

Pain Management



Dr. Zohair Alaseri, MD
FRCPC, Emergency Medicine
FRCPC, Critical Care Medicine
Intensivist and Emergency Medicine Consultant
Chairman, Department of Emergency Medicine
King Saud University Hospitals, Riyadh, KSA

I love the ER.

Every day I make a big difference in someone's life.

It is hard to find a better job description than that.

Pain Management

- Pain is the most common complaints in the ED
- Pain relief is one of ED essential missions



Pain Management





- Patients judge physicians by how they treat pain

Fosnocht DE, Swanson ER, Bossert P: Patient expectations for pain medication delivery. Am J Emerg Med 2001; 19:399.

Pain Management

Hospital Accreditation

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) requires hospitals to develop acute pain management programs including:

-  Measurement
-  Treatment
-  Documentation
-  Quality improvement

Acute Pain

Acute Versus Chronic Pain

Acute	Chronic
Is a symptom of illness	Is the problem
Serves a biologic purpose	Has no biologic function
Causes anxiety	Causes depression
with identifiable pathology	May or may not with identifiable pathology
less than 6 months	Is present for more than 6 months

Adapted from Stewart CE, MacMurdo D: Chronic pain. In Paris PM, Stewart RD (eds): Pain Management in Emergency Medicine. Norwalk, Conn, Appleton & Lange, 1988.

Acute Pain

Introduction..

Pathologic condition

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graph TD; A[Pathologic condition] --> B[Acute pain]; B --> C[warning the individual]; C --> D[limit certain activities | seek medical assistance];
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Acute pain

warning the individual

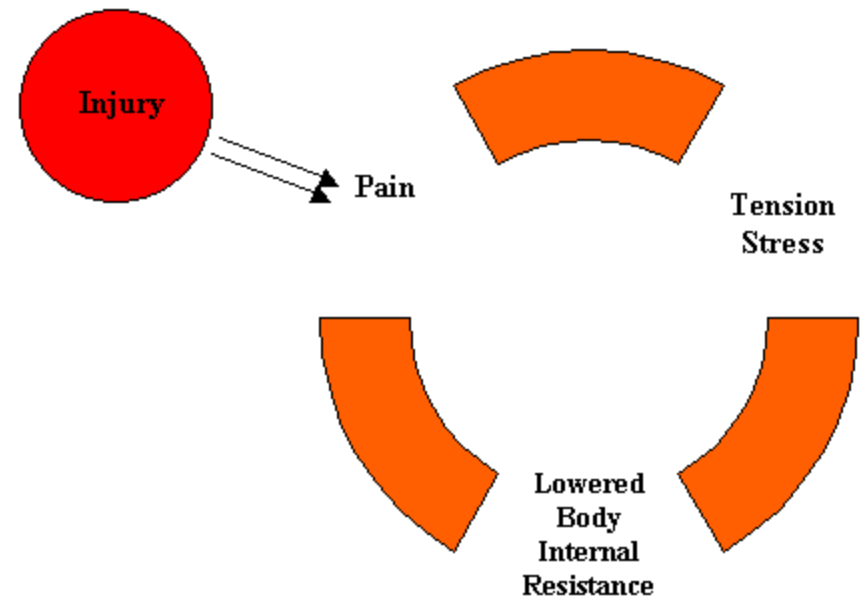
limit certain activities | seek medical assistance

The consequences of chronic stress

Whatever the type of stress, either physical or psychological, the outcome on pain is to worsen it.

Chronic stress also may result in other physical ailments such as

- tension headaches
- muscle spasms
- gastrointestinal problems
- elevated blood pressure.

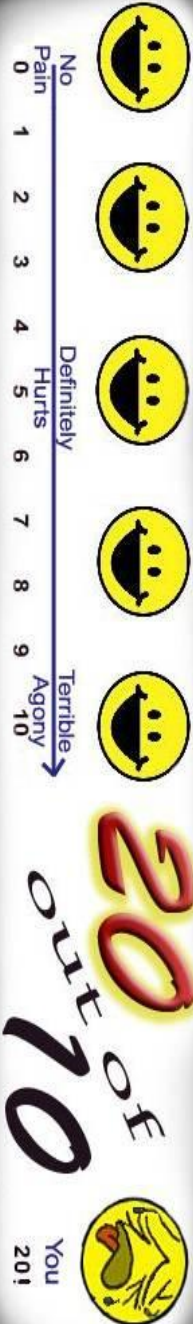


pain also lead to fatigue, depression, and a sense of hopelessness.

Pain Management

Start from triage

- **Algorithms** should consider pain as emergency
- The degree of pain should determine the **rapidity of care**.
- **Pain scales** should be used



ED crowding & Pain Management

A retrospective cohort study of all patients presenting with severe pain to ED during 17 months.

Pines JM Emergency Department Crowding Is Associated With Poor Care for Patients With Severe Pain
Ann Emerg Med - 01-JAN-2008; 51(1): 1-5

Pines JM Emergency Department Crowding Is Associated
With Poor Care for Patients With Severe Pain
Ann Emerg Med - 01-JAN-2008; 51(1): 1-5

Results

- 3,965 (59%) experienced delays in treatment from triage
- 1,319 (20%) experienced delays from time of room placement.

