

Optimising the use of Inhalers

Dr Toby Capstick

Lead Respiratory Pharmacist at Leeds Teaching Hospitals NHS Trust
& Chair at UKCPA Respiratory Group

toby.capstick@nhs.net

 @tcapper78

 @UKCPAResp



Medicines Management
and Pharmacy Services

UKCPA
CLINICAL PHARMACY ASSOCIATION

RESPIRATORY
GROUP

Declarations of Interest

- Payment received for educational events and conference sponsorship from:
 - Almirall
 - AstraZeneca
 - Boehringer Ingelheim
 - Chiesi
 - GSK (travel only)
 - Novartis
 - Pfizer
 - Teva



Choosing Inhaled Drugs: Getting more complicated!



Asthma & COPD: Inhalers in 2010

Bronchodilators

- **SABAs**
 - Salbutamol (7+ devices)
 - Terbutaline (1 device)
- **SAMAs**
 - Ipratropium (2 devices)
- **LABAs**
 - Formoterol (2 devices)
 - Salmeterol (2 devices)
- **LAMAs**
 - Tiotropium (2 devices)

Corticosteroids

- **ICS**
 - Beclometasone (4 devices)
 - Beclometasone extra-fine (3 devices)
 - Budesonide (3 devices)
 - Ciclesonide (1 device)
 - Fluticasone propionate (2 devices)
 - Mometasone (1 device)
- **ICS/LABA**
 - Fostair (1 device)
 - Seretide (fluticasone propionate / salmeterol xinafoate) (2 devices)
 - Symbicort (1 device)



Asthma & COPD: Increasing Complexity

Bronchodilators

- **SABAs**
 - Salbutamol (7 devices)
 - Terbutaline (1 device)
- **SAMAs**
 - Ipratropium (1 devices)
- **LABAs**
 - Formoterol (4 devices)
 - Salmeterol (2 devices)
 - Indacaterol (1 device)
 - Olodaterol (1 device)
 - † Vilanterol
- **LAMAs**
 - Aclidinium (1 device)
 - Glycopyrronium (1 device)
 - Tiotropium (3 devices)
 - Umeclidinium ▼ (1 device)
- **LABA/LAMAs**
 - Anoro ▼ (umeclidinium/vilanterol) (1 device)
 - Duaklir (aclidinium/formoterol) (1 device)
 - Ultibro (glycopyrronium/indacaterol) (1 device)
 - Spiolto (tiotropium/olodaterol) (1 device)

Corticosteroids

- **ICS**
 - Beclometasone (3 devices)
 - Beclometasone extra-fine (3 devices)
 - Budesonide (3 devices)
 - Ciclesonide (1 device)
 - Fluticasone propionate (2 devices)
 - † Fluticasone furoate
 - Mometasone (1 device)
- **ICS/LABA**
 - Aerivio (fluticasone propionate/salmeterol) (1 device)
 - AirFluSal (fluticasone propionate/salmeterol) (2 devices)
 - Aloflute (fluticasone propionate/salmeterol) (1 device)
 - DuoResp (budesonide/formoterol) (1 device)
 - Flutiform (fluticasone propionate/formoterol) (1 device)
 - Fobumix (budesonide/formoterol) (1 device)
 - Fostair (beclometasone/formoterol) (2 devices)
 - Relvar ▼ (fluticasone furoate/vilanterol) (1 device)
 - Sereflo (fluticasone propionate/salmeterol) (1 device)
 - Seretide (fluticasone propionate/salmeterol) (2 devices)
 - Sirdupla (fluticasone propionate/salmeterol) (1 device)
 - Symbicort (budesonide/formoterol) (2 devices)
- **ICS/LABA/LAMA**
 - Trimbow (beclometasone/formoterol/glycopyrronium) (1 device)
 - * Trelegy (fluticasone furoate/vilanterol/umeclidinium) (1 device)

How Many?

