**Supplemental material**

* Supplemental statistical description of models used for analysis
* Supplemental Table 1. Maternal characteristics of randomized infants at baseline.
* Supplemental Table 2. Baseline characteristics of randomized infants according to treatment group and preoperative diagnosis.
* Supplemental Table 3. Neurodevelopmental outcomes in survivors.
* Supplemental Table 4. Characteristics of infants with preoperative diagnosis of NEC versus IP.

Statistical description of final models used for analysis.

**Binary outcomes (relative risk models):**

1. Bayesian:  Log-binomial models were fit to binary outcomes using covariates, initial surgery, baseline risk of death or NDI, pre-op diag, initial surgery by pre-op diag interaction, and center as a random effect.  Effect coding was used.  The prior for the intercept was N(mean=0, variance=100), for the initial surgery and interaction terms the prior was N(mean=0, variance=0.31416), for baseline risk and pre-op diag the prior was N(mean=0, variance=1).  The prior for the standard deviation of the center random effect was a half normal(mean=0, variance=10).  To approximate posteriors, three chains were created using 10,000 tuning samples, 10,000 burn ins, followed by 1,000,000 samples thinned by taking every 20th sample to reduce autocorrelation among samples used for estimation.  In total, 150,000 samples were used to approximate posterior distributions of model parameters and effect estimates.  Trace plots of the overlaid chains and Gelman Rubin diagnostics were used to assess stability of the chains used for posterior estimation.  Model fitting was completed in SAS using PROC MCMC.  Posterior median relative risk, 95% credible intervals of relative risk, and posterior probabilities of benefit due to Laparotomy were used as summary statistics.
2. Frequentist: Robust Poisson regression models were fit to binary outcomes using covariates, initial surgery, baseline risk of death or NDI, pre-op diag, initial surgery by pre-op diag interaction, and center as a repeated measure.  An exchangeable working correlation matrix and effect coding was used.  Model fitting was completed in SAS using PROC GENMOD.  Estimates of relative risk and 95% confidence intervals of relative risk were used as summary statistics.

**Binary outcomes (risk difference models):**

1. Bayesian:  logistic regression models were fit to binary outcomes using covariates, initial surgery, baseline risk of death or NDI, pre-op diag, initial surgery by pre-op diag interaction, and center as a random effect.  Effect coding and post-processing were used to estimate Posterior statistics regarding risk differences.  The prior for the intercept was N(mean=0, variance=400), for the initial surgery, baseline risk, pre-op diag. and interaction terms the prior was N(mean=0, variance=9).  The prior for the standard deviation of the center random effect was a half normal(mean=0, variance=10).  To approximate posteriors, three chains were created using 10,000 tuning samples, 10,000 burn ins, followed by 1,000,000 samples thinned by taking every 20thsample to reduce autocorrelation among samples used for estimation.  In total, 150,000 samples were used to approximate posterior distributions of model parameters.  Trace plots of the overlaid chains and Gelman Rubin diagnostics were used to assess stability of chains used for posterior approximation.  Model fitting was completed in SAS using PROC MCMC.  Post processing to get posterior approximations of risk differences involved separate analyses for the infants with pre-op diag equal to NEC and the infants with pre-op diag equal to IP.  For each infant within a pre-op diag group, the model parameter chains were used to estimate the within subject posterior of risk difference which is equal to lap minus drain.  A within subject estimate of risk difference was calculated by manipulating the initial surgery variable value, estimating the probability of outcome under each initial surgery value, then subtracting the two probabilities of outcome, lap minus drain.  Since the parameter chains contained 150,000 samples, each infant contributed 150,000 samples for the approximation of the within subject risk difference posterior.  Using all samples of risk differences from all infants within a group to approximate the posterior of risk difference, the mean estimate of risk difference, 95% credible intervals of mean risk difference, and posterior probabilities of benefit due to Laparotomy were used as summary statistics.
2. Frequentist: Logistic regression with identity link were fit to binary outcomes using covariates, initial surgery, baseline risk of death or NDI, pre-op diag, initial surgery by pre-op diag interaction, and center as a repeated measure.  An exchangeable working correlation matrix and effect coding was used.  Model fitting was completed in SAS using PROC GENMOD.  Estimates of risk difference and 95% confidence intervals of mean risk difference were used as summary statistics.

