

Opioid Safety in Paediatrics

Consensus Guidelines for Opioid Medication Delivery in Paediatrics

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Opioid Safety in Paediatrics – The Beginning *CAPHC 2006 Patient Safety Collaborative Annual Symposium*

“Promoting Patient Safety and Best Practices in Paediatrics through Standardization of Medication Practices and Delivery Protocols”

Established Partnership with ISMP
Canada

http://www.caphc.org/documents_annual/2006/patient_safety_symposium_proceedings.pdf

Partnership between CAPHC & ISMP

CAPHC supports over fifty member organizations, representing multidisciplinary health professionals that provide health service delivery to children, youth and their families within acute care hospitals, community hospitals, rehabilitation centres and home care provider agencies across Canada

All children's hospitals in Canada are members of CAPHC, providing strong linkages to clinical care, education and research

ISMP Canada is an independent not-for-profit organization dedicated to reducing preventable harm from medications. Their aim is to heighten awareness of system vulnerabilities and facilitate system improvements.

2006 Symposium...

The value of creating system-wide standards for high risk medication practices across all paediatric settings was identified as a priority based on the following principles:

- Standardization of care is a key principle behind patient safety,
- Standardization forces necessary discussion and debate;
- Standardization allows for consistency across sectors; and
- Standardization has the potential to enhance learning and knowledge transfer.

Phase 1 – January 2008

NATIONAL ACTION PLAN – PROPOSED GOALS AND OBJECTIVES

- Comprehensive Medication Incident Analysis; Top 5 meds causing harm and/or potential harm;
- Paediatric best practice landscape survey;
- *"Create an intervention that would assist in the implementation of safe medication practices for the delivery of Opioids in paediatric settings"*

Phase 1 data

~5,000 Incident Reports

- Top 5 drugs causing harm are: morphine, potassium chloride, insulin, fentanyl, and salbutamol.
- The recurring themes of contributing factors for the incidents were: misinterpretation of orders, IV pumps programming issues, complex IV therapy, dosage, and weight, or time mix-ups, clarity of roles, IV admixing errors, and transfer points
- http://www.caphc.org/programs_patient_safety_med_delivery.html#plan1

National Advisory Committee Meeting (August 2008)

Developing a Paediatric Pilot Intervention

- *Established Criteria;*
- *Must address the top 5 drugs;*
- *Must address the contributing factors;*
- *Must be achievable within 2 years across the continuum of inpatient care; tertiary, community;*
- *Must be measurable;*
- *Must be a sustainable practice change linked to an Accreditation Canada ROP;*

Phase II 2009 – 2010: Clarification & Consultation

Objectives:

- To develop a set of comprehensive intervention recommendations and tools to support safe opioid medication practice including but not limited to methods of standardization of prescribing and administration, calculation tools, and storage;*
- To utilize an innovative approach applying HFE expertise and psychological theory and practice to design strategies for developing support for professionals – The O-Zone*

Death of a premature baby as a result of a morphine overdose

- *A junior doctor miscalculated a dose of intravenous morphine resulting in the administration of a 100 times overdose. The dose was calculated as 0.15 milligrams but the decimal point was inserted in the wrong place and a dose of 15 milligrams was prescribed. The dose was administered to a premature baby who tragically died despite treatment with the antidote, naloxone*
- **Cousins DH, Upton DR. Medication errors: A second check for doctors? Pharmacy in Practice 1997; 7: 368-369**

