

An anatomical illustration of the human cauda equina, showing the lower lumbar and sacral vertebrae, the spinal cord, and the bundle of nerve roots. The illustration is rendered in various shades of grey, with the nerve roots appearing as a dense, fan-like structure at the bottom. The text is overlaid on this illustration.

# **Multi Shades of Grey**

## **Cauda Equina Syndrome**

**Authors: Laura Finucane, Sue Greenhalgh, Chris Mercer**

# Multi shades of grey

## Cauda Equina Syndrome

**What time did you see Mrs X. as time scales are unclear?**

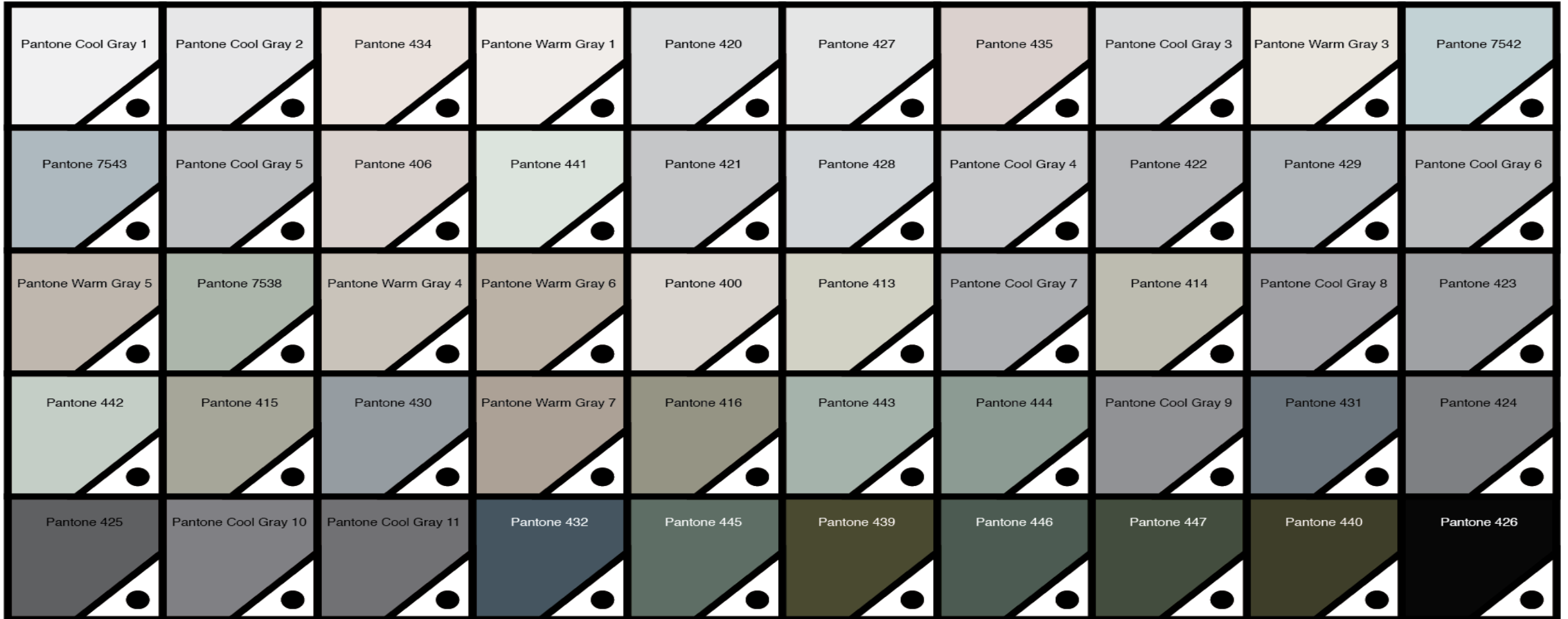
**How long had the patient had pain down both legs as some of the documentation is illegible?**

**This patient should have been sent for an urgent MRI and surgical opinion that day. Please comment**

**Your notes suggest you gave 'advice'. What advice exactly did you give to Mrs X'**

# Multi shades of grey

## Cauda Equina Syndrome



# **MULTI-SHADES OF GREY**

- **Rare**
- **Devastating consequences**
- **Serious medico legal implications**
- **Patients self report symptoms of bladder and bowel dysfunction that are NOT related to CES**



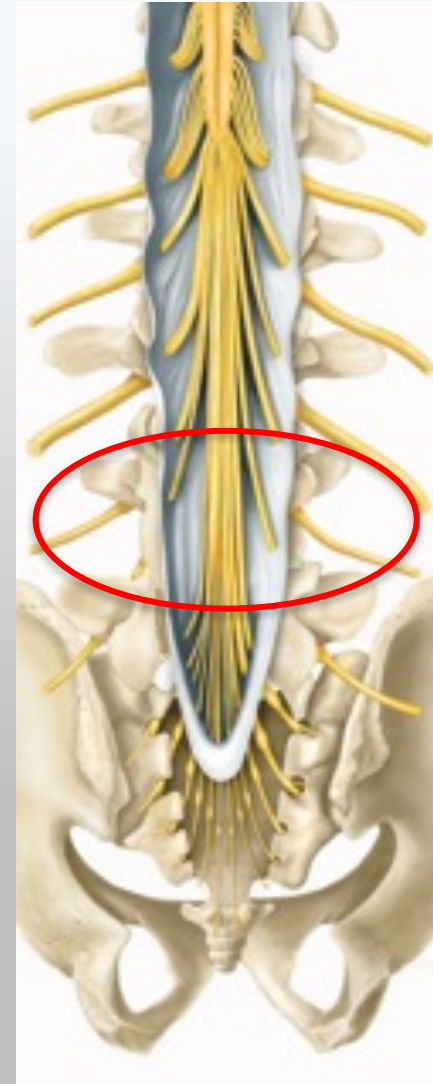
***How much black and  
white is there ?***

