



CCHD Screening

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Background- CCHD

- About 25% of congenital heart disease is considered “critical”
- Diagnosis now relies on prenatal diagnosis or neonatal signs/symptoms
- Delayed diagnosis of CCHD causes increased morbidity and mortality
- Pulse ox screening of newborns can improve detection of CCHD when combined with a thorough exam



2011 Legislation

- Original legislation (January 2011) to mandate screening effective 7/1/11
- Amended to mandate Advisory Council to evaluate and submit legislative report 12/31/11
- Required Maryland to follow recommendation of Secretary Sebelius

2011 Legislation

- Legislative report available at <http://fha.dhmf.maryland.gov/genetics/documents/CCHDLegisRpt.pdf>
- In September 2011, CCHD Screening was adopted to RUSP





Implementation

- National Leadership Academy for the Public's Health
- A Project of the Center for Health Leadership and Practice (CHLP), Public Health Institute (PHI) - Oakland, CA and funded by the Centers for Disease Control (CDC):
 - Cynthia Mueller, RN, BSN
 - Dianna Abney, MD, MPH
 - Carissa Baker-Smith, MD, MPH
 - Debbie Badawi, MD



Advisory Panel for CCHD Screening

- Carissa Baker-Smith, MD MPH
- Miriam Blitzer, PhD
- Charlene Bennett, RN
- Carrie Blout, MS, CGC
- Elizabeth Bradshaw, MSN, RN, CPN
- Joel Brenner, MD
- David Bromberg, MD
- Debbie Burke, RN
- Maria Cardona, MD
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- Anne Eder
- Julie Hoover-Fong, MD, PhD
- Renee Fox, MD
- Maureen Gilmore, MD
- Tanya Green, MS, CCC-A
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- Linda Grogan, RNC, BSN, MBA
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- Sandra Heeley, RN
- Kimberly Iafolla, MD
- Julie Kaplan, MD
- Edward Lawson, MD
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- Neil Porter, MD
- Geoffrey Rosenthal, MD, PhD
- Ann Sober, RN, BSN
- Philip Spevak, MD
- Johnna Watson, RN, BSN
- Anika Wilkerson
- S. Lee Woods, MD, PhD

Implementation

- Screening
- Evaluation of Abnormal Results
- Recording Results
- Surveillance



Screening

Baby's First
Test video

http://www.youtube.com/watch?feature=player_embedded&v=Lif7kSgHfkw



The Goal for CCHD Screening

- Identify those newborns with structural heart defects usually associated with hypoxia in the newborn period that could have significant morbidity or mortality early in life with closing of the ductus arteriosus or other physiologic changes early in life.



Screening

- All babies should be screened prior to discharge
- NICU's need to develop protocols for screening (Lakshminrusimha S et. al, e-Journal of Neonatology Research Volume 2, Issue 2, Spring 2012)
- performed by a health professional whose scope of practice includes performing pulse oximetry



Screening

When:

- 24-48 hours of age is ideal
- must be >12 hours old
- while the infant is awake and quiet if possible
- avoid performing pulse oximetry on a crying or cold infant

Where:

- quiet area
- with parent present to soothe and comfort the infant (if possible)



Screening

- Machines should be motion-tolerant (approved for neonates).
- Pre and Post-ductal saturations needed (right hand and one foot).



Right Hand Application Site (preductal)