Conclusion

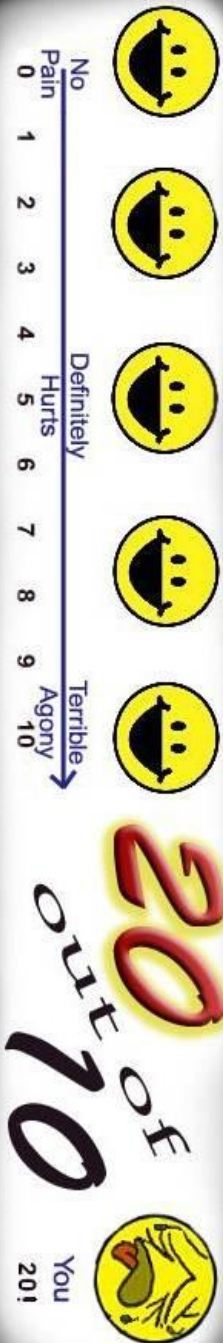
ED crowding is bad

Fosnocht DE Use of a triage pain protocol in the ED - *Am J Emerg Med* - 01-SEP-2007; 25(7): 791-3

- Time to medication administration
 - 76 minutes (95% confidence interval [CI], 68-84 minutes) before
 - 40 minutes (95% CI, 32-47 minutes) after the protocol.

Principal Conclusion

- Use of a triage pain protocol increased the number of patients with musculoskeletal injury who received pain medication in the ED.



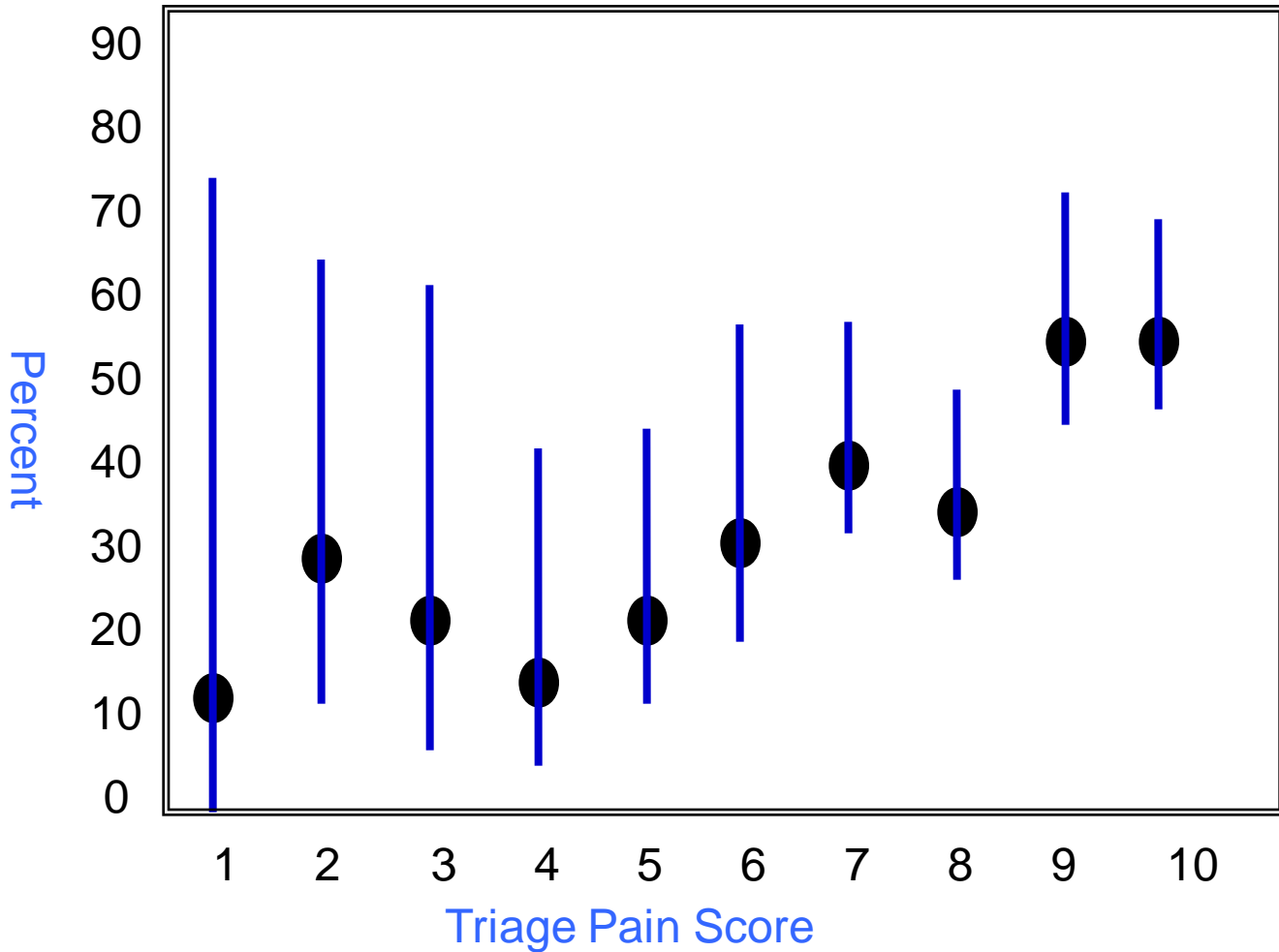
Pain Management

Numerical rating scales

- 0 to 10 “none to worst” report
- validated in the ED setting
- encourages clinicians to communicate with patients
- allows charts to be used for CQI

Bijur PE, Latimer CT, Gallagher EJ: Validation of a verbally administered numerical rating scale of acute pain use in the emergency department. *Acad Emerg Med* 2003; 10:390

Singer AJ Triage Pain Scores and the Desire for and Use of Analgesics. *Ann Emerg Med* - 01-DEC-2008; 52(6): 689-95



Percentage of patients requesting analgesics by pain score

Facial expressions or vital signs & pain Severity

- do not correlate reliably with a patient's subjective of pain.
- Patients may be experiencing severe pain despite smiles or even laughter.

