



CIGNA MEDICAL COVERAGE POLICY

The following Coverage Policy applies to all health benefit plans administered by CIGNA Companies including plans formerly administered by Great-West Healthcare, which is now a part of CIGNA.

Subject Airway Clearance Devices in the Ambulatory Setting

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Table of Contents

Coverage Policy	1
General Background	2
Coding/Billing Information	5
References	6
Policy History.....	9

Hyperlink to Related Coverage Policies

Lung and Heart-Lung Transplantation
Pulmonary Rehabilitation

INSTRUCTIONS FOR USE

Coverage Policies are intended to provide guidance in interpreting certain **standard** CIGNA HealthCare benefit plans. Please note, the terms of a customer's particular benefit plan document [Group Service Agreement (GSA), Evidence of Coverage, Certificate of Coverage, Summary Plan Description (SPD) or similar plan document] may differ significantly from the standard benefit plans upon which these Coverage Policies are based. For example, a customer's benefit plan document may contain a specific exclusion related to a topic addressed in a Coverage Policy. In the event of a conflict, a customer's benefit plan document **always supercedes** the information in the Coverage Policies. In the absence of a controlling federal or state coverage mandate, benefits are ultimately determined by the terms of the applicable benefit plan document. Coverage determinations in each specific instance require consideration of 1) the terms of the applicable benefit plan document in effect on the date of service; 2) any applicable laws/regulations; 3) any relevant collateral source materials including Coverage Policies and; 4) the specific facts of the particular situation. Coverage Policies relate exclusively to the administration of health benefit plans. Coverage Policies are not recommendations for treatment and should never be used as treatment guidelines. Proprietary information of CIGNA. Copyright ©2011 CIGNA

Coverage Policy

Coverage for airway clearance devices is subject to the terms, conditions and limitations of the applicable benefit plan's Durable Medical Equipment (DME) benefit and schedule of copayments. Please refer to the applicable benefit plan document to determine benefit availability and the terms, conditions and limitations of coverage. Under many benefit plans, coverage for DME is limited to the lowest-cost alternative.

If coverage for airway clearance devices is available, the following conditions of coverage apply.

CIGNA covers ANY of the following types of airway clearance devices as medically necessary for an individual with a diagnosis that is characterized by excessive mucus production and difficulty clearing secretions:

- mechanical percussors
- positive expiratory pressure devices
- vibratory positive expiratory pressure devices

CIGNA covers mechanical insufflation-exsufflation devices as medically necessary for an individual with a neuromuscular disorder with significant impairment of chest wall and/or diaphragmatic movement resulting in difficulty clearing secretions.

CIGNA covers high-frequency chest wall compression devices as medically necessary for EITHER of the following conditions:

- cystic fibrosis, when there is failure, contraindication or intolerance to home chest physiotherapy or it cannot be provided
- bronchiectasis confirmed by high-resolution computed tomography (CT) and characterized by **BOTH** of the following:
 - daily productive cough for at least six continuous months **OR** frequent exacerbations requiring antibiotic therapy more than two times per year
 - failure of standard treatments to mobilize secretions

CIGNA does not cover intrapulmonary percussive ventilation devices for home use because they are considered experimental, investigational or unproven.

General Background

Respiratory disorders characterized by excessive respiratory secretions and impaired airway clearance include cystic fibrosis (CF), chronic bronchitis, emphysema with a chronic bronchitic component, chronic asthma, dyskinetic cilia syndromes, diffuse panbronchiolitis, and idiopathic bronchiectasis. Neuromuscular diseases, such as muscular dystrophy, spinal muscular atrophy, amyotrophic lateral sclerosis (ALS), and multiple sclerosis (MS) can also result in the inability of the patient to effectively clear mucus from the airways (Donahue, 2002; Aldrich, 2000).

Cystic fibrosis is a major cause of severe chronic lung disease in children and is characterized chiefly by obstruction and infection of airways. CF produces thick, sticky mucus that clogs airways and breathing passages. An important activity of daily living for the CF patient is clearing of the lungs. This may be accomplished by chest percussion, mucus thinning drugs, and antibiotics.

