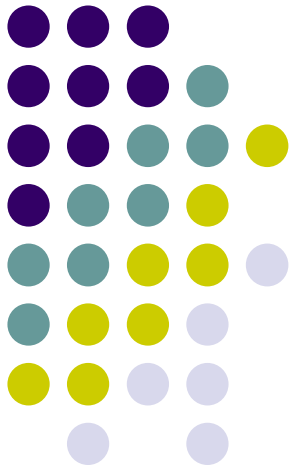

Old Dutch Church
of Sleepy Hollow
· 1685 ·
GO IN PEACE
SERVE THE LORD

post anesthetic care and post operative pain management

Chatchai Prechawai M.D.,FRCAT
Department of Anesthesiology
Faculty of Medicine
Prince of Songkla University



post anesthetic care

- Level of postoperative care a patient requires is determined by

  degree of underlying illness
- Duration and complexity of anesthesia and surgery
- Risk postoperative complications
- Patients must be carefully evaluated to determine which level of postoperative care is most appropriate

post anesthetic care

- Preoperative history
- Medication allergies or reactions
- Underlying medical illness
- Chronic medications acute problems premedication
- NPO status

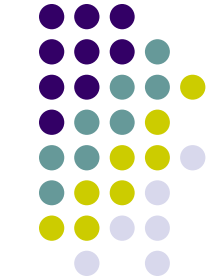
post anesthetic care

- Intraoperative factors
- Surgical procedure
- Type of anesthetic and drug doses
- Muscle relaxant and reversal status
- Intravenous fluids
- Estimated blood loss
- Urine out put
- Unexpected surgical or anesthetics events
- Intraoperative vitalsigns and lab finding
- Nonanesthetic drugs

post anesthetic care

- Postoperative instructions
- Pain management
- Acceptable vital sign ranges, blood loss, urine output
- Anticipated cardiopulmonary problems
- Diagnostic tests

post anesthetic care



- Cardiovascular complications
- Postoperative pulmonary dysfunction
- Aspiration
- Postoperative renal complications
- Metabolic complications
- Electrolytes and glucose
- Miscellaneous complications

Cardiovascular complications

Post operative hypotension

- **20-30% decrease in BP from preoperative levels that result in symptoms of organ hypoperfusion**
- **Acidosis, oliguria, SNS activation, CNS disturbances**

Cardiovascular complications

Differential diagnosis of hypotension

- Arterial hypoxemia
- Hypovolemia (most common cause)
- Pulmonary edema
- Myocardial ischemia
- Cardiac arrhythmiadecreased systemic vascular resistance pneumothorax
- Cardiac tamponade

Cardiovascular complications

Post operative hypertension

- 20-30% increase in BP from base line levels

Cardiovascular complications

Differential diagnosis of hypertension

- Arterial hypoxemia
- Pre-existing essensial hypertension
- Enhanced SNS activity (pain, carinal stimulation, bladder distension, pre-eclampsia)
- Excess fliud administration
- hypothermia

Postoperative pulmonary dysfunction

- Inadequate postoperative ventilation
- Inadequate postoperative oxygenation

Postoperative pulmonary dysfunction

Differential diagnosis hypoventilation

- Inadequate ventilatory drive (residual effects of anesthetic, lack of sensory stimulation)
- Ventilatory mechanics

  Increased airway resistance (obstruction)

  Decreased compliance (obesity, fluid overload)

  Residual neuromuscular blockade)
- Increased dead space (pulmonary embolus)
- Increased carbon dioxide production (hyperthermia, hyperalimentation)

Postoperative pulmonary dysfunction

Inadequate postoperative oxygenation

- Acceptable PaO_2 must be defined for each individual patient
- Maintain PaO_2 between 70-100 mmHg
- Splinting due to postoperative pain contributes to detrimental loss of lung volume (especially functional residual capacity)

Postoperative pulmonary dysfunction

Differential diagnosis of arterial hypoxemia

- **Distribution of ventilation (mismatch of ventilation to perfusion because of loss functional residual capacity)**
- **Distribution of perfusion (mismatch of perfusion to ventilation due to impaired hypoxic pulmonary vasoconstriction or altered pulmonary artery pressure)**

Postoperative pulmonary dysfunction

Differential diagnosis of arterial hypoxemia

- Inadequate alveolar oxygen partial pressure
- Decreased mixed venous oxygen partial pressure (decreased cardiac output, increased tissue oxygen extraction owing to shivering or sepsis)

Aspiration

- Inhalation of acidic fluid (pH<2.5) in the perioperative period may manifest as varying degrees of arterial hypoxemia and infiltrates on chest radiographs
- Treatment is correction of hypoxemia with supplemental oxygen
- Tracheal intubation may be required
- Antibiotics are prescribed only if bacterial infection develops

Postoperative renal complications

Oliguria

- Urine output < 0.5 ml/kg/hr
- Adequate perfusion pressure
- Hydration
- Increase the posssibility of acute tubular necrosis

Postoperative renal complications

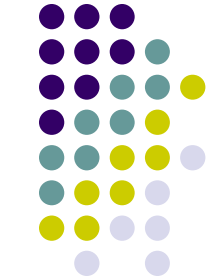
Polyuria

- Usually self-limited
- Most often is due to generous intraoperative fluid administration or hyperglycemia (osmotic diuresis)
- Sustained polyuria (urine output >4-5 ml/kg/hr) may result in hypovolemia and electrolyte disturbances

Metabolic complications

- Respiratory acidosis (alveolar hypoventilation)
- Metabolic acidosis (hypovolemia, tissue hypoxia, hypothermia, renal failure, ketoacidosis, sepsis)
- Respiratory alkalosis (hyperventilation)
- Metabolic alkalosis (prolonged gastric suctioning, potassium wasting diuretics)

Electrolytes and glucose



- Hypokalemia (cardiac dysrhythmias)
- Hyperkalemia (renal failure)
- Hyponatremia (following TUR-P)
- Hyperglycemia
- Hypoglycemia

Miscellaneous complications

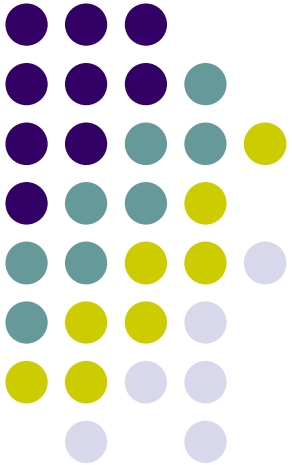
- Nausea and vomiting
- Persistent sedation
- Altered mental status

Nausea and vomiting

Several factors contribute to the etiology of postoperative nausea and vomiting

- The patient (motion sickness, women, children)
- Perioperative drugs (opioids)
- Anesthetic agents
- Site of operation (abdominal procedures, middle-ear surgery, laparoscopic surgery)
- Duration of surgery
- Gastric dilatation
- Intraoperative or postoperative hypoxemia
- Hypotension

post-operative pain management



Why pain ?

- **57%** of those who had surgery cited concern about pain after surgery as their primary fear experienced before surgery
- **77%** of adults reported pain after surgery,

  80% experiencing moderate to severe pain

sub-optimal analgesia for many patients

- lack of knowledge about drugs
- many myths associate with pain

  pain is not harmful to patient

  pain relief obscures signs of complications

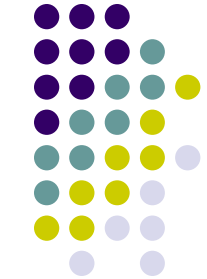
  patient will become addicted to opioids

  risk of respiratory depression is high

  PRN: means

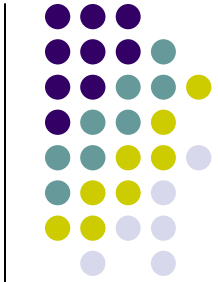
  'give as infrequently as possible'

acute pain management



- 1990-92 PCA, post op.pain management
- Faculty of pain medicine (Aus & NZ)
- pain assessment & management standard 1999
- the decade of pain control and pain research
  (a law passed by US congress in 2001)
- the changing face of pain control
- multidimensional problems need multimodal treatments

now



- pain care should be integrated into the patient's treatment plan
- pain assessment should be considered a fifth vital sign
- vital signs:
  - temperature
  - blood pressure
  - pulse rate
  - respiratory rate
  - pain score

definition of pain

- **IASP: international association for the study of pain**

  unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage

definition of pain

- pain is a very individual experience
- factors:

  previous pain experiences

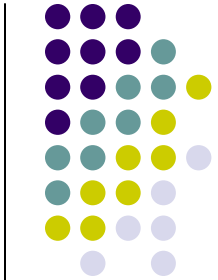
  cultural back ground

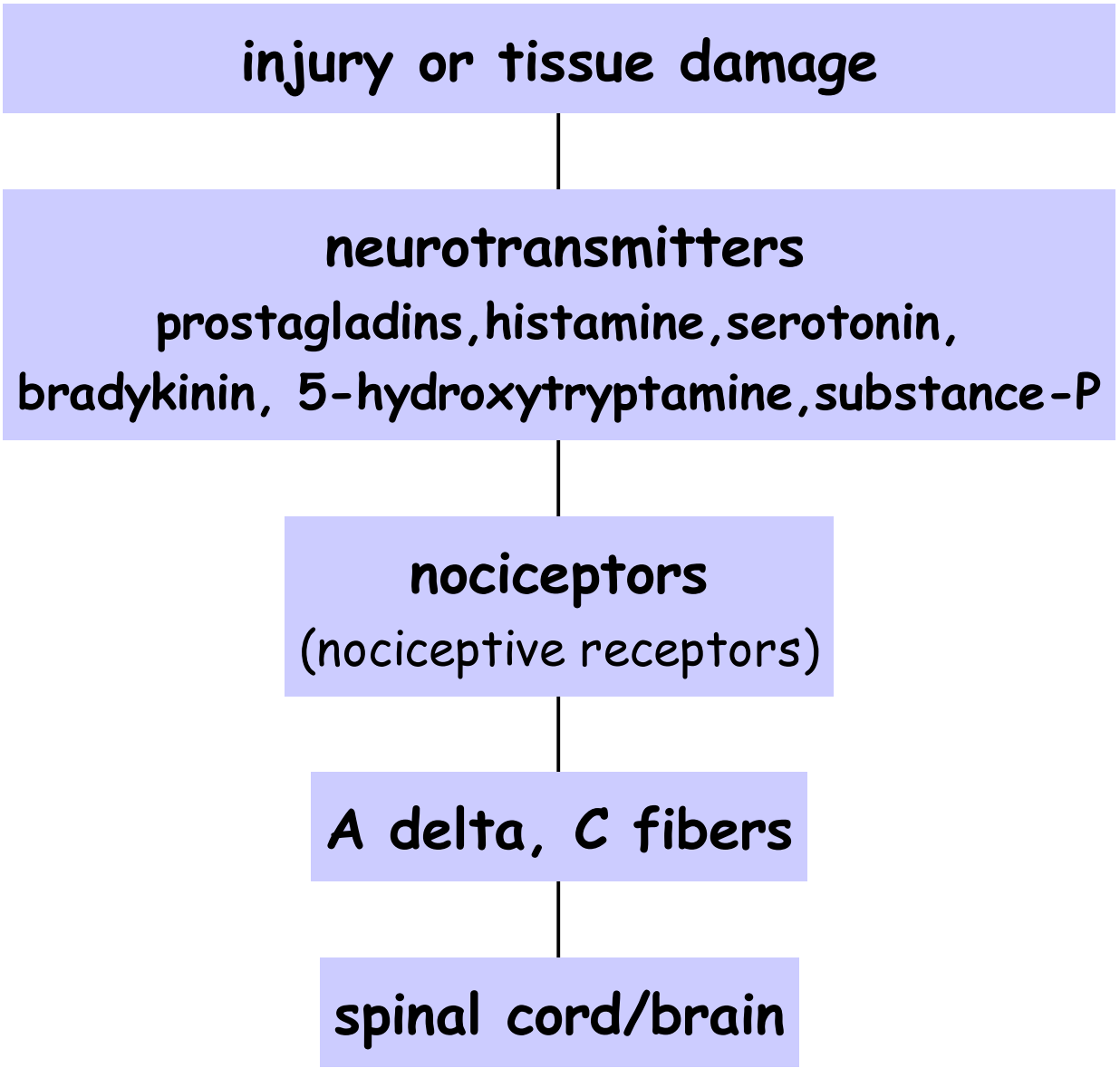
  socioeconomic

  disease or surgical prognosis

  fear, anxiety, depression
- poor correlation between patient's assessment of pain and medical staff's estimate of pain

