HIGH FREQUENCY CHEST WALL COMPRESSION DEVICES

Policy Number: CS054.F

Effective Date: October 1, 2016

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Related Community Plan Policy

- Durable Medical Equipment, Orthotics, Ostomy Supplies, Medical Supplies and Repairs/Replacements

Commercial Policy

- High Frequency Chest Wall Compression Devices

Medicare Advantage Coverage Summaries

- Durable Medical Equipment (DME), Prosthetics, Corrective Appliances/Orthotics (Non-Foot Orthotics) and Medical Supplies Grid
- Respiratory Therapy, Pulmonary Rehabilitation and Pulmonary Services

INSTRUCTIONS FOR USE

This Medical Policy provides assistance in interpreting UnitedHealthcare benefit plans. When deciding coverage, the federal, state or contractual requirements for benefit plan coverage must be referenced. The terms of the federal, state or contractual requirements for benefit plan coverage may differ greatly from the standard benefit plan upon which this Medical Policy is based. In the event of a conflict, the federal, state or contractual requirements for benefit plan coverage supersedes this Medical Policy. All reviewers must first identify member eligibility, any federal or state regulatory requirements, and the contractual requirements for benefit plan coverage prior to use of this Medical Policy. Other Policies and Coverage Determination Guidelines may apply. UnitedHealthcare reserves the right, in its sole discretion, to modify its Policies and Guidelines as necessary. This Medical Policy is provided for informational purposes. It does not constitute medical advice.

UnitedHealthcare may also use tools developed by third parties, such as the MCG™ Care Guidelines, to assist us in administering health benefits. The MCG™ Care Guidelines are intended to be used in connection with the independent professional medical judgment of a qualified health care provider and do not constitute the practice of medicine or medical advice.

BENEFIT CONSIDERATIONS

Before using this policy, please check the federal, state or contractual requirements for benefit coverage.

COVERAGE RATIONALE

High-frequency chest wall compression (HFCWC), as a form of chest physical therapy, is proven and medically necessary for treating or preventing pulmonary complications of the following conditions:

- Cystic fibrosis (CF)
- Bronchiectasis

High-frequency chest wall compression (HFCWC), as a form of chest physical therapy, is unproven and not medically necessary for diagnoses other than cystic fibrosis and bronchiectasis, including, but not limited to respiratory symptoms attributed to neuromuscular disorders when they compromise respiration, such as amyotrophic lateral sclerosis (ALS), cerebral palsy, familial dysautonomia, muscular dystrophy or quadriplegia.

The clinical evidence is insufficient to support conclusions regarding the use of HFCWC therapy in these patient populations. Additional research involving larger study populations and longer treatment and follow-up periods is needed to establish the safety and efficacy of HFCWC for patients with impaired airway clearance disorders in these patient populations.
Note: There are multiple airway clearance techniques currently used in the management of CF and bronchiectasis. These can include percussion and postural drainage, huffing, active cycle breathing and intrapulmonary percussive ventilation (IPV).

APPLICABLE CODES

The following list(s) of procedure and/or diagnosis codes is provided for reference purposes only and may not be all inclusive. Listing of a code in this policy does not imply that the service described by the code is a covered or non-covered health service. Benefit coverage for health services is determined by federal, state or contractual requirements and applicable laws that may require coverage for a specific service. The inclusion of a code does not imply any right to reimbursement or guarantee claim payment. Other Policies and Coverage Determination Guidelines may apply.

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<thead>
<tr>
<th>CPT Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>94669</td>
<td>Mechanical chest wall oscillation to facilitate lung function, per session</td>
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*CPT® is a registered trademark of the American Medical Association*

<table>
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<tr>
<th>HCPCS Code</th>
<th>Description</th>
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<tr>
<td>A7025</td>
<td>High frequency chest wall oscillation system vest, replacement for use with patient owned equipment, each</td>
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<tr>
<td>A7026</td>
<td>High frequency chest wall oscillation system hose, replacement for use with patient owned equipment, each</td>
</tr>
<tr>
<td>E0483</td>
<td>High frequency chest wall oscillation air-pulse generator system, (includes hoses and vest), each</td>
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<table>
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<tr>
<th>ICD-10 Diagnosis Code</th>
<th>Description</th>
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<tr>
<td>E84.9</td>
<td>Cystic fibrosis, unspecified</td>
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<tr>
<td>E84.0</td>
<td>Cystic fibrosis with pulmonary manifestations</td>
</tr>
<tr>
<td>J47.0</td>
<td>Bronchiectasis with acute lower respiratory infection</td>
</tr>
<tr>
<td>J47.1</td>
<td>Bronchiectasis with (acute) exacerbation</td>
</tr>
<tr>
<td>J47.9</td>
<td>Bronchiectasis, uncomplicated</td>
</tr>
<tr>
<td>Q33.4</td>
<td>Congenital bronchiectasis</td>
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</table>

