checkbox"/> Pituitary disease    | Specify diagnosis: _____   |                                 |
| <input type="checkbox"/> Other, specify _____ |  |                                 |
| <input type="checkbox"/> Unknown              |  |                                 |

If information was obtained other than from the medical record, please specify source:

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**Endocrine & metabolic conditions diagnosed after the spinal cord lesion within the last year:**

None

- |  |  |                                 |
|--|--|---------------------------------|
| <input type="checkbox"/> Diabetes mellitus         | <input type="checkbox"/> Type 1  | <input type="checkbox"/> Type 2 |
| <input checked="" type="checkbox"/> Lipid disorder | Specify diagnosis: <u>increased blood lipid values</u>   |                                 |
| <input type="checkbox"/> Osteoporosis              | Method: <input type="checkbox"/> Routine radiograph <input type="checkbox"/> DXA <input type="checkbox"/> CT |                                 |
| <input type="checkbox"/> Thyroid disease           | Specify diagnosis: _____   |                                 |
| <input type="checkbox"/> Adrenal disease           | Specify diagnosis: _____   |                                 |
| <input type="checkbox"/> Gonadal disease           | Specify diagnosis: _____   |                                 |
| <input type="checkbox"/> Pituitary disease         | Specify diagnosis: _____   |                                 |
| <input type="checkbox"/> Other, specify _____      |  |                                 |
| <input type="checkbox"/> Unknown                   |  |                                 |

If information was obtained other than from the medical record, please specify source:

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**Gonadal status (check appropriate stage):**

Male:  Prepubertal  Pubertal  Adult

Female:  Prepubertal  Pubertal  Adult  Menopausal  Postmenopausal

**Body mass index:**

Height (or length) 1.75 m      Weight 66 kg      BMI: 21.6 kg/m<sup>2</sup>

**Serum lipid profile within the last year:**

During anti-lipid therapy:  Yes  No

Total cholesterol (TC) 140 mg/dL      Triglycerides 126 mg/dL

HDL cholesterol 43 mg/dL      LDL cholesterol 78 mg/dL

(TC, HDL or LDL cholesterol: mmol/L x 39 = mg/dL; Triglycerides: mmol/L x 89 = mg/dL)

**INTERNATIONAL SPINAL CORD INJURY ENDOCRINOLOGY & METABOLISM BASIC  
DATA SET – TRAINING CASES  
CASE 2**

This 18 years old man sustained a T5 compression fracture which was treated conservatively after a motor vehicle accident. Before injury, he reported that he had never consulted a physician or visited a medical facility for any health-related problem. Thirty-three years ago, after initial discharge from the first inpatient rehabilitation, he was classified as having AIS A T5 paraplegia. His bladder management was by suprapubic tapping, which, after 16 years, he switched to intermittent self-catheterization.

After discharge, he became involved in sports for the disabled, and he competed at an elite level in several disciplines. During a wheelchair-rugby match three years ago, he fractured his left femur and an X-ray, in addition, showed severe osteoporosis of the lower limb.

Over the ensuing years, he had several inpatient hospitalizations for pressure ulcers that required surgical closure and flap surgery.

At the age of 49, he was diagnosed with diabetes mellitus type 2. Metformin and glimepirid were initiated with his glycemia well-controlled. A few months later, elevated values of serum LDL cholesterol were noted. simvastatin was begun.

On his last visit to the clinic, at March 10, 2010, no further issues related to his health were noted. His height was 179 cm and his weight 85 kg. His serum lipid profile revealed the serum total cholesterol = 256 mg/dL, LDL cholesterol = 82 mg/dL, HDL cholesterol = 43 mg/dL, and triglycerides = 134 mg/dL, all values within the acceptable range.