**Continuous outcomes (mean difference models).**

1. Frequentist: Mixed regression models were fit to continuous outcomes using covariates, initial surgery, baseline risk of death or NDI, pre-op diag, initial surgery by pre-op diag interaction, and center as a random effect.  An unstructured correlation matrix and effect coding were used.  Model fitting was completed in SAS using PROC MIXED.  Estimates of mean differences and 95% confidence intervals of mean differences were used as summary statistics.

|  |  |  |
| --- | --- | --- |
| **Characteristic** | **Initial Laparotomy Group** **(n=146)** | **Initial Drainage Group** **(n = 162)** |
|  |  |  |
| Age, mean (SD), y | 27.7 (6.7) | 27.3 (6.3) |
|  |  |  |
| Married, No. (%) | 64 (44.1) | 61 (39.1) |
|  |  |  |
| Race, No. (%) |  |  |
|  |  |  |
|  Black | 62 (44.0) | 67 (42.7) |
|  |  |  |
|  White | 73 (51.8) | 82 (52.2) |
|  |  |  |
|  Other | 6 (4.3) | 8 (5.1) |
|  |  |  |
| Hispanic ethnicity, No. (%) | 38 (26.2) | 33 (21.6) |
|  |  |  |
| Educational level, No. (%) |  |  |
|  |  |  |
|  < High school | 63 (60.6) | 66 (59.5) |
|  |  |  |
|  Any college or beyond | 41 (39.4) | 45 (40.5) |
|  |  |  |
| Private insurance, No. (%) | 48 (32.9) | 46 (28.9) |
|  |  |  |
| Received prenatal care, No. (%) | 142 (97.9) | 149 (93.7) |
|  |  |  |
| Received prenatal antibiotics, No. (%) | 79 (67.0) | 83 (66.4) |
|  |  |  |
| Rupture of membranes, No. (%) | 23 (18.6) | 25 (18.8) |
|  |  |  |
| Hypertension, No. (%) | 35 (29.2) | 33 (25.2) |
|  |  |  |
| Received magnesium, No. (%) | 77 (81.9) | 73 (77.7) |
|  |  |  |
| Received antenatal steroids, No. (%) | 124 (84.9) | 130 (80.8) |

