EPIQ Evidence-based Practice for Improving Quality

A Quality Improvement Initiative Reduces Opioid Exposure in Post-Operative and Mechanically Ventilated Neonates

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Background

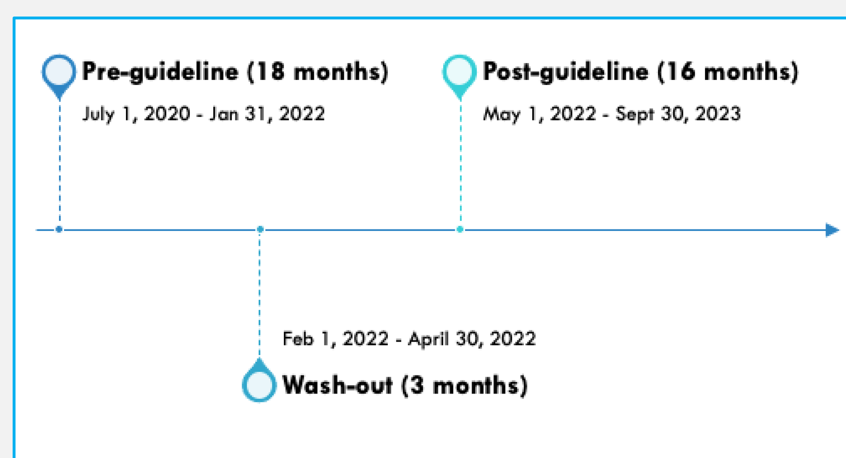
- The Children's Hospital of Eastern Ontario (CHEO) is a 19 bed Level 3B Neonatal Intensive Care Unit (NICU).
- Neonates requiring mechanical ventilation or major surgery are increasingly exposed to opioids during their admission.
- Opioids are associated with dose-dependent short and long-term adverse outcomes.
- Since 2017 joint AAP and CPS recommendations have been published, yet no established national or local guidelines for analgosedation in this patient population.

Aim

This quality improvement initiative aimed to develop and implement pain management guidelines to reduce cumulative opioid exposure by at least 20%.