mechanisms of pain

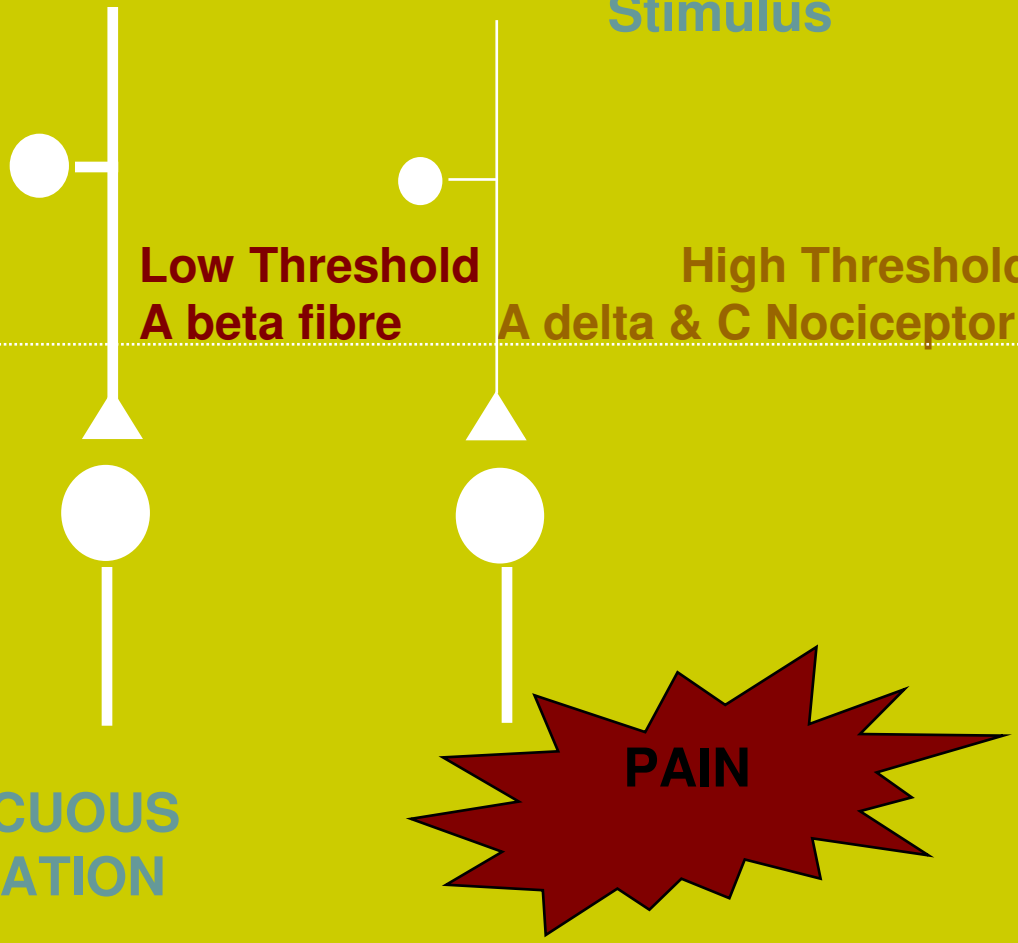


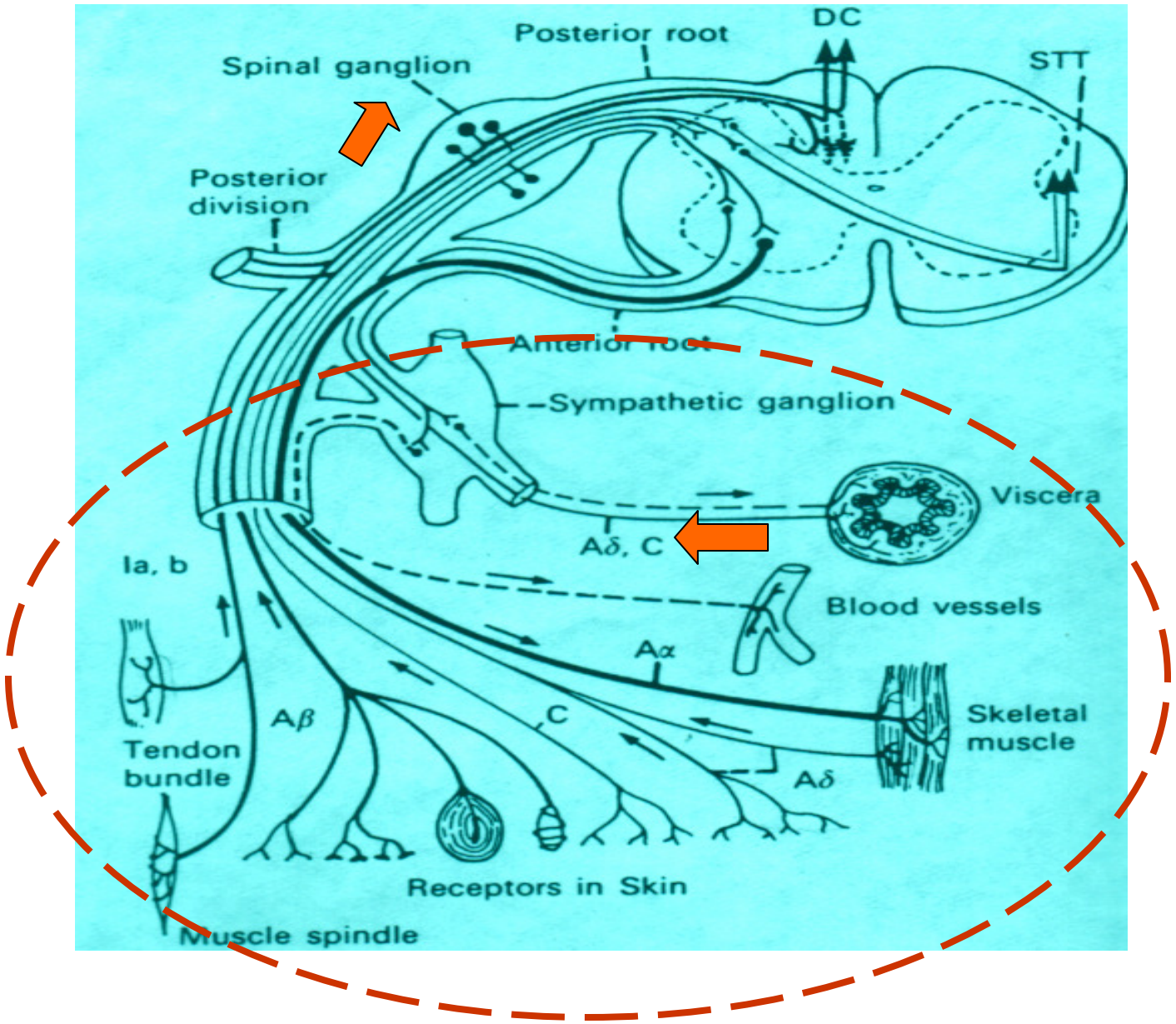


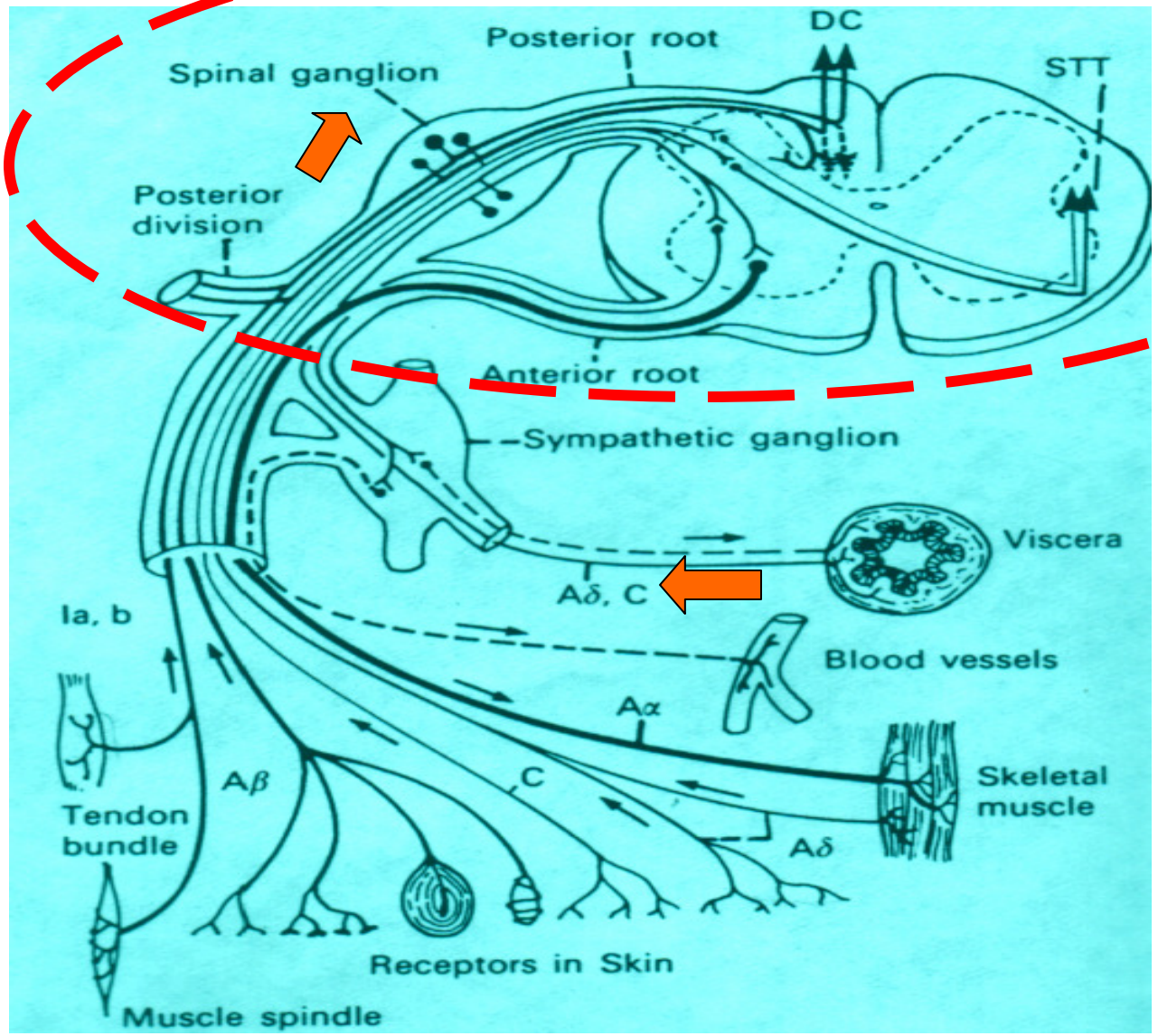
PHYSIOLOGICAL PAIN

Low Intensity Stimulus

High Intensity Stimulus




Posterior root
DC
Spinal ganglion
STT
Posterior division
Anterior root
Sympathetic ganglion
Viscera
Aδ, C
Ia, b
Blood vessels
Aα
Aβ
C
Skeletal muscle
Tendon bundle
Aδ
Receptors in Skin
Muscle spindle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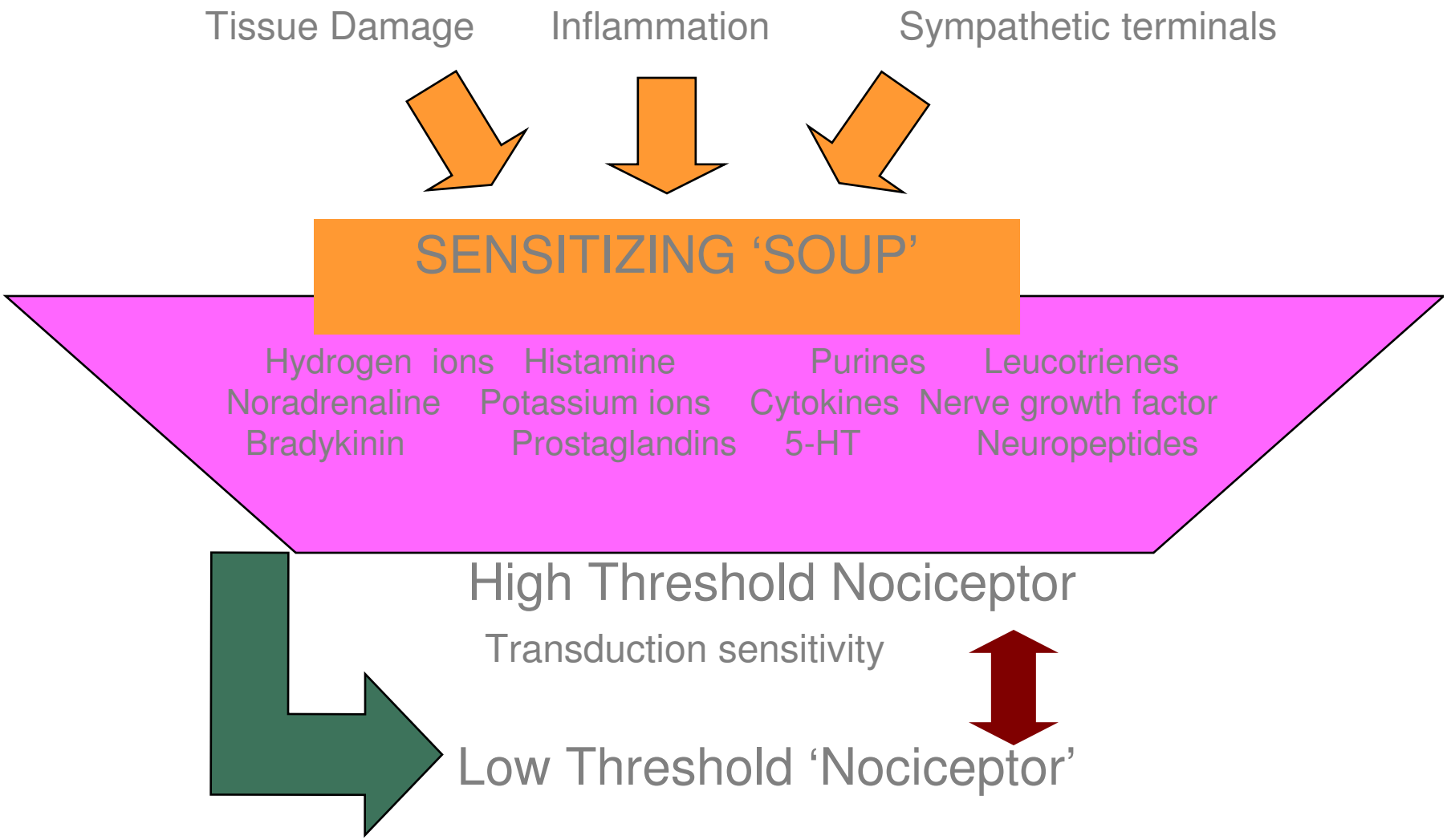
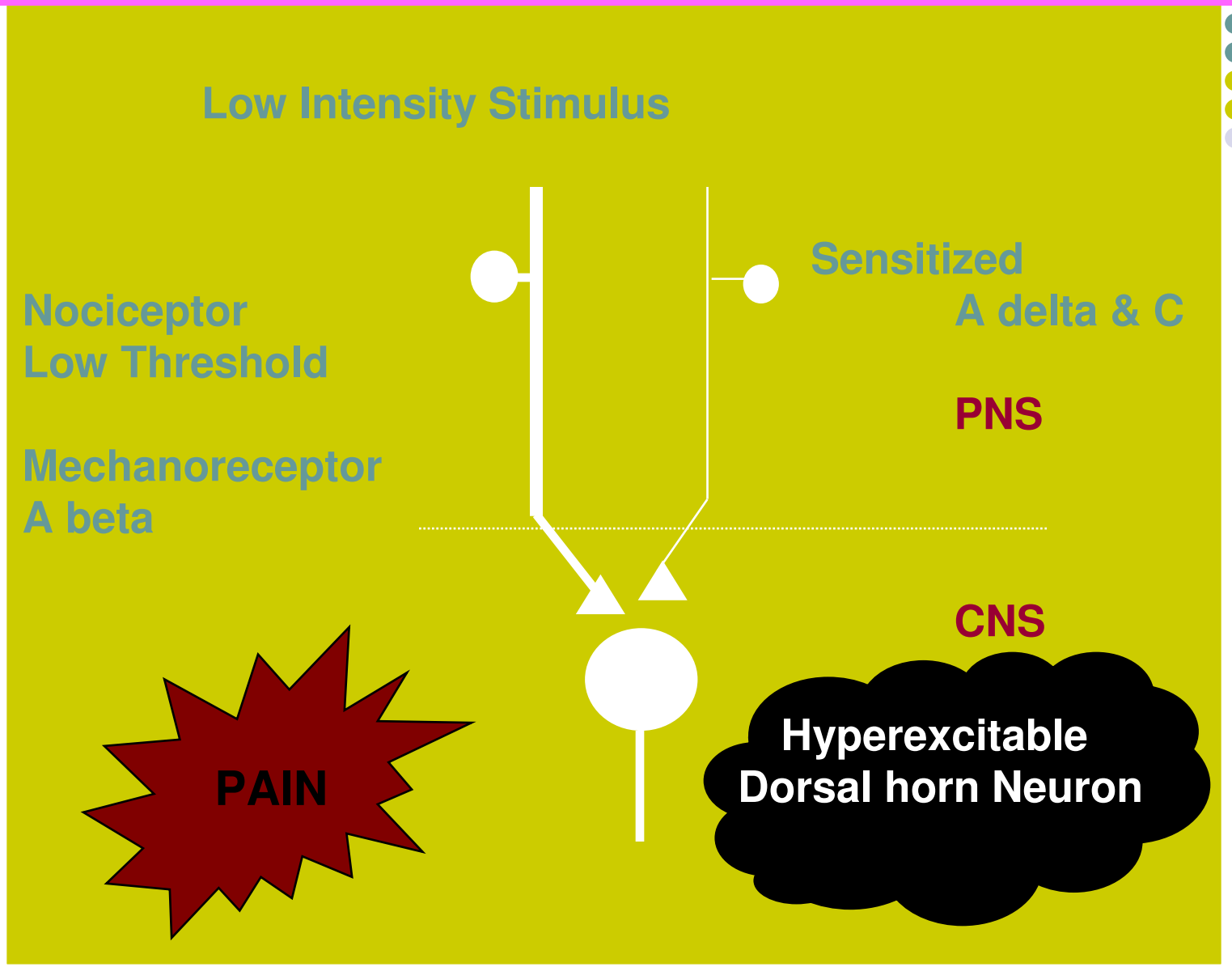
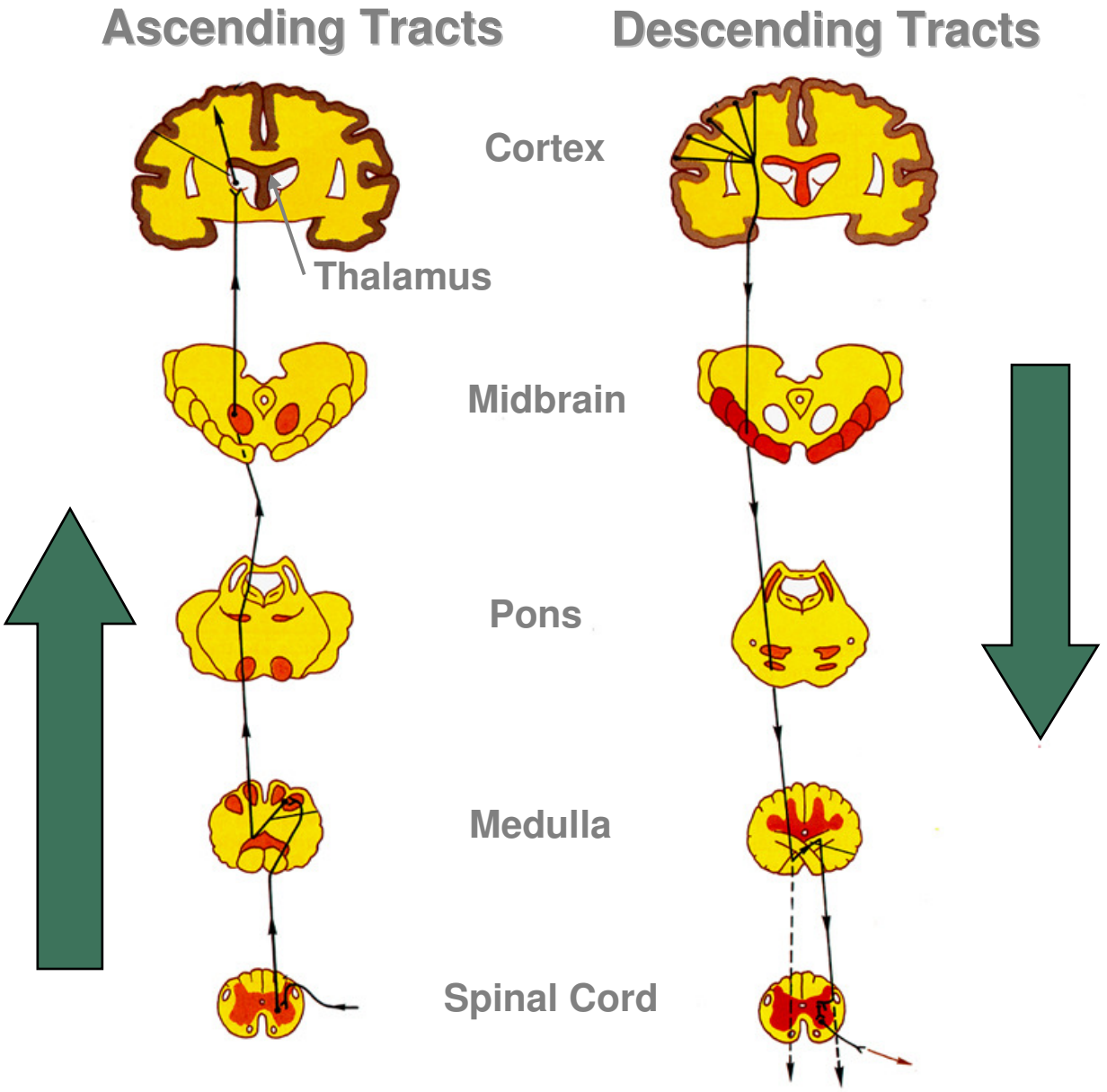
PERIPHERAL SENSITIZATION



CLINICAL PAIN



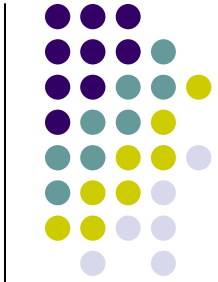
Peripheral and Central Pathways for Pain



harmful effects of undertreated severe acute pain

Respiratory	decreased lung volumes(TV,FRC) and cough, atelectasis
CVS	tachycardia, hypertension, increased myocardial O_2consumption, deep vein thrombosis
GI	decreased gastric and bowel motility
GU	urinary retention

harmful effects of undertreated severe acute pain



endocrine	vagal inhibition,
	increased adrenergic activity,
	increased metabolism, O_2 consumption
CNS	anxiety, fear, fatique
immunologic	impairment,infection,
	delayed wound healing

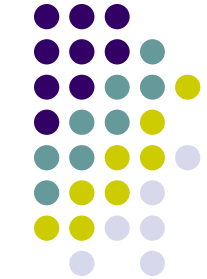
The difference of pain

- *acute VS chronic pain*
- *nociceptive VS neuropathic pain*

Acute pain

- identified event
- usually nociceptive
- due to tissue injury
- resolves days–weeks,duration less than 10 days
- trauma,surgery,acute medical condition,physiologic process

measurement of pain



- visual analog scale (VAS)
- verbal numerical rating scale (VNRS)
- categorical rating scale

measurement of pain (cont.)

