

THE DIAGNOSTIC TRIAGE OF LOW BACK PAIN

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No conflicts to declare.



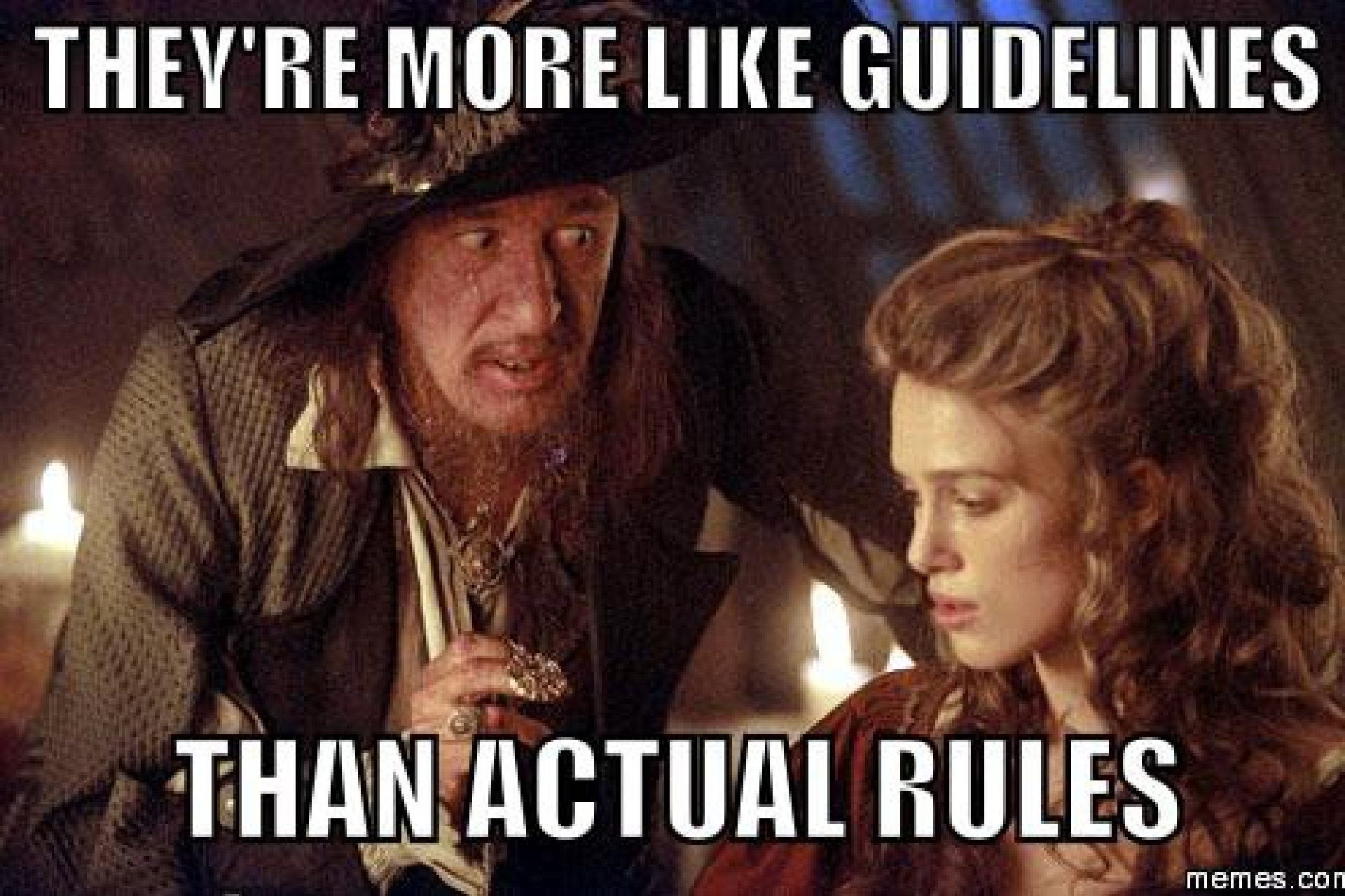


Wildest
Dreams

Objectives

- To review the diagnostic criteria for ominous, radicular and mechanical back pain.
- To list ominous causes of low back pain
- To list the clinical findings of radicular back pain
- To list the potential causes for mechanical back pain
- To list the treatment options for low back pain

THEY'RE MORE LIKE GUIDELINES



THAN ACTUAL RULES

Guidelines, Guidelines, Guidelines

- AHCPR, 1994, Australia 1999, UK, 2000, NICE
- Chou et al American Pain Society Low Back Pain Guideline Panel. Interventional therapies, surgery, and interdisciplinary rehabilitation for low back pain: an evidence-based clinical practice guideline from the American Pain Society.
- [Spine.](#) 2009 May 1;34(10):1066-1079

True or false?

- The first step in the management of acute low back pain is to make a tissue specific diagnosis.

THE PAIN STARTS IN MY HUSBAND'S LOWER BACK, THEN IT TRAVELS UP HIS SPINE TO HIS NECK, THEN IT COMES OUT HIS MOUTH AND INTO MY EARS. AND THAT'S WHY I GET THESE HEADACHES.



What's wrong with my back doc?

- Facet joint tropism with anterior innominate rotation, sacral torsion, ilio-lumbar ligament tension, aggravating multifidus trigger points and discogenic annular pain....



Why are you so dumb doc?

- You have a
Simple backache



Recommendation 1:

Clinical assessment...Old school

- Benign vs sinister
- Mechanical vs radicular
- Treatable functional deficits

Does the patient have a sinister problem? Is it cancer?

- Probability < 1 % of primary care presentation.
- No relief with recumbency->90% sensitive
- Fever, chills, anorexia.
- bladder/ bowel
- *Deyo, J Gen Int. Med, 1988.*

- *One in a hundred....*

Historical Clues 3P's of Back Pain

- Persistent, (most back pain waxes and wanes, positional....not cancer)
- Progressive deterioration in pain
- Pain worse at night.
- These three represent a very sensitive indicator of malignancy. *Cherkin, Spine 1996.*

Cancer and back pain

J Gen Intern Med 1988 May-Jun;3(3):230-8.

- Deyo and Diehl showed that:
 - prior cancer history,
 - unexplained weight loss,
 - pain lasting more than one month,
 - age over 50,
 - and no improvement with initial therapy were symptoms significantly associated with back pain due to cancer.
- ▣ *The probability of cancer in back pain patients increased from <1% to 9% in patients with a history of cancer other than most skin cancers.*

Does the patient have a sinister problem? Is it an infection?

- Prior surgery--discitis
- IV drug use, UTI or skin infection has a 40% sensitivity (true positive rate) for spinal osteomyelitis
- IV drug use and spinal procedures risks for epidural abscess... ***ESR uniformly elevated.***

[Nussbaum ES](#), et al *Spinal epidural abscess: a report of 40 cases and review.*
[Surg Neurol.](#) 1992

- ***One in ten thousand....***

Does the patient have a fracture?

Canadian C Spine Rules

- Any high-risk factor that mandates radiography?
- Age ≥ 65 yr
 - dangerous mechanism or
 - paresthesias in extremities after trauma
- Any low-risk factor that allows safe assessment of range of motion?
 - rear-end motor vehicle collision, ambulatory or sitting position in the emergency department or delayed onset of neck pain, no midline cervical-spine tenderness.
- Able to rotate neck actively 45° left and right?

Spinal fracture. Red flag conditions

Enthoven WT...Phys Ther. 2015 Jul 16

- Patients over 55 years age, 6% had notable pathology during the 1-year follow-up
- 85% were diagnosed with a vertebral fracture.
- Age of ≥ 75 years, trauma, osteoporosis, a back pain intensity score of $\geq 7/10$, and pain in the thoracic region were associated with a higher probability of a vertebral fracture.
- Trauma showed the highest positive predictive value for vertebral fracture.

Step One: Sinister versus Benign?

- Step one: rule out sinister causes.
- This is largely a matter of a focused history.
- *Simple questions:*
 - *Have you had cancer or are you losing weight?*
 - *Have you had a recent infection or a spinal procedure ?*
 - *Have you used IV drugs in the last 6 mos?*
- The questions have high specificity and sensitivity.
- Low level of concern: ESR
- High level of concern: MRI



Recommendation 2: Imaging the spine is only indicated for patients with red flags.

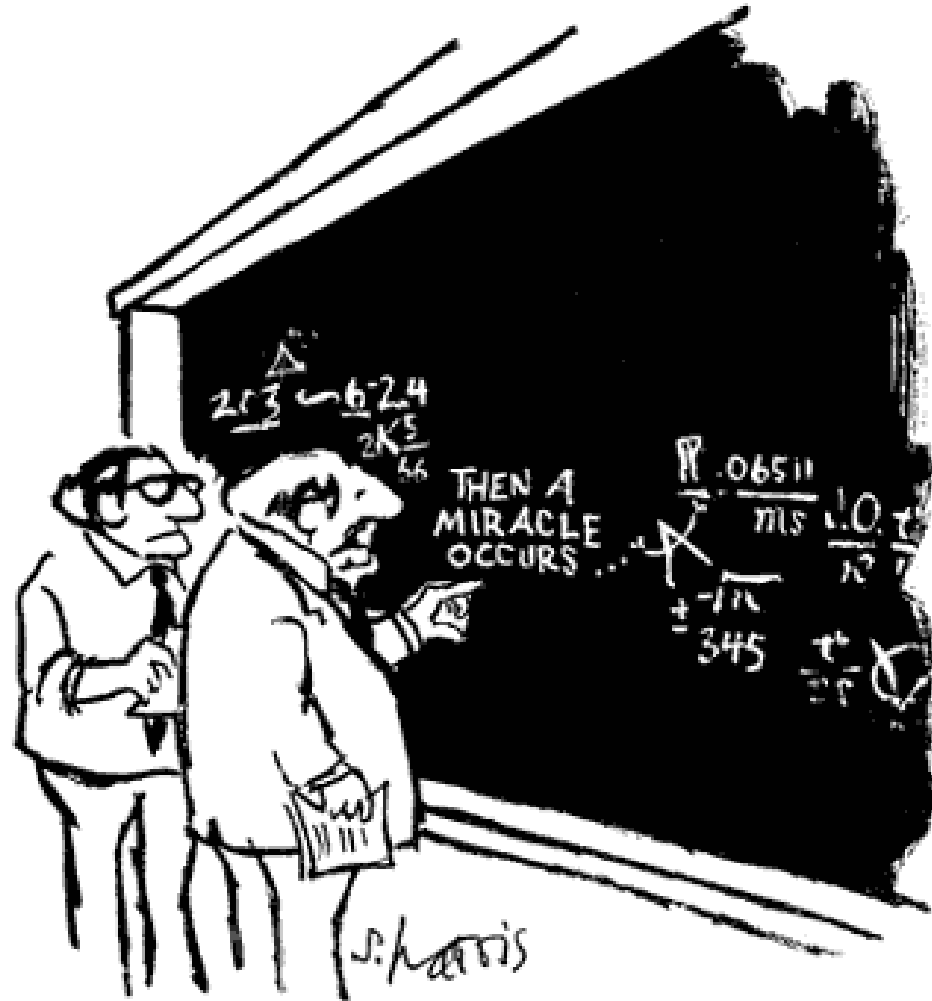
- Diagnostic imaging only required with severe or progressive neurologic deficits or when sinister conditions are suspected on the basis of history and physical examination.
(strong recommendation, moderate-quality evidence).

Consider non-spinal causes of LBP

- Spondylo-arthropathies.
 - Ankylosing spondylitis in young men
 - morning stiffness, improvement with exercise, onset under 40 years of age, alternating buttock pain, awakening due to back pain during the second part of the night only and a pain duration of more than 3 months.
- Vascular
- Gastro-intestinal
- Genito-urinary
- Gynecological



Step Two: Mechanical vs Radicular



"I think you should be more explicit here in step two."

What does
radiculopathy
look like?



