

Antenatal Risk of Coarctation of the Aorta (ARCH)

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What is a Clinical Pathway?



An evidence-based guideline that decreases unnecessary variation and helps promote safe, effective, and consistent patient care.



Objectives of Pathway



- Ensure maximal safety for babies with potentially dependent coarctation of the aorta
- Optimize the use of echocardiogram with the available resources
- Decrease variability in assessment process of newborns with suspicion of coarctation in the NICU or well baby nursery
- Decrease multiple visits for newborns for cardiac evaluation
- Minimize delay in discharge of newborn babies and their mothers



Background



- Coarctation of the aorta can develop as the ductus arteriosus closes after delivery
- Because the ductus arteriosus is open in utero, diagnosis prenatally can be challenging
- Coarctation of the aorta can never be completely ruled out in the presence of a patent ductus arteriosus, but secondary signs can be present on fetal evaluation to increase suspicion
- A hypoplastic aortic arch or reversal of flow in the transverse arch can be reliable in predicting ductal dependency
- Other prenatal signs of potential coarctation, such as ventricular size discrepancy have a 60-70% sensitivity of coarctation and ductal dependency
- Based on the prenatal signs, we can estimate the degree of risk in order to guide our postnatal management and assessment.



Why is Pathway Necessary?

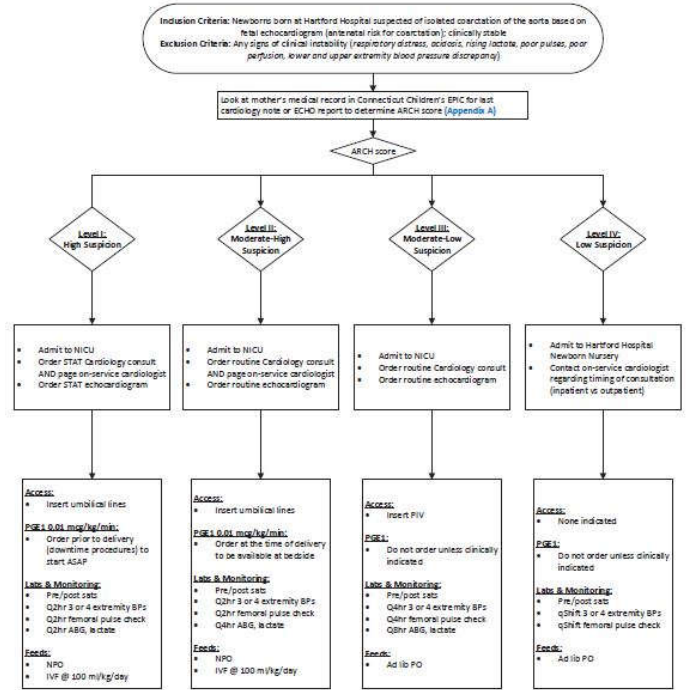


- Coarctation of the aorta cannot be reliably diagnosed on prenatal evaluation, but there are markers that increase suspicion
- Certain features or combinations of features on our fetal evaluation enable us to predict level of risk for coarctation.
- Critical coarctation of the aorta, if left untreated can lead to mortality and morbidity
- In some cases, coarctation cannot be reliably diagnosed until ductal closure occurs
- In other cases, it is clear that a critical coarctation will lead to significant obstruction
- Invasive procedures, separation of babies from their mothers, and interruption of feeding practices should be minimized when risk of coarctation is low
- Based on our risk assessment, we are able to guide immediate management of newborns after delivery for optimal care.



CLINICAL PATHWAY:
Postnatal Management Based on Prenatal Risk
for Coarctation of the Aorta (ARCH)

THIS PATHWAY
 SERVES AS A GUIDE
 AND DOES NOT
 REPLACE CLINICAL
 JUDGMENT.



If at any time the patient becomes clinically unstable, exit pathway and call on-service cardiologist to discuss initiation of prostaglandins.*

**Examples of a clinical instability include: respiratory distress, acidosis, rising lactate, poor pulses, poor perfusion, lower and upper extremity blood pressure discrepancy*

This is the Postnatal Management Based on Prenatal Risk for Coarctation of the Aorta Clinical Pathway.

We will be reviewing each component in the following slides.

