

The Benefits of the Smart Monitor 2 in Assessing Premature Infants

In this feature, Neonatal Intensive Care interviews clinicians and healthcare providers about the actual application of specific products and therapies. This interview is with Pam Stading, MPH, RN NE-BC, Patient Care Manager, Cardiopulmonary Services for Children's Minnesota about the Smart Monitor 2.

The Smart Monitor 2 family of cardiorespiratory event monitors can be used in the hospital, as well as the home, to provide caregivers with an understanding of the physical vulnerabilities of at-risk preterm infants, low birth weight infants and those infants that have tested positive for opiates. In the clinical setting, Smart Monitor 2 PS (Professional Series) can be used to measure heart rate, respiration and O₂ saturation levels that can be evaluated to aid in step-down or discharge planning and follow-up care. Used as a diagnostic tool Smart Monitor 2 PS can document central apnea, bradycardia, hypopnea and other apparent life threatening events (aka BRUEs). In the home, Smart Monitor Home Care can alert anxious parents to potential BRUEs and provide clinicians with downloadable data they can access for interpretation and prescribe an appropriate course of care. In addition to monitoring preterm infants the monitors are cleared for pediatric and adult patients. The Smart Monitor 2 product line is the only FDA approved infant apnea monitor.

Apnea of prematurity is the most common problem in premature neonates. The earlier a baby is born before full term, the higher the likelihood of having apnea of prematurity. Smart Monitor 2 PS improves the bedside detection of apnea of prematurity and allows a physician to preset alarm limits for patients. These limits can be changed to accommodate the age related norms of this patient population.

Neonatal Intensive Care: The Smart Monitor 2 PS is used to assist in the bedside detection of apnea of prematurity. What has been your experience with the use of Smart Monitor 2 PS to detect apnea of prematurity?

Pam Stading: At Children's Minnesota, as a preterm infant approaches discharge, a Smart Monitor 2 PS may be placed on the infant for monitoring and recording purposes. The Smart Monitor 2 PS is interfaced with our nurse call system to alert bedside nurses of any violation in monitoring parameters. Further use of the Smart Monitor 2 PS unit is described more fully below.

Smart Monitor 2 PS has been used by some physicians to manage infants that may have subtle or intermittent problems such as cardiac conditions, seizures, parental neglect or abuse, or the onset of infections.

NIC: How has your institution used the Smart Monitor 2 PS to

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assist in the detection of these disorders? What other diagnosis has your institution been able to detect through the use of Smart Monitor 2 PS?

PS: The Smart Monitor 2 PS unit is the apnea monitor of choice in all of Children's Minnesota acute Medical/Surgical units when an infant is hospitalized with any apnea related diagnoses (ALTE/BRUE) or other diagnoses requiring the ability to monitor all clinical parameters (apnea, heart rate, and oxygen saturation).

The added feature of being able to record alarm conditions is invaluable for objective assessment of any alarms that occur during the hospital stay and evaluation.

The Smart Monitor 2 PS has contributed to the diagnosis of preterm infants with infections, and/or infants with seizures, cardiac conditions and Munchhausen Syndrome by Proxy.

NIC: What are some of the other ways your hospital has used the Smart Monitor 2 PS in the hospital?

PS: Children's Minnesota uses the Smart Monitor 2 PS to monitor and record apnea, heart rate and oxygen saturation when we perform diagnostic car seat evaluations.

We use the Smart Monitor 2 PS with our Smart Recorder to perform bedside 4-channel pneumogram recordings (continuous recordings).

Children's Minnesota also offers these bedside recording services to other neonatal and pediatric metro hospitals for diagnostic evaluations.

Children's Minnesota Apnea Program discharges infants requiring apnea monitoring in the home with Smart Monitor 2 Home Care.

The Smart Monitor 2 PS provides important documentation including multi-parameter recording of ECG, heart rate, respiration, SpO₂ when a preset alarm parameter is violated. These monitors provide near diagnostic quality waveforms to aid in the diagnosis and treatment of cardiac arrhythmias and respiratory anomalies. Having waveforms and documented events has clinical benefits.

NIC: How has your institution benefitted clinically with the use of Smart Monitor 2 PS and the recorded waveforms?

