Institutional Affiliation: ANNE ARUNDEL MEDICAL CENTER

Solution Title: CONGENITAL HEART DISEASE SCREENING IN THE NEWBORN

Program/Project Description

Congenital heart defects in general, and newborn screening programs for critical congenital heart disease (CCHD) specifically, have become new public health priorities in the United States. In the United States, about 4,800 (or 11.6 per 10,000) babies born every year have one of seven critical congenital heart defects:

- Hypoplastic left heart syndrome
- Pulmonary atresia
- Tetralogy of Fallot
- Total anomalous pulmonary venous return
- Transposition of the great arteries
- Tricuspid atresia
- Truncus arteriosus

These seven types of CCHD usually present in newborns with hypoxemia that might be missed clinically but identified by pulse oximetry. It is estimated that at least 280 infants with an unrecognized CCHD are discharged each year from newborn nurseries in the United States. These babies are at risk of having serious complications within the first few days or weeks of life and often require emergency care.

Newborn screening for CCHD, added in September 2011 to the Recommended Uniform Screening Panel in the United States, is a new public health priority and has particular relevance for state birth defects surveillance programs.

Goals:

1. Conduct screening on all newborns at Anne Arundel Medical Center to identify those newborns with structural heart defects that are usually associated with hypoxia in the newborn period and could result in morbidity or mortality early in life.
2. Goal: At least 80% of babies to be reported as screened in the first quarter of implementation with an increase each quarter over the first year.

Process:

The quality improvement project included the following steps:

- Identified and engaged key stakeholders.
• Formation of a multidisciplinary team including physicians, nurses, administration, and ancillary staff to develop standard newborn screening tools for CCHD.
• Multidisciplinary meeting to determine implementation plan including hospital screening protocol and equipment, follow up for newborns with failed screens, screening in NICU, documentation and reporting.
• Cindy Mueller developed the Mueller CCHD Screening Table as a tool to determine if a newborn has passed the screening, needs to be rescreened according to the protocol or has failed and needs further testing. This screening table standardized the process used by staff to determine next steps with ease.
• Engaged clinical providers including Pediatricians, Cardiologists, Neonatologists, Obstetricians and Nurse Midwives participated in a quality improvement project for standard work in identification of CCHD.

Solution:

Mandatory staff education provided screening and follow-up of positive screens done appropriately. A variety of training methods were used including Webinar attendance, self-learning packets with scenarios, presentation by a Cardiologist at Pediatric Service meeting and formal lectures. Completion of a knowledge assessment quiz was required for all the nursing staff. Trainings are provided accordingly for newly hired staff to ensure that 100% of staff is educated.

Newborns are now screened between 24-48 hours of age. Premature infants in the NICU are screened when the carseat test is performed. All newborns that fail the CCHD are transferred to the NICU for evaluation.

Measureable Outcomes:

We have successfully implemented Critical Congenital Heart Disease Screening on newborns at Anne Arundel Medical Center. We have not identified any newborns that were undiagnosed prenatally with any of the seven Critical Congenital Heart defects. There were two infants with underlying respiratory illness identified as a result of CCHD screening. Inclusion of pulse oximetry screening in newborn care did not result in a strain on pediatricians, neonatologists or ECHO technicians due to additional evaluations of outcomes failed screens.

Implementation of CCHD screening began on September 1, 2012. From September 2012 - November 2012, of 1381 eligible newborns, 1350 newborns were screened.

Outcomes data reported by the State:

9/2012  88% screened
Over first 3 months, 78% of infants were reported as being screened; during the fourth month, November 87%, infants were reported as being screened for CCHD. According to recent data Anne Arundel Medical Center has met goal of 100% infants are being screened before discharge.

<table>
<thead>
<tr>
<th>September 2012</th>
<th>Total Newborns Screened or Medical Override</th>
<th>Percent of Newborns Screened</th>
<th>Percent of Newborns who Passed Screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anne Arundel Medical Center</td>
<td>444</td>
<td>88%</td>
<td>99.8%</td>
</tr>
<tr>
<td>State of Maryland</td>
<td>4353</td>
<td>77%</td>
<td>99.8%</td>
</tr>
</tbody>
</table>

**Sustainability:**

Sustainability is maintained by using the standard screening tools and guidelines when assessing the newborns before discharge. The State of Maryland is using standard tools and guidelines as well as sharing with other States the current tools. This will provide reliable data for successful outcomes in screening for CCHD.

**Role of Collaboration and Leadership**

Cindy Mueller was sponsored by Sherry Perkins PhD, RN, Chief Nursing Officer/Chief Operating Officer to participate at the State level for CCHD education and planning. Cindy was supported by NICU Clinical Director and selected as a team member for one of the 20 multidisciplinary teams forming a collaborative around CCHD screening in newborns. The support of many leaders throughout the State and area hospitals provided the time to develop partnerships and create a standard tool for successful CCHD screening tool with education and protocols to all staff, families and communities. The key elements of the program allowed on-site learning through participation in both the annual all-cohort conferences and regional meetings. In addition, there were distance learning through interactive-webinars and e-Learning events, coaching and technical assistance provided by expert practitioners and specialists that provided the foundation to develop the new screening tools. Most of the work was led by National Leadership Academy for the Public’s Health (NLAPH).
Innovation:

The multi-collaborative teamwork and development of the CCHD screening tool exemplify patient safety measures to assure newborns assessments for CCHD before discharge are completed and leave little to no error in missing components. The design of the Mueller screening table provides a pictorial view to simplify the reading of the CCHD results to assure a safety net for all practitioners engaged in reading the results. These opportunities in sharing knowledge led Cindy to develop the Mueller table has provided a standard measure for safe assessment and results.

Related Tools and Resources

![Mueller CCHD Screening Table](image-url)
Critical Congenital Heart Disease (CCHD) Screening Algorithm - AAMC

Newborn is screened between 24 and 48 hours of age. If newborn is being discharged before 24 hours of age, screening is done shortly before discharge.

Screen

- < 90% in right hand or foot = Positive Screen (Failed Test)
- 90% - 94% in right hand and foot or >3% difference between right hand and foot
- >95% in right hand or foot and <3% difference between right hand and foot = Negative Screen (Passed Test)

Repeat screen in 1 hour

- < 90% in right hand or foot = Positive Screen (Failed Test)
- 90% - 94% in right hand and foot or >3% difference between right hand and foot
- >95% in right hand or foot and <3% difference between right hand and foot = Negative Screen (Passed Test)

Repeat screen in 1 hour

- < 90% in right hand or foot = Positive Screen (Failed Test)
- 90% - 94% in right hand and foot or >3% difference between right hand and foot
- >95% in right hand or foot and <3% difference between right hand and foot = Negative Screen (Passed Test)

Positive Screen (Failed Test)
Call NICU NNP; Transfer baby’s care to Neonatology Service

Negative Screen (Passed Test)
Continue normal newborn care

Contact Person:

Title: Cindy Mueller BSN, RN
Email: cmueller@aahs.org
Phone: 410-991-5037
References