**INTERNATIONAL SPINAL CORD INJURY ENDOCRINOLOGY & METABOLISM BASIC  
DATA SET - FORM (Version 1.0)  
CASE 2**

**Date performed: 2010/03/10**

**Endocrine & metabolic conditions diagnosed before spinal cord lesion (collected once):**

None

Diabetes mellitus

Type 1    Type 2

Lipid disorder

Specify diagnosis: \_\_\_\_\_

Osteoporosis

Method:  Routine radiograph    DXA    CT

Thyroid disease

Specify diagnosis: \_\_\_\_\_

Adrenal disease

Specify diagnosis: \_\_\_\_\_

Gonadal disease

Specify diagnosis: \_\_\_\_\_

Pituitary disease

Specify diagnosis: \_\_\_\_\_

Other, specify \_\_\_\_\_

Unknown

If information was obtained other than from the medical record, please specify source:

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**Endocrine & metabolic conditions diagnosed after the spinal cord lesion within the last year:**

None

Diabetes mellitus

Type 1    Type 2

Lipid disorder

Specify diagnosis: increased blood lipid values

Osteoporosis

Method:  Routine radiograph    DXA    CT

Thyroid disease

Specify diagnosis: \_\_\_\_\_

Adrenal disease

Specify diagnosis: \_\_\_\_\_

Gonadal disease

Specify diagnosis: \_\_\_\_\_

Pituitary disease

Specify diagnosis: \_\_\_\_\_

Other, specify \_\_\_\_\_

Unknown

If information was obtained other than from the medical record, please specify source:

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**Gonadal status (check appropriate stage):**

Male:       Prepubertal    Pubertal    Adult

Female:     Prepubertal    Pubertal    Adult    Menopausal    Postmenopausal

**Body mass index:**

Height (or length) 1.79 m

Weight 85 kg

BMI: 26.5 kg/m<sup>2</sup>

**Serum lipid profile within the last year:**

During anti-lipid therapy:  Yes    No

Total cholesterol (TC) 156 mg/dL   Triglycerides   134 mg/dL

HDL cholesterol      43 mg/dL   LDL cholesterol 82 mg/dL

(TC, HDL or LDL cholesterol: mmol/L x 39 = mg/dL; Triglycerides: mmol/L x 89 = mg/dL)

**INTERNATIONAL SPINAL CORD INJURY ENDOCRINOLOGY & METABOLISM BASIC  
DATA SET – TRAINING CASES  
CASE 3**

This 58 year old gentleman was active and in excellent health until the age of 34, when he fell from a tree and sustained a dislocation and fracture of C5-6 vertebral bodies, associated with loss of consciousness. In his acute management, the patient underwent tracheostomy and anterior cervical fusion. The patient was diagnosed with C5 tetraplegia and ASIA Impairment Scale grade A. He underwent rehabilitation and was discharged home to the care of his wife. His medical course over the ensuing years was complicated by the development of pressure ulcers, urinary tract infections, seizure disorder, and heterotopic ossification of both hips. In 2008 the patient was noted to have hypertriglyceridemia (total cholesterol=202 mg/dL, triglycerides 265 mg/dL, HDL cholesterol 35 mg/dL, and LDL cholesterol 114/mg/dL). He was initially placed on a low fat diet , then started on fish oil 1000 mg PO daily, and was eventually prescribed gemfibrozil 600mg PO BID. On February 19, 2010, the date of his last office visit, his lipid profile revealed a total cholesterol = 186 mg/dL, triglycerides = 153 mg/dL, HDL cholesterol = 43 mg/dL, and LDL cholesterol = 112 mg/dL. His height was 173 cm and weight, 74.8 kg.

At the age 43 (e.g., 9 years after injury), the patient underwent a screening CT scan of lumbar spine, which demonstrated osteopenia. On a DXA scan of the total hip, the bone mineral density was 0.720 with a T-score of -2.6 and a Z-score of -3.4. He was placed on vitamin D supplementation (500 units daily) and a daily multivitamin. Three years later, he had a follow-up DXA scan that revealed osteoporosis of the total left hip and normal BMD of the lumbar spine on a standard AP DXA projection. The patient was started on alendronate 70 mg once a week and calcium carbonate 1300 mg 3 times a day, and vitamin D supplementation was increased from 500 to 1000 IU a day.