**Supplemental Table 1. Baseline maternal characteristics of randomized infants.**

**Supplemental Table 2. Baseline characteristics of the patients by preoperative diagnosis**

|  | **NEC** | **IP** |
| --- | --- | --- |
| **Variable** | **Initial Laparotomy (n=42)** | **Initial Drainage (n=53)** | **Initial Laparotomy (n=104)** | **Initial Drainage (n=109)** |
| **Infant** |  |  |  |  |
| Gestational Age, mean (SD), wk | 25.07 (1.85) | 25.21 (2.04) | 25.04 (1.68) | 24.72 (1.53) |
| Birth weight, mean (SD), g | 725.57 (134.99) | 730.53 (157.20) | 719.45 (140.36) | 702.11 (123.91) |
| Small for gestational age, No. (%) | 5 (11.90) | 8 (15.09) | 10 (9.62) | 8 (7.41) |
| Age at enrollment, mean (SD), d | 21.12 (12.33) | 20.74 (11.55) | 7.69 (5.24) | 7.91 (5.15) |
| Age at initial surgery, mean (SD), d | 21.12 (12.50) | 20.77 (11.54) | 7.73 (5.24) | 7.94 (5.18) |
| Male, No. (%) | 22 (52.38) | 32 (60.38) | 58 (55.77) | 66 (61.11) |
| Inborn status, No. (%) | 20 (47.62) | 26 (49.06) | 62 (59.62) | 64 (58.72) |
| Apgar score at 1 minute, median (min,max) | 3.0 (1.0,9.0) | 4.0 (0.0,8.0) | 3.0 (0.0,8.0) | 3.0 (0.0,9.0) |
| Apgar score at 5 minute, median (min,max) | 7.0 (2.0,9.0) | 7.0 (1.0,10.0) | 6.0 (0.0,9.0) | 6.0 (1.0,9.0) |
| PDA prior to enrollment, No. (%) | 16 (39.02) | 24 (48.00) | 43 (45.26) | 38 (39.18) |
| Infant received postnatal steroids, No. (%) [Before or on Rand.] | 12 (28.57) | 22 (41.51) | 15 (14.42) | 25 (22.94) |
| Infant received postnatal steroids, No. (%) [Before Rand.] | 11 (26.19) | 19 (35.85) | 10 (9.62) | 23 (21.10) |
| Infant received indomethacin, yes, No. (%) [Before or on Rand.] | 16 (41.03) | 24 (48.98) | 58 (55.77) | 58 (54.21) |
| Received enteral feedings before enrollment, No. (%) | 28 (87.50) | 37 (97.37) | 62 (76.54) | 58 (67.44) |
| Severe IVH (grade 3 or 4), No. (%) [Before or on Rand.] | 6 (15.38) | 9 (17.65) | 11 (10.89) | 14 (13.21) |
| Early Onset Sepsis, No. (%) [Before or on Rand.] | 1 (2.38) | 4 (7.69) | 0 (0) | 2 (1.90) |
| Late Onset Sepsis, No. (%) [Before or on Rand.] | 12 (28.57) | 22 (41.51) | 25 (24.04) | 25 (23.36) |
| **At Enrollment** |  |  |  |  |
| On vasopressors at rand., No. (%) | 17 (40.48) | 26 (49.06) | 24 (23.08) | 33 (30.28) |
| Receiving HFOV or HFJV at rand., No. (%) | 16 (38.10) | 20 (37.74) | 16 (15.38) | 28 (25.69) |
| Ph closest to enrollment, mean (SD) | 7.21 (0.15) | 7.21 (0.14) | 7.27 (0.10) | 7.24 (0.12) |
| FiO2 closest to enrollment, mean (SD) | 59.90 (29.40) | 55.96 (26.81) | 38.68 (22.37) | 41.00 (21.13) |
| Mean Blood Pressure mmHG, mean (SD) | 38.83 (9.83) | 36.00 (10.43) | 36.36 (10.41) | 37.44 (12.02) |
| Lowest platelet count, mean (SD) | 151.53 (109.40) | 131.27 (85.98) | 157.24 (90.94) | 159.72 (77.00) |
| **Maternal** |  |  |  |  |
| Age, mean (SD), y | 27.24 (6.86) | 25.63 (5.85) | 27.81 (6.64) | 28.10 (6.40) |
| Married, No. (%) | 19 (46.34) | 16 (30.19) | 45 (43.27) | 45 (43.69) |
| Race, No. (%) |  |  |  |  |
|  Black | 21 (51.22) | 24 (45.28) | 41 (41.00) | 43 (41.35) |
|  Other | 3 (7.32) | 4 (7.55) | 3 (3.00) | 4 (3.85) |
|  White | 17 (41.46) | 25 (47.17) | 56 (56.00) | 57 (54.81) |
| Hispanic Ethnicity, No. (%) | 10 (23.81) | 10 (20.00) | 28 (27.18) | 23 (22.33) |
| Maternal Education, No. (%) |  |  |  |  |
|  College graduate | 6 (24.00) | 3 (7.89) | 12 (15.19) | 18 (24.66) |
|  High school graduate | 11 (44.00) | 17 (44.74) | 31 (39.24) | 21 (28.77) |
|  Less than high school | 5 (20.00) | 10 (26.32) | 16 (20.25) | 18 (24.66) |
|  Some college | 3 (12.00) | 8 (21.05) | 20 (25.32) | 16 (21.92) |
| Private insurance, No. (%) | 15 (35.71) | 12 (22.64) | 33 (31.73) | 34 (32.08) |
| Received prenatal care, No. (%) | 40 (95.24) | 48 (92.31) | 102 (99.03) | 101 (94.39) |
| Mother received antibiotics, No. (%) | 20 (58.82) | 23 (60.53) | 59 (70.24) | 60 (68.97) |
| Rupture of membranes > 18 hours, No. (%) | 4 (11.11) | 9 (20.93) | 19 (21.59) | 16 (17.78) |
| Maternal hypertension, No. (%) | 12 (34.29) | 11 (25.00) | 23 (27.06) | 22 (25.29) |
| Received antenatal magnesium, No. (%) | 23 (88.46) | 20 (83.33) | 54 (79.41) | 53 (75.71) |
| Received steroids, No. (%) | 35 (83.33) | 43 (81.13) | 89 (85.58) | 87 (80.56) |
| **Baseline predicted risk of death or NDI** |  |  |  |  |
| Baseline risk, mean (SD) | 0.84 (0.19) | 0.82 (0.20) | 0.53 (0.25) | 0.61 (0.23) |
| Baseline risk, median (p25, p75) | 0.91 (0.84, 0.95) | 0.87 (0.78, 0.97) | 0.55 (0.34,0.73) | 0.65 (0.46,076) |