Lumbar list

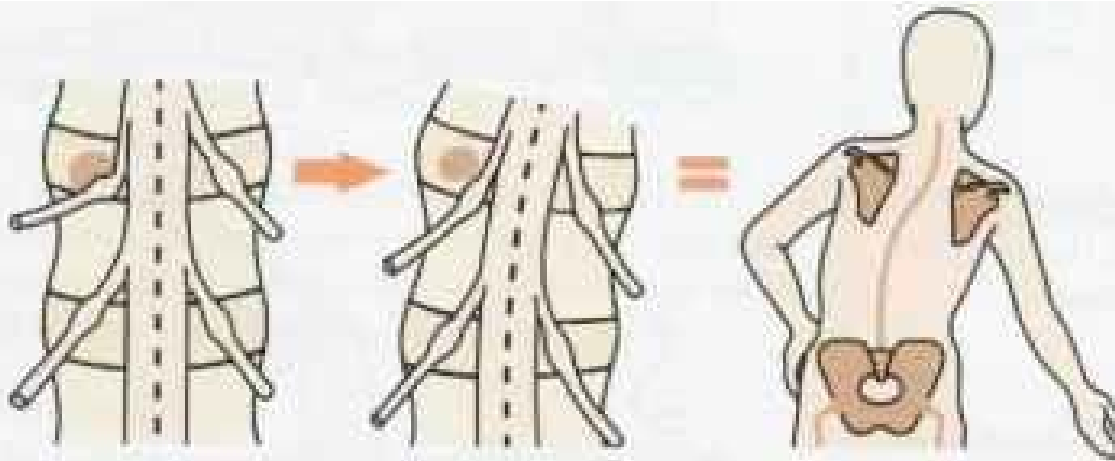
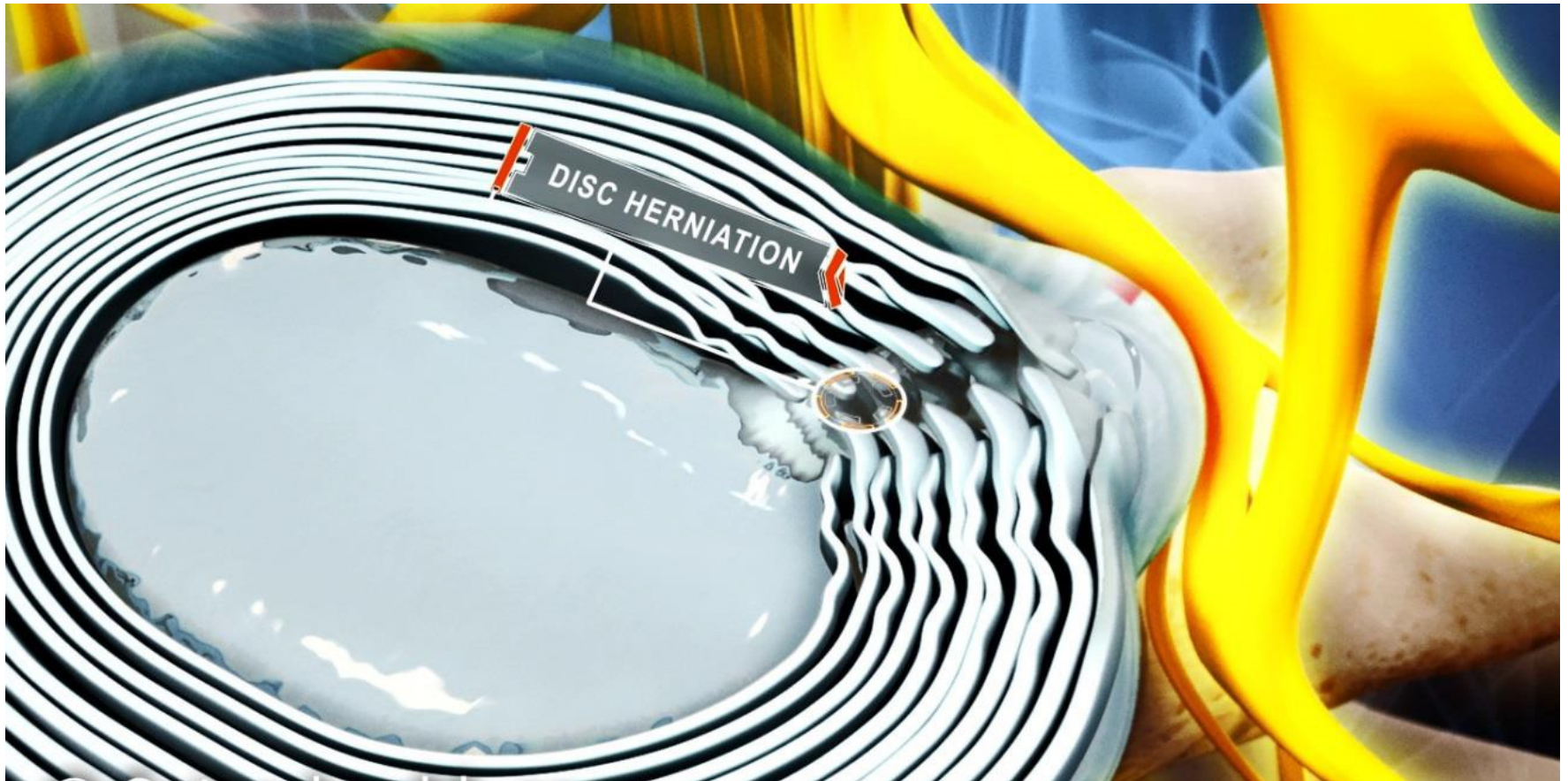


Fig. 8.9 Deviation of spine in prolapsed intervertebral disc.

Mechanical versus radicular

- Validated, sensitive and specific physical signs exist almost exclusively for radiculopathy.



Radiculopathy is usually due to disc degeneration and disc degeneration is due to aging.

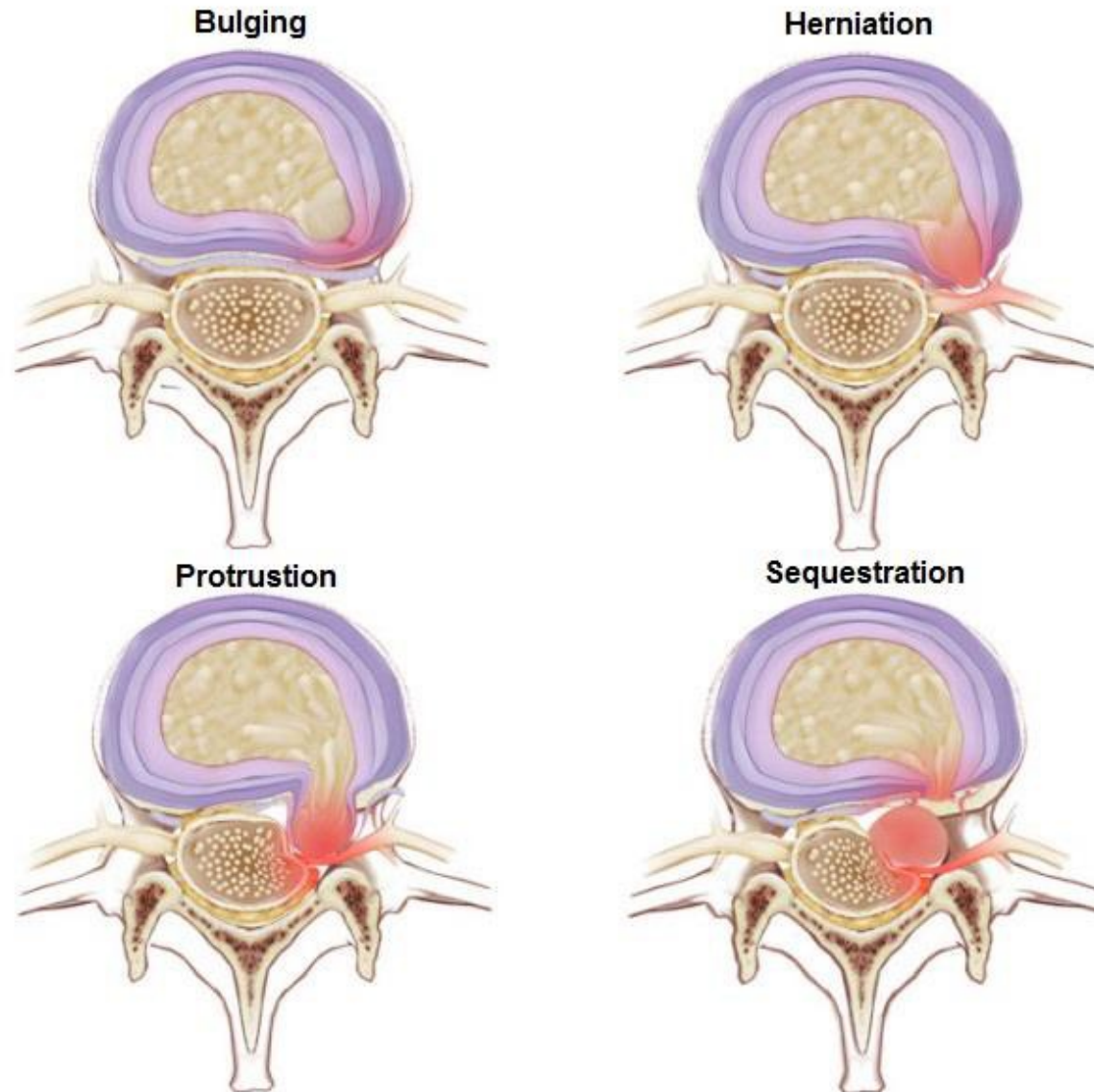




Image size: 512 x 512
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WL: 483 WW: 966
8346 (33 y, 32 y)
LUMBAR— Sag T2 rfFSE L>R
6617
2

October 2012



Image size: 512 x 512
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X: 346 px Y: 479 px Value: 49.00

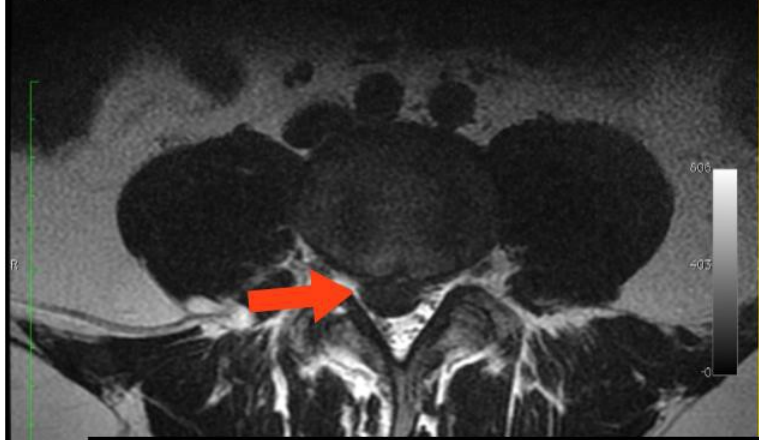
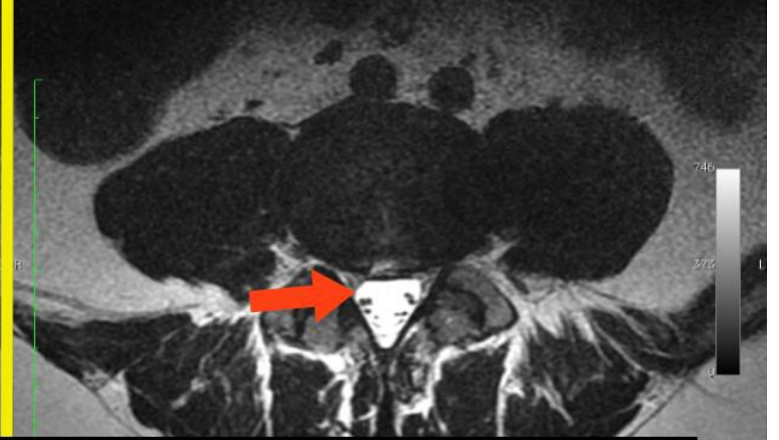


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8346 (33 y, 33 y)
LUMBAR— Sag T2 rfFSE L>R
9002
2

October 2013



Image size: 512 x 512
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WL: 373 WW: 746
X: 346 px Y: 479 px Value: 49.00
8346 (33 y, 33 y)
LUMBAR— Ax T2 rfFSE INF S>I
9002
6



Auto-Resorption of Lumbar Disc Herniation

Zoom: 192%
Im: 10/21 (L -> R)
Uncompressed
Thickness: 4.00 mm Location: -9.93 mm
Made In OsiriX

Zoom: 215%
Im: 10/21 (L -> R)
Uncompressed
Thickness: 4.00 mm Location: -35.62 mm
Made In OsiriX

Does the patient have a radiculopathy?

- extremity pain greater than back pain
- extremity pain below the knee
- numbness/paresthesiae in a dermatomal distribution-90% sensitive and specific.

Deyo JAMA 1992.

- neurologic signs
- dural signs



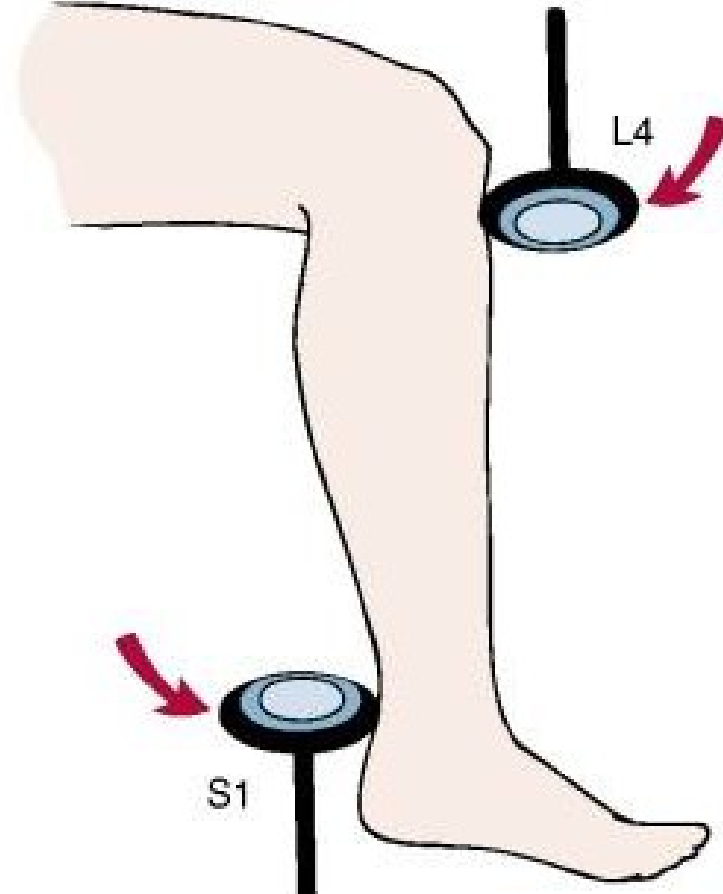
Radicular features of Low Back Pain: Neurologic Signs.

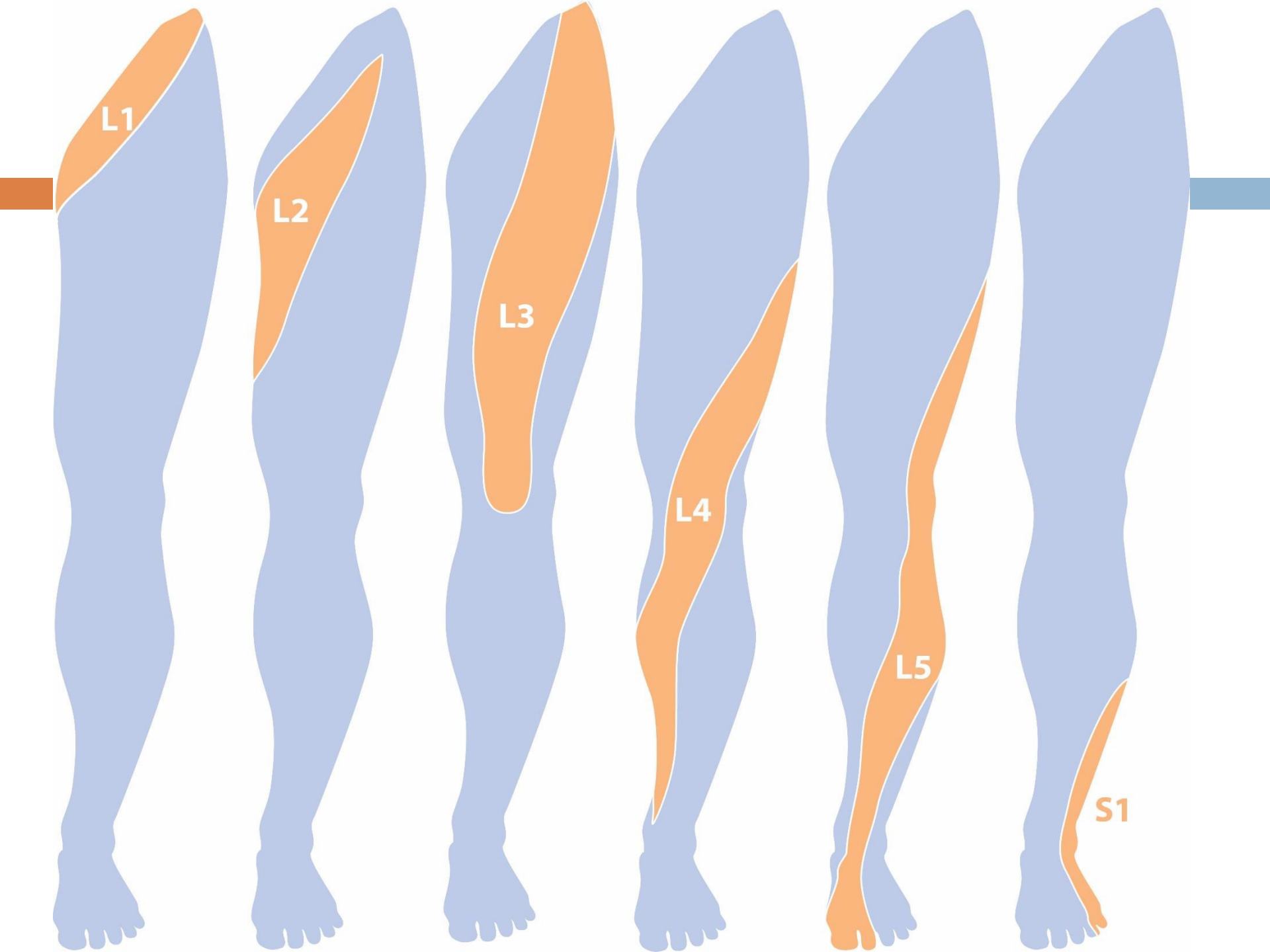
- Myotome weakness.
- Sensory loss in dermatome.
- Hyporeflexia in deep tendon reflexes.
- Dural stretch signs.

