two groups (NCPAP, HFNC). During the study, those on HFNC had more normal examination of nasal mucosa (P<0.0001). According to neonatal nurses opinions, application of HFNC was easier than NCPAP for neonates (P<0.0001).

Conclusions HFNC is as effective as NCPAP in the management of RDS in premature neonates more than 30 gestational weeks. In addition, HFNC performed easier than NCPAP with maintaining a normal nasal mucosa.

394 EARLY DETECTION OF NEONATAL RESPIRATORY DECOMPENSATION LEADING TO INTUBATION USING PREDICTIVE MONITORING

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Aims Very low birth weight (VLBW < 1500 grams) infants in the Neonatal Intensive Care Unit (NICU) are at risk for respiratory deterioration requiring endotracheal intubation and mechanical ventilation, with associated morbidities. Methods for predicting impending respiratory failure are needed, as timely non-invasive treatments might avert severe deterioration and the need to intubate.

Our aim was to develop a predictive statistical model for continuous analysis of cardiorespiratory waveforms and vital signs to predict respiratory failure requiring intubation in VLBW infants.

Methods We collected continuous cardiorespiratory and demographic data, and types and times of respiratory support on all VLBW infants admitted to the University of Virginia NICU from January 2009–June 2011. We identified non-elective intubations that were followed by mechanical ventilation for at least 12h. Over 25 physiological measures were tested, and a multivariate logistic regression model was developed to estimate the relative risk of urgent intubation in the next 24 hours.

Results Of 287 VLBW infants admitted, 96 urgent intubations in which there were at least 12h of waveform data occurred in 51 patients. The final model had ROC area 0.84 and employed oxygen saturation and its cross-correlation with heart rate, cross-correlation of heart and respiratory rates, and apnea burden. Inspection showed rising risk of intubation over the 12 to 24 hours prior to the event.

Conclusion Predictive monitoring of cardiorespiratory waveform patterns and vital signs can detect incipient respiratory failure as much as 24h prior to urgent intubation.

395 NASAL INTERMITTENT MANDATORY VENTILATION VERSUS NASAL CONTINUOUS POSITIVE AIRWAY PRESSURE FOR TRANSIENT TACHYPNEA OF THE NEWBORN: A RANDOMIZED PROSPECTIVE STUDY

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Background and Aims Nasal continuous positive airway pressure (NCPAP) is widely used for the treatment of transient tachypnea of the newborn (TTN). In this study we hypothesized that the use of nasal intermittent mandatory ventilation (NIMV) may be well tolerated in TTN and we aimed to evaluate its efficacy in reducing the duration of respiratory distress compared with NCPAP in TTN.

Methods This prospective, unblinded, randomized, controlled clinical trial was conducted in 40 eligible infants with a gestational age ≥37 weeks, and birth weight ≥2000 g who were hospitalized for TTN. Infants were randomized to either nonsynchronized NIMV (n=20) or NCPAP (n=20). The primary end point was the reduction of the duration of respiratory distress. Secondary end points were the duration and level of oxygen supplementation, the incidence of complications such as pneumothorax, pneumonia and respiratory failure requiring entubation.

Results There was no significant difference in the demographic features of the groups. There were no significant difference in the duration of respiratory support (28.0±19.2 h vs 32.2±23.3 h, p=0.231), O_2 therapy (31.2±15.6 h vs 29.0±19.3 h, p=0.187), duration of TTN (67.6±36.5 h vs 63.3±39.1 h, p=0.480) and hospitalization (6.2±2.6 d vs 5.4±2.0 d, p=0.330) between the groups. The rate of complications were not significantly different between the groups.

Conclusions Our study indicates that NIMV is well tolerated and as effective as NCPAP in the treatment of TTN.

396 CURRENT PRACTICE REGARDING THE USE OF HUMIDIFIED HIGH FLOW NASAL CANNULAE (HHFNC) IN UK NEONATAL UNITS

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Background Neonatal respiratory support using high flows of heated/humidified gas via nasal cannulae has gained acceptance in the UK despite limited evidence of efficacy and safety. HHFNC seems well tolerated with little reported airway trauma, reduced noise exposure, and easier nursing than NCPAP.

