In The World of Asthma, Device Matters

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Objectives

- COUNSEL ON THE APPROPRIATE USE OF A:
  - METERED DOSE INHALER (MDI)
  - DRY POWDER INHALER (DPI)
- DISCUSS THE APPROPRIATE USAGE OF A PEAK FLOW METER AND SPACER/HOLDING CHAMBER DEVICE
- DIFFERENTIATE BETWEEN COMMONLY USED PEAK FLOW METERS AND SPACER/HOLDING CHAMBER DEVICES

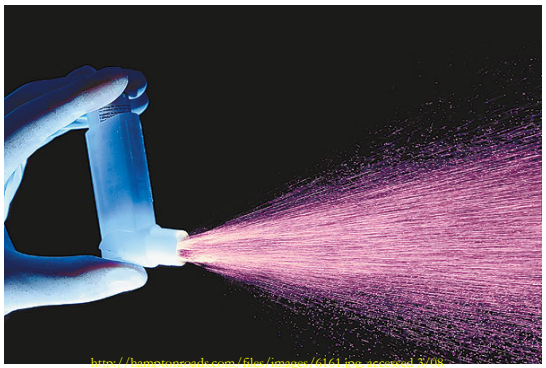
Goals of asthma therapy

(EPR 3, 2007)

- Reduce impairment
  - Prevent chronic and troublesome symptoms
  - Require infrequent use (≤2 day/week) of inhaled SABA
  - Maintain (near) normal pulmonary function
  - Maintain normal activity levels (including exercise)
  - Meet patients' and families' expectations of satisfaction with asthma care

Goals of asthma therapy
(EPR 3, 2007)

- Reduce risk
  - Prevent recurrent exacerbations of asthma and minimize the need for emergency department (ED) visits or hospitalizations
  - Prevent progressive loss of lung function; for children, prevent reduced lung growth
  - Provide optimal pharmacotherapy with minimal or no adverse effects



Metered Dose Inhaler (MDI)

- Pressurized aerosol drug delivery system
- Aerosol contains 3 components
  - Active medication
  - Surfactant
    - **maintains droplet size**
  - Propellant
    - **chlorofluorocarbon**
    - **hydrofluorocarbon 134A, 227A (non-CFC)**

Factors affecting lung depostion

- Only 5-15% of metered dose reaches the lungs
- Two main factors
  - **Particle size**
  - **Speed of inhalation**
- Additional factors
  - **Breath holding for a minimum of 2 seconds**
  - **Allow at least 30 seconds between consecutive doses**

MDI-technique "Is significant"

- Lindgren et al. Eur J Resp Dis 1987;70:93-98.
  - 56% of patients made errors in MDI-technique which resulted in a 30% decrease in bronchodilation versus control ($p<0.01$)
- Giraud et al. Eur Resp J 2002;19:246-251
  - 71% of patients misused MDI's
    - 47% due to poor coordination
  - Asthma less stable in misusers ($p<0.001$)
  - Among misusers, asthma less stable in poor coordinators ($p<0.001$)

MDI technique

- 50% of adults and children do not perform all steps correctly (Crompton GK. Lung 1990;Suppl 168:658-662)
- Reasons for noncompliance
  - **Not taking off cap**
  - **Not shaking**
  - **Failure to coordinate actuation with inspiration**
  - **Inhale through nose and not mouth**
  - **Inhale too fast**
  - **Failure to breath-hold after dose**
  - **"Cold freon" effect**
  - **Holding MDI upside down**

MDI technique

- Shim et al. Am J Med 1980;69:891-894.
  - **50% of patients reverted back to incorrect technique after one to 30 days after instruction.**
- Epstein et al. Can Med Assoc J 1979;120:813-816.
  - **Only 10.8% of patients performed all steps required for proper MDI-technique.**

MDI technique

- Plaza et al. Resp 1998;65:195-198
  - **9% of patients, 15% of nurses, and 28% of physicians showed correct MDI-technique.**
- Interiano et al. Arch Intern Med 1993;153:81-85
  - **65% of patients, 39% of housestaff, 82% of nurses were categorized as having "poor" MDI-technique.**

9-steps of MDI-technique

① Stand or sit upright with your head and neck straight or tilted slightly back.
② Hold the canister upright and shake the inhaler well. Remove the mouthpiece cap.
③ Breathe out normally through your mouth.
④ With the canister upright, position inhaler either 1-2 inches away from "open mouth" or in the mouth with lips closed tightly around the inhaler mouthpiece "closed mouth"
⑤ As you start to breathe in slowly, press down on the top of the inhaler firmly once. Continue to breathe in slowly (over 3-5 seconds) and deeply until your lungs are full of air.
⑥ Hold your breath for 5-10 seconds or as long as you can and exhale slowly.
⑦ If more than one puff is needed, wait 1 minute before taking your next puff and repeat step 1-7.
⑧ Rinse your mouth out with water and spit.
⑨ Replace the mouthpiece cap after you are finished.