□ Radicular Features

- 90% of radiculopathies involve L5 (L4-5) and S1 (L5-S1) disc herniations respectively

- Altered reflexes:
 - Knee jerk L4
 - Hamstring reflex L5
 - Ankle jerk S1





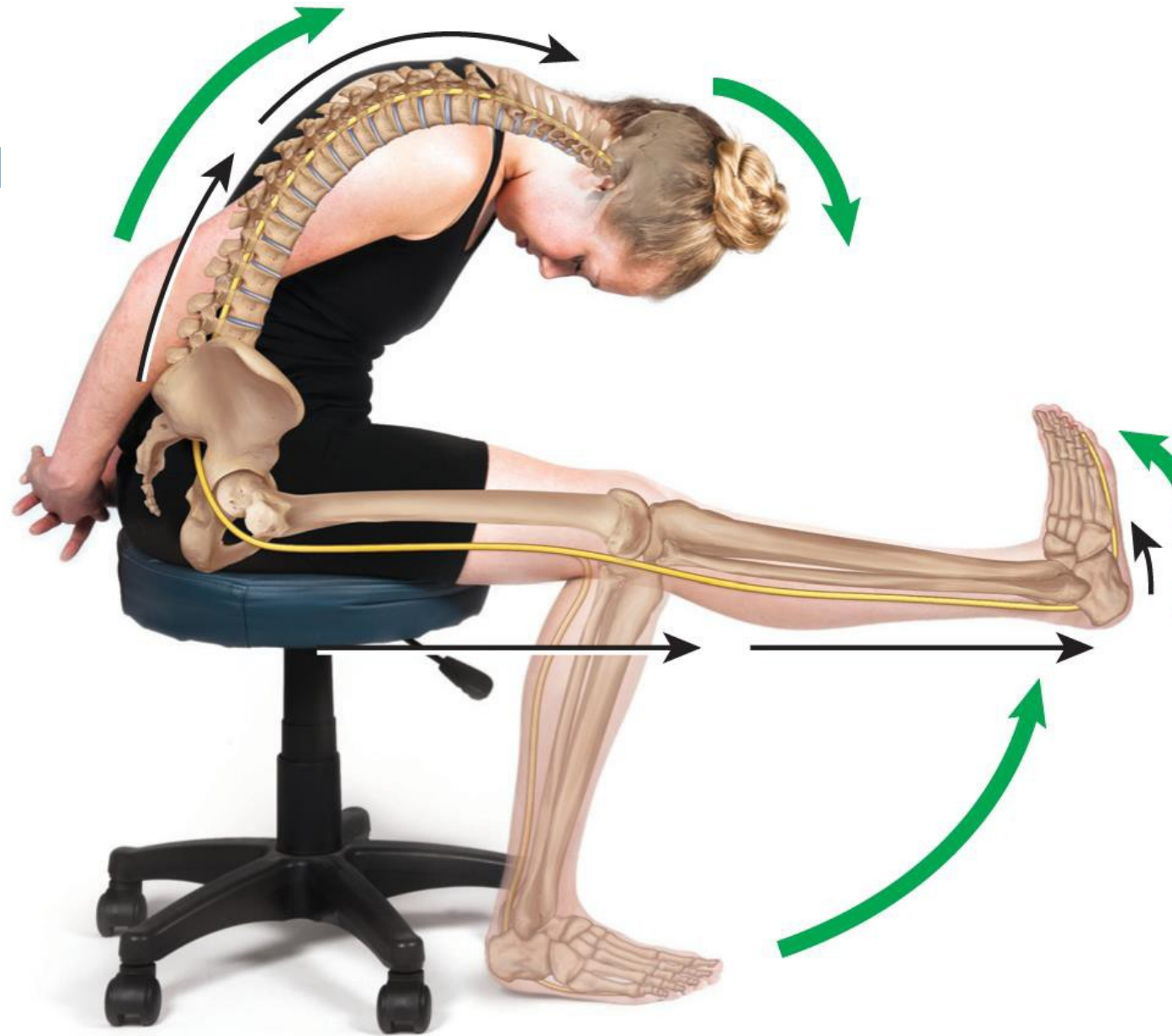
Dural Stretch signs:

- straight leg raise
- slump test
- femoral stretch test

Straight leg raise test



Slump test
for dural
tension.



Femoral stretch test



Knowing this helped Ruth....



Physical Examination is sensitive and specific for radiculopathy.

- SLR very sensitive
- Great toe weakness very specific for L5
- Crossover SLR 90% specific.
- Lost achilles reflex, 95% specific for S1.
- Quadriceps weakness 99% specific for L4.

Bigos, AHCPR guidelines 1994

Lumbar Radiculopathy: Pattern recognition.

- L4-Weak quad, tibialis anterior, lost patellar reflex, loss of medial ankle sensation, positive femoral stretch.
- L5-Weak EHL, calf, lost medial hamstring reflex, loss of first web space sensation, positive slump/SLR.
- S1 -Weak calf, lost ankle reflex, loss of lateral foot sensation, positive slump/SLR.

Doc, you gonna give me an MRI?



□ Requirement of spinal imaging:

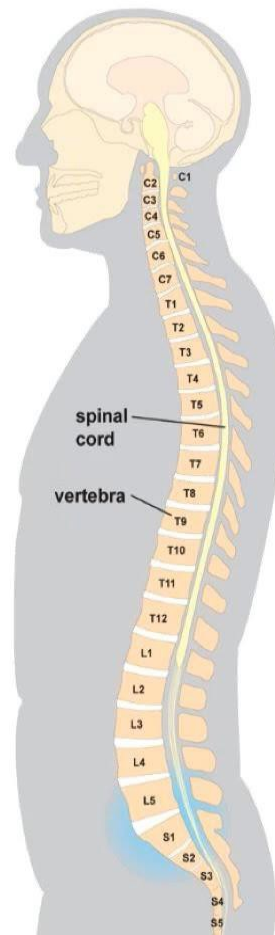
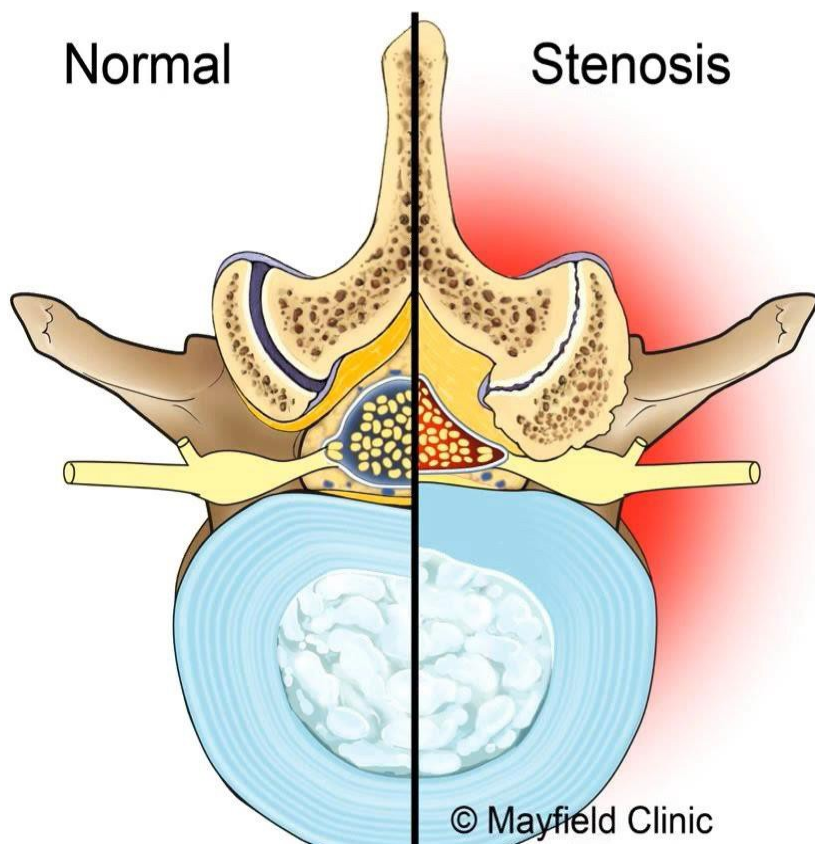
- Not required during the first month of symptoms unless a medically urgent condition is suspected.
- Not indicated in simple backache.
- Not done to confirm disc lesion, but to rule out tumor, infection, fracture.
- False positive imaging results may contribute to chronicity, unnecessary surgery.
- Disc lesions in **67%** of asymptomatic people under the age of 50.
- - Weishaupt, Radiology, 1998

Recommendation 4: Indications for spinal imaging are limited.

MRI required only if they are potential candidates for surgery or epidural steroid injection (for suspected radiculopathy) (strong recommendation, moderate-quality evidence).

Radiculopathy variants: Spinal Stenosis and Cauda Equina Syndrome

Spinal stenosis



Shopping Cart Sign

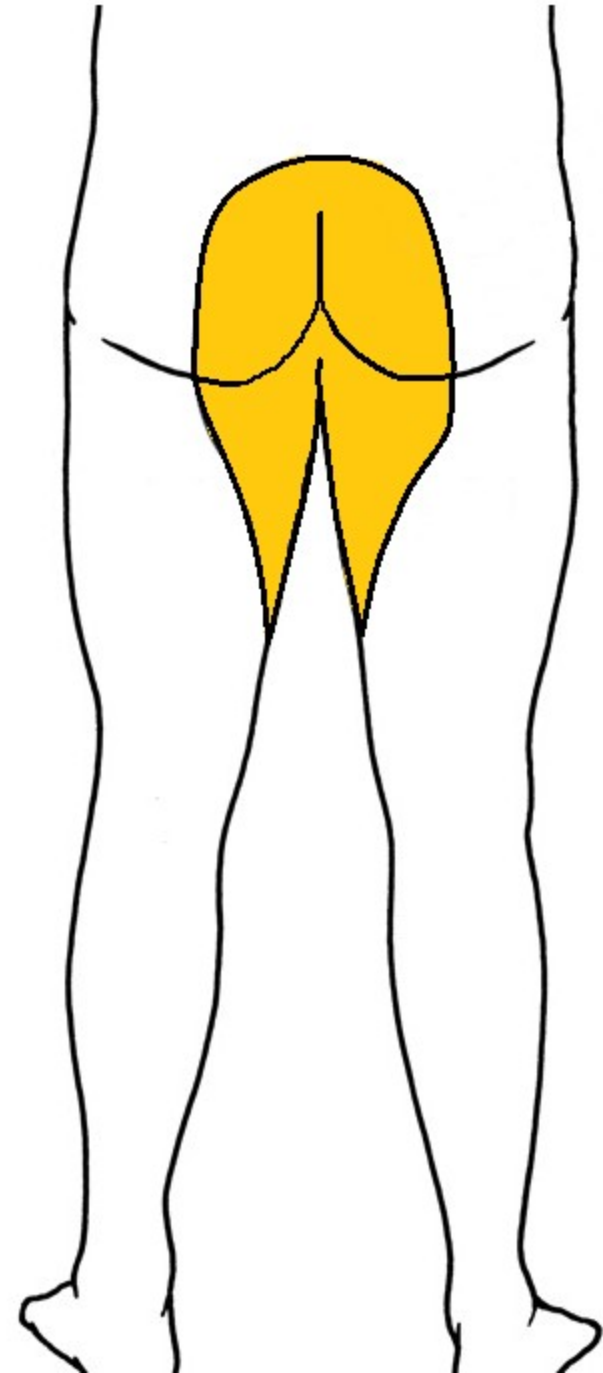


Cauda Equina Syndrome

- Rare--2–6% of lumbar disc operations.
- Secondary to a large central lumbar disc herniation.
- Any anomalies in control of stool or urine need to be considered as having CES until proven otherwise.
- Often have bilateral leg symptoms urinary urgency, and sexual dysfunction.
- Urinary retention is the most worrisome red flag.

Cauda Equina Syndrome

- Physical signs:
- saddle anaesthesia and decreased rectal tone.
- Bilateral severe sciatica should always ring alarm bells for this syndrome.



Cauda Equina Syndrome

- CES can have devastating, long-lasting neurologic consequences.
- Urinary retention indicates a poorer prognosis.
- Unfortunately, the time to surgical decompression may not influence patient outcome.

Steps in back pain assessment.

