

## CORRECTION



# Correction: Neonatal respiratory support related to lung function abnormalities in school-age children with bronchopulmonary dysplasia

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Since the publication of this article, the authors have noticed two input errors in data of one study participant related to the primary outcome, which is the classification of lung function (LF) abnormality and severity of bronchopulmonary dysplasia (BPD). After reanalysis using the corrected dataset, the authors have confirmed that the conclusion is consistent with the original paper. However, some partial changes need to be done in other results. Specifically, the correlation between LF abnormality and antenatal steroid (ANS) use has become not statistically significant. The correlation between LF abnormality and requirement for positive-pressure support at 36 weeks' postmenstrual age (PMA) has become marginally trending toward significance. Therefore, the authors have made the following corrections to main text, Table 1, Table 2, Table 3, Supplementary Table 1, Supplementary Table 2, Supplementary Table 3, Figure 2, and Supplementary Figure 1. The original article has been corrected. The authors apologize for any inconvenience caused.

In the "Abstract" section, the paragraph of the results should have read "Overall, 25 (32%) patients had LF abnormalities. Severe BPD was associated with an increased risk of abnormal LF [aOR, 3.93; 95% CI, 1.22–14.56]. Requiring positive-pressure support at 37 weeks' PMA correlated with abnormal LF [aOR, 4.86; 95% CI, 1.21–23.58]; whereas only low-flow oxygen at any PMA did not."

In the "Results" section, the sentence "Of the 78 study participants, 24 (31%) had some type of LF abnormality, and 22 (92%) had an obstructive abnormality with the % predicted of FVC  $\geq$  80 and % of FEV<sub>1,0</sub>/FVC < 80." should instead have read "Of the 78 study participants, 25 (32%) had some type of LF abnormality, and 23 (92%) had an obstructive abnormality with the % predicted of FVC  $\geq$  80 and % of FEV<sub>1,0</sub>/FVC < 80."

In the "Results" section, the sentence "There were no significant differences between the groups, except for the rates of ANS use and tracheostomy." should instead have read "There were no significant differences between the groups, except for the rates of patent ductus arteriosus and tracheostomy."

In the "Results" section, the sentence "The multivariate logistic analysis revealed that ANS use and severe BPD, as defined by the 2001 NICHD/NHLBI definition, significantly correlated with abnormal LF independent of gestational age, SGA, and sex (Table 2, model 1)." should instead have read "The multivariate logistic analysis revealed that severe BPD, as defined by the 2001 NICHD/NHLBI definition, significantly correlated with abnormal LF independent of gestational age, SGA, and sex (Table 2, model 1)."

In the "Results" section, the sentence "Additionally, ANS use did not significantly correlate with abnormal LF (Table 2, model 2)." should have been deleted.

In the "Results" section, the paragraph "The area under the curve was 0.61 calculated by receiver operating characteristic curve of requiring MV or CPAP with any FiO<sub>2</sub> at each week's PMA for abnormal LF at school age (Supplementary Fig. 1). The sensitivity, specificity, positive predictive value, and negative predictive value of requiring MV or CPAP with any FiO<sub>2</sub> at 37 weeks' PMA for abnormal LF at school age were 0.54, 0.67, 0.42, and 0.77, respectively. Requiring MV or CPAP with any FiO<sub>2</sub> at 36 and 37 weeks' PMA were indicated as best to predict abnormal LF at school age according to the Youden index." should instead have read "The area under the curve was 0.60 calculated by receiver operating characteristic curve of requiring MV or CPAP with any FiO<sub>2</sub> at each week's PMA for abnormal LF at school age (Supplementary Fig. 1). The sensitivity, specificity, positive predictive value, and negative predictive value of requiring MV or CPAP with any FiO<sub>2</sub> at 37 weeks' PMA for abnormal LF at school age were 0.52, 0.66, 0.42, and 0.74, respectively. Requiring MV or CPAP with any FiO<sub>2</sub> at 37 weeks' PMA was indicated as best to predict abnormal LF at school age according to the Youden index."

In the "Results" section, the sentence "Adjusting for a history of asthma as an additional factor, requiring MV or CPAP with any FiO<sub>2</sub> at both 36 and 37 weeks' PMA significantly correlated with abnormal LF." should instead have read "Adjusting for a history of asthma as an additional factor, the correlation between requiring MV or CPAP with any FiO<sub>2</sub> at 37 weeks' PMA and abnormal LF remained consistent."

