

Airway Clearance New Techniques and Protocol

Definition

Mucociliary clearance has long been known to be a significant innate defense mechanism against inhaled microbes and irritants.

Diseases Characterized by impaired mucociliary clearance

- Primary Ciliary Dyskinesia
- Secondary Ciliary Dyskinesia
- COPD
- Bronchial Asthma
- Cystic Fibrosis and bronchiectasis
- Chronic muscle Dystrophy
- Patients on MV

Importance of Mucous Clearance

+ 90%

of episodes of respiratory failure in patients with muscular dystrophy are caused by ineffective coughing during intercurrent chest colds. Most people with neuromuscular diseases still die prematurely or are hospitalized and undergo tracheostomy, because of failure to assist respiratory muscles to prevent respiratory failure.”

What Numbers Are Significant?

If PCF* does not exceed 270-300L/min, Patients when they are unwell are at risk of a decline in their PCF < 160L/min

PCF: Peak Cough Flow

(Bach et al, 1997, Chest)

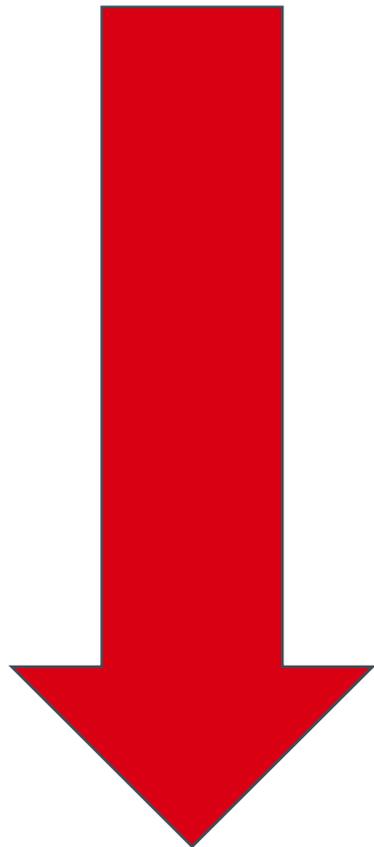
What Numbers Are Significant?

PCF < 160 L/min	No functional cough	High risk
PCF 160-270 L/min	No functional cough	Moderate risk
PCF 270-360 L/min	Weak cough	Low risk
PCF > 360 L/min	Effective cough	No risk

Other parameters:

- Max Expiratory Pressure < 45-60 cmH₂O (40-50 % theory)
ATS Consensus statement 2004; G Lopes et al. Eur Respir J 2000; 16: 37s
- Forced Vital Capacity < 1,5-2 L (30-50% theory)
JR Bach et al. Chest, 1996; G Lopes et al. Eur Respir J 2000; 16: 37s

When to introduce methods



PCF <270 l min

Select MAC* or MIC* techniques

PCF < 245 l min

Combine MAC and MIC

PCF < 160 l min

MI- E*

Consider MI-E with MAC

MAC: Manually assisted cough
MIC: maximal insufflation capacity
MI-E: Mechanical Insufflation - Exufflation

(Chatwin 2009)

Airway clearance techniques

- Breathing Exercises
- Postural drainage techniques
- Active Cycle of Breathing Techniques (ACBT)
- High Frequency Chest Oscillation
- Cough Assist
- OPEP

Breathing Exercises

- Glossopharyngeal breathing
- Diaphragmatic breathing
- Pursed lip breathing
- Segmental breathing
- Limitations:
 - Patients with reduced flow
 - Low cough reflexes
 - Patient compliance and tolerance.

Box Breathing

Step 1



Sit in a comfortable upright position and breathe in through your nose for four seconds.

Step 2



Hold your breath for four seconds.

Step 3



Exhale through your nose for four seconds.

Step 4



Hold the exhale for four seconds before repeating.

Alternate Nostril Breathing

Step 1



Sit in a comfortable position. Block your right nostril with your thumb and breathe in through your left nostril.

Step 2



Cover your left nostril with your ring finger, and breathe out through your right nostril.

Step 3



Inhale through the right nostril, switch again, and breathe out with the left nostril.

Pursed-Lip Breathing

Step 1



Sit in a comfortable, upright position and relax your neck and shoulders.

Step 2



Inhale slowly through your nose for 2 seconds.

Step 3



Pucker or purse your lips as though you're going to blow out a candle.

Step 4



Exhale slowly by blowing air through your pursed lips for four to six counts.

Belly Breathing

Step 1



Sit or lie down in a comfortable position.

Step 2



Place your hands on your belly with the tips of your fingers lightly touching.

Step 3



Inhale slowly, focusing on moving your fingers apart as you draw the air in.

Step 4



Exhale slowly, feeling your fingers moving back toward each other until they touch.

Lion's Breath

Step 1



Sit on the floor in a comfortable position, leaning forward slightly with your hands on your knees or the floor.

Step 2



Breathe in deeply through your nose.

Step 3



Breathe out forcefully with your mouth open wide, sticking your tongue out, and making a "ha" sound.

Step 4



As you exhale, roll your eyes toward the center of your forehead.

Resonance Frequency Breathing

Step 1



Lie down and close your eyes and mouth.

Step 2



Slowly breathe in through your nose for a count of six seconds. Don't fill your lungs too much.

Step 3



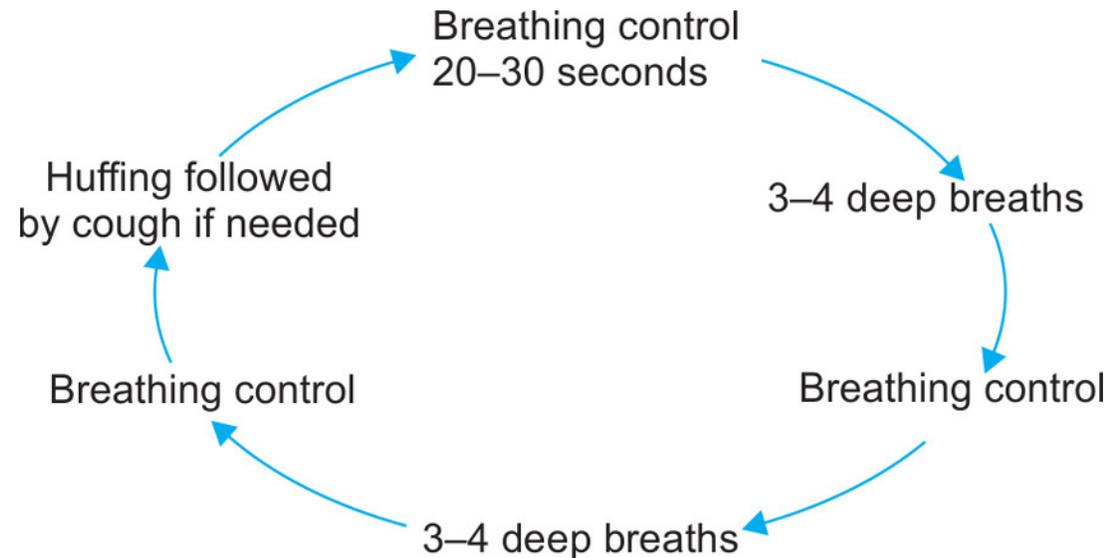
Exhale for six seconds, allowing your breath to leave your body slowly and gently without forcing it.

Postural drainage techniques

- Excellent use of gravity to mobilize secretion
- Unfortunately need high level of cognitive and physical ability to perform.
- In most cases need a physiotherapist or a respiratory therapist to help the patient.



Active Cycle of Breathing Techniques (ACBT)



Limitations:

- Patients with reduced flow
- Cognitive impairment
- Highly deconditioned
- Low cough reflexes
- Patient compliance and tolerance.

High Frequency Chest Oscillation



- Vest
 - Used to mobilize secretion only
 - Need long sessions up to 30 min usage to start giving effect.
 - Not very effective in when patient cough reflexes is reduced.
 - Expensive
 - Not suitable for obese patients.
 - Need to be joined with a Cough Assist machine

Vibrator Wrap

- Just a Vibrator
- Don't offer strong or effective percussion like the Vest.
- Designed to be DISPOSABLE single patient use, DO NOT WASH*



* based on recommendation from the manufacturer SEOIL PACIFIC CORP.