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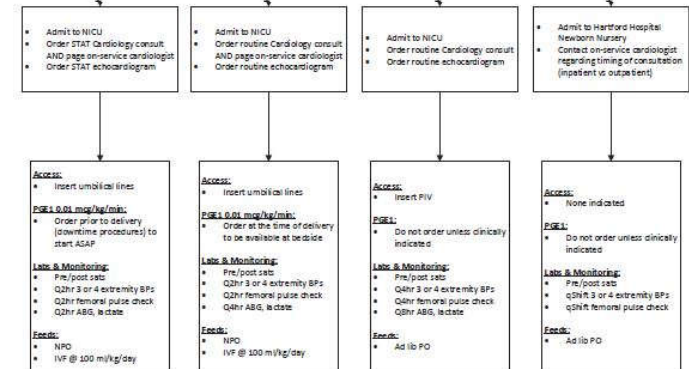
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Inclusion Criteria: Newborns born at Hartford Hospital suspected of isolated coarctation of the aorta based on fetal echocardiogram (antenatal risk for coarctation); clinically stable
Exclusion Criteria: Any signs of clinical instability (*respiratory distress, acidosis, rising lactate, poor pulses, poor perfusion, lower and upper extremity blood pressure discrepancy*)

Inclusion Criteria:

- This pathway is meant for Newborns whose mothers have had fetal echocardiogram showing risk for isolated coarctation.
- Infants must be clinically stable to be on the pathway.
- Pathway presents guidelines for clinical care of newborns prior to Cardiology evaluation

Look at mother's medical record in CCMC EPIC for last cardiology note or ECHO report to determine ARCH score (**Appendix A**)



If at any time the patient becomes clinically unstable, exit pathway and call on-service cardiologist to discuss initiation of prostaglandins.*

**Examples of a clinical instability include: respiratory distress, acidosis, rising lactate, poor pulses, poor perfusion, lower and upper extremity blood pressure discrepancy*

CONTACTS: ALICIA WANG, MD

LAST UPDATED: 06/24/18

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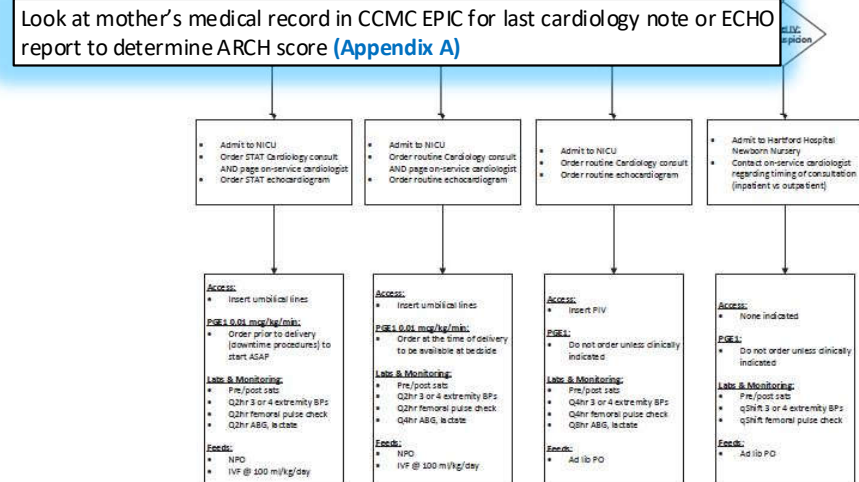
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The Antenatal Risk of Coarctation of the Aorta (ARCH) Score

- Helps to stratify patients based on the level of suspicion for coarctation prenatally.
- A patient's ARCH Score guides their clinical management.
- The ARCH score is determined by looking in the mother's medical record for the last cardiology encounter
 - See Appendix A for more information



If at any time the patient becomes clinically unstable, exit pathway and call on-service cardiologist to discuss initiation of prostaglandins.*

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CLINICAL PATHWAY:
Postnatal Management Based on Prenatal Risk for Coarctation of the Aorta (ARCH)
Appendix A: Antenatal Risk for Coarctation – for newborns born at Hartford Hospital (ARCH score)