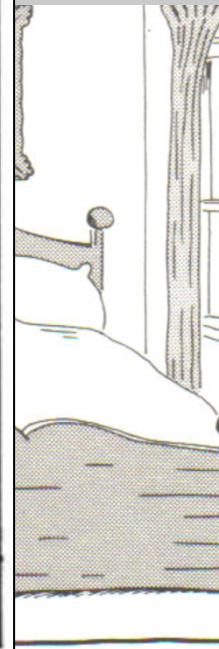
# Definition

‘A patient presenting with acute back pain and/or leg pain with a suggestion of a disturbance of their bladder or bowel function and/or saddle sensory disturbance should be suspected of having a CES.’

(BASS 2015)

# Anatomy





"Well, here we are, my little chickadee."



# Catastrophic Pain



# Catastrophic Pain



# Cauda Equina Syndrome Groups

(Todd & Dickson, 2016)

<b>CESS</b> suspected	Bilateral radicular pain (progressing unilateral)
<b>CESI</b> incomplete	Urinary difficulties of neurogenic origin, altered urinary sensation, loss of desire to void, poor urinary stream, need to strain to micturate
<b>CESR</b> retention	Painless urinary retention and overflow incontinence
<b>CESC</b> complete	Loss of all CE function, absent perineal sensation, patulous anus, paralysed insensate bladder and bowel

**'The probability of a CES patient deteriorating, with what speed and to what level is not predictable**

# Litigation

- MDU 2016 (Taylor)
  - 150 claims from 2005-16
  - 92% against GPs 70% defended
  - 8 million paid out 12% of claims over 500K
- NHSLA 2016
  - 293 claims for CES 2010-15
  - 70% 31-50 y/o
  - 25 million paid out
- Fairbank 2014
  - 30-40 cases per year go to litigation
  - Average compensation 336,000
  - 1000 operations per annum for CES

**Chartered Society of Physiotherapy**  
**Notable Bessemerick CBE HCSP HBA FC**  
 British Association of Spinal Surgeons, Chartered Society of Physiotherapy

## ARE SELF-EMPLOYED MUSCULOSKELETAL PHYSIOTHERAPISTS MIS-DIAGNOSING CAUDA EQUINA SYNDROME?

A retrospective study of clinical negligence claims in the UK

**Purpose**  
 The aim of this study was to determine whether self-employed musculoskeletal physiotherapists (SEMPs) were more likely to misdiagnose cauda equina syndrome (CES) than employed physiotherapists (EMP). The study also aimed to identify factors associated with misdiagnosis of CES.

**Methods**  
 A retrospective analysis of 100 clinical negligence claims involving SEMP and EMP physiotherapists was conducted. Data were collected from 2000 to 2010. The study included demographic information, clinical history, and management of the patients.

**Results**  
 The study identified 100 claims involving 100 patients. 50% of the claims were made by SEMP and 50% by EMP. The most common symptoms reported were lower limb weakness, sensory deficits, and bladder/bowel dysfunction. The majority of patients were referred to hospital for further investigation and surgery.

**Conclusions**  
 The study found that SEMP were more likely to misdiagnose CES than EMP. This may be due to a variety of factors, including limited access to specialist services and a lack of experience in managing complex spinal conditions.

**Implications**  
 The findings of this study have implications for the management of CES. It highlights the need for improved training and supervision of SEMP, and the importance of early referral to specialist services.



**Evaluation of patient outcomes following referral from a primary-care musculoskeletal service to Accident and Emergency for suspected cauda equina syndrome.**

**Southern Health NHS Foundation Trust**

**1. Introduction**  
 Cauda equina syndrome (CES) is a rare but serious condition that requires urgent diagnosis and treatment. The aim of this study was to evaluate the outcomes of patients referred to Accident and Emergency (A&E) for suspected CES following referral from a primary-care musculoskeletal service.

**2. Objectives**  
 The objectives of this study were to:  
 1. Determine the prevalence of CES in patients referred to A&E from a primary-care musculoskeletal service.  
 2. Evaluate the time taken to diagnose CES in these patients.  
 3. Assess the clinical outcomes of patients with CES who were referred to A&E from a primary-care musculoskeletal service.

**3. Methods**  
 A retrospective analysis of 100 patients referred to A&E for suspected CES was conducted. Data were collected from 2000 to 2010. The study included demographic information, clinical history, and management of the patients.

