



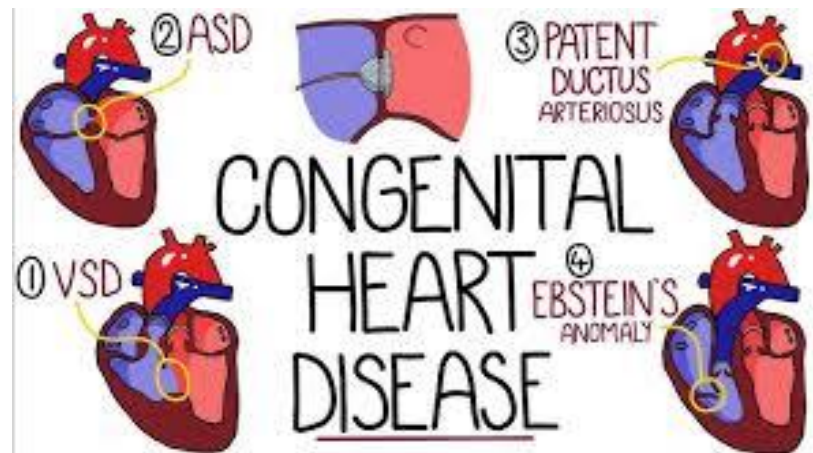
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Newborn pulse oximetry screening for critical CHD

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SUMS

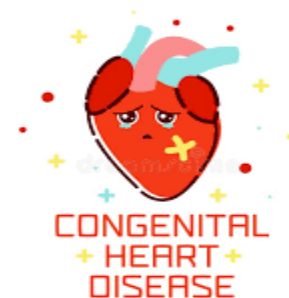


- **Congenital heart disease (CHD)** is the most common congenital disorder in newborns.



- **Critical CHD**, defined as requiring surgery or catheter-based intervention in the **first year of life**.
- **Critical CHD** includes:
 - **Ductal-dependent**
 - **Not dependent on the patent ductus arteriosus**

- **Up to 25 percent** of infants with CHD have a "critical" defect.
- **up to 30 percent** of newborns with critical CHD appear healthy on routine examination, and signs of critical CHD may not be apparent in the first days of life



Cyanosis may not be clinically apparent

**Mild desaturation
(>80 percent
saturation)**

Anemia

**Dark skin
pigmentation**

The **timing of presentation** varies with:
The **underlying lesion**
Its **dependence upon a PDA**

**Ductal-
dependent
lesions**

closure of the
PDA : rapid
clinical
deterioration
(potentially life-
threatening
consequences)

**not
dependent
on the
patency of
the PDA**

delayed
diagnosis can
similarly lead to
poor outcomes

- For infants with **critical CHD** who are not diagnosed during the birth hospitalization, the **risk of mortality** is as **high as 30%**



**BENEFITS
OF
SCREENING**

Early detection of critical CHD

Minimizing the morbidity and mortality associated with delayed diagnosis.

Detection of other serious conditions

Sepsis / Pneumonia / TTN / RDS / MAS
Pneumothorax / PPHN

False positives



**HARMS OF
SCREENING**

Anxiety in the
parents/caregivers

Discomfort or harm to
the newborn

APPROACH TO SCREENING



Timing



Technique



Screening algorithms



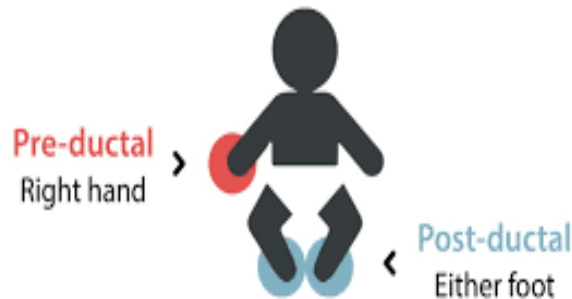
- Screening should be performed :
 - After 24 hours of life
 - As late as possible if early discharge is planned.

