QENDRA SPITALORE UNIVERSITARE "NËNË TEREZA"

Pulse-oximetry role in early detection of Critical Congenital Heart Disease.

Albert Koja[1], Numila Kuneshka[1], Niketa Kolici[2]

[1]Cardiopediatrician, HUC"Nene Tereza" Tirana, Albania.

[2]Neonatologist, American Hospital, Tirana, Albania.

Background

Congenital heart disease is the most common birth defect and represents nearly 24-40% of all deaths caused by congenital anomalies.1 Critical congenital heart disease (CCHD), which encompasses the more severe forms, is present in 2.5 to 3 in 1000 live births.2 In general, prenatal ultrasound or physical examination alone can easily miss newborns with CCHD.3,4 Failure to diagnose CCHD early in life can result in high morbidity and mortality rates, because symptoms frequently present after closing of the pulmonary ductus arteriosus, after nursery discharge. Pulse-oximetry screening is a low-cost, painless, noninvasive test that increases the ability to identify newborns with CCHD before they clinically decompensate.5–8

The AHA (American Heart Association) has endorsed newborn pulse-oximetry screening to capture these infants prior to hospital discharge. Despite the urgency of diagnosis, CCHD is missed 1 in 3 newborns. Pulse-oximetry screening is a low cost, noninvasive and painless bedside diagnostic test that can be completed by a technician just in 45 seconds. Many studies sow that Pulse-oximetry screening for CCHD has a less than 1% chance of giving false positive results.

Objective

To develop strategies for the implementation of safe, effective, and efficient screening.The aim of our study is to increase the pre-detection rate of newborns with CCHD before the symptoms appear.

Methods

We prospectively enlisted well newborn term and near term infants from January 2017 to December 2020 in a non- public Maternity structure. All pregnancies was followed according approved protocols with fetal morphologic ultrasound and with cardiac fetal consultation in all cases suspected for CCHD by cardiologist .

Near 24 hours of life trained nursing staff performed pulse- oximetry on the right hand and either foot, using an EDEN-H100B pulse oximeter. Those with saturations > 95% with 3% difference between hand and foot measurements passed. Infants with saturations< 86% failed. Infants with saturations between 86-94% or ≥3% difference in saturations were tested again up to 2 additional screens in room air with standard sea level protocol. Providers were notified and echocardiograms ordered for all infants deemed to have failed.

Results

A total of 3205 infants completed the protocol. 0.7% of CCHD screening were made before 24 hours of life, 96.6% after the first 24 hours and 2.7% of newborns have been discharged without CCHD screening. We found 2 case with CCHD (ductus dependent) during the CCHD screening at 24 h of life. Diagnosis was confirmed with heart ultrasound. Prostaglandin was started immediately till surgical intervention had place.

We had only 1 case with CCHD (ductus dependent) the CCHD screening could not discover. None of the infants fall the CCHD screening.

Conclusions

Screening for low blood oxygen saturation through the use of pulse-oximetry monitoring to detect CCHD in well-infant and intermediate care nurseries is a low cost, non invasive and painless bedside diagnostic test, especially in countries with limited resources.

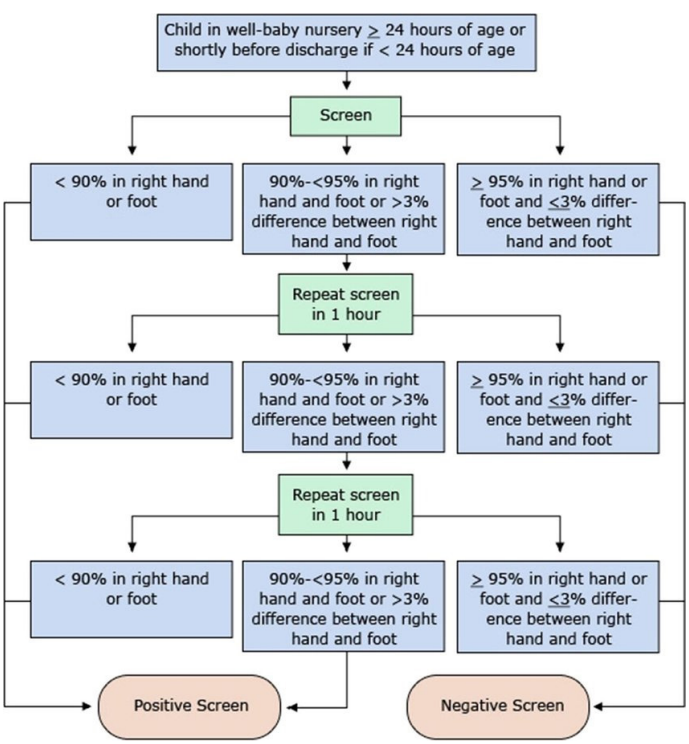
Most of CCHD are ductus dependent and 30% could not discover by CCHD screening. A second screening should be done at e second moment, maybe before discharge.

The sensitivity of our pulse oximeter should be revised.

Additional research is needed specifically addressing sensitivity and positive predictive value for screening at moderate altitudes.

Key words: Newborns, CCHD, pulse oximeter.

Algorithm for pulse oximetry screening CCHD



References

1. American Heart Association. Common Types of Heart Defects. 2012. Available at: http://www.heart.org/HEARTORG/Conditions/CongenitalHeartDefects/AboutCongenitalHeart Defects/Common-Types-of-Heart-Defects_UCM_307017_Article.jsp. Accessed June 12, 2012.

2. Reller MD, Strickland MJ, Riehle-Colarusso T, Mahle WT, Correa A. Prevalence of congenital heart defects in metropolitan Atlanta, 1998–2005. J Pediatr. 2008;153:807– 813.

3. Go AS, Mozaffarian D, Roger VL, et. al. Heart disease and stroke statistics—2013 update: a report from the American Heart Association. Circulation. 2013;127:e6-e245

4. Ewer A, Furnston A, Middleton L, et al. Pulse oximetry as a screening test for congenital heart defects in newborn infants: a test accuracy study with evaluation of acceptability and cost-effectiveness. Health Technol Assess. 2012;16(2). Available at: http://www.hta.ac.uk/fullmono/mon1602.pdf. Accessed June 13, 2012.

5. Chang R-KR, Gurvitz M, Rodriguez S. Missed Diagnosis of Critical Congenital Heart Disease. Arch Pediat Adol Med. 2008;162(10):969–974.

6. Riehle-Colaruss T, Mahle WT, Correa A. Death due to delayed diagnosis of congenital heart disease: a contemporary population-based study. Congenit Heart Dis. 2007;2:376. Abstract.

7. Kemper AR, Mahle WT, Martin GR, et al. Strategies for Implementing Screening for Critical Congenital Heart Disease. Pediatrics. 2011;128(5):e1259–e1267.

8. Warnes CA, Williams RG, Bashore TM, et al. ACC/AHA 2008 Guidelines for the Management of Adults With Congenital Heart Disease: Executive Summary. Circulation. 2008;118(23):2395–2451.