Chronic Pain and Pain Rehabilitation

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How Did Pain Become a Medical Problem?

- Descartes – The body is like machine, pain is a signal travelling from the source to the brain
- Henry Beecher – Army physician in WWII, wounded soldiers responded differently to their injuries than his patients at Mass General
- John Bonica – Anesthesiologist after WWII founded first multi-disciplinary pain clinic.
ACUTE VS CHRONIC PAIN
Acute Pain

- Associated with tissue damage
- Abrupt in onset
- Short duration
- Correlation is observed between the site and extent of tissue injury and the location and intensity of pain experienced or expressed
Chronic Pain

• Sudden or gradual onset
• May be associated with a chronic disease process or nervous system dysfunction
• May occur in the absence of identifiable causes
Chronic Pain/Symptom Conditions

- Headache Spells
- Abdominal Pain Environmental Sensitivity
- Pelvic Pain Spasms
- Back/Neck Pain Nausea/Vomiting
- Fibromyalgia Dizziness
- Myofascial Pain
- TMD
Chronic Pain Syndrome Characteristics

- Primary complain of persistent pain/symptoms
- Pain behaviors in excess of physical findings
- Deconditioned physical state
- Disturbed sleep
- Depressive symptoms
- Altered social functioning
- Disability or impaired job performance
- Potential abuse of alcohol or prescription medications
- Over-utilization of health care resources
The Psychological Set-up

• Chronic pain is invisible and incurable
• The behavioral consequences begin early and often escalate
• Social and environmental influences can be significant
• Behavioral issues worsen by physical factors – medications, de-conditioning etc
Theoretical Approaches to Chronic Pain/Symptoms

Chronic Pain Patient

Medical Approach  Gate Control  Operant Approach

Cognitive-Behavioral
Traditional Medical Model

- Pain/Symptom perception is the direct result of tissue damage or disease process.
- Severity of pain or pain complaints are directly proportional to the severity of the tissue damage.
- Pain/Symptoms, in the absence of identifiable pathology, is questionable or psychogenic.
- Fits acute pain/symptoms fairly well.
Pain - Modern Concepts

• Excitatory Pathways
• Inhibitory Pathways
• Neuromodulation
  Short-term changes
• Neuroplasticity
  Long-term changes
Pain Pathways
Abnormal Central Processing

- Patients with chronic pain have been shown to have exaggerated temporal summation of painful stimuli.
- This is analogous to “wind-up” phenomena seen in animal models of pain.
- In those models, wind-up is thought to reflect changes in the receptors for excitatory amino acids (NMDA) and neuropeptides in spinal neurons.
Medical/Biomedical

- Beginning point of investigation and intervention
- Views pain as a problem to be fixed
- Mechanistic and orderly approach to pain generators and mechanisms
- Often highly effective
“A narrow medical focus may miss that which should be found and find that which should be missed.”

J.D. Loeser, M.D.
Theoretical Approaches to Chronic Pain

- Chronic Pain Patient
  - Medical Approach
  - Gate Control
  - Operant Approach
    - Cognitive-Behavioral
Gate Control Theory
(Wall & Melzack)

- First multidimensional model of pain
- Experience of pain the result of integration of motivational-affective, cognitive-evaluative, and sensory-discriminative components
- Increased emphasis on cognitive and affective components that contribute to experience of pain and suffering
Theoretical Approaches to Chronic Pain

Chronic Pain Patient

- Medical Approach
- Gate Control
- Operant Approach

Cognitive-Behavioral
Operant Theory (Fordyce)

- Based on principles of operant learning
- Subjective experience of pain is irrelevant because it is unobservable
- Focuses on observable “pain behaviors”
- Production and maintenance of “pain behaviors” are under environmental control via selective reinforcement
Theoretical Approaches to Chronic Pain

- Chronic Pain Patient
  - Medical Approach
  - Gate Control
  - Operant Approach
    - Cognitive-Behavioral
Cognitive-Behavioral (Turk)

- Incorporates cognitive/affective components with operant learning factors
- Uses behavioral techniques
- Treatment focused on cognitions, emotions, and behavior
- Specific attention given to maintenance of treatment gains
Biopsychosocial Model

- Recognizes that pain/symptoms are multidimensional
- Pain/symptom perception is the result of emotional, environmental, and cognitive factors in addition to physical factors
- Outcomes of disability or loss of function result from the interplay of all of these variables
- Fits chronic pain/symptoms better than traditional model
Biopsychosocial Model

