



Department:	Pediatric Intensive Care Unit (PICU)		
Document:	Multidisciplinary Policy and Procedure		
Title:	Care of Pediatric Patient with Pneumothorax		
Applies To:	All Pediatric Intensive Care Unit Staff and Radiologists		
Preparation Date:	January 12, 2025	Index No:	PICU-MPP-021
Approval Date:	January 26, 2025	Version :	2
Effective Date:	February 26, 2025	Replacement No.:	PICU-MPP-021 (1)
Review Date:	February 26, 2028	No. of Pages:	4

1. PURPOSE:

- 1.1 To identify sign of decreased/diminished air entry.
- 1.2 To provide effective breathing pattern and promote effective gas exchange.
- 1.3 To recognize signs of pneumothorax for proper intervention.
- 1.4 To detect complication and the need for chest tube insertion.

2. DEFINITIONS:

- 2.1 **Pneumothorax** – is collection of air that is located within the thoracic cage between the visceral and parietal pleura. Air can enter the pleural space through a leak in either pleural surface. It may flow freely within the chest or be occluded by fibrous bands or other tissues. A pneumothorax is characterized as either spontaneous or traumatic.
- 2.2 **Traumatic Pneumothorax** – is caused by blunt, crush, or penetrating trauma to the chest, by injury from a diagnostic or therapeutic procedure such as central line placement or as a consequence of mechanical ventilation.
- 2.3 **Spontaneous Pneumothorax** – occurs in the absence of any identified trauma. It is subdivided into primary and secondary types.

3. POLICY:

- 3.1 The staff nurse must have knowledgeable about pneumothorax and must be alert to assess for signs and symptoms of the disease condition.
- 3.2 Patient's vital signs should be monitored closely for sign and symptom of respiratory distress and airway patency.
- 3.3 Resuscitation equipment, oxygen and suction are ready for use in case of emergency.
- 3.4 A set of needle decompression, appropriate chest tube, and water seal drainage set must be available at all time.
- 3.5 Standard precaution must be adhered to.

4. PROCEDURE:

- 4.1 Identify the patient correctly by using two identifiers (4 names for the Saudi and complete name for the Non – Saudi and Medical Record Number) and verify with another staff.
- 4.2 Obtain history of chronic respiratory disease, chest trauma/surgery and onset of symptom.
 - 4.2.1 Closely observed patient who will be undergone to certain diagnostic and therapeutic procedure as these will pre – disposed to risk of developing pneumothorax:
 - 4.2.1.1 Central line insertion
 - 4.2.1.2 Intubation
 - 4.2.1.3 Mechanical ventilator
 - 4.2.1.4 Transthoracic needle aspiration or biopsy
 - 4.2.1.5 Thoracentesis

- 4.2.1.6 Cardiopulmonary resuscitation
- 4.3 Provide support, calming and comforting technique to the patient. Let the attending physician appraised the condition of the patient and the possible course of treatment to the parents to allay anxiety and compliance to any medical intervention.
- 4.4 Connect to cardio – respiratory monitor and observe for sign of respiratory distress and oxygen desaturation.
- 4.5 Assess patient for sign and symptoms of pneumothorax as follows:
 - 4.5.1 Chest pain caused by crying and anxiety:
 - 4.5.1.1 Pleuritic chest pain that is described as sharp or stabbing and may be preceded by a popping sensation. The pain typically is diffuse on the affected side with radiation to the ipsilateral shoulder.
 - 4.5.2 Respiratory Distress or increased work of breathing:
 - 4.5.2.1 Tachypnea
 - 4.5.2.2 Retractions
 - 4.5.2.2.1 Intercostal retraction
 - 4.5.2.2.2 Sternal retractions.
 - 4.5.2.3 Nasal flaring
 - 4.5.2.4 Grunting
 - 4.5.2.5 Low oxygen saturation readings
 - 4.5.2.6 Air hunger
 - 4.5.3 Physical examination:
 - 4.5.3.1 Asymmetrical chest movement, with the affected chest wall moving less than the intact side reflecting the ventilation of the underlying lung.
 - 4.5.3.2 Decreased chest excursion.
 - 4.5.3.3 Diminished breath sounds.
 - 4.5.3.4 Hyper-resonant percussion.
 - 4.5.3.5 Decreased vocal fremitus on the affected side.
 - 4.5.3.6 Cyanosis depending on severity.
 - 4.5.3.7 Subcutaneous emphysema as evidence by crepitus on palpation.
 - 4.5.3.8 Sucking sound with open chest wound.
 - 4.5.4 Tachycardia may occur as this is a stress state and the child's pulse will rise to compensate for lower circulatory volume.
 - 4.5.5 Hypotension may occur as a large pneumothorax can disturb cardiopulmonary circulation.
 - 4.5.6 Jugular venous pressure may be raised.
 - 4.5.7 Collapse and shock depending on the extent of the air leak.
 - 4.5.8 Assist in chest x – ray procedure to confirm and establish the diagnosis of pneumothorax.
 - 4.5.8.1 Position the patient on supine. Anterior and posterior radiographs typically are obtained. Plain chest radiograph may be difficult to interpret in disorders such as congenital cystic lung disease (e.g., congenital lobar emphysema) or congenital diaphragmatic hernia. In these cases, the lung cysts or loops of bowel filled with air may mimic air in the pleural space.
 - 4.5.8.1.1 Chest x – ray reveals lung collapse with air between chest wall and visceral pleura. Lung are not filled with air but rather are collapsed.
 - 4.5.8.1.2 The trachea may be deviated away from the side of collapse especially in tension pneumothorax.
 - 4.5.8.2 Anticipate the need for chest CT (helpful in the detection of small apical blebs). However, CT scanning is not necessary unless abnormalities are noted on the plain chest radiograph that requires further assessment.
- 4.6 Monitor the patient for the following:
 - 4.6.1 Arterial blood gas measurements should be obtained in patients with respiratory distress.
 - 4.6.2 Place on continuous pulse oximetry monitoring (may not be accurate if perfusion is poor, as may occur in patients with tension pneumothorax).
- 4.7 Provide and initiate medical management as follows:
 - 4.7.1 Administer oxygen to enhance absorption of the air in the extra – pleural space.