Inhaler Techniques

Technique	Advantages	Disadvantages
Open Mouth "Two finger" Technique	~Increases the amount of drug deposited in the lung ~Decreases the amount of drug impacted on the oropharynx	~Diffucult to aim ~Loss of medication to the atmosphere ~DO NOT use with Atrovent or Combivent
Closed Mouth Technique	~Ease of technique ~Decreases the amount of drug loss to the atmosphere	~Increases the amount of drug impacted on the oropharynx

MD Turbo (Teamm Pharm)

- Works for Alupent, Atrovent, Combivent, Ventolin, Flovent, Ventolin HFA inhalers
- Delivers dose when inhalation speed ≥45L/min
- Counter can be set #120 or #200
- Battery lasts 365days
- AWP $90

How to tell if MDI is empty

- Diary
- Do NOT float test
- Dose counter
  - Short Acting Beta-2 Agonists
    - Ventolin HFA
  - Inhaled corticosteroids
    - Advair Diskus, Advair HFA, Alvesco, Asthmanex Twisthaler, Dulera, Pulmicort flexhaler, Symbicort

Spacer/Holding Chambers

- Advantages
  - **Increase lung deposition 10-15%**
  - **Eliminate need for coordination**
  - **Reduce cough and "cold freon" effect**
- Disadvantages
  - **Not "cool"**
  - **Not compact enough**
  - **Not compatible with all inhalers**
  - **Require regular cleaning**

ACE (DHD Healthcare)

- Fits multiple inhaler canisters
- Dishwasher safe (top rack)
- Flow signal (>30L/min)
- Cost: $18

Aerochamber (Forest Pharmaceuticals)

- 3 sizes of spacers w/ masks
- Non-Electrostatic plastic
- Flow signal (>30L/ min)
- Cost
  - Chamber $39
  - Chamber w/mask $53

Easivent (Dey)

- Fits multiple inhalers
- 3 sizes of masks available
- Flow signal (>50L/min)
- Easily cleaned
- Dishwasher safe (top rack)
- Cost
  - Chamber $18
  - Mask $9

InspirEase (Key)

- Fits multiple inhaler canisters
- Very compact
- Visual technique
- Flow signal (?)
- Cost $29

Ellipse (GSK)

- Easily cleaned
- Can store multiple inhalers
- Cost $12

PocketChamber/Pocket Spacer (NSPIRE)

- Very Compact
- 4 sizes of masks available
- Non-Electrostatic plastic
- Latex free, silicone valve
- Flow signal (>25L/min)
- Dishwasher safe (top rack)
- Cost
  - Chamber $15
  - Spacer $11

Vortex (Pari)

- Adult & Pediatric masks
- Non-Electrostatic
- Latex free, silicone valve
- Dishwasher safe
- Cost
  - Chamber $16
  - Mask $10

OptiChamber Advantage (Phillips Respironics)

- Detachable masks
- Replaceable Latex free, silicone valve
- Dishwasher safe
- Cost
  - Chamber $11
  - Mask $10

Breath Actuated Inhaler

- Pressurized aerosol drug delivery system
- Delivers a metered dose when inspiratory flow rate reaches 30L/min
- Product
  - Maxair Autohaler

Breath Actuated Inhaler

- Advantages
  - **Eliminates need for spacer**
  - **Easy to use**
  - **Not susceptible to moisture**
  - **Useful in arthritic or elderly patient**
- Disadvantages
  - **Cost**
  - **No dose counter**
  - **"Click" sound may disrupt inspiration**
  - **Contain CFC's**

Dry Powdered Inhaler (DPI)

- Non-pressurized aerosol delivery system
- Delivery of medication depends upon patients own inspiratory flow
  - generally requires>60L/min
- Products
  - Advair/Serevent diskus
  - Foradil aerolizer
  - Pulmicort Flexhaler
  - Spiriva Handihaler
  - Asthmanex Twisthaler

