A Less Interventionist Approach for Prenatally Suspected Coarctation of the Aorta: Insights from a level 3 NICU

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AIM: Reduce unnecessary interventions by 50% within one year in neonates admitted to the NICU of CHU Sainte-Justine with prenatal suspicion of CoAo by implementing prenatal risk stratification and a risk-specific postnatal management approach

Context

- Prenatal detection of coarctation of the aorta (CoAo) is challenging, (high false-positive rate)
- Neonatal hospitalization of patients with low suspicion of CoAo can have a significant impact including increased healthcare costs and the social burden of mother-baby separation
- A less interventionist approach could improve quality of care while mitigating these effects.

Implemented protocol

Risk-stratification algorithm:

Degrés de suspicion anténatal de coarctation de l'aorte selon les critères échographiques

Faible	Modéré	Élevé
• Arc aortique/isthme légèrement hypoplasique (cote Z entre -2 et -3)	• Arc aortique/isthme modérément hypoplasique (cote Z < -3) OU • Arc aortique/isthme légèrement hypoplasique (cote Z < -2) ET au moins un de ces critères : • Somme des cotes Z des valves aortique et mitrale < -4 • Somme des cotes Z des valves aortique et mitrale et de l'isthme aortique < -7.5 • Ratio valve pulmonaire/valve aortique > 1.6 • Index carotide-sous-clavière < 1 • Anomalie cardiaque associée (large CIV, CAVC, VDDI)	Même critères que risque modéré ET au moins un de des critères suivants : • Éperon postérieur • Flux rétrograde anormal dans l'isthme aortique • Présence d'un shunt gauche-droit dans le foramen oval • Autres signes d'hypoplasie du ventricule gauche ou tout patient admis d'un centre référent pour suspicion de coarctation de l'aorte

Post-natal management based on the risk-stratification:

Patients at mild to moderate risk of CoAo:

- Blood pressure q8h
- Start feeding on day 1 with human donor milk (HDM) or breastmilk (BM) ; no iv
- Cardiology consultation: day after birth for low risk ; 12 to 24 hours of life for moderate risk

Patients at high risk of CoAo:

- Blood pressure q6h
- Start on trophic feeding with HDM/BM for 48-72 hours, then progress slowly
- Perfusion of dextrose 10% with AA 3%
- Cardiology consultation: at birth

Common measures for all patients:

- Labs on admission
  - CBC, gas, lactate, blood glucose
- Labs at 24 hours of life
  - Electrolytes, bilirubin
- PGE1 started at birth according to antenatal cardiology assessment

Measures/PDSA cycle

PDSA #1

- Literature review
- Retrospective chart review (Epoch 1)
- Risk-stratification algorithm development
  - Cardiology and NICU collaboration
- CME discussion of management Implementation

PDSA #2

- Audit and follow up of implementation (Epoch 2)
- Reminder about the existence of the protocol
- Retrospective chart review
- EPIQ presentation followed by NICU presentation
- Easy access to the protocol (PANDA)

PDSA #3

- Future steps
- Improving adherence (continuous education)
- Adaptation of the protocol
- Continuous quality improvement
- Implementation in the nursery–admission of low-risk patients

Measures

Process measures

- Risk stratification management according to protocol respected

Outcome measure

- Orders at admission in NICU (meds, labs, monitoring)
- Length of stay and neonatal complication due to CoAo (eg. Shock) (*balancing measure*)

EPOCHs

Epoch 1: Pre-implantation of the algorithm and protocol (7 patients ; January 2022 to January 2023)

Intervention Implemented: February 2023 (followed by a *Contamination* period)

Epoch 2: Post-implementation of the algorithm (6 patients ; July 2023 to July 2024) ; 1 patient excluded (Transposition of the great arteries)

Results

Demographics of the cohort

- Demographics were similar between groups, except for a higher rate of postnatal CoAo confirmation in the pre-intervention group (**Table 1**)
- PGE1 started on admission : no patient in Pre-intervention *vs* one patient in the post-intervention group

Table 1. Demographics of the cohort

	Pre-intervention group n=7	Post-intervention group N=6
Median gestational age, weeks (range)	39.0 (37.1-39.6)	38.4 (35.3-40.4)
Median birth weight, kg (range)	3.45 (2.44-3.87)	3.32 (2.27-3.60)
Prenatal suspicion of CoAo, n (%)	6 (85.7)	6 (100)
Outborn, n (%)	1 (14.2)	0 (0)
Post-natal confirmation of CoAo, n (%)	3 (42.9)	1 (16.7)

Post intervention group:

- Risk stratification: **3 low-risk / 1 moderate-risk / 2 high-risk**
  - 1 CoAo confirmed in **high-risk patients**
- When protocol has been **used (3/6 patients**), there was a **decrease in the frequency of laboratory testing and vital sign monitoring (Fig. 1 and 2)**
- Median hospital length of stay (LOS) was slightly reduced (7 vs 5 days), as was NICU LOS (1.8 vs 0.8 days)
- Only one high-risk patient in the post-intervention group was NPO at admission (vs 4/7 pre-implementation)
- 5/6 patients in the post-intervention group achieved full feeding within the first 48 hours of life
- **No complications** were reported in either group

Figure 1. Frequency of laboratory testing prescribed on admission

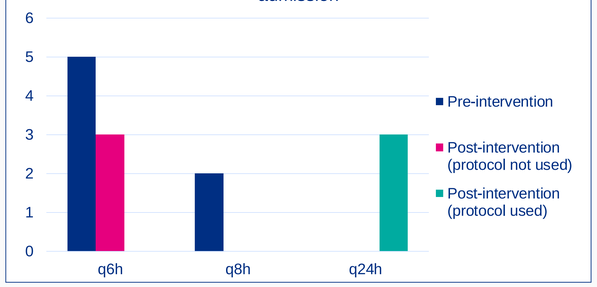
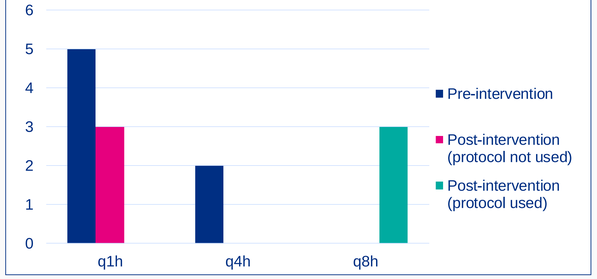


Figure 2. Frequency of vital signs surveillance prescribed on admission



Conclusion and next steps

Outcomes	Implementation of a risk-based management protocol for prenatally suspected CoAo allowed for safe and less interventional postnatal care
Quality improvement	Next PDSA cycle should focus on improving adherence
Future considerations	Extending this protocol to the nursery may help prevent mother-baby separation by allowing patients with low suspicion of CoAo to safely room-in with their mothers after delivery

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