PS: In my opinion, the use of the Smart Monitor 2 PS with associated multi-parameter event recordings is why this monitor

is set apart from all other bedside monitoring options. The ability to record any alarm conditions to download and review actual waveforms of the alarm condition provides objective clinical information useful to determine clinical interventions that may be necessary (caffeine citrate, home monitoring, and/or other diagnostic testing).

There is no standardization as to how long to keep premature infants in the NICU. Many nurseries will put infants that are otherwise ready to be discharged (taking feedings well, able to maintain their temperature and growing) on a 5-7 day apnea-bradycardia watch. Physicians have used the Smart Monitor 2 PS to track the progress of these premature infants to determine the eligibility of discharge.

NIC: How has your facility utilized Smart Monitor 2 PS to determine if a premature infant should be discharged?

PS: In our neonatal areas, when a preterm infant has reached a stable feeding regimen and growth pattern, maintaining their body temperature and not experiencing monitor alarms resulting in the need for vigorous stimulation, we will place the Smart Monitor 2 PS for a 12-18 hour recording period at the bedside. The bedside nurse documents feeding times and any alarms that may occur during this recording period. This information is downloaded, scored and a report prepared through the Synergy-E software for the Neonatologist managing the infant's hospitalization. The waveforms from the recording are available for the Neonatologist to view as well.

This objective recording information, along with other clinical preterm infant information is used to determine the infant's readiness for discharge.

The Smart Monitor 2 PS provides important documentation including multi parameter recording of ECG, heart rate, respiration, SpO₂ when an alarm or record setting is violated. The monitor provides near diagnostic quality ECG waveforms that aid in the diagnosis and treatment of cardiac arrhythmias and respiratory anomalies. The data can be downloaded into the Synergy-E software analyzed and sent to the physician for patient assessment. These summarized reports can become part of the patient's MDR. The reports available in Synergy-E software are patient event report, equipment report, summaries report and monitor compliance report.

NIC: How does your facility use these reports to assess the patient?

PS: As previously mentioned, when a Smart Monitor 2 PS overnight bedside recording is completed, our Special Diagnostic Cardiopulmonary Technologist team downloads the recorded information into the Synergy-E software for alarm waveform review and scoring. Our trained staff reviews the recorded data, scores the data (deleting false alarms, saving and printing real alarm waveforms) and prepares the final printed report. The report is made available to the Neonatologist for their interpretation.

The Synergy-E report is saved directly to our electronic medical record. The Neonatologist dictates the interpretation and this is transcribed directly to the Synergy-E report.

Premature infants that are being discharged from the NICU/hospital are known to be at risk for apnea, bradycardia and oxygen desaturation while in the upright position. The Smart

Monitor 2 PS is a great tool for administering the Car Seat Challenge. The test verifies the cardiac and respiratory stability of the preterm infant while in the upright position. The car seat challenge is recommended by the American Academy of Pediatrics when discharging any newborn at less than 37 weeks gestational age, or low birth weight even at full term.

NIC: What experience have you had with car seat testing using the Smart Monitor 2 PS?

PS: At Children's Minnesota, the initial car seat screening is completed at the bedside by the neonatal unit nurse. However, if the infant fails this initial screen or if the infant has other high risk problems (airway anomalies creating significant risk for airway obstruction, abnormal neurological exam resulting in abnormal muscle tone or head control, or significant anatomical CNS abnormalities) a diagnostic car seat evaluation is recommended.

This evaluation is done by a 4-day car seat certified Cardiopulmonary Technologist. The evaluation is attended by the technologist for the entire duration of the test.

The infant is placed in the car seat for a minimum of 90 to 120 minutes and monitored and recorded with the Smart Monitor 2 PS.

Following the recording period, the Smart Monitor 2 PS is downloaded and a report of the monitoring period is provided to the Neonatologist in order to objectively assess the infant's clinical status while in the car seat.

Apnea of prematurity may not resolve at term and may persist for some time after hospital discharge. These babies should be considered for home monitoring if apneas and bradycardias persist as discharge nears. Consideration for home monitoring of preterm infants is often a part of discharge planning. The reasons for considering home monitoring are:

- When apnea of prematurity is unresolved by discharge date
- Infants have experienced high risk BRUEs
- When infants have subtle or intermittent problems like cardiac conditions, seizures or the onset of infections
- Infants discharged with caffeine citrate therapy
- Enables physicians to manage discharged infants with conditions that may affect breathing, heart rate or O₂ saturation

NIC: How does your hospital handle the decision to monitor discharged infants in the home? What are the benefits of monitoring in the home for the infant and their family?