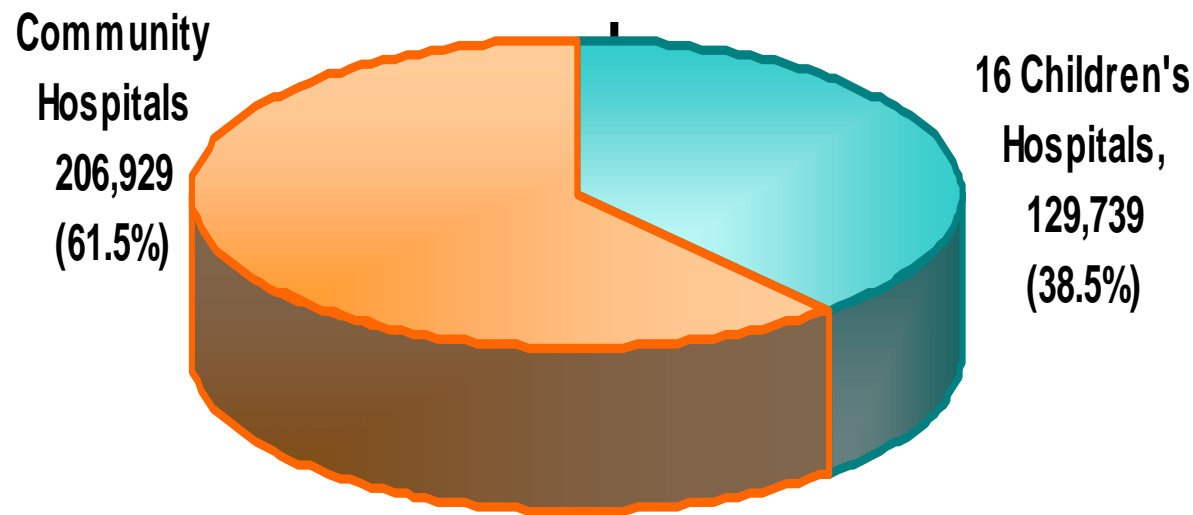
Opioid Safety Tactics are:

- Fundamental system safety elements
- Prescribing standardization elements
- Dose administration standardization elements

Where are Canadian children being treated?

F2008 Canadian Paediatric Hospitalizations

- *336,668 separations*



▪ Based on CAPHC-CPDSN paediatric definition; DAD / MedEcho encounters for individuals less than 18 years of age, excluding stillbirths, obstetrics and normal newborns* Source: FY2008-09 Canadian Paediatric Separations (336,668), Canadian Institute of Health Information (CIHI) HMDB, and CIHI Portal

* Rehab, Mental Health, and Home Care paediatric data are not available at this time



Standard Concentration Recommendation Tertiary Hospitals

ADOPT STANDARD CONCENTRATIONS of opioid solutions for continuous infusions, combined with use of infusion dosing charts and/or smart pumps to:

- **Morphine 0.2mg/mL and 1mg/mL**
- **Hydromorphone 40 mcg/mL and 250mcg/mL**
- **Fentanyl 10 mcg/mL and 50 mcg/mL**

Exception - It is recognized that additional concentrations of opioids for continuous infusions may be required for hospitals caring for very low birth weight babies, and hospitals without pumps which deliver volumes to 0.01mL/hr accuracy

Standard Concentrations Recommendation Community Hospitals

- **ADOPT STANDARD CONCENTRATIONS of morphine** for continuous infusion as noted below and use with smart pumps and/or infusion dosing charts:

**Infusion: Morphine 0.2 mg/mL
and 1 mg/mL**

Exception: Additional concentrations of morphine for infusion may be needed for very low birth weight infants and by hospitals that do not have pumps with the ability to deliver volumes to 0.01mL/hour accuracy

Guidelines re Standard Concentrations

- Ideally use “smart pumps”
- Use commercially prepared premixed IV solutions if available from manufacturer
- If not available commercially, prepare them in pharmacy whenever possible
- Provide admixing guidelines for use by nursing staff when premixed standard concentration opioid solutions not available

Limiting Opioid Recommendation - Community Hospitals

- **LIMIT** the **parenteral opioid agent** used for paediatric patients to **morphine**
 - **LIMIT** the available concentrations of injectable morphine in paediatric care areas to:
 - **Injectable: Morphine 2 mg/mL***
- * Currently the lowest concentration morphine ampoule available in Canada

Guideline re: Limiting Opioid to Morphine – Community Hospitals

- It is recognized that hydromorphone or fentanyl may be req'd in certain situations
- **RESTRICT ACCESS** to hydromorphone to specific situations where it is needed e.g. palliative
- **RESTRICT ACCESS** to fentanyl to specific situations e.g. neonatal intensive care

Opioid Preparation - Tertiary and Community

ADOPT STANDARD METHODS for preparing and administering intermittent bolus opioid doses.