Bronchiectasis refers to anatomical distortion of the conducting airways (i.e., thickening, herniation, or dilation) and is characterized clinically by chronic respiratory symptoms, such as cough and sputum production. Treatment with antibiotics and efforts at improved pulmonary clearance allow some control of disease progression, but rarely eradicates the infections completely and does not reverse the anatomical changes significantly. Treatment may also include postural drainage therapy (PDT), also commonly referred to as chest physical therapy (CPT), and other maneuvers designed to mobilize secretions (Morrissey, 2004).

The standard treatment for ineffective mucus clearance from the airways is PDT, postural drainage and percussion, and percussion and vibration. When patients are experiencing excessive mucus and having difficulty clearing secretions mechanical devices may be indicated. The various types of devices include mechanical percussors, positive expiratory pressure (PEP), vibratory positive expiratory pressure devices, mechanical insufflation-exsufflation, and high-frequency chest wall compression (HFCWC) (Yankaskas, 2004; Wagener, 2003; Boucher, 2000; Yeates, 2000). Although intrapulmonary percussive ventilation devices have been proposed for in-home use their safety and efficacy for this indication have not been established.

Mechanical Percussors

Mechanical percussors are electrical devices used to provide clapping or percussion to the external chest wall. The devices deliver consistent, programmable (i.e., adjustable speed) deep pulses. The machine is moved over the patient's chest while the patient assumes a variety of drainage positions. The hand clapping performed during conventional CPT is mimicked by the machine and is less fatiguing than manual hand percussion.

Percussors are classified as Class II 510(k) medical devices by the U.S. Food and Drug Administration (FDA). The Fluid Flo Model 2500 Percussor (MED SYSTEMS, San Diego, CA) and the Frequencer™ (Dymedso Inc., Canada) are examples of mechanical percussors.

Although there are a limited number of published studies primarily in the form of case series with small patient populations (Cantin, et al., 2006), mechanical percussion is considered an established option for airway clearance therapy.

Positive Expiratory Pressure

Expiratory resistance or positive expiratory pressure (PEP) devices promote mucus clearance by preventing airway closure and increasing collateral ventilation. PEP pushes air into the lungs behind mucus, holds the airways open, and keeps them from closing. The person breathes in normally but breathes out harder against resistance. PEP therapy can be taught to children as young as age five years and can be passively given to infants via masks (Shelton, 2004).

PEP devices are considered Class II medical devices and are regulated by the FDA. Examples of this type of device are the TheraPEP[®] (DHD Healthcare, Wampsville, NY) and the RC Cornet[®] device (Pari Respiratory Equipment, Midlothian, VA).

Systematic reviews, randomized controlled trials, and case series reported that cough scores and physical activity improved following PEP, and that PEP was as effective as other forms of physiotherapy (Su, et al., 2007; Darby, et al., 2004; Elkins, et al., 2004).

Vibratory Positive Expiratory Pressure

Another airway clearance device is the vibratory (or oscillating) positive expiratory pressure, a form of PEP, that employs deep breathing and forced exhalation to achieve airway clearance via small, hand-held devices. These devices combine high-frequency air flow oscillations with PEP. For children as young as two years of age, vibratory PEP can be administered via a mask. For older patients (i.e., over age five) the treatment may be administered via a mouthpiece (Shelton, 2004).

Examples of these Class II 510(k) devices are the Flutter[®] (Scandipharm, Birmingham, AL) and the Acapella[®] (DHD Healthcare, Wampsville, NY). Although these two devices have similar performance characteristics, Acapella's performance is not gravity-dependent and may be easier for some patients to use (Volsko, et al., 2003).

Randomized controlled trials have compared vibratory or oscillating PEP therapy (e.g., Flutter, Acapella) to chest physiotherapy, PEP, and active cycles of breathing techniques for airway clearance in patients with diseases such as cystic fibrosis and bronchiectasis. Reported outcomes included improvement in pulmonary function values, amount and weight of sputum, cough frequency, and duration of therapy (Eaton, et al., 2007; Patterson, et al., 2007; McCarren and Alison, 2006; Lagerkvist, et al., 2006; Patterson, et al., 2005; Thompson, et al., 2002; Oermann, et al., 2001).