In October 2009, the patient had a follow-up DEXA scan which revealed significant improvement to the hip since his previous DXA study, with a 15% increase in total hip BMD. The patient remains on therapy for osteoporosis.

**INTERNATIONAL SPINAL CORD INJURY ENDOCRINOLOGY & METABOLISM BASIC  
DATA SET - FORM (Version 1.0) – Case 3**

**Date performed:** 2010/02/19

**Endocrine & metabolic conditions diagnosed before spinal cord lesion (collected once):**

None

- Diabetes mellitus       Type 1     Type 2  
 Lipid disorder      Specify diagnosis: \_\_\_\_\_  
 Osteoporosis      Method:  Routine radiograph     DXA     CT  
 Thyroid disease      Specify diagnosis: \_\_\_\_\_  
 Adrenal disease      Specify diagnosis: \_\_\_\_\_  
 Gonadal disease      Specify diagnosis: \_\_\_\_\_  
 Pituitary disease      Specify diagnosis: \_\_\_\_\_  
 Other, specify \_\_\_\_\_  
 Unknown

If information was obtained other than from the medical record, please specify source:

**Endocrine & metabolic conditions diagnosed after the spinal cord lesion within the last year:**

- None  
 Diabetes mellitus       Type 1     Type 2  
 Lipid disorder      Specify diagnosis: hypertriglyceridemia  
 Osteoporosis      Method:  Routine radiograph     DXA     CT  
 Thyroid disease      Specify diagnosis: \_\_\_\_\_  
 Adrenal disease      Specify diagnosis: \_\_\_\_\_  
 Gonadal disease      Specify diagnosis: \_\_\_\_\_  
 Pituitary disease      Specify diagnosis: \_\_\_\_\_  
 Other, specify \_\_\_\_\_  
 Unknown

If information was obtained other than from the medical record, please specify source:

**Gonadal status (check appropriate stage):**

Male:       Prepubertal     Pubertal     Adult  
Female:     Prepubertal     Pubertal     Adult     Menopausal     Postmenopausal

**Body mass index:**

Height (or length) 1.73 m      Weight 74.8 kg      BMI: 25.0 kg/m<sup>2</sup>

**Fasting serum lipid profile within the last year:**

During anti-lipid therapy:  Yes     No

Total cholesterol (TC) 186 mg/dL      Triglycerides (TG) 153 mg/dL

HDL cholesterol      43 mg/dL      LDL cholesterol      112 mg/dL

(TC, HDL or LDL cholesterol: mmol/L x 39 = mg/dL; TG: mmol/L x 89 = mg/dL)

**INTERNATIONAL SPINAL CORD INJURY ENDOCRINOLOGY & METABOLISM BASIC  
DATA SET – TRAINING CASES  
CASE 4**

This 73 years old male veteran sustained gunshot wound in April 1968 at 31 years of age, resulting in T12 paraplegia with ASIA Impairment Scale grade A. Prior to the injury the patient was active, not a smoker, and had fathered two children. He was initially admitted to a private rehabilitation center for acute rehabilitation, with subsequent discharge to the community. The patient is independent in activities of daily living, able to perform his own bowel care, and has an indwelling Foley catheter for bladder drainage. At the age 59 years, a random serum testosterone level was obtained during urological evaluation for complaints of erectile dysfunction and was found to be at the lower limit of normal (330 ng/dL).

Over the next several decades, the patient developed multiple co-morbidities, including diabetes mellitus type II, osteoporosis, hypertension, chronic renal insufficiency, and bilateral rotator cuff tears. In 2000, the patient developed combined hyperlipidemia (total cholesterol 255 mg/dL, triglycerides 223 mg/dL, HDL cholesterol 43 mg/dL and LDL cholesterol 167/mg/dL). The patient was initially placed on a low cholesterol diet, then started on simvastatin 10 mg at bedtime and gemfibrozil 600mg twice a day. On August 12, 2010, the date of his last office visit, the lipid profile revealed total cholesterol 127 mg/dL, LDL cholesterol = 71/mg/dL, HDL cholesterol = 33 mg/dL, and triglycerides = 111 mg/dL. His height was 180 cm, and weight, 111.4 kg.