Currently/Commonly Used Devices



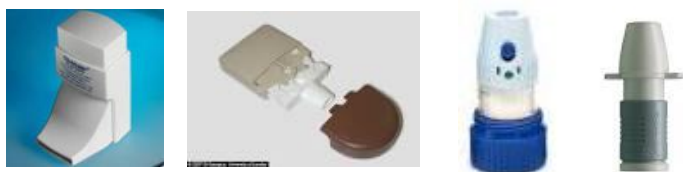
Newer Devices



Less Commonly Used Devices



Discontinued Devices



...introducing



Potential Cost Savings

Prescription Cost Analysis - England, 2016

	Drug	Quantity Supplied (OP)	Expenditure
1	Tiotropium 18mcg refills	3,625,069	£143,037,921
2	Xarelto (rivaroxaban) 20mg tablets	1,898,401	£95,871,210
3	Fostair 100/6 pMDI	2,475,450	£85,392,019
4	Symbicort 200/6 Turbohaler	1,609,099	£80,991,568
5	Januvia (sitagliptin) 100mg tablets	2,074,752	£77,973,516

These *brands* of inhaled medicines account for 4 of the top 10 drugs in terms of overall expenditure in primary care – total £370 million (includes Seretide 250 Evohaler)

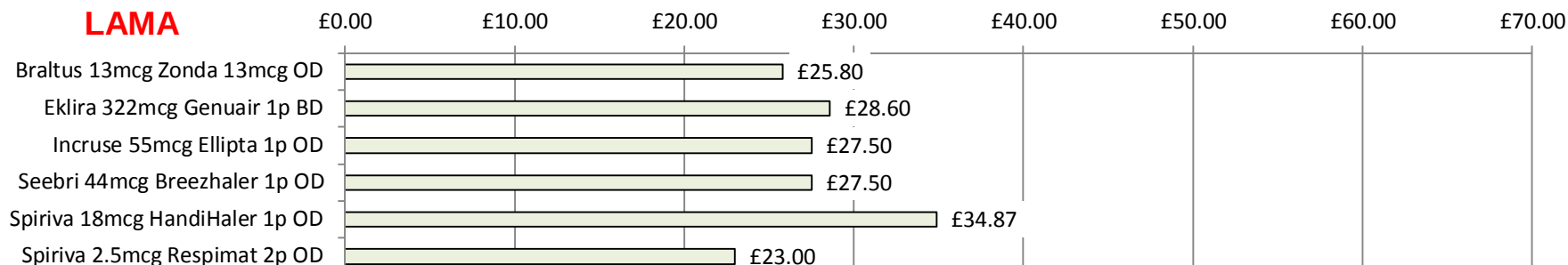
Overall, £1.0 billion spent on inhalers in England in 2016

BUT, are we getting value for money?

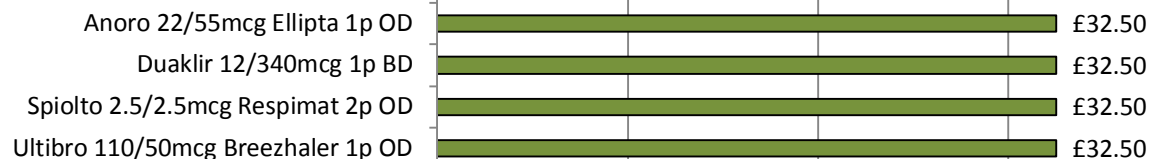


COPD Inhaler Costs (October 2017)

