AARC Clinical Practice Guideline

Nasotracheal Suctioning—2004 Revision & Update

NTS 1.0 PROCEDURE:
Nasotracheal suctioning (NTS) for tracheal aspiration is a component of resuscitation and bronchial hygiene therapy.[1]

NTS 2.0 DESCRIPTION/DEFINITION:
NTS is intended to remove accumulated saliva, pulmonary secretions, blood, vomitus, and other foreign material from the trachea and nasopharyngeal area that cannot be removed by the patient's spontaneous cough or other less invasive procedures. NTS has been used to maintain a patent airway thus ensuring adequate oxygenation and ventilation[2] and avoiding intubation that was solely intended for the removal of secretions.[1,3-6]

NTS refers to the insertion of a suction catheter through the nasal passage and pharynx into the trachea without a tracheal tube or tracheostomy (although a nasopharyngeal airway may be used)[3,7] in order to aspirate accumulated secretions or foreign material.[1,4,6]

The clearance of secretions is accomplished by application of subatmospheric pressure applied to a sterile, flexible, multi-eyed catheter[1,6,8-10] on withdrawal only.[9-15] Appropriate subatmospheric pressures are

2.1 Neonates: 60-80 mm Hg[16,17]
2.2 Infants: 80-100 mm Hg[16,18]
2.3 Children: 100-120 mm Hg[13,16]
2.4 Adults: 100-150 mm Hg[1,19]

Negative pressures should not exceed 150 mm Hg as higher pressures have been shown to cause trauma, hypoxemia and atelectasis.[3,12,14,20-25]

NTS 3.0 SETTINGS:
NTS is performed in a wide variety of settings, and this guideline applies to patients of all ages.

3.1 Critical care[1]
3.2 Emergency room or department[1]
3.3 Inpatient acute care[1]
3.4 Extended care and skilled nursing facility care[1]
3.5 Home care[1]
3.6 Outpatient or ambulatory care

NTS 4.0 INDICATIONS:
The need to maintain a patent airway and remove saliva, pulmonary secretions, blood, vomitus, or foreign material from the trachea in the presence of

4.1 Inability to clear secretions when audible or visible evidence of secretions in the large/central airways that persist in spite of patient's best cough effort.[1,5,6,25-27] This is evidenced by one or more of the following
- **4.1.1** Visible secretions in the airway[1,27]
- **4.1.2** Chest auscultation of coarse, gurgling breath sounds, rhonchi[1,14,21,27,28] or diminished breath sounds[21]
- **4.1.3** Feeling of secretions in the chest (increased tactile fremitus)[21]
- **4.1.4** Suspected aspiration of gastric or upper airway secretions[1]
- **4.1.5** Clinically apparent increased work of breathing[1]
- **4.1.6** Deterioration of arterial blood gas values suggesting hypoxemia or hypercarbia[1,21]
- **4.1.7** Chest radiographic evidence of retained secretions resulting in atelectasis or consolidation[1,27]
- **4.1.8** Restlessness[21,28]

4.2 To stimulate cough[1,2,27,29] or for unrelieved coughing[21]
4.3 To obtain a sputum sample for microbiological or cytological analysis[1,2,27]

NTS 5.0 CONTRAINDICATIONS:
Listed contraindications are relative unless marked as absolute.

5.1 Occluded nasal passages[1,6]

5.2 Nasal bleeding[1]
5.3 Epiglottitis or croup (absolute)[1,6]
5.4 Acute head, facial, or neck injury[1,2,6]
5.5 Coagulopathy or bleeding disorder[1,3,6]
5.6 Laryngospasm[1,3,6]
5.7 Irritable airway[1]
5.8 Upper respiratory tract infection[1]
5.9 Tracheal surgery[6]
5.10 Gastric surgery with high anastomosis[6]
5.11 Myocardial infarction[6]
5.12 Bronchospasm[2]

NTS 6.0 HAZARDS/COMPLICATIONS:

6.1 Mechanical trauma (mucosal hemorrhage, tracheitis, epitaxis from laceration of nasal turbinates, and perforation of the pharynx)[1,6,14,17,26,27,30-34]
6.1.1 Laceration of nasal turbinates[8,35]
6.1.2 Perforation of the pharynx[36]
6.1.3 Nasal irritation/bleeding[7]
6.1.4 Tracheitis[1,17]
6.1.5 Mucosal hemorrhage[2,32]
6.1.6 Uvular edema[37]
6.2 Hypoxia/hypoxemia[1,2,6,17,27,33,38-41]
6.3 Cardiac dysrhythmias/arrest[2,4,6,14,33-35]
6.4 Bradycardia[1,2,6,27,38,41-44]
6.5 Increase in blood pressure[1,2,6,38,40,45]
6.6 Hypotension[1,38]
6.7 Respiratory arrest[35]
6.8 Uncontrolled coughing[1,2,7,34]
6.9 Gagging/vomiting[1,6,7,46]
6.10 Laryngospasm[1,3,35]
6.11 Bronchoconstriction/bronchospasm[1,14,33,34]
6.12 Discomfort[7,41] and pain[1,2,7,41]
6.13 Nosocomial infection[1,2,27,34,44]
6.14 Atelectasis[2,8,14,17,27,33]
6.15 Misdirection of catheter[6,7,34]
6.16 Increased intracranial pressure (ICP)[6,28,40,41,45,47-49]
6.16.1 Intraventricular hemorrhage[14,40,50]
6.16.2 Exacerbation of cerebral edema
6.17 Pneumothorax[17]

NTS 7.0 LIMITATIONS OF METHOD:

7.1 NTS is a blind procedure with inherent risks (refer to complications).[1,6,7,44]
7.2 Risks are increased in a combative or uncooperative patient.
7.3 Duration of application of subatmospheric pressure, or suction, should be limited to no greater than 15 seconds.[1,2,6,9,13,14,17,20,21,24,28,39,51]
7.4 Controversy exists concerning possible overuse of this procedure.[8,14,26,52]

NTS 8.0 ASSESSMENT OF NEED:

8.1 Personnel should perform a baseline assessment for indications of respiratory distress and the need for NTS as recognized by presenting indications as listed above. This should include but not be limited to
8.1.1 Auscultation of chest[1,3,9,12,14,27,53,54]
8.1.2 Monitor patient's heart rate[3,12,14]
8.1.3 Respiratory rate[12]
8.1.4 Cardiac rhythm[12,14]
8.1.5 Oxygen saturation[12,14]
8.1.6 Skin color and perfusion[12]
8.1.7 Personnel should assess effectiveness of cough[1]
8.2 Prepare the patient for the procedure by providing an appropriate explanation along with adequate sedation and pain relief as needed.[2,9,12]

NTS 9.0 ASSESSMENT OF OUTCOME:

Effectiveness of NTS should be reflected by assessing patient post suction for
9.1 Improved breath sounds[1,36]
9.2 Removal of secretions[1,36]
9.3 Improved blood gas data or pulse oximetry[1]
9.4 Decreased work of breathing (decreased respiratory rate or dyspnea)[1]

NTS 10.0 RESOURCES:

10.1 Equipment:
10.1.1 Vacuum source[1,6,27]
10.1.2 Calibrated, adjustable regulator[1,55]
10.1.3 Collection vessel and connecting tubing[1]
10.1.4 Sterile, flexible, multiple-eyed suction catheter[1,6,8-10] of appropriate caliber[1,6,10,27,52,54]
10.1.5 Sterile disposable gloves[1,6,27,52]
10.1.6 Sterile water and cup[1,52]
10.1.7 Water-based lubricant[1,6,27,52] and/or normal saline[1,52]
10.1.8 Local anesthetic is sometimes used to reduce discomfort[1]
10.1.9 Nasopharyngeal airway when frequent NTS is required[1,3,7,54]
10.1.10 Resuscitation bag with mask[1,6,27,35,56]