<http://comfortcough.com/54>

Cough Assist

- CLEARWAY 2, the only (3.8 Kg) Cough Assist in the Egyptian market with unique extra benefits.
 - TreatRepeat®
 - iTrigger®
 - Synchrony Beep®
 - 15 min NIV



Clearway 2

by Breas



• iTrigger®

- It is based on the patented **eSync** algorithm used in the Breas VIVO 1-2-3 ventilators.
- The Clearway 2 monitors the change in acceleration of flow when a patient is triggering a breath.
- This change in acceleration of flow provides information on how much energy the patient is using to trigger the breath



• TreatRepeat®

- Allow clinicians to set and deliver different numbers of insufflations and exufflations.
- Then, save the treatment they have just delivered to be repeated automatically.
- This helps improve accuracy and speed of titration and set-up.

Clearway 2

by Breas



- Synchrony Beep®
 - The Synchrony Beep provides an audible alert to patients just before the device cycles to exsufflation, in automatic MI-E modes.
 - Allowing even patients who do not have visual contact with the Clearway 2 to synchronize with the device during MI-E therapy.
 - This adds much patient-device synchrony.
- NIV mode
 - NIV mode allows clinicians to set therapeutic Positive Pressure Ventilation prescriptions for the patient if required between sessions.
 - Runs for a maximum of 15 minutes.

OPEP



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Aerobika^{*} 

- Oscillatory positive expiratory pressure has been shown to assist airway clearance in patients with respiratory disease.



Easy to use, hand-held device offers a cost-effective solution for postoperative respiratory physiotherapy

- Short 5 minutes only treatment, 2 times daily¹
- Adjustable resistance to suit the patients' needs (1-5)
- No side-effects or complicated drug interactions (**DRUG FREE**)
- Easy-to-use and learn for independent use

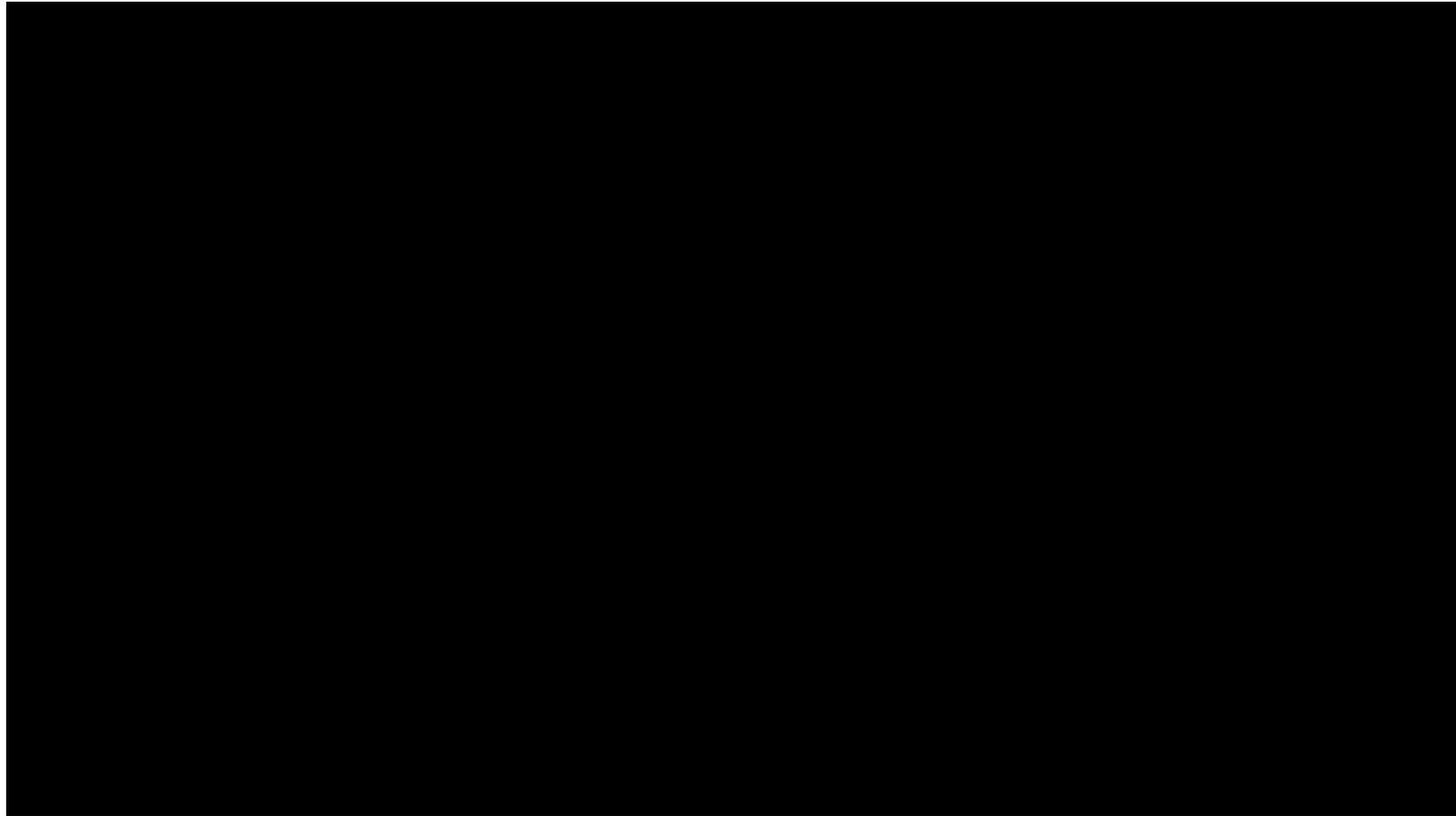


TOTAL
CARE

19825



How it Works !?





How to use !?



GetYourBreathBack.com

OPEP has been shown to assist airway clearance in patients with respiratory disease.

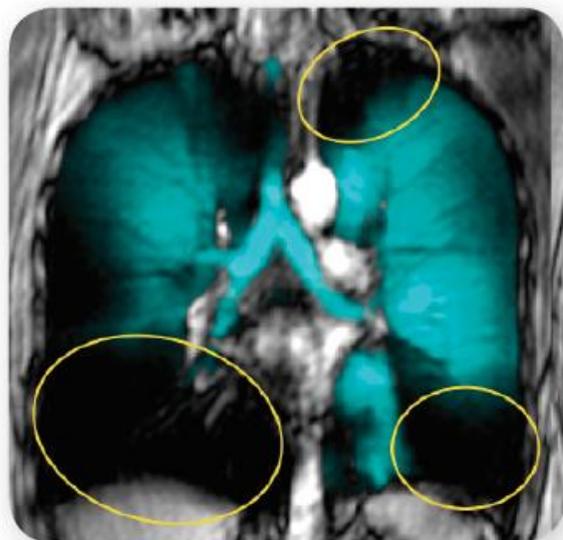
- **Counteracts weak or collapsed airways by providing positive pressure to stent them open**¹
 - Improves gas distribution to previously unventilated areas thus decreasing gas trapping²
 - Opens airways blocked by mucous plugs
- **Oscillations enhance mucus mobilization and removal**³
 - Helps thin, shear, and dislodge mucus⁴
 - Frequency range of the oscillations corresponds with natural cilia movement to complement and enhance body mechanism
- **Combination of pressure and oscillations helps move mucus to the central or upper airways where it can be coughed out**
 - Airways are stented open while oscillations thin, shear and move mucus to the larger airways where it can be coughed out