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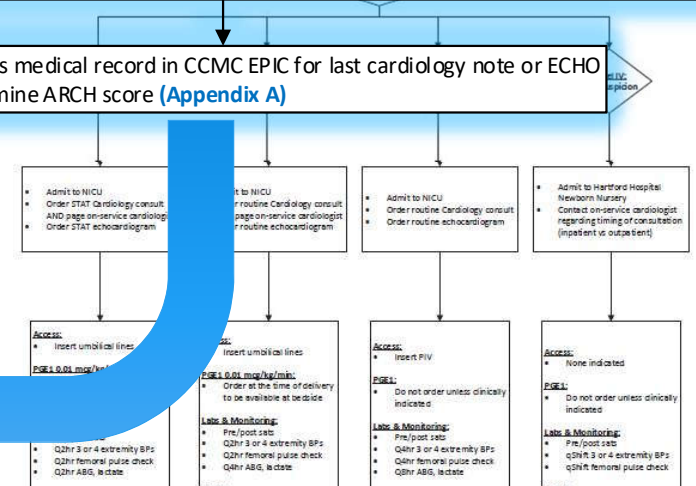
Antenatal Risk for Coarctation – for newborns born at Hartford Hospital (ARCH score)
Management recommendations for suspected isolated coarctation of the aorta based on fetal echocardiogram

- All recommendations refer to management/monitoring for *PRIOR* to cardiology consultation in *clinically stable* patients
- Clinically stable patients have *none* of the following:
 - respiratory distress, acidosis, poor pulses, poorly perfused extremities, rising lactates or BP discrepancy.
- Any clinical concerns, including the above symptoms, require notification of the on service/on call cardiologist for further discussion.
- The following recommendations only apply prior to consultation. Further management will be based on consult findings.

Level	Fetal findings - examples	Admit	Umbi Lines	PGE1	Labs and monitoring	Feed	Consultation
I High suspicion	<ul style="list-style-type: none"> Small aortic isthmus with concern for near-interruption. Flow reversal in the arch Hypoplastic aortic valve or ascending aorta 	NICU	Yes	Order prior to delivery (down-time procedures) to start ASAP	<ul style="list-style-type: none"> Pre/post sats q2h 3 or 4-extrem BP q2h fem pulse check q2h ABG, lactate 	NPO IV@100ml/kg/d	Call for immediate consult. Echo to be done ASAP.
II Mod-hi suspicion	<ul style="list-style-type: none"> Antegrade flow across the arch <p>Multiple prenatal visits demonstrating:</p> <ul style="list-style-type: none"> Great vessel/SLV discrepancy Ventricular size/AVV discrepancy Small aortic isthmus Posterior shelf Diastolic runoff in the dAo 	NICU	Yes	Order PGE at the time of delivery to be available at the bedside	<ul style="list-style-type: none"> Pre/post sats q2h 3 or 4-extrem BP q2h fem pulse check q4h ABG, lactate 	NPO IV@100ml/kg/d	Order routine consultation. Notify cards attending. Echo to be done during next available echo lab business hours or within 12 hrs on weekends.
III Mod-lo suspicion	<ul style="list-style-type: none"> Antegrade flow across the arch Significant great vessel or ventricular size discrepancy Normal sized aortic valve and transverse arch 	NICU	No	Do not order unless clinically indicated	<ul style="list-style-type: none"> Pre/post sats q4h 3 or 4-extrem BP q4h fem pulse check q8h ABG, lactate 	Ad lib PO	Order routine consultation. Notify cardiology attending. Echo to be done within 24 hours
IV Low suspicion	<ul style="list-style-type: none"> Antegrade flow across the arch Normal arch dimensions Great vessel or ventricular size discrepancy seen at late gestation only 	WBN	No	Do not order unless clinically indicated	<ul style="list-style-type: none"> q shift: Pre/post sats 3 or 4-extrem BP Fem pulse check 	Ad lib PO	At discharge

Inclusion Criteria: Newborns born at Hartford Hospital suspected of isolated coarctation of the aorta based on fetal echocardiogram (antenatal risk for coarctation); clinically stable
Exclusion Criteria: Any signs of clinical instability (*respiratory distress, acidosis, rising lactate, poor pulses, poor perfusion, lower and upper extremity blood pressure discrepancy*)

Look at mother's medical record in CCMC EPIC for last cardiology note or ECHO report to determine ARCH score (Appendix A)



Appendix A: Antenatal Risk for Coarctation – for newborns born at Hartford Hospital (ARCH score)

- Provides clinical guidelines for NICU and Well Born Nursery providers to follow based on the fetal echo

