COUGH ASSIST

Mechanical insufflation-exsufflation (MI-E) is a high-risk procedure and may generate droplets exposing staff to respiratory pathogens. Appropriate Personal Protective Equipment (PPE) must be applied to reduce exposure to respiratory secretions.

MI-E may:
- Recruit lung volumes
- Treat and prevent atelectasis
- Improve cough effectiveness
- Increase mechanical compliance
- Optimize thoracic range of motion
- Increase speaking volume

PCF:
Peak Cough Flow (PCF) is measured by using a peak flow meter. The PCF is the velocity of air expelled from the lungs during a cough maneuver. This measurement can be expressed in L/min or L/sec (L/min divided by 60).

It is useful to measure:
- Spontaneous PCF (PCF sp)
- PCF from a MIC (Maximum Insufflation Capacity) (PCF with a bag, PCF with a ventilator or PCF with Glossopharyngeal Breathing (GPB)
- PCF from MIC with an assisted cough, timed with the cough (PCF bag and assisted cough, PCF vent and assisted cough or PCF GPB and assist assisted cough)

The PCF correlates well with the actual FEF Max (maximum Forced Expiratory Flow rate) [L/sec] measurement commonly measured with the spirometer. Multiply your FEF value times 60 to obtain a PCF measurement in l/min.

CRITERIA
The patient must be alert, cooperative with respiratory maneuvers and able to communicate.
CLINICAL INDICATIONS

• An established diagnosis as paralytic/restrictive disorder. (Please see policy statement)

• Patient is unable to cough or clear secretions effectively with a PCF less than 180 L/min using LVR (Lung Volume Recruitment) with bag, GPB or volume ventilator (and assisted cough maneuver when indicated).

• Patient is overly fatigued when performing LVR with the resuscitation bag, GPB or volume ventilator.

Policy Statement:
A physician order is required before initiating the MI-E device. The MI-E is an alternative to traditional suctioning providing decreased mucosal trauma and increased patient comfort. Principally, the MI-E is for patients who are unable to cough or clear secretions effectively due to reduced peak cough flow (less than 3 liters per second or 180 L/min) resulting from spinal cord injuries (SCI) and neuromuscular diseases such as ALS, GBS, myasthenia gravis, muscular dystrophy, multiple sclerosis, post polio, kypho-scoliosis, and syringomyelia.

ABSOLUTE CONTRA-INDICATIONS

Supplemental oxygen should not be bled into the MI-E circuit. Oxygen will pass through the fan system during the exsufflation phase resulting in a potential fire hazard.

• Presence of hemoptysis, untreated or recent pneumothorax, bullous emphysema, nausea and emesis, severe COPD, severe asthma and recent lobectomy.

• Increased intra cranial pressure (ICP) including ventricular drains

• Impaired consciousness/inability to communicate.

RELATIVE CONTRA-INDICATIONS

• Therapy immediately following meals

• Tachypnea

• History of COPD and pneumothorax

• Large pleural effusion

• Cervical spinal injury unclear

• Hemodynamic instability
The use of the MI-E in patients with intrinsic lung diseases (such as chronic obstructive pulmonary disease (COPD), bronchiectasis, cystic fibrosis (CF) pulmonary fibrosis, and asthma) where secretions may be abundant should be introduced with caution and at times may not be indicated. The efficacy of the treatment in this instance must be monitored by a physician specialized in lung physiology such as a staff pulmonologist or intensivist.

The use of the MI-E in other conditions not specified in the policy should be discussed with the care team.

PRECAUTIONS

- Patients known to have cardiac instability should be monitored for arrhythmias, oximetry (SpO2), dyspnea, vital signs and symptoms.
- Patients with a combination of intrinsic diseases and paralytic/restrictive disorders must be referred to a staff pulmonologist or intensivist for consultation (the MI-E may cause early closure in flaccid airways such as COPD, CF, bronchiectasis).
- Patients with long-standing thoracic cage restriction (who may have severely reduced thoracic compliance) will require slow incremental insufflations during the initial introductory period.
- Notify physician if chest pain is present.

PROCEDURE

The MI-E is best performed in the sitting or semi-recumbent position however, can be done in supine. C-spine stabilization must be assessed and the head and neck must always be supported (appropriate brace or collar) if an assisted cough maneuver is performed in coordination with the exsufflation phase.

MI-E sessions are usually performed:

- QID, and PRN, to a maximum of Q10 minutes to avoid hyperventilation
- Ideally in the morning upon awakening, before meals and at bedtime.
- With assisted cough BID and PRN when indicated.

The MI-E can be applied via mask, tracheostomy or endotracheal tube.
PRE-THERAPY ASSESSMENT

- Perform a general respiratory assessment / confirm pulmonary restriction / exclude significant obstructive disease
- Baseline spirometry and spirometry with the LVR (lung volume recruitment) bag
- SpO2, pulse rate
- Optional: MIP / MEP and for non-intubated patients. PCF with LVR and PCF with LVR and assisted cough maneuver where applicable.

In an emergency, perform modified respiratory assessment, and monitor the SpO2 and pulse rate. Other objective measures should be performed at the first available opportunity when the circumstance is no longer urgent.