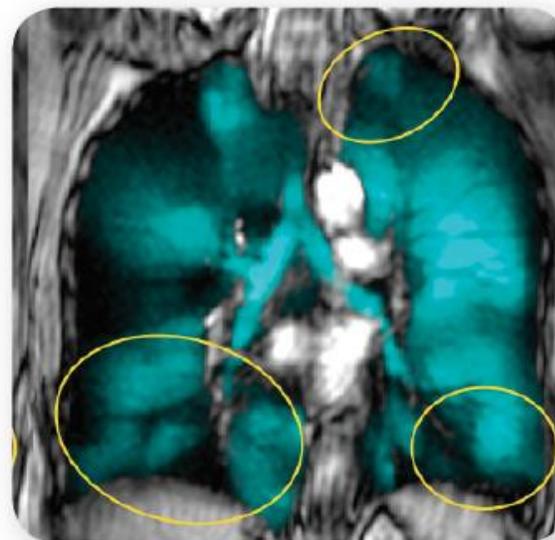
The *Aerobika** device provided increases in gas distribution, as demonstrated by lung ³He MRI¹



Before
Baseline care



After
Baseline care plus *Aerobika** device



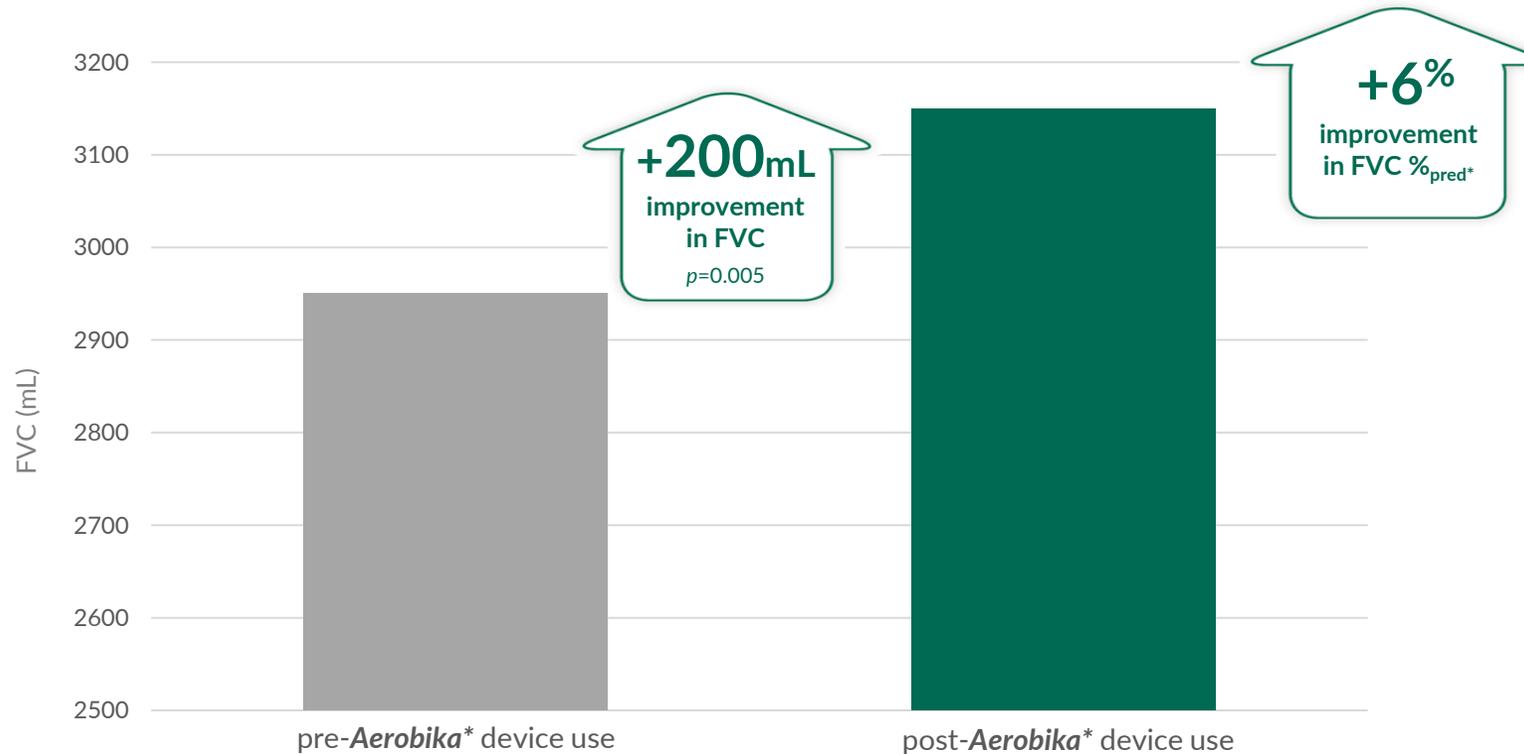
Yellow circles represent areas of greatest change after 3-4 weeks of *Aerobika** device use.

MRI=magnetic resonance imaging; ³He = hyperpolarized Helium-3.



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INTERNATIONAL

The **Aerobika*** device demonstrated statistically significant improvements in **lung function** ($n=14$)



FVC: forced vital capacity.

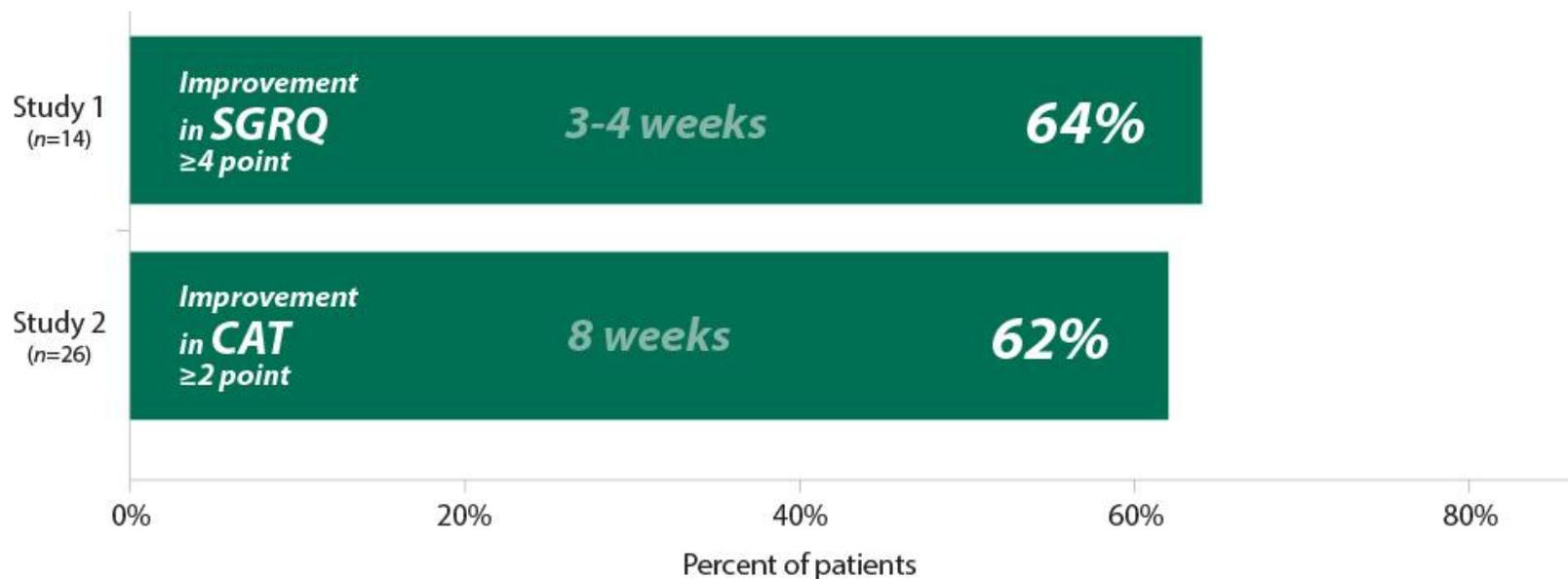
Reference: * Adapted from Svenningsen S, et al. COPD. 2016;13(1):66-74.



The **Aerobika*** device significantly improved **quality of life**, as measured by SGRQ and CAT¹



Responder rates for improvements greater than the MCID^{1†‡}



CAT=COPD assessment test; MCID=Minimum Clinically Important Difference; SGRQ=St. George's Respiratory Questionnaire.

† Randomized, cross-over study evaluating the efficacy of the **Aerobika*** device after 3-4 weeks of treatment in patients with COPD and Chronic Bronchitis .

