Predictors of Chronic Pain

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Learning objectives

- Describe a patient-centered approach to the formulation of the patient with acute pain
- Review risk factors / predictors of chronic pain
- Design rational treatment approaches to reduce the risk of developing chronic pain
Chronic Pain

What exactly is it?
Tissue injury

- Local inflammatory response
- Peripheral nociceptor sensitization
- Altered transduction, increased conduction
- Sensitization of dorsal horn nociceptors
- Modulated by descending efferents

Mediated by: NMDA, decreased inhibition, wind-up, neuromodulators, synaptic efficacy

Voscopoulos C, Lema M Br J Anaesthesia 2010
Acute sensitization

- Increases awareness of pain
- Limits damage
- Promotes healing
- Reversible

Voscopoulos C, Lema M Br J Anaesthesia 2010
Pathophysiology of pain

- Severe nociception
- Persistent inflammation
- Neuronal damage
- Central sensitization
- Nerve cell remodeling
- Modulation becomes irreversible modification!

Voscopoulos C, Lema M Br J Anaesthesia 2010
Definition of chronic pain

- Severity (≥6-7 out of 10)
- Duration (≥3-6 months)
- Impairment (Function/Quality of Life)
New Chronic Pain

Who develops it?
Case example

- 45 y/o Korean woman s/p OTJI with foot crushed by heavy equipment for depression & disability
- Immediate reconstructive surgery for stability
- Poor compliance with physical therapy
- High levels of acute pain pre- and post-op
- Treated with SAO’s and acetaminophen
- Prescribed multiple agents for insomnia & anxiety
- After 6 months, referred to Orthopedics for BKA
Typical risk factors

- Demographic variables
- Pain characteristics
- Psychological factors
- Contextual details
Demographics

- Age
- Gender
- Education
- Employment
- Health status
Pain characteristics

- High pain intensity
- Long pain duration
- Radiation of pain
- Prior episodes of pain
- Multiple sites of pain
- Multiple somatic symptoms
<table>
<thead>
<tr>
<th>Psychological factors</th>
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<tbody>
<tr>
<td>Negative emotion</td>
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<td>Depression</td>
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<td>Anxiety</td>
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<td>Anger</td>
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<td>Stress</td>
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<tr>
<td>Distress</td>
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<td>Catastrophizing</td>
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<td>Hypervigilance</td>
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<td>Self-efficacy</td>
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<td>Neuroticism</td>
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<td>Pain sensitivity</td>
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<tr>
<td>Somatization</td>
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Context

- Injured at work
- Work safety
- Work satisfaction
- Compensation
- Litigation
- Social support
- External attributions of responsibility
Hopelessness of new chronic pain

- A tornado
  - You can’t predict it

- Watching a train wreck in slow motion
  - You can’t stop it

- A list of ingredients without a recipe
  - You don’t know what to do
Causes of New Chronic Pain

How should the case be formulated?
Differential diagnosis

- The causes may be undiagnosed diseases
- The causes may be inappropriate behaviors
- The cause may be intrinsic vulnerabilities
- The cause may be particular life stressors
Perspectives of new chronic pain

- Diseases: Something you have
- Dimensions: Something you are
- Behaviors: Something you do
- Life stories: Something you encounter
Life stories – what you should do

- Expand the history to include every aspect of the patient’s life
- Understand what it means to the patient to suffer from pain
- Help the patient find an answer to the question, “what good does life hold for me?”
Behaviors – what you should do

- Point out problematic behaviors every time they occur
- Insist the patient take responsibility for his choices and acknowledge goals
- Emphasize productive behaviors and reinforce them whenever possible
Dimensions – what you should do

- Obtain descriptions of who the patient was before their illness
- Recognize how much of each individual trait a patient possesses
- Match the strengths of each trait with specific tasks to optimize capabilities
Diseases – what you should do

- Search for all possible broken parts causing pathology
- Fix as many broken parts as completely as possible to minimize pathology
- Select treatments that will minimize new damage and subsequent pathology
Perspectives of new chronic pain

- **Diseases**
  - Pain sensitization
  - Major depression

- **Dimensions**
  - Pain modulation
  - Somatic symptoms

- **Behaviors**
  - Fear and avoidance
  - Substance use

- **Life stories**
  - Catastrophizing
  - PTSD
Risk Factors for New Chronic Pain

Why does it matter?
Diseases

Syndrome → Pathology → Etiology

Pathophysiology ↔ Pathogenesis
Pain sensitization

Is there a pathophysiology of pain?
Pharmacological targets in pain

Ectopic Activity
- Na⁺ channel blockers
- Ca²⁺ channel modulators
- GABAergic enhancement
- Glutaminergic inhibition

Central Sensitization
- Opioids/tramadol
- Central α-agonists
- NMDA antagonists
- Anticonvulsants

Descending Modulation
- Central α-agonists
- TCAs
- SNRIs
- Opioids/Tramadol

Peripheral Sensitization
- NSAIDs
- Vanilloids
- TCAs
- Anticonvulsants
- Local anesthetics
- Opioids

