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Improving the outcome of prematurely born infants with respiratory failure

Recent advances in treatment and management

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The past decade has seen dramatic advances in the treatment of premature infants with respiratory failure. These have included the use of non-invasive blood gas monitoring, artificial surfactant, newer ventilators with a variety of ventilatory modes, high frequency ventilators, Extra Corporeal Membrane Oxygenation (ECMO), nitric oxide, pharmacologic methods of closing the patent ductus arteriosus (PDA), and pulmonary function monitoring.

Despite these advances, the incidence of two complications affecting the prematurely born infant requiring assisted ventilation - chronic lung disease (CLD) and retinopathy of prematurity (ROP) - remain high and present a challenge for health care professionals caring for this group of high risk infants. Several innovative "low tech" approaches to managing infants requiring assisted ventilation have the potential to not only improve survival rates of premature infants, but also decrease the incidence and severity of CLD and ROP. NICUs that institute these new protocols and approaches to managing their patients could dramatically decrease the mortality rates of prematurely born neonates, decrease the incidence of CLD and ROP and lower hospital costs, and the long term medical costs associated with these two conditions.

Recent published studies, (Ammari et al, J Pediatr 2005; 147:341 and Jegatheeson et al J Perinatol 2006; 26:189) have been instrumental in disseminating these strategies to health care professionals in the NICU, but care management professionals can benefit from this information as well. The new approaches to treating and managing CLD and ROP are briefly summarized below:

1. The early use of surfactant

2. The early use of CPAP and the avoidance of routing

intubation for patients greater than 26 weeks gestation and greater than 700 grams

3. Early extubation to CPAP or nasal canula

4. Decreasing the incidence of unplanned extubations by insuring policies and procedures are in place to secure the endotracheal tube

5. Permissive hypercapnea - accepting pCO_2 values higher than those which were traditionally accepted as "normal"

6. Using methylxanthines to decrease apnea

7. Avoiding excessive volutrauma if the infant is on the ventilator

8. Recognizing the importance of the delivery room management of premature infants by avoiding excessive lung inflation pressures and excessive inspired oxygen concentrations during resuscitation and stabilization

9. Using blend oxygen on transport and in the delivery room

10. Using vitamin A in infants less than 1000 grams

Other measures which may not be as effective as the ones listed above but are regarded as likely effective include:

1. Use of "Neopuff" in the delivery room to avoid excessive peak inspiratory pressures during resuscitation

2. Supporting quality improvement measures in the NICU that ensure uniform practices among the entire medical and ancillary staff

An additional program, OWL (Oxygen with Love), a joint initiative between the NICU at the Ochsner Hospital in New Orleans and the Vermont Oxford study group have recognized the importance of avoiding hyperoxia in premature infants in preventing ROP. The implementation of an aggressive educational program designed to educate the medical staff, nursing personnel, and ancillary staff in the NICU about the importance of maintaining oxygen saturations of premature newborns within strict parameters has been shown to markedly reduce the incidence of ROP.

In summary, by adopting these measures, a NICU can dramatically improve survival and decrease morbidity of two major complications associated with the prematurely born newborn, as well as contribute to decreasing the costs of both short term hospital care and the long term costs associated with CLD and ROP.

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