**4. Results**  
 The study identified 100 patients referred to A&E for suspected CES. The majority of patients were referred from a primary-care musculoskeletal service. The most common symptoms reported were lower limb weakness, sensory deficits, and bladder/bowel dysfunction. The majority of patients were diagnosed with CES and underwent surgery.

**5. Conclusions**  
 The study found that the majority of patients referred to A&E for suspected CES were referred from a primary-care musculoskeletal service. This highlights the importance of early referral to specialist services for suspected CES.

**6. Implications for practice**  
 The findings of this study have implications for the management of CES. It highlights the need for improved training and supervision of primary-care musculoskeletal services, and the importance of early referral to specialist services.

# Quraishi et al (2012)

## European Spine Journal

- NHSLA data for all spinal disease 2002-10
- 235 cases-144 trauma/acute
- Missed fractures 41%
- Missed CES 24%
- Missed infection 12%
- Cord damage 20%

# Quraishi et al (2012)

## European Spine Journal

- NHSLA data for all spinal disease 2002-10
- 235 cases-144 trauma/acute
- Missed fractures 41% **75000**
- Missed CES 24% **268,000**
- Missed infection 12% **433,000**
- Cord damage 20% **367,000**

# Daniels et al (2012)

- Review of 15 US court cases for CES and features of successful litigation
- Timing to surgery >48 hours
- Bladder and bowel symptoms at presentation
- Sexual dysfunction at presentation
- Time to appointment
- Time to imaging
- Setting for appointment



# Daniels et al (2012)

- Review of US court cases for CES and features of successful litigation
- **Timing to surgery**
- Bladder and bowel symptoms at presentation
- Sexual dysfunction at presentation
- Time to appointment
- Time to imaging
- Setting for appointment

**NONE HAD DRE PERFORMED**

# A Qualitative Investigation into Patients Experience of Cauda Equina Syndrome

*Greenhalgh S, Truman C, Webster V, Selfe J (2015)  
Physiotherapy Research Foundation (PRF) Grant*



## **Aim**

To identify how CES symptoms may be effectively shared between patients and clinician

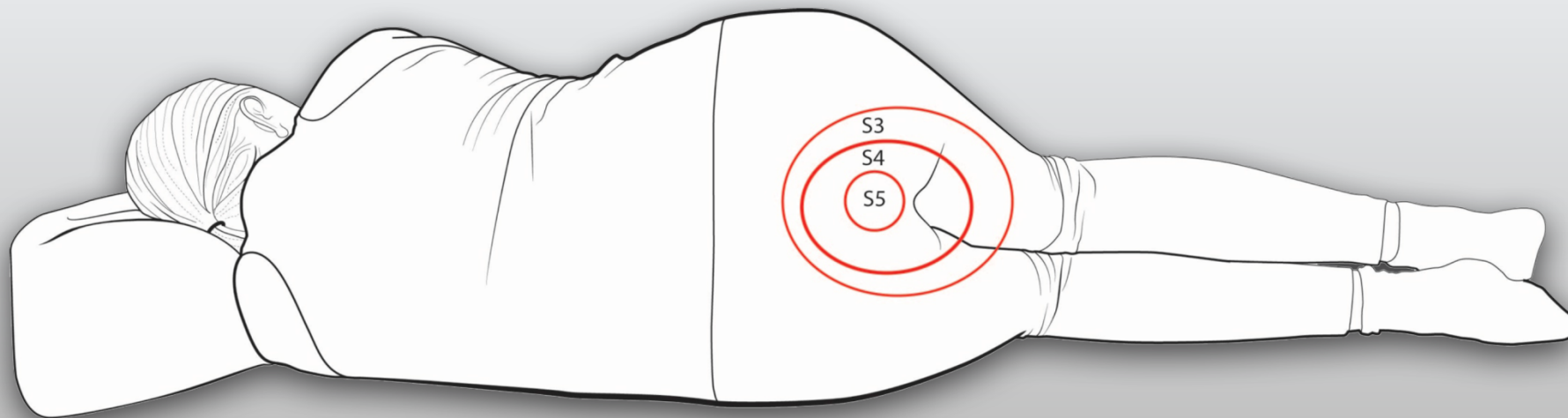
## **Objectives**

Drawing upon patient experience of signs and symptoms associated with CES including changes in bladder, bowel and sexual function

