# Development Committee

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<thead>
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<tbody>
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This program was sponsored by Pfizer Inc.
Learning Objectives

• After completing this module, participants will be able to:
  – Discuss the prevalence of acute pain
  – Understand the impact of acute pain on patient functioning and quality of life
  – Explain the pathophysiology of acute pain
  – Apply a simple diagnostic technique for the differential diagnosis of acute pain
  – Select appropriate pharmacological and non-pharmacological strategies for the management of acute pain
Table of Contents

• What is acute pain?
• How common is acute pain?
• What is the impact of acute pain on patient functioning and quality of life?
• How should acute pain be assessed in clinical practice?
• How should acute pain be treated based on its pathophysiology?
Pain Is the 5th Vital Sign

Respiration  Pulse  Blood pressure  Temperature

Pain

Overview of Pain

Protective role: vital early warning system
- Senses noxious stimuli
- Triggers withdrawal reflex and heightens sensitivity after tissue damage to reduce risk of further damage

Unpleasant experience:
- Suffering – physical, emotional and cognitive dimensions
- Continuous unrelieved pain can affect physical (e.g., cardiovascular, renal, gastrointestinal systems, etc.) and psychological states

Maladaptive response:
- Neuropathic and central sensitization/dysfunctional pain
- Not protective
- Lessens quality of life

The Pain Continuum

**Insult**

**Time to resolution**

- Acute pain
  - Normal, time-limited response to ‘noxious’ experience (less than 3 months)
    - Usually obvious tissue damage
    - Serves a protective function
    - Pain resolves upon healing
  - Pain that has persisted beyond normal tissue healing time (usually more than 3 months)
    - Usually has no protective function
    - Degrades health and function
- Chronic pain

Acute pain may become chronic

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### Somatic vs. Visceral Pain

<table>
<thead>
<tr>
<th>Somatic</th>
<th>Visceral</th>
</tr>
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<tbody>
<tr>
<td>• Nociceptors are involved</td>
<td>• Involves hollow organ and smooth muscle nociceptors that are sensitive to stretching, hypoxia and inflammation</td>
</tr>
<tr>
<td>• Often well localized</td>
<td>• Pain is usually referred, poorly localized, vague and diffuse</td>
</tr>
<tr>
<td>• Usually described as throbbing or aching</td>
<td>• May be associated with autonomic symptoms (e.g., pallor, sweating, nausea, blood pressure and heart rate changes)</td>
</tr>
<tr>
<td>• Can be superficial (skin, muscle) or deep (joints, tendons, bones)</td>
<td></td>
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</tbody>
</table>

Referred Pain

Prevalence of Acute Pain

• **Lifetime** prevalence in general population:
  – Approaches **100%** for acute pain leading to use of analgesics\(^1\)

• **Emergency room** patients:
  – Pain accounts for **>2/3** of emergency room visits\(^2\)

• **Hospitalized** patients:
  – **>50%** report pain\(^3\)

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WHAT ARE THE MOST COMMON TYPES OF ACUTE PAIN YOU SEE IN YOUR PRACTICE?
Epidemiology of Pain in General Practice

• 1 in 3 patients reported pain

• Of patients in pain:
  – 47.2% had acute pain
  – Location of pain was mainly in musculoskeletal areas and the limbs
  – 2 in 3 pain patients had a drug prescription

• Pain was more frequent in women

Most Common Types of Pain in General Practice

- MSK – soft tissue: 25%
- MSK – neck: 4%
- MSK – back: 23%
- Other: 6%
- Symptom*: 12%
- MSK – other**: 8%
- Trauma: 12%
- Cardiac: 3%
- Digestive: 3%
- Infectious: 4%

Note: types of pain are based on ICD-9 codes
*The use of the symptom code suggests clinician could not identify the underlying cause of the pain
**MSK – other refers to musculoskeletal pain at sites other than the neck, back or soft tissue
ICD = International Classification of Disease; MSK = musculoskeletal
Impact of Acute Pain on Daily Activities

- Limits participation in favourite activity
- Impedes routine tasks
- Prevents enjoyment of family time
- Prevents enjoyment of time with significant other
- Trouble falling and staying asleep

*Patients who responded “Sometimes”, “Often” or “Always”*

Consequences of Unrelieved Pain

- Acute pain
  - Impaired physical function
    - Reduced mobility
    - Disturbed sleep
    - Immune impairment
  - Dependence
    - On medication
    - On family members/other caregivers
  - Extended recovery time
    - Hospital readmissions
    - Economic costs
  - Increased risk of developing chronic pain
Post-operative Pain

80% of patients undergoing surgery experience post-operative pain.

