
Neonatal Care: Better Access To Cool Caps Improves Outcomes, Lowers Cost Of Treating Asphyxia In Newborns

The findings demonstrate through a computer-based modeling technique, that better availability and placement of "CoolCaps" within a regional healthcare system could lead to a 23 percent reduction in the number of newborns likely to develop permanent damage from hypoxic-ischemic encephalopathy (HIE), a form of asphyxia that damages the central nervous system. In Massachusetts, this would produce estimated annual savings of \$4.4 million.

"Our analyses confirm that making more cooling caps more available in hospitals can save lives and achieve significant reductions in severe neurodevelopment impairment in babies," said study co-author James Gray, MD, MS, Department of Neonatology at BIDMC, and the Division of Newborn Medicine at Harvard Medical School. "Importantly, these improvements can be achieved while lowering the costs of care for this group of critically ill infants."

Of the more than four million newborns treated in neonatal intensive care units (NICUs) each year, one in 1,000 suffer from HIE. This condition is caused by a lack of oxygen and blood flow to the brain and can lead to cerebral palsy, mental retardation, blindness or deafness. By using a selective head cooling (SHC) device within a few hours of birth, newborns' body temperature can be decreased by three to four degrees Celsius, thereby limiting or even eliminating damage to the newborn's brain.

The research team, led by Gray and John Zupancic, MD, ScD, Department of Neonatology at BIDMC and Division of Newborn Medicine, Harvard Medical School, used a computer-based industrial modeling technique known as discrete event simulation to examine potential health benefits of making the cooling devices more widely available.

Currently used in other industries, such as manufacturing, airport and shipping operations, the simulation has only recently been applied to healthcare. Researchers modeled the care and subsequent outcomes of all infants born in Massachusetts over a one-year period (approximately 76,000) and assessed how best to distribute the devices to the 24 NICUs throughout the area.

"Neonatal intensive care is highly regionalized, and as a result of the increased distances, access to life-saving technology may not be timely for all patients," explained Zupancic. "By borrowing innovative problem-solving techniques from other industries, we can establish how to achieve improved efficiency and decreased costs across complex health care systems," he said.

The Harvard researchers used estimates showing that the treatment of HIE-related disabilities costs the health care system \$900,000 per patient, including medical and non-medical costs associated with children requiring assistance for the rest of their lives. Several scenarios were tested varying the location and number of SHC devices across the state. The team plugged in specific data on ambulance transportation times and infant health, as well as economic data on hospital, physician, and treatment costs from the 2006 Center for Medicare and Medicaid Services' Hospital Cost Report.

This research was published in the January 2008 issue of Pediatrics.

The study was funded by a grant from the Institute for Health Technology Studies (InHealth), a Washington, D.C. nonprofit organization that supports research and analysis of the economic, social, and health effects of patient access to medical technology innovation.

Adapted from materials provided by InHealth: The Institute for Health Technology Studies.

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Published on : Tue, 8 Jan 2008