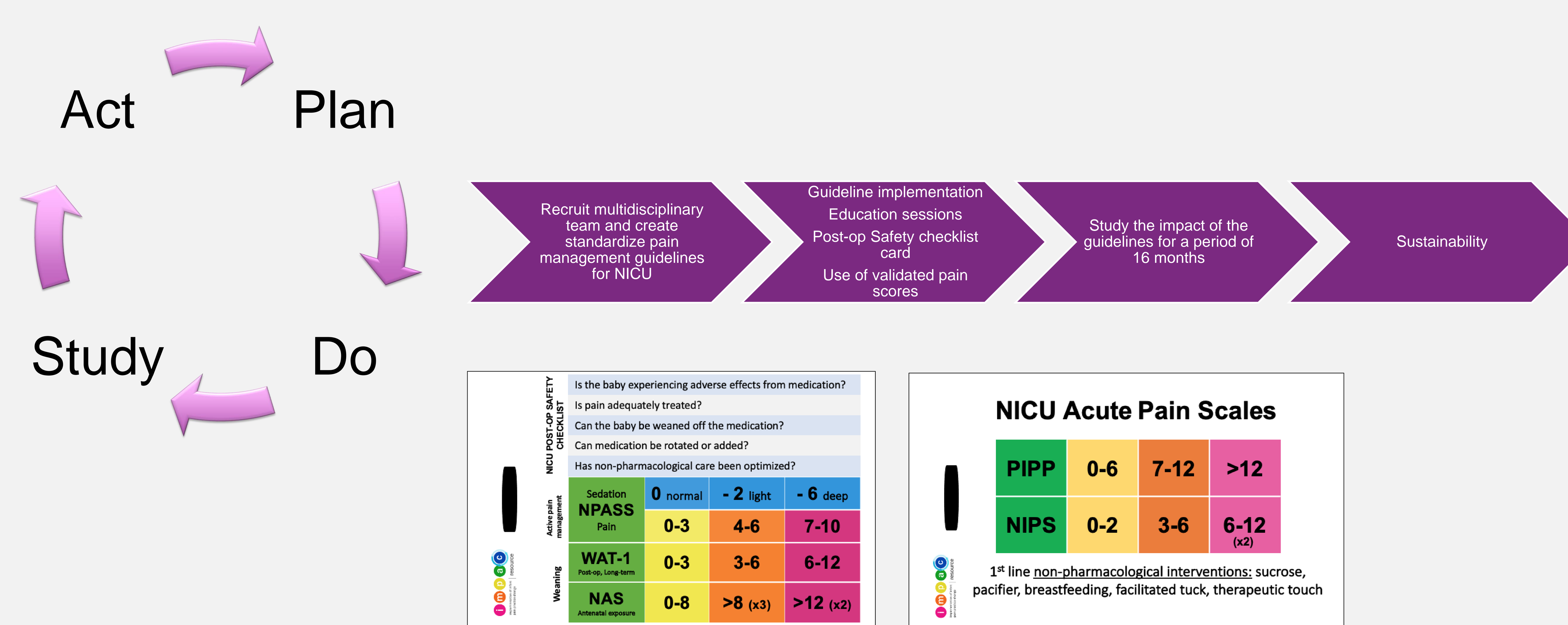
Methods

Evidence-based guidelines were developed and implemented with a multi-disciplinary team including teaching Neonatal Pain, Agitation, and Sedation Score (NPASS) measurement at the bedside and integration of a novel peri-operative safety checklist.



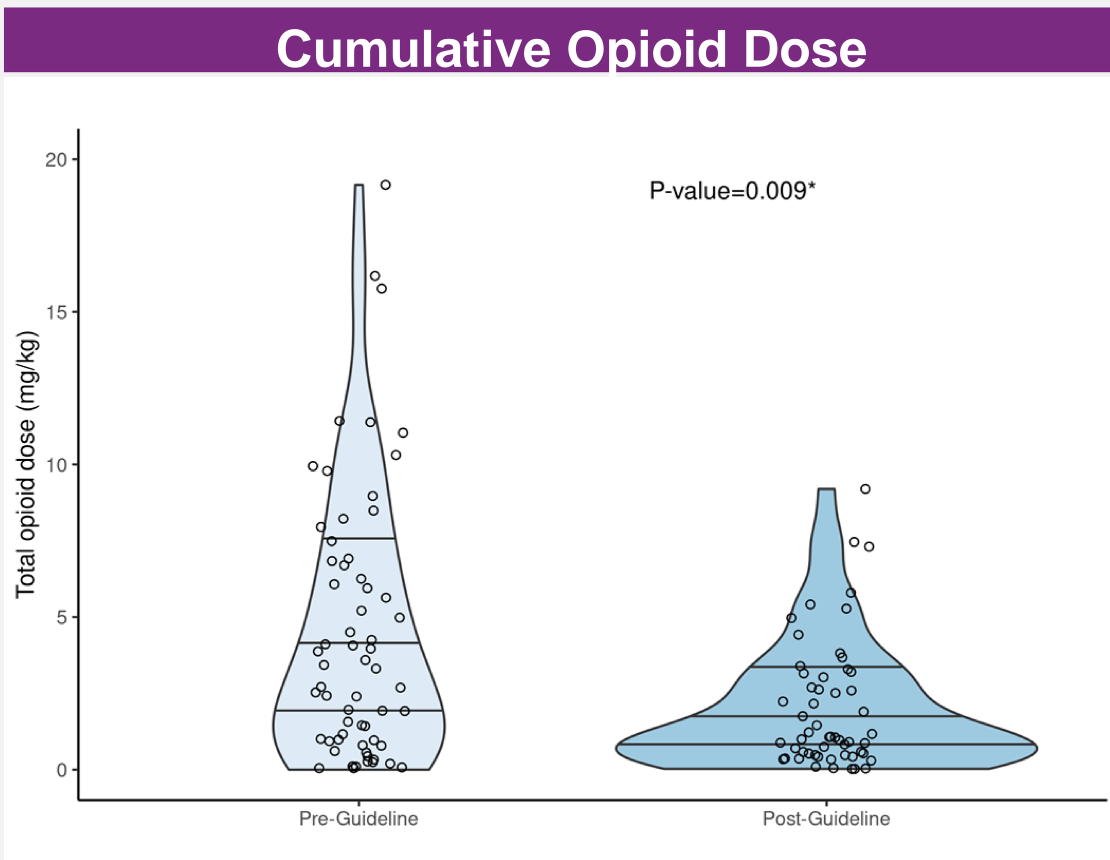
Patients were eligible if they received opioids, were mechanically ventilated for >24 hours or underwent surgical procedures. The primary outcome of this study was the mean cumulative opioid dose (expressed in morphine equivalents) before and after guideline implementation. Demographic data, opioid doses, NPASS scores, and relevant safety metrics were extracted from the electronic health record.