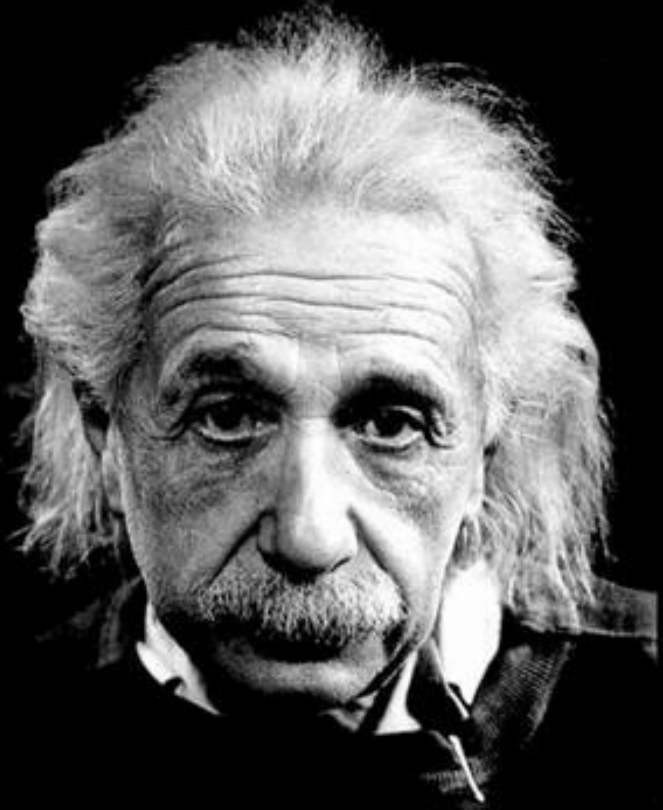
- Step one: Sinister vs. Benign: **good history**
- Step Two: Simple backache vs. radiculopathy.
Good neurological examination.
- Imaging data generally not required.



Simple backache, non-specific back pain, mechanical back pain.

“Everything should be made as simple as possible, but not simpler.”

Albert Einstein



The perturbation



Joint Dysfunction

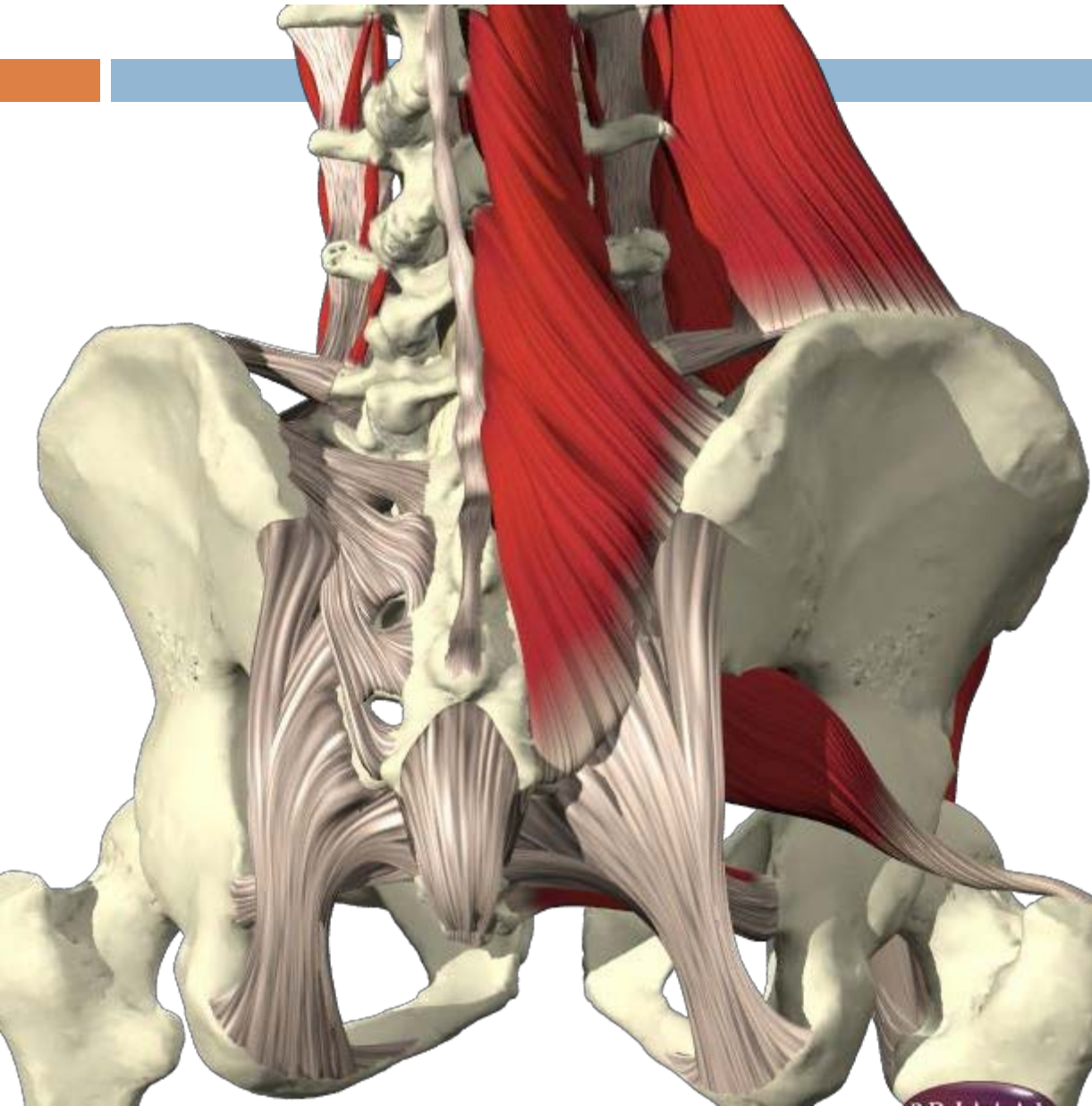
Spasm

Inflammation

Pain



Sacro-iliac joint.



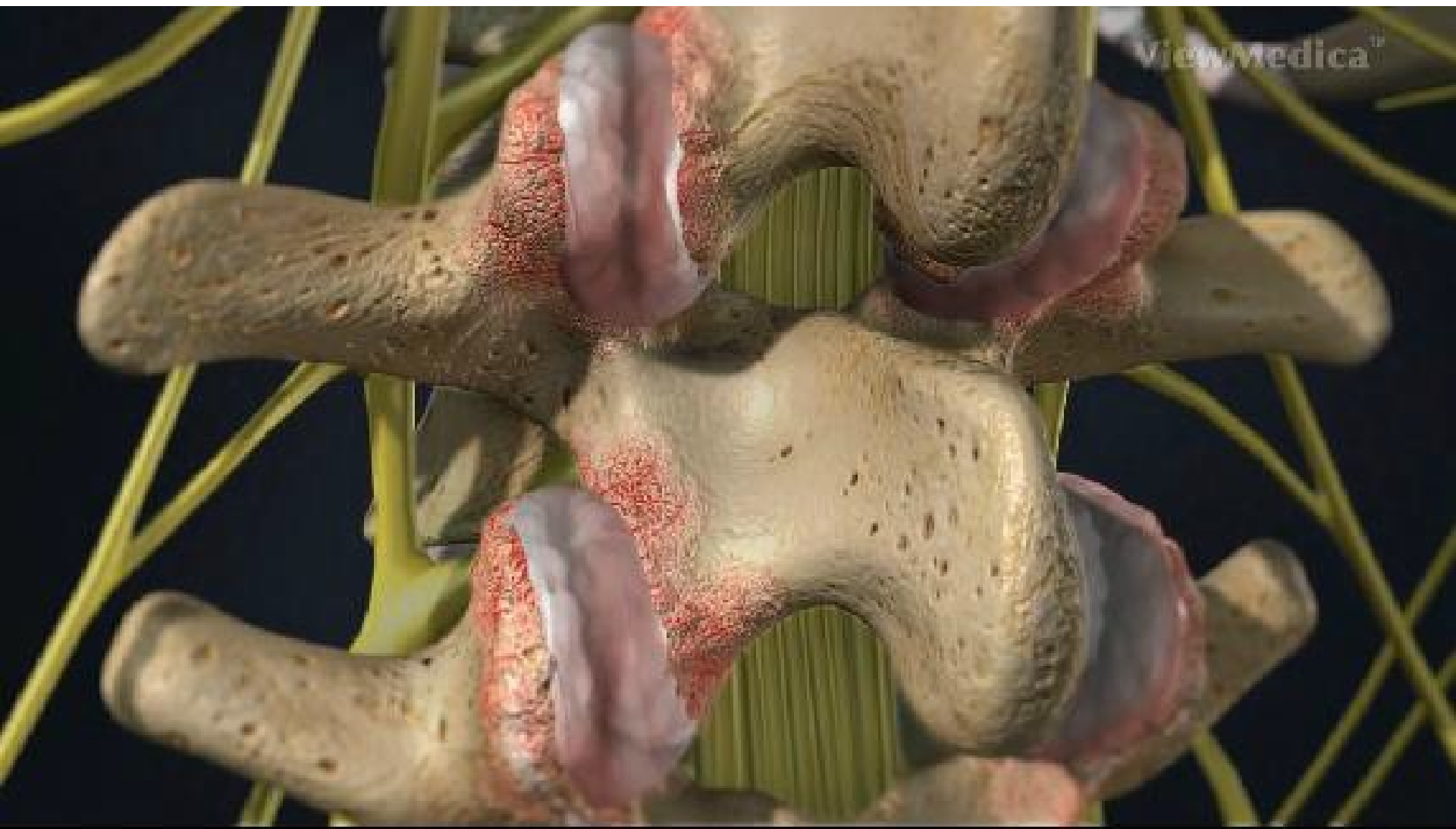
SI joint pain? 10%...one good sign.

- Can be a source of spinal pain. Dreyfuss Spine 1996.
- SI dysfunction vs. morphologic anomalies.
- Gillet's test, Patrick test and Gaenslen's test are unreliable and have poor inter-rater reliability. Carmichael JMPT 1987.
- Medical history does not yield reliable clues. Dreyfuss Spine 1996.
- Fortin Finger sign has been validated.

Hansen: Pain Physician 2007; 10:165-184

- The evidence for the specificity and validity of diagnostic sacroiliac joint injections is moderate.
- The evidence for accuracy of provocative maneuvers in diagnosis of sacroiliac joint pain is limited.
- The evidence for therapeutic intra-articular sacroiliac joint injections or neurotomy is limited.

Facet joint? 25%...no good signs.



The Zygapophyseal joint

- An important source of spinal pain. Schwarzer, Spine 1994.
- Pathology?
- No clinical features are pathognomonic of z-joint pain. Schwarzer, Spine 1994.
- 16-41% of chronic lumbar spine pain. [Pain Physician.](#) 2015 Jul-Aug;18(4):E497-533. [Boswell MV](#)
- 50% of chronic whiplash pain. Lord, Spine 1996.

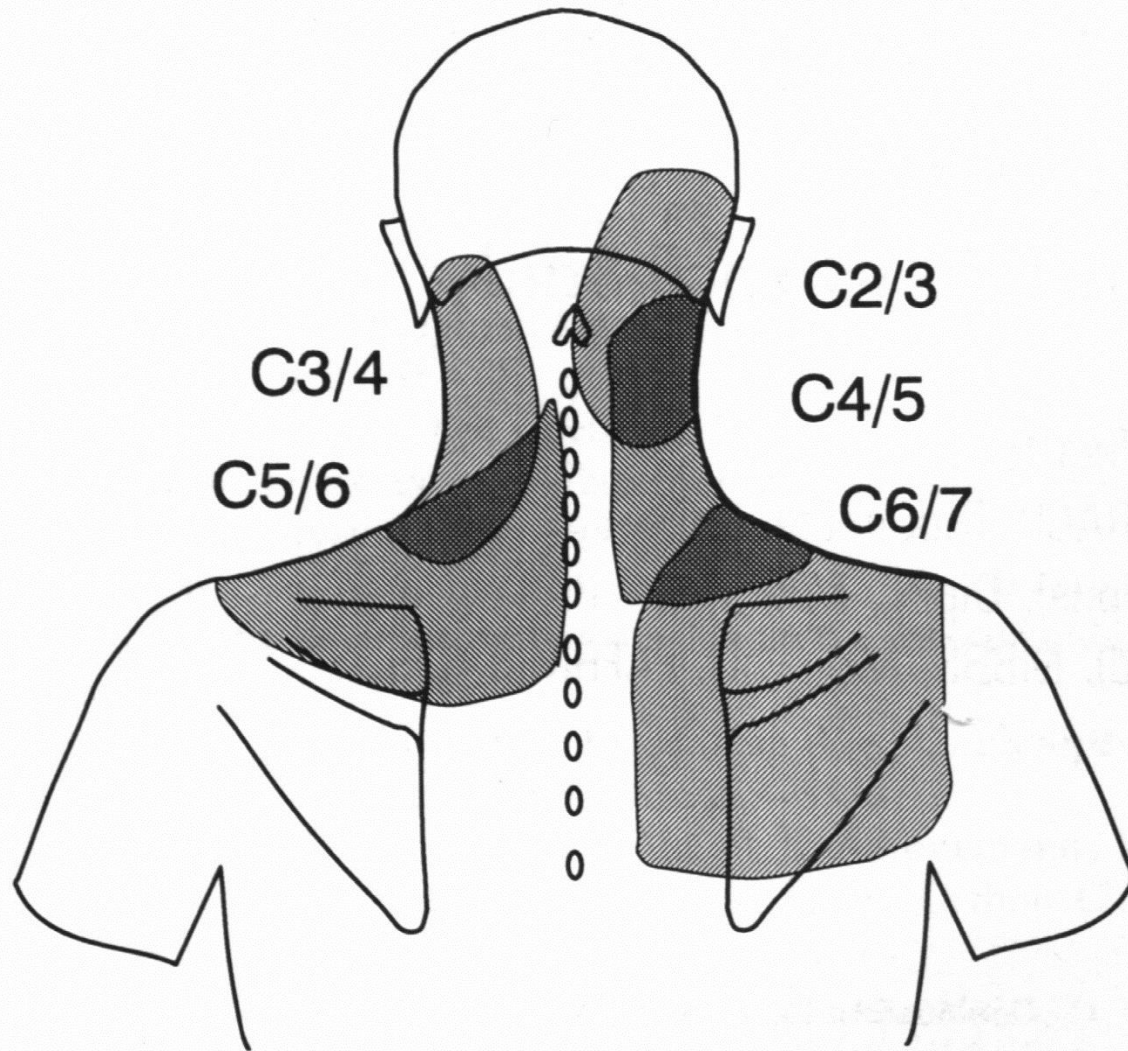
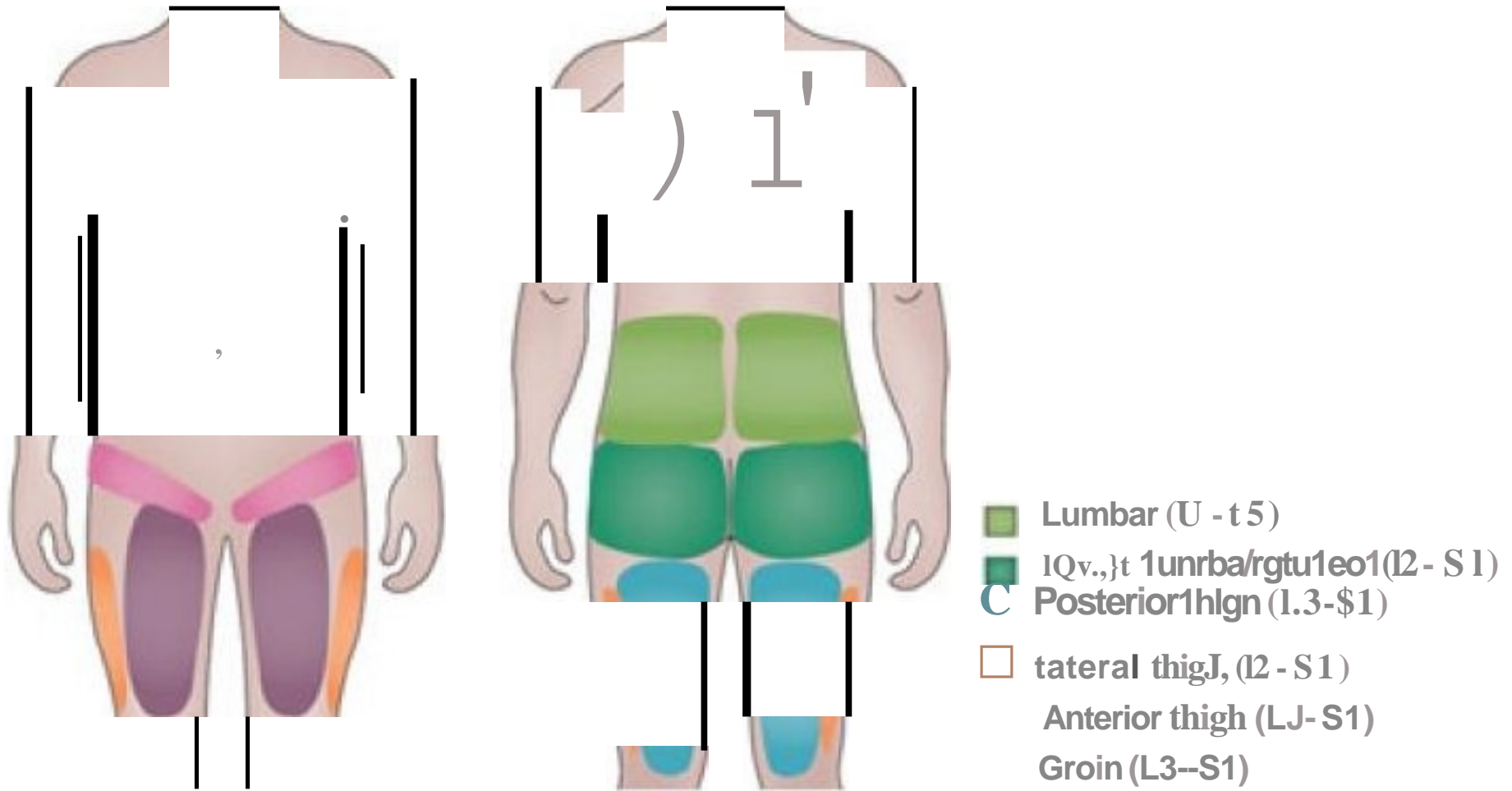


