

**Pain Management Approaches
in
Pediatric Burn Patients**

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Objectives


- Identify incidence of pediatric burns and apply it to an institutional approach for pain management for burn patients.
- Identify various treatment options for pain management in pediatric burn patients.
- Discuss pain management approaches in pediatric patient case scenarios.

No vested interest or disclosures to discuss

Burns

- Each year approximately 500,000 people receive treatment for injuries sustained from burns.
 - Nearly 40,000 U.S. hospital admissions are for burn injury.

Nationwide Children's Hospital



- Level 1 Trauma Center
- 1 of 125 Burn Centers in the US
- Part of an elite group of 53 hospitals who are Verified Burn Centers.
- Approximately 1,300 trauma patients last year
 - 168 trauma admissions related to burns

Comprehensive Pain Service

Inpatient Pain Service

Outpatient Pain Service Clinic

Palliative Care/Hospice Inpatient and Outpatient

Inpatient Pain Services

- Automatically consulted for > 10 % burns
- Manage all PCA/NCA for burn patients
- Manage weans outside of ICU setting
- Attend weekly multidisciplinary rounds

Procedural

<p>Pain</p> <ul style="list-style-type: none">• Morphine sulfate IV bolus<ul style="list-style-type: none">• 0.05-0.1 mg/kg IV• Hydromorphone IV bolus<ul style="list-style-type: none">• 0.015-0.02mg/kg IV max 1-1.5mg• Fentanyl IV bolus<ul style="list-style-type: none">• 0.5-1mcg/kg IV max 25-50mcg• Morphine<ul style="list-style-type: none">• 0.3-0.6 mg/kg PO• 30-60 min prior to procedure	<p>Sedation</p> <ul style="list-style-type: none">• Midazolam (Versed)<ul style="list-style-type: none">• 0.05 mg/kg IV• 10-15 min prior to procedure• (max 4 mg/dose q 6h)• Midazolam (Versed)<ul style="list-style-type: none">• 0.25-0.5 mg/kg PO• 15-30 min prior to procedure• (max 15 mg/dose)
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Dressing Changes

Virtual Reality in Burn Patients

- Anxiety plays major role in patient's pain level during burn dressing changes and painful procedures.
- Link between anxiety and pain
- Distraction helps decrease anxiety and pain associated with procedures.

Virtual Reality in Burn Patients
How it Works

- Patients wear a virtual reality helmet that allows them to enter into a computer-generated world
- Children interact in this world when helmet is on.
- Children are assisted by child life specialists

Virtual Reality in Burn Patients
Nationwide Children's Hospital

- First implemented in May of 2007 at NCH
- RN's report improvement in patients' ability to tolerate burn procedures.
- Positive feedback from patients
- Research study in process comparing the results of virtual reality pain distraction with other forms of patient distraction such as TV.

Virtual Reality



Non pharmacological

- Child Life Consult
 - Distraction techniques
 - Play therapy
- Psychology Consult
- PT/OT/TR
- Massage therapy



Pain Management with Therapy Sessions

- Be sure to pre-medicate if needed
 - If on long acting meds give a prn breakthrough med before therapy session

Mechanically Ventilated > 10% Burn

- 18 month old female, 10 kg
 - Admitted on 12/24/08
 - 38% Scald Burn to extremities and abdomen
- Initially admitted to PICU not intubated
 - Started on Morphine NCA+basal
- Intubated hospital day 2
 - Started on Fentanyl drip and sedation medications

Pain Management

- Initially Morphine NCA was started
- Intubated on post burn day 3 →Fentanyl drip and versed drip for sedation
- 2 weeks later
 - Converted high dose Fentanyl drip
 - Hydromorphone NCA
 - Versed wean and added ativan

Methadone

- Mu-agonist
- Synthetic opioid analgesic with multiple actions
- Act as antagonist at the N-methyl-D-aspartate (NMDA) receptor

USA TODAY

Deadly abuse of methadone tops other prescription drugs

By Dennis L. Brinkman, USA TODAY

Methadone, a painkiller that has been used to treat heroin addicts for decades, has emerged as an increasingly popular and deadly street drug, joining narcotics such as Vicodin and OxyContin as frequently abused prescription drugs.

Fatal overdoses of methadone rose at a higher rate than those involving any other narcotic from 1999 through 2004, according to a recent study by the National Center for Health Statistics (NCHS). The number of deaths from methadone in 2004 (3,842) represented a 390% rise from 1999, the study said.

ON THE STREET: Painkiller becomes more available


Methadone was cited in nearly 13% of all the overdose deaths reported in the USA in 2004, up from about 4% five years earlier. Among drugs checked in fatal overdoses, only cocaine kills more people than methadone.

