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5-2021

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Multimodal Pain Control in Common Neonatal Surgeries: Post-op Pain Protocol Reduces Opiate Exposure and Side Effects

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Background

- Opioids are the primary post-op analgesic in neonates with side effects including hypotension, apnea and ileus.
- Previous studies have shown that IV acetaminophen decreases opiate exposure however the effect of IV acetaminophen as part of a post-op pain algorithm is unknown.

Objectives

- To determine if (a) a post-op pain algorithm including IV acetaminophen and (b) IV acetaminophen exposure reduces cumulative opiate requirements in neonates undergoing common surgeries in the NICU.

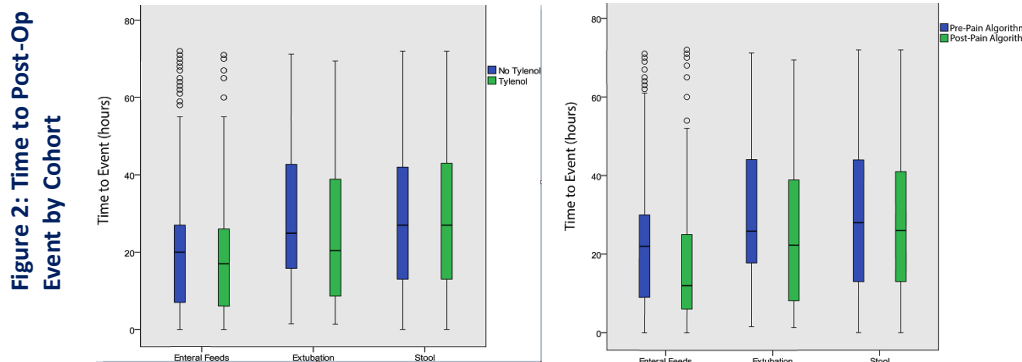
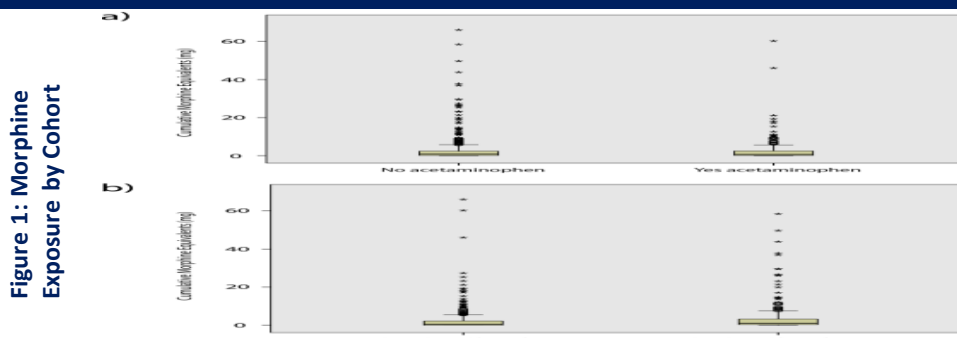
Methods

- Retrospective cohort study comparing post-operative opiate exposure between infants with common surgeries
 - pre-pain algorithm (2013-2015,) post-pain algorithm (2016-2018)
 - infants who receive post-op IV acetaminophen vs did not.
- Wilcoxon Rank Sum tests were used for outcome comparisons amongst groups

