

Respirations

Fall 2007

Hello again! “*Respirations*” returns after a summer break. I would first like to thank all of you who have given me feedback on previous editions. I am so glad that the topics covered have helped in several of your daily practices. I hope to be able to continue that trend. In this edition, we will review the use of cardiorespiratory (CR) monitors in babies at risk of sudden death. In the second section I will attempt to answer a question that was recently posed to me by a primary physician: “*When should I refer an asthma patient to a specialist?*”

Also, I would like to remind everyone about our *High Risk Infant RSV Prevention Clinic*. Over the previous four years of offering this service, we have observed a further reduction in hospitalization rate for these high risk babies compared to the original Palivizumab (Synagis) studies. Besides the actual administration of drug each month, John (Spivey) and I seek to address any co-morbidity that impacts the child’s respiratory health as well as reinforce general infection prevention measures with the families. LCK (choolr@stlo.mercy.net)

Illustrative Case

AS is a two day old infant who presents with recurrent apnea and cyanosis. She was the product of an uncomplicated 38-week gestation. The first episode occurred while she was resting on her mother’s breast within a few minutes of being born. The second happened after she had being placed in the car seat at the time of discharge. On both occasions the infant responded to stimulation and blow-by oxygen. She has a healthy 2 year old brother. There is no family history of SIDS, congenital heart disease, seizure disorder or metabolic disorder.

On physical exam she appeared to be a normal newborn. However, with monitoring there were intermittent oxyhemoglobin desaturations. Desaturations were more frequent and severe while feeding. Supplemental oxygen blunted but did not prevent episodes. An extensive evaluation including sepsis work-up, echocardiogram, and electroencephalogram was normal except for an upper gastrointestinal study that showed reflux without secondary aspiration.

Discussion – This case is a commonly encountered scenario yet, there is much inconsistency in the approach taken regarding the use of cardiorespiratory monitors. Questions that commonly arise include: (1) *Which babies should be monitored?* (2) *How long should monitoring be continued?*

Perhaps to take a step back would be helpful in not only understanding the current recommendations but also the reason for frequent confusion. Apnea monitors were first introduced in the mid 1960s for the management of apnea of prematurity in the hospital setting. The

hypothesis that apnea is the pathophysiologic precursor to sudden infant death syndrome (SIDS) was first proposed in 1972. Apnea documented by CR monitoring during hospitalizations was reported for 2 infants, both of whom were siblings of 3 infants who had died suddenly at home. Both siblings subsequently died unexpectedly after discharge from the hospital. More than 2 decades later, evidence of infanticide for all 5 infants in the original report became known. The apnea theory has never been proven despite subsequent extensive research.

In 2001, the Collaborative Home Infant Monitoring Evaluation (CHIME) study was published. In this large study of 1079 infants over the first six months of life, the researchers observed “conventional” apneas (>20 seconds) and bradycardia (HR <60 bpm x 5 sec or <80 bpm x 15 sec if PCA <44 weeks or HR <50 bpm x 5 sec or < 60 bpm x 15 sec if PCA ≥44 weeks) quite commonly in apparently normal healthy term infants. They also documented a similar frequency of at least 1 extreme event (apnea >30 seconds; bradycardia < 60 bpm x 10 seconds if PCA <44 weeks or HR <50 bpm x 10 sec if PCA ≥44 weeks) amongst all term infants including those without any apparent risk for SIDS, siblings of infants who died of SIDS and those with an idiopathic, apparent life-threatening event (ALTE). Preterm infants had an increased risk of “extreme” events until 43 weeks PCA. However since the mean age of SIDS is later (45.8 weeks at the earliest for infants 24-28 weeks gestation and increasing to 52.3 weeks for term infants), we might conclude that these extreme events are not precursors to SIDS. Furthermore, use of CR monitors has failed to prevent SIDS, including in at least 2/6 infants who died during the CHIME study.

In their current policy statement regarding apnea, SIDS and home monitoring, the American Academy of Pediatrics quite clearly state “Home cardiorespiratory monitoring should not be prescribed to prevent SIDS.” So then, for whom is use of a CR monitor warranted?

