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Spinal cord compression and cauda equina syndrome

1. Spinal cord compression and cauda equina syndrome

Spinal cord compression and cauda equina syndrome are on every primary care clinician's (long!) list of things they never want to miss. They're uncommon presentations, but they cause us a lot of anxiety. This anxiety is rational: these syndromes can be tricky to diagnose, they're easily overlooked and we're forever hearing about missed cases and litigation in the defence journals. Read on: increased knowledge is likely to increase your confidence in detecting, managing and documenting these presentations...

This article was updated in January 2025.

This article covers:

- Anatomy and neurology.
- Back pain red flags.
- Spinal cord compression.
- Cauda equina syndrome.

1.1. Anatomy and neurology

Anatomy

Back to basics! The spinal cord runs from the foramen magnum in the skull down to around L1-2, where it tapers in an area called the conus medullaris. At this point, it becomes a bunch of spinal nerve roots known as the cauda equina (horse tail) (NEJM 2017;376:1358).

Neurology: upper vs. lower motor neurone features

The nerves connecting the brain to the muscles have a single junction (synapse) in the spinal cord. This lies at the level where the nerve exits the spine. The nerve between the brain and the junction is the upper motor neurone; the nerve between the junction and the muscle is the lower motor neurone.

Clinically, things look quite different, depending on which part of the pathway is affected. As a rule of thumb:

- Spinal cord compression causes **upper** motor neurone features.
- Cauda equina compression causes **lower** motor neurone features.

-	Upper motor neurone features	Lower motor neurone features
Tone	Increased (spasticity).	Reduced tone/flaccid.
Power	Weakness: spastic (stiff) paresis.	Weakness: flaccid paralysis.
Muscle bulk	Little or no muscle wasting. No fasciculation (visible twitching).	Muscle wasting develops with time. Fasciculation may be present.
Reflexes	Hyperreflexia with clonus.	Reduced or absent deep tendon reflexes.
Babinski (plantar response)	Extensor (up-going).	Flexor (down-going).

Looking for an easy way to remember this? Both have weakness or paralysis, but:

- UPPER motor neurone: things tend to go UP: increased tone, brisk reflexes, up-going plantars.
- LOWER motor neurone: things tend to go DOWN: reduced tone, reduced/absent reflexes, down-going plantars.

1.2. Back pain red flags

In anyone with back pain, we should always look for red flags. There are many guidelines on low back pain and there is considerable variation when

it comes to lists of red flags! A systematic review looked at 8 guidelines and found that none of them shared the same list. Here, we share with you a selection of red flags from the guidelines (BMJ 2013;347:f7095) and from the national suspected cauda equina syndrome pathway (GIRFT, 2023).

Back pain red flags	
Consider	May present with
<p>Cancer: past history or active cancer diagnosis (including myeloma).</p>	<p>Can occur with any cancer, but the following have a reputation for bony metastases:</p> <ul style="list-style-type: none"> • Breast. • Lung. • Prostate. • Renal. • Gastric. <p>Look for:</p> <ul style="list-style-type: none"> • Gradual onset, progressive symptoms. • Pain may be: <ul style="list-style-type: none"> • Unremitting. • Worse at night. • Worse lying down (simple mechanical pain is often eased by lying down). • Worse on straining, e.g. cough, sneeze, straining on the loo. • Midline tenderness over spine may be present. • Weight loss.

	<ul style="list-style-type: none"> • Age $\geq 50y$.
<p>Infection (discitis, osteomyelitis, abscess).</p>	<ul style="list-style-type: none"> • Fever may be present. • Risk factors: <ul style="list-style-type: none"> • Diabetes. • IV drug use. • TB, HIV, recent urinary tract infection. • Immune compromise from disease or drugs.
<p>Fracture.</p>	<ul style="list-style-type: none"> • History of trauma: <ul style="list-style-type: none"> • Minor, e.g. coughing or lifting (especially if known osteoporosis). • Major, e.g. RTA. • Sudden-onset, severe, midline pain eased when lying down. • Rarely, you may feel a deformity, e.g. step between vertebrae. • Point tenderness over the bone.
<p>Bilateral sciatica.</p>	<ul style="list-style-type: none"> • Bilateral sciatica may suggest cauda equina syndrome. <ul style="list-style-type: none"> • Sudden-onset bilateral radicular pain OR • Unilateral sciatica which progresses to bilateral without CES symptoms.