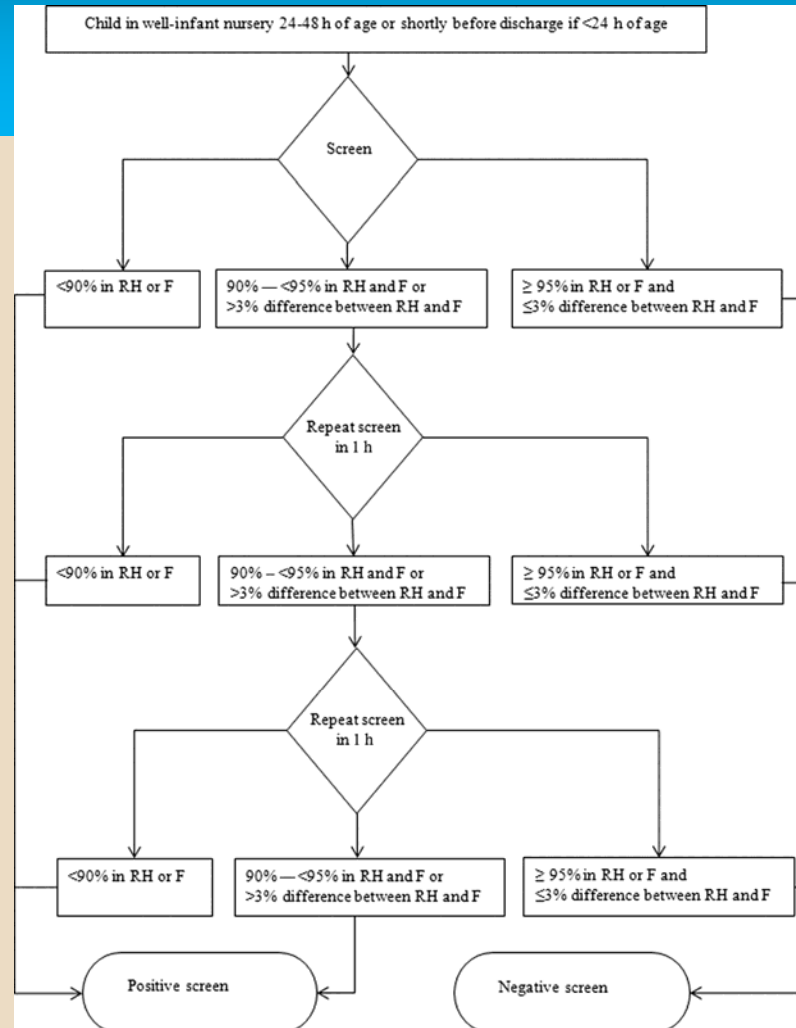


Foot Application Site (postductal)

- Wrap the probe around the outside of the infant's foot (postductal).
- Place the light emitter on the top of the foot, with the photodetector directly opposite on the bottom of the foot.

