Rational Approach to Treating Low Back Pain

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Learning Objectives

- Overview, impact of low back pain
- Initial encounter and development of a structured plan
- Identification of patients at risk of developing chronic LBP
- Incorporate a rational and evidence-based approach of available treatments
- Obtaining timely referral to pain management and surgical specialists
Everyone Gets Back Pain

- Back pain and related symptoms – 2nd most frequent complaints for PCP visits
- 5th most common reason for all physician visits
- Second only to common cold as cause of lost work time
- In the U.S., lifetime prevalence approximately 80%, one-year prevalence rate 15% - 20%
  - 90% - non emergent causes
  - 85% - no exact diagnosis
- Highest prevalence between 45 to 64 age group
- Most common cause of disability in < 45 years old
Back Pain is Expensive

- Total cost of back pain in US $253 billion per year (2011)
  - $150.4 billion - hospital treatment cost (2011)
  - 291 million lost work days per year (2012)

- Ranked highest for cause of disability worldwide (WHO, Global Burden of Disease Survey 2010)

- Spinal fusion - 6th most common OR procedure, most costliest in 2011 (Agency for Healthcare Research and Quality 2014)
Deyo RA, Mirza SK, Turner JA, Martin BI. Overtreating Chronic Back Pain: Time to Back Off? 
### eTable 3. Unadjusted Proportions of Use Over Time Without Competing Diagnoses (e.g., Pain in Limb, Spasm of Muscle)

<table>
<thead>
<tr>
<th>Year (sample n)</th>
<th>1999-2000 (n=2,417)</th>
<th>2001-2002 (n=2,767)</th>
<th>2003-2004 (n=2,894)</th>
<th>2005-2006 (n=2,979)</th>
<th>2007-2008 (n=3,263)</th>
<th>2009-2010 (n=2,997)</th>
<th>P-value*</th>
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<tbody>
<tr>
<td><strong>Medications</strong></td>
<td></td>
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<td>23</td>
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<td>35</td>
<td>29</td>
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<td>Tramadol</td>
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<td>4.0</td>
<td>4.4</td>
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<td>NSAIDs/APAP</td>
<td>37</td>
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<td>33</td>
<td>29</td>
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<td>25</td>
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<td>Physical Therapy</td>
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<td>17</td>
<td>15</td>
<td>14</td>
<td>19</td>
<td>.92</td>
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<td>Other Physician</td>
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<td>11</td>
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<td>15</td>
<td>14</td>
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<td><strong>Imaging</strong></td>
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<td>X-Ray</td>
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<td>16</td>
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<td>16</td>
<td>.36</td>
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<tr>
<td>CT/MRI</td>
<td>7.2</td>
<td>7.4</td>
<td>7.0</td>
<td>10</td>
<td>11</td>
<td>11</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

* P values are adjusted for age, sex, race/ethnicity, region, insurance type., symptom duration/context, whether the provider was the PCP, and whether the visit was located in a metropolitan area.

Abbreviations: Benzo/Relaxant, benzodiazepines and muscle relaxant prescriptions; APAP, acetaminophen prescriptions; CT/MRI, computed tomography or magnetic resonance imaging.
Figure 2. Back-related operating room procedures, 2001—2011

Is Surgery the Answer?

- Both surgical and non-operative groups had substantial improvement at 2 year follow-up, no difference at 4 or 8 years
  - Intervertebral disc herniation
  - Degenerative spondylolisthesis
  - Spinal stenosis

- Non-operative interventions
  - education/counseling
  - physical therapy
  - epidural injections
  - chiropractic therapy
  - anti-inflammatory medications
  - opioid analgesics


Surgical Compared With Non-Operative Treatment for Lumbar Degenerative Spondylolisthesis: Four-Year Results in the Spine Patient Outcomes Research Trial Randomized and Observational Cohorts* JBJS 91:1295-1304, 2009.