DESCRIPTION OF SERVICES

In healthy individuals, clearance of secretions from the respiratory tract is accomplished primarily through ciliary action. Increased production of airway secretions is usually cleared by coughing. However, a number of conditions, including asthma, chronic obstructive pulmonary disease (COPD), cystic fibrosis (CF), mucociliary disorders, neuromuscular disease and metabolic disorders can result in inadequate airway clearance, either because of increased volume of secretions or increased viscosity of secretions. These secretions accumulate in the bronchial tree, occluding small passages and interfering with adequate gas exchange in the lungs. They also serve as a culture medium for pathogens, leading to a higher risk for chronic infection and deterioration of lung function. The blockage of mucus can result in bronchiectasis, the abnormal stretching and enlarging of the respiratory passages. Bronchiectasis may complicate chronic bronchitis, one of the groups of respiratory illnesses referred to as COPD and it can occur as a complication of cystic fibrosis.

When coughing alone cannot adequately clear secretions, other therapies are used. Conventional chest physical therapy (CPT) has been shown to result in improved respiratory function and has traditionally been accomplished through the use of percussion and postural drainage. Postural drainage and percussion are usually taught to family members so that the therapy may be continued at home when needed in chronic disease. This highly labor-intensive activity requires the daily intervention of a trained caregiver which may lead to poor compliance with the recommended treatment plan.

To improve compliance and allow patients to independently manage their disease, high-frequency chest wall compression (HFCWC) devices have been developed to improve mucociliary clearance and lung function. HFCWC is a mechanical form of chest physiotherapy that consists of an inflatable vest connected by tubes to a small air-pulse generator. The air-pulse generator rapidly inflates and deflates the vest, compressing and releasing the chest wall up to 20 times per second. The vibratory forces of these devices are thought to lower mucus viscosity.
**Additional Information**

Bronchiectasis is defined as a daily productive cough for at least 6 continuous months or exacerbations requiring antibiotic therapy more than 2 times per year, and confirmed by high resolution, spiral, or standard computed tomography (CT) scan, and well-documented failure of standard treatments to adequately mobilize retained secretions.

**CLINICAL EVIDENCE**

### Cystic Fibrosis (CF) and Bronchiectasis

The available evidence indicates that high-frequency chest wall compression (HFCWC) is comparable to other airway clearance therapies for improving respiratory function in cystic fibrosis (CF) patients. However, the long-term impact of HFCWC devices on functional outcomes or on the incidence of pulmonary exacerbations leading to hospitalizations has not been adequately studied. (Hayes, 2012; updated May 2016)

In a Cochrane review, McIlwaine et al. (2015) compared positive expiratory pressure (PEP) devices to other forms of physiotherapy as a means of improving mucus clearance and other outcomes in people with CF. A total of 26 studies (involving 733 participants) were included in the review. Eighteen studies involving 296 participants were cross-over in design. Studies had to include one or more of the following outcomes: change in forced expiratory volume in one second; number of respiratory exacerbations; a direct measure of mucus clearance; weight of expectorated secretions; other pulmonary function parameters; a measure of exercise tolerance; ventilation scans; cost of intervention; and adherence to treatment. Following meta-analysis, it was concluded that the use of PEP resulted in a significant reduction in pulmonary exacerbations in individuals where exacerbation rate was a primary outcome measure.