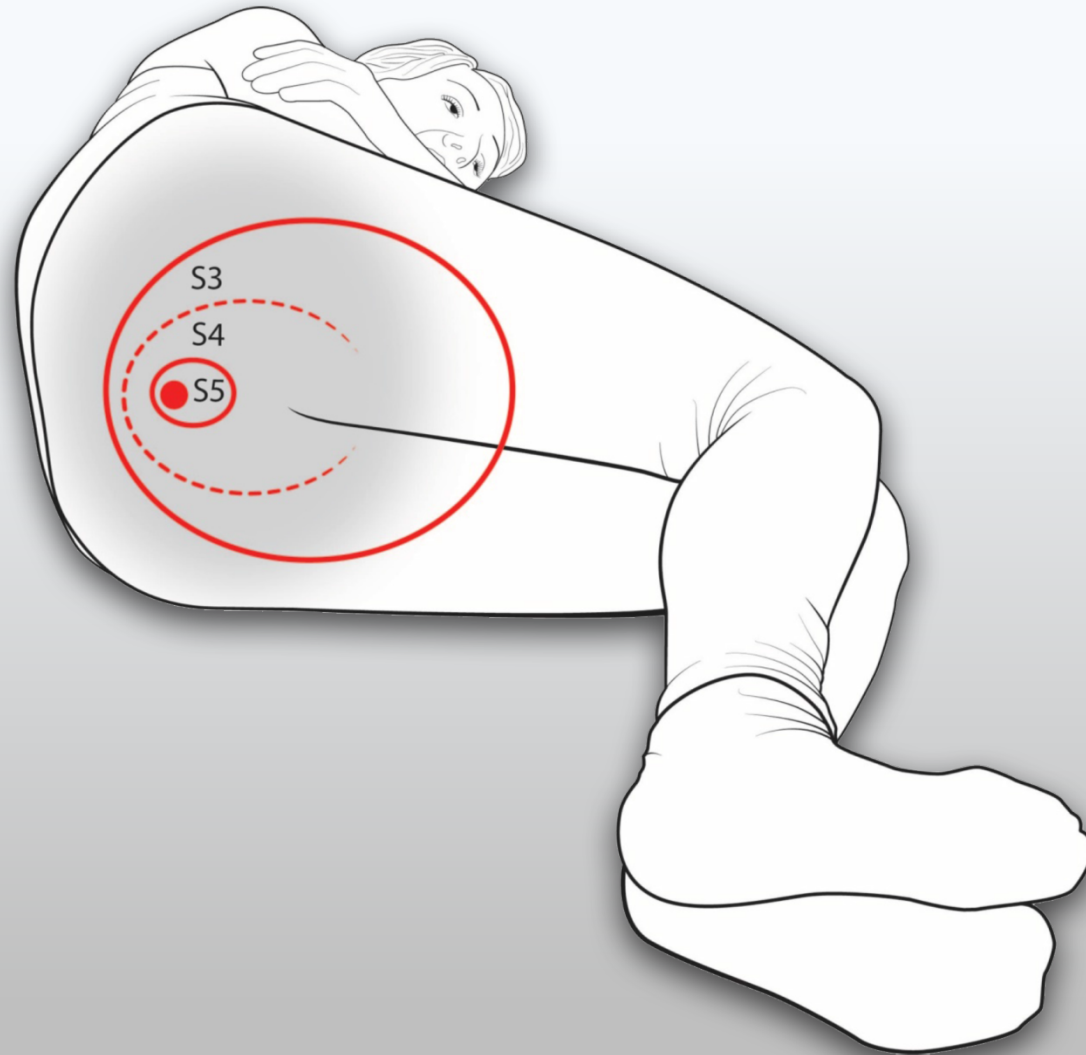
- what symptoms patients actually suffer
- patients own reasoning of these symptoms
- the patient experience of divulging this information

# What can we learn from our patients?

Dermatomes S3,4,5



# Dermatomes S3,4,5



# Themes

- Catastrophic Pain
- Impact on Life
- Common Symptoms / Varying Chronology
- Sense of change / Seriousness
- Contact with Health Professionals
- Carers Experience
- Suggestions to aid early diagnosis



# Catastrophic Pain

- *'.... The woman who was doing the MRI said oh gosh. I was all screaming and hyperventilating and she said are you ok, are you claustrophobic? I said I'm in bloody agony-Strong pain, pain in whole pelvis, real agony'*
- *'I don't think his questions weren't clear, I think that it was impossible to concentrate on anything other than pain management'.*

## Common Symptoms / Varying Chronology

*'.....It was like you could not tell where your feet were in space' 'I was sort of losing control... my legs weren't working properly like they were made of rubber.' 'it was as if I had been riding a horse for a week or something and obviously that was to do with the saddle numbness.'*

*'The first thing to go was my bladder function'*

# Sense of change / Seriousness

*'I had no comprehension that this could have permanently affected my mobility and my life...through all of this and through all the pain, and through all the people that; the ambulances, the GP I'd seen at night, it was only when the Consultant said to me just before the surgery you're within the forty eight hour window so your prospects are quite good. I didn't appreciate there was anything but all they had to do was take this pain away'*

***N.B Importance of safety netting those at risk***



# Contact with Health Professionals


*Usually already under health professionals care*

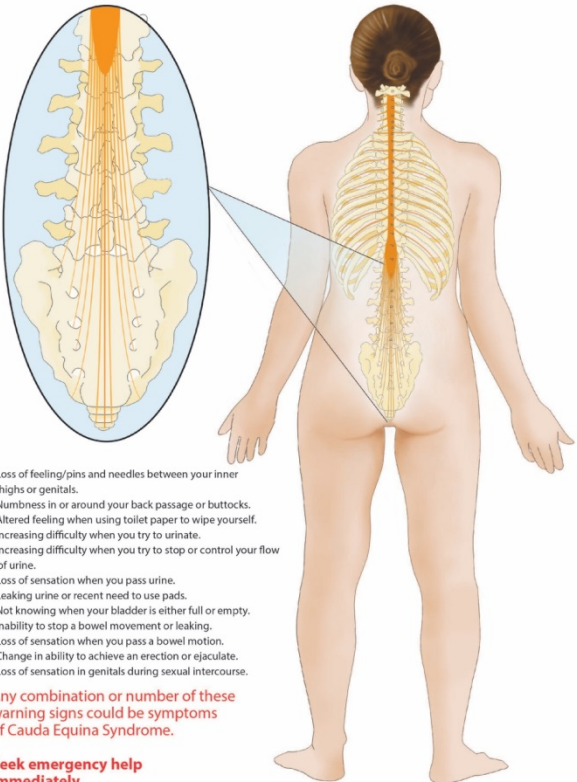
*They really do need to listen to you and they need to listen to your individual circumstances.*