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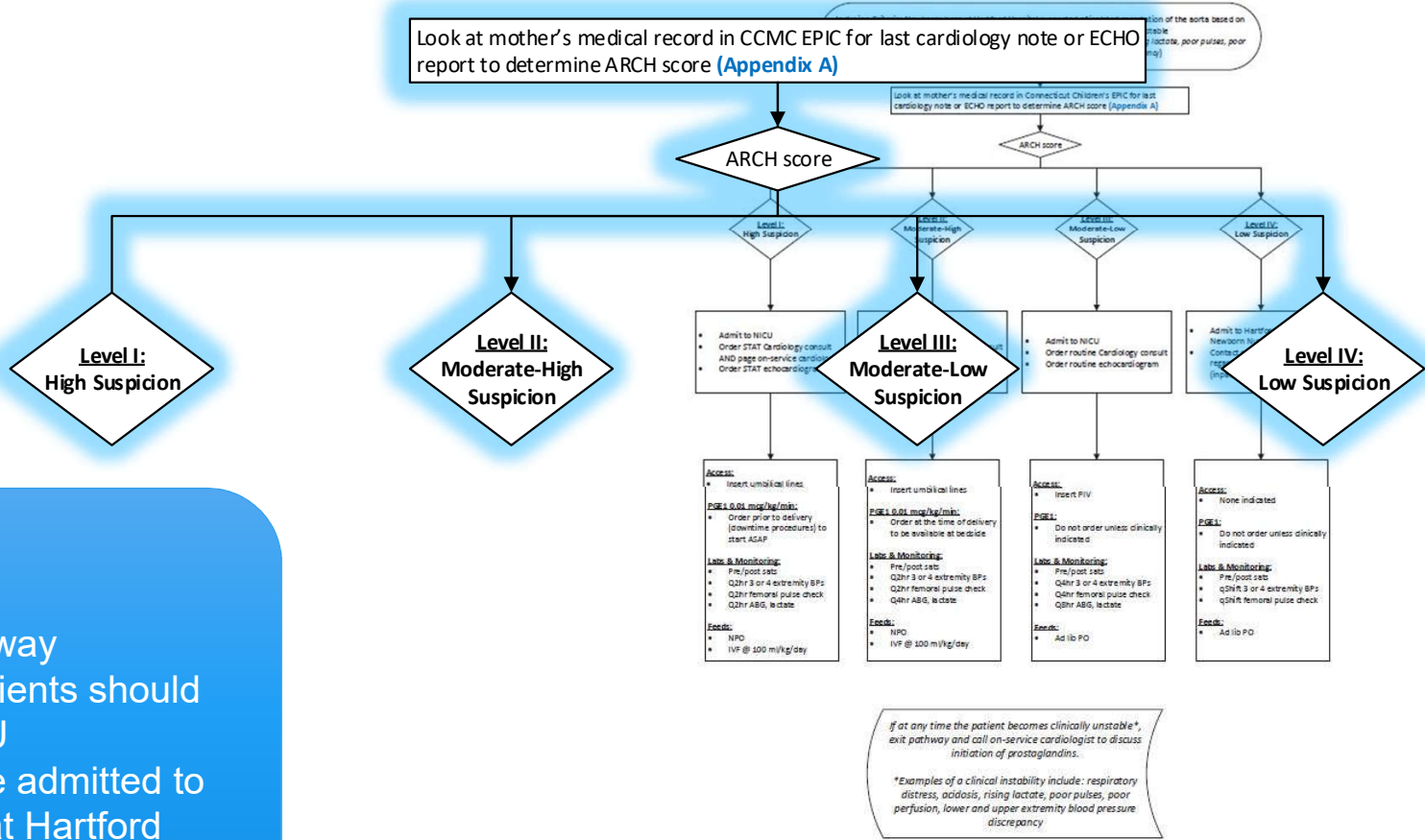
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Look at mother's medical record in CCMC EPIC for last cardiology note or ECHO report to determine ARCH score (Appendix A)



ARCH Score:

- Defines treatment Pathway
- All Level I, II, and III patients should be admitted to the NICU
- Level IV patients can be admitted to the Well Born Nursery at Hartford Hospital