- Develop admixing guidelines and calculation aids for nursing and pharmacy staff when preparing bolus opioid doses and make these tools available at the point of care
- Ensure that procedures for administration of intermittent bolus doses are developed by the organization

Order Writing

- Tertiary and Community

- INCLUDE the **dosage by weight** for ALL opioid orders for paediatric patients who weigh 40 kg or less expressed as:

(mg or mcg)/kg/dose or

(mg or mcg)/kg/h

Along with the patient-specific dose

*(standard order sets express IV opioid doses in the standard concentrations used in the organization)

Guidelines for Order Writing (Tertiary and community)

- For pts <40kg orders should include weight-based dose along with patient-specific dose
- Use consistent terminology for dosing units on all labels, preprinted orders, MAR's, pumps
- Standard order sets should express opioid doses for IV infusion in terms of the standard concentrations used by the organization and in a manner and sequence that matches entries in MAR's and pumps

Labeling

Tertiary and Community

- LABEL EVERY DOSE of oral or parenteral opioid intended for oral or parenteral administration
 - Label all containers for opioid medications (e.g. oral syringes, parenteral syringes and infusions bags. This includes opioids prepared on nursing units
 - Ensure that at a minimum labels include drug name and strength or total dose/total volume i.e. morphine 1 mg/ml or 20mg/20ml

Dosing and Monitoring Tertiary and Community

- DEVELOP and DISSEMINATE institution-wide dosing and monitoring guidelines for opioids used in paediatrics, including recommendations for the initial dose and maximum doses for opioid-naïve patients

Guidelines: Dosing and Monitoring

- Ensure that current protocols, guidelines, dosing charts (including equianalgesic charts for oral, parenteral and transdermal) and/or checklists for opioids are readily accessible to prescribers, pharmacists, and nurses and that the aids are used
- Initial weight based doses of opioids for paediatric patients should not exceed usual starting dose for opioid naïve adults
- Ensure that the reversal agent naloxone and guidelines for its use are readily available wherever opioids are administered

Segregation - Community Hospitals

- SEGREGATE paediatric formulations of opioids from adult formulations
- For hospitals without automated dispensing cabinets where adults and paedics are being treated in the same area, E.g. paedics, ambulatory, inpatient units, ensure that opioids intended for paediatric patients are physically separated from opioids intended for adults (E.g. separate cupboard)

Segregation and Differentiation Tertiary and Community

- SEGREGATE, SEPARATE and DIFFERENTIATE admixed opioid solutions for parenteral infusion from all other solutions intended for IV use
 - Different sized container, colour or labelling, use of auxiliary labels and physical separation
 - The standard concentrations for hydromorphone and morphine are intentionally dissimilar to prevent mix-ups

Oral Opioids

Tertiary and Community

- USE pre-filled oral syringes for all liquid opioids for enteral administration
 - Package liquid opioids in patient specific unit doses or standard doses appropriate to paediatric patients
 - Use only oral syringes that cannot be connected to parenteral systems (E.g. IV tubing)

KEN (Knowledge Exchange Network)

- <http://www.caphc.org/>
- <http://ken.caphc.org/xwiki/bin/view/PaediatricOpioidSafetyResourceKit/>
- Phase I & II reports, Consensus statement from the major Peds centers, Guidelines, Calculation tools, Sample pre printed orders, Orders sets, References...
- Share with us

OPIOID ANALGESIC CONVERSION TABLE FOR ACUTE PAIN

DRUG	Equal Analgesic IM/IV Dose*	Equal Analgesic PO Dose*	IV to PO Conversion Ratio*
Morphine	1 mg	3 mg	1 : 3
FentaNYL	0.01 mg = 10 mcg	n/a	n/a
Codeine	See below#		
HYDRORmorphone (Dilaudid®)	0.15 mg = 150 mcg	0.45 mg – 0.75 mg (450 mcg – 750 mcg)	1 : 3 to 1 : 5

* Chronic administration (after 5 to 7 days) will change the conversion ratios between drugs and between parenteral and oral dose comparisons. These comparisons are estimates only based on single dose adult studies. In addition, variation within a patient and between patients may occur.

Codeine is no longer recommended at CHEO (See text for details). An approximate conversion would be: Codeine 30 mg PO to Morphine 4.5 mg PO

OPIOID DOSING FOR PAIN CONTROL

CODEINE – no longer recommended at CHEO for infants and children

- Codeine's analgesic effect is due to 10% of the administered dose of codeine being metabolized into morphine.
- Codeine's efficacy can be unpredictable. After receiving the same weight-appropriate dose of codeine, poor metabolizers may have little or no analgesia while ultra-rapid metabolizers may be at risk of respiratory depression from morphine plasma levels rapidly peaking at potentially 50% higher than normal.