Intervertebral disc herniation
Degenerative spondylolisthesis
Spinal stenosis
Most Disability Improves with Time

![Graph showing the percentage of patients with disabling pain decreases over time.](image)
But Some People Never Get Better

- Recovery after 12 weeks slow, uncertain
- Disabled for 6 months: < 50% return to work
- Disabled for 1 year: 25%
- After 2 years absence from work: approaches 0%
Chronicity of Low Back Pain

- Acute: 2-4 weeks
- Subacute: up to 12 weeks
- Chronic: > 12 weeks

- 75-90% of patients with acute LBP in primary care improve within 1 month
- Exact etiology of acute LBP is identifiable in only 15% of patients
Initial Encounter

- Thorough history of pain complaint
  - Onset
  - Location, radiation
  - Aggravating factors
  - Alleviating factors
- Other health or pain problems
  - Cancer history
  - Psychological history
Predictors of Pain Chronicity

- Protective: College education

- Risk:
  - Unemployed
  - Radiating/wide spread pain
  - Inability to walk for an hour and sciatica
  - Insomnia, sleep disturbance
  - Catastrophizing
  - Kinesiophobia
  - Tobacco use
Etiologies of Low Back Pain

- Musculoligamentous injuries
- Intervertebral disks and facet joints degeneration
- Herniation of the nucleus pulposus of an intervertebral disk
- Spinal stenosis
- Anatomic anomalies of the spine: scoliosis, spondylolisthesis
- Underlying systemic diseases
  - Primary or metastatic cancer
  - Spinal infections
  - Ankylosing spondylitis
- Visceral diseases unrelated to the spine
  - Pelvic organs
  - Kidneys
  - Gastrointestinal tract
  - Aorta
Prevalence of Multiple Etiologies

- Musculoligamentous injury or degenerative changes - 85%
- Lumbar spinal stenosis - 19-47% (incr with age, imaging)
- Compression fractures - 4%
- Spondylolisthesis - 3%
- Spinal malignant neoplasms (primary or metastatic) - 0.7%
- Ankylosing spondylitis - 0.3%
- Spinal infections - 0.01%
Muscles, posterior ligaments: back pain

Facet: back pain, buttock, thigh pain

Nerve root: pain in buttock, leg

Disc annulus, posterior longitudinal ligament, anterior dura: back pain
Rule Out Systemic Diseases – Cancer

- Primary or metastatic
- Previous history of cancer = cause of pain until proven otherwise
- Unexplained weight loss
- Common primaries: Breast, lung and prostate
Sagittal magnetic resonance image of the thoracic spine (left, T1-weighted image; center, T1-weighted image with gadolinium; right, T2-weighted image). Note the lesion that is bright on T2-weighted imaging (image on the right) (arrow) and enhances with contrast (arrow) (center image compared with the left image). The lesion is clearly extra-axial and compresses the spinal cord.
Compression Fractures

- Burst
- Extension
- Wedge compression
- Dislocation
- Rotational fracture-dislocation
TLICS: Thoracolumbar Injury Classification and Severity Score

- **Morphology: immediate stability, XR/CT**
  - compression fracture - 1 point
  - burst fracture - 2 points
  - translational rotational injury - 3 points
  - distraction injury - 4 points

- **Posterior ligamentous complex: long term stability, MRI**
  - intact - 0 points
  - suspected injury or indeterminate - 2 points
  - injured - 3 points

- **Neurologic involvement: Physical exam**
  - intact - 0 points
  - nerve root - 2 points
  - cord/conus medullaris (complete) - 2 points
  - cord/conus medullaris (incomplete) - 3 points
  - cauda equina - 3 points
Treatment and Prognosis

- Based on total points, help determine plan based on co-morbidities and injury
  - 0-3: usually treated non-operatively
  - 4: surgeons choice, +/- OR
  - >4: usually treated operatively
Is There Evidence of Neurologic Compromise? Radicular Pain?
Four stages to a disc herniation

