

Research at a Glance

Unlocking the 'black box' of NICU monitors to protect vulnerable preemies

What's known:

Around the world, some 15 million infants are born prematurely each year. Babies born prematurely can spend their first weeks to months of life in the neonatal intensive care unit (NICU) tethered to machines that closely monitor vital signs, such as breathing and heart rate.

After discharge, preemies have a very high risk of returning to the NICU, often due to breathing difficulties, such as experiencing excessively long pauses between breaths. Such acute life-threatening events are a major cause of preemies' hospital readmission and may result in death.

What's new:

During infants' NICU stays, cardiorespiratory monitors amass a mountain of data about each child. Through the unprecedented collaboration of researchers working in various divisions of Children's National Health System, the team was able to unlock that black box of information by creating algorithms to extract data and by using retrospective analyses to tease out new insights. This multidisciplinary team has been able to predict with a greater degree of precision which babies are at higher risk of returning to the NICU after discharge. What these most vulnerable preemies have in common is the degree of maturation of their autonomic nervous system, which controls such involuntary actions as heart rate and breathing. The sympathetic nervous system, which the body leverages as it copes with the stress of life-threatening events (ALTE), also plays a role in these infants' heightened vulnerability. Being able to identify these newborns earlier has the potential to lower readmissions and save lives.

Questions for future research:

- Q:** How can further computer-based analyses of NICU monitor data be used to determine how preemies respond to routine activities, such as feeding to predict which infants have compromised cardiorespiratory systems?
- Q:** What are the potentially modifiable risk factors and "windows of opportunity" for early interventions to prevent cardiorespiratory instability in premature infants?
- Q:** How can we develop a test to assess all premature infants for physiologic readiness for safe NICU discharge and, thus, prevent ALTE and sudden death in this vulnerable population?