- 4.7.1.1 Supplemental oxygen therapy for all patients with pneumothorax, to hasten reabsorption of intra – pleural air. One hundred percent oxygen should be delivered using a non – rebreathing facemask and a minimum flow rate of 15 liters per minute.
- 4.7.1.2 Assist the physician in endotracheal intubation and ventilator support when needed.
- 4.7.2 Assist the physician in needle aspiration if indicated to release air in the pleural space and promote re – expansion of collapse lung.
 - 4.7.2.1 Evacuation of air is recommended for large pneumothorax or for patients with significant dyspnea, hypoxemia, or significant pain.
 - 4.7.2.1.1 Simple aspiration is done percutaneously with a large – bore intravenous catheter connected to a large syringe via a three – way stopcock.
 - 4.7.2.1.2 Air is withdrawn manually until no more can be aspirated. Continuous aspiration of a substantial volume of air indicates that the air leak is persistent and lung expansion has not occurred.
 - 4.7.2.1.3 The stopcock is closed and the catheter is secured to the chest wall if no further air can be aspirated.
 - 4.7.2.1.4 Obtain a chest radiograph after four hours of observation. If adequate expansion has occurred, the catheter can be removed and the patient observed for an additional two hours.
 - 4.7.2.2 Assist in thoracostomy (chest tube insertion) tube placement. Patients who fail aspiration treatment because of a persistent air leak, or those who present with a recurrent spontaneous pneumothorax will be managed with a thoracostomy tube or pigtail catheter.
 - 4.7.2.2.1 Thoracostomy tube requires the use of water seal device to prevent re – accumulation of air.
 - 4.7.2.2.2 If the lung does not fully expand after drainage, suction should be applied to a water seal device. Early use of strong suction is not recommended because rapid expansion of the lung is associated with a risk of re – expansion – induced pulmonary edema.
 - 4.7.2.2.3 Imperative management of pain, the presence of pain when breathing will prevent the child breathing deeply coughing, and which may decrease the ventilation of the alveoli, impede good oxygenation and impair lung expansion.
 - 4.7.2.3 Perform cardiopulmonary resuscitation if needed to prevent cardio respiratory arrest.
- 4.8 Write nursing care plan according to identified patient's problem through nursing process approach. Refer to nursing clinical practice guidelines.
- 4.9 Document in the nurses notes all nursing care rendered, all treatment given patient's condition and tolerance to treatment.

5. MATERIALS AND EQUIPMENT:

- 5.1 Chest Tube Size 8 To 12 French
- 5.2 Water Seal Drainage Set
- 5.3 Intravenous Catheter
- 5.4 Syringe
- 5.5 Three – Way Stopcock
- 5.6 Resuscitation Trolley
- 5.7 Cardio – Respiratory Monitor
- 5.8 Oxygen Source
- 5.9 Suction Machine
- 5.10 Needle Decompression Set
- 5.11 Mechanical Ventilator
- 5.12 Sterile Gloves
- 5.13 Sterile Gown
- 5.14 Mask

5.15 X – Ray

6. RESPONSIBILITIES:

- 6.1 Physician
- 6.2 Nurses
- 6.3 Radiologist










7. APPENDICES:

- 7.1 Nurses Progress Notes

8. REFERENCES:

- 8.1 Kingdom of Saudi Arabia, Ministry of Health Baish General Hospital, 2018.

9. APPROVALS:

	Name	Title	Signature	Date
Prepared by:	Ms. Asma AlShammary	Head Nurse of PICU		January 12, 2025
Prepared by:	Dr. Eman Abdelhakim Amer	Pediatric Specialist		January 12, 2025
Reviewed by:	Mr. Sabah Turayhib Al Harbi	Director of Nursing		January 13, 2025
Reviewed by:	Mr. Hassan Aldahkil	Head of Respiratory Therapy Department		January 13, 2025
Reviewed by:	Dr. Ali Alfayez	PICU Head of the Department		January 14, 2025
Reviewed by:	Mr. Ahmad Nussairy	Head of Radiology Department		January 14, 2025
Reviewed by:	Mr. Abdulelah Ayed Al Mutairi	QM&PS Director		January 17, 2025
Reviewed by:	Dr. Tamer Mohamed Naguib	Medical Director		January 19, 2025
Approved by:	Mr. Fahad Hazam Al Shammari	Hospital Director		January 26, 2025