Woolf C, Max M Anesthesiology 2001
Depression in patients with CP

Which one really came first?
Longitudinal relationships

- Majority of the data support the diathesis-stress model (depression is a consequence of chronic pain)
- Treatment of depression improves pain and disability
- Research is sorely needed to understand etiologies
Sample

- ECA project funded by NIMH (Baltimore site)
  - 1980 (wave 1 baseline) 3349 (3381)
  - 1982-3 (wave 2 follow-up) 2747 (2768)
  - 1993-6 (wave 3 follow-up) 1771 (1920)
- 20,000+ adults in 5 metropolitan areas
- Prevalence and incidence of psychiatric disorders in the general population

Larson et al. Psychol Med 2004
Longitudinal relationships

- Depressive disorders at baseline doubled the risk for new onset back pain 13 years later.
- Severe depression (impairment) tripled the risk for incident back pain 12 years later.
- Major depression + dysthymic disorder (excluding dysphoria) still increased risk for incident back pain 13 years later by 75%.

Larson et al. Psychol Med 2004
Summary of negative analyses

- Depression at baseline did **not** increase the risk for incident back pain 1 year later.

- Back pain at baseline was **not** associated with depression at baseline.

- Back pain at baseline was **not** associated with incident depression at any time point.

Larson et al. Psychol Med 2004
Behaviors

Drive → Choice → Learning
Fear and avoidance

Can we unlearn what we learn?
Fear and Avoidance Model of Chronic Pain

INJURY

DISUSE
DEPRESSION
DISABILITY

AVOIDANCE

PAIN EXPERIENCE

PAIN-RELATED FEAR

PAIN CATASTROPHIZING

NEGATIVE AFFECTIVITY
THREATENING ILLNESS INFORMATION

NO FEAR

CONFRONTATION

RECOVERY

Patients with SUD

What can we learn with a paradigm shift?
Susceptibility to chronic pain

- A positive history of substance use history increases abuse of pain medications
- Cold pressor pain tolerance is ↓ in current opiate and cocaine users compared with former users
- Alcoholics and families of alcoholics have ↑ pain sensitivity and ↑ pain reduction with EtOH

Clark et al. Can J Psychiatry 2008
Do opioids cause chronic pain?

- Powerful positive reinforcement for use
- Coupled with negative reinforcement for disuse
- Set up an unreasonable standard for pain control
- Injury not rehabilitation during pain relief
- Intoxication produces psychological comfort but worsening functional disability (palliative care)

Clark et al. Can J Psychiatry 2008
Methods

Subject Pool: In-Treatment Convenience Sample Addiction Treatment Services Program (N=232)

Assessment Process: Four Dates for Data Collection Completed During the Period of 12/18/06 - 1/10/07 (N=228; 98% of the convenience sample)

Assessment Battery:  
**Questionnaire Data:** Brief Pain Inventory (BPI), Substance Abuse Tx History, Demographics  
**Treatment Variables:** Methadone Dose, Urine Results, Duration, and Intensity (Step)
Brief Pain Inventory (BPI)

- Patients reporting pain = 61%
- Pain intensity
  - Pain right now 5.1
  - Average 5.8
  - Worst 7.2
  - Least 4.6

Clark et al. CPDD 2007
BPI Interference

To what extent does pain interfere with…

- Sleep 6.0
- General activity 5.7
- Enjoyment of life 5.6
- Work 5.6
- Walking 5.5
- Mood 5.2
- Relations with others 4.2

Clark et al. CPDD 2007
BPI Treatment

- Receiving treatment for pain outside ATS = 14%
- Average relief provided by pain treatment = 51%
- Types of pain treatment being received:
  - Analgesics (NSAIDs, Opioids): 12% (89% of treated)
  - Other (PT, Blocks, Epidurals): 7% (53% of treated)
- No one received adjuvant analgesics (ADs, AEDs)

Clark et al. CPDD 2007
Dimensions

Potential → Provocation → Response
Pain modulation

How are we different?
Central pain modulation

- Endogenous analgesia system (individual trait)
- Capability assessed via the Diffuse Noxious Inhibitory Control (DNIC) test paradigm
- Lower DNIC efficiency is associated with pain
  - Healthy people with pain
  - Chronic pain syndromes
    - Primarily those postulated to be due to central sensitization
    - FMS, TMD, Migraine, Tension headache, IBS

Incidence of post-thoracotomy pain

- 62 patients undergoing thoracotomy
  - 38 men, mean age = 62 +/- 14 years, multiple causes
  - 36 patients → chronic pain, no med/surg predictors
- Mean follow-up = 29 +/- 17 weeks
- Acute post-op pain = 49 +/- 21 (0-100 NPS)
- Chronic post-op pain = 55 +/- 27 (0-100 NPS)
- Acute post-op pain correlated with chronic pain
- DNIC efficiency correlated with chronic pain
- Test stimulus scores: Pre = 58.3 and Post = 43.9

Yarnitsky et al. Pain 2008
Predictors of post-thoracotomy pain

- Acute post-operative pain intensity (modifiable?)
  - OR = 1.80 (1.28 – 2.77)
  - Change of 10 units on scale of 0 to 100

- DNIC efficiency (dynamic pre-operative trait)
  - OR = 0.52 (0.33 – 0.77)
  - Change of 10 units on scale of -100 to +100
  - Probability of chronic post-thoracotomy pain
    - DNIC 0 → 80%; DNIC 40 → 23%; DNIC 50 → 12%
    - No correlation with acute post-operative pain (independent)

Yarnitsky et al. Pain 2008
Somatic symptoms

How do symptoms become chronic?
Somatization

- Expression of personal and social distress through physical symptoms, often accompanied by patterns of illness behavior such as increased medical help-seeking for those symptoms.

