

STANDARDIZED PROCEDURE

NEONATAL INTUBATION (Neonatal)

I. Definition

This procedure is done in order to establish access to the airway in order to assist ventilation by the use of either endotracheal tube (ET tube) and bag, ET tube and continuous positive end pressure, or ET tube and mechanical ventilation.

II. Background Information

A. Setting

Inpatient neonatal patients or outpatient during Emergency Transport of neonatal patients. If appropriate, implement procedural support, if available- make sure Child Life is involved, and use age appropriate language and age appropriate developmental needs with care of children.

B. Supervision

The necessity of the procedure will be determined by the Advanced Health Practitioner (AHP) in verbal collaboration with the attending physician or his/her designee. Direct supervision is necessary until competency is determined and the minimum number of procedures is successfully completed, as provided for in the protocol. After that time, the attending physician or his/her designee must be available.

Designee is defined as another attending physician who works directly with the supervising physician and is authorized to oversee the procedures being done by the AHP.

C. Indications

Only oral endotracheal intubation is used in emergency situations.

Nasotracheal intubation is not performed by AHP on neonates. Endotracheal intubation may be necessary for:

1. Cardiopulmonary resuscitation.
2. Mechanical ventilation or CPAP for cardiopulmonary disease.
3. Airway protection in neurologically compromised infants.
4. Meconium at delivery.
5. Airway obstruction
6. Apnea

D. Precautions/Contraindications

1. If patient has a known congenital diaphragmatic hernia or thick meconium, then try to avoid mask ventilation prior to intubation and instead intubate quickly.

The AHP will notify the physician immediately under the following circumstances:

1. Patient decompensation or intolerance to the procedure

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2. Outcome of the procedure other than expected

III. Materials

1. Laryngoscope with appropriate blade size:
 - a. Term infant (>3500 grams) - Miller 1 (straight)
 - b. Premature infant (<3500 grams) - Miller 0 (straight)
2. Endotracheal tube of appropriate size (see below)
3. Endotracheal Tube Guide (stylet)
4. Neofit or adhesive tape (1/2 in.), cut and ready for use
5. Suction catheters
6. Skin barrier
7. Elastoplast
8. 4-0 silk suture
9. Needle holder
10. Inflation bag and mask connected to oxygen
11. Stethoscope
12. Medication – Morphine Sulfate and/or Lorazepam
13. CO₂ indicator (PediCap)

TABLE 1

Optimal Size of Endotracheal Tube	
Weight (grams)	Tube Size (French)
<1250	2.5
1251 - 2000	3.0
2001 - 3500	3.5
>3500	4.0

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IV. Neonatal Intubation

A. Pre-treatment evaluation

1. If time permits (Not an emergency, nor a meconium delivery), premedicate infant for pain control and/or sedation. Assess need for further medication throughout the procedure.
2. Empty the infant's stomach if the infant has been fed. (This does not, however, assure that the stomach is completely empty).
3. Ventilate the infant with bag and mask for one minute, using 21% oxygen (unless patient condition warrants using higher oxygen) before attempting intubation (except in meconium deliveries).

B. Set up (if applicable)

1. The tube should be of such size that it does not completely occlude the airway but allows a small air leak around the cords when 15-20 cm H₂O positive pressure is applied to the lung. Too large a tube may cause subglottic stenosis. Too small a tube increases the incidence of plugging or allows the gut to become distended with gas. The correct size ET tube can usually be estimated from birth weight as shown in Table I. If a tube does not pass easily and seems to fit tightly, or there is no gas leak when pressure is applied to the lung, change to the next smaller tube.
2. It is easier to insert the endotracheal tube if an endotracheal tube guide (stylet) is used to stiffen the ET tube. If a stylet is used, be sure that the tip of the wire is 0.5 cm back from the tip of the tube. Bend the proximal end of the wire over the tube adapter so that there is no possibility that the wire will advance beyond the tip of the tube and tear the airway.

C. Patient Preparation

If time permits, inform the patient/family of the treatment plan, otherwise notify them after the intubation is completed.