Demographics of Comparative Cohorts

Cohorts defined by algorithm implementation				Cohorts Defined by IV acetaminophen administration			
	Pre-algorithm	Post-algorithm	p-value	IV acetaminophen	No IV acetaminophen	p-value	
N	306	384		202	488		
Gestational Age (wks), mean (sd)	34.58 (5.10)	34.28 (5.25)	0.446	34.91 (4.84)	34.21 (5.31)	0.109	
Sex, n (%)			0.588			0.802	
Male	180 (58.82)	218 (56.77)		118 (58.42)	280 (57.38)		
Female	126 (41.18)	166 (43.23)		84 (41.58)	208 (42.62)		
Birthweight, median (IQR)	2410 (1335-3110)	2462.5 (1415-3255)	0.829	2515 (1690-3230)	2380 (1250-3135)	0.124	
Primary Surgery, n (%)			<0.001			0.312	
G-Tube +/- fundo	128 (41.83)	173 (45.05)		86 (42.57)	215 (44.06)		
Colostomy/take down	72 (23.53)	58 (15.10)		38 (18.81)	92 (18.85)		
VPS/VSGS	45 (14.71)	65 (16.93)		33 (16.34)	77 (15.78)		
Inguinal hernia repair	24 (7.84)	24 (6.25)		17 (8.42)	41 (8.40)		
Exploratory Laparotomy	17 (5.56)	41 (10.68)		14 (6.93)	15 (3.07)		
EA repair	12 (3.92)	2 (0.52)		12 (5.94)	36 (7.38)		
TEF repair/ligation	8 (2.61)	21 (5.47)		2 (0.99)	12 (2.46)		
DOL on surgical date, median (IQR)	32 (6-68)	37 (8-72.5)	0.319	34.5 (6-65)	35 (8-72)	0.734	
PMA on surgical date (wks), median (IQR)	40.86 (38.00-44.14)	40.86 (38.43-44.29)	0.561	40.71 (38.71-44.71)	40.86 (38.00-43.86)	0.276	
Weight on surgical date (kg), median (IQR)	3.00 (2.45-3.70)	3.30 (2.60-3.80)	0.089	3.30 (2.70-3.80)	3.10 (2.50-3.70)	0.024	

Results



Results

Outcome Variable	Pre-Algorithm (n = 306)	Post Algorithm (n = 384)	P-value
Total 72 hr Opioid Exposure (mg), median (IQR)	1.09 (0.30 – 3.21)	0.57 (0 – 2.19)	<0.001
Incidence of Post-Operative Hypotension, n (%)	142 (46.56)	101 (26.44)	<0.001
Hours to Extubation (where time <=72), median (IQR)	n = 114 (37%) 25.83 (17.72 – 44.07)	n = 132 (34%) 22.28 (8.12 – 38.89)	0.004
Incidence of Respiratory Depression, n (%)	299 (98.03)	365 (95.55)	0.072
Time to first Stool (where 1 st stool is <=72hrs), median (IQR)	n = 264 (86%) 28 (13 - 44)	n = 325 (85%) 26 (13 - 41)	0.487
Time for first enteral feed (where 1 st feed is <=72 hrs), median (IQR)	n = 221 (72%) 22 (9 - 30)	n = 276 (72%) 12 (6 - 25)	<0.001
NPASS Scores, median (IQR)			
0-24	4 (3 – 5)	4 (3 – 5)	0.100
24-48	3 (1 – 4)	3 (1 – 4)	0.591
48-72	3 (1 – 4)	3 (1 – 4)	0.462

Table X: Post-operative opiate exposure pre versus post implementation of pain control algorithm. Results are presented as median (IQR)

Outcome Variable	IV Acetaminophen (n = 202)	Non-IV Acetaminophen (n = 488)	P-value
Total 72 hours Opioid Exposure (mg), median (IQR)	0.67 (0.15 – 2.50)	0.83 (0.15 – 2.40)	0.678
Incidence of Post-Operative Hypotension, n (%)	56 (27.86)	187 (38.48)	0.008
Hours to Extubation (where time <=72), median (IQR)	n = 67 (33%) 20.40 (8.45 – 39.27)	n = 179 (37%) 24.92 (15.60 – 42.73)	0.051
Incidence of Respiratory Depression, n (%)	192 (95.52)	472 (97.12)	0.290
Time to first Stool (where 1 st stool is <=72hrs), median (IQR)	n = 177 (88%) 27 (13 - 43)	n = 412 (84%) 27 (13 - 42)	0.684
Time for first enteral feed (where 1 st feed is <=72hrs), median (IQR)	n = 149 (74%) 17 (6 – 26)	n = 348 (71%) 20 (7 – 27)	0.118
NPASS Scores, median (IQR)			
0-24	4.5 (3 – 5)	4 (3 – 5)	<0.001
24-48	4 (1 – 5)	3 (1 – 4)	0.228
48-72	3 (1 – 5)	3 (1 – 4)	0.132

Table X: Comparison of post-operative opiate exposure between infants who did and did not receive IV acetaminophen in the 72 hours post-operative period. Results are presented as median (IQR)

Conclusions

- Implementation of a post-op pain algorithm in the NICU significantly reduced cumulative opiate exposure and the incidence of post-operative hypotension.
- Post-op hypotension was reduced with acetaminophen exposure.

Acknowledgements

Warren Teachout, BS; Medical Informatics
Stephanie Prince, BS; Data Analyst