The NCHS study — and reports from corners nationwide that the brand is continuing — indicate that doctors' increasing tendency to prescribe methadone as a cheap alternative to addictive pain relievers such as OxyContin has made it easier for addicts to get methadone, the Drug Enforcement Administration's Denise Curry says.

"It's out there, it's available, and it can be dangerous," Curry says. "Pharmacies report that methadone is among the most popular drugs stolen, along with Vicodin and OxyContin, she says."

Available Products

- PO
 - Liquid 5mg/5 ml and 10mg/5 ml
 - Tabs 5 mg and 10 mg
- Injectable
 - IV 10mg/ml



Methadone

- Works on Mu, Kappa and MND A receptors
 - Oral bioavailability 80%
 - 60-90% protein bound – α_1 -acid glycoprotein
 - Metabolized in liver
 - Potency greater than expected based on single-dose studies
- When used for pain: multiple daily doses, steady-state in 1 to several weeks
 - Available IV (limited use), PO (liquid and pills)

- Methadone requires additional vigilance because it can cumulate and produce delayed sedation.
- If sedation occurs, doses should be withheld until sedation resolved.
- Thereafter, doses should be substantially reduced and /or the dosing interval should be extended to 8 to 12 hours.

February 23, 2007 — The US Food and Drug Administration (FDA) has approved safety labeling revisions to advise of the risks for respiratory depression and QT interval prolongation associated with use of methadone HCl 5- and 10-mg tablets.

Methadone Oral Therapy (*Dolophine*) Linked to Risks for Respiratory Depression


On November 11, 2006, the FDA approved safety labeling revisions for methadone HCl 5- and 10-mg tablets (*Dolophine*, made by Roxane Laboratories, Inc) to emphasize the risks for fatal and life-threatening respiratory depression and cardiac arrhythmias in patients receiving initial analgesic therapy and those converted from treatment with other opioid agonists.

Medscape February 23, 2007

Morphine to Methadone Conversion for Chronic Administration

Total Daily Dose-Oral Morphine	EPERC Conversion (morphine : methadone)	EPERC % of morphine dose	FDA % of morphine dose
< 100 mg	3:1	33%	20-30%
101-300 mg	5:1	20%	10-20%
301-600 mg	10:1	10%	8-12%
601-800 mg	12:1	8%	5-10%
801-100 mg	15:1	7%	5-10%
>100 mg Adapted from Dolophine package insert	20:1	5%	<5%


FDA Warning



- Respiratory Depression, Incomplete Cross-tolerance, and Iatrogenic Overdose
- Cardiac Conduction Effects
- Misuse, Abuse, and Diversion of Opioids
- Interactions with other CNS Depressants
- Interactions with Alcohol and Drugs of Abuse
- Head Injury and Increased Intracranial Pressure
- Acute Abdominal Conditions
- Hypotensive Effect

Drug Interactions

- CNS depressants
- CYP2D6 substrates
- CYP3A4 inducers
- CYP3A4 inhibitors



QTc Prolongation

The FDA has issued an alert about the risk of unintentional overdose, dangerous cardiac dysrhythmias, and deaths associated with methadone (Dolophine), which is increasingly being prescribed for pain relief.

These adverse reactions have occurred in patients just starting methadone treatment for severe pain and in those who switched to methadone after taking another strong opioid.

QTc Prolongation

- Inhibits cardiac potassium channels and prolongs the QT interval
- Prolongation and serious arrhythmia (torsades de pointes) have been observed during methadone therapy
- Commonly associate with higher dose treatment (>200mg/day)

Signs of methadone overdose

- Difficult or shallow breathing
- Extreme tiredness or sleepiness
- Blurred vision
- Inability to think, talk or walk normally
- Feeling faintness, dizziness or confusion

Opioid Rotation

- Requires caution due to the uncertainty of dose conversion ratios and incomplete cross-tolerance.
- Potency and duration of analgesic action are similar to single doses
 - The potency increases over time with repeated dosing

Opioid Weaning

- Need to wean opioids of on them > 7-10 days consistently.
- Weaning regiment depending on length patient has been on opioids.

Recommendations for Opioid Wean

- <7 days: If wean needed - wean over 3-5 days - decrease dose by 25%-50% qd, and increase intervals then off.
- 7-14 days: wean 20% qd, then increase intervals then off (up to 7 days)
- 14-28 days: wean 20% qod, then increase intervals then off (up to 14 days)
- >28 days: wean 10% qod, then increase intervals then off (up to 24 days)

Opioid Withdrawal

- Usually seen 24 - 48 hours after change in dose or last dose.
- Signs of withdrawal
 - Irritability, anxiety, backache, joint pain, weakness, abdominal cramp, insomnia, nausea, anorexia, vomiting, diarrhea, increased BP, RR or HR.

