ALGESIOLOGY

acute & chronic pain therapy

Jozef Firment, MD. PhD.

Department of
Anaesthesiology & Intensive Care Medicine
Šafárik University Faculty of Medicine, Košice

DEFINITION OF PAIN FROM IASP

- An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage
- Subjective phenomenon

International Association for the Study of Pain, 1994.

Why treat the pain?

- Not just humanitarian reasons.
- Pain has adverse effects on various organ systems.

Consequences of pain

ENDOCRINE SYSTEM

Increase:	
ACTH	• Protein catabolism
Cortisol	• Lipolysis
Glucagon	• Hyperglycemia
Epi	
Decrease:	• Hyperglycemia
Insulin	• Decreased protein anabolism
Testosterone	

ENDOCRINE/CV SYSTEM

Increase:	• Salt and H_2O retention
Aldosterone	
ADH	
Increase:	
Cortisol	• Vasoconstriction
Catecholamines	• Inc. HR, contractility
Angiotensin II	• Poss. CHF, Angina, MI
	• Sensitize nociceptors

Consequences of pain

RESPIRATORY SYSTEM

Increase:	•Hypoxemia
Skeletal muscle tone	•Hypercapnia
	•V/Q mismatches
Decrease:	•Atelectasis
Lung compliance	•Pneumonitis

GU/GI SYSTEMS

Increase:	
Sphincter tone	
	•Urinary retention
Decrease:	•Ileus
Smooth muscle tone	

Consequences of pain

IMMUNOLOGIC SYSTEM

Decrease:

White cell count

RE system activity

Killer T-cell cytotoxicity

- Decrease immune function

COAGULATION EFFECTS

Increase:

Platelet adhesiveness

Coag cascade activity

Decrease:

Fibrinolysis

- Increase thromboembolic phenomena

TYPES OF PAIN

- **Acute pain:** Recent onset, transient, identifiable cause
- **Chronic pain**: Persistent or recurrent pain, beyond usual course of acute illness or injury
- **Breakthrough pain:** Transient pain, severe or excruciating, over baseline of moderate pain

INTENSITY & DURATION of POSTOP PAIN

SURG SITE	OPIOIDS NECESSITY(h)	VAS
Thoracotomy	72-96	10
Abdomen - upper	48-72	7-8
Abdomen - lower	<48	5
Hip surgery	<48	5
Faciomaxillary	<48	5
Perinaeum	24-48	5
Legs	24-36	5
Skin	<24	5
Groin	<36	2-3

Basic structure of the pain pathway

Fong A., Schug S. A.: Pathophysiology of Pain: A Practical Primer. Plast. Reconstr. Surg. 134: 8S, 2014

Classification of Pain

Physiological Pain		Pathological Pain
Biologically useful: adaptive and protective		Maladaptive
Nociceptive pain Physiological protective system To minimize and avoid damage from intense noxious stimuli (eg, heat, cold, mechanical force, and chemical irritants) High threshold pain Pain results in immediate attention and withdrawal reflex	Inflammatory pain Heightened sensitivity after tissue injury or infection Immune system is activated involving macrophages, mast cells, neutrophils, and granulocytes (inflammatory soup) Low threshold pain Tenderness discourages physical contact and movement, thus reducing further risk of injury and promoting healing	Neuropathic pain due to a lesion or disease of the somatosensory nervous system (eg, painful peripheral neuropathy, poststroke, and multiple sclerosis) CNS dysfunctional pain in conditions where there is no such damage or inflammation (eg, fibromyalgia, irritable bowel syndrome, and interstitial cystitis) Common features: Low-threshold pain Spontaneous pain Imbalance between excitatory/inhibitory mechanisms Central sensitization

