Online Table S9.1: Special populations: CPAP and NIV in infants (< 24 m)

Author	Country	Journal	Type of study	Number of patients	Ages	Sample description/Outcomes
Adeleye et al. [1]	Canada	Canadian Respir J	Retrospective study	92 infants <12 m with PSG, 49 were prescribed CPAP	< 12 m	Of the 92 infants (not only the CPAP treated), 35 Down syndrome, 9 prematurity, 9 Pierre Robin Sequence, 3 PHT, 6 achondroplasia, 2 Prader Willi syndrome, 2 ALTE, 2 genetic disease and 23 others No details (diagnosis) on those treated with CPAP. No data on length of use.
Al-Iede et al. [2]	Australia	Sleep Med	Retrospective study; data not presented separately for infant group	148 children treated with nasal CPAP for "non-OSA", 130 included	18.6±33.6 m (1 wk to 16.8 y) 72% < 24 m, 26% < 6 m	65 (50%) primary airway disease [36 laryngomalacia, 17 airway malacia, 5 glottic stenosis, 5 vocal cord paralysis], 33 (25%) chronic lung disease [18 prematurity, 6 oncology, 5 CDH, 4 neonatal ILD], 20 (15%) CHD, 12 (9.2%) CHD + airway. No details on those < 24 m Compliance 116/130 (89%) > 4h/night Mean CPAP 7.3 cmH_2O Follow up: telephone call, cardiorespiratory monitoring (?) at 2 weeks, CPAP titration PSG after 3-6 m 30% stopped CPAP during a 15 m follow up (various reasons)
Amaddeo et al. [3]	France	J Plastic Reconstr Surgery	Retrospective study	9 (22%) of 44 neonates with Pierre Robin sequence treated with CPAP in 1 yr at single centre	0-2 m	4 initiation in PICU, 5 on pediatric ward, CPAP level 6-8 cmH_2O CPAP duration 1-5.5 m No failure, no death, no tracheotomy after CPAP CPAP adherence after 1 m at home >8h/24h Two remained on CPAP at 4 m, 7 ceased CPAP with normal polygraphy or gas exchange between 1-5.5 m
Bach et al.	USA	Pediatr Pulmono	Retrospective	33 using	10.9±6.8	SMA type 1; from birth to 3rd birthday, NIV had more hospitalizations than IV with no difference in hospitalizations

[4]		l	comparison of SMA1 managed with NIV vs IV vs supportive care	NIV	m	beyond 3rd birthday; 2 died at home; 24 evaluated for gastro-oesophageal reflux, 13 underwent fundoplication
Bach et al. [5]	USA	Am J Phys Med Rehabil	Retrospective cohort, single centre, 1993-2006	47 (51%) of 92 with typical, severe SMA type 1	10.6±5.7 mo	SMA type 1; 32 (68%) used BPAP only during sleep, 6 (13%) more than 16h/d, 9 (19%) continuously. 34 (72%) could communicate verbally (cf 22% of IV group). 5 (17%) died at 61±26 m, 45 (96%) underwent gastrostomy, 13 (28%) underwent fundoplication, follow-up to 65±46 m. NIV and tracheostomy can both prolong survival for SMA type 1 patients, but the latter results in continuous ventilator dependence and speech does not develop.
Bedi et al. [6]	Canada	Canadian J Respir, Crit Care Sleep Med	Retrospective study	120 infants using CPAP or BPAP in the province of Alberta over 10 yrs, matched 1 :2 with older children	9.0 m (IQR 12.0 m)	All infants using CPAP or BPAP in the province of Alberta over 10 yrs (55% upper airway, 22% CNS, 15% NMD, 16% cardiorespiratory, 2% other). Average of comorbidities 4 (IQR 3), 51% with 2 or more comorbidities. In comparison with older children (2-17 yrs), infants had more comorbidities, similar efficacy of NIV in improving sleep and respiratory parameters on sleep studies, greater use of BPAP, a higher rate of discontinuation of NIV because of improvement or switch to IV and similar adherence.
Chatwin et al. [7]	UK	Arch Dis Child	Retrospective case registry after 1993	13	4-24 m	SMA type1 & 2 (11 SMA1, 2 borderline SMA type I/II); 5 (38%) died, 2 before 1 yr; tracheotomy discussed but declined in all patients. All NIV was BPAP, S/T mode, nasal mask in 11 (85%)