*"If I had been told numbness around back passage or genitals...everyone I saw who was medically trained called it saddle numbness"*

*No clear safety net advice*

# Suggestions to aid early diagnosis

 Cauda Equina Syndrome Warning Signs




- Loss of feeling/pins and needles between your inner thighs or genitals.
- Numbness in or around your back passage or buttocks.
- Altered feeling when using toilet paper to wipe yourself.
- Increasing difficulty when you try to urinate.
- Increasing difficulty when you try to stop or control your flow of urine.
- Loss of sensation when you pass urine.
- Leaking urine or recent need to use pads.
- Not knowing when your bladder is either full or empty.
- Inability to stop a bowel movement or leaking.
- Loss of sensation when you pass a bowel motion.
- Change in ability to achieve an erection or ejaculate.
- Loss of sensation in genitals during sexual intercourse.

Any combination or number of these warning signs could be symptoms of Cauda Equina Syndrome.

**Seek emergency help immediately**

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- Loss of sensation in genitals during sexual intercourse

**Any combination seek help immediately**

*Safety netting is key  
Pain is easier to communicate!*

# Safety Netting



# Safety Netting



# Multi Shades of Grey

Significantly more patients are referred on for further investigation compared with those having a radiologically confirmed diagnosis of CES

(90% negative 10% positive for CES)

Bladder and bowel dysfunction, saddle anaesthesia and sexual dysfunction are all multifactorial in their causes e.g.

Comorbidities, medication, pain

(Woods et al, 2015)



# Multi Shades of Grey

## Urinary symptoms

Cause	Men	Women	Both
Obstructive	Benign prostatic hyperplasia, meatal stenosis, paraphimosis, penile constricting bands, phimosis, prostate cancer	Organ prolapse (cystocele, rectocele, uterine prolapse); pelvis mass (gynaecological malignancy, uterine fibroid, ovarian cyst); retroverted impacted gravid uterus	Aneurysmal dilation; bladder calculi; bladder neoplasm; faecal impaction; gastrointestinal or retroperitoneal malignancy/mass; urethral strictures, foreign bodies, stones, edema
Infectious or inflammatory	Balanitis, prostatic abscess, prostatitis	Acute vulvovaginitis; vaginal lichen planus; vaginal lichen sclerosis; vaginal pemphigus	Bilharziasis; cystitis; echinococcosis; Guillain-Barre syndrome; herpes simplex virus; Lyme disease; periurethral abscess; transverse myelitis; tubercular cystitis; urethritis; varicella zoster virus
Other	Penile trauma, fracture, laceration	Postpartum complication; urethral sphincter dysfunction (Fowler's syndrome)	Disruption of posterior urethra and bladder neck in pelvic trauma; postoperative complication; psychogenic

# Multiple Shades of Grey

## Saddle sensory changes

Lesion type	Causes
Autonomic or peripheral nervous system	Autonomic neuropathy; Guillian-Barre Syndrome, herpes zoster virus; Lyme disease; pernicious anaemia; poliomyelitis; radical pelvis surgery; spinal cord trauma; tabes dorsalis
Brain	Cerebrovascular disease; concussion; neoplasm or tumour; normal pressure hydrocephalus; Parkinson's disease, Shy-Drager Syndrome
Spinal cord	Dysraphic lesions; intervertebral disc disease; meningomyelocele; multiple sclerosis; spina bifida occulta; spinal cord hematoma or abscess; spinal cord trauma; spinal stenosis; spinovascular disease; transverse myelitis tumours or masses of conus medullaris or cauda equina

# Multiple Shades of Grey; medication

- Many medications can cause or exacerbate urinary retention, incontinence and sexual dysfunction.





# Multi Shades of Grey; medication

- Cholinergic and anticholinergic drugs have an influence on the parasympathetic nervous system;

*Cholinergic; voiding of urine*

*Anticholinergic; retention of urine*

*(MTUI et al 2016)*

# Medications that cause urinary retention

- NSAIDS (x2 more likely in men)
- Opioids
- Calcium channel blockers
- Alpha-adrenergic antagonists
- Sedative-hypnotics
- Antipsychotics
- Antiparkinsonian agents

