Pulse Oximetry Screening for Congenital Heart Disease in Healthy Newborns
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No disclosures

Newborn Screening

Introduction
- Background
  - Public health screening
  - Rationale behind CHD screening
- Heart defects screened
- Expected results
- Dr. Jackson – mechanics of screening at UAB

Public Health Screening
- Objective
  - Detect a condition for which treatment will be more effective than it would be once signs/symptoms develop
- Condition should represent a significant public health problem (morbidity, mortality)
- Screening test
  - Accurate, safe, inexpensive, improve outcomes
- Therapy must be widely available
Epidemiology of Heart Defects

- 1000 babies
  - 9 heart defects
    - 3 “serious” heart defects
    - 1 “critical CHD”
  - Critical CHD (CCHD)
    - “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


Epidemiology of Heart Defects

- 7 Critical CHDs
  - Hypoplastic left heart syndrome
  - Pulmonary atresia
  - Tetralogy of Fallot
  - d-Transposition of the Great Arteries
  - Tricuspid Atresia
  - Truncus Arteriosus
  - TAPVR

Normal Heart

Do we need to do both the foot and right hand?

- Adding a pulse ox difference of > 3% between RH and foot increases sensitivity
- Does not increase the false positive rate
- Important in babies who may be highly saturated (left heart obstructive lesions)
- Important in babies with transposed great vessels and arch obstruction
- Recommended by the AAP
Transposition of the Great Arteries with Coarctation

- This screening algorithm should not take the place of clinical judgment or customary clinical practice
- A negative screen does not rule out heart disease
- Optimal results are obtained using a motion-tolerant pulse oximeter that reports functional oxygen saturation, has been validated in low perfusion conditions, has been cleared by the FDA for use in newborns, has a 2% root mean-square accuracy, and is calibrated regularly

Hypoplastic Left Heart Syndrome

Failed Screen
Pulse Ox 90-94 or RI/foot difference of 4 or more x 3
- Perform comprehensive evaluation for causes of hypoxemia including infectious and pulmonary pathology.
- If no other etiology is found, consultation with pediatric cardiology or neonatology is indicated to arrange for a diagnostic echocardiogram to be interpreted by a pediatric cardiologist. This may require telemedicine, transfer to a NICU with pediatric cardiology services, or discussion with cardiology services, or discussion with cardiology to schedule a timely outpatient echocardiogram.
Screening Population

- Infants in well-baby nurseries
- Excludes:
  - NICU infants
  - Out-of-hospital births
- Time:
  - 24-48hrs of life
  - Shortly before discharge if < 24 hrs

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
    - Lung pathology
Impact of Swedish Pulse Oximetry Study

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<tr>
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<th>Screening Regions</th>
<th>Non-Screening Regions</th>
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<tbody>
<tr>
<td>Leaving hospital with undiagnosed CCHD</td>
<td>8%</td>
<td>28%</td>
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<tr>
<td>Severe acidosis at diagnosis</td>
<td>12%</td>
<td>33%</td>
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<tr>
<td>&quot;Timely diagnosis&quot; of CCHD not obtained</td>
<td>16%</td>
<td>45%</td>
</tr>
<tr>
<td>Death from undiagnosed CCHD</td>
<td>0%</td>
<td>5%</td>
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Impact of Swedish Pulse Oximetry Study

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<tr>
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<th>Diagnosed CCHD</th>
<th>Undiagnosed CCHD</th>
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<tr>
<td>Mortality*</td>
<td>0.9%</td>
<td>18%</td>
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<tr>
<td>Severe acidosis at diagnosis</td>
<td>18%</td>
<td>50%</td>
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* Babies with standard surgical risk (excludes HLHS and premature births)

Conclusions

• Pulse oximetry is a simple, inexpensive, and widely-available screening tool that reliably detects CCHD, reducing morbidity and mortality

References