Figure 1. Maps showing the typical distribution of pain referred from each of the cervical zygapophysial joints when stimulated in normal volunteers (modified from Dwyer et al²⁰).



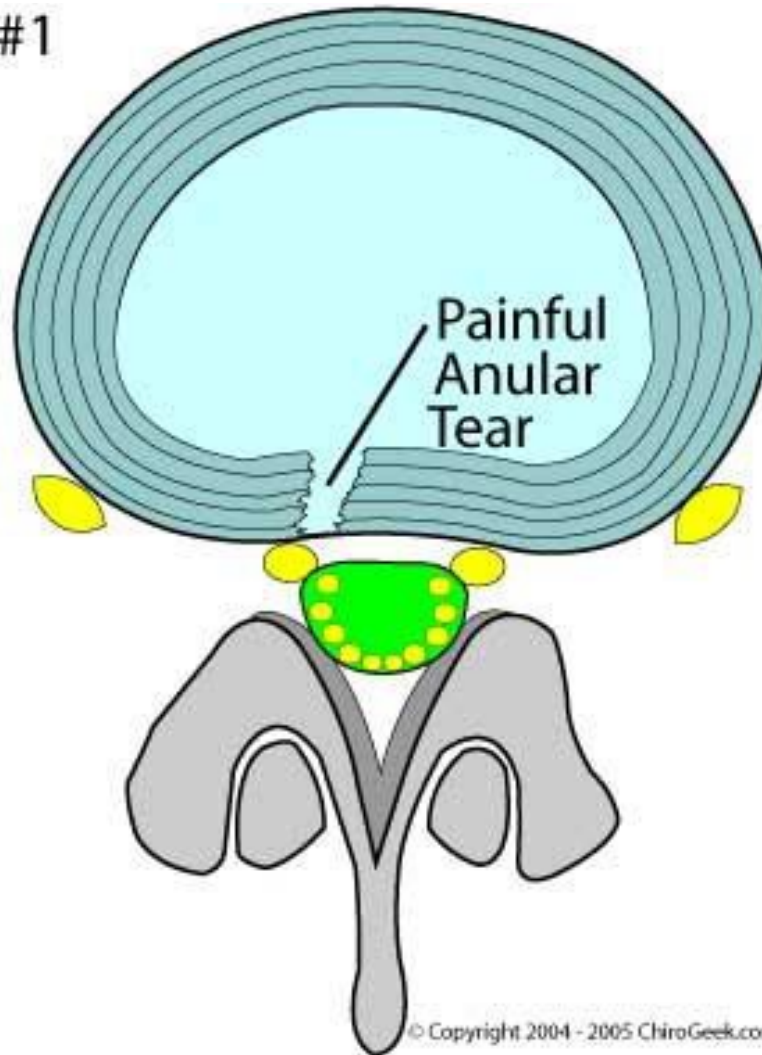
Damage and irritation of the lumbar joints will often cause pain to be felt into the hips and legs as well as the back itself. Which joints are affected will determine where the referred pain is felt.

Internal Disc Disruption: Most common...no good signs

- The most common known cause of lumbar spinal pain. Bogduk, Neurosurgery Quarterly 1996.
- Multi-level discography required.
- Single level discography not clinically meaningful
- Prevalence of internal disc disruption 39-42%.
[Pain Physician.](#) 2013 Apr;16(2 Suppl).
- Degenerative discs have more nociceptors.
Coppes, Spine 1997

Disc disruption...not visible on plain film or CT, some MRI

#1



What does this mean?

- Patients with normal plain x-rays, CT scans and MRI's can still have a clinically important disc lesion.
- Physical findings cannot indicate the probable pain generator (SI, facet, disc).



So why should I examine my patient Einstein?



Why examine your patient with low back pain?

- Sinister features.
- Radicular features.
- Non-spinal causes.
- Myelopathy.
- ???

****To find things a family doc can treat...simple functional deficits that have a reasonable probability of being related to the back*



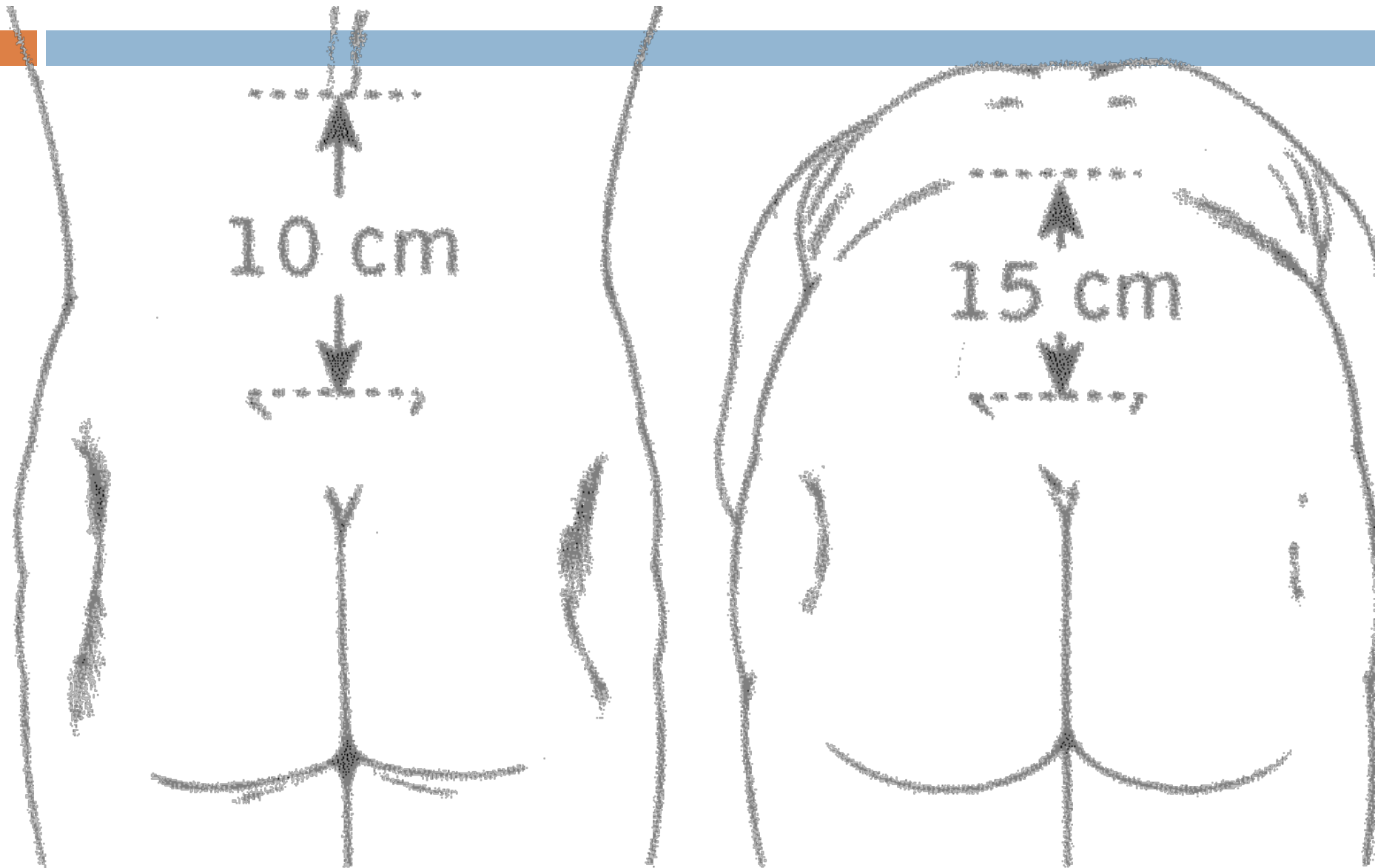
"I'm stumped.
We'll have to wait for
the autopsy."

Physical Examination:

6 Positions

- Standing, walking.
- Seated
- Supine
- Side Lying X 2
- Prone

Schober test

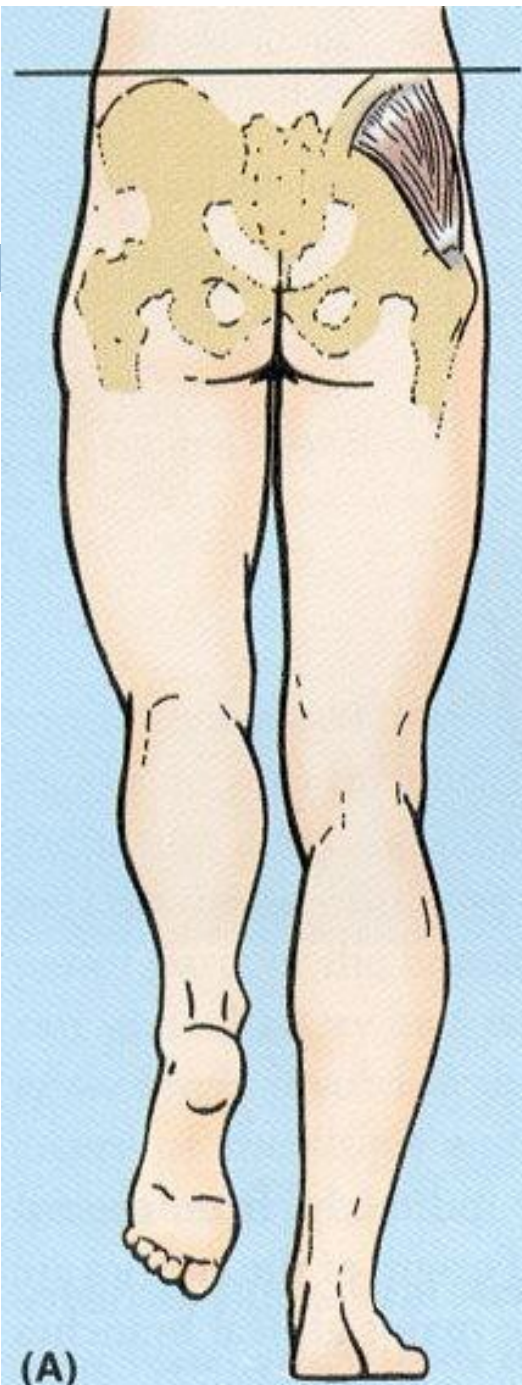


Normal spine

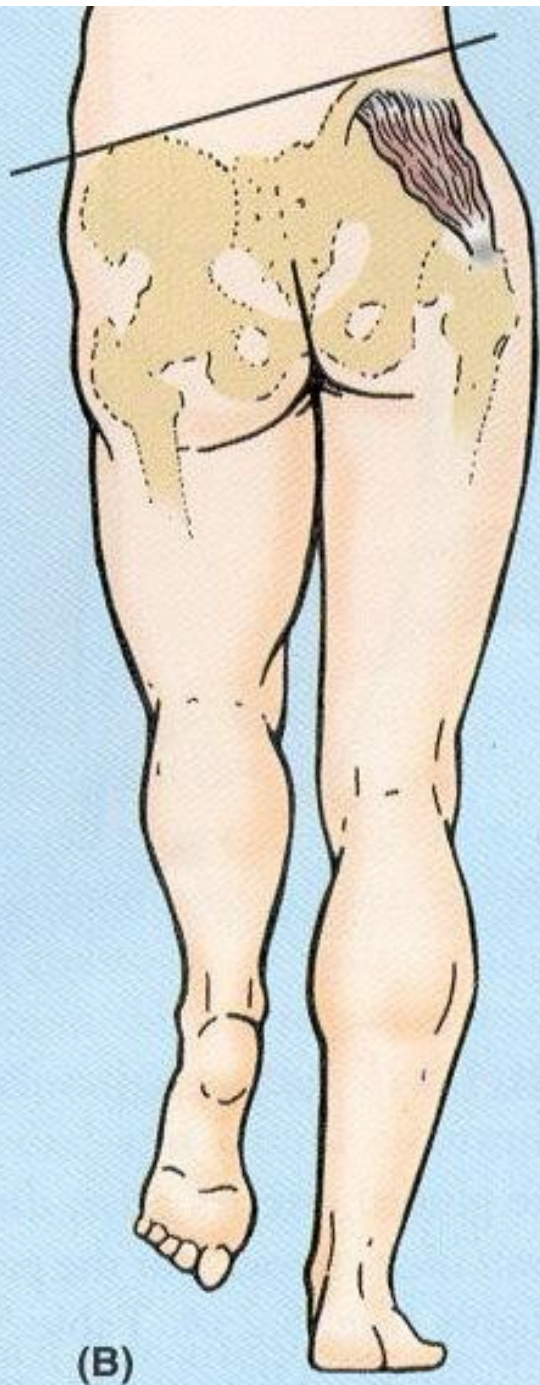


Deformity from scoliosis





(A)