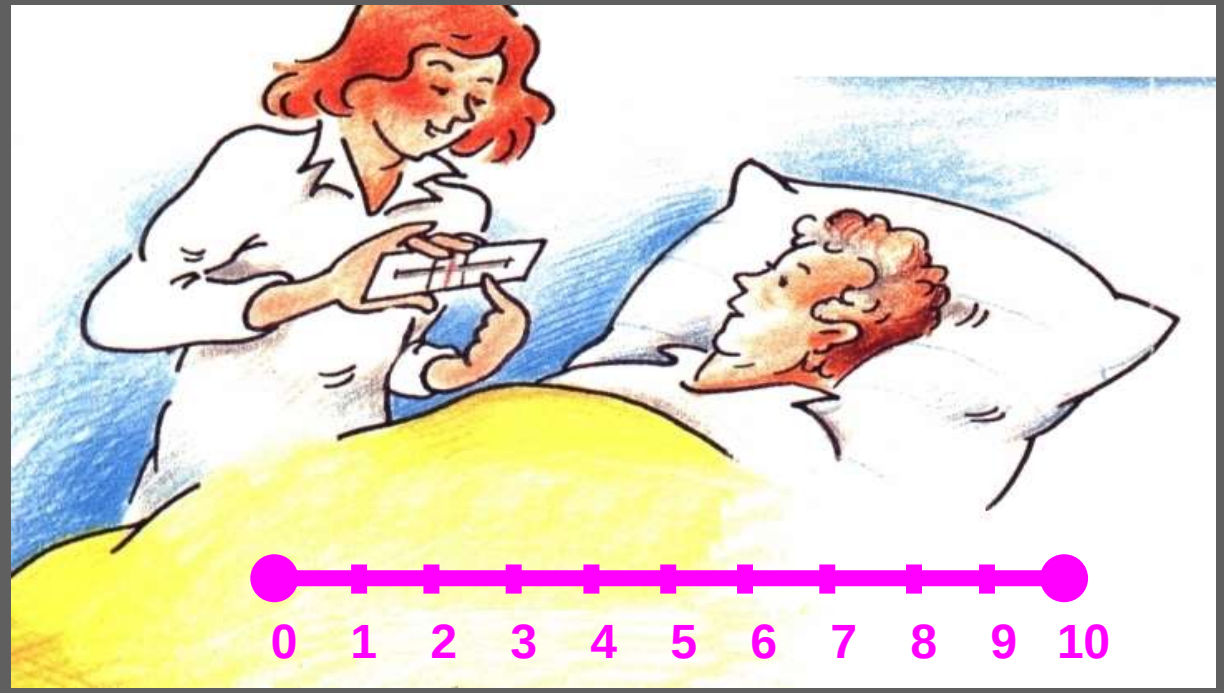
Fong A., Schug S. A.: Pathophysiology of Pain: A Practical Primer. Plast. Reconstr. Surg. 134: 8S, 2014

Typical Features of Neuropathic Pain

- **Hyperalgesia** Increased response to a painful stimulus
- **Allodynia** Pain due to a stimulus that does not normally cause pain
- **Dysaesthesia** Unpleasant abnormal sensation, whether spontaneous or evoked
- **Hyperpathia** Painful syndrome characterized by an abnormally painful reaction to a stimulus, especially a repetitive stimulus, as well as an increased threshold
- **Hypoalgesia** Diminished response to a normally painful stimulus

Fong A., Schug S. A.: Pathophysiology of Pain: A Practical Primer. Plast. Reconstr. Surg. 134: 8S, 2014

VAS - SEVERITY OF PAIN EVALUATION



MAKE PAIN VISIBLE !