Simply :

Pain exists if the patient says it does

Oligoanalgesia

- Physicians tend to underestimate the degree of patient pain and under treat it

Oligoanalgesia

Why??

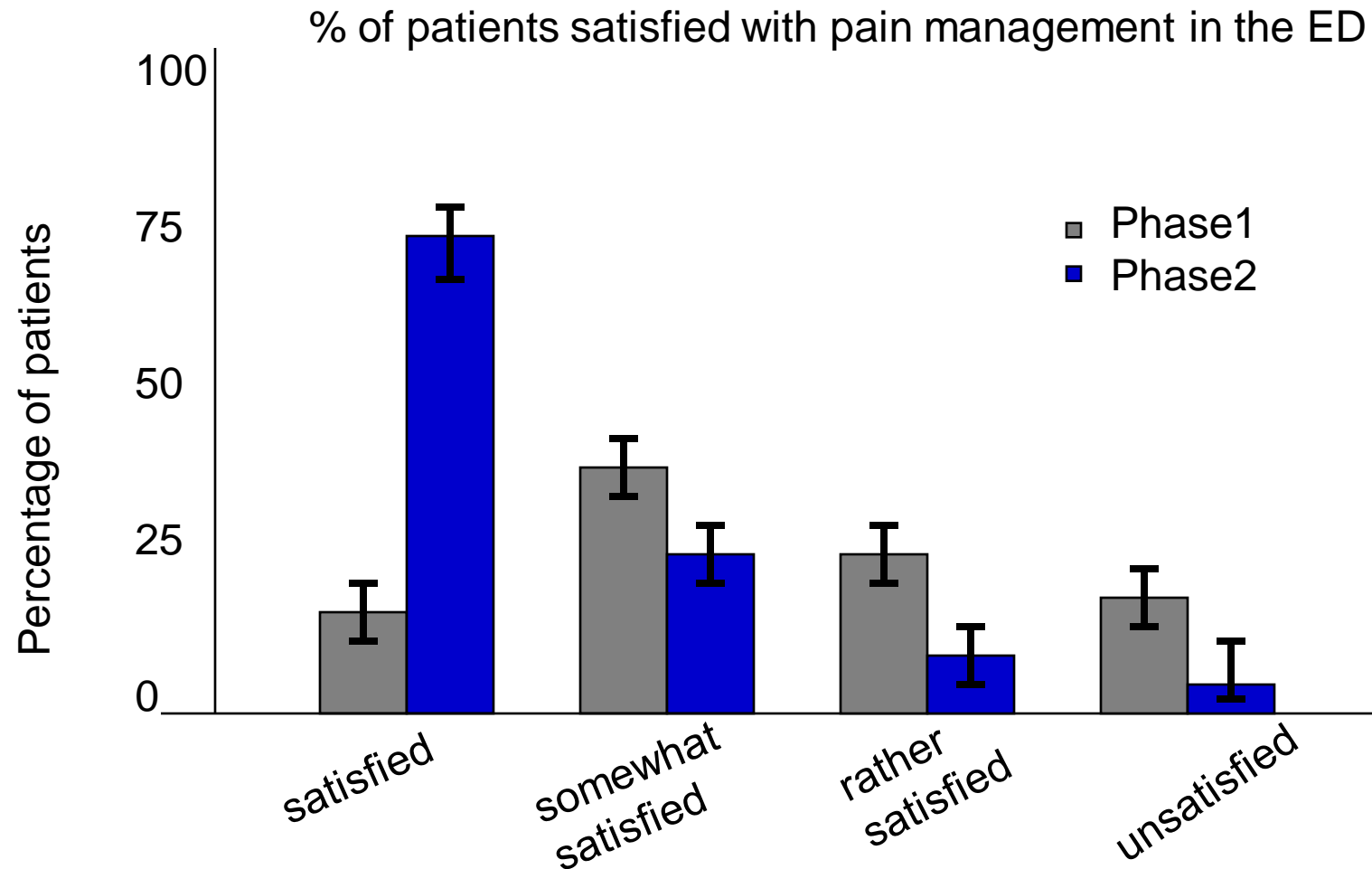
- 1) lack of educational on school curricula and postgraduate
- (2) no quality management programs
- (3) a paucity of rigorous studies of populations
- (4) clinicians' attitudes toward opioid analgesics
- (5) bias of pain reporting according to racial and ethnic stereotyping.”

Oligoanalgesia

Correcting the problems

- Priorities
- Requires a major effort by education

Decosterd I. Oligoanalgesia in the ED: Short-Term Beneficial Effects of an Education Program on Acute Pain - Ann Emerg Med - 01-OCT-2007; 50(4): 462-71



Patient satisfaction scores during phase 1 (before) and phase 2 (after guidelines implementation).