In a Cochrane review, Lee et al. (2013) evaluated the effects of various airway clearance therapies (ACT) on the rate of acute exacerbations, incidence of hospitalization and health-related quality of life in individuals with acute and stable bronchiectasis. HFCWC was one of the ACTs included. Randomized controlled parallel and cross-over trials that compared an ACT to no treatment, sham ACT or directed coughing were utilized. Five studies involving 51 participants met the inclusion criteria. The authors concluded that ACTs appear to be safe for individuals (adults and children) with stable bronchiectasis, where there may be improvements in sputum expectoration, selected measures of lung function and health-related quality of life. The role of these techniques in people with an acute exacerbation of bronchiectasis is unknown. More data are needed to establish the clinical value of ACTs over the short and long term on patient outcomes which may clarify the rationale for each technique. A 2015 update resulted in no changes to the 2013 conclusions.

Nicolini et al. (2013) compared traditional techniques of chest physiotherapy (CPT) with high-frequency oscillation of the chest wall in patients with bronchiectasis. Participants were randomized into three groups: HFCWC (n=10), positive expiratory pressure (PEP) (n=10) and a control group of medical therapy only (n=10). The authors reported that both HFCWC and PEP showed a significant improvement in pulmonary function and quality of life.

Fainardi et al. (2011) compared the short-term efficacy HFCWC and PEP mask on expectorated sputum, pulmonary function and oxygen saturation in patients with CF hospitalized for an acute pulmonary exacerbation. A controlled randomized cross-over trial with 24 hours between treatments was used. Thirty-four CF patients (26 ± 6.5 years) were included in the study. No statistically significant difference between HFCWC and PEP mask was found in sputum production and in lung function testing. Although PEP mask was associated with lower oxygen saturation, it was better tolerated than HFCWC.

In a Cochrane review of 15 studies, Main et al. (2005) compared conventional chest physiotherapy (CPT) to other airway clearance techniques in patients with CF. Other techniques included were (PEP), high pressure PEP, active cycle of breathing, autogenic drainage, airway oscillating devices, mechanical percussive devices and HFCWC devices. Outcome measures included respiratory function, individual preference, adherence and quality of life. The review did not show any difference between CPT and other therapies in terms of lung function. Studies of acute infections showed improved lung function irrespective of type of treatment. Longer-term studies showed smaller improvements or decline. There was a trend for participants to prefer self-administered airway clearance techniques. Limitations of the review include a paucity of well-designed, adequately-powered, long-term trials. A 2009 update search resulted in no changes to the 2005 conclusions.

In a separate Cochrane review, the same authors compared CPT of any type to no CPT in patients with CF. Six cross-over trials with 66 participants were included. Primary outcomes were expectorated secretions, mucus transport rate and pulmonary function tests. The results of this review show that airway clearance techniques have short-term effects in terms of increasing mucus transport. At present there is no clear evidence of long-term effects in chest clearance, quality of life or survival with CPT (van der Schans et al., 2000; a 2009 update search resulted in no changes to the 2000 conclusions).

The Cystic Fibrosis Foundation commissioned a systematic review to examine the evidence surrounding the use of...
airway clearance therapies (ACTs) for treating CF. Seven unique reviews and thirteen additional controlled trials were deemed eligible for inclusion. Recommendations for use of the ACTs were made, balancing the quality of evidence and the potential harms and benefits. The committee determined that, although there is a paucity of controlled trials that assess the long-term effects of ACTs, the evidence quality overall for their use in CF is fair and the benefit is moderate. The committee recommends airway clearance be performed on a regular basis in all patients. There are no ACTs demonstrated to be superior to others, so the prescription of ACTs should be individualized (Flume et al. 2009).

In a Cochrane review, Morrison and Agnew (2009) evaluated the effectiveness and acceptability of oscillating devices compared to other forms of physiotherapy to improve respiratory function, mucus clearance and other outcomes in people with CF. Out of 265 identified studies, 30 met the inclusion criteria (n=708). The authors noted that data were not published in sufficient detail in most of the studies to perform a meta-analysis. Forced expiratory volume in one second (FEV₁) was the most frequently measured outcome. Results did not show significant difference in effect between oscillating devices and other methods of airway clearance on FEV₁ or other lung function parameters. Where there has been a small but significant change in secondary outcome variables such as sputum volume or weight this has not been wholly in favor of oscillating devices. Participant satisfaction was reported in eleven studies, but this was not specifically in favor of an oscillating device as some participants preferred breathing techniques or techniques used prior to the study interventions. The results for the remaining outcome measures were not examined or reported in sufficient detail to provide any high level evidence. The authors concluded that there was no clear evidence that oscillation was a more or less effective intervention overall than other forms of physiotherapy. More adequately-powered long-term randomized controlled trials are needed. A 2014 update came to the same conclusions.