Aim To determine current practices in terms of usage, types of devices and weaning regimes of HHFNC.

Methods All 203 neonatal units across UK were contacted and a structured telephone questionnaire completed.

Results All 203 UK neonatal units (100%) completed the survey, 113 neonatal units (56%) use some form of HHFNC. There is more HHFNC use in level 3 neonatal intensive care units (Table 1).

Of the units using HHFNC, 47 (42%) use HHFNC either as standard respiratory support following extubation or following NCPAP with the remainder (58%) using NCPAP initially and then HHFNC. The majority (60%) of units commenced HHFNC at 8 litres per minute (lpm) flow and 30% of units at 5–6lpm and reduced in 0.5–1lpm steps to wean. Most units weaned off HHFNC once the flow rate was 2–3lpm.

Conclusion This is a large UK study evaluating the use of HHFNC. This survey demonstrates increasing use of HHFNC and wide variations in methods of use and weaning parameters. There is a need for further research in this area.

Abstract 396 Table 1 Use of HHFNC according to Level of neonatal units

	Special care baby units (level 1)	Local neonatal units (level 2)	Neonatal intensive care units(level 3)
HHFNC used (UK)	12/53 (23%)	60/92 (64%)	41/58 (70%)
HHFNC used % England/ Wales/Scotland/Northern Ireland	28%/0%/0%/0%	64%/50%/100%/50%	71%/50%/83%/100%

397 HIGH FLOW NASAL CANNULAE CAUSE LESS NASAL TRAUMA COMPARED TO NASAL CONTINUOUS POSITIVE AIRWAY PRESSURE IN PRETERM INFANTS

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Background Nasal continuous positive airways pressure (NCPAP) facilitates extubation but can cause nasal trauma which ever device is used. The burden of nasal trauma is poorly defined in the literature. Nasal trauma often occurs in the smallest infants who require

the longest duration of respiratory support. Nasal injury is usually mild and resolves with cessation of NCPAP. It can however lead to permanent disfigurement with long term functional sequelae. High flow nasal cannulae (HFNC) offer an alternative modality of respiratory support and may allow for decreased infant handling and less nasal trauma than NCPAP.

Methods 132 ventilated infants < 32 weeks of gestation were randomised to receive either HFNC (N=67) or NCPAP (N=65) following primary extubation. A nasal trauma score was adapted from Kaufman [EPAS 2007:61390] and validated. Nasal trauma scores were recorded for 7 days post-extubation (Figure 1). Each episode of prong repositioning was recorded for 72 hours post-extubation.

Results

Abstract 397 Table 1

	HFNC N=67	NCPAP N=65
Mean Nasal Trauma Score (SD)	3.12 (7.16)	11.81 (10.71)*p<0.001
Mean Prong repostions (SD)	8.25 (3.25)	16.69 (6.29) *p<0.001

Conclusions HFNC results in significantly less nasal trauma and fewer prong repositions than NCPAP. These are important benefits that should be considered especially if HFNC and NCPAP are demonstrated to be equally efficacious for post-extubation respiratory support in preterm infants.

398 SEVEN VENTILATORS DELIVERING NASAL CPAP CHALLENGED WITH LEAKAGE: AN EXPERIMENTAL PILOT STUDY

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Introduction Nasal Continuous Positive Airway Pressure (nCPAP) is an established treatment for respiratory distress in neonates. Most modern ventilators are able to provide nCPAP. Compared to traditional nCPAP delivery systems ventilators are more complex and allow correction for leakage. There have been no large studies examining the response to leakage for nCPAP delivered by ventilators. The aim of this pilot study was to compare pressure stability for nCPAP delivered by ventilators using simulated neonatal breathing and constant leakage.

Methods Neonatal breathing was simulated by using a mechanical lung simulator. Seven ventilators were tested with recommended prongs, humidifier and tubing. Tests were performed with a breath profile from a 3.4 kg infant and nCPAP of 4 cm H_2O. Constant leakage at 1-2-3-4 l/min was introduced after 30 breaths. Pressure stability was measured as pressure increase and decrease from mean pressure. Leakage stability was measured as change in mean pressure. Calculations were performed for each breath.