- visual analog scale (VAS)

no pain worst pain

0_____10

measurement of pain (cont.)

- **verbal numerical rating scale (VNRS)**

  0 = no pain

  10 = worst pain

measurement of pain (cont.)

- categorical rating scale

  none = 0

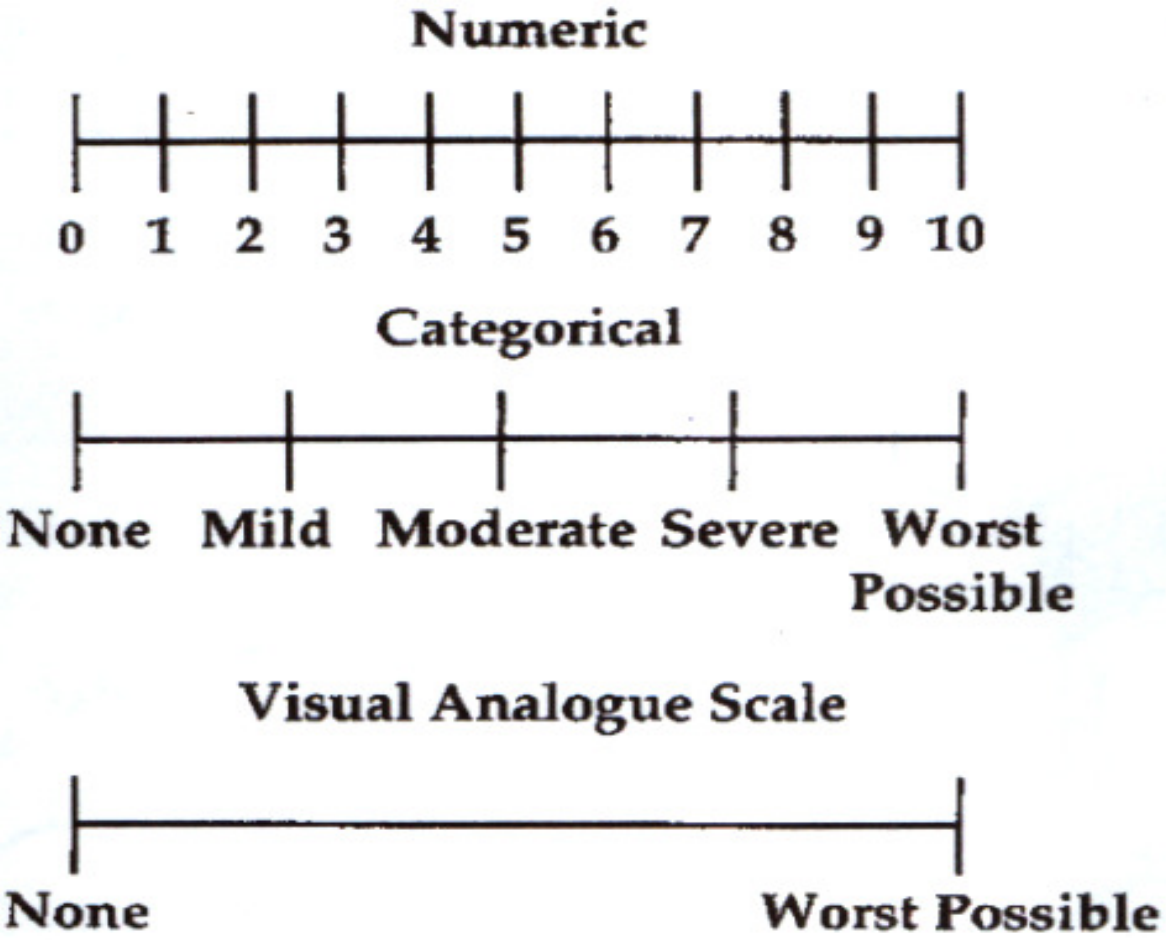
  mild = 2-3

  moderate = 4-5

  severe = 6-7

  very severe = 8-9

  worst pain = 10


Numeric
0 1 2 3 4 5 6 7 8 9 10
Categorical
None Mild Moderate Severe Worst Possible
Visual Analogue Scale
None
Worst Possible

When should pain be measured?

- usually asked when patients are resting
- better indicator is assessment of pain caused by coughing,

  deep breathing or movement
- reassessed regulary
- frequency if poorly controlled or changed treatment

techniques for reduced acute post operative pain

- traditional methods of opioids administration
- patient-controlled analgesia
- regional anesthetic techniques
- other drugs used
- other techniques

traditional methods of opioids administration

- Papaver somniferum
- 1806: alkaloid of opium: morphine
  (Morpheus: god of dreams,son of
  Hypnos: god of sleep)
- 1973: opioid receptors in
  brain and spinal cord
- 1975: endogenous opioids:
  endorphins, enkephalins,dynorphins
  in brain, spinal cord, GI, plasma

Opioid pharmacology

- Conjugated in liver
- Excreted via kidney (90%–95%)
- First-order kinetics

traditional methods of opioids administration (cont.)

opioid receptors	actions
mu 1	supraspinal, euphoria, miosis, nausea and vomiting, urinary retention, pruritus
mu 2	sedation, respiratory depression, constipation

traditional methods of opioids administration (cont.)

opioid receptors	actions
kappa	spinal, sedation, miosis
delta	spinal, respiratory depression, nausea and vomiting, pruritus
sigma	dysphoria, hallucination

Pharmacology of opioids

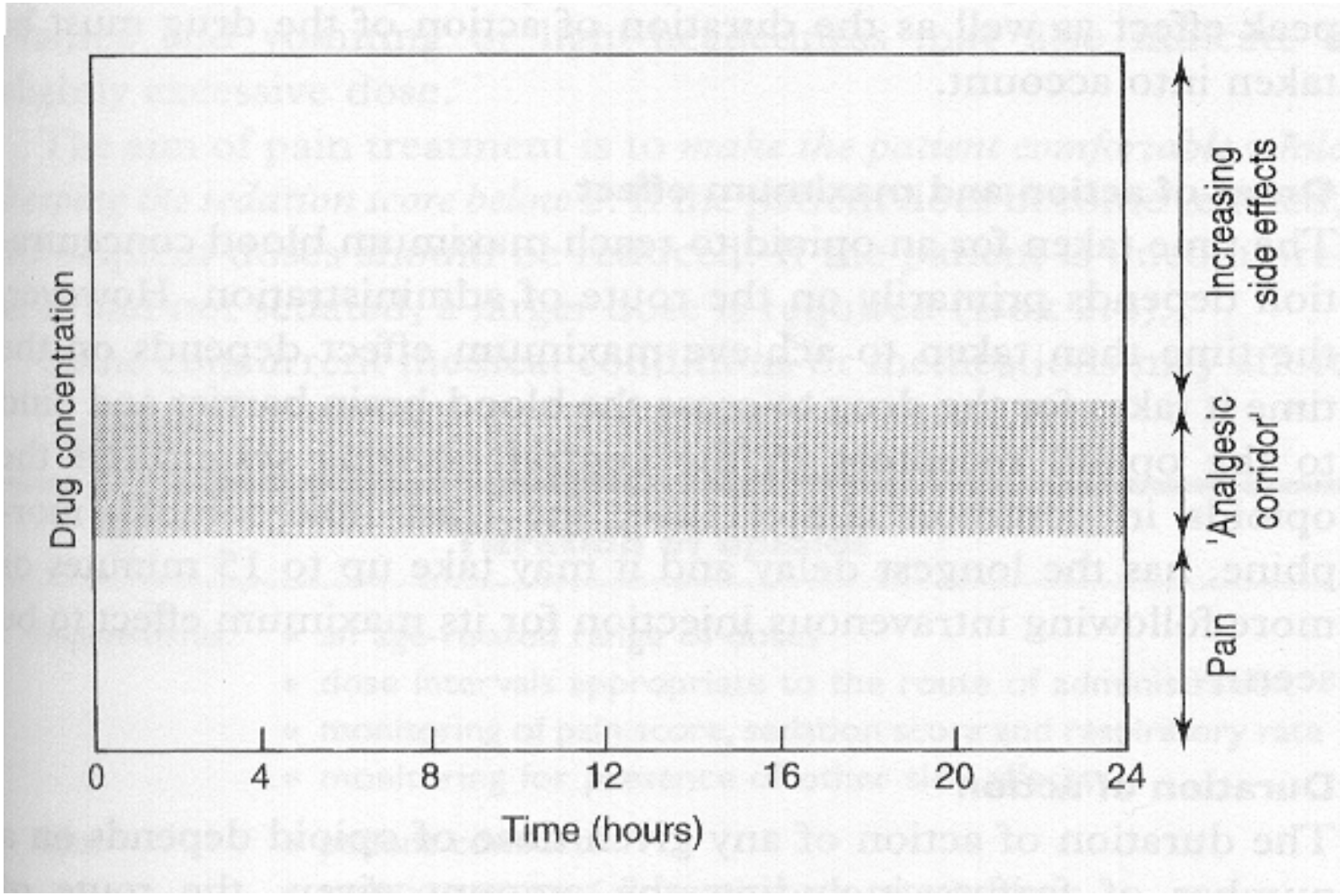
- ***mu*-agonist: morphine**
- **partial *mu*-agonist: buprenorphine**
- **mixed agonist-antagonist: pentazocine(partial *mu* agonist, *kappa* agonist, *delta*-antagonist)**
- **nalbuphine**