DPI

- Advantages
  - eliminates the need for coordination
  - may reduce incidence of local adverse effects
  - "environmentally friendly"
  - easy to use
  - not affected by cold air
  - useful in arthritic or elderly patients
- Disadvantages
  - must generate required inspiratory flow rate
  - may be affected by humidity
  - each device has unique dose loading system
  - may waste medication if device is turned upside down

9-steps of DPI-technique

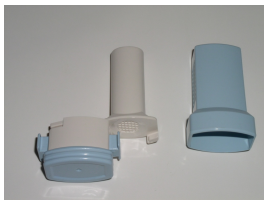
① Remove the cover.
② Load a single dose according to the specific device used.
③ Breathe out normally through your mouth.
④ Put the inhaler mouthpiece into your mouth, closing your lips tightly around it.
⑤ Inhale deeply and forcefully.
⑥ Hold your breath for 5-10 seconds or as long as you can and then exhale slowly.
⑦ If more than one dose is needed, wait 1 minute before taking your next dose and repeat steps 2-7.
⑧ Rinse your mouth out with water and spit.
⑨ Replace the mouthpiece cap after you are finished.

DPI Speed of Inhalation

- Foradil aerolizer >60 L min
- Pulmicort flexhaler >30 L/min
- Serevent, Advair diskus >30 L/min
- Spiriva Handihaler >60 L/min
- Asmanex twisthaler ??

Advair/Serevent diskus

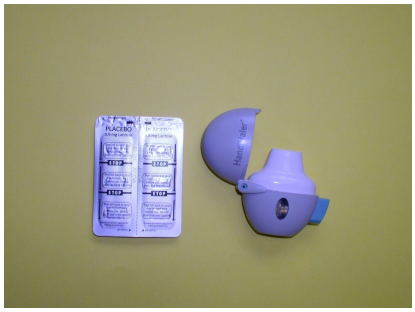
Foradil aerolizer



Pulmicort flexhaler

Asmanex Twisthaler

Spiriva Handihaler



Providers United For Improving Inhaler Technique (PUFIT SCALE)

DATE: _____

	SCORE (circle one)
Metered-Dose Inhaler Assessment	
1) Patient removes the cap	1 0
2) Patient holds the canister upright	1 0
3) Patient shakes the inhaler	1 0
4) Patient stands/sits upright with neck straight or tilted back	1 0
5) Patient exhales normally	1 0
6) Patient closes lips completely around the mouthpiece before actuating inhaler or holds the inhaler 2–4 cm away from mouth if using "open" mouth technique	1 0
7) Patient begins to breathe in slowly and then actuates the inhaler	2 0
8) Patient continues to breathe in slowly and deeply (over 3-5 seconds)	2 0
9) Patient holds breath for at least 5-10 seconds	2 0
10) Patient waits for at least 30-60 seconds before second actuation	2 0
11) Patient only uses one actuation per inspiration	1 0
Total:	
Metered-Dose Inhaler With Spacer Assessment	
1) Patient removes the cap and connects spacer properly	1 0
2) Patient holds the canister upright	1 0
3) Patient shakes the inhaler and spacer together	1 0
4) Patient stands/sits upright with neck straight or tilted back	1 0
5) Patient exhales normally	1 0
6) Patient closes lips completely around the mouthpiece	1 0
7) Patient begins to breathe in slowly and then actuates the inhaler	2 0
8) Patient continues to breathe in slowly and deeply (over 3-5 seconds); You should not hear a whistling sound if spacer has an inspiratory whistle	2 0
9) Patient holds breath for at least 5-10 seconds	2 0
10) Patient waits for at least 30-60 seconds before second actuation	2 0
11) Patient only uses one actuation per inspiration	1 0
Total:	
Dry Powdered- Inhaler Assessment	
1) Patient removes the cover	1 0
2) Patient loads a single dose properly	1 0
3) Patient exhales normally	1 0
4) Patient closes lips completely around the mouthpiece	2 0
5) Patient breathes in forcefully and deeply	2 0
6) Patient holds breath for at least 5-10 seconds	2 0
7) Patient waits for at least 30-60 seconds before second actuation	1 0
Total:	

Aerosol delivery devices (Expert Panel II, 1997)

