

Imaging Back Pain

Choosing Wisely
Presentation Prepped by EBM team with U of A & ACFP

Choose Wisely Family Medicine Says

- Don't do imaging for lower-back pain unless red flags are present.
 - Red flags include, but are not limited to, severe or progressive neurological deficits or when serious underlying conditions such as osteomyelitis are suspected. Imaging of the lower spine before six weeks does not improve outcomes.
- ER, spine surgery, radiology & occupational medicine all similar.
 - Acute low back pain is a common health problem affecting between 50- 90% of people over the course of a lifetime with less than 2% of cases representing potentially serious conditions requiring surgical or medical intervention.

What do Normal Backs Look Like

33 studies (3110 pts, no Hx of any back pain) of CT/MRI findings.

Table 2: Age-specific prevalence estimates of degenerative spine imaging findings in asymptomatic patients^a

Imaging Finding	Age (yr)						
	20	30	40	50	60	70	80
Disk degeneration	37%	52%	68%	80%	88%	93%	96%
Disk signal loss	17%	33%	54%	73%	86%	94%	97%
Disk height loss	24%	34%	45%	56%	67%	76%	84%
Disk bulge	30%	40%	50%	60%	69%	77%	84%
Disk protrusion	29%	31%	33%	36%	38%	40%	43%
Annular fissure	19%	20%	22%	23%	25%	27%	29%
Facet degeneration	4%	9%	18%	32%	50%	69%	83%
Spondylolisthesis	3%	5%	8%	14%	23%	35%	50%

^a Prevalence rates estimated with a generalized linear mixed-effects model for the age-specific prevalence estimate (binomial outcome) clustering on study and adjusting for the midpoint of each reported age interval of the study.

AJNR Am J Neuroradiol. 2015 Apr;36(4):811-6

What back findings are associated with pain

- **Sys Rev: Back Pain and X-ray findings (35 studies)**
 - Degenerative: 9/12 studies positive, Odds Ratio 1.6-3.3
 - Example OR 2 = 72% with back pain had vs 56% without pain
 - Other studies similar (e.g. DDD 57% symptomatic vs 34%)²
 - Spondylolysis/lithesis, etc: Mostly or all negative
- **Sys Rev: Back Pain & X-ray (28 studies, 26107 pts)³**
 - Disc space narrowing: OR 1.47 (1.36-1.58)
 - E.g. OR 1.53 is 56% of LBP have while 44% of normal have
 - Osteophyte: OR 1.20 (1.06-1.37)
 - Spondylolisthesis: OR 1.12 (1.03-1.23); similar Spondylosis: OR 1.32
 - Facet Joint OA: 1.07 (0.63-1.80): 59% LBP have vs 57% normal
- **Bottom-Line: No findings are reliable by any stretch.**

Spine. 1997;22:427-34. 2) Spine J. 2013;13:657-74. 3) Semin Arthritis Rheum. 2015 ;44:571-85.

What happens to “bad” discs?

- 9 studies (540 disc pts) on MRI/CT x4-19 months
 - For some numbers low
 - Lowest = complete recovery from protrusion: only 7 patients
- **Bottom-Line:** 40-96% of more serious lesions get better

	Improvement	Resolution
Bulge	13%	11%
Protrusion	41%	0%
Extrusion	70%	15%
Sequestration	96%	43%
	p<0.001	P<0.001

Clin Rehabil. 2015 Feb;29(2):184-95.

Prognosis of Sciatica

	Positive Association	No Association
Older Age	0	6
Gender	0	5
Past Sciatica	0	3
Smoking	0	4
Higher BMI	0	3
Longer Sx	1	3
Higher Sx severity	1	2
Neuro deficit	1	3
Nerve root Tension	1	2
Level of Disc Herniation	0	5
Smaller Disc Prolapse	1*	3
Heaviness of Work	0	3

- Sys rev of 8 prognosis studies (4269 patients x 12 months)
 - What predicts recovery

- **Bottom-Line:** Nothing predicts recovery well.

* And bigger worse in another. BMC Musculoskeletal Disorders 2011,12:208

More Tests = Better Care

- Do more test equal better care?
 - In MI patients, Can Docs order 5x more tests than UK Docs, with same outcomes.¹
- Are we ordering tests based on the best evidence
 - No²
 - Example: In Alberta, family medicine residents order 3-6 inappropriate tests for each PHE visit³
 - Reasons: degree of specialization, geographic location, fear of litigation, & many more

1. J Clin Pathol.1986;39:803-7 2. Neth J Med. 2007;65:167-77. 3. Can Fam Physician. 2015;61:256-62.

But at least there's no harm,...

