Learning Objectives

- Evaluate assumptions about opioid use in children
- Discuss WHO-principles of acute pain management and concept of multimodal analgesia
Pediatric Pain - Status Quo

- **Under treatment of pain in children**
- **Parents expect pain to be relieved**
- **Priorities of parents of hospitalized children**
  Taking care of pain rated as second highest priority (1st: getting right diagnosis)
- **Parents’ greatest distress:** failing to protect their child from pain
- **Assumption:** everything possible is done

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Pediatric Pain - Status Quo

- **USA:** adults receive more than two to three times as many analgesic doses as children (with identical diagnoses)
- **The younger children are, the less likely they receive appropriate analgesia**
- **Compared to adults, pediatric patients receive fewer and/or incorrectly dosed analgesics in daily routine**

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Inappropriate Analgesia: Why Bother...

- **Children with persistent pain suffer more physical symptoms in adult life, more anxiety and more depression**
  (1946 Medical Research Council and 1958 National Child Development Study)

- **Inadequate analgesia for initial procedures in children diminishes effect of adequate analgesia in subsequent procedures**

- **NICU:** increased morbidity & mortality

- **Up to 25% of adults have fear of needles with most fears developing in childhood:** avoidance of health care (including non-adherence with vaccination schedules)
Trauma & post-traumatic stress disorder (PTSD)

- US soldiers after serious combat injury: Use of morphine during trauma care reduces risk of subsequent development of PTSD.

- Children (n=48) with injury that led to hospital treatment: Morphine was associated with lower levels of PTSD at follow-up 6 months later.

- 6-16 year-olds (n=24) with acute burns: Children receiving higher doses of morphine had greater reduction in PTSD symptoms over 6 months.

- 12- to 48-month-old (n=70) children with acute burns admitted to major pediatric burn center: Management of pain with higher doses of morphine associated with decreasing number of symptoms of PTSD in months after major trauma.

Myths and Barriers to Using Opioids

Case Scenario:

- You are taking care of a child with severe acute somatic nociceptive pain (e.g. cancer, sickle-cell crisis, major burn etc.). It crosses your mind to administer a strong opioid such as morphine or fentanyl.

- What would be the most common concerns you might hear from your colleagues or parents arguing against opioid use in this child?

Common Opioid Assumptions

- Addiction
- Over Sedation / Respiratory Depression
- Ileus / Gut hypomotility / Constipation
- Medication "Too strong"
- Masking symptoms
How Do We Manage Acute Pain in Children?

WHO guidelines on the pharmacological treatment of persisting pain in children with medical illnesses (2012)

- Data suggests that applying the World Health Organization (WHO) principles of pain management result in good pain relief for a large majority of children with cancer.

- In addition there is emerging evidence, that these principles are equally effective in acute pediatric pain management for non-malignant conditions.


WHO guidelines on the pharmacological treatment of persisting pain in children with medical illnesses (2012)

- **Dosing at regular intervals** (“By the Clock”)

- Adapting treatment to the individual child (“With the Child”)

- Using the appropriate route of administration (“By the appropriate route”)

- Using a two-step strategy (“By the Analgesic Ladder”)

WHO Principle 1: Dosing at Regular Intervals

- **PRN = Patient Receives Nothing**
- When pain is constantly present, analgesics should be administered, while monitoring side-effects, at regular intervals
- “By the clock” and NOT as an “as needed” (or pro re nata “PRN”) basis
- Regular scheduling ensures a steady blood level, reducing the peaks and troughs of PRN (“as needed”) dosing
- PRN (as needed) only:
  - May take several hours & higher opioid doses to relieve pain
  - Results in cycle of undermedication and pain, alternating with periods of overmedication and drug toxicity


WHO Principle 2: Adapting Treatment to the Individual Child

- Treatment should be tailored to the individual child and opioid analgesics should be titrated on an individual basis
- **At analgesic dosing: no sedation expected**
- The effective dose is what relieves the pain
  - Different children may respond differently to same dose
  - Effective dose must be adjusted to child's needs
  - Dose of strong opioids: only the sky is the limit
- Assess response frequently
  - Pain Scales
  - Look for opioid-induced side effects and toxicity