Degeneration  Prolapse  Extrusion  Sequestration

Broad-based Herniation  Focal Herniation

INTERVERTEBRAL DISC HERNIATION

- Annulus fibrosus
- Nucleus pulposus
- Disc Herniation
- Nerve root
- Spinal cord
Lumbar Disc Herniations
# Dermatomes and Myotomes

<table>
<thead>
<tr>
<th>Level</th>
<th>Sensory</th>
<th>Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2-3</td>
<td>Anteromedial thigh</td>
<td>Hip flexion</td>
</tr>
<tr>
<td>L4</td>
<td>Medial Malleolus</td>
<td>Dorsiflexion foot</td>
</tr>
<tr>
<td>L5</td>
<td>Web space b/w 1st and 2nd toes</td>
<td>Extensor Hallucis longus</td>
</tr>
<tr>
<td>S1</td>
<td>Lateral foot and sole</td>
<td>Plantar flexion</td>
</tr>
</tbody>
</table>
Spinal Stenosis
Spinal Stenosis
<table>
<thead>
<tr>
<th></th>
<th>Neurogenic</th>
<th>Vascular</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location of pain</td>
<td>Thighs, calves, back and rarely buttocks</td>
<td>Buttocks or calves</td>
</tr>
<tr>
<td>Quality of pain</td>
<td>Burning, cramping</td>
<td>Cramping</td>
</tr>
<tr>
<td>Aggravating</td>
<td>Erect position, ambulation</td>
<td>Leg exercises</td>
</tr>
<tr>
<td>Relieving</td>
<td>Squatting, bending forward, sitting</td>
<td>Rest</td>
</tr>
<tr>
<td>Leg Pulses and BP</td>
<td>Usually normal</td>
<td>Decreased BP and pulses</td>
</tr>
<tr>
<td>Skin / Trophic changes</td>
<td>Usually absent</td>
<td>Often present (palor, cyanosis, nail dys)</td>
</tr>
<tr>
<td>Autonomic changes</td>
<td>Bladder incontinence rare</td>
<td>Impotence may coexist</td>
</tr>
</tbody>
</table>
Cauda Equina Syndrome
Cauda Equina Syndrome – RED FLAGS

- Severe low back pain (LBP)
- Sciatica: often bilateral but sometimes absent, especially at L5/S1 with an inferior sequestration
- Saddle and/or genital sensory disturbance
- Bladder, bowel and sexual dysfunction

Eur Spine J. 2011 May; 20(5): 690–697
Cauda Equina Syndrome

- Incomplete: neurogenic urinary difficulties
  - altered urinary sensation
  - loss of desire to void
  - poor urinary stream
  - need to strain in order to micturate
  - Saddle and genital sensory deficit often unilateral or partial and trigone sensation should be present.

- Complete: painless urinary retention and overflow incontinence
  - Bladder is no longer under executive control.
  - Usually extensive or complete saddle and genital sensory deficit with deficient trigone sensation.
Spondylolisthesis

- anterior displacement of a vertebra on the one beneath it
Axial Low Back Pain

- Pain limited to the area of the lumbo-sacral junction
  - Facet arthropathy 15%
  - Degenerative disc disease 40%
  - Sacroiliac arthropathy 15%

Schwarzer et al 1993
Low Back Pain
Not Coming From the Back

- Spine: 65%
- SI Joint: 5%
- Hip: 2.5%

Intersections:
- Spine and SI Joint: 7.5%
- Spine and Hip: 1.5%
- SI Joint and Hip: 0.5%
Facet Arthropathy

Right lateral oblique view of the lumbar vertebral bodies and the dorsal rami medial branches. Drawing by Frank M. Cort, M.S. (Research Associate, Department of Radiology, Johns Hopkins Hospital, Baltimore, Maryland).
# Facet Arthropathy