Oligoanalgesia

Analgesia for acute pain

 Safety

 Speed of onset

 Ease of administration

Opioid Agents

In the ED

- The mainstay for moderate to severe acute pain

Opioid Agents

Common Errors

- Reluctance to use this class of agents
- Wrong dose
- Wrong route of administration
- Wrong frequency
- Wrong opioid
- Inappropriate use of adjunctive agents
- Excessive suspicion of drug-seeking behavior

Opioid Agents

Iatrogenic Opioid Addiction

Common
Errors

- Relatively rare phenomenon.
- Only 4 in 11,892 treated with opioid developed new opioid abuse. [Boston Drug Collaborative Study](#)

Opioid Agents

Common
Errors

Suspicion of Drug-Seeking Behavior

Should be **well documented** and the information relayed to other emergency physicians

Opioid Agents

Common
Errors

Wrong Dosage

- Use a deliberate intravenous titration.

Opioid Agents

Common Errors

Wrong Route

- Oral agents if mild to moderate pain exists
- Intravenous agents if pain is moderate to severe.
- Subcutaneous route if an intravenous line cannot be established
- IM opioids have little role in acute pain in ED

Opioid Agents

Common
Errors

Wrong Route

IM opioids

Disadvantages of Intramuscular Opioid Administration

- Pain on injection
- Delayed onset of action
- Inability to predict effect
- Inability to easily titrate dosage
- Diurnal variation in level achieved
- Disease state may affect level achieved
- Level dependent on muscle used
- Hematomas may occur if coagulopathy exists
- Poor technique may damage other structures

Opioid Agents

Common Errors

Wrong Frequency

Optimal use of opioids requires:

- titrating the initial “loading” dose to desired relief of pain
- a frequent enough interval to prevent the return of significant discomfort.

Opioid Agents

Common
Errors

Wrong Opioid

- At any dose, codeine is a weak analgesic.

IV Opioid Agents

- The most commonly used are morphine & hydromorphone

IV Opioid Agents

Morphine has many advantages over meperidine, including

- 😊 a longer half-life
- 😊 much less CNS toxicity
- 😊 a metabolism that is little affected by renal or hepatic disease
- 😊 no myocardial depression

IV Opioid Agents

Morphine

- reaches its peak of action in a few minutes
- a half-life of 1.5 to 2 hours in healthy young adults
- slightly longer in elderly patients.
- The active metabolite is morphine-6-glucuronide; this substance has little analgesic activity but can cause profound sedation.

IV Opioid Agents

Morphine

- Release of histamine
(be careful in bronchospasm cases)
- Vagal stimulation causes bradycardia
- True immunoglobulin-mediated allergies are rare for morphine and other opioids.

Lvovschi V Intravenous morphine titration to treat severe pain in the ED

Am J Emerg Med - 01-JUL-2008; 26(6): 676-82

- 621 consecutive IV morphine titration
- 2 (body weight ≤ 60 kg)
- or 3 mg (body weight > 60 kg)
- Total of 0.16 ± 0.10 mg/kg and the median number of boluses was 3.

with 5-minute interval between each bolus.

Lvovschi V Intravenous morphine titration to treat severe pain in the ED

Am J Emerg Med - 01-JUL-2008; 26(6): 676-82

Results

- Pain relief was obtained in 512 (82%) patients.
- Morphine-induced adverse events occurred in 67 patients (11%) without severe adverse event.
- Titration was interrupted before pain relief had been obtained in 107 (17%) patients.
- In the remaining 514 patients, pain relief was obtained in 507 (99%) patients.

Lvovschi V Intravenous morphine titration to treat severe pain in the ED

Am J Emerg Med - 01-JUL-2008; 26(6): 676-82

Two variables were significantly associated with no pain relief:

- 1. major protocol deviation (odds ratio, 17.3; 95% confidence interval, 10.0-30.1)*
- 2. morphine-induced adverse effect (odds ratio, 13.0; 95% confidence interval, 6.7-25.3).*

Conclusion

- IV morphine titration is a safe and effective option for severe pain when used according to a strict protocol.*

Lvovschi V Intravenous morphine titration to treat severe pain in the ED - *Am J Emerg Med* - 01-JUL-2008; 26(6): 676-82

Morphine-induced Adverse effect	n (%)	95% CI
Nausea/vomiting	26 (4.2)	2.9%-6.1%
Allergy	1 (0.2)	0%-0.9%
Pruritus	4 (0.6)	0.3%-1.6%
Urinary retention	17 (2.7)	1.7%-4.3%
Respiratory depression	16 (2.6)	1.6%-4.1%
Severe respiratory depression	0	0%-0.6%
Dizziness	18 (2.9)	1.8%-4.5%
Any adverse events	67 (10.8)	8.6%-13.5%

IV Opioid Agents

Meperidine

- Removed from most of ED.

Lethal interaction with:

- MOI
- SSRI (serotonin syndrome)

Opioid Agents

Hydromorphone

- Longer half-life and effect than morphine, with similar actions otherwise

Opioid Agents

Hydromorphone (Dilaudid)

- Potent analgesic
- Excellent bioavailability when given orally.
- Excellent choice in many severe pain syndromes especially sickle cell vaso-occlusive events.
- Commercially available as a rectal suppository.
- Large doses of the drug can be given in small quantities of fluid for SQ or IM.

Naturally Occurring Alkaloids

Natural

Generic Name	Oral Dose	Iv Dose	Duration	Precaution
Morphine sulfate	30–60 mg	10 mg	3–4 h	Respiratory depression, hypotension, histamine release, sedation.
Codeine	30–100 mg	30–100 mg	4 h	Much constipation, nausea and vomiting. Decreased with supine position. Abuse potential.