(B)

Standing, walking

- Gait-foot drop, lumbar list, hip oa, myelopathic
- Stance
- Spinal alignment, asymmetry.
- Schober testing: True spinal flexion
- Hands to ground ? hypermobility
- Heel and toe walking. L4, L5 and S1
- Repeated unilateral calf raises. Best for S1
- Sacro-iliac palpation
- Muscle tone

Seated Position:



Copyright © 2013 Wolters Kluwer Health | Lippincott Williams & Wilkins

G

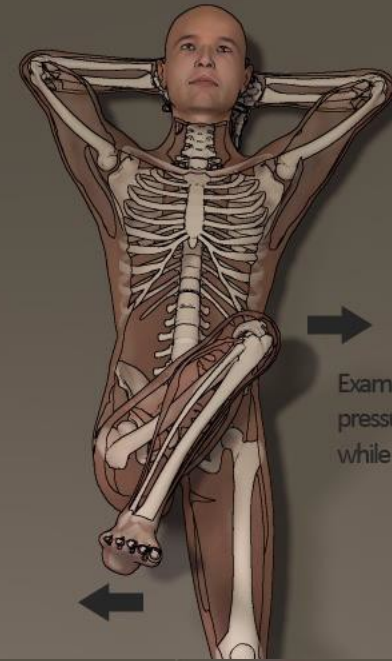
- Dural stretch, slump test.
- Deep tendon reflexes.
- Patellar, Hamstring, Ankle
- Sensory screen.
- Medial knee, medial ankle, first web space, lateral foot.
- Big toe extension. EHL power: L5
- Alignment compared with standing
- Clonus, plantar reflex.

Supine: Think Hip

- Leg length
- SLR-hamstring length.
- Hip ROM.
- FABER test
- FADIR test
- Muscle tone
- Hamstring reflex
- Bridge strength

FADIR Test

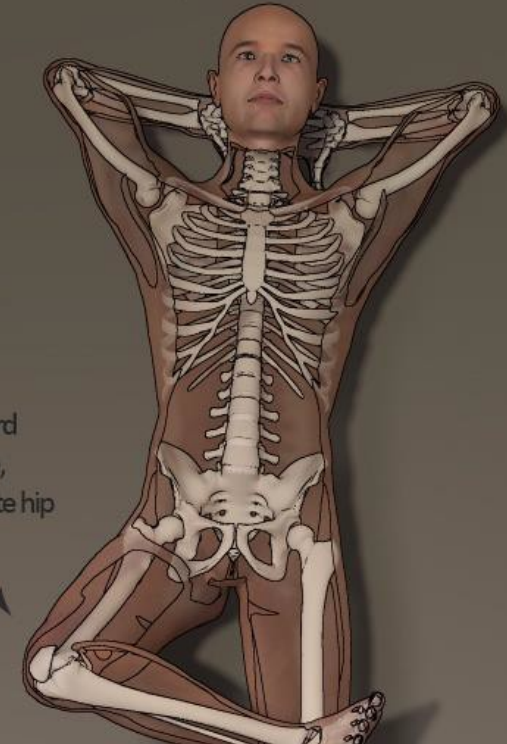
Flexion
ADduction
Internal Rotation



Examiner applies downward pressure at the flexed knee, while pulling the heel laterally

FABER Test

Flexion
ABduction
External Rotation



Examiner applies downward pressure at the flexed knee, while stabilizing the opposite hip

Bridge assessment for time and pain



A clinical tool for office assessment of lumbar spine stabilization endurance: prone and supine bridge maneuvers. [Am J Phys Med Rehabil.](#) 2007 May;86(5):380-6.

[Schellenberg KL](#)¹

- Mean duration: Plank: 73 secs
- Bridge 171 secs
- Patients with with back pain:
 - Plank 28 sec
 - Bridge 77 secs.
- Good way to motivate compliance of exercise, simple primary care recommendations.

Side Lying X 2

- Careful digital palpation of muscle
- QL, Gluteus medius, TFL, small hip external rotators.
- SI palpation.
- Fortin Finger sign
- Hip abductor strength

Palpation of quadratus lumborum



Hip abductor strength



Please tell my colleagues to stop making fun of me....

- [Eur Spine J.](#) 2015 May 26. [Epub ahead of print]
- **Prevalence of gluteus medius weakness in people with chronic low back pain compared to healthy controls.**
- [Cooper NA](#)¹,



Prone Examination

- Muscle Tone compared with standing.
- Alignment compared with standing.
- SI palpation
- Segmental assessment
- Hip extensor strength
- Femoral stretch.
- Yeoman test-hip flexor length, SI joint and femoral radiculopathy.

The steps of back pain evaluation

- Sinister versus benign.
- Mechanical versus radicular.
- Anything to guide simple physical interventions?
- Is patient at risk for chronic disabling low back pain?**

Most guidelines emphasize early psycho-social screening.



*The assessment should include exploration of **psychosocial risk factors**, which predict risk for chronic disabling back pain (strong recommendation, moderate-quality evidence).*

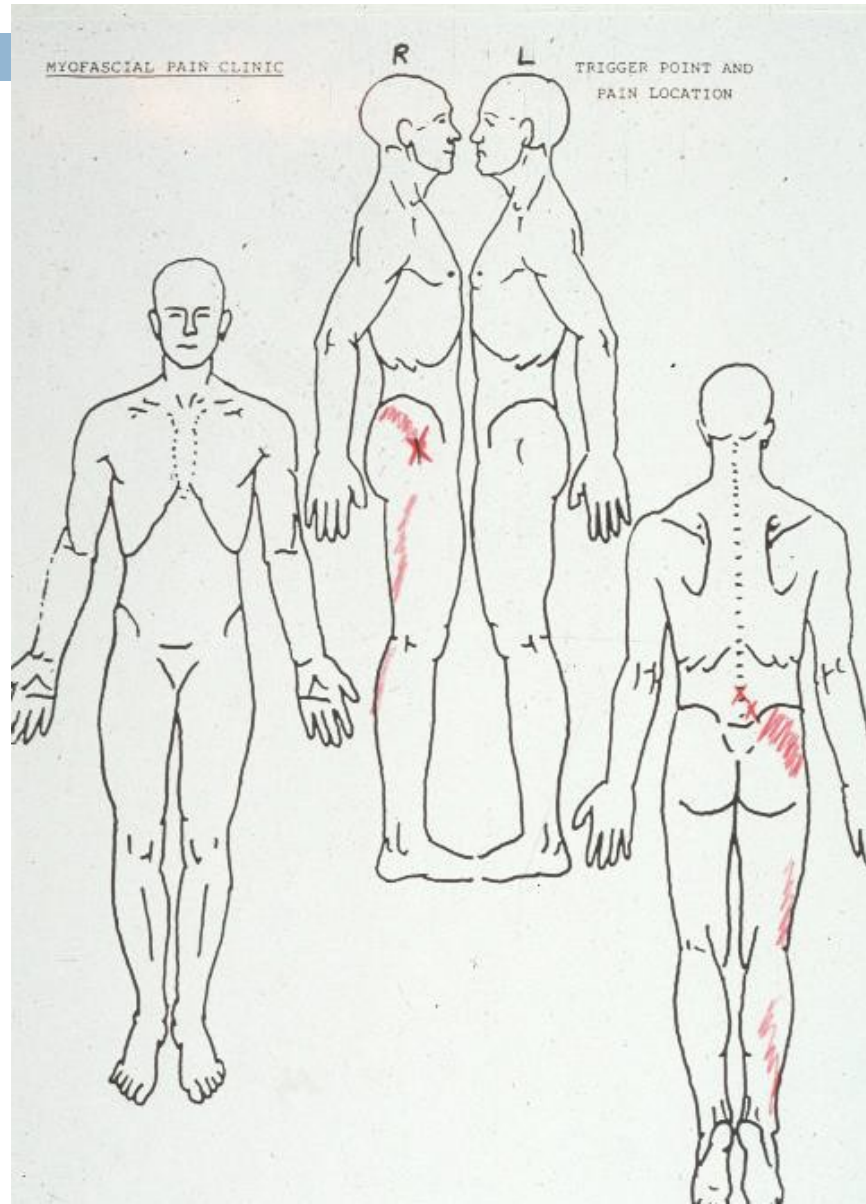
Yellow flag assessment: The best predictor of trouble.

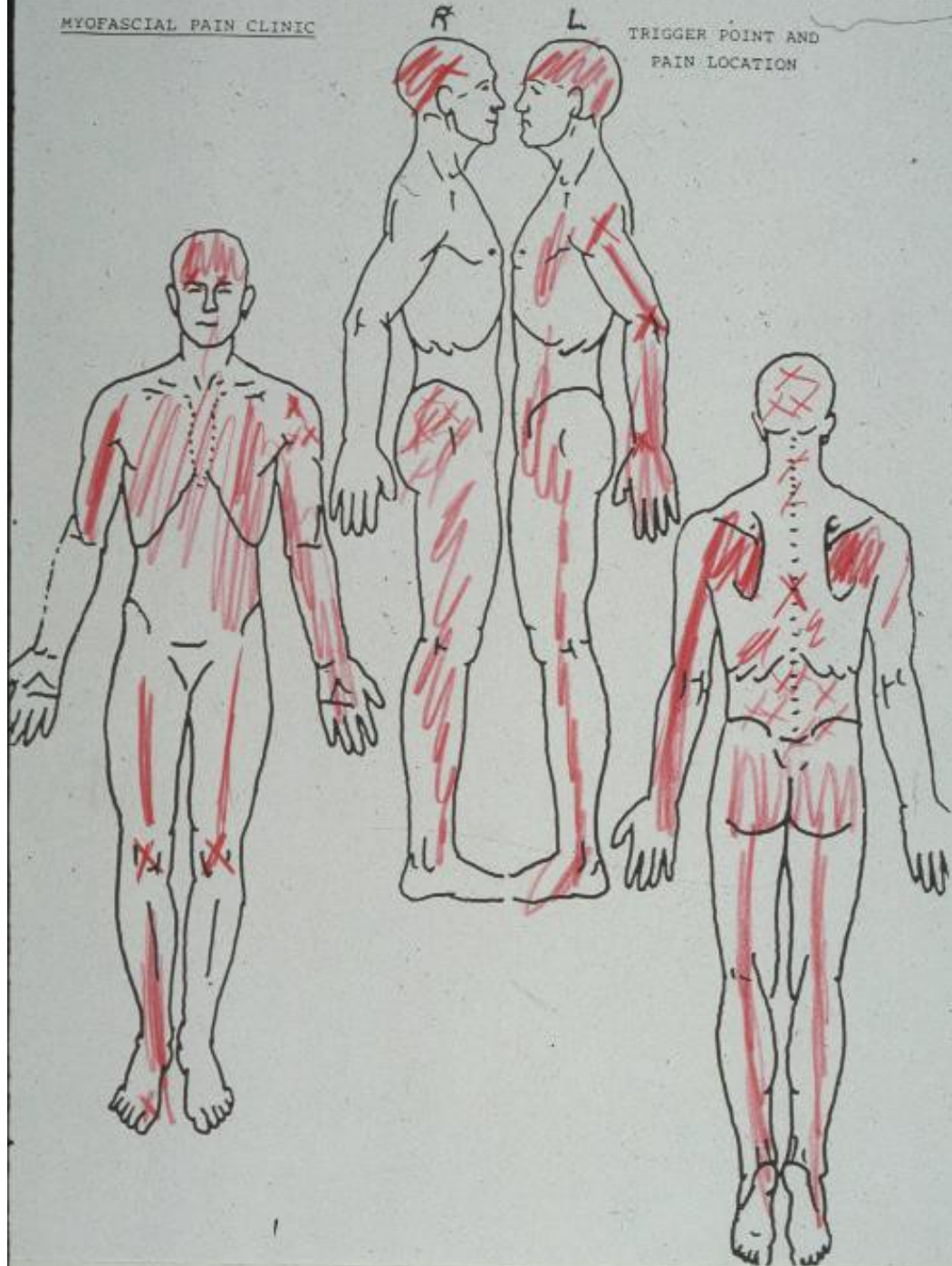
- Yellow flags from the patients history best predictors of chronicity.
- Most physical findings do not influence prognosis.
- [Michael K. Nicholas](#), etal and the “Decade of the Flags” Working Group *Early Identification and Management of Psychological Risk Factors (“Yellow Flags”) in Patients With Low Back Pain: A Reappraisal. Physical Therapy May 2011 vol. 91 no. 5 737-753.*

The Yellow flag

- A psycho-social factor which worsens prognosis.
- Risks for chronicity and worklessness
- Yellow not **orange flags...** which represent more serious psychiatric disorders.
- Depression, bipolar disorder, personality disorders, current substance use and or involvement in legal proceedings are orange flags.

Simple tools predict chronicity.