# Pharmacology causes of Sexual Dysfunction

<b>Class</b>	<b>Drug</b>
<b>Hypnotics</b>	Benzodiazepines
<b>Antihypertensive</b>	Beta blockers
<b>Antidepressants</b>	Tricyclic antidepressants; Selective serotonin reuptake inhibitors e.g. fluoxetine; Monoamine oxidase inhibitors; Viloxazine and L-tryptophan; Nefazodone; Venlafaxine; Reboxetine; Mirtazepine; Trazodone; Duloxetine
<b>Diuretics</b>	Bendroflurazide,
<b>Anti-epileptics</b>	Carbamazepine; Phenytoin; Sodium valproate
<b>Antipsychotics</b>	Thioridazine; aliphatic phenothiazines e.g. chlorpromazine, sulprides atypical antipsychotic risperidone
<b>Prostate medications</b>	Finasteride (BPH); Anti androgens e.g. cyproterone acetate, flutamide (Prostate Cancer); Gonadotrophin releasing hormone analogues e.g. goserelin, leuprorelin (Prostate Cancer)
<b>Anti-parkinsonian drugs</b>	L-dopa
<b>Recreational drugs</b>	Psychostimulants, Amphetamine, Ecstasy, Crystal methamphetamine, Alcohol, Anabolic steroids, cannabis, Opiates (Heroin, Methadone, Buprenorphine), Poppers, Tobacco

# Multi Shades of Grey; medication

- Amphetamines,
- decongestants,
- over the counter cold remedies (esp in men with enlarged prostate)
- Recreational drugs e.g Ecstasy

# Multi Shades of Grey; medication

- **Opioid Salts;** constipation, retention, reduced gastric motility, reduced bladder sensation  
(e.g. Tramadol, Codeine)
- **Anticonvulsants** (Cholinergic); urinary incontinence  
(e.g. Gabapentin, Pregabalin)
- **Antidepressants** (Anticholinergic); retention, sexual dysfunction (e.g. Amitriptyline, Nortriptyline)  
***Antidepressants can decrease awareness of needing to pass urine***
- **NSAIDS;** Retention

# Physical Assessment

- If CES is suspected a careful objective neurological examination should be carried out to evaluate and segmental neurological deficit
- Sensation of the perineum to pin prick and light touch
- Anal tone and anal “wink” reflex should be tested
- Residual bladder volume using ultrasound

# Perineal sensation

## Cauda Equina Syndrome: A Comprehensive Review

Alex Gitelman, MD, Shuriz Hishmeh, MD, Brian N. Morelli, MD, Samuel A. Joseph, Jr., MD, Andrew Casden, MD, Paul Kuflik, MD, Michael Neuwirth, MD, and Mark Stephen, MD

- 76% CES pts have SA

Eur Spine J (2017) 26:894–904  
DOI 10.1007/s00586-017-4943-8

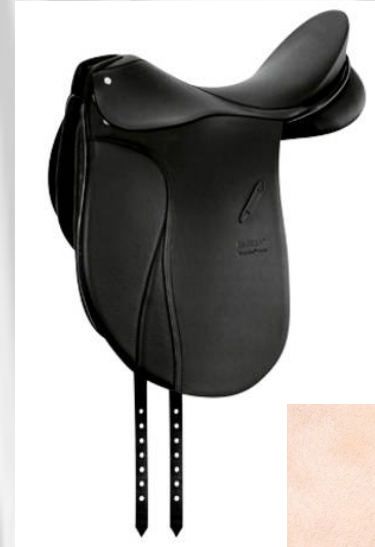


ORIGINAL ARTICLE

### Cauda Equina Syndrome: presentation, outcome, and predictors with focus on micturition, defecation, and sexual dysfunction

N. S. Korse<sup>1</sup> · J. A. Pijpers<sup>2</sup> · E. van Zwet<sup>3</sup> · H. W. Elzevier<sup>4</sup> ·  
C. L. A. Vleggeert-Lankamp<sup>1</sup>

- 93% of 75 had SA



# Digital rectal examination

Research Article

## Does rectal examination have any value in the clinical diagnosis of cauda equina syndrome?

Benjamin W. T. Gooding  Mark A. Higgins & Denis A. D. Calthorpe

Pages 156-159 | Received 02 Jun 2012, Accepted 17 Sep 2012, Published online: 01 Nov 2012

- 57 patients-23% c/f CES on MRI
- DRE 51% accurate in those with +ve MRI

Eur Spine J (2017) 26:894–904  
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C. L. A. Vleggeert-Lankamp<sup>1</sup>

- 75 patients with CES
- ↓ Anal tone ↓ Saddle sensation
- Tudose et al 2017 (Br J Neurosurg Conf)
- Variable use, variable recording, variable interpretation in 173 patients





# Residual Bladder Volume

European Journal of Neurology 2009, 16: 416-419

doi:10.1111/j.1468-1331.2008.02510.x

## SHORT COMMUNICATION

Predictive value of clinical characteristics in patients with suspected cauda equina syndrome

P. M. Domen<sup>a</sup>, P. A. Hofman<sup>b</sup>, H. van Santbrink<sup>c</sup> and W. E. J. Weber<sup>a</sup>

Departments of <sup>a</sup>Neurology, <sup>b</sup>Neuroradiology, and <sup>c</sup>Neurosurgery, Maastricht University Medical Centre, AZ Maastricht, the Netherlands

- >500ml retention correlates with +ve MRI in CES (bilat sciatica , retention)

### 13. Is post-void bladder scan a useful adjunct to the clinical examination for prediction of cauda equina syndrome?

Muralidharan Venkatesan, Luigi Nasto, M.P. Grevitt, Magnum M. Tsegaye; The Centre for Spinal Studies and Surgery, Queen's Medical Centre, Derby Rd, Nottingham NG7 2UH

- >400ml per void
- >200ml post void

(P09)

The utilisation of post micturition bladder scan in the assessment of patients with suspected cauda equina syndrome (CES)

**Main Author:** Michelle Angus

**Co Authors:** Mohammed Elmajee, Rajat Verma, Saeed Mohammad, Irfan Siddique

**Affiliation:** Salford Royal NHS Foundation Trust (SRFT), Stott Lane, Salford M6 8HD

- Stokes et al 2016 ....