Acute pain ≤3
Chronic pain ≤2

- monitoring VAS (Husskison) (0 - 10)
- monitoring BP, P, RR
- dermatom level
- sedation Ramsay (1 - 6)
- motor resp. (Bromage)
- pt satisfaction control

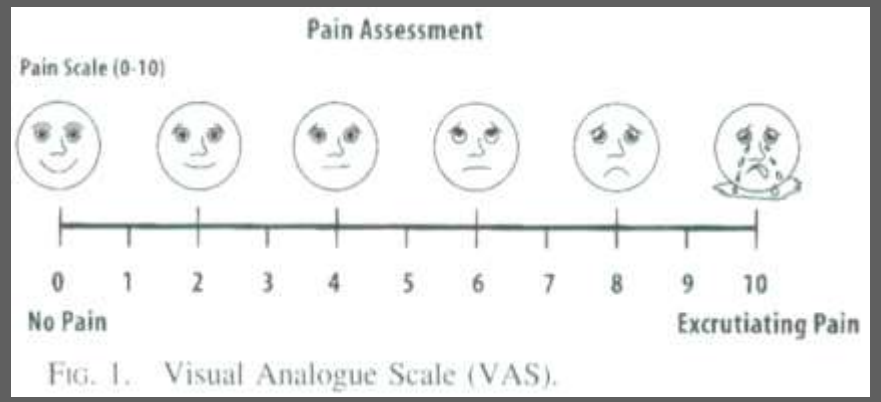


FIG. 1. Visual Analogue Scale (VAS).