Semisynthetic Opiates

Name	Iv Dose	PO Dose	Comments	Precaution
Hydromorphone Dilaudid Duration 2–4 hr	1–2 mg	2–6 mg	Very soluble, small volumes to be used for injection. Available as suppository.	Much euphoria.
Hydrocodone Hycodan Duration 3–4 hr	N/A	5–10 mg	Excellent cough suppressant. Greater potency than codeine.	Greater abuse potential than codeine.
Oxycodone Duration 3 hr Percodan Percocet Tylox	15 mg	5–10 mg	Very effective analgesic.	Euphoria predisposes to abuse.

Oral Opioid Agents

- Excellent for moderate pain
- good follow-up to IV
- for short-lived conditions and require no more than 10 to 20 doses

with exceptions of cancer and sickle cell vaso-occlusive pain

Oral Opioid Agents

Codeine with acetaminophen or aspirin

- codeine is not a very effective analgesic
- If the pain is believed to be too severe for an NSAID, a more potent opioid (e.g., oxycodone or hydrocodone) is indicated.

Oral Opioid Agents

Oxycodone (Percodan, Percocet, Tylox)

- Potent, effective oral analgesic.
- Significant euphoria in many patients, making it a popular drug of abuse.
- Quantity of pills should be limited

Oral Opioid Agents

- The long-acting oxycodone preparation Oxycontin has significant abuse potential.

Oral Opioid Agents

Hydrocodone

(Anexsia, Zydone, Vicodin, Hycodan, Lorcet, Vicoprofen)

- Semisynthetic derivative of codeine
- More effective analgesic with fewer side effects than codeine.
- Cause some euphoria and has become one of the most commonly abused oral opioids

Oral Opioid Agents


Oral morphine

- 1/6 the potency of parenteral morphine
- Excellent analgesic agent if given in the proper dose.
- Long-acting oral preparations (MS Contin) is available in 15, 30, 60, and 100 mg tablets.

Oral Opioid Agents

Propoxyphene (Darvon, Darvocet-N)


 Poor analgesic



 Overdoses can be toxic, with refractory seizures and respiratory depression leading to death.

 Use should be rare.



Oral Opioid Agents

Oral meperidine

 1/2 potency of the parenteral preparation
not recommended because of

-  the superiority of other oral agents
-  unsatisfactory side effect profile

neurotoxicity

-  significant abuse potential
-  lack of analgesic efficacy due to its significant hepatic first-pass metabolism.

Opioid Agents

Tramadol (Ultram, ultracet)

- Centrally acting analgesic
- Cause seizures
- + SSRI = increased risk of the serotonin syndrome
- Orally little potential for abuse or addiction.
- Less effective than any combination of hydrocodone plus acetaminophen

Turturro MA, Paris PM, Larkin GL: Tramadol versus hydrocodone-acetaminophen in acute musculoskeletal pain: A randomized, double blind clinical trial. *Ann Emerg Med* 1998; 32:139.

Opioid Agents

Fentanyl

- Synthetic opioid
- Short half-life 90 minutes
- Lack of decrease in cardiac contractility.
- Cross the blood-brain barrier rapidly and thus have a rapid onset of action (< 5 minutes).
- Very low (1.1%) incidence of potentially serious complications.
- No histamine release
 - Ideal for treating pain in patients with bronchospastic lung disease.

Opioid Agents

Fentanyl

- Candy matrix & oral transmucosal fentanyl citrate particularly useful for treating children.
- Intranasal delivery
- The nebulized inhaled fentanyl

1. Borland ML, Jacobs I, Geelhoed G: Intranasal fentanyl reduces acute pain in children in the emergency department: A safety and efficacy study. *Emerg Med* 2002; 14:275.
2. Bartfield JM, Flint RD, McErlean M, Broderick J: Nebulized fentanyl for relief of abdominal pain. *Acad Emerg Med* 2003; 10:215.

Opioid Agents

Fentanyl

- High or repeated doses (>15 mg/kg) may produce muscle rigidity.
 - can be treated with naloxone or (if severe) neuromuscular blockade plus intubation.

Opioid Use in Abdominal Pain

- Several studies have concluded that the titrated use of low doses of opioids does not interfere with the diagnostic timing and accuracy.

1. Mackway-Jones K: Analgesia and assessment of abdominal pain. *J Accid Emerg Med* 2000; 17:128.
2. Brewster GS, Herbert ME, Hoffman JR: Medical myth: Analgesia should not be given to patients with an acute abdomen because it obscures the diagnosis. *West J Med* 2000; 172:209.
3. Vermeulen B, et al: Acute appendicitis: Influence of early pain relief on the accuracy of clinical and US findings in the decision to operate: a randomized trial. *Radiology* 1999; 210:639.

Opioid Use in Abdominal Pain

Children

- all of studies have agreed that analgesic therapy provides relief of discomfort without compromising diagnosis or definitive therapy.

1. Kim MK, Straite RT, Sato TT, Hennes HM: A randomized clinical trial of analgesia of children with abdominal pain. *Acad Emerg Med* 2002; 9:281.
2. Thomas SH, Silen W: Effect on diagnostic efficiency of analgesia for undifferentiated abdominal pain. *Br J Surg* 2003; 90:5.