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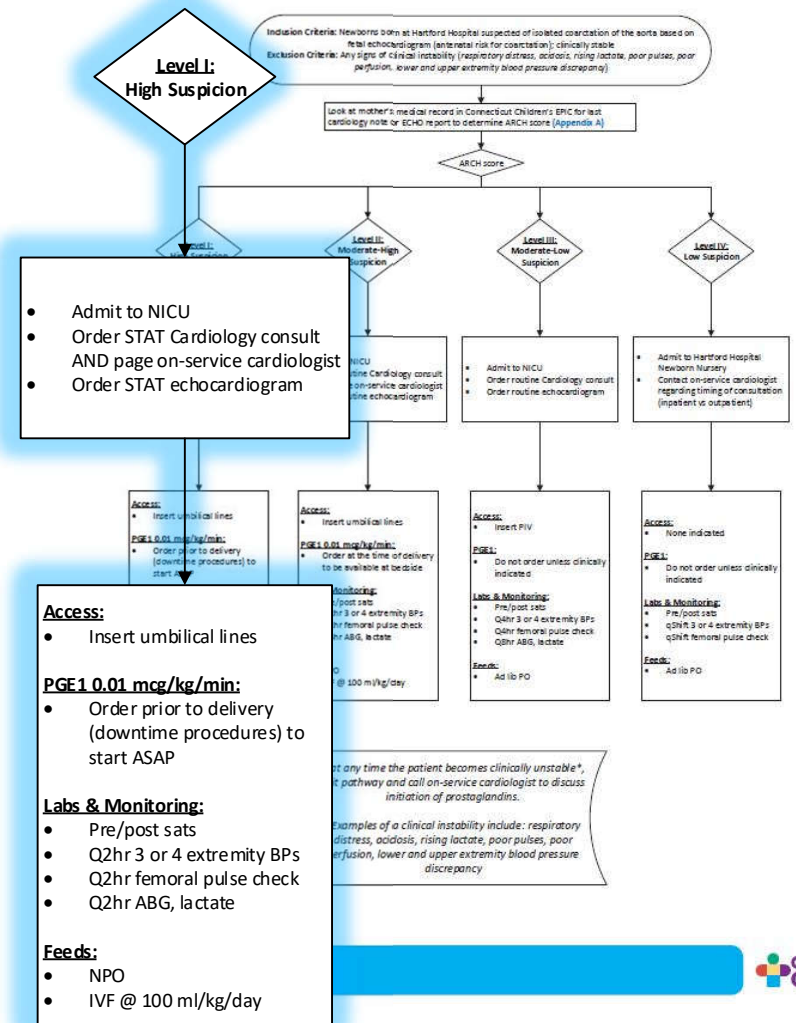
Level I Patients: There is high suspicion for Coarctation

Fetal ECHO findings may include:

- Small aortic isthmus with concern for near-interruption
- Flow reversal in the arch
- Hypoplastic aortic valve or ascending aorta

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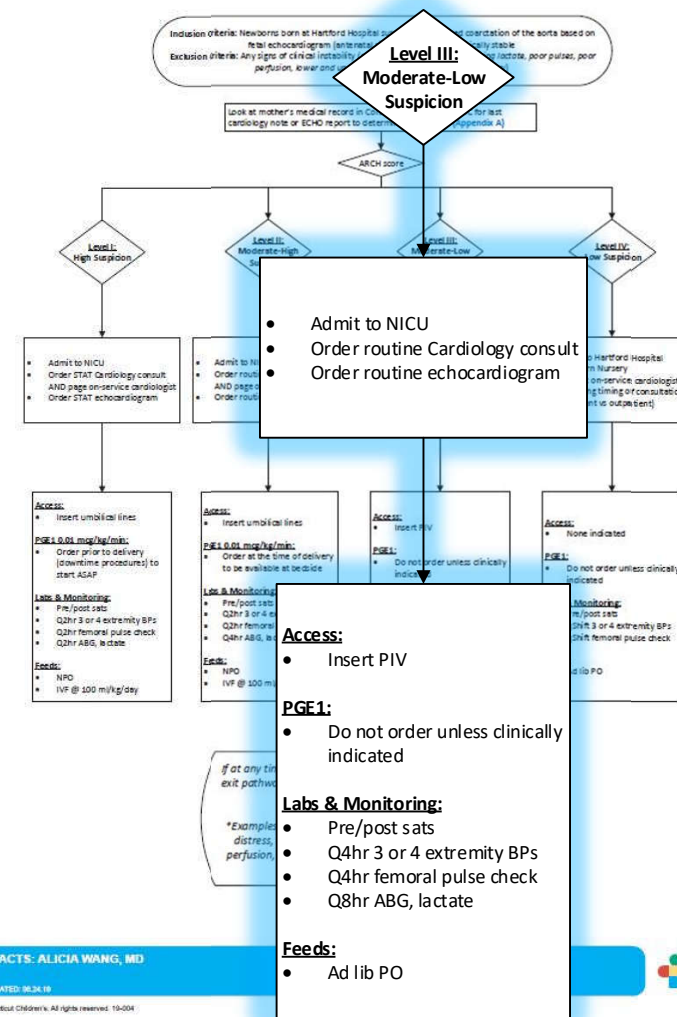
Level III Patients: There is a Moderate-Low Suspicion for Coarctation

