

Occurrence of severe cardiorespiratory events in extremely preterm infants: a longitudinal study

Jill Ranger, Ana Clouatre, Stephanie Craciunas, Wissam Shalish

Neonatal Intensive Care Unit, McGill University Health Center, Montreal Children's Hospital, MTL, QC



Background

In extremely preterm infants (gestational age [GA] ≤ 28 weeks), episodes of apneas, bradycardias, and desaturations (known as “cardiorespiratory events” [CREs]) are common, frequently require intervention, and are associated with increased morbidities. As contemporary practices have shifted towards earlier use of non-invasive respiratory support in increasingly more immature infants, the patterns of CRE occurrence in this population are unknown.

Objective

To longitudinally describe the occurrence of severe CREs as a function of time and respiratory support in extremely preterm infants (≤ 28 weeks of gestation) during the acute phase of NICU hospitalization.

Methods

Study Design: single center, retrospective chart review

Definitions:

Severe CRE – events requiring intervention (tactile stimulation, oxygen supplementation, or BMV)

Respiratory Support – none, non-invasive (CPAP, bCPAP, NIPPV, HFNC), or invasive (intubation)

Population: extremely preterm infants (GA ≤ 28 weeks) admitted to the Montreal Children's Hospital NICU (N=233).

Study Period: Jan 2016 to Dec 2020

Exposures:

- 1) Daily # severe CREs
- 2) Type of respiratory support

Time Frame: birth to 34 weeks postmenstrual age

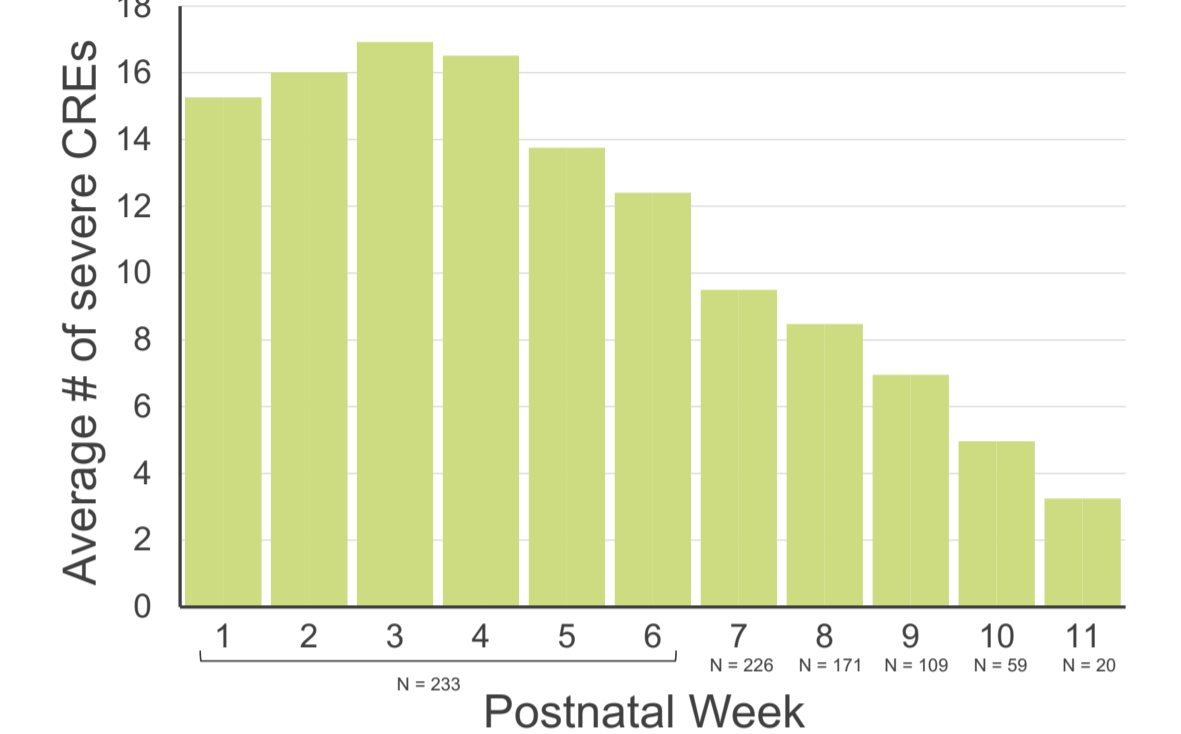
Analysis: Descriptive statistics were used to evaluate the weekly number of severe CREs for all infants, per GA, and per type of respiratory support. Two-way ANOVA was used to assess the effects of postnatal week and respiratory support on the frequency of severe CREs.