Psychosocial Variables

- Mood
- Attributions (beliefs) about pain
- Attention on pain
- Anxiety
- Social/Family support
- Employment status
- Disability compensation
- Family models of chronic pain
- Abuse history
- Somatization
Assumptions Underlying Treatment at Multidisciplinary Pain Centers

1. A chronic pain problem always involves psychological and social factors in addition to physiological ones

2. Patients benefit from taking an active role in the management of their pain problems

3. “Cure” of the pain in the sense of alleviation of the source of nociception may not be possible, but that pain complaints and behaviors need not be the focal point of the patient’s life
Objectives of Cognitive-Behavioral Approach to Pain Rehabilitation

1. Combat Demoralization
2. Foster Self-Efficacy
3. Break up automatic, maladaptive patterns
4. Skills Training
5. Facilitate maintenance and generalization
Treatment Goals

Reduce the frequency of pain behaviors

Increase the patient’s capabilities and activities to a level considered normal for his/her age and sex

Eliminate the patient’s reliance on pain-relieving medications

Reduce the patient’s utilization of medical care resources for the purposes of pain relief

Educate family members/significant others in pain rehabilitation approach in order to maintain the gains achieved while in the program
“A chronically ill person needs more than symptom relief to resume a normal lifestyle.”

J.D. Loeser, M.D.
“The goals of behavioral methods in pain treatment programs are to reduce excess disability and expressions of suffering.”

Fordyce, 1985
ABC Versions of a Chronic Pain Patient

- **A-Pre-Pain**
  - Active
  - Productive
  - Social
  - Motivated
  - Independent

- **B-Pain**
  - Depressed
  - Deconditioned
  - Discouraged
  - Dependent
  - Drugged

- **C-Post PRC**
  - More active
  - More productive
  - Stable
  - Moderation
  - More Independent
Pain and Behavioral Reinforcers

Diagram showing the relationship between pain and time with positive (R+) and negative (R-) reinforcers.
Reactive and Maintaining Factors

• Physical
• Behavioral
• Emotional
• Chemical
Treatment Outcomes for PRC

Pain Severity (MPI)

Mean T-Scores

Opioid
Non-Opioid

ns
p = .01

Within Subjects
p < .001

Rome, et al, 2004
Interference With Life (MPI)

Mean T-Scores

Opioid
Non-Opioid

Within Subjects
$p < .001$

Rome et al, 2004
General Activity (MPI)

Mean T-Scores

Opioid
Non-Opioid

Within Subjects
$p < .001$

Rome et al, 2004
CES-D

Mean Scores

PRE POST

Within Subjects

Opioid
Non-Opioid

ns ns

Rome et al, 2004

Within Subjects

$p < .001$
Catastrophizing (CSQ)

Mean Scores

- **Opioid**
- **Non-Opioid**

Within Subjects

- $p < .001$
- $p = .03$
- $p = .01$

Rome et al, 2004
“Real” Reason to Hurt
A Behavioral Rehabilitation Model for Chronic Pain: A Case Study

- The case is of a 33 year-old Caucasian female with a complex lower extremity injury following MVA in November 2006. She sustained LLE Pilon fracture initially treated with ORIF. She developed significant co-morbidities, including recurrent cellulitis.

- Interventions including outpatient PT, pharmacotherapies and chiropractic care were ineffective in relieving pain or restoring function. From injury to PRC over 6 years, Pt. became increasingly sedentary due to pain. Treatment was largely ineffective in restoring patient to her previous functional level.

- Since PRC, pt. has continued to attend PRC Aftercare sessions. She participates in a regular fitness routine. She is active in volunteer activities with PRC graduates and current patients. She has also returned to teaching music.
6 Minute Walk Test Data

Distance in Feet

- Admission: 440 feet
- Dismissal: 1500 feet
- 2 year flu: 1779 feet
Outcomes

ADMISSION TO PRC:
440 ft @ 0.8 mph
- Fall Risk, Cane
- OME = 240
- Limited Community Ambulator
- Sedentary, living with family, requires assistance

PRC DISCHARGE:
1500 ft @ 2.8 mph
- No Fall Risk, no A.D.
- OME = 0
- Community Ambulation
- Active lifestyle, living with family and no assistance

2 Year FOLLOW UP:
1779 ft @ 3.4 mph
- No fall risk, OME = 0
- Independent mobility
- Return to vocation
- Regular fitness routine, living independently
Conclusion

• 3-week PRC has a significant and enduring effect on direct medical costs
• Patients and health care systems are able to manage chronic medical conditions in a more conservative and cost-effective manner.
• The comprehensive nature of this treatment results in better independent functioning.
Economic Analysis of a Comprehensive Pain Rehabilitation Program