<50% report adequate pain relief.

88% of these report the pain is moderate, severe, or extreme.

10–50% develop chronic pain*.

For 2–10% of these, pain is severe.

Pain accounts for 38% of unanticipated admissions and readmissions following ambulatory surgery.

*Depending on type of surgery
Importance of Pain Assessment

Pain is a significant predictor of morbidity and mortality.

- Screen for red flags requiring immediate investigation and/or referral
- Identify underlying cause
  - Pain is better managed if the underlying causes are determined and addressed
- Recognize type of pain to help guide selection of appropriate therapies for treatment of pain
- Determine baseline pain intensity to future enable assessment of efficacy of treatment

Discussion Question

HOW DO YOU ASSESS ACUTE PAIN IN YOUR PRACTICE?
Assessment of Acute Pain

- Site of pain
- Circumstances associated with pain onset
- Character of pain
- Intensity of pain
- Associated symptoms (e.g., nausea)
- Comorbidities

- Treatment
  - Current and previous medications, including dose, frequency of use, efficacy and side effects

- Relevant medical history
  - Prior or coexisting pain conditions and treatment outcomes
  - Prior or coexisting medical conditions

- Factors influencing symptomatic treatment
Locate the Pain

Body maps are useful for the precise location of pain symptoms and sensory signs.*

*In cases of referred pain, the location of the pain and of the injury or nerve lesion/dysfunction may not be correlated
Determine Pain Intensity

**Simple Descriptive Pain Intensity Scale**

No pain | Mild pain | Moderate pain | Severe pain | Very severe pain | Worst pain

**0–10 Numeric Pain Intensity Scale**

0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

No pain | Moderate pain | Worst possible pain

**Faces Pain Scale – Revised**

![Faces Pain Scale](http://www.iasp-pain.org/Content/NavigationMenu/GeneralResourceLinks/FacesPainScaleRevised/default.htm)
Look for Red Flags for Musculoskeletal Pain

- Older age with new symptom onset
- Night pain
- Fever

- Sweating
- Neurological features
- Previous history of malignancy

Acute Pain Evaluation and Treatment

Patient presenting with acute pain

Perform diagnostic evaluation

Perform assessments

Pain is severe/disabling: requires opioids

Yes
Refer to specialist

No
Treat appropriately

Re-evaluate and adjust treatment if indicated

Goals in Pain Management

- Involve the patient in the decision-making process
- Agree on realistic treatment goals **before** starting a treatment plan

Optimized pain relief
Improved function

Minimized adverse effects

Multimodal Treatment of Pain Based on Biopsychosocial Approach

- Pharmacotherapy
- Stress management
- Interventional pain management
- Biofeedback
- Complementary therapies
- Education
- Lifestyle management
- Sleep hygiene
- Physical therapy
- Occupational therapy

Discussion Question

WHAT NON-PHARMACOLOGICAL APPROACHES TO MANAGING ACUTE PAIN DO YOU INCORPORATE INTO YOUR PRACTICE?

ARE THERE NON-PHARMACOLOGICAL MODALITIES YOUR PATIENTS REGULARLY ASK ABOUT?
## Physical Interventions for Acute Pain

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Potential utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transcutaneous electrical nerve stimulation</td>
<td>• Certain stimulation patterns effective in some acute pain settings (e.g., post-operative pain)</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>• Reduces post-operative pain as well as opioid-related adverse effects&lt;br&gt;• May be effective in some other acute pain settings</td>
</tr>
<tr>
<td>Massage and manual therapy</td>
<td>• Little consistent evidence for use in post-operative pain</td>
</tr>
<tr>
<td>Heat and cold therapy</td>
<td>• Evidence for benefits from post-operative local cooling is mixed</td>
</tr>
</tbody>
</table>

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Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine.<br>Acute Pain Management: Scientific Evidence. 3rd ed. ANZCA & FPM; Melbourne, VIC: 2010.
## Cognitive Behavioral Interventions for Acute Pain