Mechanical Insufflation-Exsufflation

Patients with neuromuscular weakness can have decreased ability to mobilize and remove secretions from the airways. Mechanical insufflator-exsufflators (MI-Es) are portable electric devices that alternately apply positive and rapid negative pressure to a patient's airway and are considered an established treatment option for patients with neuromuscular disorders with compromised chest wall or diaphragmatic movement. MI-Es create a rapid shift in pressure producing a high expiratory flow rate from the lungs, stimulating cough and increasing secretion clearance.

MI-Es are regulated by the FDA as Class II medical devices. An example of this device is the CoughAssist[™] (J.H. Emerson Co., Cambridge, MA). The CoughAssist delivers air via a breathing circuit incorporating a flexible tube, a bacterial filter, and either a facemask or mouthpiece. Mechanical insufflation-exsufflation therapy can be provided in the home with assistance from a family member or health professional.

Evidence in the published peer-reviewed scientific literature supports MI-E for airway management in patients with neuromuscular disorders. Decreased breathlessness and improved oxygenation, pulmonary function values, and sputum production were reported (Chatwin and Simonds, 2009; Fauroux, et al., 2008; Sancho, et al., 2004; Miske, et al., 2004; Winck, et al., 2004; Chatwin, et al., 2003).

High-Frequency Chest Wall Compression

When conventional postural drainage therapy and other devices have failed or are contraindicated, high-frequency chest wall compression (HFCWC) may be a treatment option for patients with cystic fibrosis or bronchiectasis. HFCWC, a mechanical form of chest physiotherapy, is a system composed of a fitted vest coupled to a pneumatic compressor. The compressor inflates and deflates the vest, compressing and releasing the chest wall to create airflow within the lungs. The vibrations, along with the increase in airflow, help loosen mucus from the lungs. Children as young as three years of age are able to use the vest (Shelton, 2004; Wagener, et al., 2003).

Approved by the FDA 510(k) process, these devices include the Vest™ Airway Clearance System (Hill-Rom, St. Paul, MN; previously manufactured by Advanced Respiratory, St. Paul, MN) and Medpulse™ Respiratory Vest System (Electromed, Inc. Minnetonka, MN).

Evidence in the published studies demonstrated that HFCWC is an effective therapy for airway clearance. Randomized controlled trials compared the use of HFCWC to chest physical therapy, oscillatory PEP, or no therapy. Improvements were seen in pulmonary function values, sputum production, antibiotic use, and/or frequency of hospitalization. HFCWC was noted to be well tolerated, improved breathing, and decreased fatigue in this subpopulation (Yuan, et al., 2010; Lange, et al., 2006; Oermann, et al., 2001; Sherer, et al., 1998).

Intrapulmonary Percussive Ventilation

Intrapulmonary percussive ventilation (IPV) is a modified method of intermittent positive-pressure breathing, with superimposed high-frequency mini-bursts of air or oxygen into the lungs while simultaneously delivering therapeutic aerosols. The combination of vibrations, aerosol, and pressure loosens secretions, stimulates cough, and leads to sputum production. Although typically utilized during hospitalization, IPPV has been proposed for in-home use.

IPVs are approved by the FDA 510(k) process. There are multiple IPVs manufactured by Percussionaire Corporation (Sandpoint, ID), including institutional and home devices. Examples are the Percussionator®, TXP® Universal VENTILATOR Percussionator®, and The IMPULSATOR®.

There is insufficient evidence in the published peer-reviewed literature to support the safety and efficacy of IPVs for home use. Marks et al. (2004) reported on a pilot study of 10 patients with cystic fibrosis who utilized the PercussiveTech HF (PTHF) device (now known as PercussiveNEB™, Vortran Medical Technology 1, Sacramento, CA) for a single intervention in stable cystic fibrosis patients. Outcomes indicated that there was a trend for more sputum production after PTHF compared to production after CPT, but this difference did not reach statistical significance.