1.3. Spinal cord compression

Causes

There are many causes of cord compression, but it is generally a result of (Top Spinal Cord Inj Rehabil 2013;19:1):

- Cancer (primary or secondary).
- Trauma.
- Degenerative spondylosis with myelopathy.
- Central disc herniation (cervical discs herniate centrally, while lumbar discs herniate laterally. Thoracic disc herniation is rare (2007, Marshall R., On Call Neurology, 3rd Edition, Elsevier)).
- Infection (spinal epidural abscess, spinal tuberculosis).

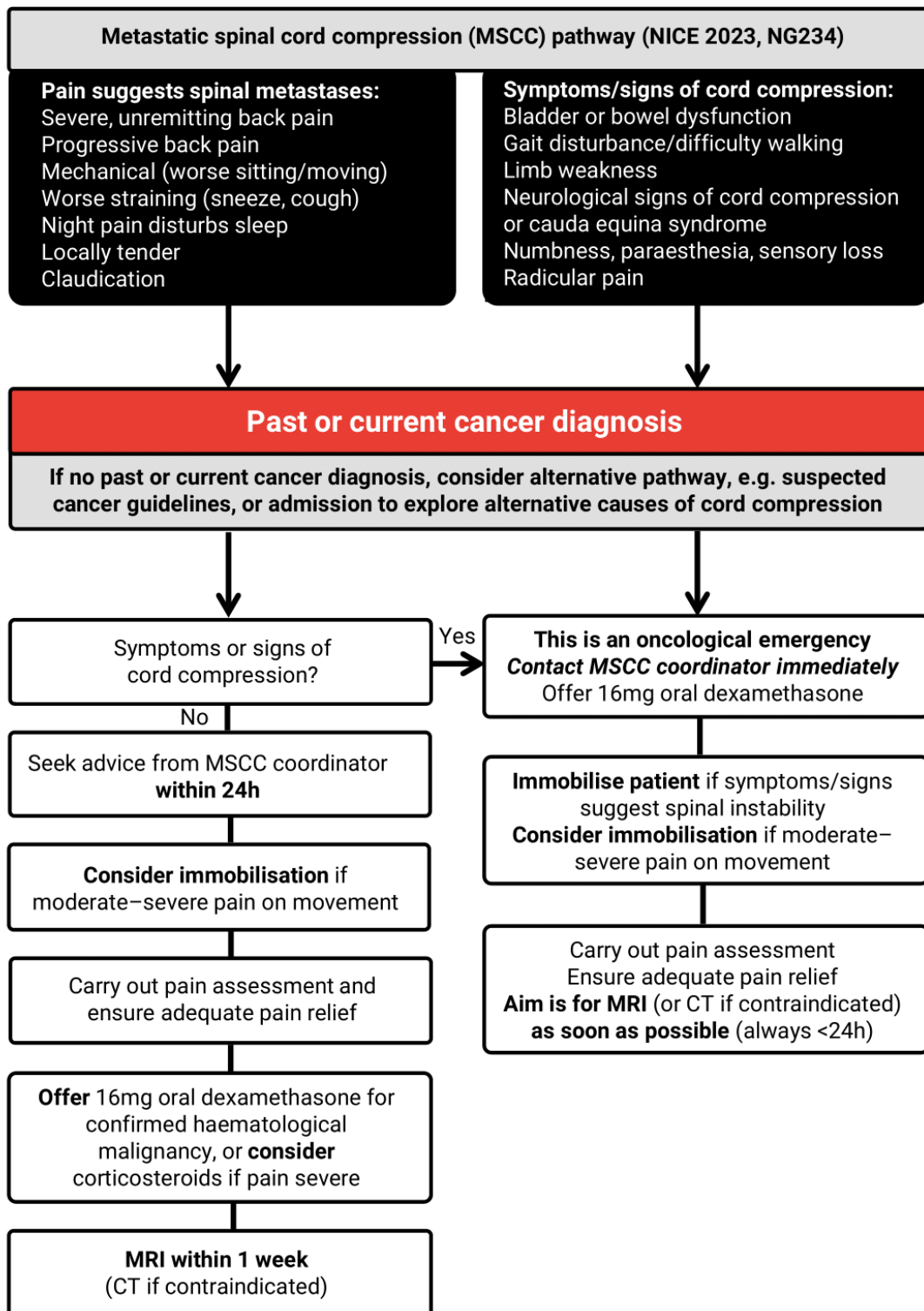
Worldwide, the most common causes of spinal cord compression are traumatic, resulting from falls or gunshots. Hopefully, we won't encounter too many of those on the morning triage list so we'll focus instead on metastatic spinal cord compression, the most likely cause in UK primary care.