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Potential utility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reassurance and provision of information</td>
<td>• Evidence that information is effective in reducing procedure-related pain is tentatively supportive and not sufficient to make recommendations</td>
</tr>
<tr>
<td>Relaxation training</td>
<td>• Evidence is weak and inconsistent</td>
</tr>
</tbody>
</table>
| Attentional techniques (e.g., imagery, distraction, music therapy) | • Listening to music produces a small reduction in post-operative pain and opioid requirement  
  • Immersive virtual reality distraction is effective in reducing pain in some clinical situations |
| Hypnosis                                               | • Evidence of benefit is inconsistent                                              |
| Coping methods/behavioral instruction                  | • Training prior to surgery reduces pain, negative affect and analgesic use        |

Australian and New Zealand College of Anaesthetists and Faculty of Pain Medicine.  
Ideal Characteristics for Acute Analgesic Therapy

• Ideal drug characteristics for acute pain therapy:

- Rapid onset
- Long duration
- Effective analgesia
- Limited adverse effects
Patients Prefer Avoiding Side Effects to Complete Pain Control

Relative Importance Placed by Patients on Different Attributes of Acute Pain Therapy

- Pain control: 41%
- Setting and route of administration: 12%
- Side effect type: 28%
- Side effect severity: 19%

47%
<table>
<thead>
<tr>
<th>Adverse event</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constipation</td>
<td>25 (50%)</td>
</tr>
<tr>
<td>Mental cloudiness/dizziness</td>
<td>41 (82%)</td>
</tr>
<tr>
<td>Itching</td>
<td>27 (54%)</td>
</tr>
<tr>
<td>Nightmares/hallucinations</td>
<td>16 (32%)</td>
</tr>
<tr>
<td>Mood changes/alterations</td>
<td>17 (34%)</td>
</tr>
<tr>
<td>Nausea</td>
<td>35 (70%)</td>
</tr>
<tr>
<td>Sleep disorders</td>
<td>24 (48%)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>16 (32%)</td>
</tr>
</tbody>
</table>

Why should we treat acute pain?

If acute pain **IS NOT** treated effectively:

- It may cause severe suffering, loss of quality of life, loss of productivity, have economic considerations
- Is associated with morbidity and even mortality
- May develop into chronic pain
So how do we treat acute pain?

- Treat according to pain mechanisms involved
- Multimodal analgesia

Multimodal or Balanced Analgesia

- Improved analgesia
- ↓ doses of each analgesic
- ↓ severity of side effects of each drug

Coxib = COX-2 inhibitor; nsNSAID = non-specific non-steroidal anti-inflammatory drug

Analgesics Should Be Given at Regular Intervals During Acute Pain Episodes


**Graph:**
- **Y-axis:** Mean pain intensity score
- **X-axis:** Times after surgery (PM day of surgery, AM day after surgery, PM day after surgery, AM 2 days after surgery, PM 2 days after surgery, AM 3 days after surgery, PM 3 days after surgery)

**Legend:**
- Blue line: Around-the-clock dosing
- Red line: PRN dosing
Nociception: Neural Process of Encoding Noxious Stimuli

Consequences of encoding may be autonomic (e.g., elevated blood pressure) or behavioral (motor withdrawal reflex or more complex nocifensive behavior). Pain perception is not necessarily implied.

Inflammation

Damaged tissue
Inflammatory cells
Tumor cells

Nociceptive afferent fiber

Inflammatory chemical mediators
- Prostanoids
- Cytokines
- Growth factors
- Kinins
- Purines
- Amines
- Ions

Changed responsiveness of nociceptors (peripheral sensitization)

Changed responsiveness of neurons in CNS (central sensitization)

Spinal cord

Brain

CNS = central nervous system
Mechanism-Based Pharmacological Treatment of Nociceptive/Inflammatory Pain

Noxious stimuli

NSAIDs/coxibs
Local anesthetics

Peripheral sensitization

Nociceptive afferent fiber

Central sensitization

Spinal cord

Brain

Perception

Opioids

α2δ ligands
Acetaminophen
Antidepressants

nsNSAIDs/coxibs/Opioids

Descending modulation

Ascending input

Transduction

Transmission

Inflammation

Coxib = COX-2 inhibitor; nsNSAID = non-specific non-steroidal anti-inflammatory drug

Discussion Question

HOW DO THESE MEDICATIONS WORK TO REDUCE ACUTE PAIN?
What are NSAIDs (nsNSAIDs/coxibs)?

