Delicate balance in the NICU

Respiratory Therapists Breathe Life into Tiny Patients

Chris Morrissey holds a tiny twin-pronged piece of plastic between his fingers. It’s hard to grasp that the unassuming length of tubing and a mask the size of the end of a man’s thumb represent a lifeline for patients whose tiny bodies struggle for each lifesaving breath of precious oxygen.

Morrissey is respiratory therapy (RT) supervisor on the Neonatal Intensive Care Unit (NICU) at University of Colorado Hospital, a world of miniature bodies and outsized challenges. There are few loud, demanding bawls on the hushed unit, where the lungs of the smallest infants — those weighing scarcely more than a pound — are the size of a peanut and can accommodate only a couple of milliliters of oxygen.

Yet prolonged intubation increases the risk of infection, including ventilator-associated pneumonia, and damage from chronic lung disease, known as bronchopulmonary dysplasia.

“A week on a ventilator can cause changes to their pulmonary systems, making it harder to get them off it,” he says. “A big focus is to get them extubated as quickly as possible.”

Early this year, Morrissey, NICU Medical Director Jim Barry, MD, and Neonatal Senior Instructor Danielle Smith, MD, authored and implemented a protocol to begin safely weaning infants off the ventilator during the first hour of life.

Morrissey says the hospital’s NICU is the first in the nation to develop a ventilator protocol that focuses on this early stage. The goal is not only to decrease the risk of chronic lung disease caused by extended ventilator use but also to prevent head bleeds that can result when concentrations of carbon dioxide in arterial blood fall below a certain level.

“Before we wrote the protocol, we looked at carbon dioxide levels that were out of range,” Morrissey reports. “We found that about 40 percent [of the infants] were low on CO2 after the first hour.” The unit has not finished collecting and analyzing data, he says, but the initial numbers are “promising,” with only about 10 percent of patients showing out-of-range CO2 levels.

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A thin line. Delivering respiratory therapy to neonates also requires a delicate therapeutic balance, Morrissey explains. Their underdeveloped lungs frequently require ventilator assistance.

Off the tube. As quickly as possible, Morrissey says, RTs move their patients from the ventilator to a continuous positive airway pressure (CPAP) device.
pressure (CPAP) system. Tiny nose prongs and a miniscule mask, tightly sealed over the nose, help force oxygen into the baby’s lungs and prevent the bronchial tubes and air sacs (alveoli) from collapsing.

To further guard against lung collapse – an ever-present threat – RTs provide patients with a synthetic form of a natural protein called pulmonary surfactant that helps keep the alveoli open by decreasing the surface tension in the fluid lining of the lungs, thus allowing them to expand.

“[Neonates] either have little of the protein or can’t produce it at all,” Morrissey says, “so we instill it in their lungs. That keeps the alveoli open and allows us to extubate.”

**Zap the VAPs.** Respiratory therapists also play an important role in preventing dangerous infections, including ventilator-associated pneumonia (or VAP). VAPs can delay the babies’ physical and cognitive development, or even cause death.

Infection-prevention protocols, or “bundles,” developed this year have helped the NICU eliminate VAPs during the past several months (*Insider*, October 13).

“We helped gather information for the VAP bundles and put them in place,” Morrissey says. To guard against infection, RTs thoroughly suction fluid out of the oral cavity, provide regular oral care, and routinely pull out and promptly replace ventilator circuits the infants breathe through to prevent bacteria from breeding in the condensate that collects in the tubing.

*The 50-bed NICU is in many ways a world unto itself at UCH, Morrissey says, from the size of the equipment and the patients to the expectations of providers.*

“We’re focused on getting them to breathe on their own and with as little damage as possible,” he says. “In the adult world, there is more of a focus on decreasing the number of ventilator days so patients don’t have to spend as long in the hospital. Our patients are going to be here for a set period of time, so our sole focus is on their lung health.”