Regular (!) Pain Assessment

- One-dimensional self-report scores
- Multi-dimensional rating scores

Infant FLACC Scale

<table>
<thead>
<tr>
<th>Category</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain</td>
<td>mild</td>
</tr>
<tr>
<td>Activity</td>
<td>sedentary</td>
</tr>
<tr>
<td>Sleep</td>
<td>good</td>
</tr>
<tr>
<td>Care</td>
<td>normal</td>
</tr>
<tr>
<td>Comfortability</td>
<td>relaxed</td>
</tr>
</tbody>
</table>

Each of the five categories (0=none, 1=light, 2=moderate, 3=severe). Add scores between 5-18

WHO guidelines on the pharmacological treatment of persisting pain in children with medical illnesses (2012)

- Dosing at regular intervals (“By the Clock”)
- Adapting treatment to the individual child (“With the Child”)
- Using the appropriate route of administration (“By the appropriate route)
- **Using a two-step strategy (“By the Analgesic Ladder”)**

**Nociceptive Pathways & Primary Sites of Action of Analgesics**

- Acetaminophen (Paracetamol)
- NSAIDs
WHO Principle 4: Using a Two-Step Strategy

**WHO Step 1**  
Mild Pain

- Ibuprofen
- and/or
- Acetaminophen (Paracetamol)
- Other NSAIDs?  
- Cox-2 Inhibitor?

**WHO Step 2**  
Moderate to Severe Pain

- Morphine
- or
- fentanyl, hydromorphone, oxycodone, methadone  
(UK: diamorphine)

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Morphine Pharmacokinetics

“A principle of pharmacokinetics teaches us that unless the drug reaches the site of action, it cannot be expected to exert its dynamic effect.

With morphine the situation is that when the drug dose not reach the PATIENT, what hope is there for pain relief?”


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WHO Principle 4: Using a Two-Step Strategy

**WHO Step 1**  
Mild Pain

- Ibuprofen
- and/or
- Acetaminophen (Paracetamol)
- Other NSAIDs?  
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**WHO Step 2**  
Moderate to Severe Pain

- Morphine
- or
- fentanyl, hydromorphone, oxycodone, methadone  
(UK: diamorphine)

- Intermediate Step?
  - Tramadol
  - Codeine
  - Hydrocodone
Integrative Pain Management

- State of the art pain management in the 21st century demands that pharmacological management must be combined with supportive and integrative, non-pharmacological therapies to manage a child’s pain.
- Physical methods (e.g., cuddle/hug, massage, comfort positioning, heat, cold, TENS)
- Cognitive behavioral techniques (e.g., guided imagery, hypnosis, abdominal breathing, distraction, biofeedback)
- Acupuncture, acupressure, aromatherapy

Integrative Pain & Symptom Management

A Pediatrician’s Top 10 Apps for Distraction & Pain Management http://NoNeedlessPain.org

Nociceptive Pathways & Primary Sites of Action of Analgesics

Descending pathways that modulate transmission of nociceptive signals originate in periaqueductal grey (PAG), ventral midbrain, substantia nigra, raphe nuclei, hypothalamus, and are relayed through brainstem nuclei in the PAG and medulla to spinal cord.

Inhibitory transmitters involved in these pathways incl. norepinephrine, 5-hydroxytryptamine, dopamine, and endogenous opioids.
Choice of Analgesics: Step 1

Mr. Strong Pain

Mr. Acetaminophen (Paracetamol)

Mr. Ibuprofen

Choice of Analgesics: Step 2

Mr. Strong Pain

Mr. Morphine

Choice of Analgesics: Step 3

Multimodal Analgesia

Mr. Sleep Hygiene

Mr. CBT

Mr. Morphine

Mr. Acetaminophen (Paracetamol)

Mr. Physical Therapy

Mr. Regional Anesthesia

Mr. CAM

Mr. Adjuvant
**Multimodal Analgesia**


**Multimodal = Awesome!**

**Conclusions Acute (!) Pain**

- Pain is, when the child says so
- Use multimodal (opioid-sparing) analgesia
  - incl. combination of integrative methods, rehabilitation and analgesic medications
- Include 4 WHO Principles
- Patients/Parents do NOT have to choose between poor pain control or over sedation
- Opioids should NOT be administered long-term
- Opioids NOT indicated for chronic pain
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Blog: http://NoNeedlessPain.org

Further Training:

9th Annual Pediatric Pain Master Class
• Minneapolis, MN | June 11-17, 2016

Education in Palliative & End-of-life Care [EPEC]: Become an EPEC-Pediatrics Trainer
• Chicago, IL | March 12-13, 2016 (Professional Development Workshop March 9, 2016)