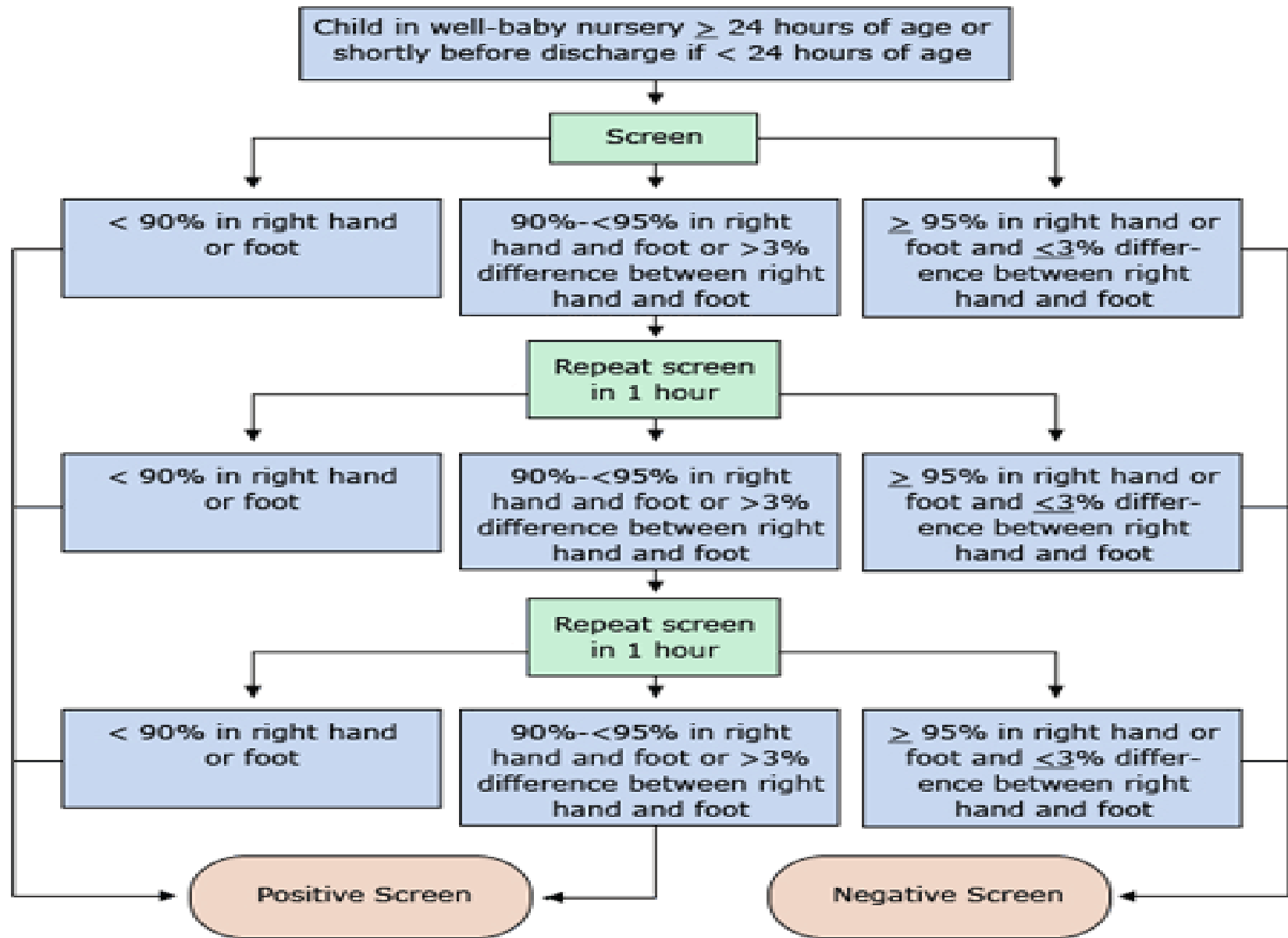


The proposed pulse-oximetry monitoring protocol based on results from the right hand (RH) and either foot (F).



Kemper A R et al. Pediatrics 2011;128:e1259-e1267

PEDIATRICS[®]





Screening

- **Any infant with sats $\leq 90\%$ in the RH or foot has failed and must be evaluated by the attending clinician.**
- If sats are 90 - $<95\%$ in RH and foot, or if there is $> 3\%$ difference between RH and foot, repeat in 1 hour.
- If still abnormal screen after repeat X 2, screen is failed and baby must be evaluated.



Mueller CCHD Screening Table

Green= Negative Screen (PASS)
 Red=Rescreen in 1 hour
 Red for 3 consecutive screens= Positive Screen (FAIL)
 Red= Automatic Positive Screen (FAIL)

RIGHT HAND	FOOT											<90
100	100	99	98	97	96	95	94	93	92	91	90	*
99	100	99	98	97	96	95	94	93	92	91	90	*
98	100	99	98	97	96	95	94	93	92	91	90	*
97	100	99	98	97	96	95	94	93	92	91	90	*
96	100	99	98	97	96	95	94	93	92	91	90	*
95	100	99	98	97	96	95	94	93	92	91	90	*
94	100	99	98	97	96	95	94	93	92	91	90	*
93	100	99	98	97	96	95	94	93	92	91	90	*
92	100	99	98	97	96	95	94	93	92	91	90	*
91	100	99	98	97	96	95	94	93	92	91	90	*
90	100	99	98	97	96	95	94	93	92	91	90	*
<90	*	*	*	*	*	*	*	*	*	*	*	<90



Negative Screen (PASS)

- $\geq 95\%$ in either extremity with $\leq 3\%$ absolute difference in oxygen saturation between the upper and lower extremity
- The **Green** Section of the Table



Screening

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- **Red**=Rescreen in 1 hour
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97	100	99	98	97	96	95	94	93	92	91	90	*
96	100	99	98	97	96	95	94	93	92	91	90	*
95	100	99	98	97	96	95	94	93	92	91	90	*
94	100	99	98	97	96	95	94	93	92	91	90	*
93	100	99	98	97	96	95	94	93	92	91	90	*
92	100	99	98	97	96	95	94	93	92	91	90	*
91	100	99	98	97	96	95	94	93	92	91	90	*
90	100	99	98	97	96	95	94	93	92	91	90	*
<90	*	*	*	*	*	*	*	*	*	*	*	<90