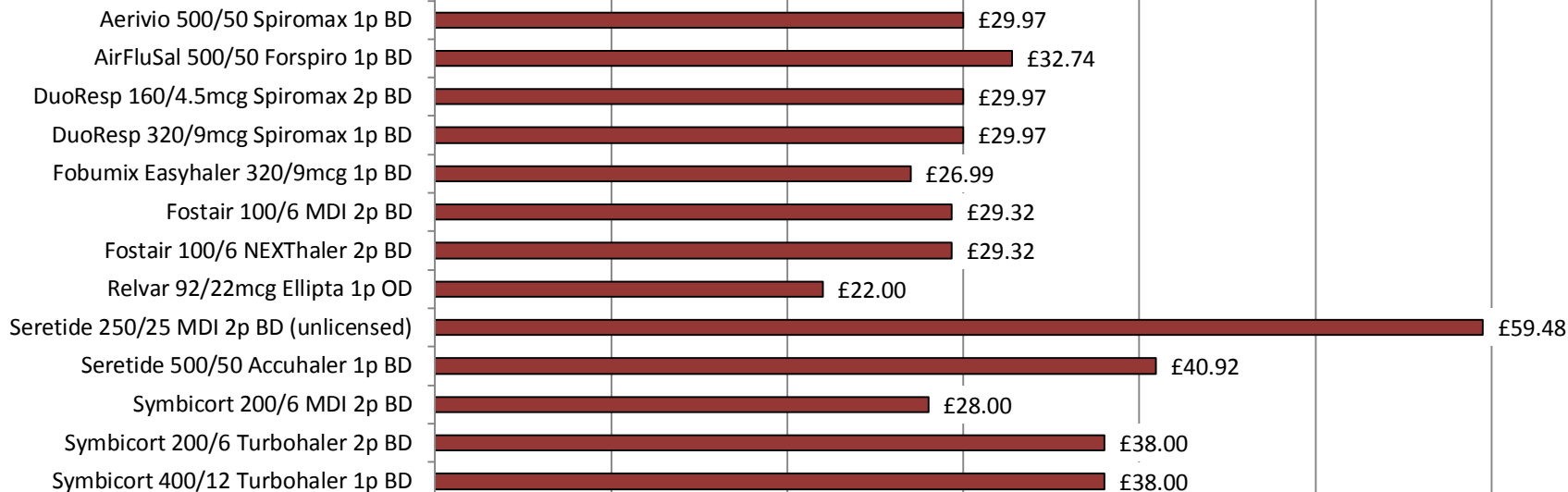
LAMA



LABA/LAMA



ICS/LABA



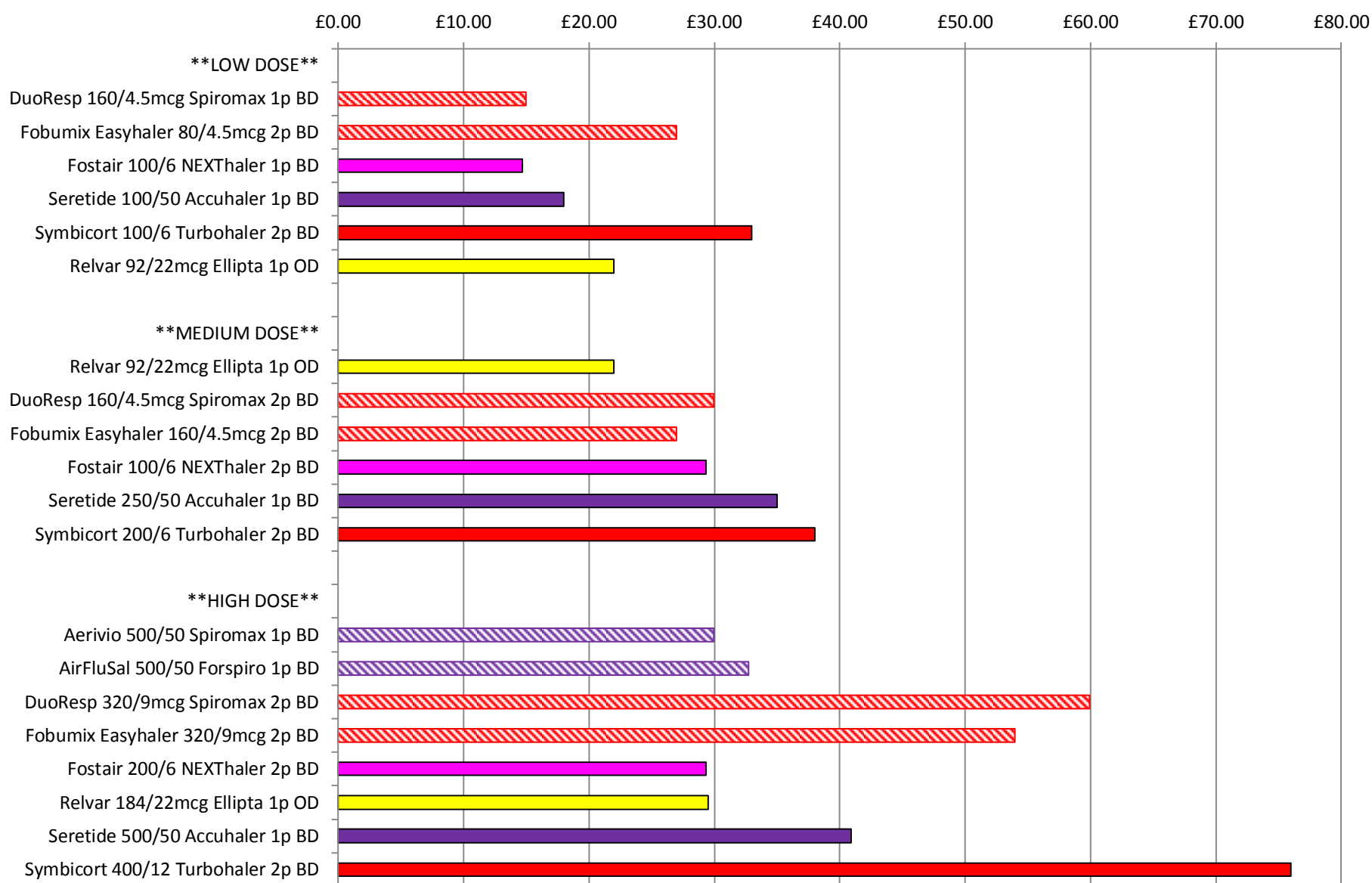
ICS/LABA/LAMA



Asthma Inhaler Costs - MDI devices (October 2017)



Asthma Inhaler Costs - DPI devices (October 2017)



Switching Inhaler Devices: Practical Considerations

- Patients who may be suitable for inhaler device switch:
 - Poor inhaler technique with current device
 - Poor control of asthma / COPD
 - Poor adherence
 - Prescribed expensive inhalers
- When and how?
 - Face-to-face consultations
 - Check inhaler technique
 - Patient consent essential