## Table 1. Motions Associated with the Largest Intervertebral Angulation and Strain for the Lumbar Facet Joints

<table>
<thead>
<tr>
<th>Facet Joint Level</th>
<th>Movement Associated with Maximal IVA</th>
<th>Largest Strain</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1–L2</td>
<td>Right bending</td>
<td>Right bending</td>
</tr>
<tr>
<td>L2–L3</td>
<td>Left bending</td>
<td>Right bending</td>
</tr>
<tr>
<td>L3–L4</td>
<td>Right bending</td>
<td>Right bending</td>
</tr>
<tr>
<td>L4–L5</td>
<td>Forward flexion</td>
<td>Forward flexion</td>
</tr>
<tr>
<td>L5–S1</td>
<td>Extension</td>
<td>Forward flexion</td>
</tr>
</tbody>
</table>

IVA = intervertebral angle.

Modified from Ianuzzi et al.\(^{62}\)
Table 5. Levels of Degeneration of Facet Joints based on Magnetic Resonance Imaging

<table>
<thead>
<tr>
<th>Grade</th>
<th>Radiologic Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal z-joints (2–4 mm width)</td>
</tr>
<tr>
<td>1</td>
<td>Joint space narrowing and/or mild osteophyte formation and/or mild hypertrophy of the articular process</td>
</tr>
<tr>
<td>2</td>
<td>Narrowing of the joint space with sclerosis or moderate osteophyte formation and/or moderate hypertrophy of the articular process and/or mild subarticular bone erosions</td>
</tr>
<tr>
<td>3</td>
<td>Narrowing of the joint space with marked osteophyte formation and/or severe hypertrophy of the articular process and/or severe subarticular bone erosions and/or subchondral cysts</td>
</tr>
</tbody>
</table>

Adapted from Weishaupt et al.\textsuperscript{145}; used with permission.
Analgesics for LBP

- NSAIDS – 1st line
- Muscle relaxants
- Anticonvulsants
- Antidepressants
- Opioids

Largest Expenditure for Back Pain Care: Narcotics!
LBP and Opioids

- Retrospective cohort study of WC claims with acute disabling LBP
- Objective: examine the association between early opioid use for acute LBP and outcomes at 2 years
- Sample: 8443 claimants from 1/2002 - 12/2003
- Conclusion: Opioids counterproductive to recover
  - Longer length of disability
  - More costs
  - Increased risk of surgery
  - Ongoing opioid use

Opioids Have Clear Disadvantages

- A systematic review found aberrant drug-taking behaviors in up to 24% patients prescribed opioids for LBP

- May be appropriate for short-term use for severe, acute exacerbations; use with caution for long-term treatment of chronic LBP

- Should restrict to patients not highly vulnerable to drug dependence, abuse, addiction

OPIOID OVERUSE ON THE RISE; MORE WIDESPREAD ACROSS U.S.

HOSPITALIZATIONS
Between 2002 and 2012, the rate of hospitalizations for opioid overdose among adults 18 years and older increased by more than 60 percent. By 2012, U.S. hospitals recorded a total of 795,000 opioid-related hospitalizations. Rates were highest in the Northeast and Midwest regions.

COSTS
Total spending on prescription opioids (painkillers like morphine, codeine, fentanyl, and oxycodone) more than doubled between 2002 and 2012, from $4.1 billion to $9 billion. During this same time, total out-of-pocket spending fell by more than 30 percent.

DEMOGRAPHICS
In 2002, young adults between the ages of 25 and 44 had the highest hospitalization rates for opioid overdose. Over the next 10 years, hospitalization rates for other age groups grew more rapidly. The highest rate is currently in adults between the ages of 45 and 64.
Some states have more painkiller prescriptions per person than others.

Number of painkiller prescriptions per 100 people

- 52-71
- 72-82.1
- 82.2-95
- 96-143

SOURCE: IMS, National Prescription Audit (NPA™), 2012.
National Overdose Deaths
Number of Deaths from Prescription Opioid Pain Relievers

Source: National Center for Health Statistics, CDC Wonder
OVERDOSE DEATH RATES IN AMERICA

All underlying causes of death*

*Includes deaths from unintentional drug poisoning, suicide drug poisoning, homicide drug poisoning or drug poisoning of undetermined intent.