‡ Clinical assessment of patients with COPD and Chronic Bronchitis over 8 weeks of treatment with the **Aerobika*** device

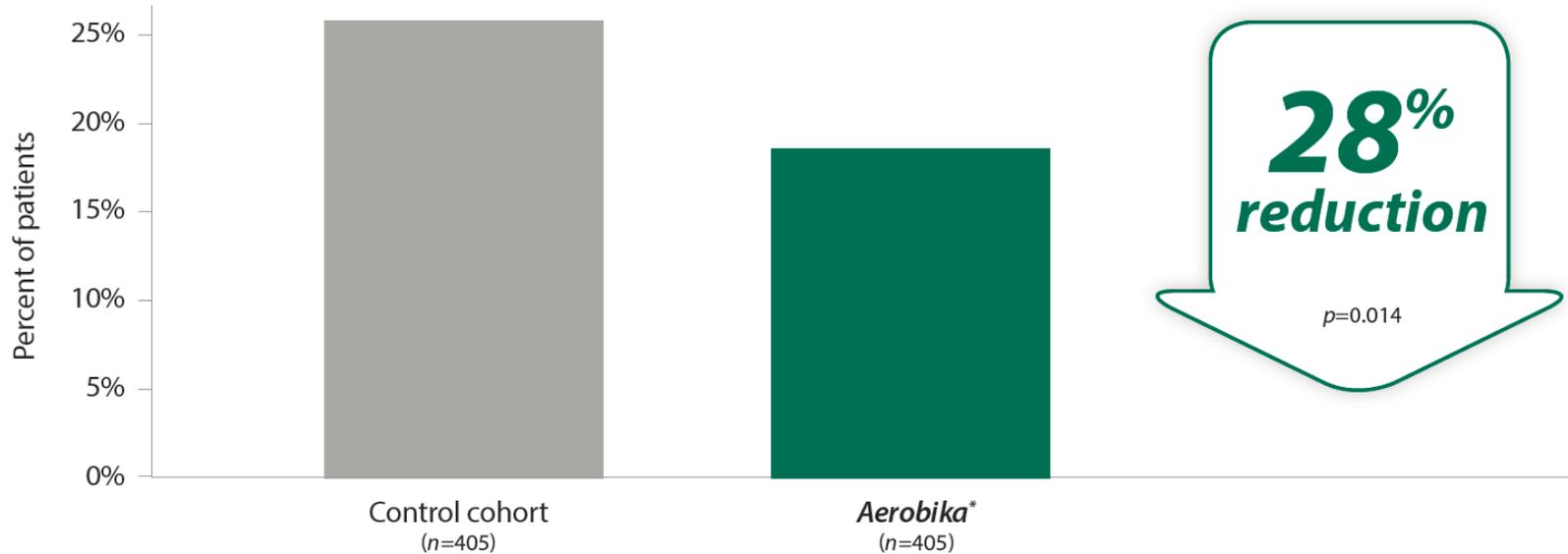


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The **Aerobika*** device demonstrated a significant reduction over usual care in the percentage of patients with a **moderate-to-severe exacerbation** at 30 days



Percentage of patients with a moderate-to-severe exacerbation at 30 days



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Remember !



- You can integrate **Aerobika*** and Nebulizers together to enhance compliance and tolerance.

Humidification & Temperature Importance



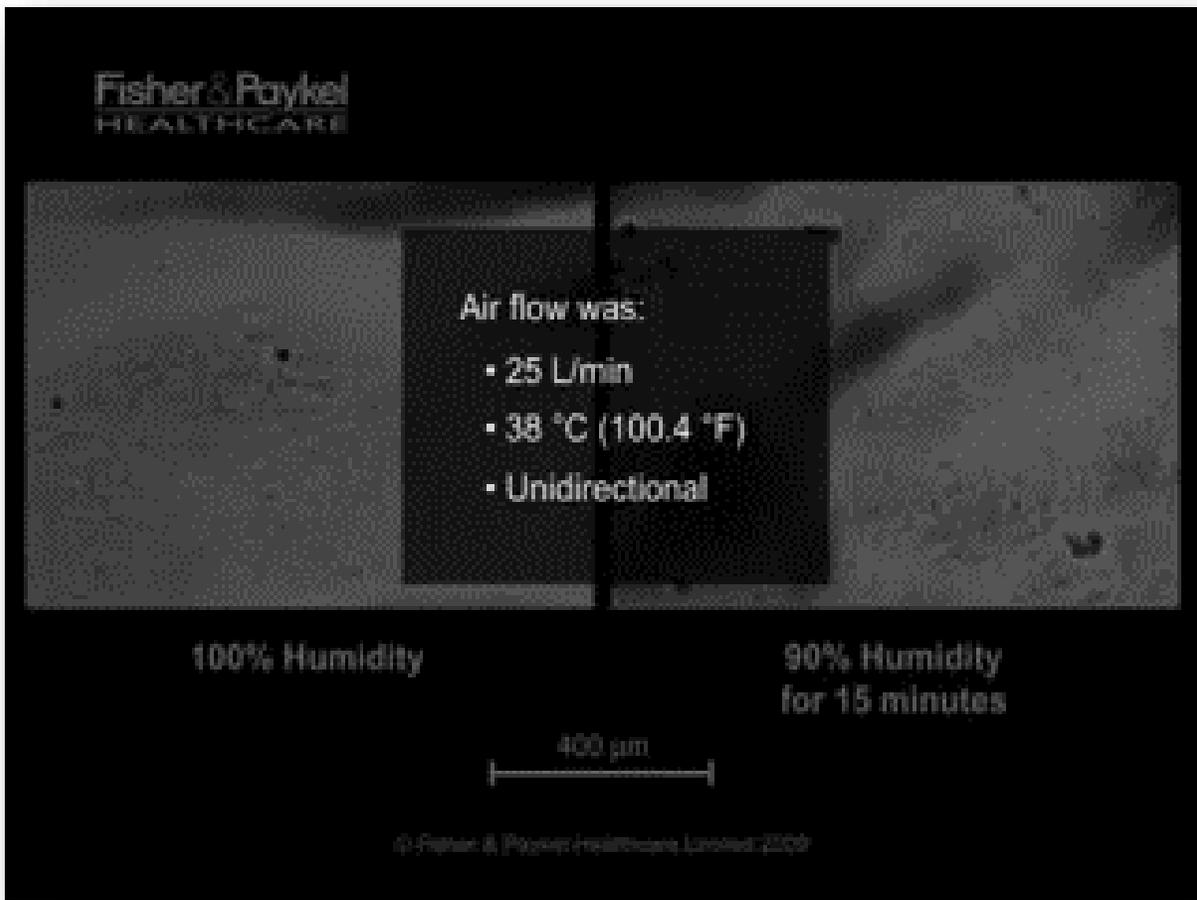
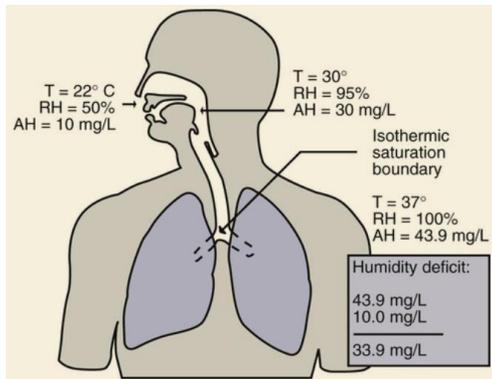
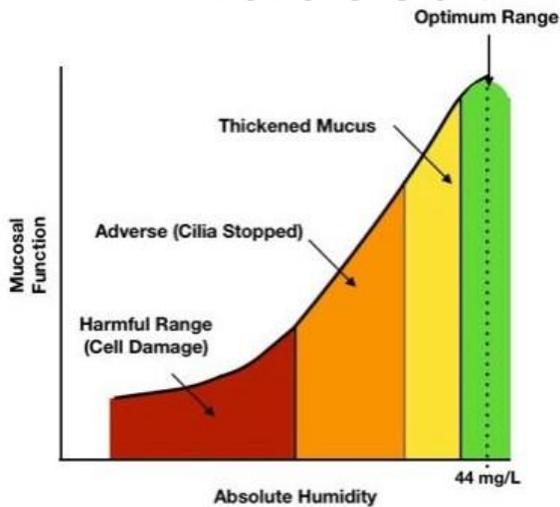


Membrane Humidification



Why Humidity matters ?

