Reducing Opioid Exposure in CHEO's NICU Post-Op Patients: A Quality Improvement Initiative

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Background

- Opioids and sedative medications are commonly used in the neonatal intensive care unit (NICU)
- These medications have been associated with negative long-term neurodevelopmental outcomes (Williams, *Front Ped, 2020*)
- From July 2020 to Jan 2022, 118/373 (32%) of patients admitted to CHEO's NICU received opioids or sedative medications
- Despite the widespread use of these medications, there is no protocol at CHEO to guide their rationale use in post-operative and mechanically ventilated patients

Aim

To reduce cumulative opioid exposure through the creation and implementation of evidence-based guidelines for pain management in past operative +/- mechanically ventilated neonates

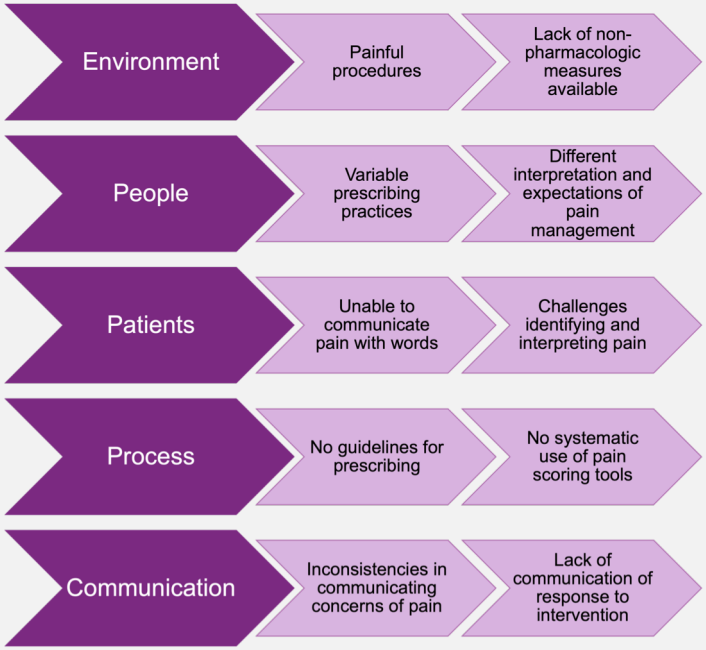
Methods of Analysis

- Guideline development through literature review of therapeutic interactions between different medications, effectiveness, and side-effects with both short-term, long-term or chronic use
- Group consensus recommendations from multi-disciplinary team including neonatal nurses, neonatologists, NICU pharmacists, and pediatric palliative care/pain and symptom management physicians

Intervention

NICU pain guidelines implementation including:

- Provider awareness at the bedside and education sessions on post-operative pain (see example Table 1)
- Safety checklist card (Figure 1)
- Use of pain score (NPASS) and weaning tools (WAT-1 or NAS)