Bailey B. Efficacy and Impact of Intravenous Morphine Before Surgical Consultation in Children With Right Lower Quadrant Pain Suggestive of Appendicitis:
A Randomized Controlled Trial
Ann Emerg Med - 01-OCT-2007; 50(4): 371-8

- 90 patients with a suspected diagnosis of appendicitis were randomized to receive morphine or placebo.
- There was no important difference in the time between arrival in the ED and the surgical decision

Gallagher EJ. Randomized Clinical Trial of Morphine in
Acute Abdominal Pain

Ann Emerg Med - 01-AUG-2006; 48(2): 150-60, 160.e1-4

- 153 patients with acute abdominal pain
- 0.1 mg/kg IV morphine (78 patients) or placebo (75 patients).
- The primary endpoint was clinically important **diagnostic accuracy**.

Gallagher EJ. Randomized Clinical Trial of Morphine in Acute Abdominal Pain. *Ann Emerg Med* - 01-AUG-2006; 48(2): 150-60, 160.e1-4

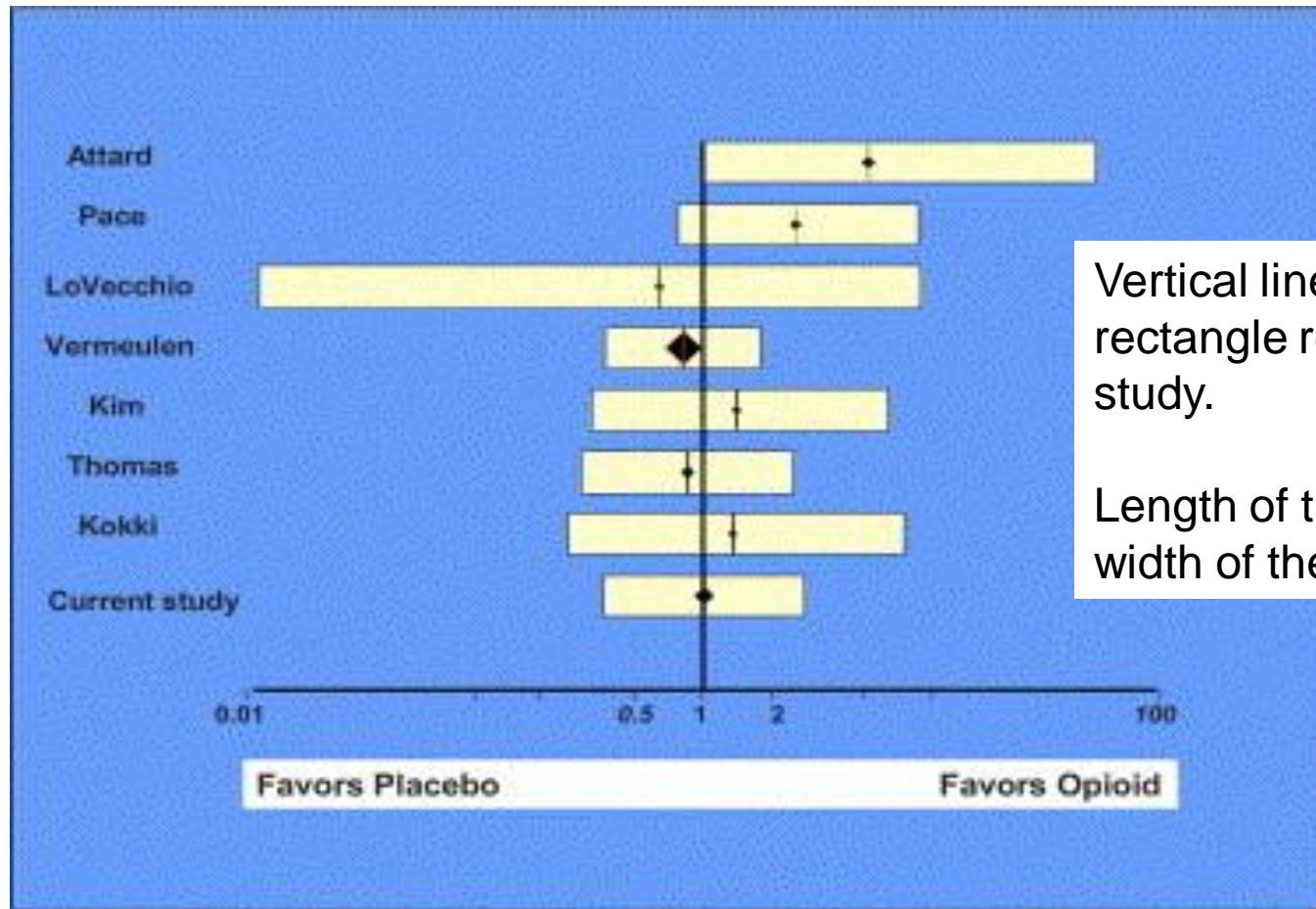
- 2 independent, blinded investigators to identify any discordance between the provisional and final diagnoses.
- The provisional diagnosis was provided by an ED attending physician, who examined the patient only once, 15 minutes after administration of the study agent.
- The final diagnosis was obtained through follow-up at least 6 weeks after the index ED visit.

Gallagher EJ. Randomized Clinical Trial of Morphine in Acute Abdominal Pain. *Ann Emerg Med* - 01-AUG-2006; 48(2): 150-60, 160.e1-4

Diagnostic accuracy

- 86% (67/78) morphine group
- 85% (64/75) in the placebo group.
- The difference was 1%
(95% confidence interval [CI] -11% to 12%).
- **Conclusion** Morphine safely provides analgesia **without impairing** clinically important **diagnostic accuracy**.

Summary of randomized clinical trials examining opioid analgesia and diagnostic accuracy in acute abdominal pain.