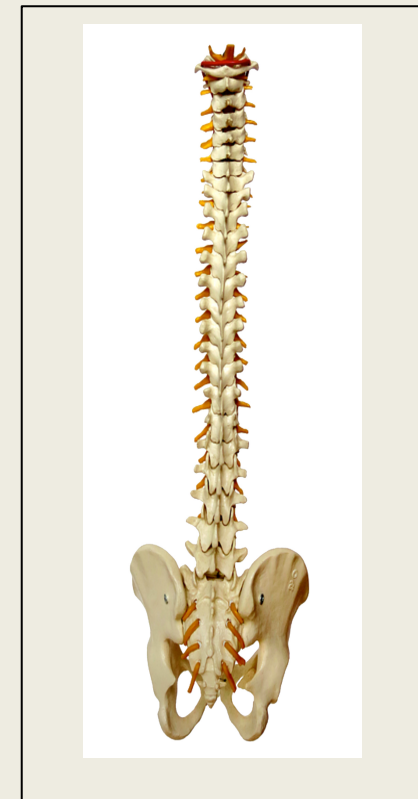
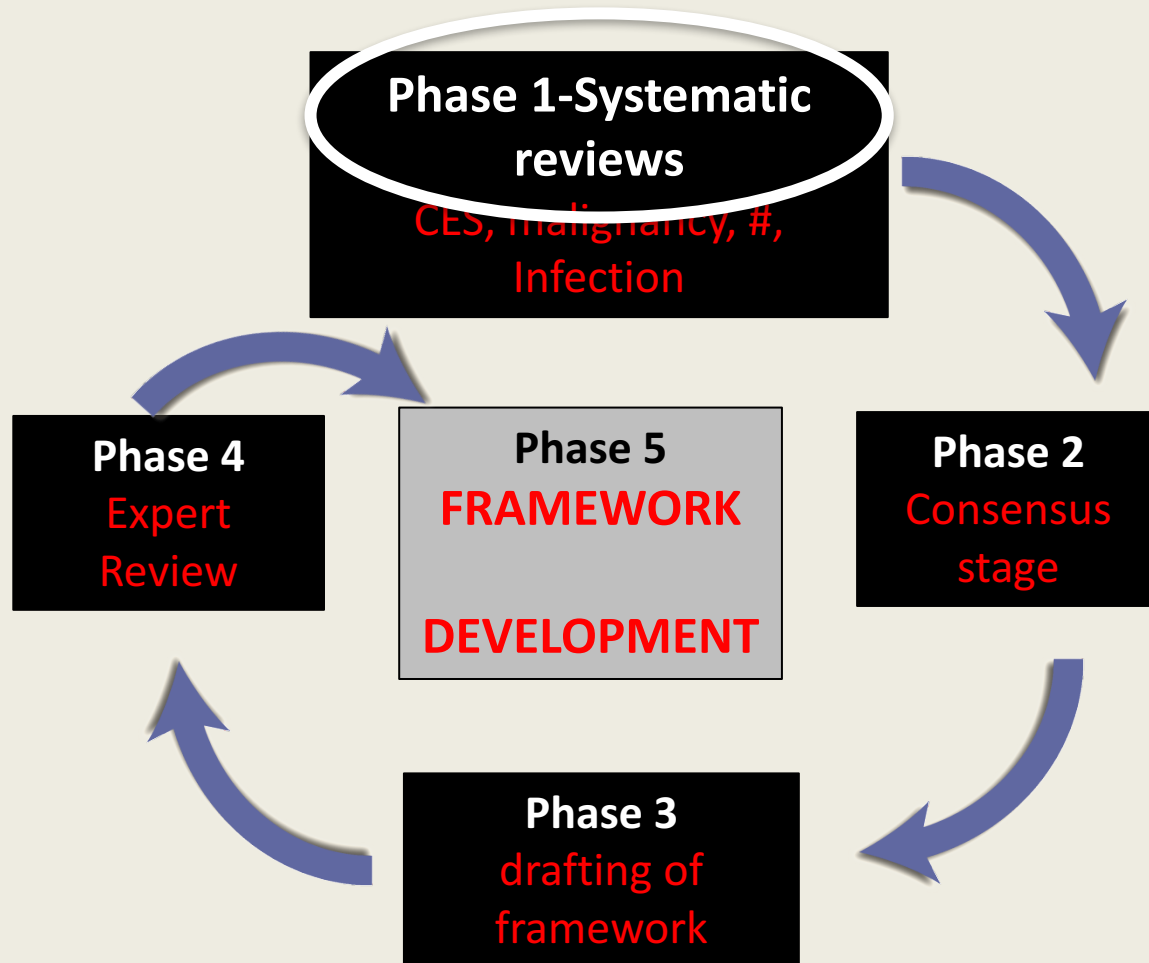
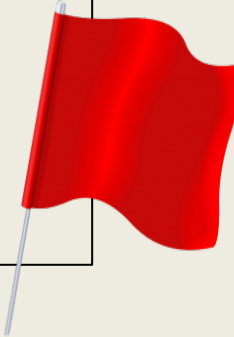
# Multi shades of grey (between 49 and 51)