- **Screening within the first 24 hours of life is not as specific as later screening**, Due to **hypoxemia** commonly occurs during the transition from intrauterine to extrauterine life conditions



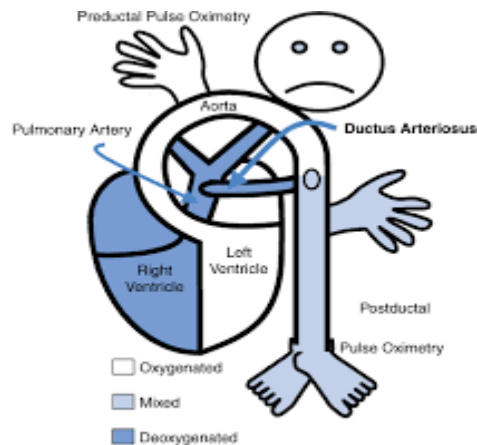


- Screening should be performed by **qualified** and **trained personnel**.
- SpO₂ is measured in the **right hand** (preductal) and **either foot** (postductal).
- Screening at both locations can occur **simultaneously** or **in direct sequence**.



Postductal measurement of SpO₂ is important **because**

defects with **right-to-left shunting** of desaturated blood **through the ductus arteriosus** will not be detected with only preductal measurement.





Technique

- using a motion-tolerant pulse oximeter
- using disposable or reusable probes
- No crying or moving

Pulse oximetry testing may fail to detect hypoxemia

ambient light

partial probe detachment

poor perfusion at the site of measurement

hemoglobinopathy

Universal newborn screening for critical CHD



**American
Heart
Association®**

American Academy
of Pediatrics



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**AMERICAN
COLLEGE of
CARDIOLOGY®**

positive Screens

2018 meta-analysis of 21 studies

>450,000 newborns

cutoff SpO₂ threshold of <95 or ≤95 %

Sensitivity was 76.3 %

specificity 99.9%

Screening algorithms



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2011

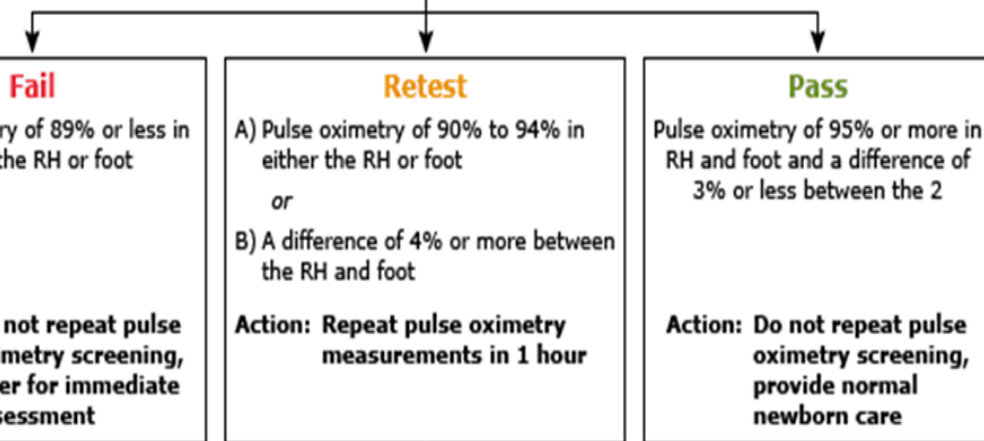


2018

- The main difference between the two algorithms is that for newborns who neither pass nor fail on the initial screen, the **modified algorithm (2018) requires only one repeat screen**; whereas the original **2011 algorithm required two repeat screens**.

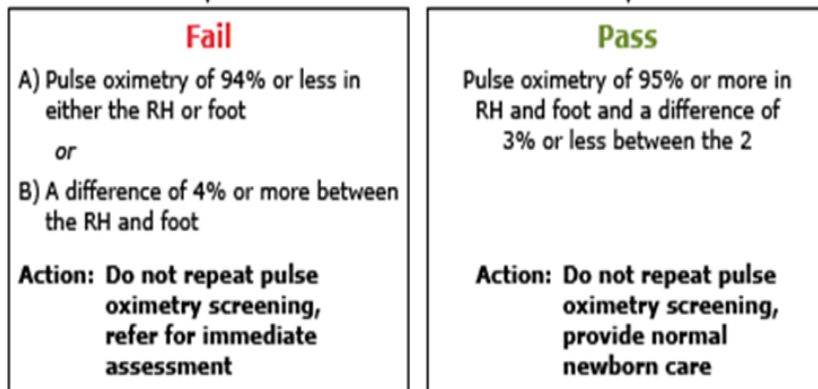
Measurement 1

Pulse oximetry on RH and 1 foot around 24 hours of age (or earlier, if being discharged)