  (partial *kappa*-agonist,*mu*-antagonist)

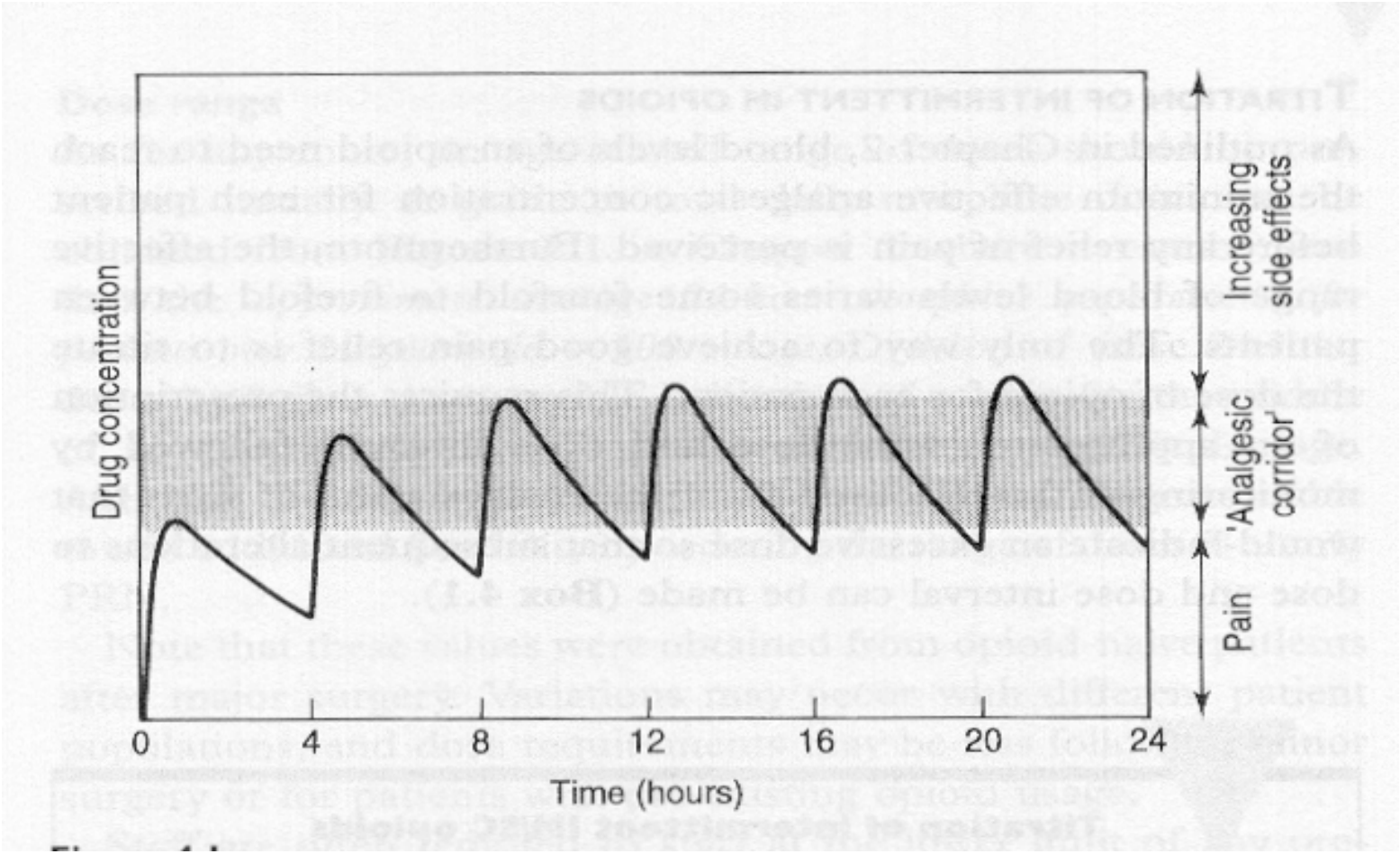
traditional methods of opioids administration (cont.)

- **PRN:** pro re nata
  according to circumstances
  as the situation requires
- q 4 hours: wait until 4 hours
  for another injection
- IM, IV, SC, PO, Rectal

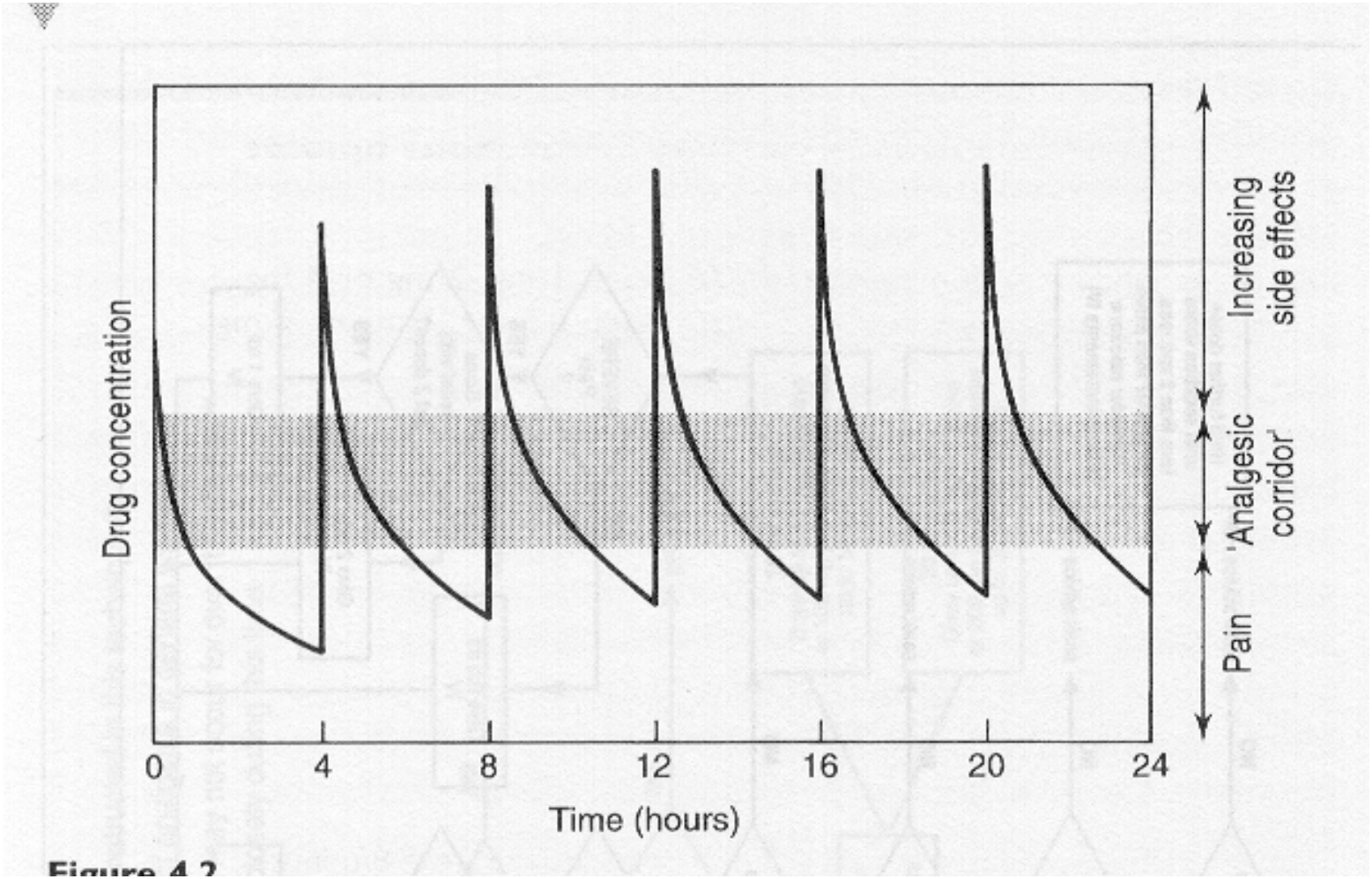
opioids administration (cont.) :analgesic corridor



opioids administration (cont.): IM.



opioids administration (cont.): IV.

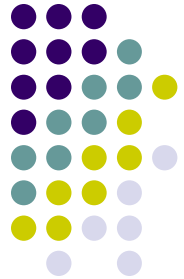



CARROLL AND MILTON PETRIE
EUROPEAN SCULPTURE COURT

traditional methods of opioids administration (cont.)

