What is pain?

“Pain is physical suffering or distress, as due to injury, illness, etc. A distressing sensation in a particular part of the body.” > Dictionary.com
The Power of the Brain...

- Neuroscience in Action...
# US Pain Stats

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of Sufferers</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Pain</td>
<td>100 million Americans</td>
<td>Institute of Medicine of The National Academies (2)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>25.8 million Americans (diagnosed and estimated undiagnosed)</td>
<td>American Diabetes Association (3)</td>
</tr>
<tr>
<td>Coronary Heart Disease (heart attack and chest pain) Stroke</td>
<td>16.3 million Americans</td>
<td>American Heart Association (4)</td>
</tr>
<tr>
<td>Cancer</td>
<td>11.9 million Americans</td>
<td>American Cancer Society (5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2010</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Population</td>
<td>282 million</td>
<td>309 million</td>
<td>↑ 9.6%</td>
</tr>
<tr>
<td>Chronic Pain</td>
<td>45 million</td>
<td>100 million</td>
<td>↑ 122%</td>
</tr>
</tbody>
</table>
The Pain Dilemma...
US Pain Stats

- “Pain” is the MC presenting Sx in medicine
- $560-$635 billion annually ($2,000 for EVERY person)
- Most common cause of disability (followed by anxiety/depression)

Low Back Pain:
- 2\textsuperscript{nd} MC reason for PCP visits
- 80\% of us will have it at some point
  - 30\% of ♀; 25\% of ♂ CURRENTLY HAVE IT
- 90\% of cases resolve in 6 weeks, regardless of Tx
- 90\% of patients NEVER KNOW THE PRIMARY CAUSE!!
LBP Disability

- ‘64–’94 LBP disability rates ↑14 x population ↑
- Structural (MRI/discography) = WEAK
- Psychosocial = STRONG
- **Most predictive factor = Poor job satisfaction**
- Psychosocial: SES, low social support/stability
- Abuse: childhood and adult (PTSD)
- Psychiatric Comorbidities
- Pain Beliefs / Maladaptive Coping
- Genetic/Epigenetic

Carragee The Spine Journal 2005
### US Pain Stats

#### What we did…

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRI’s</td>
<td>↑ 300%</td>
</tr>
<tr>
<td>Procedures</td>
<td>↑ 130-700%</td>
</tr>
<tr>
<td>Surgeries</td>
<td>↑ +300%</td>
</tr>
<tr>
<td>Opioids</td>
<td>↑ +700%</td>
</tr>
</tbody>
</table>

#### What we got…

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disability rates</td>
<td>↑</td>
</tr>
<tr>
<td>Complications rates</td>
<td>↑</td>
</tr>
<tr>
<td>No self-reported improvements</td>
<td></td>
</tr>
<tr>
<td>Costs</td>
<td>↑</td>
</tr>
</tbody>
</table>
40 drivers

~1500 collisions/career (Avg 26, Max 45 mph)

Only 3 drivers reported derby-related chronic neck pain

Simotas Arch Phys Med Rehabil 2005
Pictured: Heroic female medic who ignored shrapnel embedded in her shoulder to save SEVEN soldiers during Taliban attack

By DAILY MAIL REPORTER
UPDATED: 03:05 EST, 3 September 2009

An heroic army medic treated seven injured comrades after a Taliban attack in Afghanistan despite being wounded with shrapnel herself, it emerged today.

Lance Corporal Sally Clarke, of 2 Rifles, ignored the searing pain caused by the shards embedded in her shoulder and back and set about treating the rest of her patrol.

The worst hit was Corporal Paul Mather who incredibly managed to radio instructions for jets circling above to open fire on Taliban insurgents despite bleeding heavily from wounds the size of his fist.
Asymptomatic Grade IV Spondylolisthesis

Pain w/o.....SENSATION?!?
Table 2: Age-specific prevalence estimates of degenerative spine imaging findings in asymptomatic patients

<table>
<thead>
<tr>
<th>Imaging Finding</th>
<th>Age (yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20</td>
</tr>
<tr>
<td>Disk degeneration</td>
<td>37%</td>
</tr>
<tr>
<td>Disk signal loss</td>
<td>17%</td>
</tr>
<tr>
<td>Disk height loss</td>
<td>24%</td>
</tr>
<tr>
<td>Disk bulge</td>
<td>30%</td>
</tr>
<tr>
<td>Disk protrusion</td>
<td>29%</td>
</tr>
<tr>
<td>Annular fissure</td>
<td>19%</td>
</tr>
<tr>
<td>Facet degeneration</td>
<td>4%</td>
</tr>
<tr>
<td>Spondylolisthesis</td>
<td>3%</td>
</tr>
</tbody>
</table>

*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.*
The self-fulfilling prophecy of Imaging

What happens when you MRI ~100 pain-free pts?