						12 (92%) required enteral nutrition, none had problems with feeding overnight during NIV. No infant given NIV subsequently developed pectus excavatum. Parents of those who died report more comfortable breathing with NIV, allowed family time at home. One family reported that NIV gave them time at home to come to terms with the diagnosis and prognosis.
Downey et al. [8]	USA	Chest	Retrospective	10	< 2 yrs; 11 were <1 yr	OSA diagnosed on PSG who consented to CPAP use; 3 laryngomalacia, 2 post adenotonsillectomy with residual OSA, 1 BPD, 1 Down syndrome, 1 CHD, 1 Pierre Robin Sequence. CPAP 6-9 cmH_2O, 5 with O_2 2 with tracheotomy used CPAP; 1 used CPAP until OSA resolved, 1 used CPAP for 1 yr then elected tracheotomy as long-term treatment. 2 with residual OSA post adenotonsillectomy used CPAP until OSA revolved 6 used CPAP until OSA resolution; 1-5 y Awakenings, apnea index, obstructive apnea index, hypopnea index, longest apnea, minimal SpO_2, SaO_2<90% all improved from baseline PSG on titration PSG
Essouri et al. [9]	France	Intensive Care Med	Prospective physiological and clinical study (oesogastric pressure measures)	10 infants	9.5 m (3-18 m)	5 laryngomalacia (1 + Down syndrome), 3 tracheomalacia (1 + T21), 1 tracheal hypoplasia, 1 Pierre Robin Sequence CPAP level 8-12, mean 11 ± 2 cmH_2O BPAP associated with patient-ventilator asynchrony (trigger not sufficiently sensitive) CPAP resulted in approximayely 7% reduction in all indices of respiratory effort. There was no correlation between optimal level of CPAP, age, cause of upper airway obstruction, or oesophageal or transdiaphragmatic pressure swing during spontaneous breathing.

						BPAP improved breathing pattern and respiratory effort similar to that observed with CPAP
Gregoretti et al. [10]	Italy	Pediatrics	Retrospective; 1992-2010; NIV not available until 1999	31 infants with SMA type i	age of first respiratory failure: 12.6±14.4 m (0-42 m to start NIV)	BPAP; 14 (45%) died at median age 28.6 m (means age 32±21 m, IQR 12.8-41.4 m). NIV used increased from 8% (1999-2004) to 23% (2005-2010). Follow-up 38±21 m. Survival at 24 and 48 m higher in IV than NIV group: 24 m - 95 (95%CI 82-99)% vs 68 (95%CI 47-82)%; 48 m – 89% vs 45%. Hospitalization rate lower in IV vs NIV: 0.023 vs 0.006 episodes/patient/y. Hours/day on ventilation less for NIV vs IV. 7 (22%) eventually tracheostomized.
Guilleminault et al. [11]	USA	J Pediatr	Retrospective study	74 infants with CPAP at home	< 12 m	Reasons for referral: ALTE (23%), failure to thrive (11%), abnormal sleeping patterns with growth retardation (50%) or without growth retardation (16%). 57 (77%) had craniofacial anomalies. 45 (60%) were below the 20% for weight and 40% for height. Follow-up period between 5 m to 12 yrs with mean 35±21 m. 72 infants successful treated at home with CPAP, 28 eventually discontinued CPAP, 7 were lost to follow-up, 37 continued CPAP. Complications: major problems were related to mask selection. Treatment failure: 1 infant with Down syndrome, extensive cardiac procedures; 1 infant with Pierre Robin Sequence, BPAP tried for 3 weeks, new cardiorespiratory complications, child died at 6 weeks.
Kam et al. [12]	Canada		Retrospective; comparison of surgical and non-surgical treatment	20 infants with Pierre Robin Sequence	9±14 m	CPAP; 14 (70%) isolated, 6 (30%) syndromic. PICU stay 16±23 days (cf tracheotomy 37±34 days), hospital admission 66±46 days (cf tracheotomy 138±76 days). Duration of CPAP use: 6±6 m

