Pulmonary Diagnostics: Respiratory Muscle Strength (MIP/MEP)

Site Applicability

St. Paul's Hospital

Practice Level

Respiratory Therapist

Need to Know

The measurement of respiratory muscle strength (inspiratory and expiratory) assesses the aggregate force or pressure that respiratory muscles can generate against an occlusion at the mouth. Maximal inspiratory pressure (MIP) is an index of diaphragm strength, while maximal expiratory pressures (MEP) measures the strength of abdominal and intercostal muscles.

A tight seal should be emphasized during maneuvers to avoid loss in volume around the lips and mouthpiece.

Indications

- To diagnose and measure the level of muscle weakness in neuromuscular disease, obstructive lung disease, chronic steroid use, chest deformities, and dyspnea
- Abnormal diagnostic test results (i.e. decreased forced vital capacity (FVC), peak expiratory flowrate (PEF), or CXR)
- To assess and diagnose the severity of diaphragm injuries
- To evaluate therapy that is designed to improve respiratory muscle strength

Contraindications

Absolute

- Unstable angina
- Recent myocardial infarction
- Uncontrolled systemic hypertension
- Recent pneumothorax
- Lung biopsy within one week

Relative

- Hypertension
- Recent spinal surgery
- Recent ocular surgery

- patients who are unable to follow instructions and perform maneuver

Special Considerations

- Avoid vigorous exercise prior to testing
- Assess the patient for their physical and mental ability to undergo testing

Equipment and Supplies

- Micro RPM MIP/MEP unit
- Expiration pressure valve assembly
- Inspiration pressure valve assembly
- Micro RPM filter
- Clear connector
- Silicone mouthpiece
- Nose clips
- MIP/MEP worksheet

Procedure

Steps

1. Explain the procedure to patient: **We will be measuring inspiratory and expiratory pressures by having you inhale and exhale as forcefully as you can. It is very important that you give your best effort.**
2. Instruct the patient to sit upright in a chair with both feet flat on the floor
3. Attach the appropriate pressure valve assembly to the Micro RPM unit. **Note**: the inspiratory and expiratory maneuvers require separate valves.
4. Place a Micro RPM filter, clear connector, and silicone mouthpiece to the valve assembly.

Maximal Inspiratory Pressure

1. Turn on machine.
2. Instruct the patient to place the mouthpiece in their mouth. Ask the patient to exhale slowly and completely to residual volume (RV). Once the patient has reached RV ask them to inhale through the mouth with as much force as possible.
3. Urge the patient to suck in as hard as they can until a plateau has been reached for a minimum of 1 second. Provide encouragement and feedback as this test is completely effort dependent.
4. Obtain at least three efforts (maximum of eight) with a goal of the two highest measurements agreeing within 10%. If the final effort is the highest, obtain an additional trial.
5. Allow the patient to rest for 30 to 60 seconds between efforts.
6. Report results on the MIP/MEP worksheet.

Maximal Expiratory Pressure

1. Turn on Machine.
2. Instruct the patient to place the mouthpiece in their mouth. Ask the patient to inhale completely to total lung capacity (TLC). Once the patient has reached TLC ask them to exhale

through the mouth with as much force as possible until a plateau has been reached for a minimum of 1 second.

3. Obtain at least three efforts (maximum of eight) with a goal of the two highest measurements agreeing within 10%. If the final effort is the highest value, obtain an additional trial.
4. Allow the patient to rest for at least 30 to 60 seconds between efforts.
5. Report results on the MIP/MEP worksheet.

Documentation

- Document the MIP/MEP test in CST PowerChart using the appropriate Adhoc Powerform.
- During the test, informally report the MIP/MEP values on the worksheet. If the patient is completing other pulmonary function testing, report the MIP/MEP values in the comment section of the report. If the patient is completing MIP/MEP as a standalone test, document the values using a “Free Text” note in CST Powerchart.
- Print a copy of the results for physician interpretation.

References

ATS/ERS Statement on Respiratory Muscle Testing, Am J Respir Crit Care Med Vol. 166. pp 518-624, 2002 DOI: 10.1164/rccm.166.4.518

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