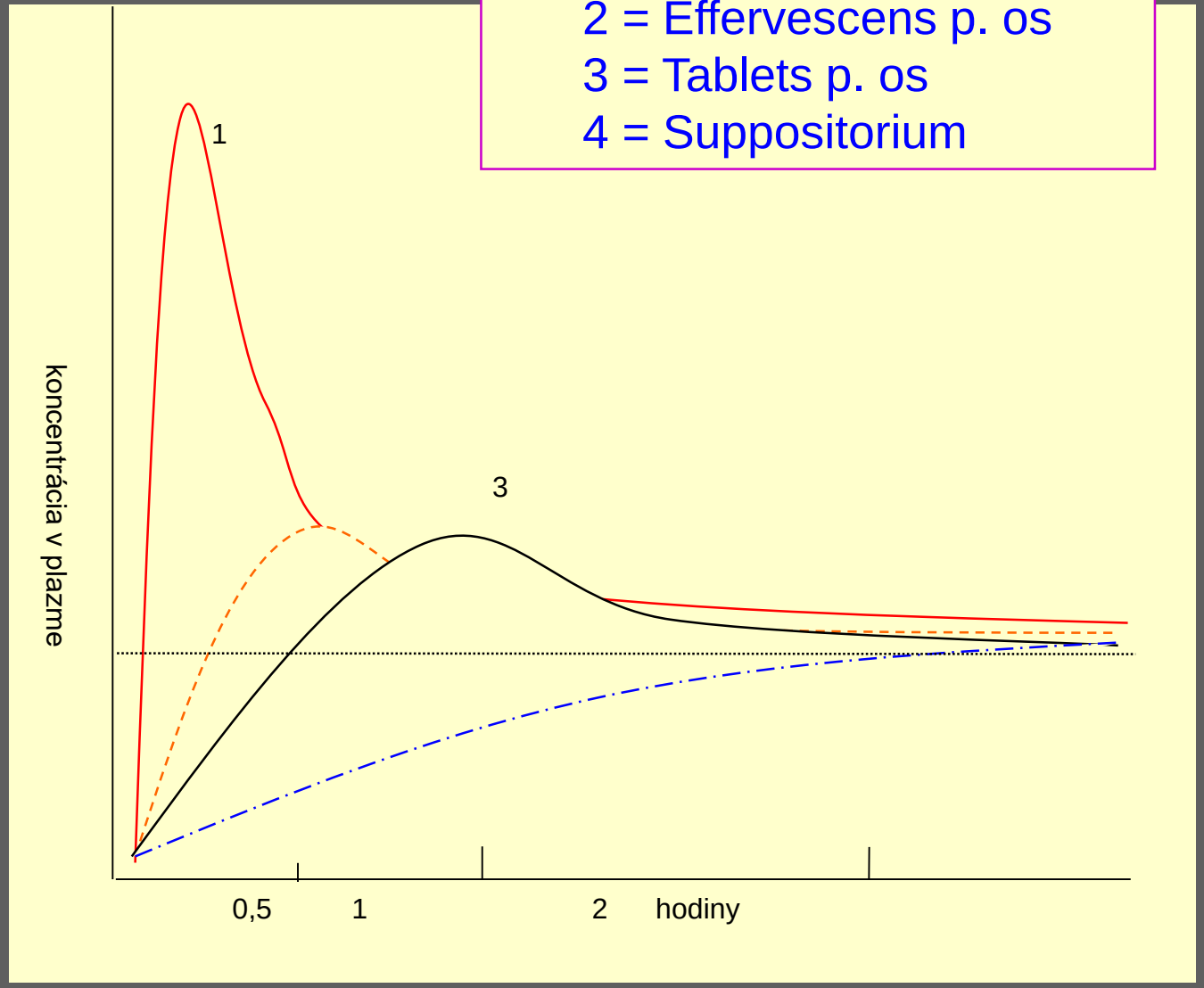
Paracetamol aplic forms

1 = i.v.