Kherani et al. [13]	Canada	Pediatr Pulmonol	Retrospective study	25 children treated with NIV between 1991 and 2013	0.6 (IQR 0.4-0.7) yrs	Underlying disease: CNS n=3 (2 CCHS, 1 other central cause), NMD n=14 (3 SMA 1, 2 congenital myopathy, 2 congenital dystrophy, 3 NMD), respiratory disease n=8 (3 CLD, 2 airway malacia, 1 diaphragmatic paresis, 1 pulmonary atresia, 1 OSA). Location of NIV start: 72% PICU, 21% hospital ward, 13% sleep lab. Outcomes: 32% continuing on NIV, 28% improved (no longer require NIV), mortality 32% (age at death 1.1 [IQR 0.9-1.4] y), treatment failure 8% Main complications: mid face hypoplasia 8%, dermatographism 8%
Shatz et al. [14]	Israel	Oto Rhinol Laryngol	Retrospective study	50 infants with pharyngomalacia	1-18 m	9/50 treated with BPAP, 5/50 treated with CPAP, spontaneous weaning from respiratory support before the age of 36 m
Khirani et al. [15]	France	Crit Care	Prospective physiological study (oesogastric pressure measures)	12 infants treated with CPAP for OSA	2-22 m	5 BPD, 1 Pierre Robin Sequence, 1 Prader Willi syndrome, 3 laryngomalacia and 1 laryngomalacia + Down syndrome + 1 OSA
Leboulanger et al. [16]	France	Pediatrics	Prospective physiological and clinical study (oesogastric pressure measures)	7 infants with Pierre Robin Sequence	2 m (1-10 m)	4 required enteral nutrition. Respiratory effort, assessed by oesogastric pressure measures, decreased significantly during NIV (CPAP, BPAP). Time spent with SpO_2 <90% was reduced (14% to 2%) as was mean and maximal $PtcCO_2$ values and proportion of time with $PtcCO_2$>50 mmHg. Objective compliance was excellent at >8h/day. No tracheotomy or death, 6 of 7 infants weaned from nutritional support. No facial side effects attributable to NIV. CPAP/BPAP duration 16.7±12.2 m (3-39 m) Custom-molded nasal mask for all patients

						Multidisciplinary hospital/home care approach
Lemoine et al. [17]	USA	Pediatr Crit Care Med	Retrospective, intention to treat, Jan 2002 to May 2009, Proactive respiratory care vs supportive care	23 with SMA type I (3 with tracheotomy so 20 with NIV)	Age at diagnosis: 136 (IQR 54-196) d; days after diagnosis to BPAP: 44 (IQR 22-93) days	BPAP; proactive respiratory care (including NIV and tracheotomy), as opposed to supportive care, was associated with fewer days to first episode of respiratory insufficiency, similar frequency of acute life threatening events, higher rates of in-patient care for respiratory insufficiency, longer survival. Adherence to treatment protocols was associated with a trend for longer adjusted survival.
Leonardis et al. [18]	USA	JAMA Otolaryngo Head Neck Surgery	126 infants with OSA on PSG	18/126 treated with CPAP/BPAP	16 mos	No details on those treated with CPAP/BPAP 46/(129) 126 had congenital malfomration or craniofacial syndrome (10 Down syndrome, 9 cleft palate, 6 Pierre Robin Sequence, 6 achondroplasia) and 36 laryngomalacia For those with pre and post-intervention PSG, CPAP showed the highest mean percentage decrease in AHI (67.2% decrease) followed by tracheotomy (67.0%), observation (65.6%), and suprglottoplasty (65.3%). CPAP proved to be the most objectively efficacious intervention.
Markstrom et al. [19]	Sweden	Acta Pediatr	Retrospective study	18 infants treated with NIV	4 m (1-12 m)	Reason for initiation of NIV: hypoventilation in 12 and reduced cough/recurrent infections in 6 infants. Diagnoses: 7 intermediate SMA, 3 CCHS, 2 diaphragmatic paralysis, 2 Down syndrome, 1 centronuclear myopathy, 1 nemaline myopathy,1 Leigh syndrome, 1 myelomeningocele. Initiation of NIV resulted in significant improvements in $PtcCO_2$ and PtcO2. Location of initiation: PICU 44%, ward with special training in NIV 28%, electively on ordinary children's ward 28%.