Generic Prescribing

- **Budesonide/formoterol**



Symbicort
Turbohaler



DuoResp
Spiromax



Symbicort
MDI

- **Beclometasone/formoterol**



pMDI



NEXThaler

- **Fluticasone/salmeterol**



Seretide
Accuhaler



AirFluSal
Forspiro



Aerivio
Spiromax

- **Formoterol**



Atimos Modulite
pMDI



Formoterol
Easyhaler



Foradil
Aeroliser



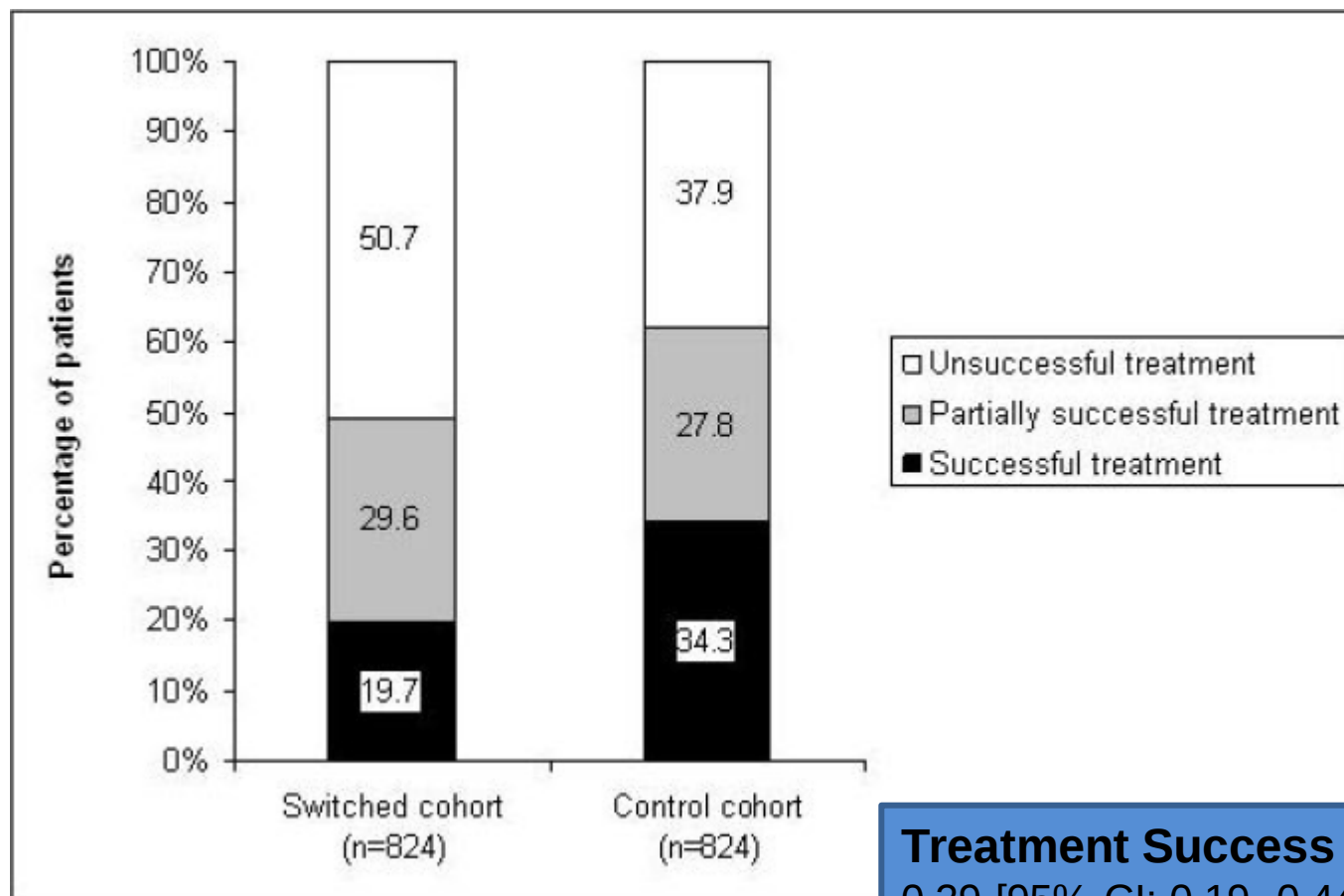
Oxis
Turbohaler