Vertical lines within each horizontal rectangle represent the OR for that study.

Length of the rectangles reflects the width of the corresponding 95% CI.

Cochrane-style mini-meta-analysis, summarizing all work published in English on analgesia in acute abdominal pain targeting diagnostic accuracy.

Frei SP. Is early analgesia associated with delayed treatment of appendicitis?

Am J Emerg Med - 01-FEB-2008; 26(2): 176-80

- *a matched case-control study, with patients having delayed treatment of appendicitis as the cases and patients with no delay in treatment of appendicitis as controls matched for age, sex, Alvarado score, and date of diagnosis.*

Frei SP. Is early analgesia associated with delayed treatment of appendicitis?

Am J Emerg Med - 01-FEB-2008; 26(2): 176-80

- *Of 957 patients with appendicitis, there were 103 delayed cases*
- *Matching patients were identified yielding 103 controls.*

Frei SP. Is early analgesia associated with delayed treatment of appendicitis?

Am J Emerg Med - 01-FEB-2008; 26(2): 176-80

😊 for early *opiate* use (26/103 cases, 24/103 controls),

no association with delayed treatment

(odds ratio, 1.11; $P = .745$; 95% confidence interval, 0.59-3.89).

😄 for early NSAID use (29/103 cases, 17/103 controls)

an association was found with delayed treatment

(odds ratio, 1.98; $P = .045$; 95% confidence interval, 1.01-3.89).

Nonopioid Analgesic Agents

The most commonly used of the nonopioid analgesic agents are

- Aspirin
- Acetaminophen
- Ibuprofen

Nonopioid Analgesic Agents

NSAIDs

Mechanism

- Inhibition of the cyclooxygenase enzyme and prostaglandin production.
- NSAIDs also inhibit production of leukotrienes.

Prostaglandin inhibition accounts for the antipyretic and anti-inflammatory properties.

- A newer class of NSAID agents, cyclooxygenase 2 (COX-2) inhibitors
 - In ED offer no particular advantage over traditional NSAIDs

Nonopioid Analgesic Agents

NSAIDs & Colic Syndromes

- NSAIDs effective in providing some analgesia in patients with colic.
- optimal approach is to use both NSAID and an opioid agents.

Nonopioid Analgesic Agents

NSAIDs

In a survey

- for every 100,000 people taking NSAIDs each year, there are
 - 300 gastrointestinal-related deaths
 - 5 liver-related deaths
 - 4 renal-related deaths
 - CHF–related deaths.

Nonopioid Analgesic Agents

NSAIDs

Interaction

May interfere with the antihypertensive actions of numerous drugs.

The major side effects

- GI
- renal failure
- Anaphylaxis
- platelet dysfunction.

Nonopioid Analgesic Agents

Acetaminophen

- not to exceed 4000 mg/day.
- metabolized in the liver primarily through conjugation to sulfate or glucuronides.
- A minor pathway produces *N*-acetyl-*p*-benzoquinoneimine (NAPQI).
- NAPQI requires glutathione for detoxification and elimination.
- Hepatic toxicity can occur when glutathione pathways are overwhelmed by an increase in NAPQI or a decrease in glutathione.

Pain Management in the Elderly

Opioid

- needs lower dosages
- produce sedation and constipation more often.

NSAIDs

- Cautious
- Worsening renal function and gastrointestinal bleeding

Skeletal Muscle Relaxants

- No clear evidence for superiority over the analgesic
- Evidence is strong that they are associated with an increase CNS side effects
- A benzodiazepine, offering sedation and anxiolysis, may be a reasonable adjunct in cases of particularly disabling or difficult pain.

Nitrous Oxide/Oxygen Mixtures

- Self-administered hand-held masks in the nitrous oxide and oxygen ratio of 50:50

Nitrous Oxide/Oxygen Mixtures

Basic Pharmacology and Physiology

- Nonflammable colorless gas
- Diffuse through membranes
- In the two-tank, a fixed-ratio nitrous oxide/oxygen mixture is delivered.
- A - 3 to - 5 cm H₂O pressure must be produced within the mask or mouthpiece to activate the flow of gas.

Nitrous Oxide/Oxygen Mixtures

Basic Pharmacology and Physiology

- No documented adverse hemodynamic effects have occurred with the self-administered forms of this agent.
- Safety has also been confirmed in the prehospital care setting.
- At significant high altitude elevations nitrous oxide may need to be increased to 70%.

Nitrous Oxide/Oxygen Mixtures

Indications

Minor procedures

Nitrous Oxide/Oxygen Mixtures

Contraindications

- Those with altered consciousness
- Patients with head injury
- Patients with decompression sickness
- High need for O₂
- Pneumothorax or bowel obstruction

Nitrous Oxide/Oxygen Mixtures

Side Effects

- Light-headedness
- Occasional, paresthesias and nausea.
- Resolve within minutes of discontinuation

low-dosage forms do not cause a significant incidence complications.

Nitrous Oxide/Oxygen Mixtures

Precautions

- It should be used with a scavenging device to prevent raised concentrations in the environment
- A strict protocol of accountability for its use must be in place
- Adults should not be allowed to drive a motor vehicle or operate machinery for at least 1 hour.
- Nitrous oxide can be used carefully in conjunction with lowered IV opioids dosages

Local Anesthesia

Mechanism of Action

- Cutaneous pain receptors, when stimulated, cause sodium channels in the nerve endings to open, which depolarizes the nerve and causes the sensation of pain.