Fetal ECHO Findings may include:

- Antegrade flow across the arch
- Significant great vessel or ventricular size discrepancy
- Normal sized aortic valve and transverse arch

CLINICAL PATHWAY: Postnatal Management Based on Prenatal Risk for Coarctation of the Aorta (ARCF)

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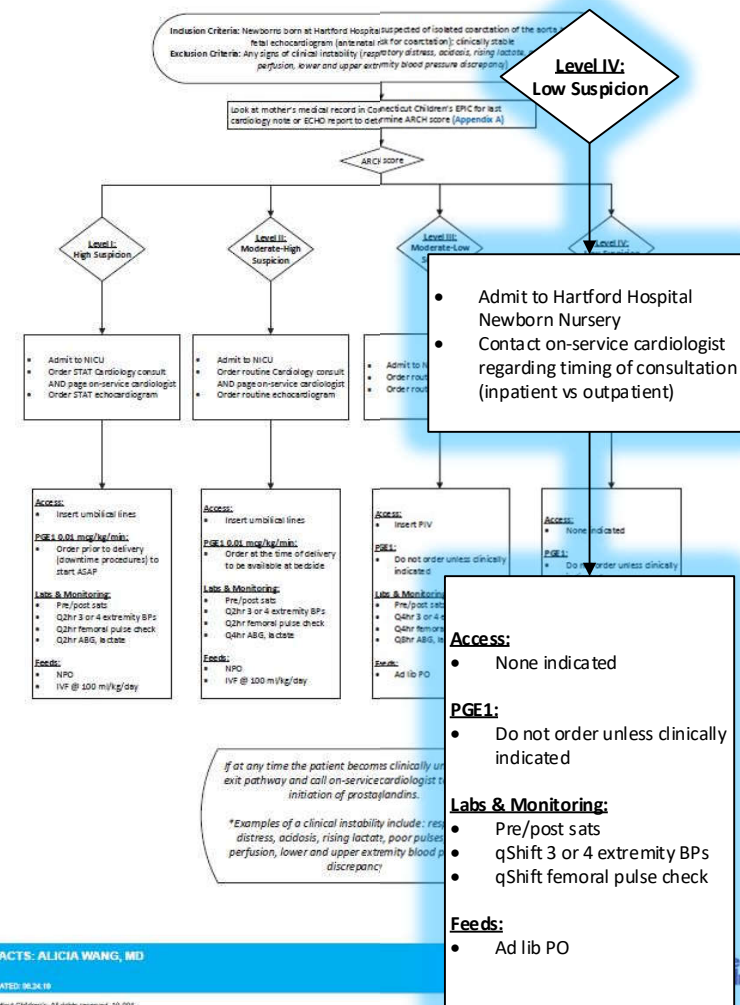
Level IV Patients: There is a Low Suspicion for Coarctation

Fetal ECHO Findings may include:

- Antegrade flow across the arch
- Normal arch dimensions
- Great vessel or ventricular size discrepancy seen at late gestation only

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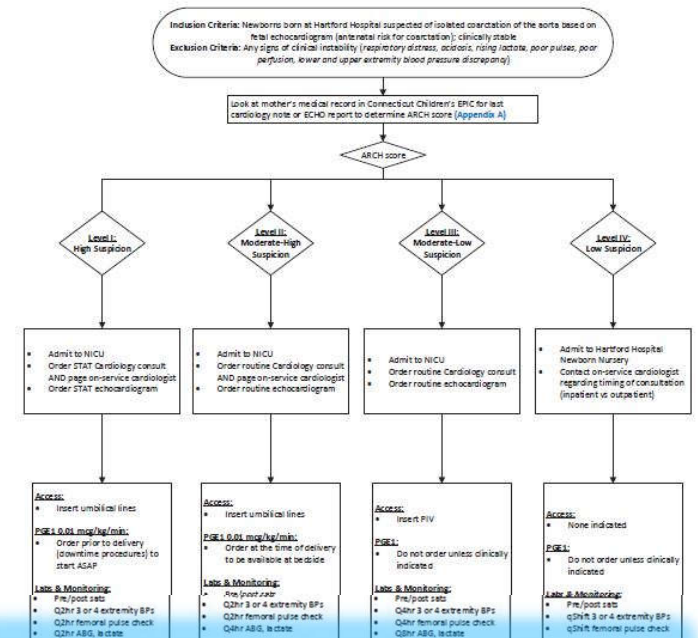


It is important to know that these are guidelines but do not replace clinical judgement.