Generic prescribing of inhalers should be avoided as this might lead to people with asthma being given an unfamiliar inhaler device which they are not able to use properly.

BTS/SIGN 2016

Switching Inhaler Devices: Effect of unconsented switch (Asthma)



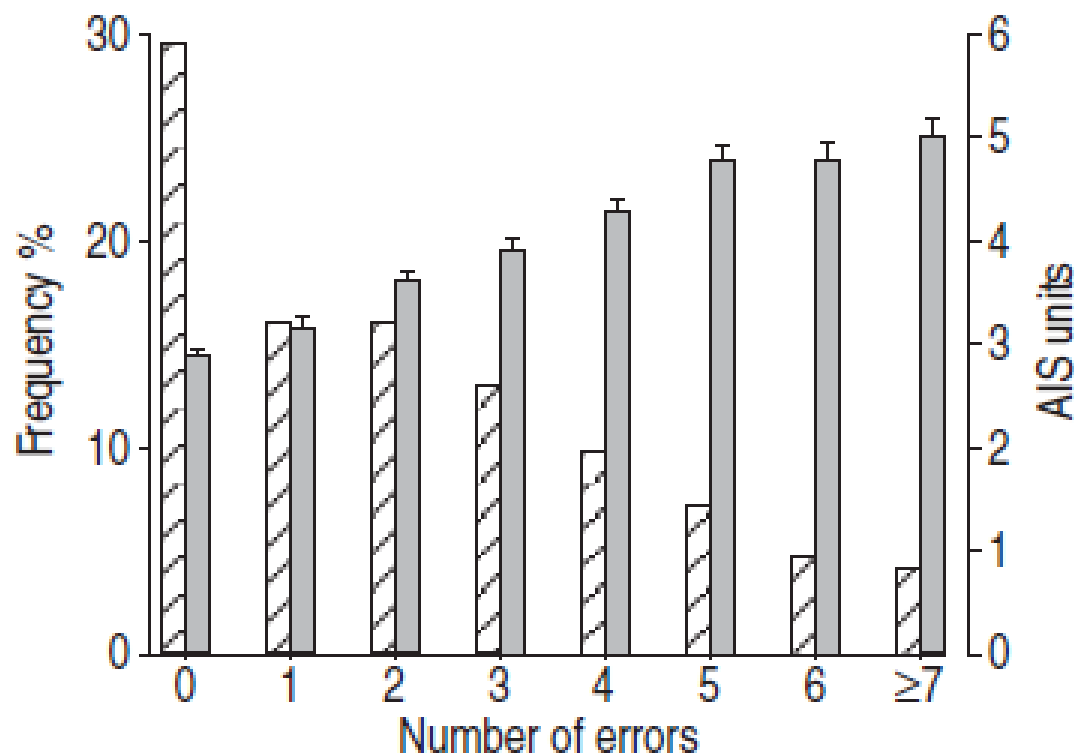
Treatment Success OR:
0.29 [95% CI: 0.19, 0.44; $p < 0.001$]



Why is Inhaler Technique Important?