Kleinman and Kleinman, 1985
Somatization ↔ Chronic Pain?

- Prospective population-based follow-up survey
- 1658 people without chronic widespread pain
  - (No pain = 825; Some pain = 833)
- Somatic symptoms, psychological distress, fatigue, health anxiety, illness behavior
- 1404 respondents at 12-month follow-up
- New chronic widespread pain
  - 4.4% of men; 6.8% of women
  - One-third of new cases were men

McBeth et al., Arthritis & Rheumatism, 2001
Predictors of chronic pain

- 8% of people with some pain vs. 2% w/o pain
- Health anxiety: NS
- Fatigue: OR = 2 (univariate only)
- Psychological distress: OR = 2 (univariate only)

- Somatic symptoms >2: OR = 4 (1.5 – 7.4)
- Illness behaviors: OR = 4 – 9 (1.8 – 22.2)
  - Frequent HC visits for sx’s that disrupt normal activity

McBeth et al., Arthritis & Rheumatism, 2001
How important are these predictors?

<table>
<thead>
<tr>
<th>Illness Behavior score</th>
<th>0-4</th>
<th>5-7</th>
<th>8-24</th>
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<tbody>
<tr>
<td><strong>Somatic Symptoms score</strong></td>
<td>n</td>
<td>New CWP</td>
<td>%</td>
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<tr>
<td>0-2</td>
<td>440</td>
<td>6</td>
<td>1.4</td>
</tr>
<tr>
<td>3-5</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

McBeth et al., Arthritis & Rheumatism, 2001
Life Stories

Setting → Sequence → Outcome
Post-traumatic stress disorder

What events are traumatic?
PTSD and chronic pain

- High rates of sexual abuse correlated with CP

Criteria for PTSD
- Re-experiencing the event
- Avoidance of reminders of the event
- Hyperarousal

Motor vehicle collisions → whiplash
- Great variation across countries
- Decreases if financial benefits are reduced
- Rare for same magnitude collisions in other contexts
- No dose effect of trauma intensity and probability

McLean et al. Psychosom Med 2005
Pain catastrophizing

Why are these people so distressed?
Pain catastrophizing

- An exaggerated negative mental set brought to bear during an actual or anticipated painful experience.

- An expectation or worry about major negative consequences from a situation, even one of minor importance.

- Multidimensional cognitive construct:
  - Magnification: “I am afraid that something serious will happen.”
  - Rumination: “I cannot stop thinking about how much it hurts.”
  - Helplessness: “There is nothing I can do to reduce the intensity of the pain.”

Modifying outcome

- Catastrophizing predicts
  - Acute pain intensity and pain sensitivity
  - Development of chronic pain, disability, ↓QoL

- Treatments for catastrophizing
  - CBT and adaptive coping skills training
  - Distraction, relaxation, and visual imagery
  - Social support (number, type)
  - Illness education

Conclusions

What can really be done?
Preventing chronic pain

- Diseases: Repair and Cure
- Dimensions: Guide and Strengthen
- Behaviors: Extinguish and Expose
- Life stories: Rescript and Remoralize
Treatments of predictors

- **Diseases**
  - Neuropathic pain and Major depression
    - Antidepressants
    - Anticonvulsants
    - Augmenting agents

- **Dimensions**
  - Pain modulation and Somatosensory amplification
    - Biofeedback and relaxation
    - Yoga, tai chi, qigong
    - Cognitive-behavioral psychotherapy
Treatments of predictors

Behaviors

- Substance use disorders and Fear/Avoidance
  - Group-based behavioral psychotherapy
  - Desensitization
  - Active physical therapy

Life Stories

- PTSD and Catastrophizing
  - Patient support groups
  - Interpersonal psychotherapy
  - Insight oriented psychotherapy
Case – Amputation was performed!

- **Diseases**
  - MDD: Sertraline 300 mg/d
  - PAP: Valproate 500 mg BID

- **Dimensions**
  - Introvert: Puppy with training
  - Amputee: Prosthetics + PT

- **Behaviors**
  - SUD: Opioid taper after other tx’s
  - F&A: Support groups (OT, Amputees, Church)

- **Life Stories**
  - Marital therapy → infidelity → divorce
  - Vocational rehabilitation → RTW
Hope for preventing chronic pain

- Recognize profiles of risk for new chronic pain
- Prevent the transition from acute to chronic pain
- Treat specific causes of new chronic pain
- Address the nature of barriers to restoring health