Factors impacting opioid and sedative medication exposure for babies in the NICU

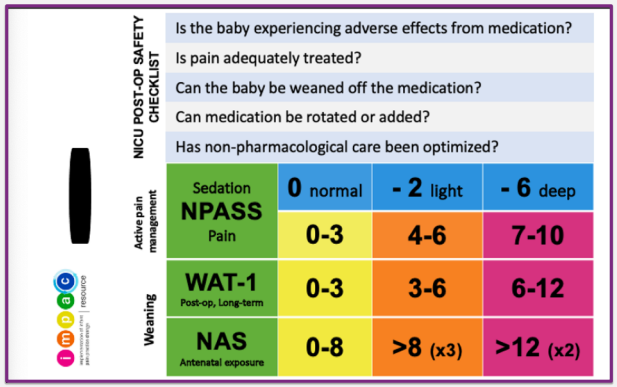


Figure 1. *Post-operative safety checklist card*

Management of Expected Moderate to Severe Post-Operative Pain for Intubated Patients				
Time	0-24 Hours	24-48 Hours	48-72 Hours	Route
Phase	Initiation + Maintenance Phase	Maintenance and Weaning Phase	Weaning and Cessation Phase	
	Achieve Desired Analgesia/Sedation Level	Consider weaning infusions and Scheduled Doses	Continue Weaning Infusions and Scheduled Doses	
Prior to opioids (1st line)	Acetaminophen * PO CGA 28-32 weeks: 10-12 mg/kg/dose Q6-8H, max 40 mg/kg/day CGA > 32-37 weeks: 10-15 mg/kg/dose Q6H , max 60 mg/kg/day CGA > 37 weeks: 10-15 mg/kg/dose Q4-6H, max 75 mg/kg/day PR CGA 30-33 weeks: 20 mg/kg/dose Q12H, max 40 mg/kg/day CGA 34-39 weeks: 25 mg/kg/dose Q8H, max 75 mg/kg/day CGA ≥ 40 weeks: 30 mg/kg/dose Q6H, max 120 mg/kg/day IV CGA 23 - < 32 weeks: 10mg/kg pre-operative loading dose then 7.5mg/kg Q6H CGA > 32 weeks: 20mg/kg pre-operative loading dose then 10mg/kg Q6H *Order as scheduled medication for 72 hours***			IV or PO
Aim	Start with lowest initiation dose	Initiate weaning. Weaning infusions at 24H can be done by 50% daily	Wean infusions by 10-20% daily as tolerated	
Scheduled	Fentanyl 0.5 mcg/kg/h and increase by 0.5 mcg/kg/h Q30 minutes to effect. Max 4 mcg/kg/h → Consider 1mcg/kg *bolus* prior to initiation of infusion	Fentanyl Aim to wean. Can be weaned by 50% if within 24-48 hours	Fentanyl Continue to wean. Wean by 10-20% if > 48 hours	IV
	OR			
	Morphine 10-50 mcg/kg/h (preterm) or 25- 100 mcg/kg/h (term) → Consider *bolus* prior to initiation	Morphine Wean as tolerated. By 50% if within 24-48 hours	Morphine Wean as tolerated. By 10-20% if > 48 hours	IV
	AND/OR*** τ ©			
	Dexmedetomidine 0.2 mcg/kg/h up to a maximum of 1 mcg/kg/h	Dexmedetomidine Wean by 0.1 mcg/kg/h Q12H as tolerated	Dexmedetomidine Wean by 0.1 mcg/kg/h Q12-24H as tolerated	IV
PRN	Fentanyl - 0.5-1 mcg/kg Q4H			IV
	OR			
	Morphine - 50-100 mcg/kg Q4H			IV or PO
* Discuss with senior medical Staff prior to initiation in infants with PPHN or duct-dependent cardiac lesions				
** Consider monitoring LFT's in infants on regular acetaminophen and cease if evidence of additional renal dysfunction				
*** Only initiate dexmedetomidine after discussion with staff neonatologist in infants with refractory pain/agitation. Once infant requires dexmedetomidine, strongly consider PSMT and/or PICU consult (see P20 for consulting practices)				
τ Dexmedetomidine not recommended for use in preterm neonates				
© Consult with PSMT/and/or PICU is warranted (see P21 for consultation practices)				
NOTE – For *acute post-op breakthrough pain* use intermittent Morphine IV 100 mcg/Kg Q4H PRN				

Table 1. *Pain and sedation management table (extracted from local CHEO guidelines)*

Next Steps

- Chart review of opioid and sedative medication cumulative exposure in the 18 months pre- and 6 months post-guidelines implementation and any changes to key safety metrics (e.g., mortality, length of stay, duration of central or peripheral venous access)
- Identify any barriers to guidelines adherence and use in the unit
- Identify nursing compliance in the use of pain tools in post-op patients
- Measure the use of the safety checklist
- Integration of a best-practice advisory or Epic flag based on cumulative doses, to prompt provider review of medication used