Misuse of Inhalers is Associated with Decreased Asthma Stability



AIS = Asthma Instability Score

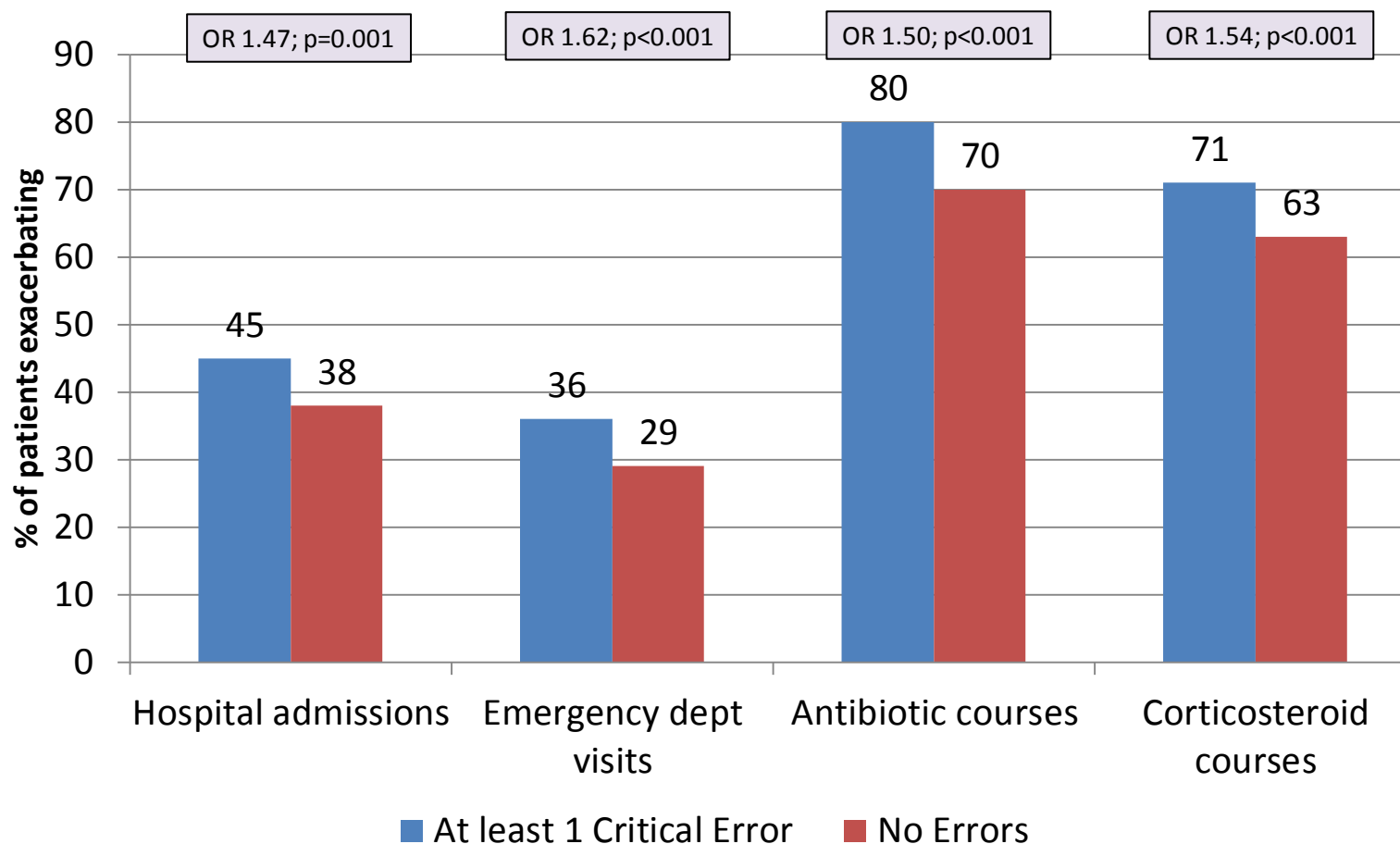
- 0: best asthma stability
- 9: worst asthma stability

□ Frequency distribution of the number of errors in inhalation technique (left axis)

■ Asthma Instability Score (right axis)



Association Between Inhaler Technique and COPD exacerbations



How Frequently do COPD Patients make Errors Using Inhaler Devices?