Table 1 | Demographics & popn characteristics

Demographics		
GA, weeks	26	[24.86 - 27]
BW, grams	810	[680 - 962]
Male, %	108	(46.4)
Inborn, %	200	(85.8)
Maternal Factors		
GBS positive, %	31	(13.3)
Hypertension, %	29	(12.4)
Diabetes, %	28	(12.0)
Infection*, %	56	(24.0)
Delivery Factors		
Cesarean, %	152	(65.2)
Singleton, %	179	(76.8)
ROM > 18hrs, %	88	(37.8)
ANS‡, %	216	(92.7)
Cord pH	7.30	[7.25 - 7.34]
BE	-3.5	[-5.3 - -2.0]
Resuscitation		
PPV, %	204	(87.6)
Max FiO2	0.70	[0.40 - 1.00]
Intubation 1 st hr, %	85	(36.5)
APGAR 5 min	6	[5 - 7]
Placental Factors		
Chorio, %	106	(45.5)
Malperfusion, %	86	(36.9)
Postnatal Factors		
Surfactant, %	123	(52.8)
Inotrope, %	24	(10.3)
Caffeine, %	233	(100)
Infection‡, %	97	(41.6)
IVH, %	79	(33.9)

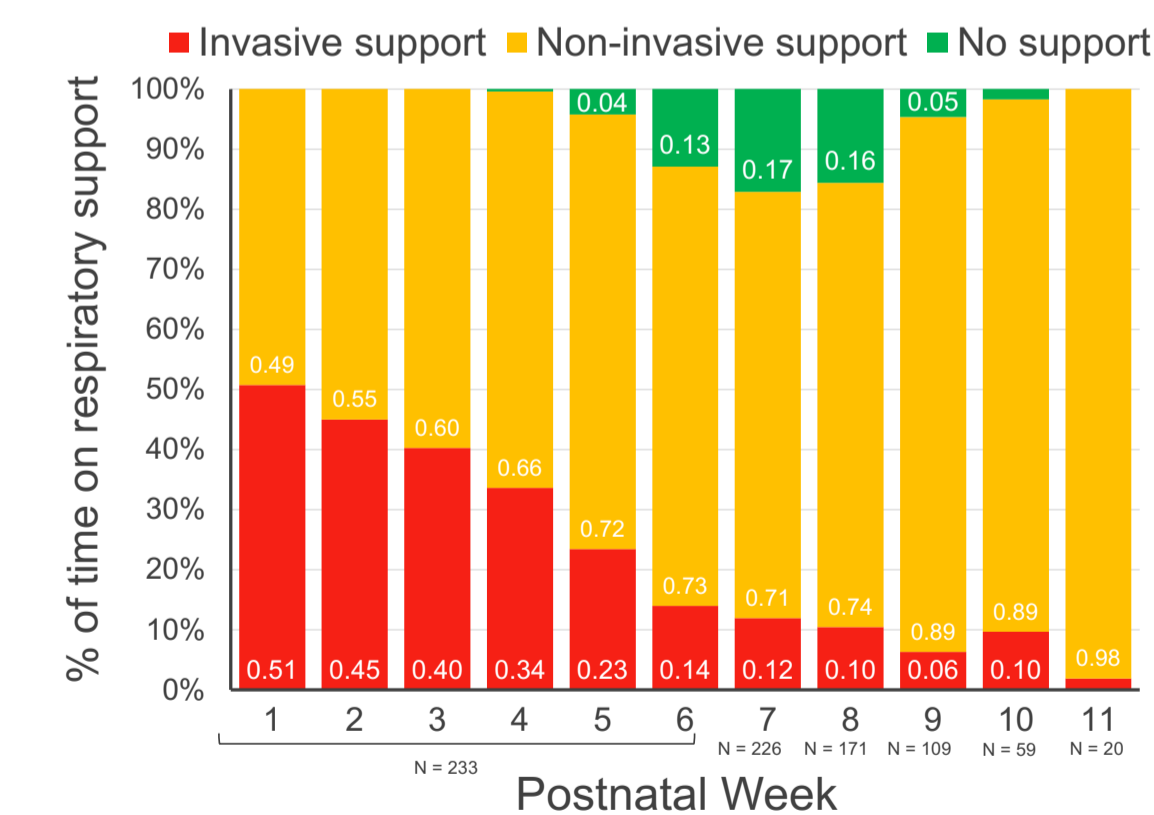
Values are expressed as median [IQR] or N (%)
 Abbreviations: GA – gestational age, BW – birth weight, ANS – antenatal steroids, BE – base excess, FiO2 – fraction of inspired oxygen, Chorio – histological chorioamnionitis, IVH – intraventricular hemorrhage
 * Culture-documented maternal infection ≤ 1 wk prior to delivery
 ‡ Administration of antenatal steroids
 † Culture-documented infant infection after birth