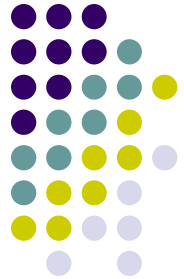
- morphine
- pethidine
- fentanyl

Not recommended



- pethidine
  - norpethidine is a toxic metabolite
    - longer half-life (6 hours), no analgesia
    - psychotomimetic adverse effects, myoclonus, seizures
    - accumulates with renal failure

Not recommended



- **Mixed agonist-antagonists:**

  pentazocine, nalbuphine

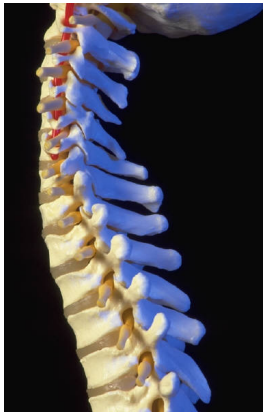
  - **compete with agonists → withdrawal**
  - **analgesic ceiling effect**
  - **high risk of psychotomimetic adverse effects with pentazocine**

Parenteral

- SC, IV, IM
  - bolus dosing q 3–4 h
  - continuous infusion
    - easier to administer
    - more even pain control

Intraspinal

- Epidural
- Intrathecal



traditional methods of opioids administration (cont.)

- **side effects:**

  respiratory depression

  nausea and vomiting

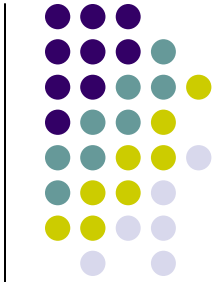
  hypotension

  delayed gastric emptying time

  urinary retention

  pruritus

traditional methods of opioids administration (cont.)



- respiratory depression
- sedation score

0	none
1	mild, occasionally drowsy, easy to rouse
2	moderate, constantly or frequently drowsy, easy to rouse
3	severe,somnolent, difficult to rouse
S	normally asleep

traditional methods of opioids administration (cont.)

- How much is enough?
- How much is too much?
- aim of pain treatment:

  to make the patient comfortable while keeping the

  sedation score below 2 and

  respiration more than 8 /minute

traditional methods of opioids administration (cont.)

- **requirements:**
  - an age-related range of doses
  - dose intervals appropriate to the route of administration
  - monitoring of pain score, sedation score, respiration
  - monitoring for presence of other side effects

Misconceptions

Pharmacology of opioid

- addiction = psychological dependence, behavioral & response including a compulsion to take drug on continuous or periodic basis for psychic effects
- pseudoaddiction =analgesia still not effective,increase dose for pain relief

Tolerance

- Reduced effectiveness to a given dose over time
- Not clinically significant with chronic dosing
- If dose is increasing, suspect disease progression

Physical dependence

- A process of neuroadaptation
- Abrupt withdrawal may → abstinence syndrome
- If dose reduction required, reduce by 50% q 2–3 days
  - avoid antagonists

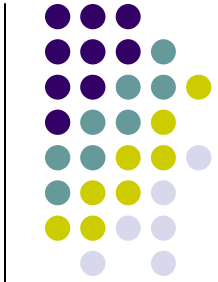
Opioid adverse effects

Common	Uncommon
Constipation	Bad dreams / hallucinations
Dry mouth	Dysphoria / delirium
Nausea / vomiting	Myoclonus / seizures
Sedation	Pruritus / urticaria
Sweats	Respiratory depression
	Urinary retention

Opioid allergy

- !! Nausea / vomiting, constipation, drowsiness, confusion
  - adverse effects, not allergic reactions
- Anaphylactic reactions are the only true allergies
  - bronchospasm
- Urticaria, bronchospasm can be allergies; need careful assessment

Respiratory depression



- Opioid effects differ for patients treated for pain
  - pain is a potent stimulus to breathe
  - loss of consciousness precedes respiratory depression
  - pharmacologic tolerance rapid
- Management
  - identify, treat contributing causes
    - reduce opioid dose
    - observe
  - if unstable vital signs
  - naloxone, 0.1-0.2 mg IV q 1-2 min

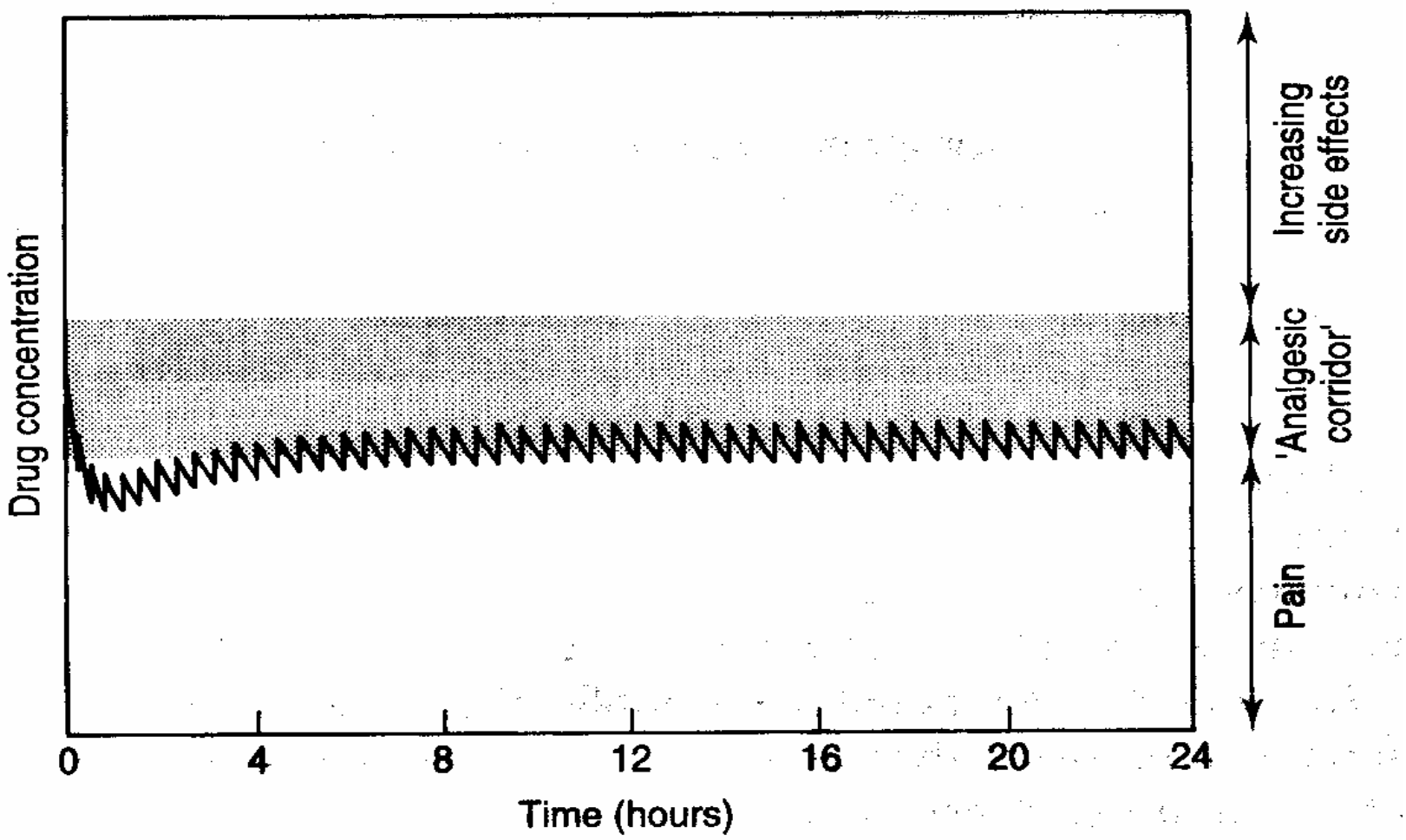
techniques for reduced acute post operative pain

- traditional methods of opioids administration
- **patient-controlled analgesia**
- regional anesthetic techniques
- other drugs used
- other techniques

patient-controlled analgesia (PCA)