CR monitoring may be helpful in preventing sudden death by other identifiable conditions. It is justified when it allows rapid recognition of apnea, airway obstruction, respiratory failure, interruption of supplemental oxygen supply or failure of mechanical respiratory support. Infants for whom these indications may apply include: (1) infants who have experienced an ALTE; (2) infants with chronic lung disease (bronchopulmonary dysplasia) requiring supplemental oxygen, continuous positive airway pressure, or mechanical ventilation; (3) infants with tracheostomies or anatomic abnormalities that make them vulnerable to airway compromise; and (4) infants with neurological or

metabolic disorders affecting respiratory control. The prescription of a CR monitor should however always be considered on an individual basis weighing all medical and social risk factors.

When prescribed, the AAP recommends the use of CR monitors with event recorders as well as an established plan by the physician for periodic review and termination. The data recorded on home monitors is crucial in determining when monitoring could be safely discontinued. Analysis of these events could also identify which infants may need further evaluation and/or intervention. Two important points must be mentioned. Monitor downloads provided by DME companies are not reliable in making clinical decisions. These tabular reports may contain many artefactual events such as “low amplitude respiratory signals” that the monitor is incapable of distinguishing from a true apnea. So, when there is a clinical concern the actual recorded tracings of each event should be reviewed. Also, current home monitors do not identify obstructive respiratory events. Using a special monitoring device called respiratory inductance plethysmography (RIP) the CHIME group found obstructive respiratory events to be present in 70% of “extreme” events. Since there is good correlation between obstructive events identified by RIP and overnight polysomnography, our current approach is to evaluate all infants with recurrent “extreme” events in the sleep lab.

Generally, monitoring for the preterm infant is not necessary beyond 43 weeks PCA unless there are remaining risk factors such as supplemental oxygen dependence or recent “extreme” events. Term infants with a recent ALTE should typically be monitored for six weeks after the index event as long as there are no further episodes. So in summary, CR monitors do have an important role in certain “at risk” infants but the pathophysiology of the underlying condition and the limitations of these devices should be clearly understood. LCK

References:

1. JAMA 2001; 285: 2199-2207
2. Pediatrics 2003; 111: 914-917

Asthma: When to refer a patient to a specialist?

Asthma is a common disorder often with its onset during early childhood. Its diagnosis is usually based on clinical grounds and does not require specialized testing. In fact objective testing may not be readily available for children <4 years of age. With rare exception (omalizumab), medications prescribed by specialists are fully available to the primary provider. Recommendations of when to prescribe these medications are also available in the form of consensus guidelines such as the Expert Panel Report (EPR-3) from the National Heart Lung and Blood Institute. After considering all of these factors, it is not surprising that primary providers may be unsure of when a specialist consultation is warranted.

The most common reason for asthma patient referral to our practice is failure to respond to prior treatment. In these children the problem may be one or more co-morbidities such as allergic disease, gastroesophageal reflux, incomplete adherence to prescribed medications, exposure to nonallergic irritants such as secondary cigarette smoke, immunological deficiency and vocal cord dysfunction. Both allergy skin prick and *in vitro* testing is available to guide environmental modifications, prescription and predicting clinical outcome. It is also not unusual that after an appropriate evaluation in refractory patients, the diagnosis of asthma is excluded and the correct cause of the patient’s symptoms (e.g. dysfunctional swallow, tracheomalacia, vocal cord dysfunction) is identified and treated.

Another reason for referring a patient is to establish the correct diagnosis whenever the clinical presentation is atypical. Common scenarios include the child with suspected “cough-variant” asthma or the athlete whose dyspnea does not respond to bronchodilators (vocal cord dysfunction, laryngomalacia, decreased level of cardiopulmonary fitness). Other situations that warrant diagnostic consultation include recurrent pneumonia, failure to thrive and onset of wheezing at age <3 months of life. Generally the younger the child, the less likely the cause of wheezing is asthma.

Once a diagnosis of asthma is established and treatment prescribed, NHLBI management guidelines recommend that patients be reassessed on a periodic basis. This assessment should include an objective measurement of lung function. When office-based spirometry is performed, patients with abnormal lung function should be referred for consultation even if they are asymptomatic. If office-based spirometry is not available in your practice then you may choose to consult us or refer the patient directly to the hospital-based pediatric pulmonary function laboratory (call 314-251-4811 to schedule). LCK

Candid Camera



Adam Eaton and I still had enough energy to smile for this photo last Saturday after completing a 100-mile ride over hilly roads in Hillsboro, MO. We would both love to have anyone who might have an interest in cycling to contact us...the more, the merrier.