Figure 1 | Mean number of severe cardiorespiratory events per week



Overall, the average number of severe CREs was 15 ± 16 events/week in the first week of life, peaked at 3 weeks (17 ± 14 events/week), and then decreased with increasing postnatal age.

Figure 3 | Respiratory support frequency



The proportion of infants primarily on non-invasive respiratory support was 49% in the first week of life and increased to 66% and 74% by postnatal weeks 4 and 8, respectively.

Figure 2 | Heatmap depicting the mean number of cardiorespiratory events per week based on gestational age and postnatal week

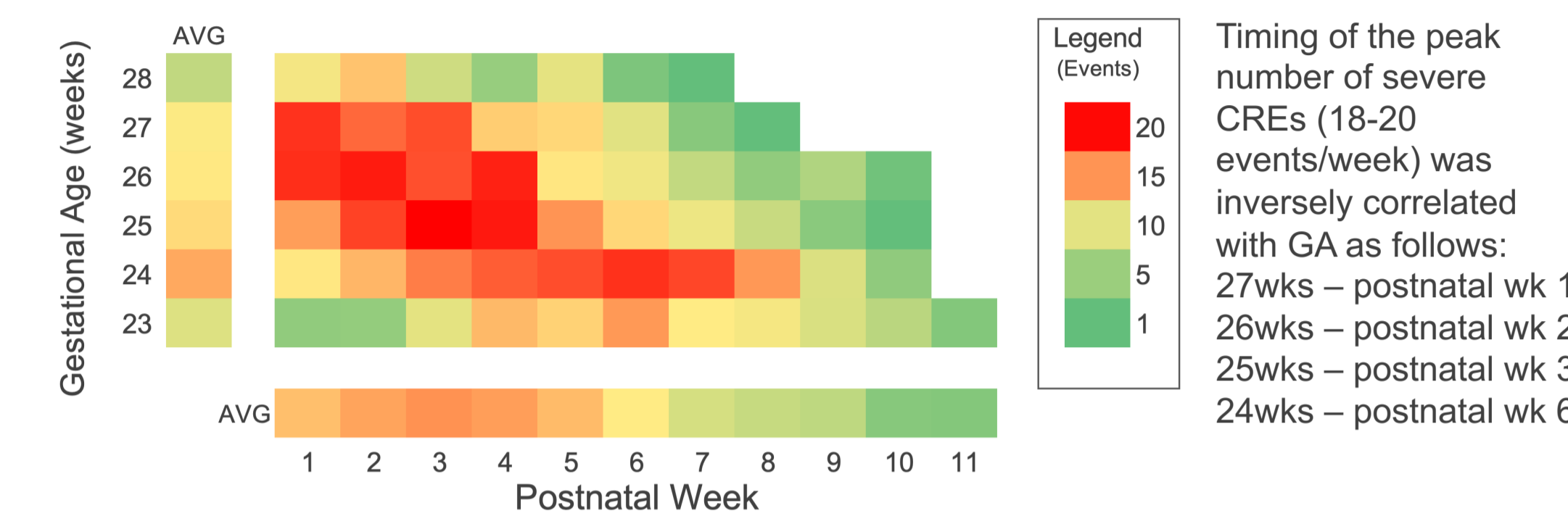
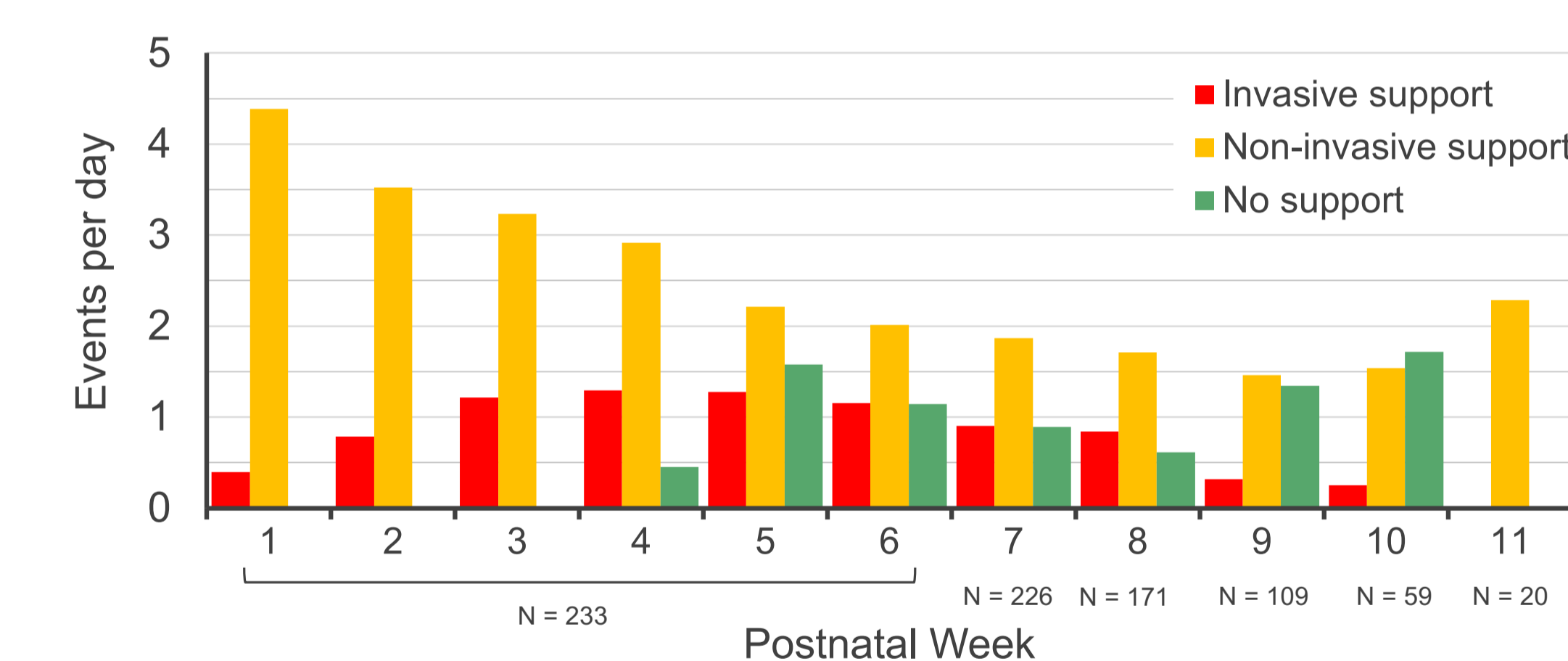


Figure 4 | Severe cardiorespiratory events per day based on respiratory support



Across all postnatal weeks, severe CREs occurred significantly more frequently on non-invasive compared to invasive respiratory support [F(1)=209.7, p<0.001], with a significant interaction between postnatal week and respiratory support [F(7)=6.5, p<0.001].

Conclusions

In a contemporary cohort of extremely preterm infants:

- severe CREs **decreased with increasing postnatal age**
- the **burden** of severe CREs was **highest** in infants on **non-invasive respiratory support**

Future studies should focus on strategies to reduce the burden of CREs, especially during the early postnatal period while on non-invasive respiratory support.