SOURCE: Wonder.cdc.gov
Number of opioid related deaths in Massachusetts

150 deaths in January 2015

1256 estimated deaths

1089 confirmed deaths

6878 total deaths from 2005-2014

SOURCE: Massachusetts Department of Public Health
NSAIDS and Acetaminophen

- A systematic review of randomized trials

- NSAIDS effective for short-term symptom relief for subacute and chronic low back pain
  - Effect size small, not more effective than APAP
  - Exposure to COX-2 selective - increased risk of MI

- APAP ineffective on both pain and disability outcomes for LBP in immediate and short term
  - Not clinically superior to placebo on both pain and disability outcomes for osteoarthritis

Antidepressants for LBP

- Recent meta-analysis, no difference between antidepressant and placebo for LBP, no difference between types of antidepressants

- Antidepressants associated with higher risk of adverse events vs. placebo
  - drowsiness
  - dry mouth
  - dizziness

- Because of questionable benefits and known side effects, tricyclic antidepressants are not a first-line option for chronic axial low back pain
Muscle Relaxants

- There was no difference in short-term reduction of muscle spasm between cyclobenzaprine and placebo

- Skeletal muscle relaxants may be considered as adjunctive therapy to analgesics in patients with acute exacerbations of chronic low back pain
Benzodiazepines

- Tetrazepam (not available in the US) more effective than placebo for short-term pain intensity after 5 to 7 days and overall improvement

- Only trial evaluating BZDs used in US found no difference between diazepam and placebo for muscle spasm

- Because of limited evidence on efficacy and potential for addiction and abuse, BZDs should not be used for long-term treatment of chronic low back pain
Gabapentin

- One trial (n = 80) found statistically significant, small improvements in back pain with movement (but not for back pain at rest) and leg pain, compared to baseline, for patients randomly assigned to gabapentin, titrated to 1200 mg/day.

- Gabapentin titrated to 3600 mg/day was more effective than placebo for back pain at rest in a second trial, but this trial lacked a double-blind design.

- Adverse events reported with gabapentin include drowsiness (6%), loss of energy (6%), and dizziness (6%)
Gabapentin for Spinal Stenosis

- N=55, open label trial

- Patients with pseudoclaudication and spinal stenosis on CT or MRI

- Titrated to 2400 mg/day, along with supervised exercise therapy, lumbar supports and NSAIDs

- Moderately improved mean pain scores, compared to no gabapentin, at four months (2.9 versus 4.7 on a 0 to 10 scale).
Exercise Therapy

- Systematic review of 43 trials

- Exercise therapy for patients with chronic low back pain to be slightly to moderately superior to no treatment for pain relief, though there were no significant differences in functional outcomes.

- Surgical decompression similar to PT among patient with lumbar spinal stenosis who were surgical candidates.
Yoga

- Randomized trial of 101 patients with chronic low back pain found viniyoga improved functional status and symptoms at 12 weeks compared to a back exercise class, or a self-care book.

- At 26 weeks outcomes for yoga were equivalent to exercise but remained superior to the self-care book.

- Yoga was associated with decreased medication use compared to exercise or the self-care book.
Acupuncture

- Two systematic reviews found acupuncture moderately more effective than no treatment for short-term pain relief and improvement in function.

- More effective than sham acupuncture for pain relief, but not for improvement in function.

- However, two well-blinded trials found no difference between acupuncture and sham acupuncture for either pain or function.
Spinal Manipulations

- Systematic review of RCTs found lumbar spinal manipulation to be moderately superior to sham manipulation or therapies thought to be ineffective.

- No advantage compared to other interventions, including general practitioner care, analgesics, physical therapy, exercises, and back school.

- Other systematic reviews similarly concluded that spinal manipulation has a minimal beneficial effect.
Conclusion