Professional Societies/Organizations

Following a systematic review of the literature that included thirteen randomized controlled trials, the Ontario Health Technology Advisory Committee (2009) recommendations for airway clearance devices for cystic fibrosis stated “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”, and airway oscillation devices are an alternative therapy for cystic fibrosis patients when positive expiratory pressure devices are ineffective, contraindicated, or intolerable. However, they do not recommend the use of high-frequency chest wall compression (HFCWC) devices as an alternative to conventional physiotherapy for the treatment of cystic fibrosis because of the “low quality of the evidence concerning their effectiveness in comparison to physiotherapy and the excessive cost of the devices”.

In their practice parameters on the care of patients with amyotrophic lateral sclerosis (Miller, et al., 2009), the American Academy of Neurology recommendations stated that “MI-E may be considered to clear secretions in patients with ALS who have reduced peak cough flow, particularly during an acute chest infection”.

The evidence-based guidelines by the Paralyzed Veterans of America Consortium for Spinal Cord Medicine (2008) lists MI-E as a treatment option in the respiratory management of spinal cord injury patients with retained secretions due to expiratory muscle weakness.

The American College of Chest Physicians guidelines (McCool and Rosen, 2006) recommended PEP over conventional chest physiotherapy for the treatment of cystic fibrosis, stating that PEP is effective, inexpensive,

safe, and can be self-administered. They also recommended devices designed to oscillate gas into the airway either directly or by chest wall compression. Mechanical insufflation-exsufflation was recommended for patients with neuromuscular disease who had an impaired cough.

The American Thoracic Society issued a consensus statement (Finder, et al., 2004) on respiratory care of the patient with Duchenne muscular dystrophy (DMD). The committee supported MI-E for patients with DMD to clear airway secretions.

The Cystic Fibrosis Foundation (Yankaskas, 2004) consensus report on the care of adults with cystic fibrosis included chest physical therapy, positive expiratory pressure, and high-frequency chest wall compression (HFCWC) as treatment options for airway clearance. The report noted that chest physiotherapy (CPT) can be physically demanding and time-consuming for both the individual and his/her support person. Poor adherence with CPT is common. As patients become older and more independent, they frequently seek other airway clearance methods which can be performed without assistance.

Summary

Professional societies and evidence in the published peer-reviewed scientific literature support in-home use of mechanical percussion, positive expiratory pressure (PEP) devices, vibratory positive expiratory pressure therapy, high-frequency chest wall compression, and mechanical insufflation-exsufflation for the management of airway secretions. The evidence in the published peer-reviewed scientific literature does not support in-home use of intrapulmonary percussive ventilation.

Coding/Billing Information

Note: This list of codes may not be all-inclusive.

Covered when medically necessary:

HCPCS Codes	Description
A7025 [†]	High frequency chest wall oscillation system vest, replacement for use with patient owned equipment, each
A7026 [†]	High frequency chest wall oscillation system hose, replacement for use with patient owned equipment, each
E0480 [†]	Percussor, electric or pneumatic, home model
E0482 [†]	Cough stimulating device, alternating positive and negative airway pressure
E0483 [†]	High frequency chest wall oscillation air-pulse generator system, (includes hoses and vest), each
E0484 [†]	Oscillatory positive expiratory pressure device, non-electric, any type, each
S8185 [†]	Flutter device

[†]**Note:** Coverage is limited to those specific indications outlined in the Coverage Policy section of this document.

ICD-9-CM Diagnosis Codes	Description
138	Late effects of acute poliomyelitis
277.00 – 277.09	Cystic fibrosis
335.20 – 335.29	Motor neuron disease
358.8	Other specified myoneural disorders
358.9	Unspecified myoneural disorders
359.0 – 359.1	Muscular dystrophies and other myopathies

491.20 – 491.22	Obstructive chronic bronchitis
493.20 – 493.22	Chronic obstructive asthma
494.0 – 494.1	Bronchiectasis
519.4	Disorders of the diaphragm
	Multiple/Varied

Experimental/Investigational/Unproven/Not Covered:

HCPCS Codes	Description
E0481	Intrapulmonary percussive ventilation system and related accessories

ICD-9-CM Diagnosis Codes	Description
	All codes

*Current Procedural Terminology (CPT®) © 2010 American Medical Association: Chicago, IL.