Metastatic spinal cord compression

Metastatic spinal cord compression (MSCC) affects 3–5% of those with cancer, and may cause pain, vertebral collapse and cord compression (Clin Med 2014;14:542). It is crucial to spot it early: it may lead to irreversible neurological damage, which may be prevented by timely intervention.

NICE updated its guidance in 2023 (NICE 2023, NG234), summarised in the

following flowchart:



Management of metastatic spinal metastases and cord compression

NICE suggests the following treatment (NICE 2023, NG234):

- For spinal metastases:
 - Asymptomatic: consider radiotherapy if part of a trial, radiological signs of impending cord compression or as part of a treatment strategy for oligometastases.
 - With non-mechanical pain: radiotherapy.
 - With spinal instability or uncontrolled pain: formulate a plan which may involve invasive interventions, e.g. vertebroplasty, surgical stabilisation.
- For metastatic cord compression:
 - Suitable for surgery: offer surgery to halt or reverse neurological decline as soon as possible. If instability present, consider spinal stabilisation surgery.
 - Unsuitable for surgery: urgent radiotherapy, if suitable (excludes those with overall poor prognosis or those with complete tetraplegia or paraplegia for 2 weeks and pain controlled).
 - Unsuitable for either surgery or radiotherapy: if there is mechanical pain which is not controlled with analgesia, offer external spinal support to treat spinal instability, e.g. halo vest.

1.4. Cauda equina syndrome

Cauda equina syndrome is due to the same range of things that can cause

cord compression; it just happens at a lower level, i.e. beyond the end of the spinal cord. A central disc prolapse at L4/5 or L5/S1 is the most common cause, but it can still be due to trauma, cancer, fracture or infection (BMJ 2009;338:b936).

Cauda equina syndrome presentation

- EARLY SIGNS:
 - Altered saddle sensation (tingling, pins and needles).
 - Altered sensation of micturition: “Does it feel normal when you pee?”.
 - Delay or difficulty opening bowels or initiating micturition.
 - Change in erections or vaginal sensation. Patients may not tell you this...ask!
 - Back pain (with or without sciatic pain).
 - Bilateral sciatica *may* be present.
- LATE SIGNS:
 - Saddle anaesthesia (these patients are more likely to have permanent bladder paralysis).
 - Incontinence (this is overflow – people go into retention first).
 - Severe, progressive bilateral neurological deficit in the lower limbs.
 - Lower motor neurone signs.
 - Loss of anal tone.

Rectal examination

Since medicine was invented, rectal examination and anal tone have been enshrined in the surgical textbooks as a cornerstone of examination....but does rectal examination have any actual diagnostic value for cauda equina syndrome?

No! A brave team of researchers challenged this doctrine and reached the conclusion that it had *no significant value* in the diagnosis (Br J Neurosurgery, 2013;27:156).

- Presence of anal tone does NOT rule out cord/cauda equina damage.
- However, absence of anal tone should make you worry (and admit immediately!).

Types of cauda equina syndrome

The timescale of development can alter how CES presents (BMJ 2009;338:b936).