Mucosal Function vs. Inspired Humidity



Adapted from Williams, RB. Respir Care Clin N Am 1998 Jun; 4 (2): 215-28

Physiologic state of gas in the lungs:

37° C

100% Relative Humidity
Or (44mg H₂O/L)

100% Relative humidity **improved mucociliary clearance.**¹

Only -slight- 10 % change in relative humidity differs.

In vitro ovine model of the effects of high flows of warm, humidified air on mucociliary transport.²

(1) Hasani, A; Chapman, T.; McCool, D; Smith, R.; Dilworth, J.; Agnew, J. (2008). *Domiciliary humidification improves lung mucociliary clearance in patients with bronchiectasis. Chronic Respiratory Disease, 5(2), 81-86.* doi:10.1177/1479972307087190.

(2) Tatkov, S.; Pack, R. J. (2011). *Symmetrical-Waveform High-Frequency Oscillation Increases Artificial Mucus Flow Without Changing Basal Mucus Transport in In Vitro Ovine Trachea. Respiratory Care, 56(4), 435-441.* doi:10.4187/respca.00809



Why WE Win

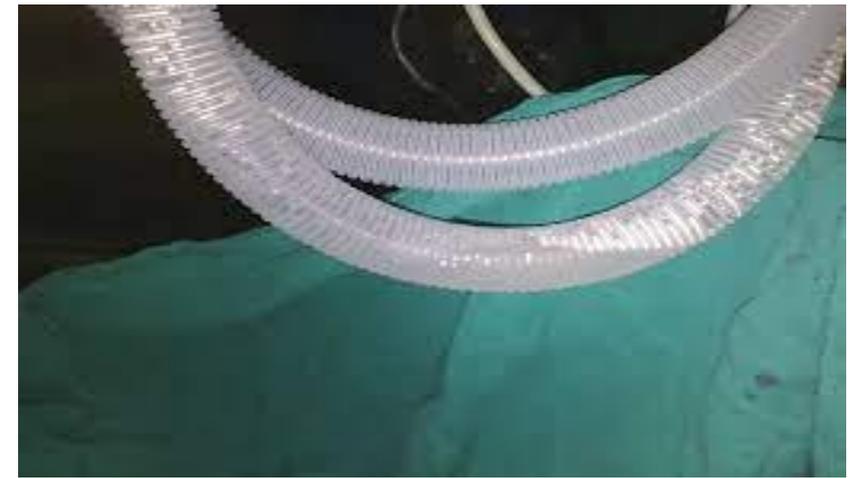
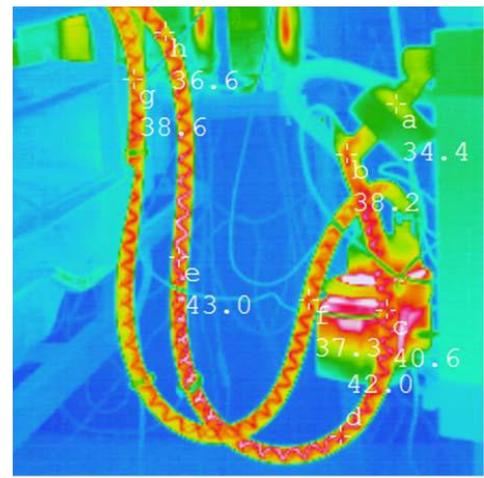
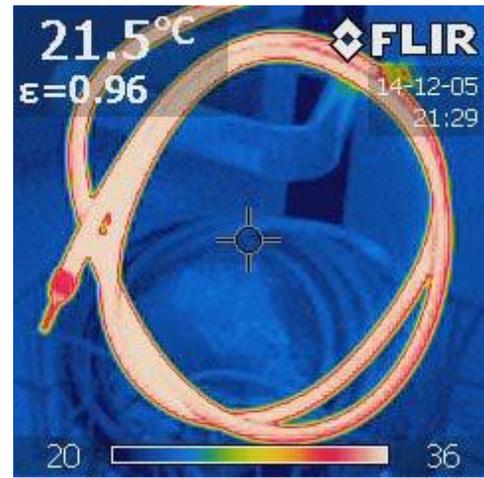
Membrane humidification
enables high velocity and
ensure a 100% relative
humidity





Why WE Win (eliminating rain out)

- Water Jacket Delivery Vs Heated Wire



VAP



Ventilator Associated Pneumonia

High-Cost Management

- **Diagnosis** : Sputum culture /BAL, infection marker (LABS), Chest radiography , CPIS score
- **Antibiotics:**
 - Meronam + tygacil
 - (Meronem 228 + tygacil 390) twice daily (1236 L.E)
 - 2 weeks = 17,305 LE**
 - Colistin + Unasyn
 - (Colistin x 14 day = 21000) (Unasyn x 14 day = 5400)
 - 2 Weeks = 26,400 LE**
- **X-ray or CT Scan** daily or 3 times weekly = 1200 to 2500
- **Sputum culture** = 1000 to 3000
- **Sedation**
 - Precedex (Dexmedetomidine)Vial = 145 L.E x 5 amp per day = 725
 - Propofol = 160 L.E x 5 amp per day = 800

Check for updates

ORIGINAL ARTICLE

Bacterial Superinfection Pneumonia in Patients Mechanically Ventilated for COVID-19 Pneumonia

Chiagozie O. Pickens¹, Catherine A. Gao¹, Michael J. Cuttita¹, Sean B. Smith¹, Lorenzo L. Pesce², Rogan A. Grant¹, Mengjia Kang¹, Luisa Morales-Nebreda¹, Avni A. Bavishi³, Jason M. Arnold³, Anna Pawlowski⁴, Chao Qi^{5*}, G. R. Scott Budinger^{1*}, Benjamin D. Singer^{1*}, and Richard G. Wunderink¹; for the NU COVID Investigators

¹Division of Pulmonary and Critical Care, Department of Medicine, ²Department of Pharmacology, ³Department of Medicine, ⁴Clinical Translational Sciences Institute, and ⁵Department of Pathology, Northwestern University Feinberg School of Medicine, Chicago, Illinois

ORCID IDs: 0000-0003-4140-0599 (A.A.B.); 0000-0001-8687-0063 (J.M.A.); 0000-0001-5775-8427 (B.D.S.); 0000-0002-8527-4195 (R.G.W.).

Intensive Care Med
https://doi.org/10.1007/s00134-022-06773-3

LASTING LEGACY IN INTENSIVE CARE MEDICINE

Ventilator-associated pneumonia

Otavio T. Ranzani^{1,2}, Michael S. Niederman^{3*} and Antoni Torres⁴

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Attributable Mortality of Ventilator-Associated Pneumonia
A Reappraisal Using Causal Analysis

Maarten Bekaert¹, Jean-Francois Timsit^{2,3}, Stijn Vansteelandt^{1,4}, Pieter Depuydt^{5,6}, Aurélien Vésin³, Maité Garrouste-Orgeas⁷, Johan Decruyenaere⁸, Christophe Clec'h⁹, Elie Azoulay⁹, and Dominique Benoit⁵; on behalf of the Outcomerea Study Group*

¹Department of Applied Mathematics and Computer Sciences, and ²Heymans Institute of Pharmacology, Ghent University, Ghent, Belgium; ³Medical Intensive Care Unit, Albert Michallon Hospital, Grenoble, France; ⁴INSERM 823, University Joseph Fourier, Grenoble Cedex, France; ⁵Department of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine, London, United Kingdom; ⁶Department of Intensive Care Medicine, Ghent University Hospital, Ghent, Belgium; ⁷Medical-Surgical Intensive Care Unit, Saint-Joseph Hospital Network, Paris, France; ⁸Medical-Surgical ICU, Avicenne Teaching Hospital, Bobigny, France; and ⁹Medical Intensive Care Unit, Saint-Louis Hospital, Paris, France

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New Antibiotics for Hospital-Acquired Pneumonia and Ventilator-Associated Pneumonia

Matteo Bassetti, MD, PhD^{1,2}, Alessandra Mularoni, MD, PhD³, Daniele Roberto Giacobbe, MD, PhD^{1,2}, Nadia Castaldo, MD^{4,5}, Antonio Vena, MD, PhD^{1,2}

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Emerg Infect Dis 2022;28(1):280–294.