In the “Discussion” section, the sentence “In the present study, the LF in 8–9-year-old VLBW children with BPD was examined with 31% of the participants having LF abnormalities, most of them with a low FEV<sub>1.0</sub>/FVC ratio indicating an obstructive abnormality of the lung.” should instead have read “In the present study, the LF in 8–9-year-old VLBW children with BPD was examined with 32% of the participants having LF abnormalities, most of them with a low FEV<sub>1.0</sub>/FVC ratio indicating an obstructive abnormality of the lung.”

In the “Discussion” section, the sentence “When the evaluation was adjusted for a history of asthma, the requirement for MV or CPAP at 36 and 37 weeks’ PMA significantly increased the aORs for abnormal LF at school age (Table 3).” should instead have read “When the evaluation was adjusted for a history of asthma, the requirement for MV or CPAP at 36 weeks’ PMA also increased the

aOR for abnormal LF at school age with marginal trend toward significance (Table 3).”

In the “Discussion” section, the sentence “Children with abnormal LF were less likely to have received ANS after adjusting for demographic characteristics (Table 2, model 1).” should instead have read “The effect of ANS use on LF at school age was not significant in the results of this study (Table 2).”

In the “Discussion” section, the sentence “The effect of ANS use on LF became not significant when a history of asthma was included in the adjustments to the results of this study.” should have been deleted.

Table 1 should have appeared as follows:

**Table 1.** Comparison of perinatal, neonatal, and current characteristics between the abnormal and normal LF groups at school age.

	Abnormal LF group (N = 25)	Normal LF group (N = 53)	p value <sup>a</sup>
<b>Perinatal characteristics</b>			
ANS use, n (%)	7 (28.0)	26 (49.1)	0.08
Histological chorioamnionitis, n/N <sup>b</sup> (%)	7/24 (29.2)	14/49 (28.6)	0.96
Pregnancy induced hypertension, n (%)	8 (32.0)	16 (31.4)	0.96
Maternal smoking, n/N <sup>c</sup> (%)	3/21 (14.3)	4/41 (9.8)	0.59
Maternal asthma, n (%)	1 (4.0)	3 (5.7)	0.76
<b>Neonatal characteristics</b>			
Gestational age, median (weeks); (IQR)	26.9 (25.5–27.8)	26.9 (25.6–28.4)	0.97
Birth weight, median (g); (IQR)	850 (724–1015)	796 (673–937)	0.34
SGA, n (%)	4 (16.0)	14 (26.4)	0.31
Sex, male/female, n (%)	13 (52.0)/12 (48.0)	19 (35.9)/34(64.2)	0.18
Patent ductus arteriosus, n (%)	12 (48.0)	13 (24.5)	0.04
Sepsis, n (%)	2 (8.0)	1 (1.9)	0.19
Postnatal steroid use, n (%)	5 (20.0)	10 (18.9)	0.91
Late-onset circulatory collapse, n (%)	2 (8.0)	5 (9.4)	0.84
Postnatal steroid use for respiratory conditions, n (%)	4 (16.0)	5 (9.4)	0.40
Intraventricular hemorrhage, n (%)	1 (4.0)	0 (0)	0.14
Periventricular leukomalacia, n (%)	1 (4.0)	2 (3.8)	0.96
Retinopathy of prematurity, n (%)	5 (20.0)	12 (22.6)	0.79
<b>Respiratory complications</b>			
Respiratory distress syndrome, n (%)	19 (76.0)	37 (69.8)	0.57
<b>BPD</b>			
Mild, n (%)	4 (16.0)	12 (22.6)	
Moderate, n (%)	3 (12.0)	12 (22.6)	
Severe, n (%)	18 (72.0)	29 (54.7)	0.15 <sup>d</sup>
Bubbly/cystic appearance, n (%)	8 (32.0)	24 (45.3)	0.27
MV discontinued, median (weeks’ PMA); (IQR), n <sup>e</sup>	36.9 (34.1–39.4), 23	35.4 (32.7–37.7), 53	0.19
Positive-pressure support discontinued, median (weeks’ PMA); (IQR), n <sup>e</sup>	37.1 (35.1–39.4), 23	36.1 (34.4–38.6), 53	0.23
Oxygen inhalation discontinued, median (weeks’ PMA); (IQR), n <sup>f</sup>	40.7 (36.6–41.3), 23	37.9 (35.9–42.3), 45	0.57
Home oxygen therapy, n (%)	2 (8.0)	8 (15.1)	0.38
Tracheostomy, n (%)	2 (8.0)	0	0.04
<b>Characteristics at 8–9 years of age</b>			
History of asthma, n (%)	11 (44.0)	8 (15.1)	0.006
Current asthma, n (%)	6 (24.0)	6 (11.3)	0.15
Weight (SD score), mean (SD)	−0.48 (1.24)	−0.75 (0.82)	0.31 <sup>g</sup>
Height (SD score), mean (SD)	−0.67 (1.54)	−0.90 (0.85)	0.50 <sup>g</sup>

