Supplemental Figure S1. Sample signals from a successful and failed extubation during mechanical ventilation weaning.

Legend: Edi = electrical activity of the diaphragm, MV = mechanical ventilation, ETT-CPAP = endotracheal tube continuous positive airway pressure, CV = coefficient of variation.

Supplemental Table S1. Patient demographics.

	Success							Failure					
Patients	1	2	3	5	8	9	13	4	6	7	10	11	12
Demographics													
Birth weight (g)	830	965	620	920	1240	1020	890	550	800	620	600	600	610
Gestational age (wk)	26.3	29.1	25.3	25.7	28.0	27.9	24.4	23.1	25.7	24.9	24.1	25.4	23.6
Weight at extubation (g)	760	990	650	850	1240	1080	1140	720	775	780	950	910	870
PCA at extubation (wk)	27.1	29.6	26.3	25.9	28.1	28.7	29.6	27.1	26.0	27.4	27.6	29.3	26.6
DOL at extubation (days)	7	4	8	2	1	7	37	29	3	19	25	28	22
Sex	M	M	F	M	M	M	M	F	F	M	F	M	M
Pre-extubation blood gas													
pH	7.25	7.23	7.35	7.28	7.34	7.34	7.41	7.3	7.35	7.39	7.4	7.37	7.39
PCO_2 (mmHg)	55	56	35	39	38	47	47	57	37	41	43	53	48
Base Excess (mmol/L)	-3	-3.9	-5.8	-7.6	-4.5	-0.8	4.8	1.9	-4.4	-0.1	1.9	4.8	3.9
Total hemoglobin (g/L)	139	159	116	122	168	141	101	133	139	150	95	112	125
Pre-extubation settings													
Endotracheal tube size (mm)	2.5	3.0	2.5	2.5	3.0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Mechanical Ventilation													
PEEP (cmH_2O)	6	5	6	5	5	5	8	5	5	6	6	5	5
MAP (cmH_2O)	6.9	6	7.9	8	5.3	7.2	9	5.4	7.3	7.8	6.2	6.4	7.9
Maximum FiO_2	0.25	0.21	0.24	0.21	0.21	0.25	0.38	0.45	0.21	0.25	0.31	0.29	0.26
Tidal volume (ml/kg)	5.5	4.8	-	5.3	4	-	4.8	4.2	-	4.9	4.5	4.6	4.7
Rate	45	20	-	40	20	-	20	20	-	20	20	10	20
ETT-CPAP													
PEEP (cmH_2O)	6	5	6	5	5	5	8	5	5	6	6	5	5
Maximum FiO_2	0.25	0.21	0.24	0.24	0.21	0.3	0.38	0.4	0.3	0.25	0.31	0.42	0.32
Extubation failure													
Time to reintubation (h)	-	-	-	-	-	-	-	16	100	82	1	13	0.5
Reason for reintubation	-	-	-	-	-	-	-	A&B	A&B	RA	A&B	A&B	A&B

Legend: PCA = post-conceptional age, DOL = day of life, PCO$_2$ = partial pressure of carbon dioxide, PEEP = positive end-expiratory pressure, MAP = mean airway pressure, FiO$_2$ = fraction of inspired oxygen, A&B = apneas and bradycardias, RA = respiratory acidosis. All patients were on assisted control mode before extubation.

Supplemental Table S2. Respiratory variability during mechanical ventilation weaning.

