# Congenital Diaphragmatic Hernia (CDH) Clinical Pathway

Disclaimer

This clinical pathway is not intended to replace clinical judgment. It is meant to assist licensed independent practitioners and other health care providers in clinical decision-making by describing a range of generally acceptable approaches to the diagnosis and management of a particular condition. A particular patient's circumstances should always be taken into account when a practitioner is deciding on a course of management.

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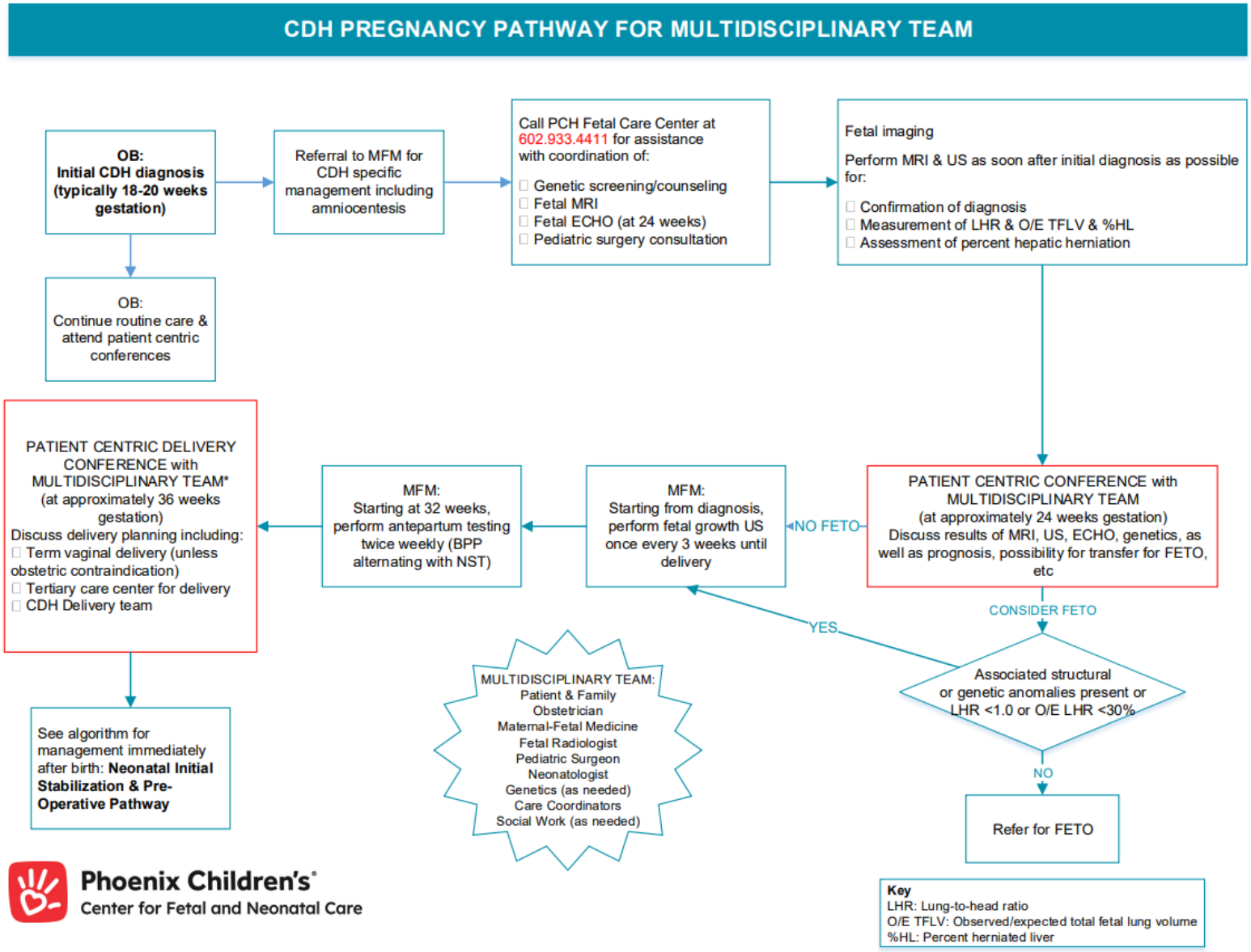
## A. CDH Pregnancy Pathway

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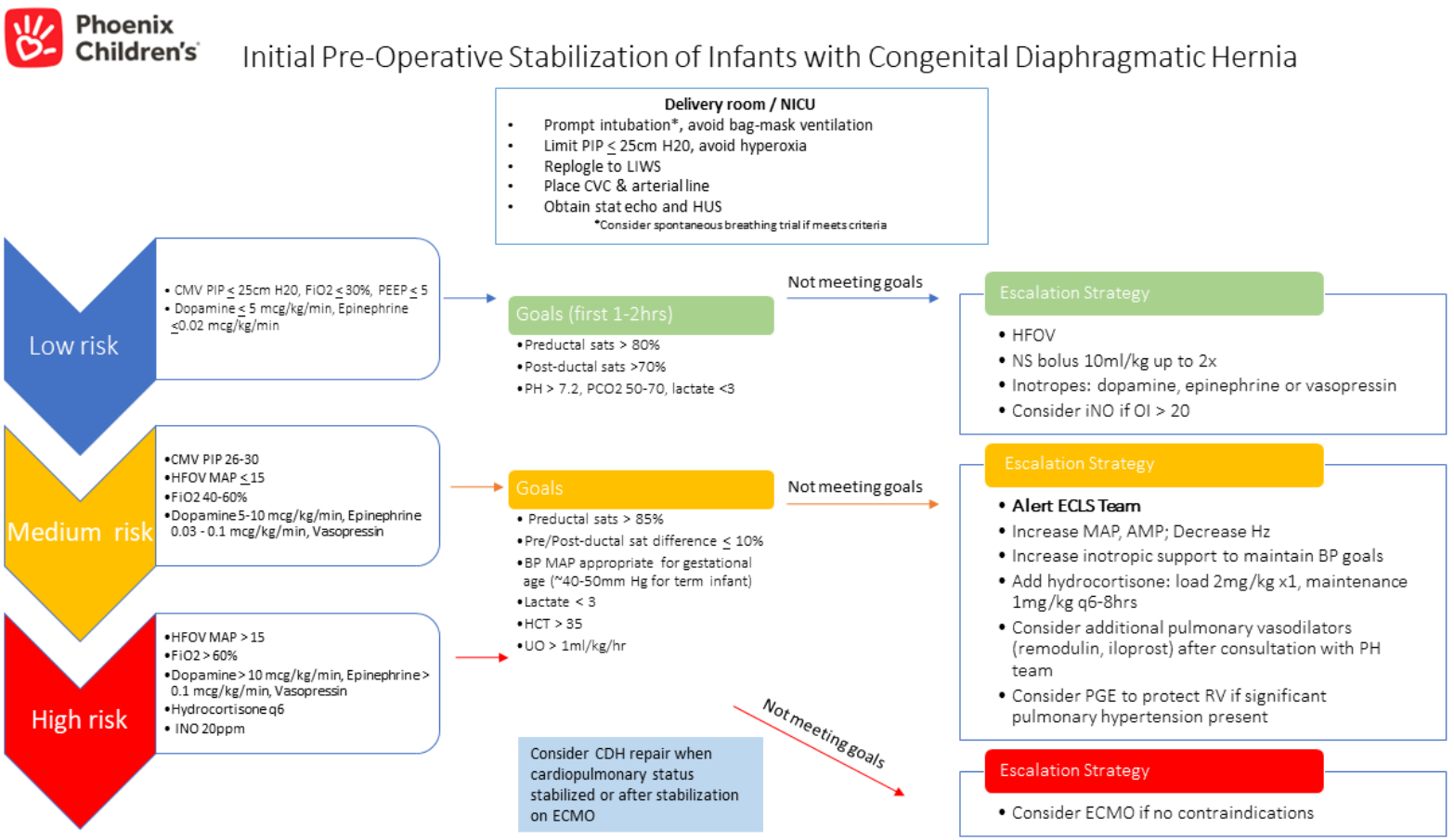
## B. CDH Postnatal Stabilization Pathway



**CONSIDERATION CRITERIA FOR ECMO SUPPORT**

(each case evaluated individually at the discretion of the neonatologist and surgeon)

**Criteria**

- Infants who have failed optimal medical management, as described in the Neonatal Initial Stabilization & Pre-Operative Pathway
- Gestational age ⩾34 weeks
- Birth weight ⩾2000 g
- No significant coagulopathy or uncontrolled bleeding, no major intracranial/intraventricular hemorrhage
- Reversible lung disease with length of mechanical ventilation <10–14 days
- No uncorrectable congenital heart disease
- No lethal congenital anomalies (includes trisomy 13, 18, but not 21)
- No evidence of irreversible brain damage

**Relative contraindications**

- Mechanical ventilation greater than 10-14 days

"When there is concern to the appropriateness of ECMO, the specific issues should be discussed with the relevant medical subspecialists prior to cannulation. This allows an in-depth discussion as to the risks of the procedure vs. the potential benefits. There will, however, be situations where time does not allow for a complete evaluation of the full prognosis. In these cases, discussions should occur shortly after cannulation. If ECMO support is not in the patient's best interest, it should be discontinued" (ELSO, 2017)

**GENETICS**

- Send chromosomes and/or chromosomal microarray (if no amniocentesis)
- Obtain mid-line work-up: HUS, AUS, Echocardiogram
- Assess for other anomalies: consider a Genetics Consult

**NEURO**

- Judicious use of narcotics, benzodiazepines & dexmedetomidine to relieve agitation/ work of breathing in the setting of PPHN
- Avoid routine neuromuscular blockade as it may worsen VQ mismatching and contribute to fluid overload
- Avoid fentanyl on ECMO due to circuit binding. Consider morphine sulfate.

**Decision Making Regarding Continuation of Intensive Care and/or Initiation of ECMO**

An attending neonatologist should be at the delivery for purposes of resuscitation and decision - making regarding escalation of care as well as appropriateness of continued provision of intensive care, including decision to proceed with ECMO. Decision to redirect care may be appropriate in some circumstances.

***For infants suspected prenatally to have severe pulmonary hypoplasia:**

If infant is unable to obtain a pH >7.0, pCO2 ≤100, preductal SaO2 ≥80%, and a paO2 ≥40 on vent support utilizing a PIP ≤30 on CMV or MAP ≤22 on HFOV/HJFV, with appropriate sedation and optimization of BP over the first 2 hours of life, redirection of care to comfort rather than proceeding to ECMO should be strongly considered

## Scope

Congenital diaphragmatic hernia (CDH) is a developmental defect in the diaphragm that results in herniation of abdominal viscera in the chest. It occurs in 1 in 2200 live births and is often detected antenatally, although postnatal diagnosis still occurs. In Arizona, pregnant women with antenatally detected CDH may be referred to the Center for Fetal & Neonatal Care for further fetal assessment (Flow Diagram A). Delivery is encouraged to occur at a level III NICU, such as Dignity St Joseph's Hospital & Medical Center, however may occur elsewhere per the patient's and delivery obstetrician's preference.

Clinical presentation of CDH postnatally ranges from an inability to resuscitate in the delivery room, to an incidental finding on chest x-ray. Severity of disease is determined by the degree of pulmonary hypoplasia and pulmonary hypertension. Survival is multifactorial and reported anywhere between 50 and 90%. The introduction of protocolized care has significantly improved survival of infants with CDH.

## Pathway Goals

- To standardize the care of the fetus, newborn and infant with CDH, from pregnancy, to the delivery room and NICU stay, to post-hospital discharge
- To improve communication amongst key stake holders, including obstetricians, maternal-fetal medicine specialists, pediatric surgeons, radiologists, neonatologists and cardiologists

## Clinical Recommendations

Prenatal management and delivery (Flow Diagram A)

Following prenatal diagnosis, disease severity should be assessed at an experienced center.

This will involve measurement of the O/E LHR and position of the liver (grade of recommendation = D).

- O/E LHR > 45% associated with 89-100% survival, < 25% associated with 18% survival
- Liver herniation associated with 45% survival
- Consider measurement of O/E total fetal lung volume. Decreased survival noted for O/E TFLV < 35%.

– In case of an anticipated birth prior to 34 weeks of gestation, antenatal steroids should be given (grade of recommendation = D).

Delivery after a gestational age of 39 weeks (a high-volume tertiary center) should be planned (grade of recommendation = D).

Pre-delivery

- ✓ Ensure bedspace availability at delivery hospital and PC Main Thomas Campus. Confirm transport team is on standby, ECLS availability, pediatric surgery is notified
- ✓ Pre-admit orders placed, lines primed, infusions for IV fluids, sedation drips and inotropes are prepped
- ✓ Prepare conventional ventilator, high frequency ventilator and inhaled nitric oxide
- ✓ Review delivery room (DR) check list, pre-brief with DR team
- ✓ Replogle tube for orogastric decompression
- ✓ Notify pediatric surgery of impending delivery
- ✓ Notify PCH ECLS team of impending delivery

At Delivery (Flow Diagram B)

- Attendance by the attending neonatologist, advanced practice provider (APP), high-risk delivery nurse and respiratory therapist is mandatory.
- *The baby must not be given bag-mask ventilation as this will introduce air to the GI tract and worsen mediastinal compression*
- Infants with respiratory distress should be intubated immediately without bag and mask ventilation by the most experienced and reliable operator present (Recommendation = D).
- In infants with favorable antenatal predictors of survival, a trial of spontaneous breathing could be considered initially rather than immediate intubation in order to avoid ventilator induced lung injury.
    - The following criteria must be met in order to consider a spontaneous breathing trial: 1) Gestational age > 35 weeks, 2) Left-sided CDH, 3) O/E LHR > 50%, 4) Intrabdominal position of the liver (<20% herniation).
    - If the patient shows any signs of respiratory distress, the baby should be intubated at the discretion of the attending neonatologist.
- Premedication may be given prior to intubation if possible (Recommendation = D). Neuromuscular blocking agents should be avoided.

*Key points to consider in DR Resuscitation*

- The goal of treatment in the delivery room is achieving acceptable preductal saturation targets, between 80-95% (grade of recommendation = D).
- In the first 2h of life, a preductal saturation of 70% is acceptable as long as it's improving without ventilator changes and there is evidence of adequate end organ perfusion (pH > 7.2, PCO2 < 65mm Hg)
- Ventilation in the delivery room should be done with a peak pressure as low as possible, preferably maximum of 25 cm H2O, or below (grade of recommendation = D).
- Avoid hyperoxia, as this may be harmful. Recommend starting resuscitation with an FiO2 lower then 1.0. Titrate FiO2 downwards when preductal saturation exceed 95%.
- A large gauge (8-10Fr) orogastric tube should be passed and regularly aspirated to decompress the stomach - at least every five minutes until baby is established on ventilation when it should be placed on free drainage (grade of recommendation = D).

Resuscitation failure

If despite full resuscitation, the baby remains hypoxic and bradycardic, it is possible that the degree of pulmonary hypoplasia is lethal. Adjunctive criteria may include: inability to maintain pH > 7.0, PCO2 persistently > 100mm Hg, preductal sats < 70%, need for PIPs > 30 on CMV or MAP > 22 on HFOV after optimization of sedation and BP in the first 2h of life. Discussion may be held with family to redirect goals of care to comfort care, and to discontinue life support measures to allow family to hold their baby, allowing for natural death

Initial NICU Management (Flow Diagram A)

- Minimal handling and minimal stimulation
- Admit to NICU as soon as possible
- Insert umbilical venous (UVC) and umbilical arterial (UAC) catheters
    - Consider right radial peripheral arterial line (PAL) to monitor preductal PaO2
    - Consider early PICC line due to mediastinal shift and difficulty positioning UVC at IVC-RA junction
- Neuromuscular blocking agents should be avoided during initial treatment in the delivery room (grade of recommendation = D).
- Opiate sedation should be given to provide comfort and avoid gaseous distension of bowel.

*Initial Respiratory Management*

- Obtain chest/abdominal radiograph after line placement.
- No routine use of surfactant in either term or preterm infants with CDH (grade of recommendation = D).
- Aim for preductal saturation between 80 and 95%, postductal saturation above 70% and arterial CO2 levels between 50 and 70 mm Hg (permissive hypercapnia). Hypercarbia is acceptable as long as blood lactate and pH are normal.
- Oxygen saturation levels down to 80% may be accepted, providing organs are well perfused, as indicated by a pH >7.2, lactate levels <3 mmol/l and urinary output >1 ml/kg/h, cerebral/renal oximetry > 60s. Postductal saturations should remain above 70%.
- Conventional mechanical ventilation is the optimal *initial* ventilation strategy (grade of recommendation = C).
- Avoidance of ventilator-induced lung damage (judicious use of PIP, MAP and PEEP)
    - Pressure-controlled ventilation: initial settings are a PIP <25 cm H2O and a PEEP of 3–5 cm H2O; ventilator rate of 40–60/min (grade of recommendation = D).
    - Escalate to high frequency oscillatory ventilation (HFOV) if a PIP of >28 cm H2O is necessary to achieve pCO2 and saturation levels within the target range (grade of recommendation = D).
        - Avoid MAP > 18 due to risk of barotrauma
        - Avoid hyperinflation (>8 ribs, flattened diaphragms)
        - Consider iNO if MAP > 12 and FiO2 > 60%, OI > 20
        - Assuming that the MAP is no more than 16 and lungs are not hyperinflated on CXR, the MAP MUST NOT be decreased until $FiO_2$ is consistently <30 – 40%.
        - Consider conventional ventilator when MAP $\leq$ 12 and FiO2 $\leq$ 30%

- After stabilization, reduce FiO2 if the preductal saturation is above 95% (grade of recommendation = D).

*Management Of Hemodynamics*

- Maintain BP at a normal level for gestation (avoid hypertension/supraphysiologic pressures)
- In the case of hypotension and/ or poor tissue perfusion, 10–20 ml/kg 0.9% sodium chloride should be administered up to 2 times (grade of recommendation = D).
- In cases of persistent hypotension after the administration of 0.9% sodium chloride, inotropic and vasopressor agents should be considered (grade of recommendation = D).
- Obtain echocardiogram to evaluate cardiac function and rule out structural heart disease

Choice of inotropes

This should be guided by functional ECHO. Consideration of all aspects of circulation should include assessment of preload, contractility, afterload and the balance between systemic and pulmonary circulations. Consult pulmonary hypertension team to assist with vasoactive medication management.

Please refer to Neofax or Lexicomp Formularies for dosing regimens where not stated.

- Epinephrine. Dose range 0.02 mcg/kg/min to 0.2 microgram/kg/min via central venous catheter. Vasoconstriction is also a side-effect and may be especially marked in combination with dopamine.

- Dopamine. Dose range 5 mcg/kg/min to 20 mcg/kg/min. Consider addition additional agent if needing > 10 mcg/kg/min.

- Vasopressin. Suggested dose range 0.3 to 1.2 milliunits/kg/min. Vasopressin has been shown to improve systemic hemodynamics and gas exchange without adverse effects on PVR in infants with CDH and PPHN who have refractory hypotension in a small retrospective cohort study (Acker, S. et al 2014). Serum sodium should be monitored closely as significant urine salt wasting can occur, leading to hyponatremia that may require correction with 3% NaCl. In the systemic circulation, vasopressin acts via V1a receptors of the smooth muscle leading to vasoconstriction of both arteries and veins. Animal studies have shown that unlike its effects on systemic vasculature, vasopressin causes dilation of the pulmonary circulation, likely mediated via nitric oxide release from the endothelium.

- Milrinone. Suggested dose 0.25 mcg/kg/min. Can be considered for treating reduced cardiac output due to RV failure. While milrinone augments RV function, it should be used in conjunction with epinephrine as systemic vasodilatation could otherwise lead to a significant reduction in systemic blood pressure and reduced pulmonary blood flow.

- Hydrocortisone should be considered in the setting of pressor resistant hypotension. Many infants with CDH also have concurrent adrenal insufficiency. Consider sending a random cortisol level prior to initiation. Hydrocortisone may also enhance the adrenergic effects of inotropic therapy. Suggested dose: consider loading dose of 2mg/kg followed by maintenance 1mg/kg q6-q8hrs.