Predictors of poor outcome

- Fear-avoidance beliefs and catastrophic thoughts, were strongly associated with the development of disability following onset of pain.
- Passive coping methods, such as waiting for someone else to help or resting, were associated with poor outcomes.
- Kinesiophobia.

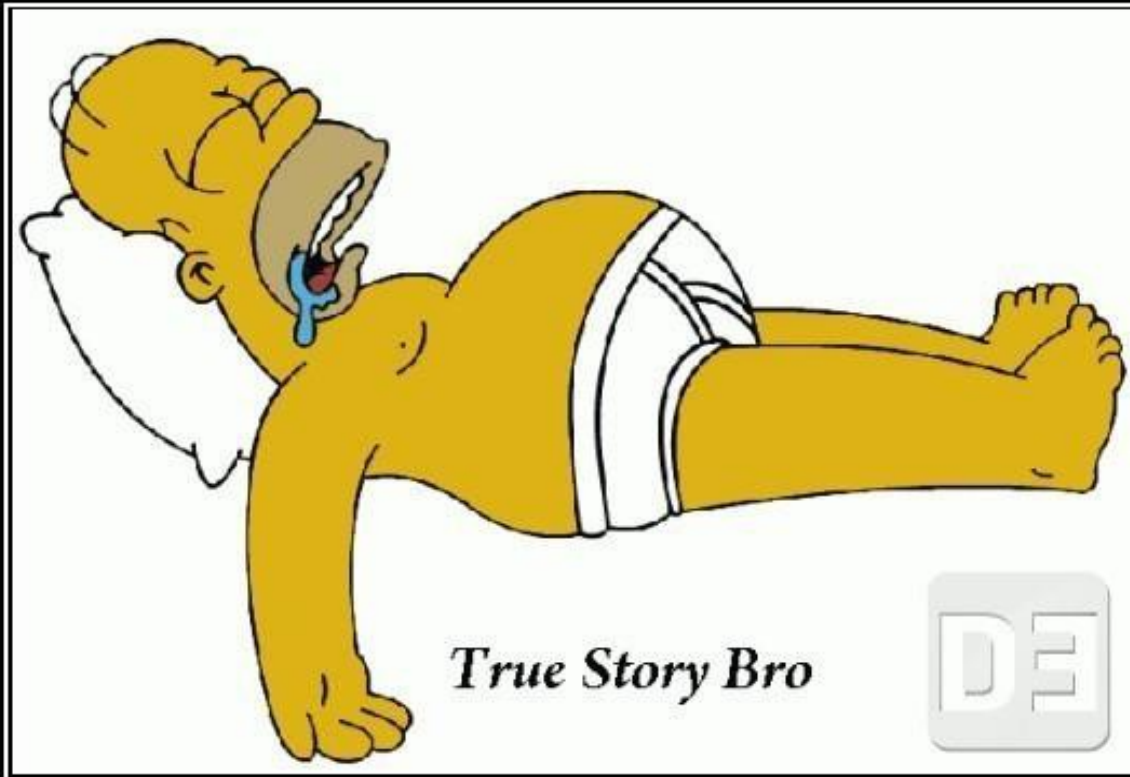
Table 1.

Summary of Different Types of Flags

Flag	Nature	Examples
Red	Signs of serious pathology	Cauda equina syndrome, fracture, tumor
Orange	Psychiatric symptoms	Clinical depression, personality disorder
Yellow	Beliefs, appraisals, and judgments	Unhelpful beliefs about pain: indication of injury as uncontrollable or likely to worsen Expectations of poor treatment outcome, delayed return to work
	Emotional responses	Distress not meeting criteria for diagnosis of mental disorder Worry, fears, anxiety
	Pain behavior (including pain coping strategies)	Avoidance of activities due to expectations of pain and possible reinjury Over-reliance on passive treatments (hot packs, cold packs, analgesics)
Blue	Perceptions about the relationship between work and health	Belief that work is too onerous and likely to cause further injury Belief that workplace supervisor and workmates are unsupportive
Black	System or contextual obstacles	Legislation restricting options for return to work Conflict with insurance staff over injury claim Overly solicitous family and health care providers Heavy work, with little opportunity to modify duties

Michael K. Nicholas et al. *PHYS THER* 2011;91:737-753

Sleep and depression important



THE PARADOX OF SLEEPING UNTIL LUNCH

The more you sleep, the more sleepy you'll wake up

Special Populations.

- Active adolescents-pars inter-articularis stress fracture.
- Growing patients-scoliosis.
- Older populations-osteoporotic compression fractures--kyphoplasty.
- Immune Compromised
- Post surgical.

**Sitting is the
new smoking.**



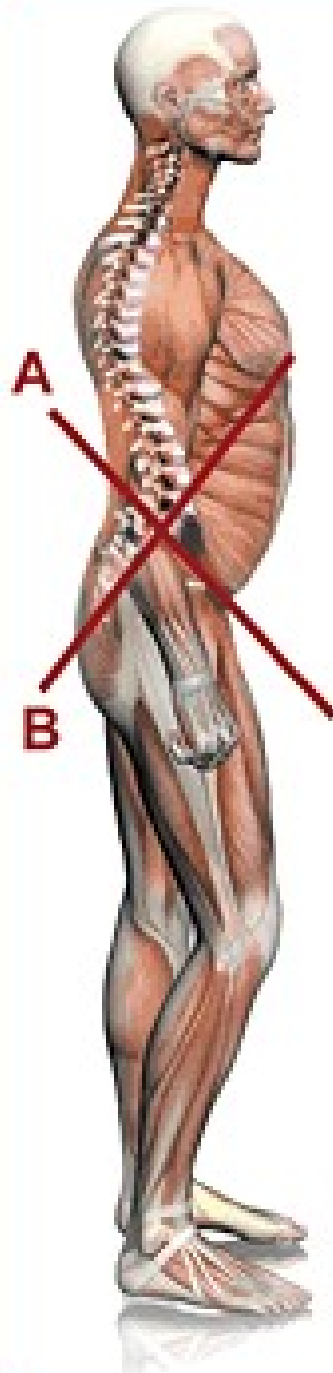
Inactivity is putting your bones at risk.

The Muscle Balance Paradigm

Janda, Rehabilitation of the Spine

- Weak, inhibited muscles
- Short, hypertonic muscles
- Crossed pelvis syndrome or distal crossed syndrome.
- Short, hypertonic psoas.
- Weak, inhibited gluteus maximus.
- Short hypertonic hip adductors.
- Weak inhibited hip abductors.
- Short, overactive synergist-piriformis.

Lower Crossed Syndrome



A = Tight Line: Observe how tight line (A) traverses the lumbar erector spinae muscles and iliopsoas. Neurologically shortened iliopsoas tissues anteriorly tilt the pelvic bowl creating excessive lumbar lordosis.

B = Weak Line: Connecting the abdominals and gluteals, weak line B permits the lower crossed asymmetry. Core support is lost as the stretch-weakened rectus and transversus abdominal muscles are overpowered by the pull of the strong iliopsoas and erector spinae groups.

Typical Muscle Imbalances in the LOWER CROSSED SYNDROME

BOX A

TIGHT, FACILITATED

Iliopsoas
Rectus Femoris
Hamstrings
Erector Spinae
Tensor Fascia Lata
Thigh Adductors
Piriformis
Quadratus Lumborum
Gastroc/Soleus

BOX B

WEAK, INHIBITED

Rectus Abdominis
Transversus Abdominis
Obliques
Gluteus Maximus
Gluteus Medius/Minimus
Vastus Lateralis
Vastus Medialis
Tibialis Anterior/Posterior
Peroneus Longus

TIGHT
Trapezius
levator scapula

WEAK
Deep Neck
Flexors

WEAK
Rhomboids
Serratus Anterior

TIGHT
Pectorals

TIGHT
Erector Spinae

WEAK
abdominals

WEAK
Gluteus
Maximus

TIGHT
Iliopsoas

UPPER
CROSSED

LOWER
CROSSED



Spinal Pain Diagnostic Triage.

- History for the sinister-Red flags
- Consider the sufferer-Yellow flags, Orange flags
- 6 position exam
- Range of motion: Schober's test
- Efficient neurologic screen
- Dural tension signs
- Hip and SI examination
- Muscle Balance

Recommendation 5: First step in treatment is to the patient what to expect.

- Clinicians should provide patients with evidence-based information on low back pain with regard to their expected course, advise patients to remain active, and provide information about effective self-care options (strong recommendation, moderate-quality evidence).
- *Here's what we can expect....*

thirtysomething



Expected course of low back pain

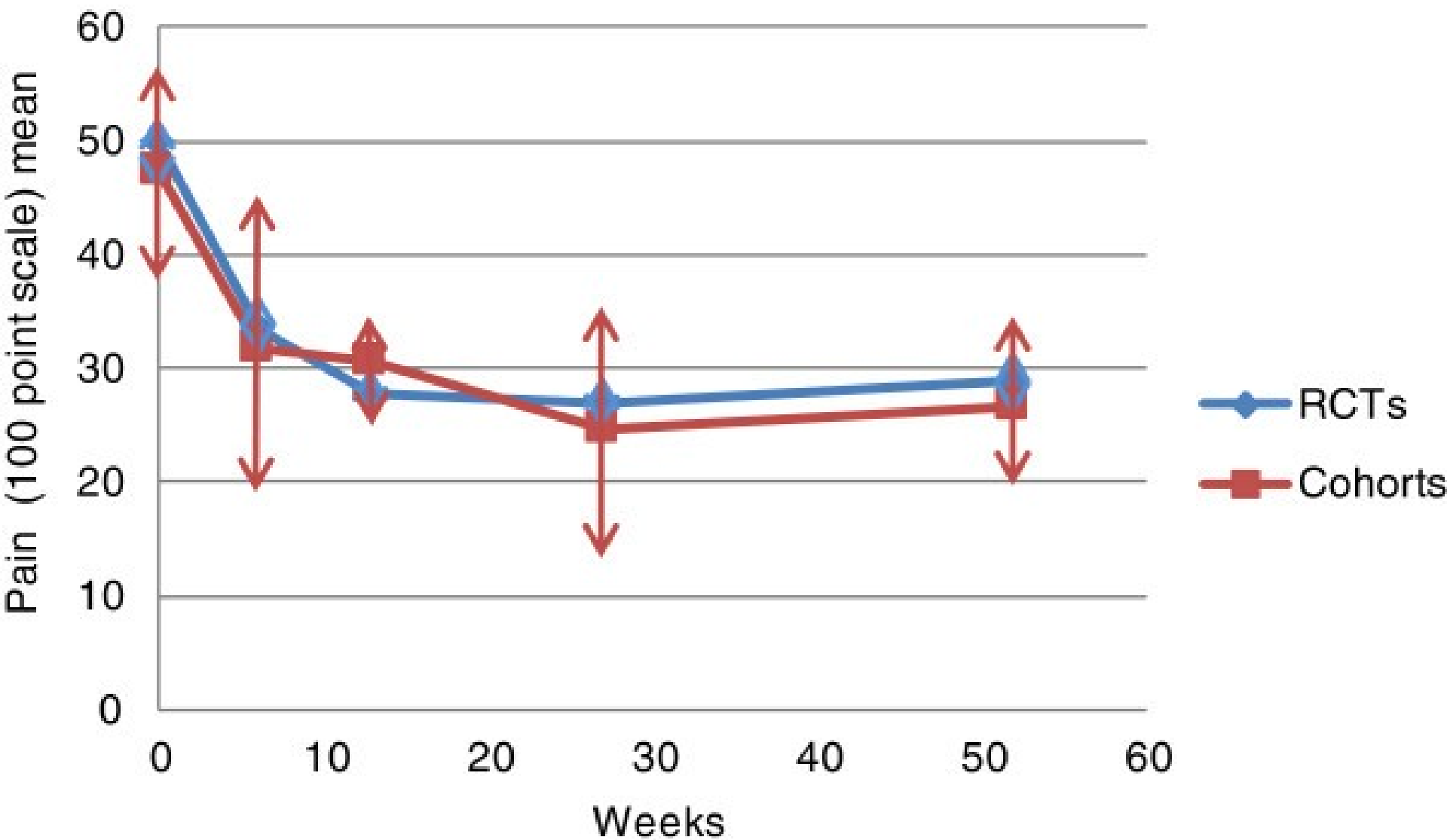
- [Ann Rheum Dis.](#) 1998 Jan;57(1):13-9.
- **On the course of low back pain in general practice: a one year follow up study.**
- [van den Hoogen HJ¹, Koes BW, van Eijk JT, Bouter LM, Devillé W.](#)

Of 45 patients...

- 35% symptomatic at 12 weeks, 10% at one year.
 - *This could last a while but its best to stay active.*
- Pain and the disability diminish quickly after initial visit, stabilize at a lower level but low back pain did not disappear completely.
 - *You should be able to get back to all activities soon, even with some back pain.*
- 75% annual relapse rate.
 - *Back pain like this has a tendency to recur so you have to do your exercises!*
- The median duration to relapse was six weeks usually less severe than the first episode.

- **The clinical course of low back pain: a meta-analysis comparing outcomes in randomised clinical trials (RCTs) and observational studies**
- Majid Artus¹[Email author](#), BMC Musculoskeletal Disorders 2014 **15**:68

Pooled pain data




Recommendation 6:

Clinicians should consider the use of medications with proven benefits in conjunction with back care information and self-care.

(strong recommendation, moderate- quality evidence).

For most patients, first-line medication options are acetaminophen or nonsteroidal anti-inflammatory drugs.