References

1. Aldrich TK, Rochester DF. The lungs and neuromuscular diseases. In: Murray JF, Nadel JA, Mason RJ, Boushey HA Jr, editors. Textbook of respiratory medicine. 3rd ed. Philadelphia, PA: W.B. Saunders Company; 2000. p. 2329-49.
2. Boat TF. Cystic fibrosis. In: Behrman RE, Kliegman RM, Jenson HB, editors. Nelson textbook of pediatrics. 17th ed. Philadelphia, PA: W.B. Saunders Company; 2004. p. 1437-50.
3. Boucher RC, Knowles MR, Yankaskas JR. Cystic fibrosis. In: Murray JF, Nadel JA, Mason RJ, Boushey HA Jr, editors. Textbook of respiratory medicine. 3rd ed. Philadelphia, PA: W.B. Saunders Company; 2000. p. 308-9.
4. Bradley JM, Moran FM, Elborn JS. Evidence for physical therapies (airway clearance and physical training) in cystic fibrosis: an overview of five Cochrane systematic reviews. *Respir Med.* 2006 Feb;100(2):191-201.
5. California Thoracic Society. Position paper. Airway clearance devices: limited evidence for what is 'the best method'. May 25, 2006. Accessed Apr 14, 2010. Available at URL address: <http://www.thoracic.org/sections/chapters/thoracic-society-chapters/ca/publications/resources/respiratory-disease-adults/AirwayClearanceDevices.pdf>
6. Cantin AM, Bacon M, Berthiaume Y. Mechanical airway clearance using the frequencer electro-acoustical transducer in cystic fibrosis. *Clin Invest Med.* 2006 Jun;29(3):159-65.
7. Chatwin M, Simonds AK. The addition of mechanical insufflation/exsufflation shortens airway-clearance sessions in neuromuscular patients with chest infection. *Respir Care.* 2009 Nov;54(11):1473-9.
8. Chatwin M, Ross E, Hart N, Nickol AH, Polkey Mi, Simonds AK. Cough augmentation with mechanical insufflation/exsufflation in patients with neuromuscular weakness. *Eur Respir J.* 2003 Mar;21(3):502-8.
9. Cystic Fibrosis Foundation. Airway clearance techniques. 2004. Accessed Apr 14, 2010. Available at URL address: <http://www.cff.org/treatments/Therapies/Respiratory/AirwayClearance/>