**NSAID = Non-Steroidal Anti-Inflammatory Drug**

- Analgesic effect via inhibition of prostaglandin production
- Broad class incorporating many different medications:

**Examples of nsNSAIDs:**
- Diclofenac
- Ibuprofen
- Naproxen

**Examples of Coxibs:**
- Celecoxib
- Etoricoxib
- Parecoxib

*Coxib = COX-2-specific inhibitor; nsNSAID = non-specific non-steroidal anti-inflammatory drug*  
How do nsNSAIDs/coxibs work?

Coxib = COX-2-specific inhibitor; NSAID = non-steroidal anti-inflammatory drug
nsNSAID = non-specific non-steroidal anti-inflammatory drug

Adverse Effects of nsNSAIDs/Coxibs

All NSAIDs:
- Gastroenteropathy
  - Gastritis, bleeding, ulceration, perforation
- Cardiovascular thrombotic events
- Renovascular effects
  - Decreased renal blood flow
  - Fluid retention/edema
  - Hypertension
- Hypersensitivity

Cox-1-mediated NSAIDs (nsNSAIDs):
- Decreased platelet aggregation
Discussion Question

HOW DO YOU EVALUATE GASTROINTESTINAL RISK IN PATIENTS YOU ARE CONSIDERING PRESCRIBING A NONSNSAID OR A COXIB?
Risk Factors for Gastrointestinal Complications Associated with nsNSAIDs/Coxibs

ASA = acetylsalicylic acid; coxib = COX-2-specific inhibitor; GI = gastrointestinal; NSAID = non-steroidal anti-inflammatory drug; nsNSAID = non-specific non-steroidal anti-inflammatory drug; SSRI = selective serotonin reuptake inhibitor

**Guidelines for nsNSAIDs/Coxibs Use Based on Gastrointestinal Risk and ASA Use**

<table>
<thead>
<tr>
<th>Gastrointestinal risk</th>
<th>Not elevated</th>
<th>Elevated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not on ASA</td>
<td>nsNSAID alone</td>
<td>Coxib nsNSAID + PPI</td>
</tr>
<tr>
<td>On ASA</td>
<td>Coxib + PPI nsNSAID + PPI</td>
<td>Coxib + PPI nsNSAID + PPI</td>
</tr>
</tbody>
</table>

How Opioids Affect Pain

Modify perception, modulate transmission and affect transduction by:

• Altering limbic system activity; modify sensory and affective pain aspects
• Activating descending pathways that modulate transmission in spinal cord
• Affecting transduction of pain stimuli to nerve impulses

WHAT POTENTIAL SIDE EFFECTS DO YOU DISCUSS WITH PATIENTS FOR WHOM YOU ARE CONSIDERING PRESCRIBING AN OPIOID?
## Adverse Effects of Opioids

<table>
<thead>
<tr>
<th>System</th>
<th>Adverse effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal</td>
<td>Nausea, vomiting, constipation</td>
</tr>
<tr>
<td>CNS</td>
<td>Cognitive impairment, sedation, lightheadedness, dizziness</td>
</tr>
<tr>
<td>Respiratory</td>
<td>Respiratory depression</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>Orthostatic hypotension, fainting</td>
</tr>
<tr>
<td>Other</td>
<td>Urticaria, miosis, sweating, urinary retention</td>
</tr>
</tbody>
</table>

CNS = central nervous system

Acetaminophen

• Action at molecular level is unclear
• Potential mechanisms include:
  – Inhibition of COX enzymes (COX-2 and/or COX-3)
  – Interaction with opioid pathway
  – Activation of serotoninergic bulbospinal pathway
  – Involvement of nitric oxide pathway
  – Increase in cannabinoid-vanilloid tone

Peri-operative Pain Management Aims to Control Pain and Decrease Likelihood of Developing Chronic Pain

Use of pharmacological agents before, during and after surgery may:
- acute pain
- subsequent development of chronic pain
- morbidity, costs and other consequences of chronic pain

Reduced morbidity and accelerated convalescence

Controlling Post-operative Physiology

- Pre-operative information + teaching
- Attenuation of intra-operative stress
- Pain relief
- Exercise
- Enteral nutrition
- Supportive agents/therapy in high-risk patients