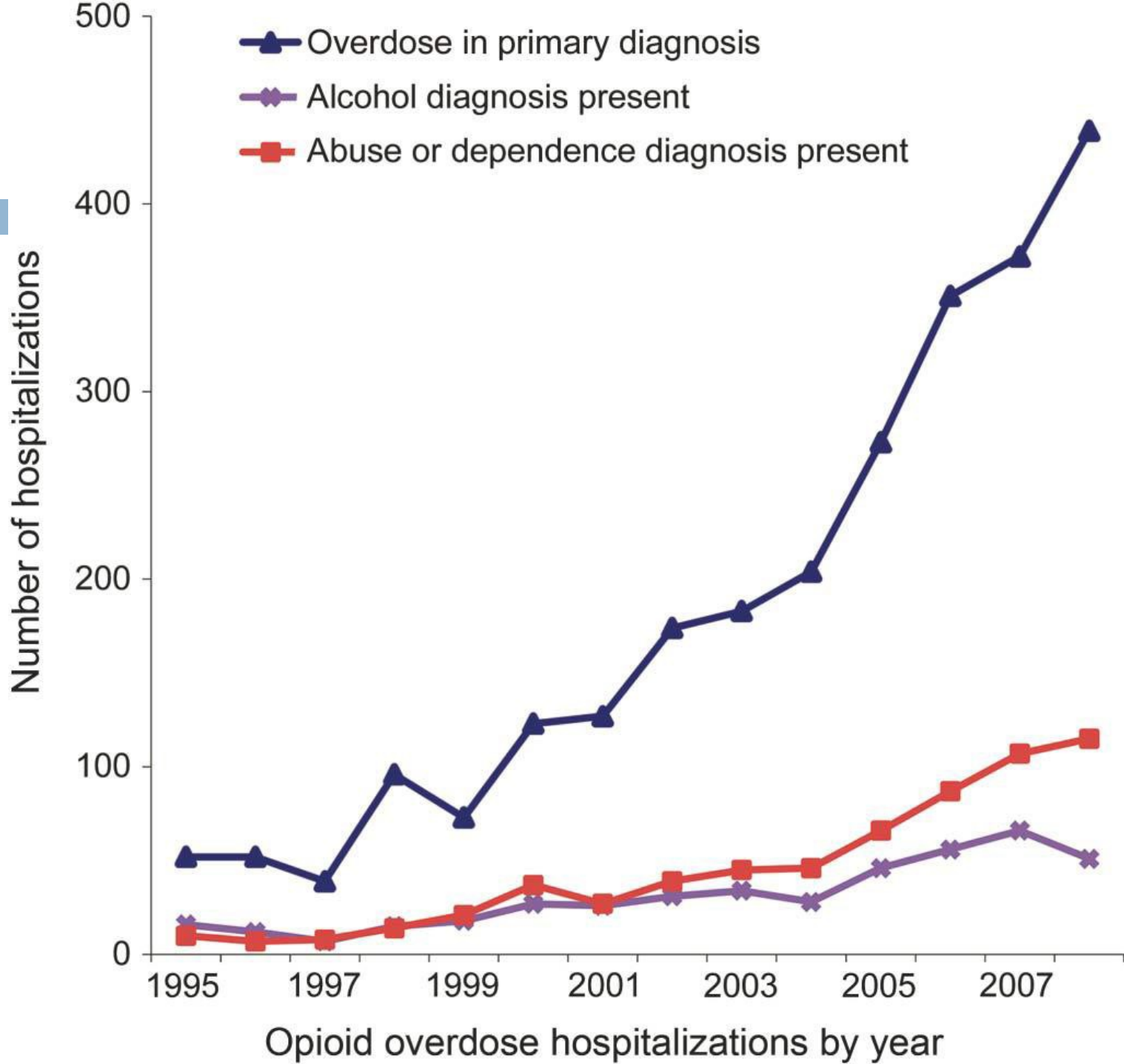
Gabapentin, Lyrica, prednisone for radiculopathy

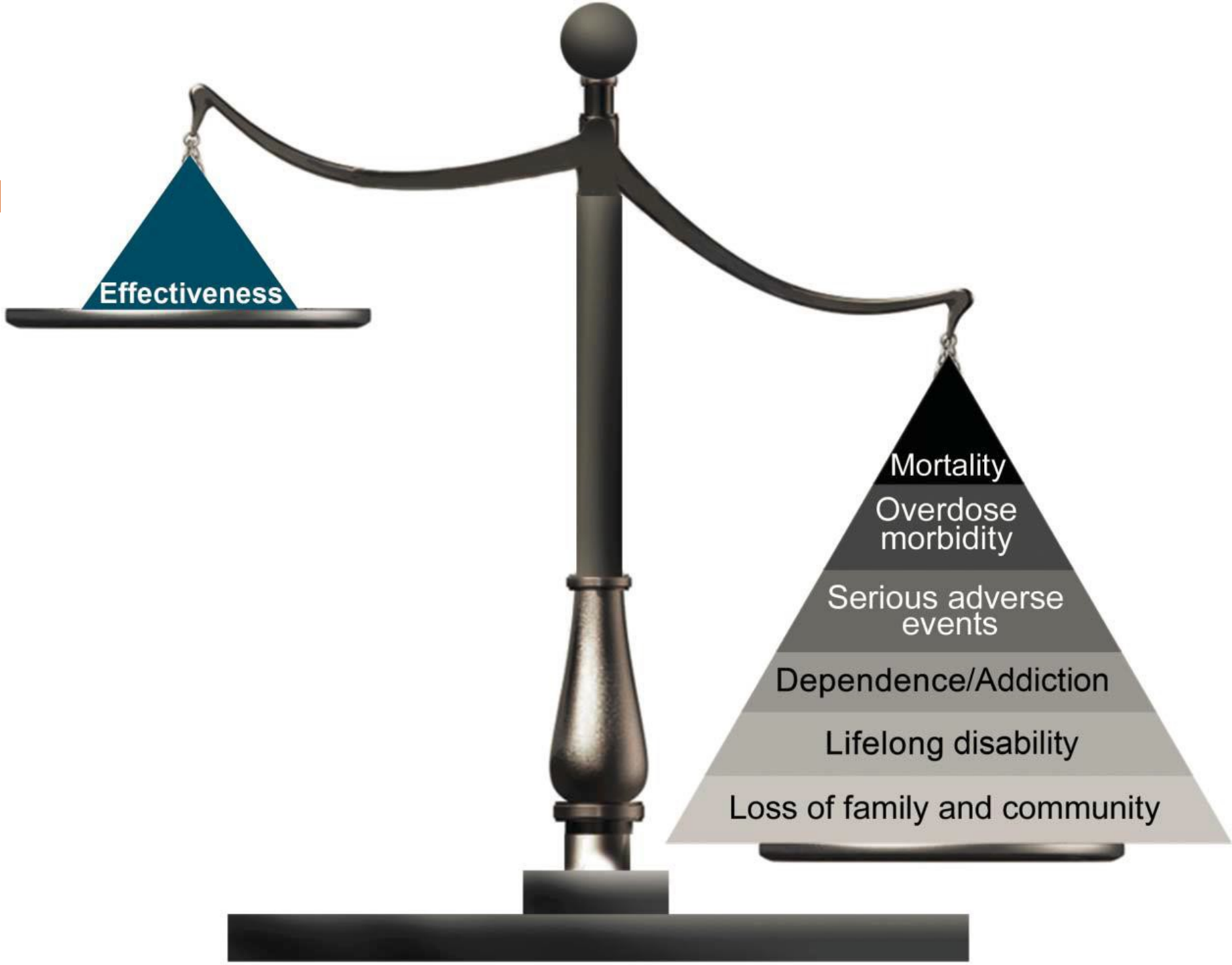


Opioids for chronic noncancer pain
A position paper of the American
Academy of Neurology
ABSTRACT. Neurology, June 2014

AAN opiates

- THE POOR SAFETY PROFILE OF OPIOIDS:
EMERGENCE OF A NATIONAL EPIDEMIC OF
MORBIDITY AND MORTALITY
- The risks for chronic opioid therapy for some chronic conditions such as headache, fibromyalgia, and **chronic low back pain** likely outweigh the benefits.





Effectiveness

Mortality

Overdose morbidity

Serious adverse events

Dependence/Addiction

Lifelong disability

Loss of family and community

Recommendation 7: For those not improving



Patient not improving...

- Clinicians should consider the addition of non-pharmacologic therapy acute low back pain
 - for chronic low back pain, intensive interdisciplinary rehabilitation, exercise therapy, acupuncture, massage therapy, spinal manipulation, yoga, cognitive-behavioral therapy, or progressive relaxation (weak recommendation, moderate-quality evidence).
 - Mostly movement based therapies with clinicians who are not afraid to push a little.

Practical spinal rehabilitation



Cat, Camel McGill 2002



Bird dog



Bridge with abdominal activation (active bracing)



Prone bridge/front plank



Standing core work



Side plank, side bridge

Level 1



Level 2



Level 3



Crescent Moon stretch for Quadratus lumborum



Figure 4 stretch for gluteals, hip ER





How are we doing so far...

- Don't need the imaging.
- Don't need the injections.
- Don't use opiates.
- Don't's do fusions.

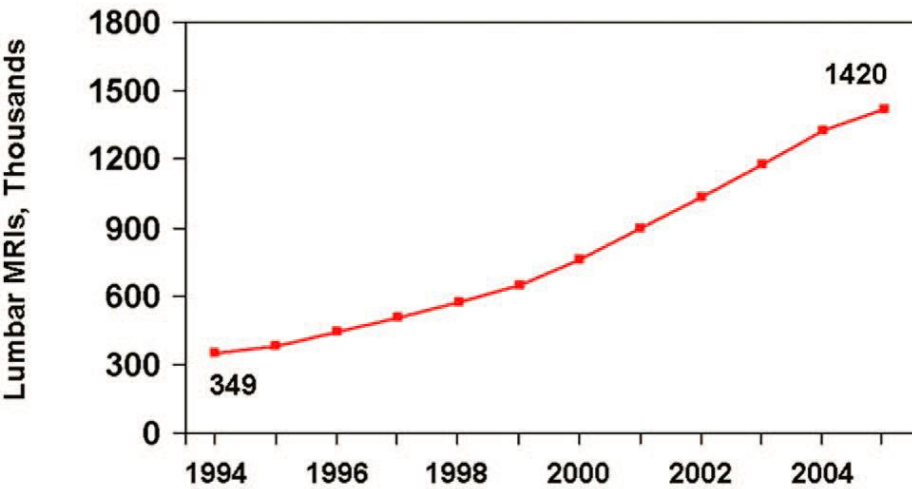
THEY'RE MORE LIKE GUIDELINES

THAN ACTUAL RULES

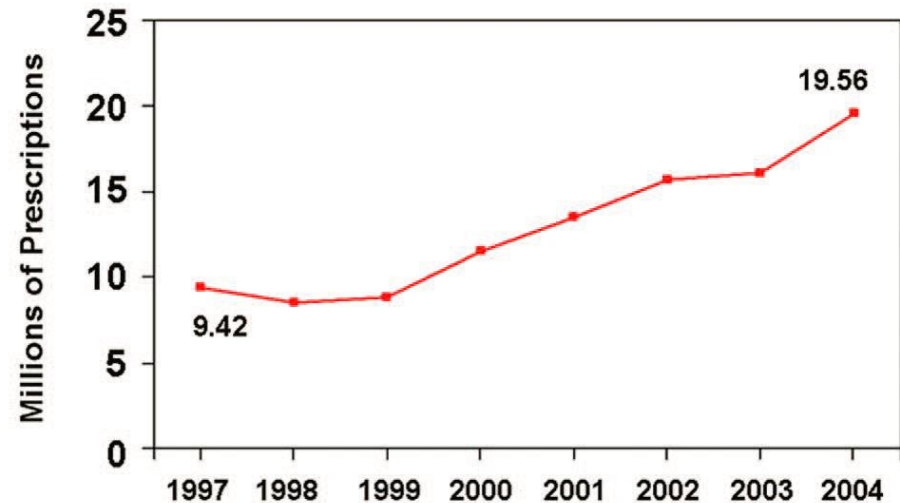
400% increase in MRI, opioids, injections and fusions despite guidelines.

Deyo et al Overtreating Chronic Back Pain: Time to Back Off? *J Am Board Fam Med* 2009

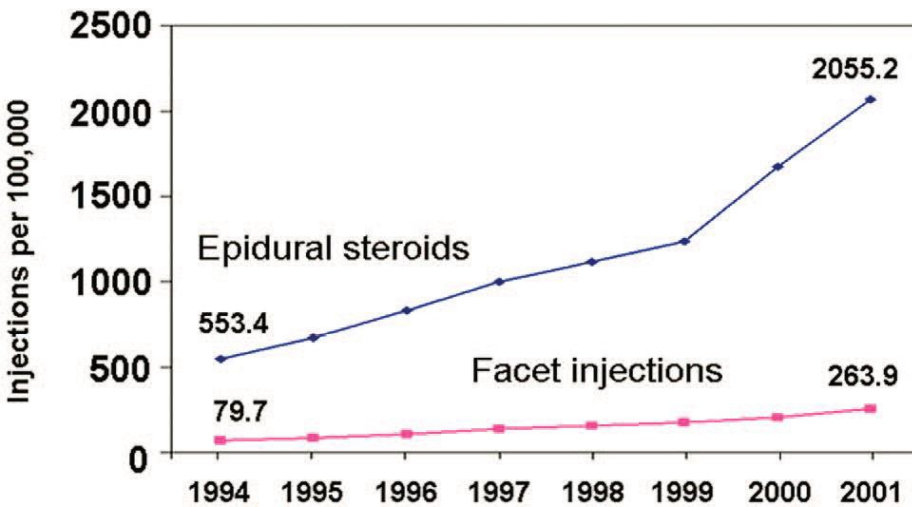
a Lumbar spine MR imaging, Medicare



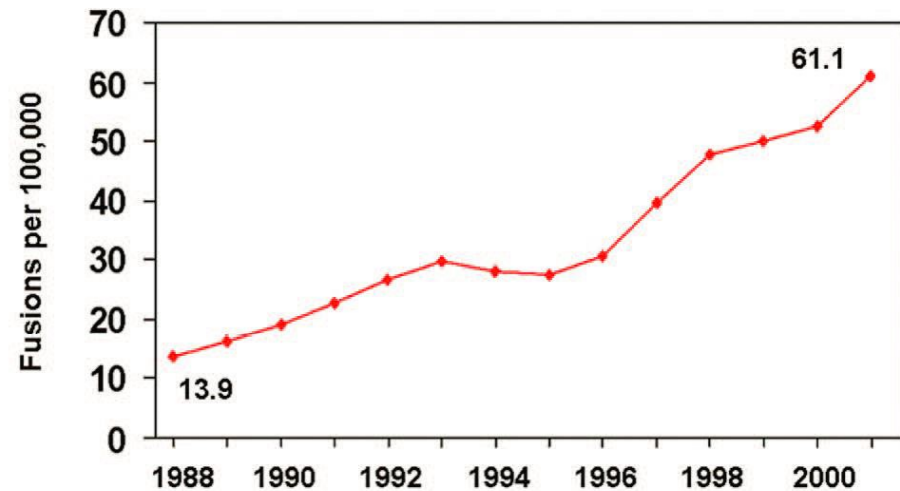
b Opioid analgesic prescriptions for spine problems



c Lumbosacral injection rates, Medicare



d Lumbar fusion rates, degenerative spine conditions



Conclusions: Diagnostic Triage

- Rule out the sinister.
- Consider the sufferer.
- Examine for the radicular.
- Image for the non-resolving radicular or sinister.
- Appreciate the art of labels for simple backache.