10. Darbee JC, Ohtake PJ, Grant BJ, Cerny FJ. Physiologic evidence for the efficacy of positive expiratory pressure as an airway clearance technique in patients with cystic fibrosis. *Phys Ther.* 2004;84:524-37.
11. Eaton T, Young P, Zeng I, Kolbe J. A randomized evaluation of the acute efficacy, acceptability and tolerability of flutter and active cycle of breathing with and without postural drainage in non-cystic fibrosis bronchiectasis. *Chron Respir Dis.* 2007;4(1):23-30.
12. Elkins M, Jones A, Schans C. Positive expiratory pressure physiotherapy for airway clearance in people with cystic fibrosis. *Cochrane Database Syst Rev.* 2004;(1):CD003147. In: The Cochrane Library, Issue 1. Chichester, UK: John Wiley & Sons, Ltd. Update: 2005;2. Updated Dec 15, 2005.
13. Fauroux B, Guillemot N, Aubertin G, Nathan N, Labit A, Clément A, Lofaso F. Physiologic benefits of mechanical insufflation-exsufflation in children with neuromuscular diseases. *Chest.* 2008 Jan;133(1):161-8.
14. Finder JD, Birnkrant D, Carl J, Farber HJ, Gozal D, Iannaccone ST, Kovesi T, Kravitz RM, Panitch H, Schramm C, Schroth M, Sharma G, Sievers L, Silvestri JM, Sterni L; American Thoracic Society. Respiratory care of the patient with Duchenne muscular dystrophy: ATS consensus statement. *Am J Respir Crit Care Med.* 2004 Aug 15;170(4):456-65.
15. Hristara-Papadopoulou A, Tsanakas J, Diomou G, Papadopoulou O. Current devices of respiratory physiotherapy. *Hippokratia.* 2008;12(4):211-20.
16. Homnick DN. Making airway clearance successful. *Paediatr Respir Rev.* 2007 Mar;8(1):40-5. Epub 2007 Mar 26.
17. Irwin RS, Baumann MH, Bolser DC, Boulet LP, Braman SS, Brightling CE, Brown KK, Canning BJ, Chang AB, Dicipinigaitis PV, Eccles R, Glomb WB, Goldstein LB, Graham LM, Hargreave FE, Kvale PA, Lewis SZ, McCool FD, McCrory DC, Prakash UB, Pratter MR, Rosen MJ, Schulman E, Shannon JJ, Smith Hammond C, Tarlo SM; American College of Chest Physicians (ACCP). Diagnosis and management of cough executive summary: ACCP evidence-based clinical practice guidelines. *Chest.* 2006 Jan;129(1 Suppl):1S-23S. Accessed Apr 14, 2010. Available at URL address: <http://www.chestnet.org/accp/guidelines>
18. Karlson KH. Cystic fibrosis. In: Rakel RE, Bope ET, editors. *CONN'S current therapy 2005.* 57th ed. St. Louis, MO: W.B. Saunders Co.; 2005. p. 260-2.
19. Lagerkvist AL, Sten GM, Redfors SB, Lindblad AG, Hjalmarson O. Immediate changes in blood-gas tensions during chest physiotherapy with positive expiratory pressure and oscillating positive expiratory pressure in patients with cystic fibrosis. *Respir Care.* 2006 Oct;51(10):1154-61.
20. Lange DJ, Lechtzin N, Davey C, David W, Heiman-Patterson T, Gelinas D, Becker B, Mitsumoto H; HFCWO Study Group. High-frequency chest wall oscillation in ALS: an exploratory randomized, controlled trial. *Neurology.* 2006 Sep 26;67(6):991-7.
21. Main E, Prasad A, Schans C. Conventional chest physiotherapy compared to other airway clearance techniques for cystic fibrosis. *Cochrane Database Syst Rev.* 2005 Jan 25;(1):CD002011.
22. Marks JH, Hare KL, Saunders RA, Homnick DN. Pulmonary function and sputum production in patients with cystic fibrosis: a pilot study comparing the PercussiveTech HF Device and standard chest physiotherapy. *Chest.* 2004 Apr;125(4).
23. McCarren B, Alison JA. Physiological effects of vibration in subjects with cystic fibrosis. *Eur Respir J.* 2006 Jun;27(6):1204-9.
24. McCool FD, Rosen MJ. Nonpharmacologic airway clearance therapies: ACCP evidence-based clinical practice guidelines. *Chest.* 2006 Jan;129(1 Suppl):250S-259S.