	MV	ETT-CPAP	$\Delta_{\text{ETT-CPAP - MV}}$	*p*-value
BB Intervals (s)				
SD_{BB}	0.56 [0.32 - 0.90]	0.40 [0.36 - 0.46]	-0.14 [-0.39 - 0.05]	0.305
CV_{BB}	0.48 [0.36 - 0.68]	0.37 [0.33 - 0.46]	-0.11 [-0.20 - 0.02]	0.127
$SDSD_{BB}$	0.76 [0.40 - 1.01]	0.48 [0.40 - 0.58]	-0.12 [-0.43 - 0.07]	0.340
TI_{BB}	3.19 [2.46 - 4.00]	3.05 [2.52 - 3.58]	0.05 [-0.42 - 0.57]	1.000
Breath Area (μV•s)				
SD_{Area}	312 [209 - 415]	326 [230 - 458]	48 [22 - 127]	0.040
CV_{Area}	0.84 [0.67 - 0.91]	0.62 [0.58 - 0.86]	-0.09 [-0.27 - 0.06]	0.141
$SDSD_{Area}$	402 [221 - 468]	424 [287 - 549]	58 [37 - 136]	0.021
TI_{Area}	4.08 [3.39 - 5.49]	5.00 [3.58 - 7.38]	1.38 [0.57 - 2.49]	0.033
Neural Ti (s)				
SD_{NTi}	0.34 [0.20 - 0.61]	0.21 [0.19 - 0.29]	-0.09 [-0.16 - 0.01]	0.094
CV_{NTi}	0.74 [0.52 - 0.87]	0.48 [0.42 - 0.55]	-0.18 [-0.32 - 0.00]	0.046
$SDSD_{NTi}$	0.46 [0.26 - 0.73]	0.27 [0.23 - 0.39]	-0.10 [-0.27 - -0.01]	0.080
TI_{NTi}	3.12 [2.43 - 3.90]	3.25 [2.58 - 3.67]	0.61 [-0.48 - 0.90]	0.455
Neural Te (s)				
SD_{NTe}	0.44 [0.23 - 0.55]	0.27 [0.26 - 0.32]	-0.04 [-0.22 - 0.04]	0.497
CV_{NTe}	0.60 [0.46 - 0.76]	0.46 [0.39 - 0.55]	-0.06 [-0.21 - 0.09]	0.530
$SDSD_{NTe}$	0.55 [0.30 - 0.63]	0.33 [0.31 - 0.39]	-0.02 [-0.30 - 0.06]	0.542
TI_{NTe}	4.79 [3.33 - 5.50]	3.57 [3.44 - 4.67]	-0.29 [-0.89 - 0.30]	0.588
Breath amplitude (μV)				
SD_{Amp}	6.29 [4.83 - 7.83]	7.15 [4.97 - 9.17]	1.47 [0.13 - 2.49]	0.110
CV_{Amp}	0.64 [0.58 - 0.72]	0.54 [0.49 - 0.69]	-0.05 [-0.15 - 0.04]	0.077
$SDSD_{Amp}$	7.57 [5.52 - 9.43]	9.50 [6.45 - 10.74]	2.35 [0.67 - 3.31]	0.013
TI_{Amp}	2.55 [2.02 - 3.32]	2.48 [1.99 - 3.44]	0.45 [-0.39 - 0.83]	0.305
Breath Width (s)				
SD_{Width}	0.15 [0.12 - 0.23]	0.11 [0.11 - 0.15]	-0.02 [-0.11 - -0.01]	0.033
CV_{Width}	0.37 [0.32 - 0.50]	0.34 [0.28 - 0.37]	-0.04 [-0.21 - -0.03]	0.046
$SDSD_{Width}$	0.19 [0.15 - 0.31]	0.16 [0.14 - 0.21]	-0.04 [-0.17 - 0.01]	0.040
TI_{Width}	2.69 [2.47 - 2.82]	2.44 [2.27 - 3.11]	-0.12 [-0.28 - 0.33]	1.000

Legend: MV = mechanical ventilation, ETT-CPAP = endotracheal tube continuous positive airway pressure, $\Delta_{\text{ETT-CPAP - MV}}$ = difference between ETT-CPAP and MV, BB = breath-to-breath, SD = standard deviation, CV = coefficient of variation; SDSD = standard deviation of successive differences, TI = triangular index, NTi = neural inspiratory time, Ti = inspiratory time, Te = expiratory time. Values are presented as median [IQR].

Supplemental Table S3. Receiver-operator characteristics (ROC) for select variability measures for the identification of successfully extubated infants.

Variability Parameter	MV				ETT-CPAP			
	AUC_{ROC}	Cut-off value	Sens.	Spec.	AUC_{ROC}	Cut-off value	Sens.	Spec.
$SDSD_{BB}$ (s)	0.91	<0.89	100%	83.3%	0.98	<0.48	85.7%	100%
CV_{NTi}	0.91	<0.81	100%	83.3%	1.00	<0.50	100%	100%
CV_{Amp}	1.00	<0.66	100%	100%	0.93	<0.56	85.7%	83.3%

Legend: MV = mechanical ventilation, ETT-CPAP = endotracheal tube continuous positive airway pressure, $SDSD_{BB}$ = standard deviation of successive differences of breath-to-breath intervals, CV_{NTi} = coefficient of variation of the neural inspiratory time, CV_{Amp} = coefficient of variation of breath amplitude, AUC_{ROC} = area under the receiver operator characteristic curve, Sens. = sensitivity, Spec. = specificity.