Measurement 2

Pulse oximetry on RH and 1 foot 1 hour after measurement 1



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**Positive
screening**

- **Pulse oximetry of 89% or less in either right hand or foot**



**NEGATIVE
SCREEN**

- **SpO₂ ≥ 95%** in right hand and feet
- **SpO₂ difference ≤ 3 %** between the upper and lower extremities

Repeat
pulse
oximetry

- **SpO₂: 90 to 94%** in both the right hand and a lower extremity
- **SpO₂ difference $\geq 4\%$** between the upper and lower extremities

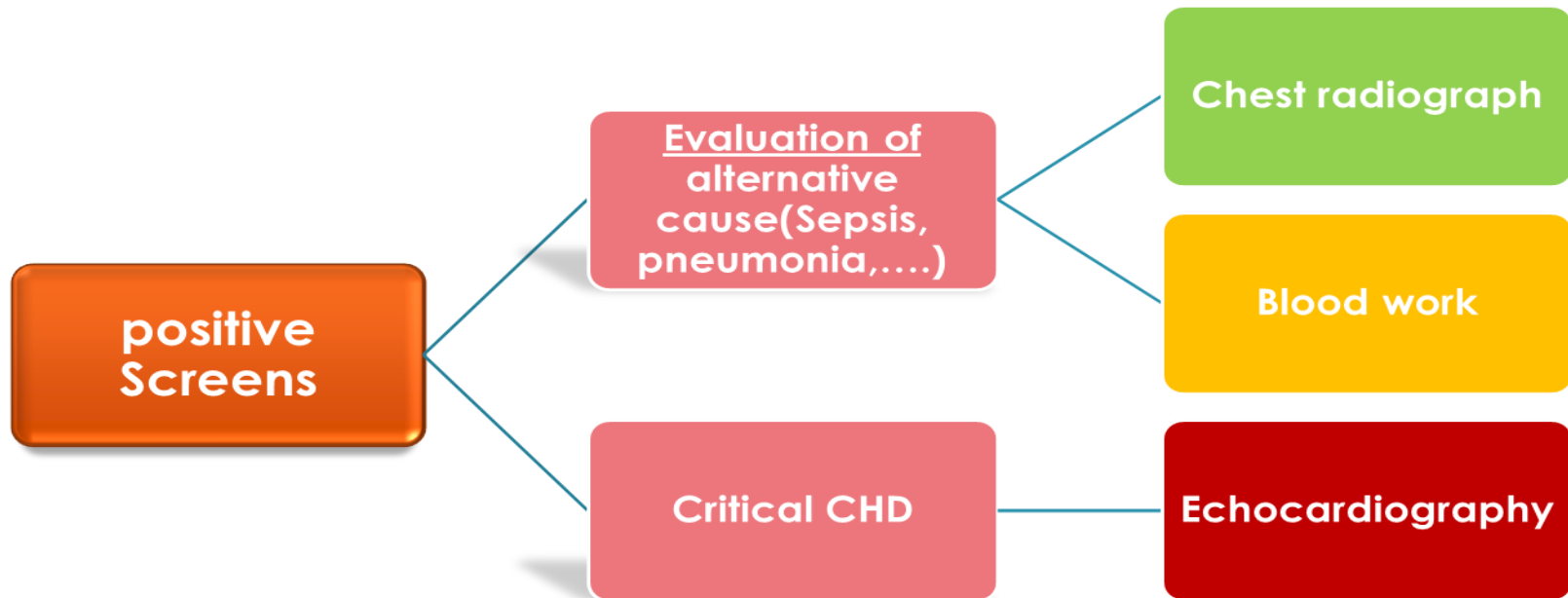
This spo2 on two to three measurements, each separated by one hour