Recommendations for Management of Acute Pain

**Acetaminophen**

*If ineffective*

**Add nsNSAIDs/coxibs**

*If ineffective*

**Add opioids**

/preferences short-acting agents at regular intervals; ongoing need for such treatment requires reassessment

*Coxib = COX-2-specific inhibitor; nsNSAID = non-selective non-steroidal anti-inflammatory drug*

Algorithm for Treatment of Acute Pain Based on Severity

Acute pain due to:
- Sport injury
- Traumatic or inflammatory condition
- Musculoskeletal injury

Mild or moderate acute pain

Inadequate analgesia

Step 1: Acetaminophen
(4 g/day maximum dose; 4 h minimum interval between each 1 g dose)

Inadequate analgesia

Step 2: Coxib or nsNSAID
(make choice based on patient risk profile)

Inadequate analgesia

Step 3: Add 1 of following:
- Acetaminophen/codeine
- Acetaminophen/tramadol
- Tramadol

Severe acute pain

Opioids
(refer patient to pain clinic or specialist)

Topical nsNSAID
(with or without combined oral acetaminophen, coxib or nsNSAID)

Coxib = COX-2 inhibitor; nsNSAID = non-specific non-steroidal anti-inflammatory drug
Analgesia for Post-operative Pain Based on Type of Surgery

**Surgical procedures**

**Minor surgery**
- Acetaminophen
- nsNSAIDs/coxibs*
- Wound infiltration
- Regional block analgesia
- Weak opioid or rescue analgesic, if necessary

**Moderate surgery**
- Acetaminophen
- nsNSAIDs/coxibs*
- Wound infiltration
- Peripheral nerve block or IV opioid

**Major surgery**
- Acetaminophen
- nsNSAIDs/coxibs*
- Wound infiltration
- Epidural or major peripheral nerve or plexus block or IV opioid

*Unless contraindicated

Coxib = COX-2-specific inhibitor; IV = intravenous; nsNSAID = non-selective non-steroidal anti-inflammatory drug


IN YOUR PRACTICE, DO YOU REGULARLY ASSESS RISK FOR DEVELOPING CHRONIC PAIN? IF SO, HOW?
Risk Factors for Chronic Post-operative Pain

Pre-operative factors
- Moderate to severe pain, lasting >1 month
- Repeat surgery
- Psychologic vulnerability (e.g., catastrophizing)
- Pre-operative anxiety
- Female gender
- Younger age (adults)
- Workers’ compensation
- Genetic predisposition
- Inefficient diffuse noxious inhibitory control

Intra-operative factors
- Surgical approach with risk of nerve damage

Post-operative factors
- Moderate to severe acute pain
- Radiation therapy to area
- Neurotoxic chemotherapy
- Depression
- Psychological vulnerability
- Neuroticism
- Anxiety

Acute Pain Can Become Chronic

Life Cycle Factors Associated with Development of Chronic Pain

From birth
- Genetics
- Female sex
- Minority race/ethnicity
- Congenital disorders
- Prematurity
- Parental anxiety
- Irregular feeding/sleeping
- Parents’ pain exposure and reactions
- Personality

Childhood
- Physical/sexual abuse and other traumatic events
- Low socioeconomic status
- Emotional, conduct and peer problems
- Hyperactivity
- Serious illness or injury
- Separation from mother
- Acute or recurrent pain experience

Adolescence
- Changes of puberty
- Gender roles
- Education level
- Injuries
- Obesity
- Low levels of fitness

Adulthood
- Vivid recall of childhood trauma
- Lack of social support
- Accumulated stress
- Surgery
- Overuse of joints and muscles
- Occupation
- Chronic disease
- Aging

Key Messages

• Acute pain is extremely common, with musculoskeletal pain being the most common presentation in primary care.
• Clinicians should maintain high degree of awareness for “red flags” indicating potential serious disorders and should, when possible, treat the underlying cause of pain.
• In acute pain, normal nociception is modified by inflammation.
  – Acetaminophen, nsNSAIDs/coxibs and opioids target common mechanisms of acute pain.
  – Pain severity and individual patient risk profile should be considered when selecting pain management therapies.
• Timely and appropriate treatment may help prevent acute pain from becoming chronic pain.

Coxib = COX-2-specific inhibitor; nsNSAID = non-selective non-steroidal anti-inflammatory drug;