D. Procedure

1. Perform time out with all appropriate steps.
2. The left hand holds the laryngoscope and the little finger compresses the hyoid bone to help bring the larynx into view, while the right hand steadies the head.
3. At this point, the ET tube can be advanced easily with the right hand. If resistance is met, do not apply more force; the tube tip may be anterior to the epiglottis in the vallecula, or lateral to the false cords. If the tube is forced further, the hypopharynx may be perforated and the tube forced into the soft tissue of the neck.

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4. If the endotracheal tube cannot be inserted after 20-30 seconds, or if the infant develops cyanosis, hypoxia by the O₂ saturation monitor, hypotension or bradycardia, the process should be stopped, and the infant ventilated with a bag and mask for two minutes. The intubation procedure can be re-attempted once these abnormalities have been corrected.
5. The ET tube should be inserted to a depth of 1 to 1.5 cm below the vocal cords. The mark on the tube opposite the upper lip should be noted, and the level of the ET tube maintained while securing it in place.
6. As soon as the tube is in place, a CO₂ indicator (PediCap) should be placed at the end of the ET tube and assisted ventilation should be initiated while listening in both axillae for breath sounds. If the tube is in the esophagus, there will be faint breath sounds over the chest and a loud sound over the stomach. Another serious complication of endotracheal intubation is intubation of the right main bronchus with interruption of ventilation to the entire left lung. When this happens, breath sounds are decreased over the left chest, but not necessarily absent. If this is the case, the ET tube should be slowly withdrawn while listening to the left side, and stopped 0.5 -1.0 cm after the breath sounds become equal bilaterally. The CO₂ indicator should change color with ventilation if the ET tube is in the trachea, unless there is minimal pulmonary perfusion or a large air leak, in which case it may not turn color even if it is in the trachea.
7. When the ET tube tip is in good position, the number corresponding to the upper lip should be noted from the numbering along the side of the ET tube. This position should be maintained by putting a finger in the infant's mouth and gently pressing the tube against the palate just behind the alveolar ridge. The tube should not be pressed hard enough to partially occlude the tube. Before the ET tube is secured, it should be rotated so that the lettering faces the middle of the lower lip and the blue line is on the left. This causes the bevel of the tube to face forward and reduces the likelihood of the tip of the tube becoming occluded by the tracheal wall if the infant's neck is flexed.
8. Securing the ET Tube – use NEO-fit or Neo-Bar if available, if not then:
 - a. Skin prep should be applied liberally from ear to ear and over the upper lip.
 - b. A skin barrier should be placed over the skin prep.
 - c. A 1/4 inch width of Elastoplast should be sutured and then placed over the skin barrier.
 - d. The suture is passed into the edge of the endotracheal tube without entering the lumen so that the endotracheal tube is securely held against the upper lip. If the suture enters the lumen of the endotracheal tube, it may obstruct passage of suction catheters.
 - e. Adhesive tape cut in the form of an "H" is applied first to the upper edge of the Elastoplast to help secure the Elastoplast to the upper lip. The other "arms" of the "H" are then wrapped around the tube.

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- f. Single 3/8 inch strips of adhesive tape are then fastened to the lower edge of the Elastoplast posterior to the inferior lobes of the ears and wound around the endotracheal tube. The tape should not be passed all the way around the neck as this increases the likelihood of brain stem hemorrhage. This taping helps secure the lower edges of the Elastoplast to the face and lip.

E. Follow-up treatment

1. Location of the tip of the ET tube should be checked by x-ray and documented on procedure note. It should be approximately 0.5 to 1 cm above the carina.

F. Termination of treatment

The ETT will be discontinued in the event that it is no longer needed, or thought to be occluded.