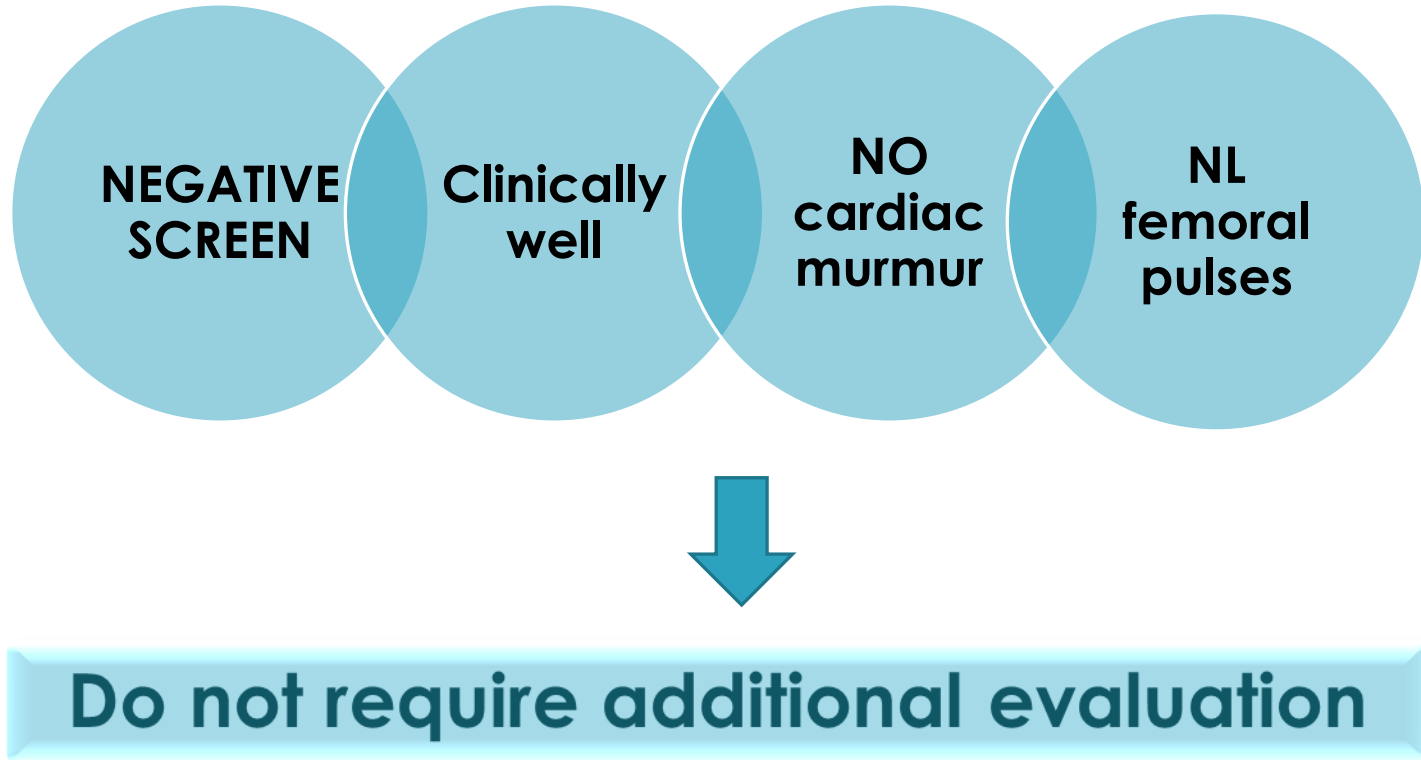


positive screen

Assessment of newborns with positive Screens

- A neonate with hypoxemia **should be not discharged** from the hospital without excluding potentially life-threatening conditions.







- POS most frequently **failed to detect** :
 - Aortic stenosis
 - Large ASD or VSD
 - Coarctation of the aorta
 - severe pulmonic stenosis (PS)



- If there is clinical suspicion for CHD, additional evaluation should be pursued even in the setting of a normal pulse oximetry result.

SPECIAL SETTINGS

- ❑ Out-of-hospital delivery
- ❑ Neonatal intensive care unit
- ❑ Prematurity

- For newborns **delivered out-of-hospital** (home births and birth centers), critical CHD screening using pulse oximetry can be performed using **portable pulse oximetry probes**.
- Most neonates **admitted to NICUs** have pulse oximetry performed as part of their routine care; however, protocols used in newborn nurseries to identify critical CHD **may not be appropriate** for the NICU

Premature infants

higher false-positive rate

having **lower saturations** at baseline as compared with term newborns

False negatives

pulse oximetry may **overestimate** the arterial oxygen saturation

The child who has had a **postnatal echocardiogram** may not separately need **pulse oximetry testing** to be performed.