Green= Negative Screen (PASS)
 Red=Rescreen in 1 hour
 Red for 3 consecutive screens= Positive Screen (FAIL)
 Red= Automatic Positive Screen (FAIL)



Positive Screen (FAIL)

- ANY Oxygen Saturation $<90\%$ (the **RED** *)
- O₂ Saturation 90-95% in both extremities on 3 measures, each separated by 1 hour
- 90-95% in either extremity with $>3\%$ difference in oxygen saturation between the upper and lower extremity (the **RED** Section of the Table) on 3 measures, each separated by 1 hour



Screening

- Protocols are needed for:
 - Who will screen and when? (remember potential need for evaluation)
 - Who will be notified of abnormal screens?
 - How will a baby be evaluated after an abnormal screen?
 - Who will enter data?
 - If a baby is discharged without screening, what will you do?



Evaluation



- *Cyanotic* Congenital Heart Disease (cyanotic CHD)
 - Tetralogy of Fallot (TOF)
 - Hypoplastic Left Heart syndrome (HLHS)
 - Dextro- Transposition of the Great Arteries (dTGA)
 - Tricuspid atresia (TA)
 - Total anomalous pulmonary venous return (TAPVR)
 - Truncus arteriosus
 - Pulmonary atresia (PA)



Evaluation



Critical Congenital Heart Disease (CCHD)

- Critical Acyanotic CHD
 - Severe aortic coarctation
 - Interrupted aortic arch
 - Severe aortic valve stenosis
- Critical Cyanotic CHD
 - HLHS
 - d-TGA w/ inadequate mixing
 - TAPVR w/ obstruction
 - TOF w/ severe obstruction
 - Pulmonary atresia



Evaluation



- All children, regardless of pulse oximetry findings require a detailed physical examination in the nursery or neonatal intensive care unit
- Children with “positive” pulse oximetry screening test results (i.e. sats < 95% or greater than 3% difference in saturation between upper and lower extremity) may undergo an echocardiogram, interpreted by a pediatric cardiologist
 - Other causes of desaturation, including pulmonary disease and sepsis, should be considered



Evaluation



- Avoid supplemental oxygen administration in children with ductal dependent systemic blood flow (i.e. HLHS) and/or children at risk for pulmonary overcirculation as this may lead to greater impairment in systemic perfusion and also contribute to premature ductal closure
- Start PGE in cases of confirmed ductal dependent pulmonary or ductal dependent systemic blood flow



Evaluation



- If needed, immediate transfer of the baby to a facility able to perform neonatal cardiac catheterization procedures (i.e. balloon atrial septostomy) or surgery
 - Some patients may not require immediate transfer or intervention
 - In some cases, children with critical CHD will require a cardiac catheterization and/or surgical procedure within the first few days of life



Parent Education- Failed Screen

- an out-of-range screening result does not necessarily mean that your baby has CCHD
- your baby's doctor will be notified and further evaluation will take place
- Because the harmful effects of CCHD can develop shortly after birth, follow-up testing must be completed as soon as possible to determine whether or not your baby has a heart problem



Evaluation



- Families should be informed of the following:
 - Warning signs of CHD
 - Poor feeding
 - Poor urine output (less than 3 solid wet diapers per day)
 - Tires easily or sleeps a lot
 - Poor weight gain
 - Often irritable or difficult to console
 - Pale, bluish color



Evaluation



- Families should be informed of the following (cont'd):
 - Pulse oximetry does not detect all forms of CHD
 - Once the baby has been discharged, any concerns for CHD should be brought to the immediate attention of the child's pediatrician

Surveillance

- DHMH will provide surveillance of screening.
- Data will be entered into OZ for this function.





Surveillance

- Nurse will follow up on missed screens and on abnormal screens regarding evaluation and ultimate diagnosis.
- Purpose is to evaluate efficacy of protocol and implementation.
- Quarterly feedback to birthing facilities regarding numbers screened and false positives.





Maryland Prevention and Health Promotion Administration

<http://ideha.dhmfh.maryland.gov>

<http://fha.dhmfh.maryland.gov>