In the acute care setting, with initiation of NTS or when working with the unstable patient, the following are recommended

10.1.11 Electrocardiogram monitor[1,27]

10.1.12 Oxygen (hyperoxygenation with appropriate delivery device as indicated)[1,6,14,27,28,39,41,51,57,58]

10.1.13 Personnel protective equipment for Standard Precautions[1,12,20,23,59-62]

10.1.14 Stethoscope[27]

10.2 Personnel:

10.2.1 Level I caregiver may be the provider of service *after* Level II personnel have established need by patient assessment and the first NTS episode has been completed. Level I personnel must demonstrate

10.2.1.1 Knowledge of proper assembly and use of equipment[2]

10.2.1.2 Knowledge of upper airway anatomy and physiology[35,44]

10.2.1.3 Ability to recognize secretion retention on auscultation[1,3,12,27,54]

10.2.1.4 Ability to monitor vital signs and assess patient's condition and response to procedure[3,12,14]

10.2.1.5 Ability to recognize and respond to adverse reactions and complications of procedures

10.2.1.6 Ability to employ technique of cardiopulmonary resuscitation when indicated

10.2.1.7 Ability to evaluate and document procedure effectiveness and patient response

10.2.2 Level II provider initially assesses the patient, determines the need for NTS, and evaluates response to and effectiveness of first episode. Level II personnel have all the skills of Level I providers plus:

10.2.2.1 Knowledge and understanding of patient's disease, goals, and limitation of NTS[44]

10.2.2.2 Recognition and understanding of basis of pathophysiology

10.2.2.3 Ability to perform initial treatment and be available to troubleshoot the procedure

10.2.2.4 Ability to modify techniques and equipment and take definitive action in response to adverse reaction

10.2.2.5 Ability to detect adverse reactions and avoid patient harm by employing techniques of cardiopulmonary resuscitation with mechanical airway adjuncts and bag-mask devices

10.2.2.6 Knowledge of basic electrocardiogram and dysrhythmia recognition

10.2.2.7 Knowledge of signs and symptoms of decreased cardiac output, oxygenation, and perfusion

10.2.2.8 Ability to teach Level I and lay personnel providing home care

10.2.3 Home care should be provided by lay personnel trained and knowledgeable in

10.2.3.1 Proper assembly and use of equipment

10.2.3.2 Correct positioning of patient

10.2.3.3 Proper suctioning technique

10.2.3.4 Signs and symptoms of respiratory distress

10.2.3.4 Assessment of patient response to procedure

10.2.3.5 Response to adverse reaction

10.2.3.6 Care and cleaning of equipment

NTS 11.0 MONITORING:

The following should be monitored before, during and following the procedure.

11.1 Breath sounds[1,3,12,27,59]

11.2 Skin color[1,6,12,61]

11.3 Breathing pattern and rate[1,6,12]

11.4 Pulse rate, dysrhythmia, electrocardiogram if available[1,6,12,14,27,41]

11.5 Color, consistency, and volume of secretions[1,6]

11.6 Presence of bleeding or evidence of physical trauma[1,6]

11.7 Subjective response including pain[1,2,7,41,46]

11.8 Cough[1]

11.9 Oxygenation (pulse oximeter)[1,2,3,6,12,14]

11.10 Intracranial pressure (ICP), if equipment is available[1]

11.11 Arterial blood pressure if available[6]

11.12 Laryngospasm[6]

NTS 12.0 FREQUENCY:

Nasotracheal suctioning should be performed by a skilled caregiver when indicated and when other methods to remove secretions from airway have failed.[1,5,6,8,26,52,54]

NTS 13.0 INFECTION CONTROL:

13.1 CDC Guidelines for Standard Precautions should be adhered to.[1,12,20,23,60,62]

13.2 All equipment and supplies should be appropriately disposed of or disinfected.[6,23,62]

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