- What are the harms of tests
 - Direct: Radiation or phlebotomy pain
 - Anxiety or unwarranted reassurance.
 - Inconvenience and costs (work time, parking, etc)
 - Investigation cascade
 - Costs
 - And the law of unintended consequences.

“There must be something wrong”

- A 40 year old ♀ hospital cleaner is in concerned about her back pain for almost 10 weeks.
 - Her range motion is 50%,
 - tender in paraspinal muscles around L3-5.
 - occasional radiation into buttock & upper legs.
 - Her neuro exam is normal
- She wants to know what is causing this!
- She asks “Don’t I need a scan?”

Studies offering early Imaging

- Sys Rev: 6 trials (1804 patients): MRI/CT 2 trials & X-ray 4 trails. 0-44% had sciatica
- Relatively good quality but lots of heterogeneity (except pain).
- Short term & Long-term outcomes of pain, function, quality of life, mental health and patient satisfaction did not differ sign
 - Pain at 3 months was borderline worse with x-ray (SMD 0.19, CI -0.01 to 0.19)
- Is there any Newer Evidence,...

Lancet 2009; 373: 463–72

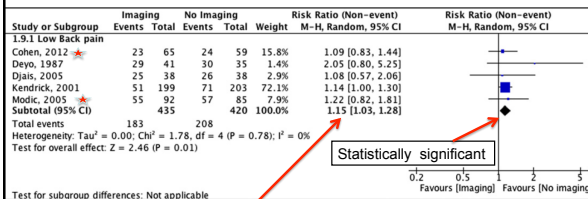
More of the Same,...

- Sys Rev: Back Pain 7 RCTs (1936 pts): 3 good quality
 - MRI/CT 3 (1160 pts), X-ray 4 (776 pts).
- No statistical difference in 3 or 12 month outcomes for function, quality of life & patient satisfaction
- Statistically Significant Outcomes
 - Overall Improvement: imaging (42%) vs none (50%), Risk ratio 1.15 (95% CI 1.03 to 1.28), Moderate quality, NNT 14.

Outcome	Number of RCTs (Pts)	Standardized Mean Difference	Quality
Short-term (~3 months) Pain	5 (890)	0.17 (0.04 to 0.31)	Low
Long-term (~12 months) pain	4 (1281)	0.13 (0.02 to 0.24)	Moderate

European J Intern Med 2015;26: 585–95.

Overall Improvement with Immediate Imaging



This would be interpreted as: "If you get imaging, it causes a relative 15% increase chance of not getting overall improvement"

This means that for every 14 people imaged early, one will have a delayed overall improvement (NNH 14)

Figure E. Euro J Intern Med 2015;26: 585–95.

Law of Unintended Consequences

- RCT, UK, 421 GP pts, low-back pain \geq 6 weeks
 - 60% female, mean age 39, back pain x 10 weeks
- At 3 months Stat diff in:
 - Still in pain: 74% X-ray vs 65%, NNH 12
 - Had f/u doctor visit: 53% X-ray vs 30%, NNH 5
 - Self rated health status: 5% worse in X-ray group.
- After 6 more months
 - Few borderline worse (disability & pain) but not Stat Sign
- However, \geq 80% of both groups want X-rays.
 - Those with x-rays more satisfied with visit.
 - X-rays findings did not correlate to clinical
- Also MRI compared to X-ray, no diff.²

1. BMJ. 2001 Feb 17;322:400-5. 2. JAMA 2003;289:2810-8.

Patient Expectations

- Systematic Review¹: 12 qualitative, 8 quantitative studies. Main concerns/frustrations (4243 patients):
 - Lack of diagnosis or cause of pain
 - Lack of information/instructions (what to do or not do)
 - Inadequate pain relief; Lack of confidence in us; sense they're pain is not believed; desire x-rays.
- Newer
 - 11 patients interviewed: Want X-ray (more pain = more x-ray desire), feel it helps manage their pain.²
 - Reassurance in imaging LBP (Sys rev, 2 LBP studies)³:
 - X-ray "reassured": 58% imaged vs 48% not
 - MRI "reassured": mean score 13.8 vs 13.3 out of 24

1) Spine 2004;29:2309-18. 2) BMC Fam Pract 2013;14:7. 3) Patient Educ Couns. 2012;86:3-8.

Doctors LBP CPG beliefs

- Systematic Review of Qualitative research (17 studies, 705 pts)¹
 - Lack confidence in CPG & believe they restrict autonomy
 - Imaging:
 - quicker to image (vs being thorough OR explaining why imaging not needed).
 - Reassures patients nothing serious is missed;
 - Get patient buy-in treatment.
 - Patient request or temporize other request (you want to see back surgeon so compromise with x-ray).
 - Risk of missing something.