G. Potential Complications:

1. Intubation of the esophagus and trauma to the hypopharynx are complications of the intubation procedure and have been discussed above. Other complications include:
2. Plugging of the endotracheal tube by mucus or blood.
 - a. Indicated by difficulty ventilating patient, increased ventilatory pressures, decreased breath sounds, poor lung expansion or a rising PaCO₂ when none of the other complications (below) are present.
 - b. If this occurs, the ET tube should be replaced.
3. Accidental extubation
 - a. May occur if the tape securing the tube comes loose and allows the ET tube to move.
 - b. May be indicated by reduced breath sounds (but not absent), and louder breath sounds over the stomach than those over the chest.
 - c. Inspection of the larynx with a laryngoscope will usually identify the problem.
 - d. If this occurs, the infant should be reintubated.
4. ET tube may enter a bronchus (usually right)
 - a. Causes over-ventilation of the corresponding lung and hypoventilation or atelectasis of the other.
 - b. Indicated by a difference in breath sounds which become equal when the ET tube is pulled back.
5. Occlusion of the ET tube.
 - a. The tube may become occluded at its tip if the beveled opening is pushed against the side of the trachea by neck flexion.
 - b. Usually indicated by changes in the degree of chest expansion and in the intensity of breath sounds when the position of the head is changed.

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- c. Occlusion of the ET tube is less likely when the head faces straight forward and the neck is not flexed. However infants should not be kept in this position for a prolonged period of time. A satisfactory compromise is achieved by putting the head in a neutral position when it is turned to the left or the right.
- d. Rotating the tube so that its bevel faces forward (ventrally) reduces the likelihood that the tube will become obstructed with head positioning.

Note: Meconium Deliveries:

If an infant is delivered through meconium and is compromised, then prompt endotracheal intubation and suctioning is required. Do not stimulate the infant. Intubate the trachea, attach the meconium aspirator, and suction. Remove the ET tube. If the ET tube contains meconium, repeat procedure until clear. The infant may need some mechanical ventilation between attempts of intubation if the infant is bradycardiac. Under ideal situations, the ET tube should be clear before mechanical ventilation is given. Continue the resuscitation under the Neonatal Resuscitation Program (NRP) guidelines.

IV. Documentation

A. Documentation is in the electronic medical record

1. Documentation of the pretreatment evaluation and any abnormal physical findings.
2. Record the time out, indication for the procedure, procedure, type and size of ETT used, the outcome, how the patient tolerated the procedure, medications (drug, dose, route, & time) given, complications, ETT placement by CXR, and the plan in the note.

B. All abnormal findings are reviewed with Attending or supervising physician

V. Competency Assessment

A. Initial Competence

1. The AHP will observe the procedure in its entirety at least once. Under the direct supervision of the attending physician the AHP will perform neonatal intubation successfully **three** times and will be evaluated for competence and technical skill.
2. The AHP will demonstrate knowledge of the following:
 - a. Medical indication and contraindications of neonatal intubation
 - b. Risks and benefits of the procedure
 - c. Related anatomy and physiology
 - d. Consent process (if applicable)
 - e. Steps in performing the procedure
 - f. Documentation of the procedure
 - g. Ability to interpret results and implications in management.

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3. The AHP will ensure the completion of competency sign off documents and send them directly to the medical staff office.

B. Continued proficiency

1. The AHP will demonstrate competence by successful completion of the initial competency.
2. Each candidate will be initially proctored and signed off by an attending physician. AHPs must perform this procedure at least **three** times per year. In cases where this minimum is not met, the AHP must demonstrate skill with this procedure in a simulation or skills lab, or the attending, must again sign off the procedure for the AHP. The AHP will be signed off after demonstrating 100% accuracy in completing the procedure.
3. Demonstration of continued proficiency shall be monitored through the annual evaluation.
4. A clinical practice outcomes log is to be submitted with each renewal of credentials. It will include the number of procedures performed per year and any adverse outcomes. If an adverse outcome occurred, a copy of the procedure note will be submitted.

VII. RESPONSIBILITY

Questions about this procedure should be directed to the Chief Nursing and Patient Care Services Officer at 353-4380.

VIII. HISTORY OF POLICY

Initial policy approved 1986 by CIDP and EMB

Revised 4/89, 1/93, 5/01, 7/03, 12/05, 6/08, 2/11

Revised most recently July 2012 by Subcommittee of the Committee for Interdisciplinary Practice

Reviewed most recently July 2012 by the Committee on Interdisciplinary Practice

Approved most recently July 2012 by the Executive Medical Board and the Governance Advisory Council.

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