## Cauda Equina Syndrome (thanks to Pantone paints!)

Urinary Tract Infection	Gabapentin	Prostate cancer	Cocodamol	Pudendal nerve	Prolapse	Pain inhibition	Anxiety	Diabetes	Parkinsons
Polio	Neuropathy	Pernicious anaemia	Balanitis	Urethral stricture	Multiple Sclerosis	Lyme disease	Constipation	Bladder calculi	Retro-peritoneal malignancy
Guillain-Barre	Fibroid	Pelvic mass	Transverse myelitis	Ovarian cyst	Amphetamines	Tramadol	Herpes zoster	Cholinergic medication	Anti-cholinergic medication
Tabes dorsalis	NSAIDS	Diverticulitis	Renal calculus	Benign Prostate hypertrophy	Pelvic fracture	Post partum trauma	Ischaemia	Peripheral Vascular Disease	Retroverted uterus
Decongestant medication	Central sensitisation	Bilharziasis	Ca bladder	Vulvovaginitis	Psychogenic	Intra-Pelvic adhesions	Alcoholism	Smoking	Rectocele

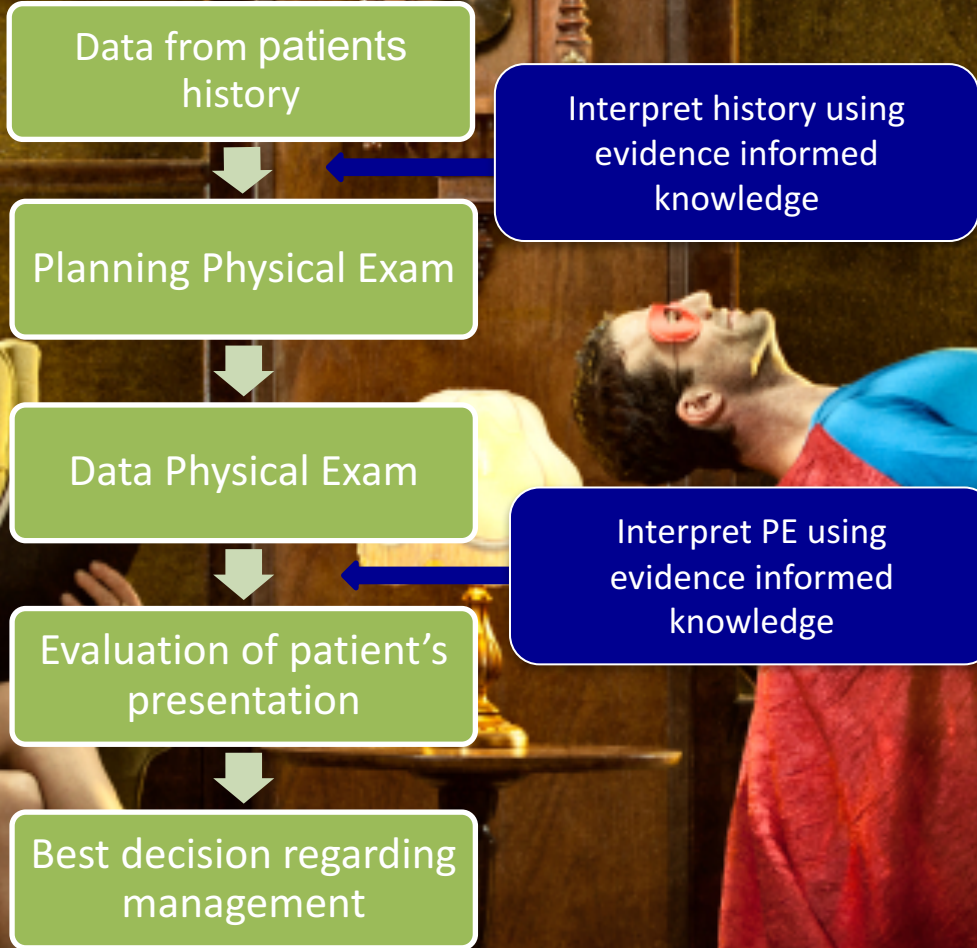
# *An evidence informed clinical reasoning framework for clinicians in the face of serious pathology in the spine*

Finucane, Selfe, Mercer, Greenhalgh, Downie, Verhagen, Poole, Henschke, Boissonault, Beniuck



@laurafinucaneB

# Framework example







## Cauda Equina a surgical emergency

<https://www.youtube.com/watch?v=8rRq5QqoK3o>





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