

Pulse Oximetry Screening for Congenital Heart Disease in Healthy Newborns in Alabama

**Satellite Conference and Live Webcast
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Faculty

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Epidemiology of Heart Defects

- 1% of babies in the United States are born with congenital heart disease (CHD)
- ¼ of these babies have “critical CHD”
- Critical CHD (CCHD)

Epidemiology of Heart Defects

- “Structural heart defect usually associated with hypoxia in the newborn period that could have significant mortality or morbidity early in life with closing of the ductus arteriosus or other physiologic changes early in life”
- Deaths from undetected CCHD
 - Estimated ~1/25000 live births

Kemper AR, et al. Pediatrics 128:e1-e9, 2011.

Targets of Pulse Oximetry Screening for CCHD

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

Secondary Benefits

- Ability to detect other conditions not considered primary screening targets
 - Other cardiac hypoxic lesions
 - Non-cardiac hypoxic conditions
 - Pulmonary hypertension
 - Transitional circulation
 - Infection

Secondary Benefits

- Lung pathology
- Methemoglobinemia

Pathology found	No (%) of babies
Other critical congenital heart disease*	4 (6)
Other milder congenital heart disease	10 (14)
Persistent pulmonary hypertension	5 (9)
Transitional circulation]	8 (12)
Infections	10 (14)
Pulmonary pathology	7 (10)
Normal (verified from hospital charts)	24 (35)

Out of 69 false positive infants.
De-Wahl Granelli A, et al. BMJ 338:a3037, 2009.

Does screening improve outcomes? Impact of Swedish Pulse Oximetry Study

	Screening Regions	Non-Screening Regions
Leaving hospital with undiagnosed CCHD	8%	28%
Severe acidosis at diagnosis	12%	33%
Timely diagnosis of CCHD not obtained	18%	45%
Death from undiagnosed CCHD	0%	5%

De-Wahl Granelli A, et al. BMJ 338:a3037, 2009.

Does screening improve outcomes? Impact of Swedish Pulse Oximetry Study

	Diagnosed CCHD	Undiagnosed CCHD
Mortality*	0.9%	18%
Severe acidosis at diagnosis	18%	50%

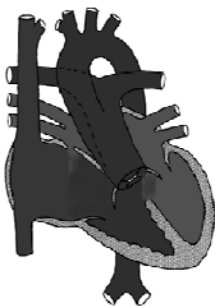
* Babies with standard surgical risk (excludes HLHS and premature births)

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Limitations / Problems

- False positives
- False negatives
- Does not screen for certain critical CHDs
- Complexity of the algorithm
- Cost of screening
- Pulse oximetry screening reimbursement
- Electronic reporting/tracking/quality assurance

Local Cases



- False Negative Screen
- Sats 98% RH and foot
- Screening violation
 - Day of life #3
- Diagnosed at 5 weeks
 - Tachypnea
- Truncus Arteriosus
- Mean age of death (without repair)
 - 5 weeks

References

- de-Wahl Granelli A, et al. Impact of pulse oximetry screening on the detection of duct dependent congenital heart disease: a Swedish prospective screening study in 39,821 newborns. BMJ 338:a3037, 2009.
- Kemper AR, et al. Strategies for implementing screening for critical congenital heart disease. Pediatrics 128(5):e1259-67, 2011.
- Koppel RI, et al. Effectiveness of pulse oximetry screening for congenital heart disease in asymptomatic newborns. Pediatrics 111(3):451-5, 2003.
- de-Wahl Granelli A, Mellander M, Sunnegårdh J, Sandberg K, Ostman-Smith I. Screening for duct-dependant congenital heart disease with pulse oximetry: a critical evaluation of strategies to maximize sensitivity. Acta Paediatr 94(11):1590-1596, 2005.
- Thagaratnam S, et al. Pulse oximetry screening for critical congenital heart disease in asymptomatic newborns: a systematic review and meta-analysis. Lancet 379:2459-64, 2012.

Sample Questions

- The following can affect the accuracy of the pulse oximetry (pulse ox) reading:
 - a. Movement
 - b. Cold extremities or shivering
 - c. Crying
 - d. Bilirubin lamps and surgical lights
 - e. All of the above

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 - a. Movement
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Sample Questions

- One clean, disposable pulse ox probe can be used on up to five patients.
 - a. True
 - b. False

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Sample Questions

- All of the following can affect the accuracy of the pulse ox reading except:
 - a. Placing the pulse ox probe on the same extremity that you are taking the blood pressure
 - b. Performing the pulse ox test while the infant is crying
 - c. Using a clip on the finger of an infant
 - d. Infant skin color or jaundice

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Sample Questions

- Pulse oximetry screening will detect all forms of CHD:
 - a. True
 - b. False

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Sample Questions

- The screening guidelines state that pulse ox should be performed on:
 - a. The right hand
 - b. One foot
 - c. Both a and b
 - d. Neither a or b

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Sample Questions

- Pulse oximetry screening should be performed when the infant is what age?
 - a. less than 8 hours
 - b. between 8 and 18 hours
 - c. greater than 24 hours
 - d. less than 24 hours

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Sample Questions

- An infant's pulse ox readings should be reported to the physician or nurse practitioner caring for the infant if:
 - a. Pulse ox readings are greater than 94% for both right hand and one foot and there is a difference of 4 or more between the two on three measures each separated by one hour
 - b. Pulse ox readings are less than 95% for both right hand and one foot or there is a difference of 4 between the two on three measures each separated by one hour
 - c. Pulse ox reading is less than 90% for either or both the right hand and one foot
 - d. All of the above

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Sample Questions

- Does the echocardiogram and cardiology consult have to be done inpatient?
 - Answer: Not necessarily. Consultation with pediatric cardiologist is recommended to decide on appropriateness of scheduling an outpatient echocardiogram.

Sample Questions

- Is it important that the infant is awake during the screening?
 - Answer: It can be helpful but not mandatory to screen infants while awake. This is because oxygen levels in the blood are lower during sleep due to mildly reduced levels of breathing.

Sample Questions

- I work in a rural hospital, does the echocardiogram have to be read by a pediatric cardiologist?
 - Answer: It is recommended that the echocardiogram be read by a pediatric cardiologist when available.

Sample Questions

- Where can I find the "Reporting Form?"
 - Answer: The pulse oximetry reporting form may be found on the Newborn Screening website at www.alabamapublichealth.gov/newbornscreening Practitioner Page

Sample Questions

- **Why does the screening have to be done on the right hand?**
 - **Answer: Screening should be completed both preductal (right hand) and postductal (foot) in order to detect duct-dependent congenital heart disease. The left hand has always been ignored as it was unclear if the ductus arteriosus influences left-hand arterial perfusion.**