He remains independent in his activities of daily living. However, he requires moderate assistance with transfers.

In July 2009, the patient developed an acute fracture of the proximal tibia and was hospitalized for stabilization. A DEXA scan of the total hip was obtained, which revealed a BMD = 0.611 gm/cm<sup>2</sup> and a T score = -3.4 and a Z score = -2.5. In October 2009, the patient received zoledronic acid 4 mg intravenously. As part of endocrine work up for osteoporosis, a serum testosterone level was obtained and found to be low (196 ng/dL). The LH level was 6.79 mIU/mL, and the serum PSA level was 1.36 ng/mL. Reportedly, by choice, the patient had not been sexually active for many years. A diagnosis of hypothalamic hypogonadism was presumptively made and testosterone replacement was recommended, in part, with the expectation to prevent more rapid deterioration in bone mass and strength. In October 2010, the patient was started on testosterone replacement therapy (testosterone patch 2.5mg daily). Despite self reported increased energy level, a repeat serum testosterone level in June 2010 remained low (188 ng/dL). No significant side effects have been reported to date. The serum PSA level remained within the normal range at 1.76 ng/mL.

**INTERNATIONAL SPINAL CORD INJURY ENDOCRINOLOGY & METABOLISM BASIC  
DATA SET - FORM (Version 1.0) – Case 4**

**Date performed:** 2010/08/12

**Endocrine & metabolic conditions diagnosed before spinal cord lesion (collected once):**

None

- Diabetes mellitus       Type 1     Type 2  
 Lipid disorder      Specify diagnosis: \_\_\_\_\_  
 Osteoporosis      Method:  Routine radiograph     DXA     CT  
 Thyroid disease      Specify diagnosis: \_\_\_\_\_  
 Adrenal disease      Specify diagnosis: \_\_\_\_\_  
 Gonadal disease      Specify diagnosis: \_\_\_\_\_  
 Pituitary disease      Specify diagnosis: \_\_\_\_\_  
 Other, specify \_\_\_\_\_  
 Unknown

If information was obtained other than from the medical record, please specify source:

**Endocrine & metabolic conditions diagnosed after the spinal cord lesion within the last year:**

None

- Diabetes mellitus       Type 1     Type 2  
 Lipid disorder      Specify diagnosis: hypercholesterolemia  
 Osteoporosis      Method:  Routine radiograph     DXA     CT  
 Thyroid disease      Specify diagnosis: \_\_\_\_\_  
 Adrenal disease      Specify diagnosis: \_\_\_\_\_  
 Gonadal disease      Specify diagnosis: hypothalamic hypogonadism  
 Pituitary disease      Specify diagnosis: \_\_\_\_\_  
 Other, specify \_\_\_\_\_  
 Unknown

If information was obtained other than from the medical record, please specify source:

**Gonadal status (check appropriate stage):**

Male:       Prepubertal     Pubertal     Adult  
Female:     Prepubertal     Pubertal     Adult     Menopausal     Postmenopausal

**Body mass index:**

Height (or length) 1.80 m      Weight 111.4 kg      BMI: 34.4 kg/m<sup>2</sup>

**Fasting serum lipid profile within the last year:**

During anti-lipid therapy:  Yes     No

Total cholesterol (TC) 127 mg/dL      Triglycerides (TG) 111 mg/dL

HDL cholesterol      33 mg/dL      LDL cholesterol      72 mg/dL

(TC, HDL or LDL cholesterol: mmol/L x 39 = mg/dL; TG: mmol/L x 89 = mg/dL)



