

Newborn Screening Cost-Effective in Detecting Rare but Treatable Genetic Disease

PHILADELPHIA, PA -- November 3, 2003 -- Screening newborns for a rare but treatable genetic disease benefits families and society, according to a team of pediatricians and health care economists who analyzed patient records and data from mass screening programs in several states. The study appears in the November issue of *Pediatrics*.

The researchers, from The Children's Hospital of Philadelphia and The University of Pennsylvania School of Medicine, analyzed the cost-effectiveness of screening for medium-chain acyl-CoA-dehydrogenase deficiency, or MCADD. An inherited metabolic disease that impairs energy production from stores of body fat, MCADD may go undetected until it causes childhood death or brain damage.

"Our research showed that screening newborns for MCADD is cost-effective compared to not screening," said Charles P. Venditti, M.D., Ph.D., the study's corresponding author. "Furthermore, as automated screening technology continues to enable expanded newborn screening for many genetic diseases, we may find similar benefits for other diseases." (A specialist in pediatric biochemical genetics at the University of Pennsylvania and The Children's Hospital of Philadelphia during the period of the study, Dr. Venditti is now at the National Human Genome Research Institute of the National Institutes of Health.)

Drawing on records of 32 patients with MCADD treated at Children's Hospital over a 30-year period, the researchers compared results for two hypothetical groups of patients, one that did not undergo newborn screening, another group that did receive the screening. Using decision-modeling methods, the researchers computed the costs of hospitalizations and lifetime medical services for chronic disease. "We found the cost of newborn screening for MCADD to be well below the accepted costs for other health care interventions, such as acute newborn intensive care or newborn hearing screening," said Dr. Venditti.

The current study considered the use of a recent technology called tandem mass spectrometry (TMS), which employs automated technology to detect particular biochemicals in a sample of newborn blood. An abnormally high value for certain fatty acids, amino acids or other chemicals may signal a genetic defect in how the body processes food. TMS can screen for more than 30 metabolic diseases. Many of these diseases are rare, but collectively they affect one in 4,000 newborns, approximately the same percentage affected by Down syndrome.

Routine newborn screening has been carried out in all 50 states since the 1970s for genetic diseases such as phenylketonuria (PKU) and congenital hypothyroidism, with a handful of other diseases added over the years on a state-by-state basis. The recent development of the TMS technique has greatly expanded the number of diseases that can be detected, but less than half of U.S. newborns receive TMS testing. TMS uses the same sample of blood required for the conventional screening tests.

Based on TMS statistics, the authors estimate MCADD to occur in 1 in 15,000 newborns, making it equally as common as PKU. Both diseases are devastating if untreated, but when managed, allow patients a normal quality of life.

"MCADD is a particularly sneaky disorder," said Charles A. Stanley, M.D., senior author of the study and chief of Endocrinology at The Children's Hospital of Philadelphia. "A child with undetected MCADD can be perfectly normal, then get a viral illness and stop eating. After 12 hours of fasting, a child can become extremely ill and go into a life-threatening crisis. The MCADD defect interferes with metabolizing fat that the child needs for producing energy." The metabolic crisis can inflict heart failure, brain damage or even death. Some unexpected infant

deaths, first attributed to sudden infant death syndrome, were later found to be the result of previously undiagnosed MCADD.

Dr. Stanley led the Children's Hospital research team that discovered MCADD in 1983, simultaneously with independent reports from the University of Iowa and researchers in Denmark. It was the first fatty acid oxidation defect to be identified. Over the years, he has followed some two dozen patients with MCADD, some of whom had severe outcomes. He added, "I'm delighted to see a screening program applied to this very treatable disorder."

"Unlike some other metabolic diseases," say the study's authors, "the complications of MCADD are preventable." Parents and caregivers who know a child has MCADD must be vigilant that the child does not miss feedings. If a child cannot eat for some reason, parents bring the child to a hospital to receive intravenous nourishment and prevent disease complications. When the researchers projected their cost model over a 70-year period, they predicted that the savings obtained by avoiding the medical costs of undiagnosed disease would offset nearly all the additional costs of screening for MCADD. "It is plausible that newborn screening might even provide net savings to society, compared to the costs of not screening," said Dr. Venditti. "For instance, some studies suggest that people with asymptomatic MCADD, who have less severe forms of the disease than we find in children, may have higher risks of death and illness than people without MCADD. At the present time, we are not certain how many patients exist in this category."

In addition to Drs. Venditti and Stanley, other co-authors were Laura Venditti, M.Sc., and Henry Glick, Ph.D., both health economists from the University of Pennsylvania School of Medicine; and Gerard Berry, M.D., Paige Kaplan, M.D., and Edward Kaye, M.D., of the Division of Human Genetics and Molecular Biology at The Children's Hospital of Philadelphia.

SOURCE: Children's Hospital of Philadelphia