	Accuhaler (n=452)	Breezhaler (n=876)	HandiHaler (n=598)	pMDI (n=422)	RespiMat (n=625)	Turbohaler (n=420)	Total (n=3,393)
No error	29.2 [25.0-33.4]	36.5 [33.3-39.7]	10.7 [8.2-13.5]	16.4 [12.8-19.9]	23.0 [19.7-26.3]	30.5 [26.1-34.9]	25.3 [23.6-26.7]
At least one critical error	21.2 [17.5-25.0]	15.4 [13.0-17.8]	29.3 [25.6-32.9]	43.8 [39.1-48.6]	46.9 [43.0-50.8]	32.1 [27.7-36.6]	30.0 [28.5-31.6]

All data presented as % [95% CI]

Rate of hospitalisation or ER visit in the previous 3 months was:

- No error: 3.3% (95% CI 2.0–4.5)
- At least 1 critical error: 6.9% (95% CI 5.3–8.5)
 - **OR 1.86 [95% CI 1.14–3.04], $p < 0.05$**

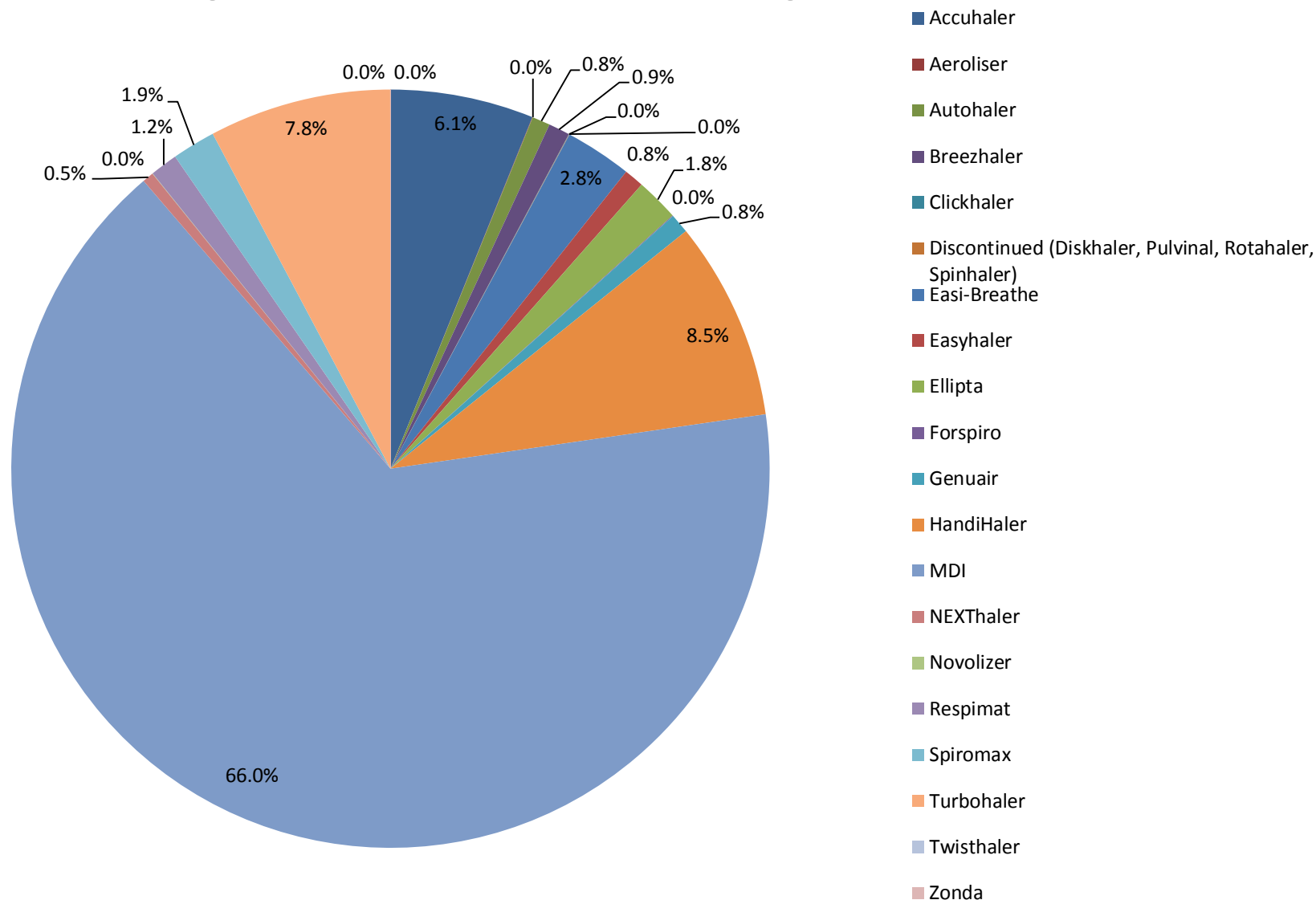


Inhaler Technique: Has it Improved Over 40 Years?

