INPATIENT GUIDELINE

# Post-operative Chylothorax Management Guideline

Children's MINNESOTA

Aim: Standardize the diagnosis and management of post-operative chylothorax

Within 30 days of sternotomy or thoracotomy

Yes

Clinical concern for chylothorax or 1+ risk factor (see Note 1)?

Yes

Send pleural fluid for cell count and triglycerides

Is pleural fluid consistent with chyle? (See Note 2)

Yes

- Initial screening labs (blood): Antithrombin III, albumin, IgG, PT, PTT, Fibrinogen, TSH, Free T4
- Obtain head/neck US with doppler.
- Consider repeat echo

No

- Continue regular diet
- Consider diuretics if clinically appropriate

Is there a new thrombus on US?

Yes

Anticoagulate per hematology recommendations

No

Chest tube output >10 mL/kg/day?

Yes

See page 2

No

- Continue regular diet*
- Diuretics
- Ongoing monitoring

* Consider diet modification per team discretion

**Note 1: Risk Factors for chylothorax**

- Redo sternotomy
- Chest tube output >20 ml/kg/day 24h after chest closure
- Intra-operative concern for chyle
- Milky appearance of pleural fluid

**Note 2: Pleural fluid studies**

- Positive for chyle if 1+ present:
  - Triglycerides >110mg/dL
  - >80% lymphocytes

*Disclaimer: This guideline is designed for general use with most patients; each clinician should use their own independent judgment to meet the needs of each individual patient. This guideline is not a substitute for professional medical advice, diagnosis or treatment.*

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Chyle chest tube output (CTO) >10mL/kg/day

Yes

- Switch to fat modified diet
- Obtain dietician consult
- *See supplemental box 1 for details*

After 48-72 hours of fat modified diet:

**Chest tube output >20 mL/kg/day**

- Make NPO on TPN/SMOF
- Activate CVICU Chylous Effusion order set
- *See supplemental box 2 for details*

Output <10 mL/kg/day for >48 hours?

Yes → Restart fat modified diet

No → Refractory chylothorax (NPO ≥ 7 days with CTO >10 mL/kg/day)

- Consider secondary interventions (see Note 2)
- Consider lymphatic center consultation

**Chest tube output 10-20 mL/kg/day**

Continue fat modified diet

≥ 5 days of chest tube output >10 mL/kg/day **OR** >20 mL/kg/day on any day

Yes → Make NPO on TPN/SMOF

No → Continue fat modified diet for:
- 4 weeks total for biventricular patients
- 8-12 weeks total for single ventricle patients

**Chest tube output <10 mL/kg/day**

Continue fat modified diet for:
- 4 weeks total for biventricular patients
- 8-12 weeks total for single ventricle patients

**Note 2: Secondary interventions**

Replacement Therapies:
- IVIG
- 25% albumin
- Volume replacement

Adjunctive therapies:
- Octreotide
- Midodrine
- PDE-5 inhibitor
- Beta-blocker
- Systemic corticosteroids

*See supplemental box 3 for details*

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## Supplemental Information

Children's MINNESOTA

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### Supplemental Box 1: Dietary fat modifications

**MCT based enteral formulas**:
< 1 year of age: Enfaport, Lipstart*, or Vivonex Pediatric* or Vivonex TEN (for milk protein intolerance). Supplement with 400 IU Vitamin D/day.

1-13 years of age: Enfaport, Lipstart, Vivonex Pediatric** or Vivonex TEN**(for milk protein intolerance).
Medium Chain Triglyceride (MCT) Based Calorie Modulars: MCT oil (8 Cal/ml), Nutricia Liquigen (4.5 Cal/ml), Vitaflo MCT Procal (112 Cal/1 powder packet).

**Oral Fat Modified Diet**:
Start <10g fat/day from long-chain triglycerides to provide 2-4% total calories from linoleic acid (LA) and 0.25-0.5% from alpha-linolenic acid (ALA). Please select "no fat" in the diet order set.

**Defatted human milk**: *(not currently available at Children's Minnesota)*
Fortify as below with MCT based formula for <1 year of age. Consider supplementation with ADEK multivitamin if chylous output >7 days.

**Essential Fatty Acid (EFA) Deficiency Monitoring**:
EFA deficiency may develop in 1-3 weeks on no/low exogenous EFA delivery.
- EFA deficiency: dry/scaly rash, sparse hair, poor wound healing.
- For prolonged restriction or symptoms present: obtain EFA profiles, monitoring triene:tetraene ratio (>0.4 diagnostic of EFA deficiency), LFTs, platelets.

*Nutritionally complete but off label use in patients less than 1 year old
**Not nutritionally complete, requires trace mineral supplementation

### Supplemental Box 2: Parenteral nutrition information

**Parenteral Nutrition**: Optimize calories and protein. Protein may need to be increased by 1.5-2x RDA/DRI (0-2 years old: provide 3-4 g/kg; preterm: provide 3.5-4 g/kg). Dose lipids (IL) per needs/tolerance but with minimum of 0.5 g/kg/day 20% IL or 1 g/kg/day SMOF (goal is 2 g/kg/day SMOF for 0-12 months of age) in order to deliver ~0.1 g/kg/day LA. For preterm infants, double lipid dose in order to deliver the minimum 0.25 g/kg/day LA to prevent EFA deficiency.

**Parenteral Nutrition Screening Labs**: daily until stability: electrolytes (BMP) including Mg, PO4; 1-2x/week: triglycerides, LFTs and albumin.

### Supplemental Box 3: Secondary chylothorax interventions

**Adjunctive therapies** (If no response within two weeks of starting an adjunct therapy, the treatment should be discontinued and an alternative agent should be trialed):
- *Phosphodiesterase-5 inhibitor* (Sildenafil): Recommended dose: 2-4mg/kg/day PO divided q8h.
- *Octreotide*: Recommended dose: 40 mcg/kg/day SQ divided q8h or 3 mcg/kg/hr IV infusion (double dose daily to max 10 mcg/kg/hr if no effect).
- *Systemic corticosteroids*: dexamethasone, methylprednisolone, or hydrocortisone
- *Non-selective beta-blocker* (Propranolol): Recommended dose: 0.5-2mg/kg/day PO divided TID
- *Midodrine*: Recommended dose: 0.1 mg/kg PO q8h.

**Replacement therapies**:
- *Volume replacement*: Consider alternating the following products for replacement: FFP, 5% albumin, and/or LR. Caution using additional volume during early postoperative period.
- *Intravenous Immunoglobulin*: Recommended dose: 400 mg/kg IV. Replacement for serum level <400. Limit replacement to twice/week.
- *25% Albumin*: Recommended dose 0.5-1 g/kg IV q6h x24h to keep serum Albumin >3.0 mg/dl.
- *Antithrombin III (currently not available at Children's Minnesota)*: Recommended dose: 500 Units=1 vial for serum activity level <60-80%, especially if requiring therapeutic anticoagulation or at higher risk for thrombosis (i.e. shunted patients, nephrotic patients, etc.). Limit replacement to twice/week. Consider FFP as an alternative to ATIII and for volume replacement.

**REFERENCES:**

1. Adapted from the PC4 Quality Improvement Committee Chylothorax Work Group v.1.0 pediatric postoperative chylothorax management algorithm
2. Lion RP, et al. Development of consensus recommendations for the management of post-operative chylothorax in paediatric CHD. Cardiol Young. 2022 Aug;32(8):1202-1209. doi: 10.1017/S1047951122001871. Epub 2022 Jul 6. PMID: 35792060.
3. Winder M, Bailly D. Pediatric chylothorax: where we've been and where we're going. J Thorac Dis. 2023 Apr 28;15(4):1526-1529. doi:10.21037/jtd-23-7. Epub 2023 Mar 20. PMID: 37197529; PMCID: PMC10183518.

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