2 = Effervescens p. os

3 = Tablets p. os

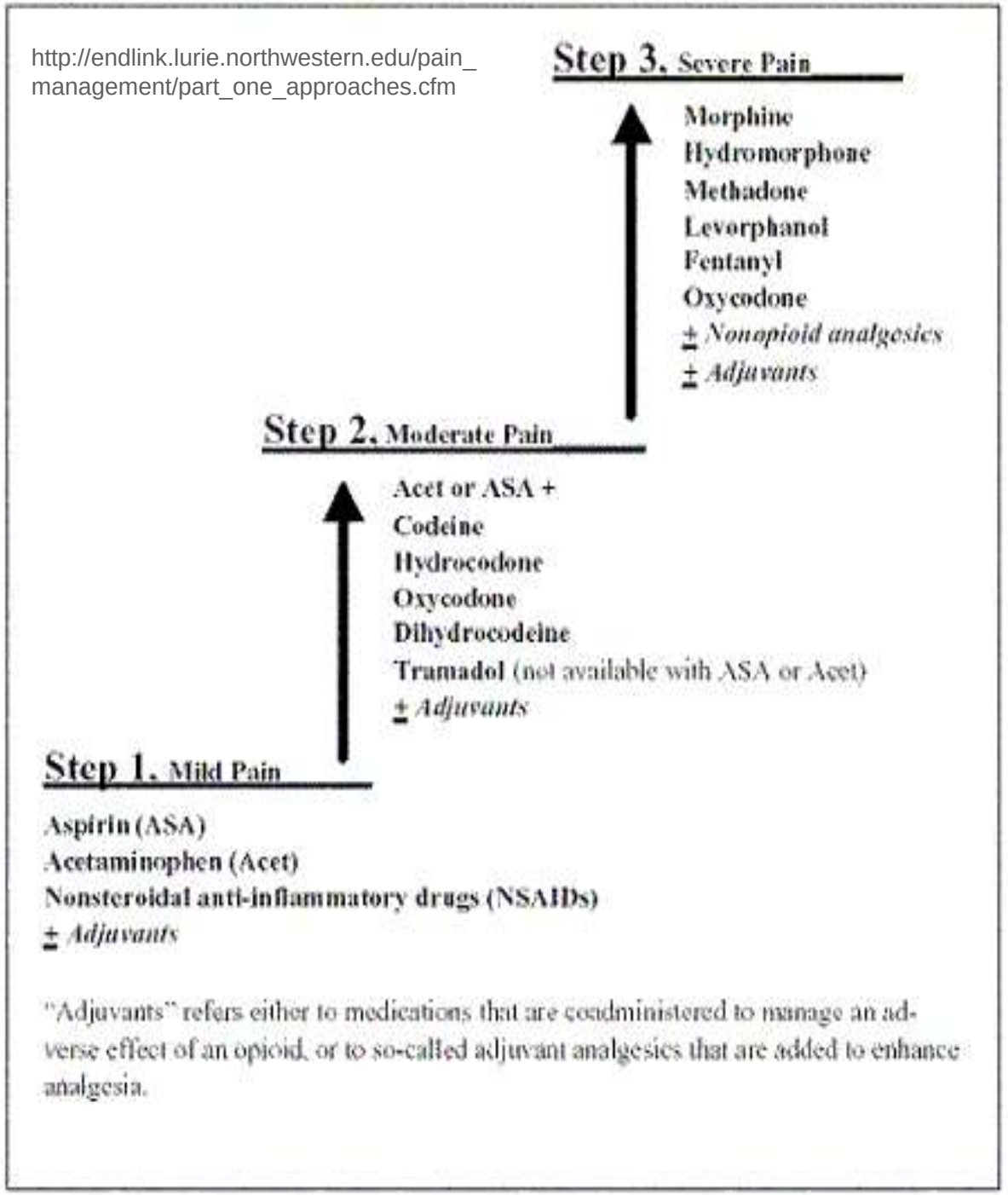
4 = Suppositorium



POSTOPERATIVE PAIN THERAPY

- IM
- IV (pump)
- Epidural (pump)
- Orally
- Rectally
- Transdermal

http://endlink.lurie.northwestern.edu/pain_management/part_one_approaches.cfm



The WHO 3-Step Model for Pain Management

C.L.

MORPHIN PROPERTIES

1. Analgesia
2. Sedation
3. Respir. depression
4. Antitussic
5. Vasodilation
6. Histhamin releasing
7. Constipation
8. Nausea vomiting
9. Miosis
10. Oddi sph. spasm
11. Urine retention
12. Tolerability
13. Addiction

Pharmacokinetic Data Are Presented as Average Values

	Bioavailability	Peak Plasma Concentration	Plasma Half-Life	Duration of Action
Acetaminophen oral (1 g)	85–95%	10–90 min	2–3 h	4–6 h
Acetaminophen IV (1 g)	100%	5–10 min	2.7 h	4–6 h
NSAID				
Indomethacin (50 mg)	90%	1 h	4.5 h	4–6 h
Ibuprofen (400 mg)	?	1–2 h	2 h	4–6 h
Diclofenac (50 mg)	60–70%	15–30 min	1.2–2 h	4–8 h
Ketorolac IV (30 mg)	100%	10–15 min	4–9 h	11 h
COX-2 inhibitors				
Etoricoxib (120 mg)	100%	1 h	22 h	20 h
Parecoxib IV (40 mg)	100%	10–15 min	8 h	15 h

Parecoxib is a prodrug and is converted to the active form valdecoxib rapidly in the liver.

GuptaA., Jakobsson Jan : Acetaminophen, Nonsteroidal Anti-Inflammatory Drugs, and Cyclooxygenase-2 Selective Inhibitors: An Update. Plast. Reconstr. Surg. 134: 24S, 2014

The Selectivity of Different NSAID and COX-2

	COX-2/COX-1 Ratio	COX-1/COX-2 Ratio
Aspirin	167	3.1
Naproxen	0.6	1.7
Ketorolac	2.0	0.5
Diclofenac	2.2	1.4
Indomethacin	30	0.02
Ibuprofen	15	0.07
Piroxicam	33	0.04
Tenoxicam	15	0.62
Meloxicam	0.33	3
Etoricoxib	0.02	344
Celecoxib	0.03	30
Rofecoxib	0.003	272