MORPHINE	
MORPHINE IV Intermittent	Usual initial range: 0.05 – 0.1 mg/kg/dose IV/SC q2-4h PRN (usual maximum starting dose 5 mg)
MORPHINE IV infusion	<ul style="list-style-type: none"> • INFANTS less than 6 months: usual initial range: 10 – 20 mcg/kg/hr IV • CHILDREN greater than 6 months: usual initial range: 10 – 40 mcg/kg/hr IV For Breakthrough Pain: Morphine 20 – 50 mcg/kg/dose IV over 5 minutes q2h PRN
MORPHINE Oral	Usual initial range: 0.2 – 0.3 mg/kg/dose PO q4h PRN (usual maximum starting dose 10 mg)

Standard Drug Calculator

ANALGESIA/SEDATION DRUGS

Dose calculations intravenous unless otherwise specified

Patient Name:	Patient E <small>(if unknown, enter as Patient X, etc.)</small>	Date:	May 02, 2011
Patient Weight:	45 kg	Entered by:	Initials
	45 kg	Verified by:	Initials

Drug	Concentration	Dose		Volume		Notes	Admin Notes
ANALGESIA/SEDATION							
Analgesics							
Fentanyl - Low Dose (1 mcg/kg)	50 mcg/mL	45	mcg	0.9	mL		Undiluted. Over 3-5 min.
Fentanyl - High Dose (2 mcg/kg)	50 mcg/mL	90	mcg	1.8	mL		Undiluted. Over 3-5 min.
Ketamine (1 mg/kg)	10 mg/mL	45	mg	4.5	mL		Undiluted. Over ≥ 1 min
Morphine - Low Dose (0.05 mg/kg)	2 mg/mL	2.25	mg	1.13	mL	Max 5 mg	Dilute to ≤ 2 mg/mL in NS. Over 4-5 min
Morphine - High Dose (0.1 mg/kg)	2 mg/mL	4.5	mg	2.25	mL	Max 5 mg	Dilute to ≤ 2 mg/mL in NS. Over 4-5 min
Sedatives							
Ketamine (1 mg/kg)	10 mg/mL	45	mg	4.5	mL		Undiluted. Over ≥ 1 min
Lorazepam - Low Dose (0.05 mg/kg)	4 mg/mL	2.25	mg	0.56	mL	MAX 4 mg	Dilute 1:1 with NS. Over 2-5min
Lorazepam - High Dose (0.1 mg/kg)	4 mg/mL	4	mg	1	mL	MAX 4 mg	Dilute 1:1 with NS. Over 2-5min
Midazolam - Low Dose (0.05 mg/kg)	1 mg/mL	2.25	mg	2.25	mL	MAX 5 mg	Undiluted. Over 2-5 min
Midazolam - High Dose (0.1 mg/kg)	1 mg/mL	4.5	mg	4.5	mL	MAX 5 mg	Undiluted. Over 2-5 min
Propofol - Low Dose (1 mg/kg)	10 mg/mL	45	mg	4.5	mL		Undiluted. Over 20-30 sec
Propofol - High Dose (2 mg/kg)	10 mg/mL	90	mg	9	mL		Undiluted. Over 20-30 sec
Narcotic Antagonist							
Naloxone (0.1 mg/kg)	0.4 mg/mL	2	mg	5	mL	Give dose slowly in 1/10 increments. Titrate to effect. MAX 2 mg	Undiluted. Give slowly.

Revised November 2009

Label options for Infusions

Name _____ Weight _____ kg

Drug _____

_____ mcg _____ mcg / ml
 _____ mg = _____ ml of _____ mg / ml
 _____ units _____ units / ml

NS

in _____ ml of D _____ W For total volume _____ ml

Final Concentration = _____ mcg / ml
 _____ mg / ml
 _____ units / ml

Dose: _____ ml / hr = _____ mcg / kg / min

Or _____ mcg / kg / hr Or _____ mg / kg / hr

Or _____ units / kg / hr

Prepared Date: _____ Time: _____

RN _____ RN _____



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