- negative feed back loop
- microprocessor-controlled pump
- basal (infusion) rate
- incremental (bolus) dose
- lockout interval
- 4-hour limit
- monitoring: pain score, sedation score, RR, other side effects

patient -controlled analgesia (PCA)



techniques for reduced acute post operative pain

- traditional methods of opioids administration
- patient-controlled analgesia
- **regional anesthetic techniques**
- other drugs used
- other techniques

regional anesthetic techniques

- **peripheral block**

  local infiltration

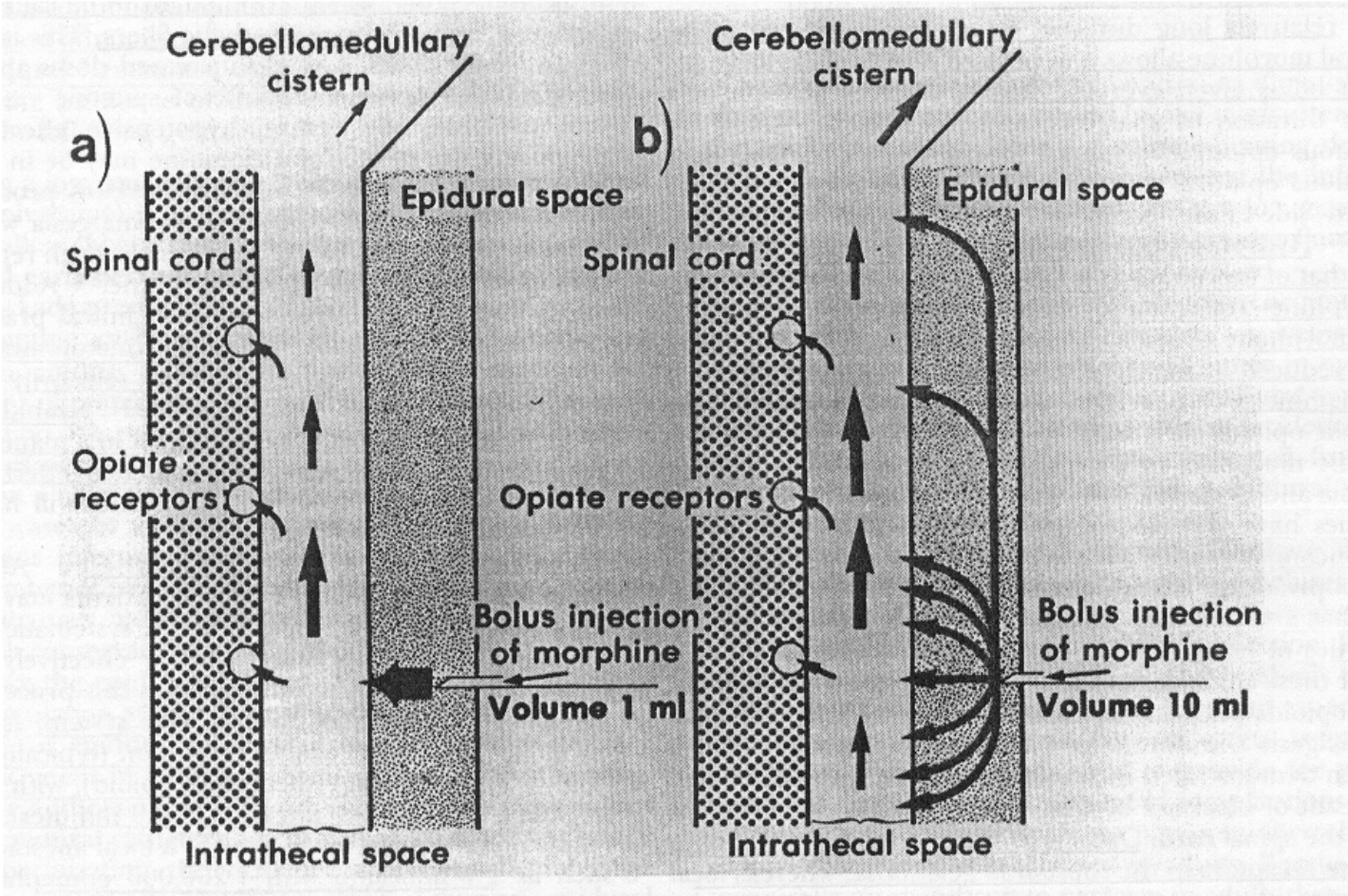
  nerve block -femoral n.block etc.

- **central neuraxial block**

  subarachnoid/spinal block (intrathecal)

  epidural block

regional anesthetic techniques (cont.)



regional anesthetic techniques (cont.)

- **intrathecal analgesia**

  morphine: water soluble, 8-24 hr

- **epidural analgesia**

  intermittent, continuous, patient-controlled epidural analgesia(PCEA)

  opioids and/or local anesthetics

  0.0625% bupivacaine and morphine or fentanyl

  3-5 days

regional anesthetic techniques (cont.)

- **side effects**

  respiratory depression

  nausea and vomiting

  hypotension

  delayed gastric emptying time

  urinary retention

  pruritus

techniques for reduced acute post operative pain

- traditional methods of opioids administration
- patient-controlled analgesia
- regional anesthetic techniques
- **other drugs used**
- other techniques

other drugs used (cont.)

Paracetamol (Acetaminophen)

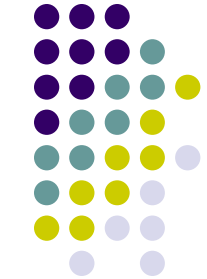
- antipyretic
- analgesic (mild to moderate pain or synergistic)
- step 1 analgesic, coanalgesic
- site, mechanism of action unknown
  - minimal anti-inflammatory effect
  - inhibit cyclo-oxygenase
- 15-20 mg/kg
- Hepatic toxicity if > 4 g / 24 hours
  - increased risk
    - hepatic disease, heavy alcohol use

NSAIDs

- antipyretic, anti-inflammation
- analgesic (mild, moderate pain, synergistic)
- inhibit cyclo-oxygenase
- side effects: GI irritation, GI bleeding, platelet dysfunction,

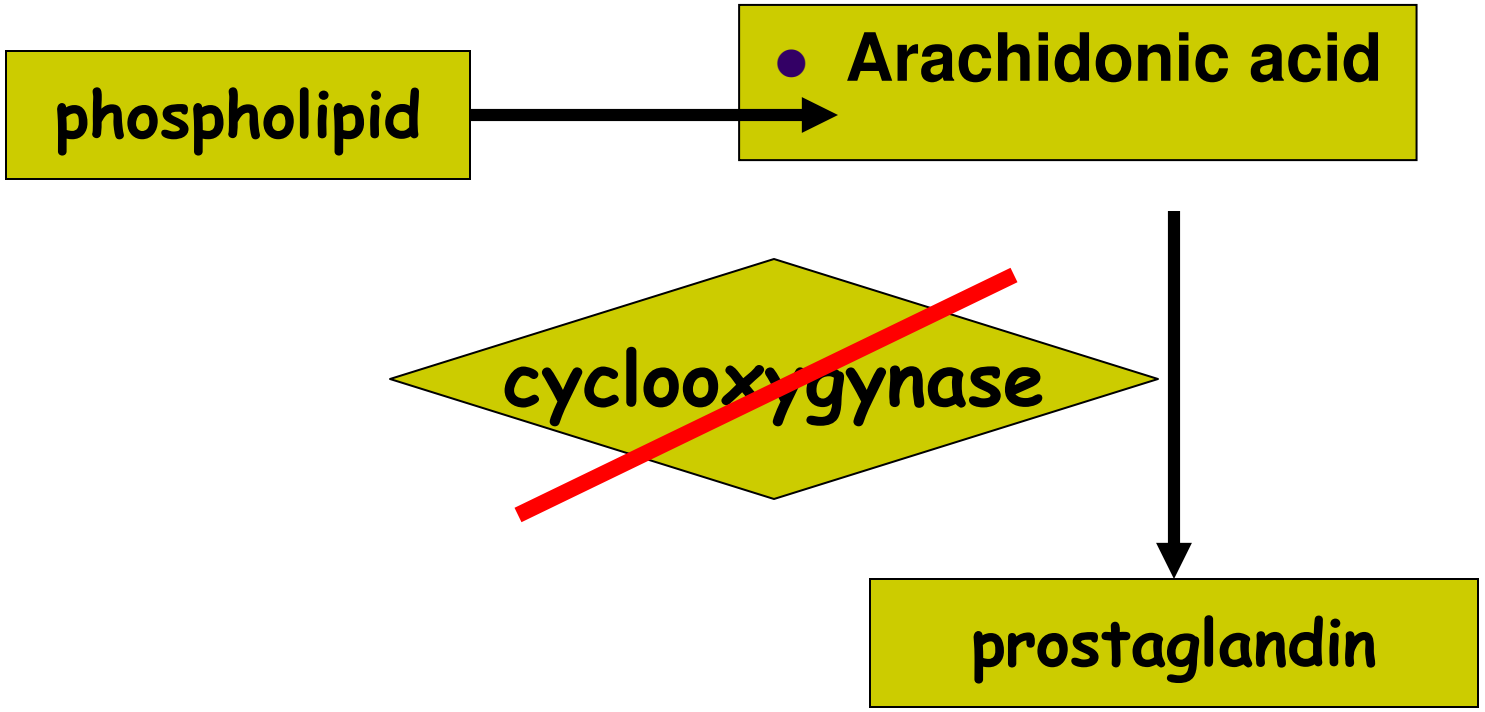
  renal toxicity, hemorrhage

NSAIDs

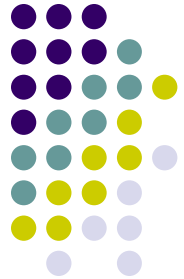


- Inhibit cyclo-oxygenase (COX)
  - vary in COX-2 selectivity
- Highest incidence of adverse events
  - Renal insufficiency (maintain adequate hydration,COX-2 selection inhibitors)
  - Inhibition of platelet aggregation
  - Gastropathy
- analgesic ceiling effects
  - effective for bone, inflammatory pain
  - individual variation, serial trials

NSAIDSs


phospholipid
Arachidonic acid
cyclooxygynase
prostaglandin

NSAIDSs



- AHCPR guidelines suggest that NSAIDS should be the

  first-line drug for treatment of mild to moderate pain

  and should be used in combination with opioids for more severe pain

listens with your eyes
looks with your ears

and touch
the patient's inner
feeling