PDSA Cycle



Post-guidelines Implementation Data

Cumulative Opioid Dose



Median total opioid dose reduction of 55%

Absolute decrease of 6.5 mg/kg oral morphine equivalents per patient

33 doses (0.2 mg/kg/dose) saved

OR

5 days Q4h of morphine

PAIN SCORES

	Pre-guidelines (N=84)	Post-guidelines (N=75)	p-value
Pain/ Agitation Score completed			
Yes, N (%)	17 (20%)	46 (61%)	0.001
No, N (%)	67 (80%)	29 (39%)	
Sedation Score completed			
Yes, N (%)	17 (20%)	45 (61%)	0.001
No, N (%)	67 (80%)	30 (40%)	
NPASS Score			
Pain/ Agitation Median (IQR)	2.1 (0.22, 2.7)	1.8 (0.74, 2.8)	0.7
Sedation Median (IQR)	-2.4 (-3.2, -0.54)	-1.5 (-2.8, -0.67)	0.5

3-fold increase in recorded pain scores post-guideline implementation

No increase in inadequately treated pain or sedation

Results

The study included 170 patients (N=84 pre-guideline, N=11 washout, and N=75 post-guideline). Chronological and gestational age, sex, and birth weight were similar between study periods (p=0.6, >0.9, 0.4, and >0.9 respectively). Cumulative median opioid exposure (mg/kg) was reduced by 55% with guideline implementation (13.7±26.7 vs 7.2±15.9, p=0.009). Length of stay in days was similar between groups (22.2±27.8 vs 16.7±19.5, p=0.3). The frequency of having a pain score recorded increased significantly (pre-guideline 21%, post-guideline 65%, p=0.001). Mean NPASS score values were unchanged during the pre and post guidelines study period (for pain 1.73±1.43 vs 1.86±1.40; for sedation -2.25±1.97 vs -1.93±1.89). There was also no statistical significance across study periods in rates of intubation (84% vs 75%, p=0.12), mean duration of IV access days (7.3±14 vs 7.4±13, p=0.4), mean duration of TPN days (9.1±8.0 vs 9.9±8.0, p=0.8), or mortality (18% vs 12%, p=0.6).

Conclusion

A quality improvement approach with evidence-based guidelines reduced cumulative opioid exposure in mechanically ventilated and post-operative patients by 55% without adverse effects on pain and sedation.

Next Steps

- Second PDSA Cycle over a 6 months period
- Continue to ensure integration and knowledge of evidence-based guidelines → refresher/teaching sessions and pain management at bedside
- Measure rates of opioid use and duration compared to documentation of pain scores
- Measure direct adherence to guidelines
- *Overall aims*:
  - Reduce opioids exposure even further
  - Increase documentation of pain scores to >90%