Slade SC. Clin J Pain. 2015 Dec 24.

Getting patients to accept "no"

- In a study when pts asked for anti-depressants
 - When refused but still attain high satisfaction best of focus on patients context (why do you want this, understand their concerns, & offering a clear other approach).
- RCT (102 non-specific LBP): X-ray vs education
 - 88% vs 29% (in education) got x-ray
 - 73% vs 44% felt x-ray needed.
 - Satisfaction = 23.7 vs 24 (from 9-27, higher better)
- Agreement predicted satisfaction
 - But how do you get agreement? Not really answered
- Bottom-Line: Education, getting patient context and (maybe) testing for agreement improve satisfaction without imaging.

Arch Intern Med. 2010;170:381-8. 2) Arch Intern Med 1987;147:141-5 3) J Gen Intern Med 2005; 20:9-937.

Yellow Flags

Yellow Flag	Intervention
Belief that pain and activity are harmful	Educate and consider referral to active rehab including CBT
'Sickness behaviours' (like extended rest)	Educate and consider pain clinic referral
Low or negative moods, social withdrawal	Assess for psychopathology and treat
Treatment beliefs do not fit best practice	Educate
Problems with claim and compensation	Connect with stakeholders and case manage
History of back pain, time-off, other claims	Follow-up regularly refer if recovering slowly
Problems at work, poor job satisfaction	Engage case management through disability carrier
Heavy work, unsociable hours (shift work)	Follow-up regularly refer if recovering slowly
Overprotective family or lack of support	Educate patient and family

TOP CPG: http://www.topalbertadoctors.org/cpgs/?sid=65&cpg_cats=90
 Resources: - Management Of Psychosocial Yellow Flags
 - Clinical Assessment Of Psychosocial Yellow Flags

Triaging Back Pain

Triage back pain in to 3 groups

- Non-specific back pain: >85% (maybe >95%)
- Radicular symptoms (Nerve root problems)
 - Spinal stenosis 3%
 - Symptomatic disc herniation 4%
- Specific pathology:
 - Compression Fracture 4%
 - Tumor 0.7%
 - Ankylosing Spondylitis 0.3%
 - Infection 0.01%

BMJ 2006;332:1430-4. & Ann Intern Med. 2007;147:478-491.

History and Physical: Hard Sell

- Sys Rev 54 studies (see next slide)¹
- User's Guide to the Medical Literature.²
- Reasons why tests don't work as well
 - Clinicians disagree on test interpretation (e.g. common to have disagreement interpreting tenderness)
 - Some findings occur in normal people (e.g once age >60, 30% have both absent, 10% have one absent)
 - Gold Standard sometimes surgery, MRI, both, or combination with expert opinion.
 - MRI is weakly predictive of surgery findings (LR+ 3.2, LR- 0.33)³
 - What works well for one specific area can be distract for another (weak abductor LR 11 for L5 but not elsewhere)

1) Spine. 2011;36:63-73. 2) User's Guide to the Rationale Clinical Exam 2009. 3) Eur Spine J. 2012; 21:220-227.

Red Flags: specific pathology & nerve root problem

Box 1: Red flag conditions indicating possible underlying spinal pathology or nerve root problems²

- Red flags**
- Onset age < 20 or > 55 years
 - Non-mechanical pain (unrelated to time or activity)
 - Thoracic pain
 - Previous history of carcinoma, steroids, HIV
 - Feeling unwell
 - Weight loss
 - Widespread neurological symptoms
 - Structural spinal deformity
- Indicators for nerve root problems**
- Unilateral leg pain > low back pain
 - Radiates to foot or toes
 - Numbness and paraesthesia in same distribution
 - Straight leg raising test induces more leg pain
 - Localised neurology (limited to one nerve root)

TOP (most urgent)

- Cauda Equina: emergent
- Severe Unremitting (↑at night or lying)
- Trauma, Weight loss, fever, history of cancer / HIV / IV drugs / steroids
- Widespread Neuro Sx
- Age >50, particularly ≥65, new severe back pain

BMJ 2006; 332:1430-4

Diagnosing Back Problems

- Can signs & symptoms predict cauda equina?
 - 4 studies (259 patients)
 - Limits: all neurosurgery, 3/4 retrospective cohorts
 - Reports none great BUT data not accessible!
- Dx of spinal stenosis: 46 studies

	Sensitivity	Specificity	+ LR	- LR
Sensory Deficit	0.32-0.40	0.59-0.72	1.02 - 1.10	0.93-1.00
Motor Deficit (Paresis)	0.22-0.40	0.62-0.72	1.05-1.17	0.94-0.96
Motor Deficit (atrophy)	0.31	0.76	1.08	1.02
Reflex deficit	0.25-0.29	0.75-0.78	1.25-1.26	.133-1.47

