

OHTAC Recommendation

Airway Clearance Devices for Cystic Fibrosis

*Presented to the Ontario Health Technology
Advisory Committee in July, 2009*

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OHTAC Ontario
Health Technology
Advisory Committee

Background

The Ontario Health Technology Advisory Committee (OHTAC) met on July 31, 2009 to review the effectiveness and safety of airway clearance devices for cystic fibrosis therapy, based on an evidentiary review produced by Ontario's Medical Advisory Secretariat (MAS).

Cystic fibrosis is an uncommon, inherited, life-limiting disease that affects multiple systems of the human body, although respiratory dysfunction is the primary complication and leading cause of death among affected individuals. The disease causes abnormal mucus secretion in the airways, leading to airway obstruction. Removal of airway secretions, termed airway clearance, is thus an integral component of the management of cystic fibrosis.

Fortunately, there is a variety of methods available for airway clearance. A current standard of care is conventional chest physiotherapy. This is a hands-on approach that requires the aid of a caregiver, usually a parent. Despite general acceptance of this technique as a standard of care, because individuals with cystic fibrosis are now living longer (the median age of survival has almost doubled in the past three decades to 37 years of age), there is a need for independent methods of airway clearance. Independent methods often involve the use of a mechanical airway clearance device, one that can be self-administered, thus reducing patients' reliance on their caregivers.

There are at least three classes of airway clearance devices in current use: positive expiratory pressure devices, airway oscillating devices (either handheld or stationary) and high frequency chest compression/mechanical percussion devices. Within these classes are numerous different brands of devices from various manufacturers, each with subtle iterations. At least 10 devices are licensed by Health Canada (ranging in class from Class 1 to Class 3). The MAS, therefore, sought to determine the effectiveness and safety of airway clearance devices in comparison to conventional physiotherapy, and in comparison to each other between device classes.

Summary of OHTAC Findings

Thirteen randomized controlled trials met the inclusion criteria for the MAS' evidentiary review, along with three Cochrane systematic reviews. The three Cochrane reviews had been identified during preliminary searching and were used as a basis for formulating MAS' review. Results were subgrouped by outcome and comparison. The following comparisons were possible given the literature:

- Conventional chest physiotherapy vs. positive expiratory pressure
- Conventional chest physiotherapy vs. airway oscillating devices
- Conventional chest physiotherapy vs. high frequency chest compression/mechanical percussion devices
- Positive expiratory pressure vs. handheld airway oscillating devices
- Handheld airway oscillating devices vs. high frequency chest compression devices

The majority of the evidence was of low quality according to GRADE criteria (a tool used to evaluate the quality of a body of evidence and the strength of recommendations). The quality level was downgraded because the trials were generally underpowered and not generalizable to Ontario patient populations.

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Based on the evidence available, the following conclusions were made:

1. Moderate quality evidence suggests that positive expiratory pressure is at least as effective as, or more effective, than conventional chest physiotherapy according to primary outcomes of pulmonary function.
2. Moderate quality evidence suggests that there are no significant differences between positive expiratory pressure and handheld airway oscillating devices, according to primary outcomes of pulmonary function; however, secondary outcomes may favour positive expiratory pressure.
3. Low quality evidence suggests no significant difference between airway oscillating devices and conventional chest physiotherapy, or between high frequency chest compression/mechanical percussion devices and chest physiotherapy, according to both primary and secondary outcomes.
4. Very low quality evidence suggests that there is no significant difference between handheld airway oscillating devices and conventional chest physiotherapy according to primary outcomes of pulmonary function.
5. Adverse events caused by the use of airway clearance devices are generally mild or negligible and easily managed by discontinuation of device use and the treatment of symptoms.
6. Budget impact projections show positive expiratory pressure and handheld airway oscillating devices to be highly economically feasible.
7. It is unlikely that there will be any future trials comparing airway clearance devices to conventional chest physiotherapy as withholding airway clearance device based therapy may be seen as unethical.

OHTAC Recommendations

- Positive expiratory pressure devices can be considered as an alternative to conventional physiotherapy since they are at least as effective as physiotherapy, are safe, inexpensive, and can be self-administered.
- The devices currently funded by the Ministry of Health and Long-Term Care are obsolete or not supported by evidence and should be replaced by positive expiratory pressure devices.
- While low quality evidence suggests no that there is difference in effectiveness between airway oscillation devices and conventional physiotherapy, moderate quality evidence suggests that these devices are at least as effective as positive expiratory pressure devices. Therefore, airway oscillation devices can be considered as an alternative therapy for patients in whom positive expiratory pressure devices are ineffective, contraindicated, or intolerable.
- High frequency chest compression and mechanical percussion devices should not be considered as an alternative to conventional physiotherapy given low quality evidence concerning their effectiveness in comparison to physiotherapy and the excessive cost of these devices.