	Abnormal LF group (N = 25)	Normal LF group (N = 53)	p value <sup>a</sup>
IQ			0.41
≥100, n (%)	10 (40.0)	14 (26.4)	
85 to <100, n (%)	10 (40.0)	29 (54.7)	
70 to <85, n (%)	5 (20.0)	10 (18.9)	

ANS antenatal steroid, BPD bronchopulmonary dysplasia, IQ intelligence quotient, IQR interquartile range, LF lung function, PMA postmenstrual age, SD standard deviation, SGA small for gestational age.

<sup>a</sup>Analyzed using the Wilcoxon rank-sum or  $\chi^2$  test, unless otherwise noted.

<sup>b</sup>N represents the number of cases evaluated pathologically.

<sup>c</sup>N represents the number of cases in which smoking history was recorded during pregnancy.

<sup>d</sup>Comparing severe BPD with mild plus moderate BPD.

<sup>e</sup>Except for cases treated with tracheostomy.

<sup>f</sup>Except for cases treated with home oxygen therapy.

<sup>g</sup>Analyzed using the Welch's t-test.

Table 2 should have appeared as follows:

**Table 2.** Association of perinatal factors and severe BPD with abnormal LF at school age.

	OR <sup>a</sup> (95% CI)	Adjusted OR <sup>b</sup> (95% CI)	
		Model 1	Model 2
Gestational age, weeks	1.00 (0.77–1.31)	1.17 (0.84–1.65)	1.12 (0.79–1.60)
SGA	0.53 (0.14–1.70)	0.23 (0.04–1.00)	0.22 (0.03–1.07)
Sex, male	1.94 (0.74–5.16)	2.17 (0.74–6.62)	1.87 (0.60–5.99)
ANS use	0.40 (0.14–1.09)	0.36 (0.11–1.05)	0.43 (0.13–1.31)
Severe BPD	2.13 (0.78–6.26)	3.93 (1.22–14.56)	4.70 (1.35–19.50)
A history of asthma	4.42 (1.51–13.62)		4.42 (1.31–16.27)

ANS antenatal steroid, BPD bronchopulmonary dysplasia, LF lung function, OR odds ratio, SGA small for gestational age.

<sup>a</sup>OR for abnormal LF at school age.

<sup>b</sup>OR for abnormal LF at school age, adjusted for gestational age, SGA, sex, ANS use and severe BPD in model 1 and these factors with a history of asthma in model 2.

Table 3 should have appeared as follows:

**Table 3.** Relation between the requirement for respiratory support during the neonatal period and risk of abnormal LF at school age.

Respiratory support at PMA, weeks	Abnormal LF group (N = 25), n/N (%)	Normal LF group (N = 53), n/N (%)	OR <sup>a</sup> (95% CI)	Adjusted <sup>b</sup> OR (95% CI)	Adjusted <sup>c</sup> OR (95% CI)
35					
MV or CPAP with any FiO <sub>2</sub>	20 (80.0)	36 (67.9)	1.94 (0.42–13.89)	4.66 (0.74–43.65)	7.04 (0.84–58.96)
Low-flow oxygen inhalation <sup>d</sup>	3 (12.0)	10 (18.9)	1.05 (0.14–9.61)	0.97 (0.11–10.06)	1.43 (0.14–14.69)
No support	2 (8.0)	7 (13.2)	1	1	1
36					
MV or CPAP with any FiO <sub>2</sub>	17 (68.0)	27 (50.9)	1.73 (0.50–7.05)	3.97 (0.93–20.98)	5.19 (0.97–27.77)
Low-flow oxygen inhalation <sup>d</sup>	4 (16.0)	15 (28.3)	0.73 (0.14–3.73)	0.97 (0.18–5.48)	1.08 (0.18–6.39)
No support	4 (16.0)	11 (20.8)	1	1	1
37					
MV or CPAP with any FiO <sub>2</sub>	13 (52.0)	18 (34.0)	1.86 (0.61–5.97)	4.86 (1.21–23.58)	6.18 (1.22–31.22)
Low-flow oxygen inhalation <sup>d</sup>	5 (20.0)	17 (32.1)	0.76 (0.19–2.83)	1.26 (0.28–5.63)	1.47 (0.32–6.88)
No support	7 (28.0)	18 (34.0)	1	1	1