PS: At Children's Minnesota, the decision to discharge an infant on a home monitor is multifaceted. The decision is made using information about the infant's current clinical status, diagnostic testing results (Smart Monitor 2 PS recording or 4-channel pneumogram recording), the need for caffeine citrate in preterm infants at the time of discharge, parental input and Neonatologist recommendation. Each infant is assessed on a case-by-case basis.

In most cases, the decision to monitor the infant in the home is comforting to the parent as they know they would be alerted to any potential life threatening situation after discharge.

Once the decision to monitor in the home is made, a referral to the Apnea Program is made.

The Apnea Program provides a benefit to the family in the home as they are able to be discharged earlier, in most cases. The family has a medical team in place for the course of the home monitoring. Apnea monitoring in the home for the infants that need it allows a safe, inexpensive transition to home from the inpatient neonatal unit.

The cost of keeping an infant in the NICU is expensive. Some facilities will put an infant on a 5-7 day apnea/bradycardia watch prior to discharging the infant.

NIC: With the ability to monitor the infant with Smart Monitor 2 Home Care in the home what are the cost savings benefits of an early discharge for the hospital?

PS: Certainly the ability to send an otherwise stable, growing preterm infant home safely on a home apnea monitor will reduce the hospital stay by several days, if not more. This saves considerable amounts of money.

Although each infant is different, we believe we save a minimum of 2-3 additional nights in the hospital.

NIC: How does home monitoring allow physicians to manage premature infants that have been discharged from the hospital?

PS: At Children's Minnesota, all infants discharged on home apnea monitor are enrolled in the Apnea Program.

The Apnea Program is medically directed by Children's Minnesota Neonatology Services providing in-home clinical management of the monitor. The same Neonatologists stay involved with the management of unresolved apnea of prematurity (or other conditions warranting home monitoring) until the infant can safely have their in-home apnea monitor discontinued. This medical management model provides consistency from the inpatient hospitalization throughout the course of home monitoring.

Prior to discharge, the Apnea Program nurses meet with individual families to train them on the use of the monitor, alarm intervention, record keeping and review of apnea protocols to be able to discontinue the home monitor. All families are trained in infant CPR and aiding the obstructed infant.

We provide 24/7 availability for families to call with questions or alarm status changed.

We download the in-home apnea monitors on a routine basis as determined by our Apnea Program protocols.

The decision to discontinue the home monitor is based on in-home monitor download results, parent reports, Apnea Program nurse input and Apnea Program Medical Director recommendations.

Physicians will discharge an infant with a prescription for home monitoring using a Smart Monitor 2 Home Care. This requires the hospital to have a relationship with a home care company that provides home monitoring services. The home care provider should set up the monitor in the NICU prior to discharge to enable the family to become familiar with the equipment and the alarms. The care givers of an infant being discharged with the Smart Monitor 2 Home Care should also be trained in CPR. Parents room in with their baby the last night in the hospital. The NICU training reduces caregiver

anxiety and allows them to participate in the care of their infant.

NIC: How has having a good working relationship with your local durable medical equipment provider benefited the hospital's Apnea Program?

PS: Children's Minnesota does not have our own Durable Medical Equipment (DME) service. We rely exclusively on our local pediatric only based DME provider—Pediatric Home Service. They provide our preferred home monitor equipment for our families. We use the Smart Monitor 2 Home Care units for in the home.

Pediatric Home Services provides the technical monitor education and monitoring supplies for our families. They provide home visits, when necessary, to facilitate direct monitor downloads. This downloaded information is sent directly to the Apnea Program. This information is scored, reviewed and a report is generated for the Apnea Program Providers to interpret and direct in-home clinical management of the monitor.

Circadiance develops, manufacturers and markets remote patient monitoring and respiratory therapy products. Our clinically proven, innovative solutions address patients ranging from premature newborns to elderly. Circadiance products deliver superior patient comfort in the home care and acute care settings, ultimately resulting in reduced cost of care and improved patient outcomes.