

Inhaled Medications and Hospice

There are 4 factors that determine proper drug deposition with inhaled medications: 1) Inhalation flow, 2) Proper use/coordination of the inhaler, 3) Aerosol velocity, and 4) Drug particle size. Two of these factors, inhalation flow and coordination, may decline over time making it very important to assess a COPD patient's ability to correctly use an inhaler to ensure adequate dosing. Age and gender appear to be the key determinants of inspiratory flow, not the degree of expiratory airway obstruction. For dry powder inhalers (DPIs) the inhalation must be deep and forceful to disperse the medication adequately. While most COPD patients can generate sufficient inspiratory flow for optimal drug delivery with DPIs, advanced age, the female gender, and exacerbations can all be predictors of inadequate peak inspiratory flow (PIF). Therefore, it is necessary to assess the patient's PIF rate to determine suitability for inhaled medication initiation and throughout disease progression.

Below is the inspiratory effort required for several common devices:

- Turbohaler device (Symbicort) 30-60 L/min
- Twisthaler device (Asmanex) 28 L/min
- Diskhaler device (Serevent) >30 L/min
- Aerolizer device (Foradil) 60 L/min
- Diskus device (Advair) 60 L/min
- Flexhaler device (Pulmicort) 60L/min
- Handihaler device (Spiriva) 30L/min
- Neohaler device (Arcapta) 60L/min
- Pressair device (Tudorza) 35L/min

Metered-dose inhalers (MDIs) require the actuation of the inhaler to be carefully coordinated with inspiration. Spacer devices slow down the particles and make coordination of actuation and inhalation less critical.

We recommend that if there is any question regarding the ability of a patient to properly use an inhaler to switch to nebulized medication. This will ensure proper dosing, improving patient comfort.

Brand Name	Generic Name	Albuterol	Ipratropium	Ipratropium + Albuterol	Oral Steroid (eg. Prednisone)	Cost
Advair	Fluticasone + Salmeterol	X			X	\$300-\$500
Advair HFA	Fluticasone + Salmeterol	X			X	\$300-\$500
Aerospan	Flunisolide				X	\$250
Alvesco	Ciclesonide				X	\$300
Anoro Ellipta	Umeclidinium + Vilanterol			X		\$400
Arcapta Neohaler	Indacaterol	X				\$250
Arnuity Ellipta	Fluticasone Furoate				X	\$150-\$250
Asmanex Twisthaler	Mometasone				X	\$200-\$400
Asmanex HFA	Mometasone				X	\$200-\$250
Atrovent HFA	Ipratropium		X			\$400
Breo Ellipta	Fluticasone + Vilanterol	X			X	\$350
Combivent Respimat	Ipratropium + Albuterol			X		\$400
Dulera	Mometasone + Fomoterol	X			X	\$200-\$300
Flovent Diskus	Fluticasone				X	\$200
Flovent HFA	Fluticasone				X	\$200-\$400
Incruse Ellipta	Umeclidinium		X			\$350
ProAir HFA	Albuterol					\$60
Pulmicort Flexhaler	Budesonide				X	\$200-\$250
Qvar	Beclomethasone				X	\$175-\$250
Seebri Neohaler	Glycopyrrolate		X			\$400
Serevent Diskus	Salmeterol	X				\$300
Spiriva	Tiotropium		X			\$400
Stiolto Respimat	Tiotropium + Olodaterol			X		\$400
Symbicort	Budesonide + Fomoterol	X			X	\$200-\$350
Tudorza Pressair	Acclidinium		X			\$125-\$250
Utibron Neohaler	Indacaterol + Glycopyrrolate			X		\$400
Ventolin HFA	Albuterol	Keep as "security blanket"				\$60
Xopenex HFA	Levalbuterol	Keep as "security blanket"				\$80

References:

1. Elliot D, Dunne P, Guide to Aerosol Delivery Devices for Physicians, Nurses, Pharmacists, and Other Health Care Professionals. American Association for Respiratory Care 2011. Available at: https://www.aarc.org/resources/aerosol_nonrts.pdf
2. Laube BL, Janssens HM, Jongh FHC, Devadason SG, Dhand R, Diot P, Everard ML, Horvath I, Navalesi P, Voshaar T, Chrystyn H, What the pulmonary specialist should know about the new inhalation therapies Eur Respir J 2011; 37: 1308–1331 DOI: 10.1183/09031936.00166410 <http://erj.ersjournals.com/content/37/6/1308.full.pdf+html>
3. Malberg LP, Ryttila P, Happonen P, Haahtela T, Inspiratory Flows Through Dry Powder Inhaler in Chronic Obstructive Pulmonary Disease: Age and Gender Rather than Severity Matters. August 2010 Volume 2010:5 Pages 257 – 262 DOI: <http://dx.doi.org/10.2147/COPD.S11474>
4. DOI: <http://dx.doi.org/10.2147/COPD.S11474>
5. Also please reference medication package inserts for some inspiratory flow effort required