- **64% Abnormal findings...36% Normal at all levels...**
  - 52% Bulging ≥1 level (Increasing w/ age)
- OA: 30-50% w/ mod-severe changes asymptomatic
  - 10-20% w/ mod-severe pain have normal images
- MYTH: Changes on imaging are the CAUSE of pain
  - Degeneration = NORMAL
- MRI = 2x↑ surgery, no better outcomes
- Imaging can CAUSE the problem = FEAR

Oh, by the way...

**MUS: 30% of Pts in general medicine**
Which patient plays tennis 4 days a week & which one uses a scooter?

A.  

B.
Chronic Functional Syndromes

**Chronic Pain Syndromes**
- Migraine headache
- Tension headache*
- TMJ syndrome*
- Neck pain*
- Whiplash
- Vulvodynia
- Fibromyalgia
- Myofascial pain*
- Chronic tendonitis*
- Repetitive stress injury*
- Chronic abdominal pain
- Low Back/sciatica pain*
- Foot pain*
- Pelvic Floor Hypertonic D/O

**Autonomic Nervous System**
- Postural orthostatic tachycardia
- Irritable bowel syndrome
- Functional dyspepsia*
- Interstitial cystitis / PBS
- CRPS

**Other**
- Tinnitus
- Rhinitis
- Insomnia*
- Dizziness*
- Paresthesias*
- Poor memory*
- Chronic fatigue
- Hypersensitivities
- Spasmodic dysphonia
- Globus hystericus
- Non-cardiac CP
- Chronic hives
- Restless leg synd,*
- Depression
- Anxiety
- PTSD
- OCD*
- MVP

Clauw FM
Schubiner 2012
Lumbar Surgery Failure

- Failure = repeat surgery, cont’d disability, persistent pain/opioids, repeat MRI/epidural

- Consistent population, same indications/MRI’s, same surgeries, same surgeons.

- Childhood **Trauma** → Adult Pain
  - 1) Physical abuse
  - 2) Sexual abuse
  - 3) Emotional neglect
  - 4) Abandonment
  - 5) Parental drug abuse

Schofferman Spine 1992
Victimization → FM, migraine, IC, pelvic pain, & IBS
Childhood? Emotions? Really...?
Are we sometimes confusing perception (what we think and feel is happening) for actual tissue damage (nociception)?
“As any doctor can tell you, the most crucial step toward healing is having the right diagnosis. If the disease is precisely identified, a good resolution is far more likely. Conversely, a bad diagnosis usually means a bad outcome, no matter how skilled the physician.”

Andrew Weil

“Listen to your patient, he is telling you the diagnosis.”

Sir William Osler

So let’s start with rethinking the DIAGNOSIS...!
(re)Defining: PAIN

NOPE!

Let’s start w/ better Neuroscience...!
So what IS “pain”…?!?

Pain is an unpleasant sensory and emotional experience that follows actual or potential tissue damage or is described in terms of such damage.

IASP, ‘94
Pain Is Like...

Fire

OXYGEN

HEAT

FUEL
Pain Is Like...
“These pains you feel are messengers. Listen to them…” ~Rumi

- What about the other “pains” we feel in life…?
  - Emotional pain?
  - Hunger “pains”?
    - The common denominator…?

PROTECTION from something perceived to be a THREAT
What Elements Create The Experience?

- Cognition
  - Attention
  - Survival & Threat
  - Context

- Emotion
  - Meaning
  - Beliefs & Expectations
  - Learning

- Sensation & Transmission
  - Genetic, Epigenetic, Developmental
  - Peripheral & Spinal Cord
  - Cognition & Emotion
So what IS “pain”…?!?

Pain is an unpleasant sensory and emotional experience that follows actual or potential tissue damage or is described in terms of such damage.

IASP, ‘94

Pain is produced by the brain after a person’s [nervous system] has been activated and concluded the body is in danger and action is required.

Moseley, ’03,’07
Pain Theory Simplified

Input
(Nociception, ANY stimulus)

Output
- Pain + fear = change in behavior

“Danger”
“No Danger”

Past Experience
Brain Changes
Personality
Stress

D’Oh!

...OR Minimal Sx

Melzack Pain Pract. 2005
SO, PERHAPS BETTER...

THE REIGN OF PAIN
LIES MAINLY IN THE BRAIN