NOTE:

- Initial suggested pressures should be set 5-10 cm H2O above the patient’s maximum MIP (to minimize the over-stretching of the chest wall soft tissues and muscles). Gradually increase the pressures over the first 48 to 72 hours by 5-10 cmH2O until the ordered level is reached. In an acute condition the pressure should be increased within a few sessions, however, in emergent situations, utilize minimal effective pressure of +/-30 cmH2O from the onset (unless otherwise prescribed by physician).
- Minimal effective pressures are +/-30 cmH2O and the most common therapeutic range is +/- 40 to 50 cmH2O.
- The exsufflation pressure (absolute number) should never be less than the insufflation pressure.
- When initiating the MI-E it is important to maintain LVR with the bag on a daily basis, minimum twice a day, (AM and PM) and PRN thereafter. This ensures the patient will be able to resume LVR with the bag once the MI-E is discontinued.
- Patients requiring supplemental oxygen can be oxygenated with the resuscitation bag between MI-E treatments.
EQUIPMENT

- Appropriate PPE;
- Cough Assist
- Breathing filter
- 6-foot disposable smooth bore tubing;
- 10 – 6-inch flex tube with 15 mm connector for trached or intubated patients;
- Transparent mask (preferred option);
- Trach / endotracheal connector;
- Mouthpiece and nose clip (optional) for exceptional circumstances;
- Suction source on stand-by for patients with artificial airways and as clinically indicated for other patients (in-line suction where indicated in isolation cases).

EMERSON COUGHASSIST Model CA 3200)

Manual Mode

Always verify pressure settings before starting each treatment.

1. Turn power ON
2. Turn the Inhale Pressure Control Knob (top right) clockwise to maximum position (varies the inspiratory pressure between 50-100% of the exhale pressure).
3. Set the initial insufflation/exsufflation pressure by occluding the end of the circuit with your gloved thumb while holding the Manual Control Lever in the inhale/exhale for a minimum of 2 seconds for each position. At the same time, adjust the Pressure Adjustment Knob (below Manual Control Lever) to the desired prescribed pressure while watching the manometer on the display panel. Release the Manual Control Level to ensure the pressure returns to 0cmH₂O.
4. Apply the facemask interface securely and adjust to eliminate leak.
5. Coordinate therapy with patient breathing pattern.
6. Slide the Manual Control Level to the (+) as the patient is breathing in. Hold for 3 seconds and vocalize IN-ONE THOUSAND, TWO-ONE THOUSAND, and THREE-ONE THOUSAND.
7. Rapidly slide the Manual Control Level from the (+) to the (-). Hold for 2-3 seconds and vocalize COUGH ONE-THOUSAND, TWO-ONE THOUSAND (and THREE-ONE THOUSAND). An assisted cough maneuver may be added where indicated at the onset of the COUGH command.
Remember to rapidly shift the lever from (+) to the (-). This sudden change promotes the greatest pressure gradient and a maximum expiratory flow.

8. Repeat the inhale/exhale cycle 5 times.
9. Remove the facemask to clear the secretions from the airway.
10. Rest 30 seconds to avoid hyperventilation between treatments.
11. One treatment is equal to 3 - 5 cycles and one session is equal to 3 - 5 treatments.
12. Suction should be on standby if clinically indicated. Suctioning beyond the tracheostomy and endotracheal tube is rarely indicated.
13. Assess treatment efficacy including weekly spirometry to assess PCF.

**Remark:** Unequal pressures such as +30, -35 cmH2O may be prescribed to maximize the exsufflation phase while minimizing the stretch to the intercostals muscles during the insufflation phase. Turn the *Inhale Pressure Control Knob* (top right) to decrease the inhalation pressure.

**EMERSON COUGHASSIST Model CA 3200**

**Automated Mode**

Always verify pressure settings before starting each treatment.

1. Turn power ON
2. Turn the *Inhale Pressure Control Knob* (**top right**) clockwise to maximum position (varies the inspiratory pressure between 50-100% of the exhale pressure).
3. Set the initial insufflation/exsufflation pressure by occluding the end of the circuit with your gloved thumb while holding the *Manual Control Lever* in the inhale/exhale for a minimum of 2 seconds for each position. At the same time, adjust the *Pressure Adjustment Knob* (below Manual Control Lever) to the desired prescribed pressure while watching the manometer on the display panel. Release the Manual Control Level to ensure the pressure returns to 0cmH2O.
4. Set the therapy mode switch to AUTO.
5. Set the Inhale Time to 3 seconds, Exhale Time 2-3 seconds and Pause Time between 3-5 seconds. Set the Inhale Flow toggle switch to patient comfort. Note: patients with long standing thoracic cage restriction will require slow incremental insufflations during the initial introductory period.

Note: Taken from “Mechanical Insufflation-Exsufflation for Paralytic/Restrictive Disorders” by The Ottawa Hospital
6. Apply the facemask and coordinate therapy with patient effort.
7. Give five breaths on the Automatic Mode (this is one cycle). Remove the mask to clear secretions from the airway.
8. Rest 30-60 seconds to avoid hyperventilation. Repeat (5-breath cycles) 3 to 5 times.
9. Suction should be available if clinically indicated. Suctioning beyond the tracheostomy / endotracheal tube is rarely indicated.
10. Assess treatment efficacy including weekly spirometry to assess PCF.

HELPFUL HINTS
MI-E with trachs and endotracheal tubes

- Suction equipment must always be available
- Connectors must have a snug fit
- May require higher pressures due to the narrowing of artificial airway
- Best to have trach with cuff inflated to allow for in-exsufflation via trach
- For a cuffless trachs, cork the trach and use the MI-E via mask/mouth, a tight stoma is required and if the stoma is not tight you should consider having the trach changed to cuffed trach tube
- In-exsufflation may be achieved via the trach site with a cuffless trach however, the patient must have excellent control of the upper airway
- Discard the six-inch tube with 15 mm connector after each use when sputum present.

EXCELLENT REFERENCE:
http://www.doctorbach.com
REFERENCE


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