Study Background

• First of its kind collaboration between a major commercial health insurance company and an independent health care organization
• Blue Cross/Blue Shield of Florida (Florida Blue) provided economic costs for a sample of 53 patients
• These patients completed the Mayo Clinic Pain Rehabilitation Center (MCPRC).
• MCPRC is a 3-week, hospital-based, day treatment program that includes:
  Physical Therapy: Daily stretches, Cardiovascular conditioning, and PT strengthening
  Occupational Therapy: Daily instruction in moderation, time management and functional adaptation
  Behavior Therapy: 3, one-hour group sessions/day focused on behavioral therapy for stress management and behavior change
  Medically supervised medication withdrawal: Opiates, benzodiazepines, sleeping pills etc.
# Key Findings

<table>
<thead>
<tr>
<th>Category</th>
<th>3 Months (pre/post)</th>
<th>6 Months (pre/post)</th>
<th>12 Months (pre/post)</th>
<th>18 Months *(pre/post)</th>
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<tr>
<td>Average Medical Cost</td>
<td>- 86%</td>
<td>- 68%</td>
<td>- 64%</td>
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<tr>
<td>Total Pharmacy Cost</td>
<td>3%</td>
<td>- 24%</td>
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<td>Specialty Care Visits</td>
<td>- 17%</td>
<td>- 34%</td>
<td>- 39%</td>
<td>- 51%</td>
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*only 10% of original sample was eligible for 18 Month analysis
Conclusion

• 3-week PRC has a significant and enduring effect on direct medical costs.

• Patients and health care systems are able to manage chronic medical conditions in a more conservative and cost-effective manner.

• The comprehensive nature of this treatment results in better independent functioning.
Future Directions

- Expand treatment to more conditions that fall under Central Sensitization Syndromes
- Outcome studies for these new populations
Central Sensitization
Peripheral Upregulation

- Skin
- Gut
- Muscle
- Bones
- Joints
- Vascular

- Nerves
- Balance
- Taste
- Smell
- Vision
- Hearing
Central Sensitization

- Somatosensory Cortex
- Consequence: More sensitive to...

  - Pain
  - Dizziness
  - Touch
  - Sound
  - Temperature

  - Fatigue
  - Nausea
  - Light
  - Smell
  - Taste
Central Sensitization

- Motor Cortex

- Consequence: More prone to...
  - Imbalance
  - Weakness
  - Tremor
  - Abnormal Gait
  - Spasms
  - Muscle ‘Jerks’
  - Spells
  - Seizure-Like
  - Difficulty starting and maintaining movements
Autonomic dysfunction (dysautonomia)

Dizziness, lightheadedness
Passing out (syncope)
Cold hands and feet
Leg/arm swelling (RSD/CRPS)
Heavy sweating (hyperhydrosis)

Temperature intolerance
Mottled purple/blue legs
Bowel/bladder symptoms
Hair loss
Fingernails brittle, deformed
Brain imaging of Fibromyalgia pain

Painful forearm injection
Central sensitization

BRAIN REORGANIZATION

Sensory Amplification
No return to normal
No self-adjustment to pain

TENDS TO PERSIST
EVEN WITH REDUCED SENSORY INPUT

Pain begets more pain, becoming autonomous
Postural Orthostatic Tachycardia

Six-minute Walk (feet)

<table>
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<th>Post</th>
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Psychosocial Outcomes

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<th>SF-36</th>
<th>MPI-i</th>
<th>CES-D</th>
<th>PCS</th>
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Performance & Satisfaction

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<th>COPM-s</th>
<th>QOL</th>
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Ehlers Danlos

Six-minute Walk (feet)

Post: 1707
Pre: 1211

Psychosocial Outcomes

MPI-c: Post 60, Pre 44
SF-36: Post 40, Pre 29
MPI-i: Post 55, Pre 43
CES-D: Post 11, Pre 29
PCS: Post 16, Pre 27

Performance & Satisfaction

COPM-p: Post 8, Pre 3
COPM-s: Post 8, Pre 2
QOL: Post 8, Pre 8
Functional Movement Disorder

Six-minute Walk (feet)

- Pre: 1092 feet
- Post: 1458 feet

Psychosocial Outcomes

- MPI-c: Pre - 47, Post - 55
- SF-36: Pre - 39, Post - 50
- MPI-i: Pre - 55, Post - 47
- CES-D: Pre - 29, Post - 16
- PCS: Pre - 29, Post - 16

Performance & Satisfaction

- COPM-p: Pre - 3, Post - 7
- COPM-s: Pre - 4, Post - 8
- QOL: Pre - 4, Post - 8
Questions & Discussion