Respiratory support at PMA, weeks	Abnormal LF group (N = 25), n/N (%)	Normal LF group (N = 53), n/N (%)	OR <sup>a</sup> (95% CI)	Adjusted <sup>b</sup> OR (95% CI)	Adjusted <sup>c</sup> OR (95% CI)
<b>38</b>					
MV or CPAP with any FiO <sub>2</sub>	8 (32.0)	14 (26.4)	1.64 (0.50–5.46)	4.05 (0.93–20.02)	4.39 (0.86–22.52)
Low-flow oxygen inhalation <sup>d</sup>	9 (36.0)	16 (30.2)	1.62 (0.51–5.20)	2.36 (0.65–9.16)	2.77 (0.69–11.11)
No support <sup>e</sup>	8 (32.0)	23 (43.4)	1	1	1
<b>39</b>					
MV or CPAP with any FiO <sub>2</sub>	7 (28.0)	12 (22.6)	1.34 (0.40–4.43)	2.77 (0.65–12.61)	3.08 (0.65–14.69)
Low-flow oxygen inhalation <sup>d</sup>	8 (32.0)	18 (34.0)	1.02 (0.33–3.12)	1.39 (0.40–4.89)	1.59 (0.43–5.88)
No support <sup>e</sup>	10 (40.0)	23 (43.4)	1	1	1
<b>40</b>					
MV or CPAP with any FiO <sub>2</sub>	4 (16.0)	8 (15.1)	1.25 (0.28–4.99)	2.67 (0.50–14.28)	3.58 (0.63–20.48)
Low-flow oxygen inhalation <sup>d</sup>	11 (44.0)	20 (37.7)	1.37 (0.49–3.94)	1.91 (0.58–6.64)	1.99 (0.55–7.23)
No support <sup>e</sup>	10 (40.0)	25 (47.2)	1	1	1

ANS antenatal steroid, CPAP continuous positive airway pressure, FiO<sub>2</sub> fraction of inspired oxygen, LF lung function, MV mechanical ventilation, OR odds ratio, PMA postmenstrual age, SGA small for gestational age.

<sup>a</sup>OR for abnormal LF of infants requiring respiratory support versus no respiratory support.

<sup>b</sup>Adjusted for gestational age, SGA, sex, and ANS use.

<sup>c</sup>Adjusted for gestational age, SGA, sex, ANS use, and a history of asthma.

<sup>d</sup>Low-flow oxygen inhalation includes oxygen inhalation supplied into the incubator with FiO<sub>2</sub> of ≤0.3 or FiO<sub>2</sub> of 1.0 via a nasal cannula with a flow of ≤0.5 L/min.

<sup>e</sup>No support includes a patient discharged before the PMA weeks.

Supplementary Table 1 should have appeared as follows:

**Supplementary Table 1.** Comparison of study participants and excluded VLBW children with BPD.

	Study participants (N = 78)	VLBW children without evaluation (N = 85)	p value <sup>a</sup>	VLBW children with neurodevelopmental disorders (N = 28)	p value <sup>b</sup>
Gestational age, median (weeks); (IQR)	26.9 (25.6–28.3)	27.4 (26.4–28.5)	0.04	26.2 (24.3–28.6)	0.25
Birth weight, median (g); (IQR)	839 (677–951)	956 (750–1067)	0.003	736 (602–899)	0.15
Sex, male/ female, n (%)	32 (41.0)/46 (59.0)	52 (61.2)/33 (38.8)	0.01	18 (64.3)/10 (35.7)	0.03
BPD			0.68		0.04
Mild, n (%)	16 (20.5)	21 (24.7)		3 (10.7)	
Moderate, n (%)	15 (19.2)	15 (17.7)		1 (3.6)	
Severe, n (%)	47 (60.3)	49 (57.7)	0.74 <sup>c</sup>	24 (85.7)	0.01 <sup>c</sup>
MV discontinued, median (weeks' PMA); (IQR), n <sup>d</sup>	35.6 (33.5–37.9), 76	36.0 (34.6–38.3), 85	0.26	38.3 (35.0–43.9), 25	0.005
Oxygen inhalation discontinued, median (weeks' PMA); (IQR), n <sup>e</sup>	39.5 (36.1–42.1), 68	40.0 (36.7–41.5), 77	0.58	42.6 (39.6–47.3), 16	0.007
Home oxygen therapy, n (%)	10 (12.8)	8 (9.4)	0.49	12 (42.9)	0.0008
Tracheostomy, n (%)	2 (2.6)	0 (0)	0.14	3 (10.7)	0.08

BPD bronchopulmonary dysplasia, IQR interquartile range, MV mechanical ventilation, PMA postmenstrual age, VLBW very low birth weight.

<sup>a</sup>Comparison between VLBW children without evaluation and study participants.

<sup>b</sup>Comparison between VLBW children with neurodevelopmental disorders and study participants.

<sup>c</sup>Comparing severe BPD with mild plus moderate BPD.

<sup>d</sup>Except for cases treated with tracheostomy.

<sup>e</sup>Except for cases treated with home oxygen therapy.

Supplementary Table 2 should have appeared as follows:

**Supplementary Table 2.** LF variables.

LF variable	Total subjects (N = 78)	Mild BPD (N = 16)	Moderate BPD (N = 15)	Severe BPD (N = 47)
FVC	101.0 (94.3–109.8)	100.5 (94.5–112.8)	103.9 (95.0–109.3)	100.3 (94.2–106.3)
FEV <sub>1.0</sub>	94.4 (85.6–102.9)	99.0 (84.7–104.5)	95.3 (90.8–108.7)	92.8 (82.6–102.3)
FEV <sub>1.0</sub> /FVC, %	84.6 (77.6–89.9)	87.2 (77.6–91.5)	86.1(81.5–94.7)	82.5 (77.1–89.0)
FEF <sub>25–75%</sub>	70.3 (56.9–91.4)	90.1 (58.5–102.3)	83.8 (61.1–102.8)	65.7 (52.5–82.4)
PEF	96.5 (84.8–110.5)	110.2 (94.5–125.3)	101.4 (89.1–112.4)	92.3 (80.8–103.0)
FEF <sub>50%</sub>	71.1 (55.7–92.9)	92.5 (60.4–104.8)	86.1 (61.1–98.8)	68.2 (53.4–82.0)
FEF <sub>75%</sub>	61.5 (47.3–84.5)	83.7 (49.5–94.2)	71.6 (53.1–104.7)	58.1 (43.6–72.4)

Values are presented as % predicted, median (IQR), unless otherwise indicated.

BPD bronchopulmonary dysplasia, FEF forced expiratory flow, FEV<sub>1.0</sub> forced expiratory volume in 1 s, FVC forced vital capacity, IQR interquartile range, LF lung function, PEF peak expiratory flow.

Supplementary Table 3 should have appeared as follows:

**Supplementary Table 3.** Relation between oxygen use during the neonatal period and abnormal LF at school age.

Respiratory support at PMA, weeks	Abnormal LF group (N = 25), n/N (%)	Normal LF group (N = 53), n/N (%)	OR <sup>a</sup> (95% CI)	Adjusted <sup>b</sup> OR (95% CI)	Adjusted <sup>c</sup> OR (95% CI)
35					
Oxygen with any respiratory support mode <sup>d</sup>	16 (64.0)	37 (69.8)	1.51 (0.32–10.91)	2.34 (0.41–19.53)	3.52 (0.47–26.06)
MV or CPAP with FiO <sub>2</sub> 0.21	7 (28.0)	9 (17.0)	2.72 (0.47–22.32)	4.78 (0.66–47.85)	8.10 (0.86–76.47)
No support	2 (8.0)	7 (13.2)	1	1	1
36					
Oxygen with any respiratory support mode <sup>d</sup>	17 (68.0)	37 (69.8)	1.26 (0.37–5.07)	2.06 (0.54–9.41)	2.36 (0.53–10.60)
MV or CPAP with FiO <sub>2</sub> 0.21	4 (16.0)	5 (9.4)	2.20 (0.38–13.35)	4.56 (0.67–34.74)	6.61 (0.83–52.57)
No support	4 (16.0)	11 (20.8)	1	1	1
37					
Oxygen with any respiratory support mode <sup>d</sup>	15 (60.0)	34 (64.2)	1.13 (0.40–3.43)	2.02 (0.59–7.73)	2.28 (0.59–8.79)
MV or CPAP with FiO <sub>2</sub> 0.21	3 (12.0)	1 (1.9)	7.71 (0.83–171.4)	13.64 (1.26–336.11)	16.21 (1.13–231.96)
No support	7 (28.0)	18 (34.0)	1	1	1
38					
Oxygen with any respiratory support mode <sup>d</sup>	14 (56.0)	29 (54.7)	1.39 (0.50–4.01)	2.32 (0.69–8.64)	2.59 (0.68–9.92)
MV or CPAP with FiO <sub>2</sub> 0.21	3 (12.0)	1 (1.9)	8.63 (0.95–188.9)	25.41 (2.13–711.11)	31.77 (1.79–565.19)
No support <sup>e</sup>	8 (32.0)	23 (43.4)	1	1	1
39					
Oxygen with any respiratory support mode <sup>d</sup>	14 (56.0)	29 (54.7)	1.11 (0.42–3.01)	1.64 (0.53–5.38)	1.81 (0.53–6.19)
MV or CPAP with FiO <sub>2</sub> 0.21	1 (4.0)	1 (1.9)	2.30 (0.09–62.15)	5.40 (0.16–206.71)	8.76 (0.32–241.48)
No support <sup>e</sup>	10 (40.0)	23 (43.4)	1	1	1

Respiratory support at PMA, weeks	Abnormal LF group (N = 25), n/N (%)	Normal LF group (N = 53), n/N (%)	OR <sup>a</sup> (95% CI)	Adjusted <sup>b</sup> OR (95% CI)	Adjusted <sup>c</sup> OR (95% CI)
40					
Oxygen with any respiratory support mode <sup>d</sup>	13 (52.0)	27 (50.9)	1.20 (0.45–3.29)	1.75 (0.54–5.97)	1.85 (0.52–6.61)
MV or CPAP with FiO <sub>2</sub> 0.21	2 (8.0)	1 (1.9)	5.00 (0.43–114.89)	14.75 (0.99–435.55)	21.85 (1.21–395.64)
No support <sup>e</sup>	10 (40.0)	25 (47.2)	1	1	1

ANS antenatal steroid, CPAP continuous positive airway pressure, FiO<sub>2</sub> fraction of inspired oxygen, LF lung function, MV mechanical ventilation, OR odds ratio, PMA postmenstrual age, SGA small for gestational age.

<sup>a</sup>OR for abnormal LF of infants requiring respiratory support versus no support.

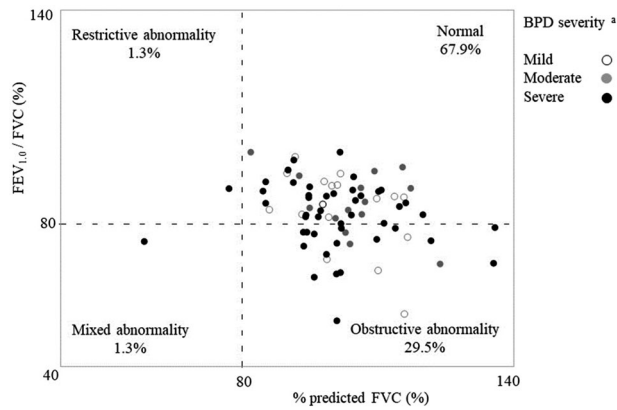
<sup>b</sup>Adjusted for gestational age, SGA, sex, and ANS use.

<sup>c</sup>Adjusted for gestational age, SGA, sex, ANS use, and a history of asthma.

<sup>d</sup>Respiratory support includes MV, CPAP, and oxygen supplied into the incubator or through a nasal cannula.

<sup>e</sup>No support includes a patient discharged before the PMA weeks.

Figure 2 should have appeared as follows:



Supplementary Figure 1 should have appeared as follows:

