Spontaneous Pneumothorax (PTX)

Emergency Department & Inpatient

Nationwide Children's — When your child needs a hospital, everything matters.

Center for Clinical Excellence

Concern for Primary Spontaneous Pneumothorax in pt >8 years

- Continuous Pulse Oximetry
- Pain control as needed, prefer non-opioid
- Upright PA/Lat CXR
- CT Scan is NOT recommended

Pneumothorax present? — No → **Off Pathway**

Yes

Consult to Pediatric Surgery
Transfer pt to MCED if at LCED or UC

Patient stable*, no indication for urgent intervention

Yes → **Observation Trial****
- 4 hours from initial CXR result

Patient remains stable*?

Yes → Repeat PA CXR

CXR stable/improved & patient stable*?

Yes → **Discharge**

No → Place 8-14 FR chest tube
- Place CT to suction x10 minutes, then clamp
- Immediate Upright PA CXR
- Admit to Pediatric Surgery

No → Chest tube to -20 cm H_2O suction x 48 hrs
- Repeat Upright PA CXR daily

PTX improved & stable*?

No → Chest tube to -20 cm H_2O suction x 48 hrs

Yes → Chest tube clamped x6 hours
Repeat Upright PA CXR

Yes → CXR stable/improved & stable*?

No → Chest tube to -20 cm H_2O suction x 48 hrs

Yes → Remove chest tube & observe for 4 hours

Stable*?

Yes → **Discharge**

No → Obtain Upright PA CXR

Off Pathway
Treat as clinically indicated
Surgeon on call to be notified

PTX improved & no leak?

Yes → Water seal trial for 4 hours then obtain Upright PA CXR

PTX stable & stable*?

Yes → Remove chest tube & observe for 4 hours

No → **Off Pathway OR for VATS vs repeat suction trial**

No → **Off Pathway OR for VATS vs repeat suction trial**

- For observation trial successful patients, pediatric surgery clinic f/u phone call at 24-72h
- F/u clinic visit to be scheduled in 6 weeks with repeat upright PA CXR

[Signs/Symptoms](#) | [Inclusion/ Exclusion Criteria](#)

Stable*
- Oxygen Saturation >92% on room air
- No hypotension
- No respiratory distress
- No tachypnea
- Pain controlled with non-opioid medications

Observation Trial**
- Observation occurs in the ED, but patients can be admitted to Pediatric Surgery as needed for limited ED capacity and/or surgeon discretion.

Inclusion & Exclusion Criteria

Inclusion Criteria

- Patients **8** years or older presenting with concern for **primary** spontaneous pneumothorax

Exclusion Criteria

- Prior spontaneous pneumothorax on the **SAME** side
  - *Prior **contralateral** pneumothorax is NOT an exclusion criteria*
- Traumatic or tension pneumothorax
- Respiratory failure
- Secondary Pneumothorax
  - Malignancy
  - Intrinsic pulmonary disease (CF, BPD) **(Consult Pulmonology)**
    - *Asthma is NOT an exclusion criteria*
  - Known connective tissue disease (Marfan's, Ehlers-Danlos, etc.)
  - History of ***ipsilateral*** VATS or other recent thoracic instrumentation or procedure (ie EGD, biopsy, bronchoscopy, thoracentesis)
- Other associated findings
  - Hemothorax, pleural effusion, pneumomediastinum

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Signs & Symptoms

- Sharp chest pain made worse by a deep breath
- Shortness of breath
- Decreased breath sounds on the affected side
- Chest pain (sudden onset or insidious)
- Respiratory Distress
- Hypoxia (O2 sat <92%)
- Lack of infectious symptoms

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Diagnosis & Definition

- *Primary spontaneous pneumothorax* is an abnormal accumulation of air in the space between the lungs and the chest cavity (called the pleural space) that can result in the partial or complete collapse of a lung. This is not due to any underlying condition or traumatic event.

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Differential Diagnosis

- Traumatic pneumothorax, especially if history of trauma
- Secondary pneumothorax, especially if history of an underlying pulmonary condition such as lung lesions or tumors
- Pneumonia
- Foreign body
- Pneumomediastinum

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Testing

- Upright PA Chest x-ray is the preferred radiograph for the assessment of pneumothorax

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Severity Assessment

- Shortness of breath/respiratory distress
- Oxygen saturation < 92% on room air
- Blood pressure
- Respiratory rate

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Assessment & Monitoring

- Continuous pulse oximetry until treatment is completed
- Daily upright PA chest x-rays or as needed based on clinical change
- Serial exam Q8H for presence of air leak

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Recommended Treatments

- Pain control as needed
  - Non-opioid preferred, Opioid if needed
- Incentive spirometry
- Supplemental Oxygen should only be applied if persistent O2 sats <92% or symptomatic
- **Chest tube aspiration:**
  - Place to suction x 10 minutes, then clamp
  - Immediately obtain Upright PA CXR after clamping
  - If PTX is less than 2 cm, repeat Upright PA CXR in 6 hours
  - If PTX ≥ 2 cm, repeat suction x 10 minutes x1 and repeat Upright PA CXR after clamping. If PTX again remains ≥ 2 cm, aspiration has failed so place CT to -20 cm suction continuous.

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Treatments Not Recommended

CT scan – Several studies have shown that CT scans do not predict recurrence. CT has a low sensitivity rate and no change in management has been shown in most patients. *See **references** (6-8)*

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Deterioration & Escalation of Care

- Identification of Deterioration
  - Respiratory distress
  - Dyspnea
  - Acute desaturation <92%
  - Sudden onset of worsening pain
- Escalation of Care Protocol
  - Patient should be placed on 100% oxygen by non-rebreather
  - RN to notify Pediatric Surgery APP or resident immediately
  - ACT or Code called based on hospital parameters
  - APP/resident to notify fellow or attending on call

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Discharge Criteria & Planning

Discharge Criteria

- Oxygen Saturation >92% on room air
- No respiratory distress
- No tachypnea or tachycardia
- Pain controlled with non-opioid medication

- If no chest tube placed:
  - Patient can be observed x 4 hours and discharged home from ED after stable repeat imaging
  - Patient may be admitted to Pediatric Surgery during observation trial if needed for ED bed availability or per surgeon discretion, but consider that no sedation is available on the floor if the need for chest tube placement becomes needed
- If chest tube placed, patient can be admitted to Pediatric Surgery and discharged after:
  - Aspiration and clamping trial with 6 hour observation if successful
  - Post-chest tube removal, patient observed for 4 hours on continuous pulse oximetry (CXR not required if asymptomatic)
- Follow Up: Nursing phone call at 24 – 72 hours after discharge for patients discharged after successful observation trial
  - Clinic visit in ~6 weeks after discharge with repeat upright PA CXR for all pneumothorax patients

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Patient & Caregiver Education

- Spontaneous Pneumothorax Discharge Instructions: IP DC INSTRUCTIONS - PNEUMOTHORAX
- Education on:
  - Signs of recurrent pneumothorax
  - Signs of contralateral pneumothorax
  - **Helping Hands**

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Key References

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Quality Measures

- Utilization metric: Order set use
- Process metric: CT chest (goal=decrease)
- Outcome metric: Decreased LOS, Decreased Time from admission to surgery, Decreased rate of recurrent pneumothorax
- Balancing metric: 7 and 30 day ED/IP return for pneumothorax recurrence

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Potential Areas for Research

- Current study: Success of Observation Trial
  - Does a trial of observation only approach decrease interventions and length of stay for patients with primary spontaneous pneumothorax that do not require chest tube placement for physiologic impairment?

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Origination Date: *August, 2023*
Last Revision Date: *February 2025*
Next Revision Date: *February 2028*

Clinical Pathway Development

This clinical pathway was developed using the process described in the NCH Clinical Pathway Development Manual Version 6, 2022. Clinical Pathways at Nationwide Children's Hospital (NCH) are standards which provide general guidance to clinicians. Patient choice, clinician judgment, and other relevant factors in diagnosing and treating patients remain central to the selection of diagnostic tests and therapy. The ordering provider assumes all risks associates with care decisions. NCH assumes no responsibility for any adverse consequences, errors, or omissions that may arise from the use or reliance on these guidelines. NCH's clinical pathways are reviewed periodically for consistency with new evidence; however, new developments may not be represented, and NCH makes no guarantees, representations, or warranties with respect to the information provided in this clinical pathway.

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