Results The pressure stability of the tested ventilators showed large variations before introducing leakage. Fabian, Evita XL and SERVO-i were the most pressure stable systems (with and without leakage). Changes in mean pressure with leakage also showed large variations. Four of the ventilators had leakage compensation.

Conclusion The tested ventilators showed large variations in pressure stability and ability to maintain pressure when exposed to leakage. Ability to maintain mean pressure and provide pressure stable nCPAP are different aspects of nCPAP systems. Being able to compensate for leakage does not necessarily give more pressure stable nCPAP.

399 AUTOMATIC CONTROL OF THE INSPIRED OXYGEN FRACTION IN PRETERM INFANTS. PRELIMINARY RESULTS OF A MULTICENTER RANDOMIZED CROSS-OVER TRIAL

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Background and Aims In preterm infants receiving supplemental oxygen, manual control of the inspired oxygen fraction is often time-consuming and inappropriate. We developed a system for automatic oxygen control (FiO_2-Controller) and hypothesized that this system is more effective than routine manual oxygen control in maintaining target arterial oxygen saturation levels.

Methods We performed a multicenter randomized controlled cross-over clinical trial in preterm infants receiving mechanical ventilation or nasal continuous positive airway pressure and supplemental oxygen. Periods with routine manual oxygen control (period 1) were compared to periods of routine manual oxygen control supported by the FiO_2-Controller (period 2).

Results Preliminary results including 18 patients are presented. The median (range) percentage of time with arterial oxygen saturation levels within target range (90–95%) was 59.3% (37.9–99.5) for period 1, and 69.4% (43.8–95.4) for period 2. Final analysis including significance testing is pending.

Conclusions Automatic oxygen control may improve oxygen administration to preterm infants receiving mechanical ventilation or nasal continuous positive airway pressure.

400 OSCILLATION TRANSMISSION AND VENTILATION DURING FACE MASK-DELIVERED HIGH FREQUENCY OSCILLATORY VENTILATION IN INFANTS: A BENCH STUDY WITH ACTIVE LUNG SIMULATOR

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Background Noninvasive high frequency oscillatory ventilation (nHFOV) has been applied through nasal prongs as a new respiratory technique in preterm neonates and has been found to reduce CO_2, but it has never been studied in bigger infants. Its mechanical properties when applied through a face mask are not known.

Methods We modeled the application of face mask-NHFOV in infants using a pediatric mannequin connected to an active lung simulator (ASL5000). This was set mimicking the mechanical properties of a normal lung (Crs 1 mL/cmH_2O/Kg; Raw: 40 cmH_2O/L/sec; Pmus 6 cmH_2O; rate: 40 breaths/min) in a male infant at 1 year, 8 Kg, 3rd percentile for age. NHFOV parameters were sequentially changed. Spontaneous tidal volume (sTv), oscillatory stroke volume (oTv) and oscillation amplitude (DeltaPdist) at the lung simulator were recorded. Oscillatory pressure ratio (OPR: DeltaPdist/DeltaP) and the theoretical ventilation during HFOV (DCO2=frequency x oTv^2) were also calculated.

Results Mean oTv, OPR and DCO2 were 1.9±0.7 mL/Kg, 0.05±0.02 and 221±136 Hz x mL^2/Kg, respectively. Significant correlations were found between OPR and oTv (r=0.48; p<0.001) and OPR and DCO2 (r= 0.47; p<0.001).oTv significantly correlates with sTv (r=0,885; p<0,001). At a multivariate regression OPR was the factor more strongly associated with oTv (st.β=0.88) and DCO2 (st. β=0.96; p<0.001).

Discussion NHFOV through face mask is feasible. Oscillation amplitude is dampened by the interface and may reach in the lung 11% of the set value.Nonetheless, in this model adequate Tv and DCO2 are reached and OPR was the factor more strongly influencing ventilation.