						Duration of NIV: 3 (17%) CCHS on nocturnal only, 2 11%) diaphragmatic paralysis discontinued because of improvement, 7 (38%) still on NIV, 4 (22%) discontinued because of improvement, 2 (11%) tracheotomy, 1 (5%) died. Asynchrony associated only with leakage from the mask. Mid face hypoplasia of varying degree in CCHS and diaphragm paralysis; custom-made full face mask in 1 CCHS
McNamara et al. [20]	Australia	Chest	Retrospective study	8 infants with OSA treated with CPAP [compared to 8 control infants and 8 with OSA not treated with CPAP]	At diagnosis 10.8±1.3 weeks (6-18 weeks); At CPAP sleep study: 11.4±1.3 weeks	Referred for OSA investigation because of ALTE or family history. CPAP resulted in prevention of nearly all obstructive events during sleep with a significant reduction in central apnea. Each infant tolerated CPAP mask and CPAP well. Parents reported their infants sleeping well at home with the use of CPAP. Treatment with CPAP resulted in significant increase in the spontaneous arousals during rapid eye movement sleep which was similar to the spontaneous arousal index in control infants.
Pelen et al. [21]	Australia	Int J Ped Otorhinolaryngo	Retrospective study	19 infants with congenital tracheal stenosis	0 - 9 m	All treated with NIV pre and post-operative, age at start 0 – 6 m, duration NIV 1 – 24 m, 2 (20%) patients discharged home on NIV
Robison et al. [22]	USA	Laryngoscope	Retrospective study, treatment of OSA in infants	18 (6%) of 295 treated with CPAP or BPAP	15.6 m (3-29 m)	No data on medical comorbidities in those on NIV Mean age at CPAP/BPAP initiation 3 –29 m No information on diagnosis, settings, follow up Subjective intervention efficacy (-1 to 3) based on subjective parental response. Objective efficacy based on reduction in AHI: 84% (on tracheotomy 93%, supplemental O_2 60%, adenotonsillectomy 56%, observation 54%, adenoidectomy alone 18%, tonsillectomy alone increase of

						5%).
Rosen et al. [23]	USA	Clin Pediatr	Retrospective study, Down syndrome < 2 yrs, referred to sleep lab, Jan 2004-June 2009	6 (21%) of 29 treated with CPAP	< 2 yrs	3 (50%) of 6 infants treated with CPAP found at 5, 5, and 10 m to have no further evidence of OSA
Vasconcelos et al. [24]	Portugal	Retrospective study, 11 yrs		7	13 m (3 m to 3 yrs)	SMA type 1 on BPAP Duration: 29 m (16 m-3.5y) Deaths: 5 (71%), age 4 m (1 m-15 m) [At least one started NIV outside of infancy]

Abbreviations: m: months, yrs: years, OSA: obstructive sleep apnea, BPAP: bilevel positive airway pressure, NIV: noninvasive ventilation, IV: invasive ventilation, SMA: spinal muscular atrophy, NMD: neuromuscular disease, BPD: bronchopulmonary dysplasia, ALTE: acute life-threatening event, SIDS: sudden infant death syndrome, CDH: congenital diaphragmatic hernia, CHD: congenital heart disease, CLD: chronic lung disease, ILD: interstitial lung disease, CNS: central nervous system, CCHS: congenital central hypoventilation syndrome, BPD: bronchopulmonary dysplasia, PHT: pulmonary hypertension, AT: adenotonsillectomy, PSG: polysomnography, PICU: pediatric intensive care unit, O2: oxygen, SpO_2: pulse oximetry, $PtcO_2$: transcutaneous oxygen pressure, $PtcCO_2$: transcutaneous carbon dioxide pressure.

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