If any patient becomes clinically unstable, exit the pathway and proceed with necessary care.

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Review of Key Points



- There are certain fetal ECHO characteristics that can be used to stratify an infant's risk of having isolated coarctation of the aorta.
- These guidelines are meant to help providers manage patients prior to the postnatal cardiology consultation
- PEG drips should be initiated on all Level I and II infants
- Unstable infants should never be managed on the pathway



Use of Order Set



Admit to NICU - Antenatal Risk for Coarctation (ARCH) Manage My Version ▾ ⌵

▼ General

▼ ADT

- Admit to Inpatient
 - P** Patient Class: Inpatient

▼ Pathway

- Initiate Clinical Pathway: Suspected Isolated Coarctation of the Aorta in Newborn
 - Until discontinued starting Today at 1302 Until Specified

▼ Nursing

▼ Vital Signs

- Vital signs-TPR, BP and O2 sats
 - Routine, Every hour First occurrence Today at 1400 Until Specified
 - On admission then per NICU Vital Sign Measure Policy
- Cardiorespiratory monitoring
 - Routine, Continuous starting Today at 1302 Until Specified
 - May be off Monitor? No

Order Set use helps ensure that the pathway is followed correctly.

In addition, it allows for tracking of Quality Metrics.

This order set can be found by typing ARCH into the Order manager on EPIC



Use of Order Set



▼ Vital Signs

- Vital signs-TPR, BP and O2 sats
Routine, Every hour First occurrence Today at 1400 Until Specified.
On admission then per NICU Vital Sign Measure Policy
- Cardiorespiratory monitoring
Routine, Continuous starting Today at 1302 Until Specified
May be off Monitor? No

▼ Antenatal Risk For Coarctation

- Level I: High Suspicion
- Level II: Moderate-High Suspicion
- Level III: Moderate-Low Suspicion
- Level IV: Low Suspicion

▼ Activity

- Activity, as tolerated
Until discontinued starting Today at 1302 Until Specified

▼ Nursing Assessments

- Growth measurements-infant
Until discontinued starting Today at 1302 Until Specified
- Strict intake and output
Until discontinued starting Today at 1302 Until Specified
- Newborn Hearing Screen
P Once First occurrence Today at 1302
If initial hearing screen refers, repeat hearing screen. If second hearing screen also refers, alert ordering provider to
- Pulse Oximetry Screening for Critical Congenital Heart Disease(CCHD)
P Once First occurrence Today at 1302
Per Guideline, Prior to Discharge
- Car seat test
Once First occurrence Today at 1302

The ARCH Order Set breaks down potential orders by ARCH score Level I- IV

It also contains other standard NICU admission orders



Quality Metrics



- Percentage of eligible patients treated per pathway
- Percentage of eligible patients with order set usage
- Number of patients requiring surgery for coarctation prior to discharge
 - Stratified by ARCH risk score and presence of coarctation
- Number of patients who had umbilical lines placed who did not require treatment for coarctation of the aorta
 - Stratified by ARCH risk score and presence of coarctation
- Number of patients who received prostaglandins started
 - Stratified by ARCH risk score and presence of coarctation



Pathway Contacts



- Alicia Wang, MD
 - Department of Pediatric Cardiology



References



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- Familiari A, Morlando M, Khalil AA, et al. [Risk factors for coarctation of the aorta on prenatal ultrasound: a systematic review and meta-analysis](#). *Circulation*. 2017 Feb;135(8):772–785.



Thank You!



About Connecticut Children's Clinical Pathways Program

Clinical pathways guide the management of patients to optimize consistent use of evidence-based practice. Clinical pathways have been shown to improve guideline adherence and quality outcomes, while decreasing length of stay and cost. Here at Connecticut Children's, our Clinical Pathways Program aims to deliver evidence-based, high value care to the greatest number of children in a diversity of patient settings.

These pathways serve as a guide for providers and do not replace clinical judgment

This Educational Module was edited by:

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