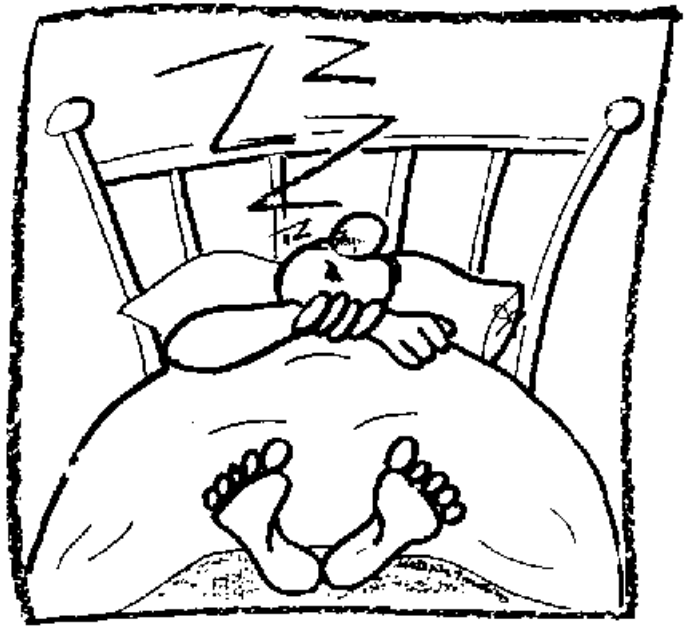
GuptaA., Jakobsson Jan : Acetaminophen, Nonsteroidal Anti-Inflammatory Drugs, and Cyclooxygenase-2 Selective Inhibitors: An Update. Plast. Reconstr. Surg. 134: 24S, 2014

Incidence of Cardiovascular Events in Patients Taking NSAIDs and COX-2 Inhibitors

	Incidence of Event in Experimental Group (%)	Incidence of Event in Placebo Group (%)	*p* (Experimental Group versus Placebo)
Rofecoxib 50 mg			
Hypertension	14.3	7.3	<0.05
Thromboembolic event	4.5	2.0	0.008
Celecoxib 400 mg			
Major adverse cardiovascular events	2.8	0.8	0.01
Naproxen			
Myocardial infarct	1.28	0.95	0.5
Stroke	1.70	0.76	0.06

GuptaA., Jakobsson Jan : Acetaminophen, Nonsteroidal Anti-Inflammatory Drugs, and Cyclooxygenase-2 Selective Inhibitors: An Update. Plast. Reconstr. Surg. 134: 24S, 2014

POSTOPERATIVE PAIN TREATMENT



REGIONAL GENERAL

POSTOPERATIVE ANALGESIA

Chronic pain

Chronic pain

- **Non malignant**
- **Malignant**

CONSEQUENCES OF PAIN

- Loss of employment / income
- Depression, fear, anxiety
- Isolation
- Sleep disorders
- Marital and family dysfunction

CLASSIFICATION OF PAIN

	Characteristics	Examples	Primary Therapy
Somatic	Constant, aching, gnawing, often well localized	Bone metastases	Treatment of tumor, anti-inflammatory, analgesics
Visceral	Constant, aching, often associated with nausea	Pancreatic Cancer	Treatment of tumor, analgesics, nerve blocks
Neuropathic	Paroxysmal shock-like pain on top of a burning, constricting sensation	Plexopathy or posttherpetic neuralgia	Treatment of tumor, analgesics, TENS, nerve blocks
Sympathetically maintained	Severe burning, squeezing, or constricting with local edema	Reflex sympathetic dystrophy	Sympathetic blockade, physiotherapy, adjuvant analgesics

ETIOLOGY OF PAIN IN CANCER PATIENTS 1/2

Direct Tumor Involvement (70%)

- Invasion of bone
- Invasion or compression of neural structures
- Obstruction of hollow viscus or ductal system of solid viscus
- Vascular Obstruction or invasion
- Mucous membrane ulceration or involvement

Cancer-Induced Syndromes (<10%)

- Paraneoplastic syndromes
- Pain associated with debility

ETIOLOGY OF PAIN IN CANCER PATIENTS 2/2

Diagnostic or Therapeutic Procedures (20%)

- Procedure-related pain (i.e. bone marrow aspiration, lumbar puncture)
- Acute postoperative pain or postsurgical syndromes (i.e. postmastectomy)
- Postradiation (i.e. injury to spinal cord)
- Postchemotherapy (i.e. mucositis, peripheral neuropathy)

Pain unrelated to the malignancy or its treatment

The End