Ibrahim et al. Egypt J Radiol Nucl Med (2021) 52:226
https://doi.org/10.1186/s43055-021-00609-8

Egyptian Journal of Radiology and Nuclear Medicine

RESEARCH Open Access

Invasive mechanical ventilation complications in COVID-19 patients

Ghada Sobhy Ibrahim¹, Buthaina M. Alkandari^{2,3}, Islam Ahmed Abo Shady⁴, Vikash K. Gupta⁵ and Mohsen Ahmed Abdelmohsen^{6*}



Water Jacket Delivery

By the Triple Lumen Tube

Water Jacket delivery preserves humidity and temperature all the way to the patient nasal Canula.

Preventing any cool down or any Condensation leading to rain out.



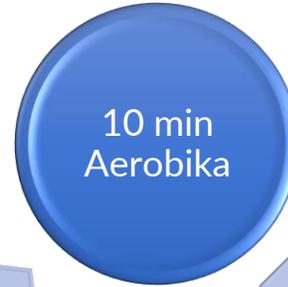
Best Airway Mucous Clearance Protocol



Whenever MI-E is needed



25 l/m – 37° C



3 coughs after each 5 expirations



25 l/m – 37° C



3 coughs after each 5 expirations

AeroChamber Plus Flow-Vu*

Anti-Static Valved Holding Chamber



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Metered Dose Inhalers: the most widely prescribed aerosol drug delivery format

- Most widely prescribed format¹
- Widest range of drug classes¹
- Lowest price¹
- Provide similar efficacy to other delivery formats^{2,3,4}



User Errors With Metered Dose Inhalers Are Common¹

In 2016, a published meta-analysis of 144 papers including data on 54,354 patients the most frequent errors to be:¹



46%

(95% CI, 42%–49%)

No post-inhalation breath-hold



45%

(95% CI, 42%–49%)

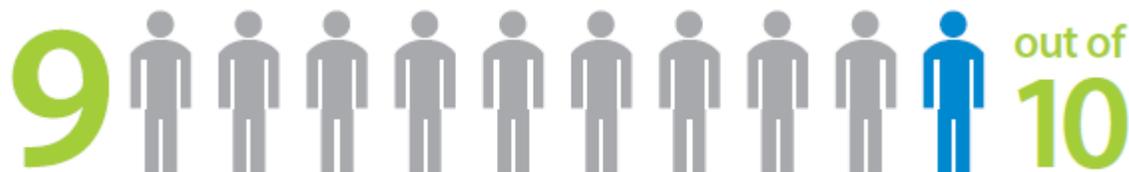
Coordination



44%

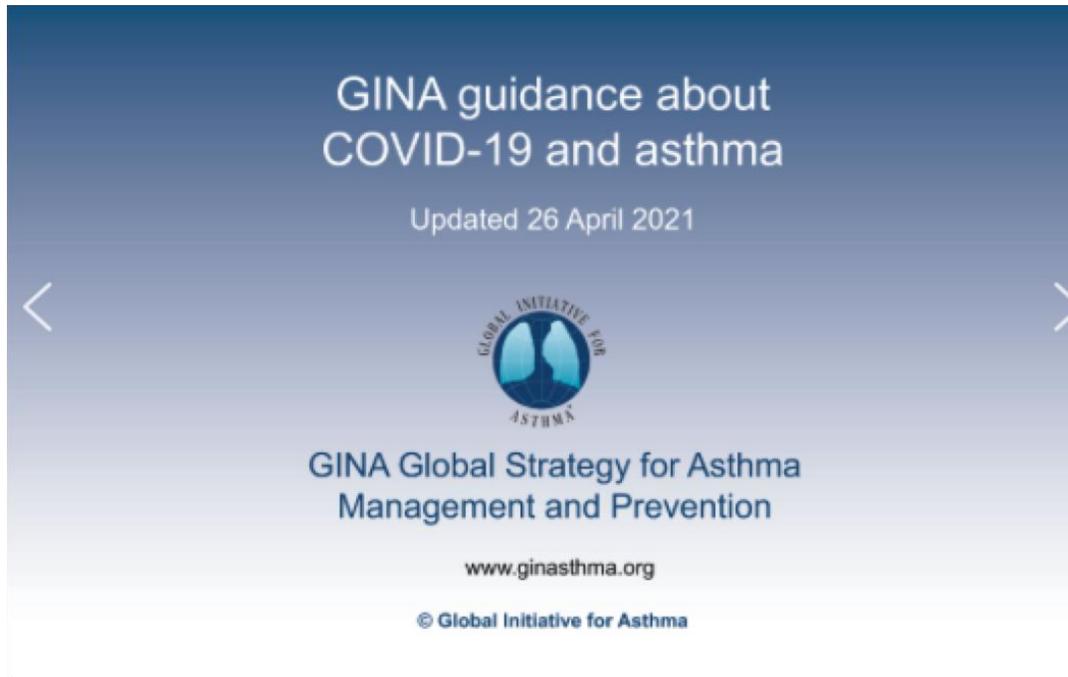
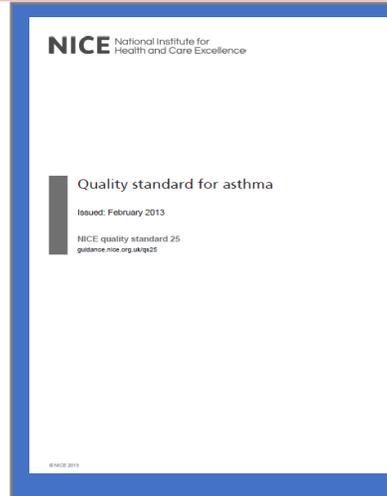
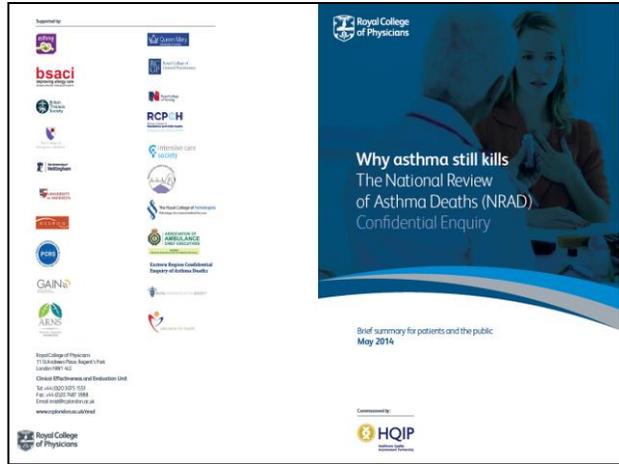
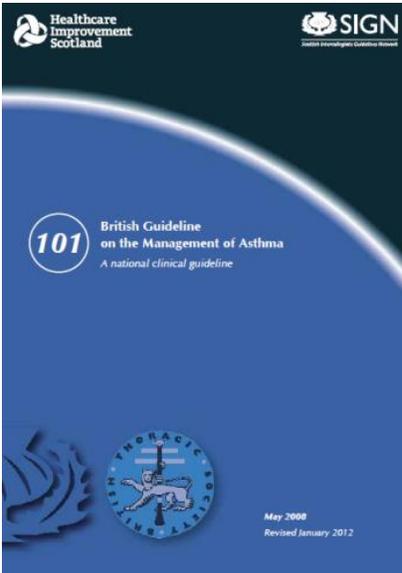
(95% CI, 40%–47%)

Speed and/or depth of inspiration



MDI Patients don't use their inhalers correctly.

1. Sanchis J, *et al.* Systematic review of errors in inhaler use: Has patient technique improved over time? *CHEST* 2016;150:394–406. CI, confidence interval.