Possible Recommendations for Benzodiazepine Wean

- Benzodiazepine Wean: Midazolam Continuous Infusion
- Convert to long acting benzodiazepine
 - Divide total daily midazolam dose by 12 to get daily lorazepam dose -divide q6h
- Cross Taper
 - Decrease midazolam infusion by 50% after 2nd dose of lorazepam
 - Decrease infusion by additional 50% after 3rd dose
 - Discontinue infusion after 4th dose is administered
- Weaning Schedule
 - Length of Exposure
 - <10 days: lorazepam weaned over the same number of days
 - >10 days: lorazepam weaned over 20 days
- Weaning Schedule
 - Administer calculated lorazepam dose q6h around the clock
 - Decrease dose by 10%-20% a day and administer q6h
 - Alternative: Wean 20% q48hrs
 - Increase dosing interval to every 8-12 hours, then off
 - For Symptoms of Benzodiazepine Withdrawal
- Breakthrough
 - Lorazepam: 0.05mg/kg/dose q2hr prn
 - If need >4 prn lorazepam, then take total daily lorazepam (including prn) and divide over 4 doses
 - Consider clonidine for persistent withdrawal symptoms for opioids or benzos.

Benzodiazepine Withdrawal

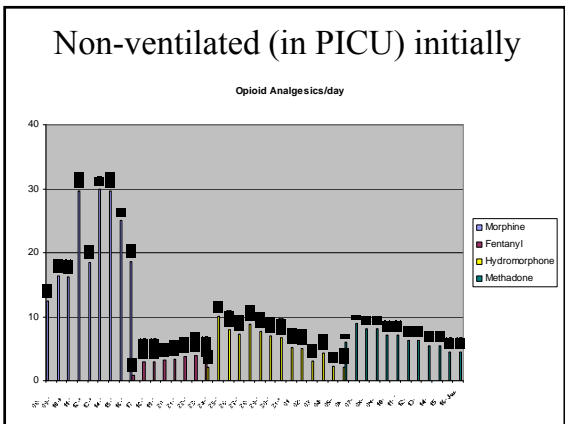
- Many times patient's with burns are on prolong use of benzo for sedation
- Withdrawal symptoms can be similar to opioids

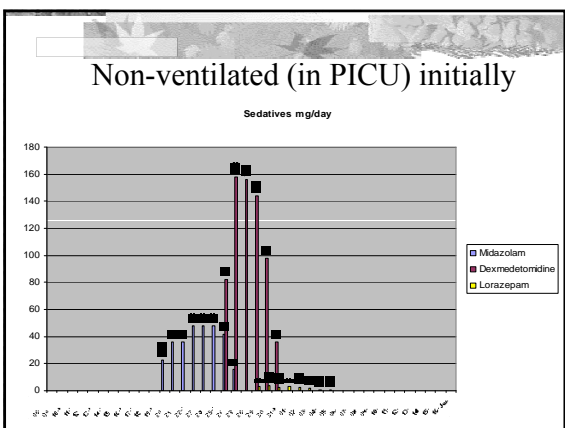
Why we might choose certain medication regiments

- Need long acting medications
- Not able to swallow pills
- Having neuropathic pain
- Needs smaller dosing then able to get in pills
- Social situation

**Non-ventilated
(in PICU) initially**

- 2 y.o male, 11.4 kg, 38% TBSA scald burns
 - Admitted 5/7/06
- Treatment while on PTS
 - Morphine NCA
 - Fentanyl NCA
 - Hydromorphone NCA






- ### Non-ventilated (in PICU)
- Pain management
 - How best to administer it
 - Is sedation needed
 - Long acting vs short acting
 - Consult pain service before transfer to floor if possible.
 - Most will require some type of wean.

**>10% TBSA burn
(Floor patients)**

- 7 y.o. male 20kg with 20% TBSA flame burns
 - Admitted 10/16/06
 - Morphine NCA
 - Oxycodone IR
 - Morphine PCA
 - Oxycodone IR
 - Weaned 25% qod

**<10% TBSA burn
(Floor patients)**

- Stay away from Tylenol with codeine
- Be sure they are on ibuprofen if able
- ? ATC vs PRN



Side Effect Management

- Oversedation
- Pruritus
- Constipation
- Nausea/Vomiting
