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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.

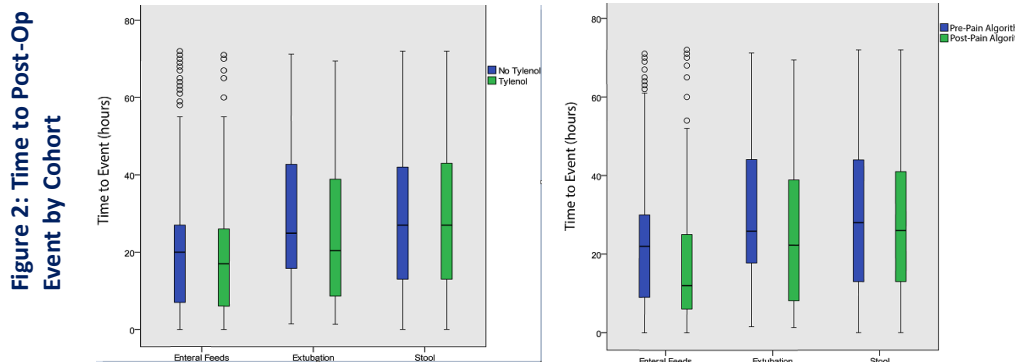
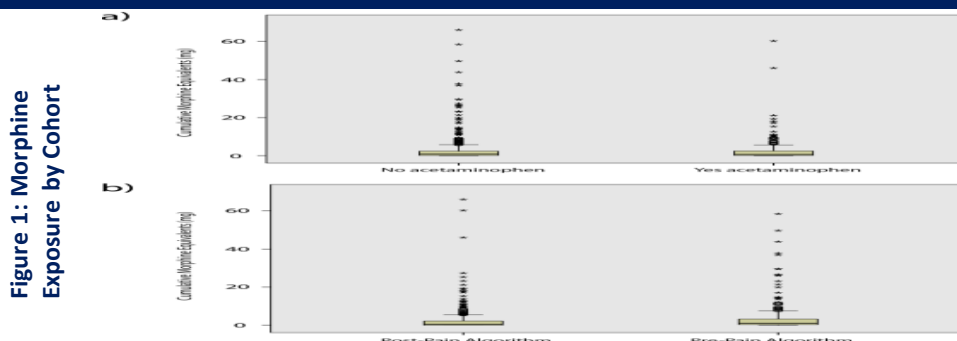
Methods

- 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.

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