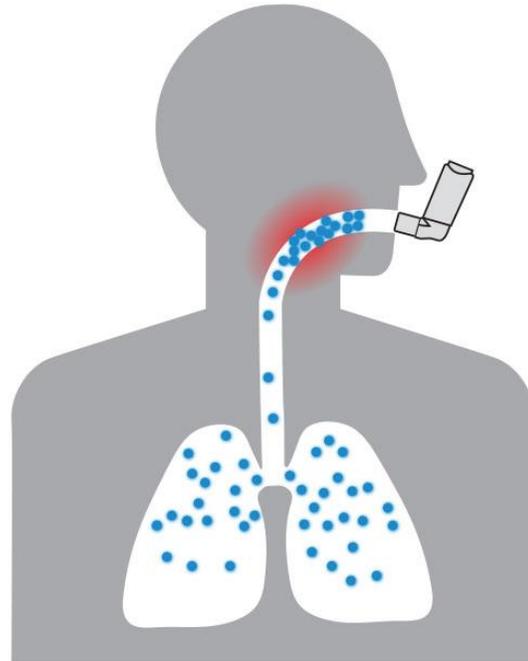
1. NHS Outcomes Framework(s)
2. Public Health Outcomes Framework
3. The CCG Outcomes Indicator Set
4. Quality standard for asthma
5. Quality and Outcomes Framework (QOF) for asthma
6. An outcomes strategy for COPD and asthma: NHS companion document
7. Children and Young People's Health Outcomes Forum
8. Improving children and young people's health outcomes – a system-wide response
9. Specialised services for difficult to control / severe Paediatric asthma
10. Facing the Future – Royal College for and Child Health (RCPCH)
11. You're welcome – quality criteria for young people friendly health services
12. Respiratory Atlas of Variation
13. Designing and commissioning services for children and young people with asthma.
14. National review of asthma deaths
15. All Party Review of Respiratory Deaths
16. British Thoracic Society / Sign Guidance 2014
17. NICE: Asthma: diagnosis and monitoring of asthma in adults, children and young people,
18. British Thoracic Society / Sign Guidance 2018
19. GINA 2021

Guidelines !!!

Chambers are designed to improve medication delivery, reduce side effects and help patients overcome difficulties in taking their medication^{1,2}

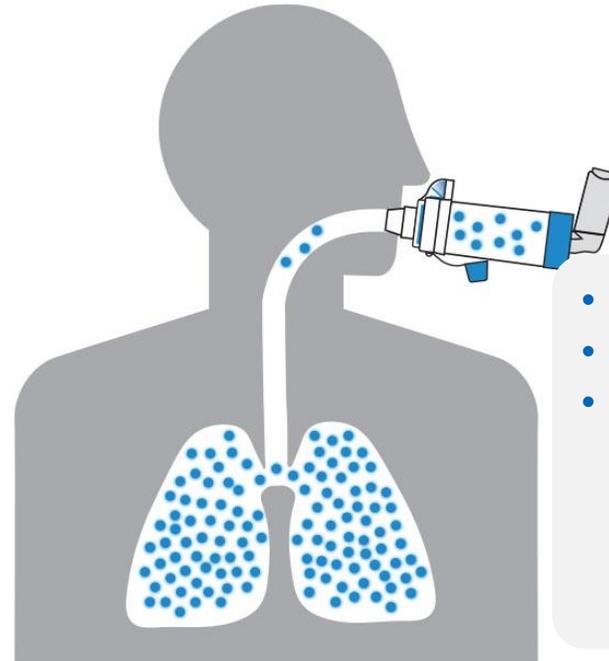
Inhaler Alone

- Actuation of pMDI and inhaling must be simultaneous
- More medication collects in mouth and throat increasing the potential for side effects



Inhaler with *AeroChamber Plus® Flow-Vu®* Anti-Static Valved Holding Chamber

- Patient inhales with own timing
- Medication delivered to the lungs
- Significantly reduces medication delivered to the throat
 - Medication in the throat can lead to side effects



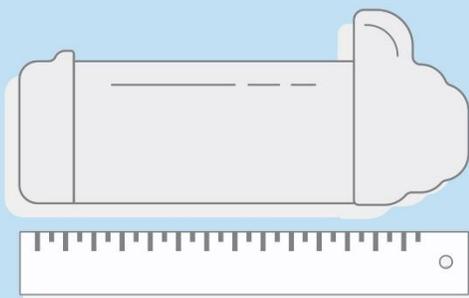
pMDI, pressurised metered-dose inhaler.

1. Lavorini F, Fontana GA. *Expert Opin Drug Deliv* 2009;6(1):91-102; 2. GINA. Global Strategy for Asthma Management and Prevention, 2021.

Not All Valved Holding Chambers (VHCs[‡]) Are The Same

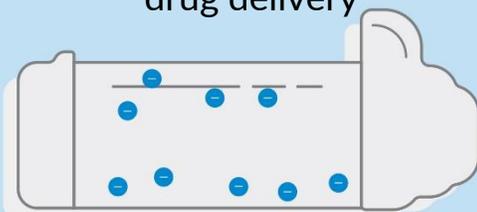
Drug delivery via a valved holding chamber[‡] may vary according to:

Size of the chamber¹

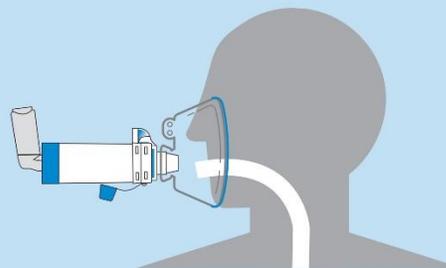


Accumulation of static charge on plastic VHCs^{‡1,2}

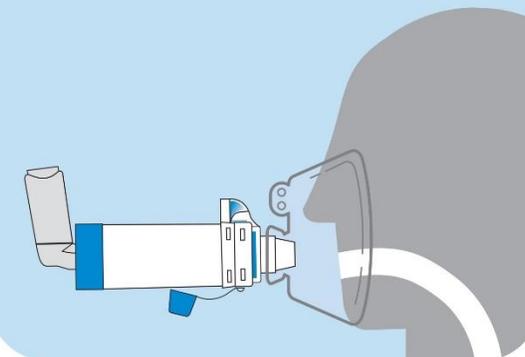
Static charge attracts drug particles and reduces drug delivery



Face mask seal³



Dead-space volume in chambers[‡] with face masks³



Changing VHCs[‡] may alter dose delivered¹

[‡]Sometimes referred to as spacer/holding chamber devices/valved holding chambers.⁴⁻⁷

1. Global Initiative for Asthma. Global Strategy for Asthma Management and Prevention, 2018. Available from www.ginasthma.org (accessed May 2018). 2. BTS/SIGN Asthma Guideline 2016. Available from www.brit-thoracic.org.uk/document-library/clinical-information/asthma/btssign-asthma-guideline-2016/ (accessed May 2018). 3. Shah SA, Berlinski AB, Rubin BK. Force-dependent static dead space of face masks used with holding chambers. *Respir Care* 2006;51:140–144. 4. Lavorini F. The challenge of delivering therapeutic aerosols to asthma patients. *ISRN Allergy* 2013;2013:ID 102418. 5. National Health Service England and Wales. Electronic Drug Tariff May 2018. Part IXA-Appliances. Available from www.nhs.uk/sites/default/files/2018-04/Drug%20Tariff%20May%202018.pdf (accessed May 2018). 6. ISD Scotland. Scottish Drug Tariff. Part 3-Appliances. Drug Tariff May 2018. Available from www.isdscotland.org/Health-topics/Prescribing-and-Medicines/Scottish-Drug-Tariff/Docs/May-2018/2018-05-SDT-PART3.pdf (accessed May 2018). 7. Health and Personal Social Services for Northern Ireland. Drug Tariff May 2018. Available from www.hscbusiness.hscni.net/pdf/DT%20Full%20May%202018.pdf (accessed May 2018).

How does *AeroChamber** VHC compare to other chambers?