**Supplemental Table 3. Neurodevelopmental outcome in surviving infants by preoperative diagnosis**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Outcome** | **Initial Laparotomy** **(N = 105)****n/N (%)** | **Initial****Drainage****(N = 114)****n/N (%)** | **Frequentist****Relative Risk** **(95% CI)** | **Bayesian****Relative Risk****(95% CrI)** | **Bayesian Posterior Prob. (%) of RR < 1****With Laparotomy** |
| **NDI** |  |  |  |  |  |
|  NEC | 12/25 (48.0%) | 17/25 (68.0%) | 0.77 (0.46, 1.29) | 0.77 (0.49, 1.17) | 89 |
|  IP | 44/75 (58.7%) | 43/81 (53.1%) | 1.13 (0.86, 1.47) | 1.08 (0.82, 1.42) | 28 |
|  |  |  |  |  |  |
| **Moderate to severe cerebral palsy** |  |  |  |
|  NEC | 5/25 (20.0%) | 11/25 (44.0%) | 0.47 (0.16, 1.37) | 0.60 (0.30, 1.14) | 94 |
|  IP | 12/76 (15.8%) | 20/84 (23.8%) | 0.71 (0.49, 1.03) | 0.71(0.41, 1.22) | 89 |
|  |  |  |  |  |  |
| **Bayley cognitive composite score < 85** |  |  |  |
|  NEC | 11/25 (44.0%) | 14/23 (60.9%) | 0.73 (0.38, 1.43) | 0.79 (0.48, 1.29) | 83 |
|  IP | 43/75 (57.3%) | 38/80 (47.5%) | 1.21 (0.91, 1.60) | 1.17 (0.88, 1.57) | 14 |
|  |  |  |  |  |  |
| **Blindness** |  |  |  |  |
|  NEC | 0/25 | 3/25 (12.0%) | NA | NA | NA |
|  IP | 0/76 | 1/84 (1.2%) | NA | NA | NA |
|  |  |  |  |  |  |
| **Hearing loss** |  |  |  |  |
|  NEC | 0/25 | 1/25 (4.0%) | NA | NA | NA |
|  IP | 2/75 (2.7%) | 2/83 (2.4%) | NA | NA | NA |

**Supplemental Table 4. Patient characteristics by preoperative diagnosis**

| **Variable** | **Preop NEC (n=95)** | **Preop IP (n=213)** | **P Value** |
| --- | --- | --- | --- |
| Age at initial surgery, mean (SD), d | 20.93 (11.90) | 7.84 (5.19) | <0.001 |
| Pneumatosis, No. (%) | 34 (35.79) | 11 (5.16) | <0.001 |
| Pneumoperitoneum, No. (%) | 48 (50.53) | 198 (92.96) | <0.001 |
| Portal vein air, No. (%) | 18 (18.95) | 5 (2.35) | <0.001 |
| Gasless abdomen, No. (%) | 9 (9.47) | 8 (3.76) | 0.04 |
| Vasopressors at time of randomization, No. (%) | 43 (45.26) | 57 (26.76) | 0.001 |
| **Ventilatory support** |  |  |  |
| Conventional vent, No. (%) | 56 (58.95) | 151 (70.89) | 0.04 |
| High frequency ventilation, No. (%) | 36 (37.89) | 44 (20.66) | 0.001 |
| FiO2, mean (SD) | 57.71 (27.90) | 39.87 (21.73) | <0.001 |
| pH, mean (SD) | 7.21 (0.15) | 7.25 (0.11) | 0.007 |
| Birth weight, mean (SD), g | 728.34 (147.05) | 710.58 (132.17) | 0.29 |
| Gestational Age, mean (SD), wk | 25.15 (1.95) | 24.88 (1.61) | 0.21 |
| Weigh at initial surgery, mean (SD), g | 900.37 (314.64) | 706.56 (157.83) | <0.001 |
| Bluish discoloration, No. (%) | 40 (42.11) | 80 (37.56) | 0.45 |
| **Measures Prior to Randomization**  |  |  |  |
| Received indomethacin prior to randomization, No. (%) | 40 (45.45) | 116 (54.98) | 0.13 |
| Received postnatal steroids prior to randomization, No. (%) | 34 (35.79) | 40 (18.78) | 0.001 |
| Received enteral feedings prior to randomization, No. (%) | 65 (92.86) | 120 (71.86) | <0.001 |