Rapid	Intermediate	Chronic
Sudden change prompts patient to seek advice.	Pre-existing back pain or sciatica for a few weeks; later develops new symptoms.	Chronic low back pain and/or sciatica. Patient (and clinician) 'acclimatised' to ongoing pain.
Textbook symptoms and signs.	Not present at acute assessment.	May develop slowly; alarm bells may not ring.
Easier to spot: red flags everywhere!	Safety-netting vital.	Very hard to spot early, especially in those with pre-existing bladder symptoms. Always ask, even in well-known patients. Education is key.

Neurosurgeons divide cauda equina syndrome into 2 types:

- Incomplete (CES-I), where there is reduced urinary sensation but no established retention or overflow.
- Cauda equina syndrome with retention (CES-R), where there is established urinary retention.

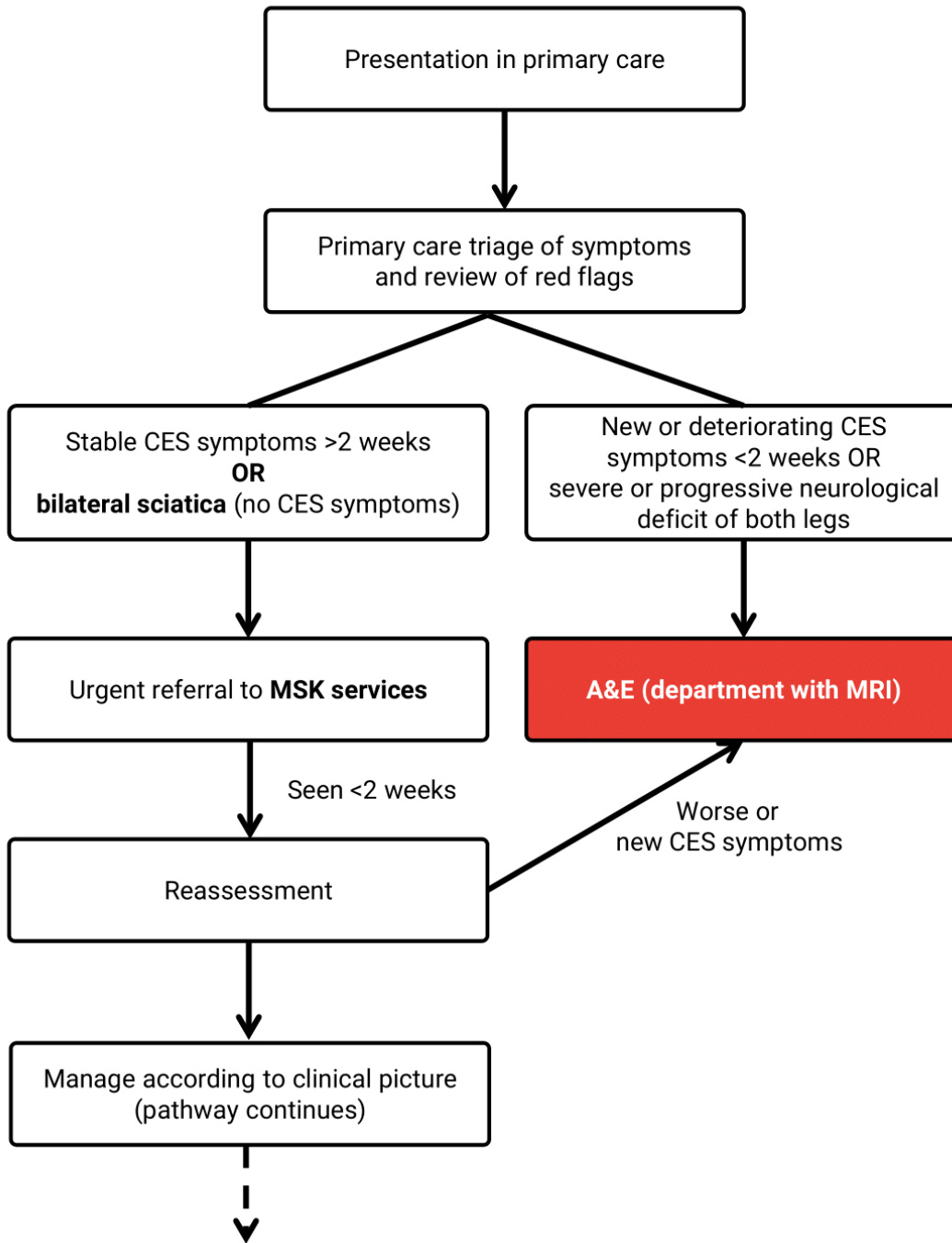
The aim is to treat patients BEFORE they develop retention.