**Other Conditions**

The current evidence (9 randomized controlled trials, 3 randomized crossover studies, and 1 prospective before-after study) suggests that high-frequency chest wall compression (HFCWC) therapy is safe and at least comparable with chest physical therapy and usual care in patients with impaired airway clearance not due to cystic fibrosis. The quality of evidence is considered low due to small sample size and/or lack of statistical power, short duration of treatment and follow-up, and lack of or failure to report binding in most studies. (Hayes, 2014; updated 2015)

Huang et al. (2014) evaluated the effectiveness, safety and tolerance of HFCWC after extubation in prolonged mechanical ventilation (PMV) patients. Forty-three participants were randomly assigned to either receive HFCWC for 5 days (n=23) or not (n=20). Effectiveness was based on weaning success rates, daily clearance volume of sputum, serial changes in sputum coloration and chest X-ray (CXR) improvement rates. The weaning success rates were 82.6% (19/23) and 85% (17/20) in the HFCWO and non-HFCWO groups, respectively. The HFCWO group had consistently greater numbers of daily sputum suctions and higher CXR improvement rates compared with the non-HFCWO group. There was significant sputum coloration lightening in the HFCWO group only. In PMV patients, HFCWO was safe, comfortable and effective in facilitating airway hygiene after removal of endotracheal tubes, but had no positive impact on weaning success.

Clinkscale et al. (2012) compared the overall effectiveness of conventional chest physical therapy (CPT) to HFCWC in hospitalized intubated and non-intubated adult patients requiring chest physical therapy. The primary outcome measure was hospital stay. A total of 280 patients were randomly assigned to receive CPT (n=146) or HFCWC (n=134). The hospital stay was 12.5 ± 8.8 days for patients randomized to CPT and 13.0 ± 8.9 days for patients randomized to HFCWC. Patient comfort was assessed using a visual analog scale and was statistically greater for patients randomized to CPT compared to HFCWC. All other secondary outcomes, including hospital mortality and nosocomial pneumonia, were similar for both treatment groups. The authors reported that because the study was inadequately powered for the primary outcome, they could not make recommendations on the preferential use of HFCWC or CPT for intubated and non-intubated adult patients.

Yuan et al. (2010) conducted a prospective, randomized controlled trial of HFCWC in pediatric patients with neuromuscular disease and cerebral palsy. Twenty three patients (9 with cerebral palsy; 14 with neuromuscular disease) were randomized to receive either HFCWC or standard CPT. The mean study period was 5 months. Outcome measures included respiratory-related hospitalizations, antibiotic therapy, chest radiographs and polysomnography. No significant changes were seen between the two groups for any outcome measure. The authors concluded that the data suggests safety, tolerability and improved compliance with HFCWC but acknowledged that larger, controlled trials are needed to confirm results. Study limitations include small sample size, heterogenous nature of diagnoses and short-term follow-up.

A randomized controlled trial evaluated the changes in respiratory function in patients with amyotrophic lateral sclerosis (ALS) after using HFCWC. Twenty-two patients received HFCWC and 24 patients were untreated. HFCWC users had less breathlessness and coughed more at night at 12 weeks compared to baseline. The investigators concluded that HFCWC demonstrated a slowing of the decline of forced vital capacity. Limitations of this study include small patient numbers and lack of long-term follow-up (Lange et al. 2006).
A very small group of patients with severe pulmonary disease due to ALS participated in a randomized study of HFCWC in which 5 patients who received HFCWC in addition to usual care, which included noninvasive respiratory support, were compared with 4 patients who received usual care only. These patients were evaluated by the investigators until their death, and the primary outcome studied was time to death. There was no difference in time to death between the two groups, indicating that HFCWC did not improve survival (Chaisson et al. 2006).

In an uncontrolled study of 15 patients with familial dysautonomia patients receiving HFCWC reported some functional improvement and demonstrated significant improvement in some pulmonary functions compared with patients on usual treatment only. However, the progressive nature of the underlying disease may have prevented the clinical effect from being accurately measured (Giarraffa et al. 2005).