- Metered-dose inhaler
  - >5years
- Breath actuated inhaler
  - >5years
- Dry powdered inhaler
  - >4-5years
- Spacer/Holding chamber
  - >4years-spacer/holding chamber
  - <4years-spacer/holding chamber with mask

Recommended Peak Flow Monitoring (NAEPP, 2007)

- **Patients who have moderate or severe persistent asthma**
- **Patients who have a history of severe exacerbations**
- **Patients who poorly perceive airflow obstruction and worsening asthma**
- **Patients who prefer this monitoring method**

Peak flow meters

- Advantages:
  - gives objective measure of the patients condition
  - helps patient predict impending exacerbation's
  - helps patients identify possible asthma triggers
  - helps patients decide if condition is serious enough to seek medical attention
- Disadvantages:
  - highly effort dependent
  - patients must be highly motivated and interested in their disease process

8-Steps to Peak Flow Monitoring

① Place the pointer at the bottom of the numbed scale (set it to zero).
② Stand or sit upright.
③ Take a deep breath, filling your lungs completely.
④ Place the meter in your mouth and close your lips around the mouthpiece. DO NOT put your tongue inside the hole.
⑤ Blow out as hard and as fast as you can.
⑥ Write down the number indicated by the pointer.
⑦ Repeat steps 1-6 two more times.
⑧ Write down the highest of the three numbers in your peak flow diary.

Astech (Dey)

- 30-880L/min
- Sliding color zone indicators
- Accurate +/-7%
- Reproducible +/-3%
- Cost $20

Mini-Wright (Clement Clarke)

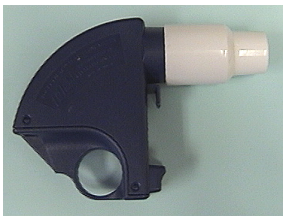
- Standard (60-850L/min); Low (30-400L/min)
- Accurate +/-5%
- Cost
  - Standard $26
  - Low $23

Personal Best (Phillips Respironics)

- Standard (60-810L/min); Lov (50-390L/min)
- Sliding color zone indicators
- Compact fold up design
- Accurate +/-5%
- Cost
  - Standard & low $25

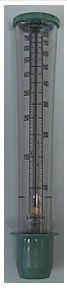
Pocket Peak (Ferraris)

- 50-720L/min
- Sliding color zone indicators
- Very compact
- Dishwasher safe (top rack)
- Cost $15



Truzone (Monaghan)

- 30-800L/min
- Very compact
- Dishwasher safe (top rack)
- Cost $15



Piko-1, Piko-6 (NSPIRE)

- PIKO-1
  - Measure PEF & FEV-1
  - Piko-NET software
  - Records 96 tests
  - Cost $ 33
- PIKO-6
  - Measures PEF, FEV_1, FEV_6, FEV_1/FEV_6,
  - Piko-NET software
  - Records 96 tests
  - Cost $60

KoKo Peak Pro-6 (Roxon)

- Peak Pro 6
  - Measures PEF, FEV_1, FEV_6
  - Records 64 tests; 16 diary questions
  - KAMP Professional software
  - Cost $ 75

Airwatch (Enact Health)

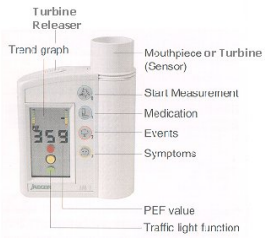
- Measures PEF, FEV_1
- Accurate +/-5%
- Records 500 tests
- Airwatch monitoring service
- "Wilby" zone indicator
- Cost $120.00 (monitor); $295.00 (monitor + monitoring service)

Accutrax (Kahntact)

- Measures PEF, FEV_1
- Accurate +/-5%
- Records 300 tests
- KoKo Asthma Management Program (KAMP) software
- Cost $279.00

Asthma Monitor AM1 (Viasys Healthcare)

- Measures PEF, FEV_1, FVC, and MEF
- Accurate +/-3%
- Records 490 tests
- Allows for entry of medication, symptoms, and events (records 20
  entries)
- AMOS software (transmit informat
  telephone
- Cost $299.00



LifeSigns SP (Instromedix)

- Measures PEF, FEV_1, FEV_1/FV
  FEV_3, FEV_3/FVC
- Accurate +/-5%
- Records 50 tests
- EasyTrace software (transmi
  information via telephone)
- Cost $995.00

Conclusions

- Proper inhaler technique is critical to successful asthma therapy
- Health care providers should recommend asthma devices according the individual patient needs