We're going to send ALL our suspected cauda equina cases through the emergency pathway, regardless of the presence or absence of retention/incontinence, but neurosurgeons may decide not to operate acutely in those with CES-R. They argue that the outcome at this stage is poor anyway, regardless of surgery, so they may opt to wait for an elective list.

Investigation, referral and management

MRI is the investigation of choice (CT may be performed if MRI is contraindicated). In the absence of trauma, plain films are unhelpful in the assessment of cauda equina syndrome (Ulster Med J, 2013;82:100).

In 2023, a [national suspected cauda equina pathway](#) was published (updated 2024). We've summarised the key primary care section below. Where appropriate, the neurosurgeon will decide if emergency decompression is warranted. Drug treatments, e.g. corticosteroids, have no role. The GIRFT pathway allows for remote assessment and referral if face-to-face review is not possible or may delay referral.



Local pathways may differ: if you suspect spinal cord compression or cauda equina syndrome, a same-day scan is required. *If in doubt, speak to a senior A&E clinician or the on-call radiologist.*

Safety-netting and record-keeping

General practice is littered with uncertainty. We fear missing cauda equina syndrome. We fear litigation.

We read articles like this one, and look at the tables and lists above, and it all looks fairly logical. But then a patient appears and stubbornly refuses to neatly fall into one of our boxes...

“Does it feel any different when you pee?”

“No...well...yes...err... it might have felt a bit different yesterday, but it’s fine again today, and it was just once...”

“Have you had any tingling or numbness around your bottom area?”

“Yes, I’d been in the car last week for 3 hours and I got tingling in my bum cheek, but it got better once I got out of the car.”

In cases like this, where things are not clear-cut, safety-netting is essential!

Safety-netting should be specific, not simply *“come back if it gets worse”*.

We should be telling patients (Musculoskelet Sci Pract 2020;48:102179):

- Specific red flag symptoms.
- The likely time course of symptoms.
- Specific information about when and how to get back in touch.

The defence unions remind us that good documentation helps defend negligence claims.




This is one of those areas where we must carefully, accurately and comprehensively document what we observe at the point of our assessment.

Things change, and complications may subsequently develop. It may be

argued that those symptoms and/or signs were present when we made our assessment. Our records are our defence.

We must be in a position where we can clearly demonstrate that **those symptoms or signs were not present at the moment we assessed the patient.**

Consider providing written instructions (or text a link to the patient) because, unfortunately, we know that pain might have a negative effect on a patient's ability to concentrate and remember information (Prim. Health Care Des. Dev. 2016;17:559). Cauda equina credit cards are available in 29 languages (link in useful resources, below); this could be a change in practice that you can start tomorrow. Don't forget to document it!

	<p>Spinal cord compression and cauda equina syndrome</p> <ul style="list-style-type: none"> • Cauda equina syndrome and spinal cord compression are both emergency presentations needing same-day referral. • Beware of red flags in the history which raise the likelihood of serious or sinister disease. • Ask specifically about subtle signs of early cauda equina syndrome. • The aim is to manage cauda equina syndrome <i>before</i> urinary retention occurs. • Safety-net clearly and specifically, and make clear clinical notes.
	<ul style="list-style-type: none"> • What are your local pathways for suspected CES and SCC? Check if unsure.
	<p>Useful resources:</p> <p><u>Websites</u> (all resources are hyperlinked for ease of use in Red Whale Knowledge)</p> <ul style="list-style-type: none"> • Musculoskeletal Association of Chartered Physiotherapists – cauda equina information cards (cards in 29 different languages) • National Suspected Cauda Equina Syndrome Pathway (GIRFT)

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