**INTERNATIONAL SPINAL CORD INJURY ENDOCRINOLOGY & METABOLISM BASIC  
DATA SET – TRAINING CASES  
CASE 5**

This 80 years old woman fell on the stairs at home and sustained a C5-6 fracture dislocation, which, within the first day of injury, was surgically managed and she was mobilized the day after surgery in a chair. Her neurological injury was identified as a C5 ASIA Impairment Scale D lesion. Prior to her injury she had hypertension, hypercholesterolemia, hyperthyroidism, and diabetes mellitus type 2. She had been receiving oral pharmacological treatment for all these disorders for several years. Furthermore, several years before spinal cord injury, she had X-ray documentation of osteoporotic fracture of the thoracic spine, which was treated conservatively with analgesics and immediate mobilization.

At discharge, she was able to walk short distances indoors with a walker; otherwise, she used a power wheelchair for mobility. A suprapubic tube had been placed for bladder management, and her bowel evacuations were performed using a klyisma once daily. She continued with her pre-injury medications, and was started on baclofen 5mg thrice daily for mild spasticity.

At her follow-up consultation May 12, 2012, she continued with her prescribed oral medications, and her medical conditions were found to be well managed. As a new medical issue, she began to experience symptoms suggestive of sleep apnea and was sent for overnight monitoring at a sleep-center. Her blood lipid values revealed total cholesterol = 125 mg/dL, LDL cholesterol = 70 mg/dL, triglycerides = 112 mg/dL, and HDL cholesterol = 31 mg/dL. Her height was 1.67 m and weight, 52.4 kg.

**INTERNATIONAL SPINAL CORD INJURY ENDOCRINOLOGY & METABOLISM BASIC  
DATA SET - FORM (Version 1.0) – Case 5**

**Date performed:** 2012/05/12

**Endocrine & metabolic conditions diagnosed before spinal cord lesion (collected once):**

- None
- Diabetes mellitus       Type 1     Type 2
- Lipid disorder      Specify diagnosis:   hypercholesterolemia
- Osteoporosis      Method:  Routine radiograph     DXA     CT
- Thyroid disease      Specify diagnosis:   hyperthyroidism
- Adrenal disease      Specify diagnosis: \_\_\_\_\_
- Gonadal disease      Specify diagnosis: \_\_\_\_\_
- Pituitary disease      Specify diagnosis: \_\_\_\_\_
- Other, specify \_\_\_\_\_
- Unknown

If information was obtained other than from the medical record, please specify source:

\_\_\_\_\_

**Endocrine & metabolic conditions diagnosed after the spinal cord lesion within the last year:**

- None
- Diabetes mellitus       Type 1     Type 2
- Lipid disorder      Specify diagnosis: hypercholesterolemia
- Osteoporosis      Method:  Routine radiograph     DXA     CT
- Thyroid disease      Specify diagnosis: \_\_\_\_\_
- Adrenal disease      Specify diagnosis: \_\_\_\_\_
- Gonadal disease      Specify diagnosis: \_\_\_\_\_
- Pituitary disease      Specify diagnosis: \_\_\_\_\_
- Other, specify \_\_\_\_\_
- Unknown

If information was obtained other than from the medical record, please specify source:

\_\_\_\_\_

**Gonadal status (check appropriate stage):**

Male:       Prepubertal     Pubertal     Adult

Female:     Prepubertal     Pubertal     Adult     Menopausal     Postmenopausal

**Body mass index:**

Height (or length)   1.67   m      Weight   52.4   kg      BMI:   18.8   kg/m<sup>2</sup>

**Fasting serum lipid profile within the last year:**

During anti-lipid therapy:  Yes     No

Total cholesterol (TC)   125   mg/dL      Triglycerides (TG)   112   mg/dL

HDL cholesterol        31   mg/dL      LDL cholesterol        70   mg/dL

(TC, HDL or LDL cholesterol: mmol/L x 39 = mg/dL; TG: mmol/L x 89 = mg/dL)