Another study evaluated the impact of HFCWC vest therapy in a group of 7 pediatric nursing home patients with quadriplegic cerebral palsy and a history of frequent pulmonary infections. The total number of pneumonias, hospitalizations due to pneumonia, the frequency of effective suctioning, and the average monthly frequency of seizures in patients with epilepsy were recorded during the period of HFCWC vest therapy and then compared with data from the previous year. There were improvements in all of the measured parameters during the 12 months of vest therapy, although only the reduction in number of pneumonias and the improvement in number of effective suctioning episodes reached statistical significance, likely due to the very small sample size. Definitive conclusions regarding the relative efficacy of HFCWC vest therapy and conventional CPT cannot be drawn from this study, since the frequency and protocol for CPT administered to these patients prior to HFCWC therapy were highly variable, and the sample size was so small. The investigators noted a reduction in staff time required for respiratory therapy during the HFCWC vest therapy study period (Plioplys et al. 2002).

**Professional Societies**

**American Academy of Neurology (AAN)**
An AAN practice parameter states that there is insufficient data to support or refute HFCWC for clearing airway secretions in patients with ALS (Miller et al., 2009; reaffirmed April 2014).

**American Association for Respiratory Care (AARC)**
AARC clinical practice guidelines on nonpharmacologic airway clearance therapies in hospitalized patients state that, due to insufficient evidence, HFCWC cannot be recommended for adult or pediatric patients with neuromuscular disease, respiratory muscle weakness or impaired cough (Strickland et al., 2013).

**American College of Chest Physicians (ACCP)**
The ACCP indicates that devices designed to oscillate gas in the airway (e.g., Flutter, Intrapulmonary Percussive Ventilation, HFCWC), either directly or by compressing the chest wall, may be considered an alternative to chest physiotherapy in patients with CF. (level of evidence, low; benefit, conflicting; grade of recommendation, inconclusive) (McCool and Rosen, 2006).

**American Thoracic Society (ATS)**
In a consensus statement on the respiratory care of patients with Duchenne muscular dystrophy (DMD), ATS states that effective airway clearance is critical for patients with DMD to prevent atelectasis and pneumonia. Ineffective airway clearance can hasten the onset of respiratory failure and death, whereas early intervention to improve airway clearance can prevent hospitalization and reduce the incidence of pneumonia. HFCWC has been used in patients with neuromuscular weakness but there are no published data on which to base a recommendation. Any airway clearance device predicated upon normal cough is less likely to be effective in patients with DMD without concurrent use of assisted cough. Patients with DMD should be taught strategies to improve airway clearance and how to employ those techniques early and aggressively.

ATS makes the following recommendations:
- Use assisted cough technologies in patients whose clinical history suggests difficulty in airway clearance, or whose peak cough flow is less than 270 L/minute and/or whose maximal expiratory pressures are less than 60 cm H2O.
- The committee strongly supports use of mechanical insufflation-exsufflation in patients with DMD and also recommends further studies of this modality.
- Home pulse oximetry is useful to monitor the effectiveness of airway clearance during respiratory illnesses and to identify patients with DMD needing hospitalization (Finder et al, 2004).

**U.S. FOOD AND DRUG ADMINISTRATION (FDA)**
High-frequency chest wall compression devices are designed to promote airway clearance and improve bronchial drainage. They are indicated when external chest manipulation is the physician's treatment of choice to enhance
mucus transport. See the following website for more information (use product code BYI):

Additional Product Information
The Vest® Airway Clearance System, SmartVest® Airway Clearance System, inCure® System

CENTERS FOR MEDICARE AND MEDICAID SERVICES (CMS)

Medicare covers high-frequency chest wall oscillation devices when criteria are met. Medicare does not have a National Coverage Determination (NCD) for high-frequency chest wall oscillation devices. Also see the Local Coverage Determinations (LCDs) for High Frequency Chest Wall Oscillation Devices, Respiratory Care (Respiratory Therapy) and Respiratory Therapy (Respiratory Care).
(Accessed July 6, 2016)

REFERENCES


**POLICY HISTORY/REVISION INFORMATION**

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<th>Date</th>
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<tr>
<td>10/01/2016</td>
<td>• Reformatted and reorganized policy; transferred content to new template</td>
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<td></td>
<td>• Removed list of applicable ICD-9 codes (discontinued Oct. 1, 2015)</td>
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