Characteristics of Common Local Anesthetic Agents					
Agent	Trade Name(s)	Potency (Lipid Soluble)	Duration (min)	Onset	Comments
Procaine (ester)	Novocaine	1	60–90	Slow	Solutions of 0.5%-2%; infiltration, blocks
	Neocaine				
Tetracaine (ester)	Pontocaine	8	180–600	Slow	Topical eye
Lidocaine (amide)	Xylocaine	3	90–200	Rapid	Most commonly used; 1½ times as toxic as procaine infiltration, blocks
	Dilocaine				
	Ultracaine				
Mepivacaine (amide)	Carbocaine	2.4	120–240	Very rapid	Slightly less potent than lidocaine; 75% as toxic as procaine infiltration, blocks, epidurals
Bupivacaine (amide)	Marcaine	8	180–600	Intermediate	Blocks; recent toxicity reported, now not used in emergency department for intravenous regional
Etidocaine (amide)	Duranest	6	180–600	Rapid	Twice as toxic as lidocaine blocks; epidurals

Local Anesthesia

Potency	High	Low
lipid solubility	High	Low
Examples	Tetracaine, Etidocaine	Procaine, Mepivacaine

Local Anesthesia

Techniques that Can Be Used to Reduce the Pain of Injection

Buffering of local anesthetic agents

Counterirritation

Changing size of needle used

Slowing rate of injection

Changing depth of injection

Changing site of injection

Use of topical anesthetics

Warming solution

Distraction techniques

Counter irritation by scratching the skin or repetitive pinching of the skin during needle puncture or injection has been shown to reduce discomfort

Local Anesthesia

Epinephrine & Local Anesthesia

A comprehensive review of the use of epinephrine in digits

- Safe when diluted to 1:200,000 in a dose of 10 $\mu\text{g}/\text{mL}$ or less
- Not in patients with vascular disease
- Less bleeding

Reduce the Pain of Injection

Buffering of local anesthetic agents

A standard preload syringe of sodium bicarbonate (8.4% in 50 mL) can be used as a multidose vial and the bicarbonate added to a syringe containing lidocaine in a ratio of 1:10 (e.g., 1 mL bicarbonate to 10 mL lidocaine, or 0.5 mL to 5 mL).

can be kept in the ED and has been shown to stay effective for up to 1 week.

Bupivacaine ratio should be 1:50 (i.e., 0.1 mL bicarbonate to 5 mL bupivacaine).

Local Anesthesia

Guidelines for Maximum Doses of Commonly Used Agents

Agent	Without Epinephrine	With Epinephrine
Lidocaine HCl	3–5 mg/kg	7 mg/kg
Mepivacaine HCl	8 mg/kg	7 mg/kg
Bupivacaine HCl	1.5 mg/kg	3 mg/kg

Local Anesthesia

Toxicity

Local

restrict the use of vasoconstrictors to well-vascularized areas and ensure that wounds are well irrigated.

Local Anesthesia

Systemic Toxicity

Cardiovascular Effects

- The more lipophilic agents (e.g., etidocaine, bupivacaine)
- Increased by the use of epinephrine.

Treatment

- Hypotension can be treated with fluids and α -adrenergic agents.
- Dysrhythmias that occur should be treated by standard algorithms.

Local Anesthesia

Toxicity

Systemic

CNS

- In high blood or CNS concentrations.

Local Anesthesia

Toxicity

Systemic

CNS

- Lidocaine from 1 mg/kg to 1.5 mg/kg increases the incidence of CNS side effects 10% to 80%.
- begins with drowsiness and progresses to confusion, convulsions, and coma.
- The benzodiazepines work best for treating local anesthetic-induced seizures.

Topical Anesthesia

Several agents are useful when applied to mucosal surfaces.

1% equals 10 mg/mL of the anesthetic.
Therefore, a 5% solution has 50 mg/mL.

Topical Anesthesia

1. Cocaine:
 - potent vasoconstrictor
 - useful intranasally.

A 4% (40 mg/mL)
solution provides rapid treatment of epistaxis

- more than 200 mg should not be exceeded in adults
- not for patients with known CAD

Topical Anesthesia

2. Lidocaine:

- 2% or 4% solution in a viscous matrix
Lidocaine jelly (2%)
- Lidocaine spray (4%)
- Lidocaine spray (10%) is useful for upper airway anesthesia

Topical Anesthesia

3. Tetracaine:

potent ester is used for surface anesthesia of the cornea (Pontocaine)

4. Benzocaine:

intraoral preparations to dull the discomfort of needle puncture.

It comes in various flavors.

Topical Anesthesia

5.

~~TAC:~~

combination of tetracaine, adrenaline (epinephrine), and cocaine (TAC)

largely replaced with LET and EMLA which do not contain cocaine.

Topical Anesthesia

6. LET:

A solution of lidocaine, epinephrine, and tetracaine (LET)

- requires 20 minutes for analgesia
- administered at the time of triage

Topical Anesthesia



7. EMLA:

is a eutectic *m*ixture of *l*ocal *a*nesthetic agents—

- lidocaine and prilocaine—along with some other chemicals to be kept in oil phase.
- applied on the desired area with an occlusive dressing
- local anesthesia is achieved for 1 to 5 hours.
- The most significant side effect is the development of methemoglobinemia
- not for mucous membranes or for skin wounds.

Pain Management In Disaster

- ketamine
useful analgesic agent in the field.
- Fentanyl
safe analgesic agent in prehospital air medicine use.

THANK YOU

Q&A