Evid Based Spine Care J. 2011 Nov;2(4):27-33. Spine 2013 ;38:E469-E481

L2-L4 Nerve Impingement			L5-S1 Nerve Impingement		
	LR +ve	LR -ve		LR +ve	LR -ve
SLR	Useless		SLR	4.3	0.37
Crossed SLR	Useless		Crossed SLR	1.7	0.97
Femoral Stretch	∞	0.5	Femoral Stretch	Useless	
Crossed Fem Stret	∞	0.96	Crossed Fem Stret	Useless	
Sit to Stand (1 leg)	4.6	0.58	Sit to Stand (1 leg)	Useless	
Heel Raise	Useless		Heel Raise	3.5	0.90
Heel Walk	1.1	0.98	Heel Walk	Useless	
Great toe extension	Useless		Great toe extension	1.9	0.78
Hip Abductors	Useless		Hip Abductors	4.5	0.86
Anterior thigh	2.3	0.95	Anterior thigh	Useless	
Medial knee	4.7	0.86	Medial knee	Useless	
Medial ankle	∞	0.83	Medial ankle	Useless	
Great Toe	Useless		Great Toe	1.4	0.94
Lateral foot	Useless		Lateral foot	2.6	0.86
Patellar Reflex	∞	0.72	Patellar Reflex	Useless	
Ankle Reflex	Useless		Ankle Reflex	7.1	0.74

Some other concerning things: Cancer & Compression Fracture

	+LR	-LR
Cancer		
1 History of Cancer	15.5	0.70
2 Unexplained Weight Loss	2.5	0.90
3 Bed rest no help	1.7	0.20
4 Failure to improve x1 month Tx	3.1	0.77
1 or 2 or 3 or 4	2.5	0
Compression Fracture		
Age ≥50	2.2	0.26
Age ≥70	5.5	0.81
Trauma	2	0.82
Corticosteroid Use	12	0.94

User's Guide to the Rationale Clinical Exam 2009

Sample Case

- 62 year old woman presents with back pain. It has been present for 2 months. She has a history of breast cancer (3 years ago). She has tried a number of treatments but her back is aching continually (worse at night).
- Assume a 5% risk of something serious at baseline
 - History of Cancer (LR 15.5) = 45% risk
 - No improve x1 month (LR 3.1) = 70% risk
 - Pain with bed rest (LR 1.7) = 75% risk
- Bottom-Line: Our patient's risk of having cancer back pain is 75% (45% just with a history of cancer)

Bottom-Line: What to look for

- Multiple studies show similar results: Individual tests have limited utility but collectively they have power.
 - Frequency of cancer in studies was 0-0.66%
- Bottom-Line: Many of the core features of neurologic assessment and the red flags help identify patients are risk. They work best when used in combinations.

Spine J. 2013;13:657-74. Cochrane 2010;2:CD007431. Cochrane 2013;1:CD008643. Cochrane 2013;2:CD008686

Radicular Symptoms

- Wait 1 month if no progressive neuro deficit.
 - Only image if considering injection OR surgery.
- If progressive neuro then investigate immediately
- Best study: MRI
 - X-ray won't see soft tissues
 - CT not as good ruling in or out (LR's not as high or low)

condition	Positive MRI Likelihood ratio	Negative MRI Likelihood ratio
Herniated Disc	1.1 - 33	0 – 0.93
Stenosis	3.2 - ∞	0.1 – 0.14

Ann Intern Med 2002;137:586-97. BMJ 2006;332:1430-4. Ann Intern Med 2007;147:478-

Specific Pathology

- Investigate immediately (for infection/cancer)
- Infection & Cancer: MRI best.
 - X-ray good at ruling in for cancer but if –ve, can't rule-out

Condition	Positive MRI Likelihood ratio	Negative MRI Likelihood ratio
Cancer	8.3 - 31	0.07 – 0.19
Infection	12	0.04

Ann Intern Med 2002;137:586-97. BMJ 2006;332:1430-4. Ann Intern Med 2007;147:478-

Specific Pathology, Continued

- Compression #: no rush usually
 - Guidelines suggest x-ray okay, but Sys Rev suggest MRI (can assess acuity)
- Ankylosing Spondylitis:
 - X-ray (angled views of SI joint) good ruling in (+ve LR ∞ but –ve LR 0.55-.74),
 - Radionuclide scanning similar results.
 - US Guideline recommend X-ray with special views and labs.

Ann Intern Med 2002;137:586-97. BMJ 2006;332:1430-4. Ann Intern Med 2007;147:478-