25. Miller RG, Jackson CE, Kasarskis EJ, England JD, Forshew D, Johnston W, Kalra S, Katz JS, Mitsumoto H, Rosenfeld J, Shoesmith C, Strong MJ, Woolley SC; Quality Standards Subcommittee of the American Academy of Neurology. Practice parameter update: The care of the patient with amyotrophic lateral sclerosis: drug, nutritional, and respiratory therapies (an evidence-based review): report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology*. 2009 Oct 13;73(15):1218-26.
26. Miske LJ, Hickey EM, Kolb SM, Weiner DJ, Panitch HB. Use of the mechanical inextufflator in pediatric patients with neuromuscular disease and impaired cough. *Chest*. 2004;125:1406-12.
27. Morrison L, Agnew J. Oscillating devices for airway clearance in people with cystic fibrosis. *Cochrane Database of Systematic Reviews* 2009, Issue 1. Art. No.: CD006842. DOI: 10.1002/14651858.CD006842.pub2.
28. Morrissey BM, Harper RW. Bronchiectasis: sex and gender considerations. *Clin Chest Med*. 2004 Jun;25(2).
29. Oermann CM, Sockrider MM, Giles D, Sontag MK, Accurso FJ, Castile RG. Comparison of high-frequency chest wall oscillation and oscillating positive expiratory pressure in the home management of cystic fibrosis: a pilot study. *Pediatr Pulmonol*. 2001 Nov;32(5):372-7.
30. Ontario Health Technology Advisory Committee. Airway clearance devices for cystic fibrosis. Nov 2009. Accessed Apr 15, 2010. Available at URL address: http://www.health.gov.on.ca/english/providers/program/ohtac/tech/recommend/rec_mn.html
31. Paralyzed Veterans of America. Consortium for Spinal Cord Medicine. Early acute management in adults with spinal cord injury: a clinical practice guideline for health-care professionals. *J Spinal Cord Med* 2008;31(4):403-79. Accessed Apr 15, 2010. Available at URL address: <http://www.pva.org/site/News2?page=NewsArticle&id=8407>
32. Patterson JE, Bradley JM, Hewitt O, Bradbury I, Elborn JS. Airway clearance in bronchiectasis: a randomized crossover trial of active cycle of breathing techniques versus Acapella. *Respiration*. 2005 May-Jun;72(3):239-42.
33. Patterson JE, Hewitt O, Kent L, Bradbury I, Elborn JS, Bradley JM. Acapella versus 'usual airway clearance' during acute exacerbation in bronchiectasis: a randomized crossover trial. *Chron Respir Dis*. 2007;4(2):67-74.
34. Sancho J, Servera E, Diaz J, Marin J. Efficacy of mechanical insufflation-exsufflation in medically stable patients with amyotrophic lateral sclerosis. *Chest*. 2004 Apr;125(4):1400-5.
35. Scherer TA, Barandun J, Martinez E, Wanner A, Rubin EM. Effect of high-frequency oral airway and chest wall oscillation and conventional chest physical therapy on expectoration in patients with stable cystic fibrosis. *Chest*. 1998 Apr;113(4):1019-27.
36. Shelton K. Airway clearance: something for everyone. The Cystic Fibrosis Center at Stanford. *Cystic Fibrosis News*. Accessed Apr 14, 2010. Available at URL address: <http://cfcenter.stanford.edu/CFnews1.html#AirClear>
37. Su CL, Chiang LL, Chiang TY, et al. Domiciliary positive expiratory pressure improves pulmonary function and exercise capacity in patients with chronic obstructive pulmonary disease. *J Formos Med Assoc*. 2007;106(3):204-211.
38. Thompson CS, Harrison S, Ashley J, Day K, Smith DL. Randomised crossover study of the Flutter device and the active cycle of breathing technique in non-cystic fibrosis bronchiectasis. *Thorax*. 2002;57:446-8.

39. Wagener JS, Headley AA. Cystic fibrosis: current trends in respiratory care. *Respir Care*. 2003;48(3):234-47.
40. Winck JC, Gonçalves MR, Lourenço C, Viana P, Almeida J, Bach JR. Effects of mechanical insufflation-exsufflation on respiratory parameters for patients with chronic airway secretion encumbrance. *Chest*. 2004 Sep;126(3).
41. Yankaskas JR, Marshall BC, Sufian B, Simon RH, Rodman D. Cystic fibrosis adult care consensus conference report. *Chest*. 2004 Jan;125(1 Suppl):1S-39S.
42. Yeates DB, Mortensen J. Deposition and clearance. In: Murray JF, Nadel JA, Mason RJ, Boushey HA Jr, editors. *Textbook of respiratory medicine*. 3rd ed. Philadelphia, PA: W.B. Saunders Company; 2000. p. 370.
43. Yuan N, Kane P, Shelton K, Matel J, Becker BC, Moss RB. Safety, Tolerability, and Efficacy of High-Frequency Chest Wall Oscillation in Pediatric Patients With Cerebral Palsy and Neuromuscular Diseases: An Exploratory Randomized Controlled Trial. *J Child Neurol*. 2010 Mar 31. [Epub ahead of print].

Policy History

Pre-Merger Organizations	Last Review Date	Policy Number	Title
CIGNA HealthCare	5/15/2008	0069	Airway Clearance Devices in the Ambulatory Setting
Great-West Healthcare	5/16/2006	04.229.02	Intrapulmonary Percussive Ventilation (IPV)
	12/20/2007	07.358.01	Mechanical Insufflation-Exsufflation
	5/15/2006	00.228.03	High-Frequency Chest Compression

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