Delivers the intended dose



Safety and efficacy validated



Visual assurance



Improves clinical outcomes



Other chambers are not equivalent

Dedicated inspiratory flow indicator



The exclusive **Flow-Vu*** Inhalation Indicator moves with inspiration and helps provide assurance that inhalation is performed correctly by allowing caregivers to:

- Ensure a proper seal
- Coordinate actuation with inhalation
- Count patient breaths

Anti-Static Chamber

- Can be used out of package without pretreatment
- Maximizes aerosol suspension time and allows patients more time to inhale their medication



Made of Anti-Static Materials, not a coat or a lining layer.

Low Resistance Inhalation Valve

- Allows patients to easily inhale their medicine
- Responsive one-way Inspiratory Valve opens with minimal inspiratory effort
- Valve closes upon exhalation to retain any medication inside the chamber for the next breath



**Special 'low-flow'
valves in pediatric
chambers**

EZ Flow Exhalation Valve



***EZ Flow* Exhalation Valve**

Minimizes re-breathing and directs exhaled flow away from the patient's face

Facemask contours gently to the face

- Mask design is the most important component of the VHC¹
- The anatomically designed **ComfortSeal*** Mask with curved lip is flexible and ensures a proper seal with as little as 0.7 kg applied force² (gentle)
- **Flow-Vu*** Inspiratory Indicator provides assurance of a proper seal

100% Silicone



¹ Amirav I, Newhouse MT. Review of Optimal Characteristics of Face-Masks for Valved-Holding Chambers (VHCs). Pediatric Pulmonology 43: 268-274 (2008) ² Shah SA et al. Force-Dependent Static Dead Space of Face Masks Used With Holding Chambers. Respiratory Care, February 2006, Vol 51; No 2

Coaching aid to encourage slow inhalation



FlowSignal Whistle sounds when the patient is inhaling too rapidly, encouraging patients to breathe slowly.

What chambers are available?

Pediatric

Adult



Small Mask
0-18 months

Medium Mask
1-5 years

Youth
Mouthpiece
5+ years

Mouthpiece

Adult Small
Mask

Adult Large
Mask

How do I determine which size of facemask should be used?

CHILD

SMALL MASK
0-18 months

MEDIUM MASK
1-5 years

ADULT

SMALL MASK **NEW**

LARGE MASK

ComfortSeal* Mask Sizer

The top of the mask should sit on the bridge of the nose and the bottom should rest between the bottom of the lips and chin.

Small Mask Medium Mask Youth Mouthpiece Mouthpiece Small Mask Large Mask

CHILD **ADULT**

Children should transition to a mouthpiece around the age of 5.

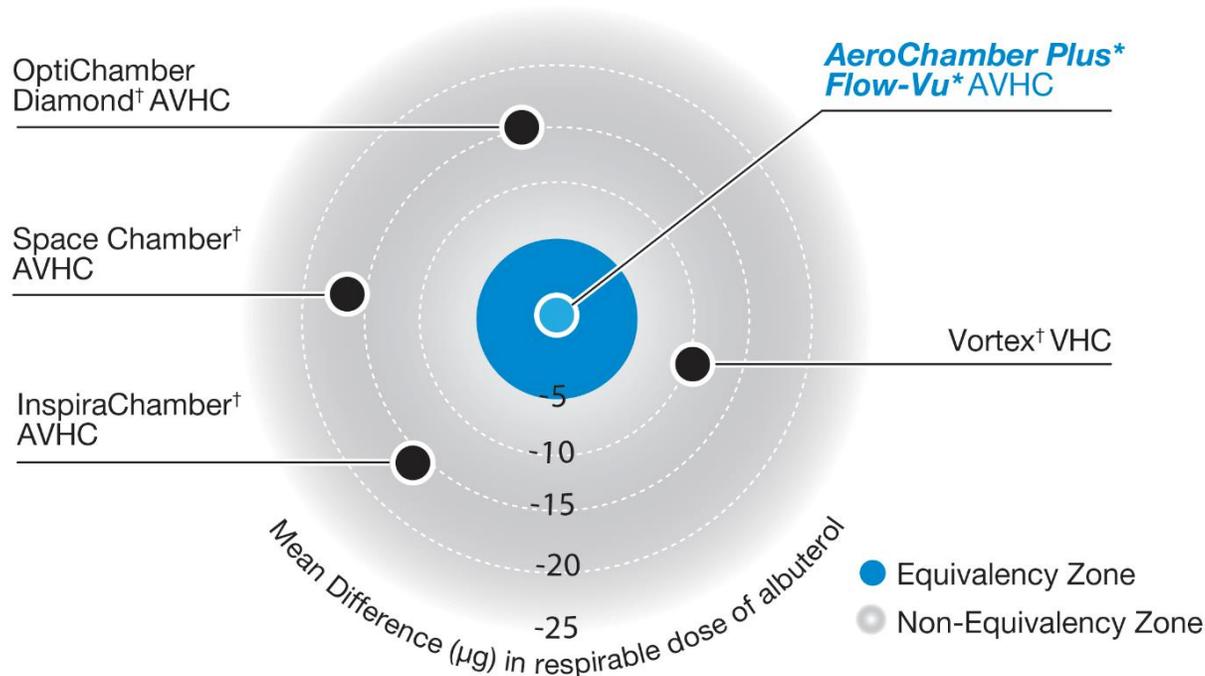
AeroChamber Plus Flow-Vu
Anti-Static Valved Holding Chamber
www.aerochamber.com

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- Mask sizer helps determine the appropriate facemask size
- The top of the mask should sit on the bridge of the nose and the bottom should rest between the bottom of the lips and the chin.

Is There Variability in Fine Particle Mass Delivered by Different anti-static VHCs?

Mean Difference in Fine Particle Mass (1.1 µm - 4.7 µm)



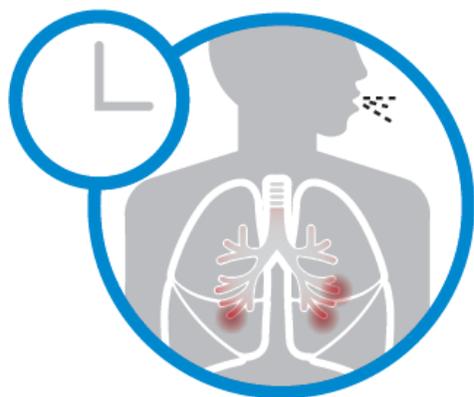
- Differences in VHC design (shape, size, valves) have an impact upon drug delivery^{2,3}
- European Medicines Agency recommends the development and registration process for a new MDI includes testing and supporting data along with a specific VHC device
- Interchanging VHCs has safety *and* efficacy implications unless (otherwise proven as equivalent using in vitro and/or in vivo data)⁴

1. Nagel M et al. Equivalence evaluation of valved holding chambers with albuterol pressurized metered dose inhaler. CSACI Annual Scientific Meeting, 2017.
2. Dissanayake S. et al. Are valved holding chambers interchangeable? An in vitro evaluation of VHC equivalence. Pulmonary Pharmacology & Therapeutics, 2017.
3. Dissanayake S. Suggett J. A review of the in vitro and in vivo valved holding chamber literature with a focus on the AeroChamber Plus Flow-Vu Anti-static VHC. Therapeutic Advances in Respiratory Disease, 2018, Vol. 12: 1-14.
4. Dissanayake S. In Respiratory Drug Delivery 2010. Vol 1. Ed: Dalby RN, Byron PR, Peart J, Suman JD, Farr SJ, Young PM. DHI Publishing; River Grove, IL: 2010: 293-304

Improved clinical outcomes with *AeroChamber Plus* Flow-Vu** Anti-Static VHC

- A landmark real-world study in more than 18,000 patients has demonstrated **superior asthma control** with the *AeroChamber Plus* Flow-Vu** anti-static chamber compared with other chambers.
- The *AeroChamber Plus* Flow Vu** Anti-Static VHC was associated with **delayed time to first exacerbation, reduced ER visits and hospitalizations** compared to other VHCs

Delayed time
to first exacerbation



Reduction in
ER visits



Reduction in
hospitalizations



Thank You

For more info Kindly

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