*Management of Pulmonary hypertension*

- Pulmonary hypertension in CDH must be anticipated and is secondary to pulmonary hypoplasia and pulmonary vascular remodelling.
- Monitor pre and post-ductal saturations
- A pre-ductal – postductal $SpO_2$ difference > 10% provides evidence of significant R-L ductal shunt
- If significant pulmonary hypertension is present, it may be necessary to augment systemic blood pressure
- Consult pulmonary hypertension (PH) team

Oxygenation Index (OI) should be calculated with each blood gas using the following:

$$OI = \frac{[\text{mean airway pressure} \times \% O_2]}{[PaO_2 \text{ in mm Hg}]}$$

- iNO administration at a dose of 10–20 ppm is advised if there is evidence of extrapulmonary right-to-left shunting, the oxygenation index is above 20, and/or the saturation difference is more than 10%. This should be given for at least 1 hr (grade of recommendation = D).
- In nonresponders to iNO, consider discontinuation of iNO. iNO responders are defined as follows: a decline of 10–20% in the pre-post ductal saturation difference, or an increase of 10–20% of PaO2, or improvement in hemodynamic parameters meaning a 10% increase in mean blood pressure, or a decrease in lactate levels (grade of recommendation = D).
- Caution is advised when using iNO in the setting of LV dysfunction as suggested by a right-to-left ductal shunt and left-to-right atrial level shunt due to the risk of pulmonary venous congestion, heart failure, hypotension and compromised systemic cardiac output

- In consultation with Pulmonary Hypertension (PH) Team, additional PH therapy may be considered
    - Sildenafil a cyclic GMP specific phosphodiesterise 5 inhibitor causing pulmonary vascular smooth muscle relaxation. Activity with iNO is synergistic. Oral sildenafil has more frequently been used in the management of chronic pulmonary hypertension.
    - Prostacyclins
        - Consider inhaled epoprostenol or IV treprostinil (Remodulin) as recommended by the Pulmonary Hypertension team.
    - Prostaglandins
        - Consider using alprostadil to prevent PDA closure, in order to offload the right ventricle.

*Metabolic acidosis*

- Consider the reason for metabolic acidosis.
- Bicarbonate infusions should be used with caution, as they may worsen intracellular acidosis.

Other Considerations

- Obtain head ultrasound to rule out intracranial hemorrhage (pre-ECMO)
- DOL 0 - Keep maintenance fluids (including infusions) restricted to 60ml/kg
- Large bore replogle to low intermittent wall suction (LIWS)
- Send blood culture and start ampicillin and gentamicin as appropriate
- Correct hypocalcemia and hypoglycemia.
- Check magnesium and ensure level within the normal range
- Maintain normothermia
- Treat air leaks and pneumothoraces.
- Type and screen, obtain blood transfusion consent
- Consider genetics consent and chromosomal microarray testing if amniocentesis declined during pregnancy
- Discuss breast milk and donor milk with family

When should ECMO be considered?

- Inability to maintain preductal saturations >85% or postductal saturations >70%.
- Increased PaCO2 and respiratory acidosis with pH <7.15 despite optimization of ventilator management.
- Peak inspiratory pressure >28 cm H2O or mean airway pressure >17 cm H2O is required to achieve saturation >85%.
- Inadequate oxygen delivery with metabolic acidosis as measured by elevated lactate ≥5 mmol/l and pH <7.15.
- Systemic hypotension, resistant to fluid and inotropic therapy, resulting in urine output <0.5 ml/kg/h for at least 12–24 h.
- Oxygenation index ≥40 present for at least 3 h.

The ECMO team should be notified for any CDH patient requiring escalation of therapy.

When to consider transfer to an ECMO Center if born outside of PC system

- If the infant requires HFOV mean airway pressure > 12
- OI > 25, increasing FiO2 requirements ≥ 60%
- Persistent metabolic acidosis (pH < 7.2, base deficit > 5, lactate > 5mg/dl) for ≥ 4 to 6 hours
- Escalating pressor support to more than one pressor
- *Patients with CDH are susceptible to rapid deterioration, therefore earlier transfer is recommended even if above criteria are not met*

Discharge and Follow-up

- Order equipment, medications at least 1 week prior to discharge
  - PH team orders sildenafil prescription if indicated. Requires an insurance prior authorization.
- Parents nest per NICU nesting guidelines

- Long-term follow-up is necessary to assess the multi-organ morbidity associated with CDH
- All CDH patients should be referred to CDH follow-up clinic (MDC) within 1 month and NEST clinic within 3 months of discharge.
- Other discharge appointments to consider
    - Pulmonary if discharging on home O2 or a tracheostomy
    - GI if discharging home on nasogastric or gastrostomy feeds
    - Pulmonary hypertension if discharging on sildenafil and/or home O2

| Recommended follow-up schedule for infants with CDH | | | | | | |
|---|---|---|---|---|---|---|
| | Before Discharge | 1–3 mo After Birth | 4–6 mo After Birth | 9–12 mo After Birth | 15–18 mo After Birth | Annual Through 16 y |
| Weight, length, occipital-frontal circumference | x | x | x | x | x | x |
| Chest radiograph | x | If patched or primary closure | If patched or primary closure | If patched or primary closure | If patched or primary closure | If patched If patched or primary closure up to age 5 |
| Pulmonary function testing | | | | | | Starting age 5 |
| Childhood immunizations | As indicated | x | x | x | x | X |
| Echocardiogram and cardiology follow-up | x | If previously abnormal or if on supplemental oxygen | If previously abnormal or if on supplemental oxygen | If previously abnormal or if on supplemental oxygen | If previously abnormal or if on supplemental oxygen | If previously abnormal or if on supplemental oxygen |
| Head CT or MRI | If (1) abnormal finding on head ultrasound; (2) seizures/abnormal neurologic findings a ; or (3) ECMO or patch repair | As indicated | As indicated | As indicated | As indicated | As indicated |
| Hearing evaluation | Auditory brainstem evoked response or otoacoustic emissions screen | x | x | x | x | Every 6 mo to age 3y, then annually to age 5y |
| Developmental screening evaluation | x | x | x | x | | Annually to age 5 |
| Neurodevelopmental evaluation | x | | | x | | Annually to age 5y |
| Assessment for oral feeding problems | x | x | If oral feeding problems | If oral feeding problems | If oral feeding problems | If oral feeding problems |
| Upper GI, pH proble and/or gastric scintiscan | Consider for all patients | If symptoms | If symptoms | Consider for all patients | If symptoms | If symptoms |

| | | | | | | |
|---|---|---|---|---|---|---|
| Esophagoscopy | | If symptoms | If symptoms | If symptoms or if abnormal GI evaluations | If symptoms | If symptoms |
| Scoliosis and chest wall deformity (physical exam, chest radiograph and/or CT of the chest) | | | | x | | x |
| Taken directly from: American Academy of Pediatrics, Section on Surgery and the Committee on Fetus and Newborn. (2008). Postdischarge follow-up of infants with congenital diaphragmatic hernia. Pediatrics. | | | | | | |

## Admission Criteria

- Any infant with CDH requiring postnatal surgery

## Discharge Criteria

- Stable on home respiratory support (nasal canula <= 0.5L, tracheostomy and stable on home ventilator settings x 2 weeks, stable in room air)
- Tolerating enteral feeds by mouth, NG or gastrostomy tube
- Controlled pulmonary hypertension
- All prescriptions and DME obtained. Parent education and nesting requirements completed
- Discharge follow-ups ordered and scheduled

## References


1. Snoek KG et al, for the CDH EURO Consortium Standardized Postnatal Management of Infants with Congenital Diaphragmatic Hernia in Europe: The CDH EURO Consortium Consensus – 2015 Update Neonatology 2016;110:66–74. DOI: 10.1159/000444210
2. Jani J, Nicolaides KH, Keller RL et al, Observed to expected lung area to head circumference ratio in the prediction of survival in fetuses with isolated diaphragmatic hernia. Ultrasound Obstet Gynecol, 2007:30:67-71.
3. Jani J, Cannie M, Sonigo P et al. Value of prenatal magnetic resonance imaging in the prediction of postnatal outcome in fetuses with diaphragmatic hernia. Ultrasound Obstet Gynecol, 2008;32:793-99.
4. Kotecha S, Barbato A, Bush A, Claus F, Davenport M, Delacourt C, Deprest J, Eber E, Frenckner B, Greenough A, Nicholson AG, Antón-Pacheco JL, Midulla F. Congenital diaphragmatic hernia. Eur Respir J. 2012 Apr;39(4):820-9. Epub 2011 Oct 27.
5. Mugford M, Elbourne D, Field D. ECMO for severe respiratory failure in newborn infants. Cochrane database Syst Reviews, 2008.
6. Ng GYT, Derry C, Marston L Choudhury M, Holmes K, Calvert SA. Reduction in ventilator-induced lung injury improves outcome in congenital diaphragmatic hernia? Pediatr Surg Int (2008) 24:145–150.
7. Osman I, Stenhouse E, Ledingham MA et al. The observed to expected lung head ratio and total fetal lung volume as predictors of outcome in antenatal congenital diaphragmatic hernia. Am J Obstet Gynecol, 2011;204:S139
8. Peetsold MG, Heij HA, Kneepkens CM, Nagelkerke AF, Huisman J, Gemke RJ.

The long-term follow-up of patients with a congenital diaphragmatic hernia: a broad spectrum of morbidity. Pediatr Surg Int. 2009 Jan;25(1):1-17. Epub 2008 Oct 8.
9. Tracey ET, Mears SE, Smith PB, Danko ME, Diesen DL, Fisher KA, Hoehner JC, Goldberg RN, Cotton CM, Rice HE. Protocolised approach to management of congenital diaphragmatic hernia: benefits of reducing variability in care. J Pediatr Surg, 2010;45(6):1343-8.
10. Turner MA, & Baines P. Which inotrope and when in neonatal and paediatric intensive care. Arch Dis Child Educ Pract Ed 2011;96:216-222. Published online first 3 August 2011
11. UK Collaborative ECMO Trial Group. UK collaborative randomised trial of neonatal extracorporeal membrane oxygenation. Lancet 1996;348:75-82
12. Pittinger, T. Adrenocortical Insufficiency in Infants with Congenital Diaphragmatic Hernia: A Pilot Study. J Pediatr Surg, 2000: 35 (2); 223-226
13. Robertson, J., Criss, C., Hsieh, L., Matsuko, N., Gish, J., Rodrigo, A., Johnson, K., Gadepalli, S. Steroid Use for refractory hypotension in congenital diaphragmatic hernia. Pediatr Surg Int 2017; 33: 981-987
14. Petroze, RT, Caminsky, NG, Trebichavsky, J., Bouchard, S., Le-Nguyen, A., Laberge, JM., Emil, S., Puligandla, P. Prenatal prediction of survival in congenital diaphragmatic hernia: An audit of postnatal outcomes. J Pediatr Surg 2019; 54: 925-931
15. Jani, J., Nicolaides, KH., Keller, RL, Benachi, A., Peralta, CFA., Favre, R., Moreno, O., Tibboel, D., Lipitz, S., Eggink, A., Vaast, P., Allegaert, K., Harrison, M., Deprest, J. Observed to expected lung area to head circumference ratio in the prediction of survival in foetuses with isolated diaphragmatic hernia. Ultrasound Obstet Gynecol 2007; 30: 67-71
16. Acker, SN, Kinsella, JP, Abman, SH, Gien, J. Vasopressin improves hemodynamic status in infants with congenital diaphragmatic hernia. J Pediatr 2014; 165 (1): 53-58
17. Suzan, CM., Horn-Oudshoorn, EJ, Allegaert, K., DeKonick, P., Peters, N., Cohen-Overbeek, T., Reiss, I., Tibboel, D. Routine Intubation in Newborns With Congenital Diaphragmatic Hernia. *Pediatrics*. 2020; 146.

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Committee approval dates

- Neonatal Patient Care Committee February 9, 2024
- P&T Committee – April 24, 2024
- CEC committee May 2024