Systematic review. 144 studies, 54,354 patients

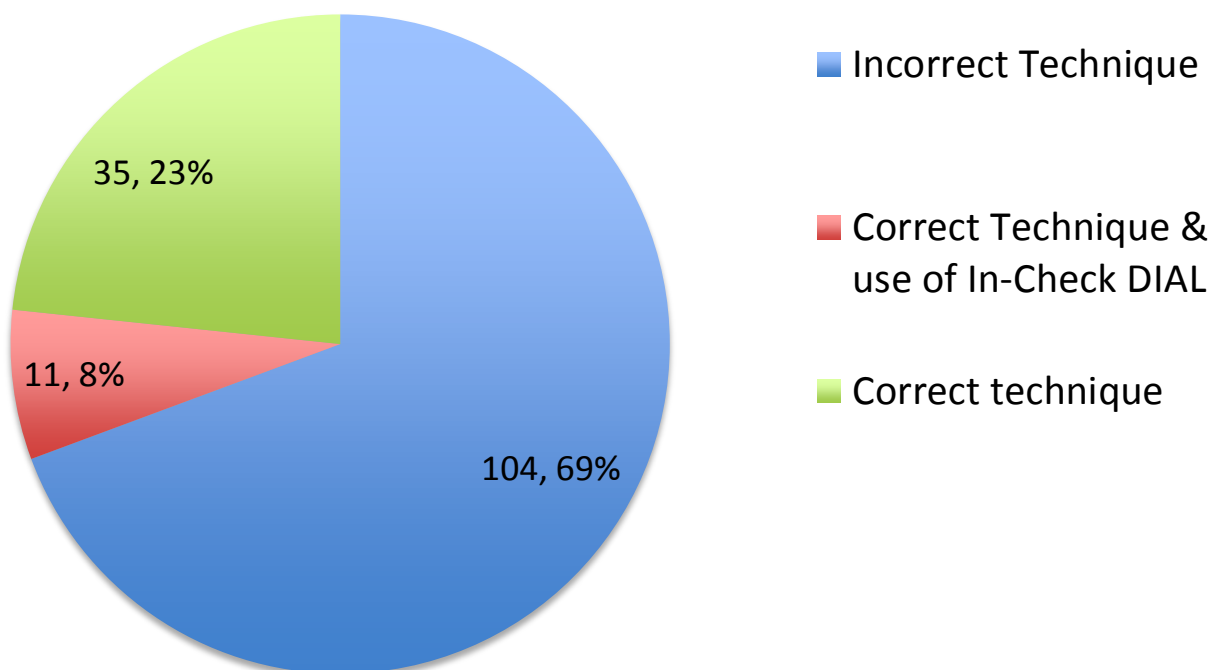


Prescribing of Inhaler Devices, England 2016



Can Healthcare Professionals use pMDIs?

150 Hospital doctors, hospital nurses, general practitioners, practice nurses, hospital and community pharmacy staff



What do Guidelines Recommend?

BTS/SIGN Asthma Guidelines 2016

- Prescribe inhalers only after patients have:
 - Received training in the use of the device, *and*
 - Have demonstrated satisfactory technique
- Before initiating a new drug therapy practitioners should check:
 - Adherence with existing therapies
 - Inhaler technique, and
 - Eliminate trigger factors

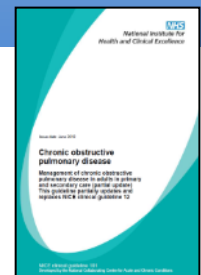
BTS/SIGN Asthma Guidelines 2016



NICE COPD Guidelines 2010

- Inhalers should be prescribed only after patients have
 - received training in the use of the device, *and*
 - have demonstrated satisfactory technique
- Patients should have their ability to use an inhaler device regularly assessed by a competent healthcare professional and, if necessary, should be re-taught the correct technique

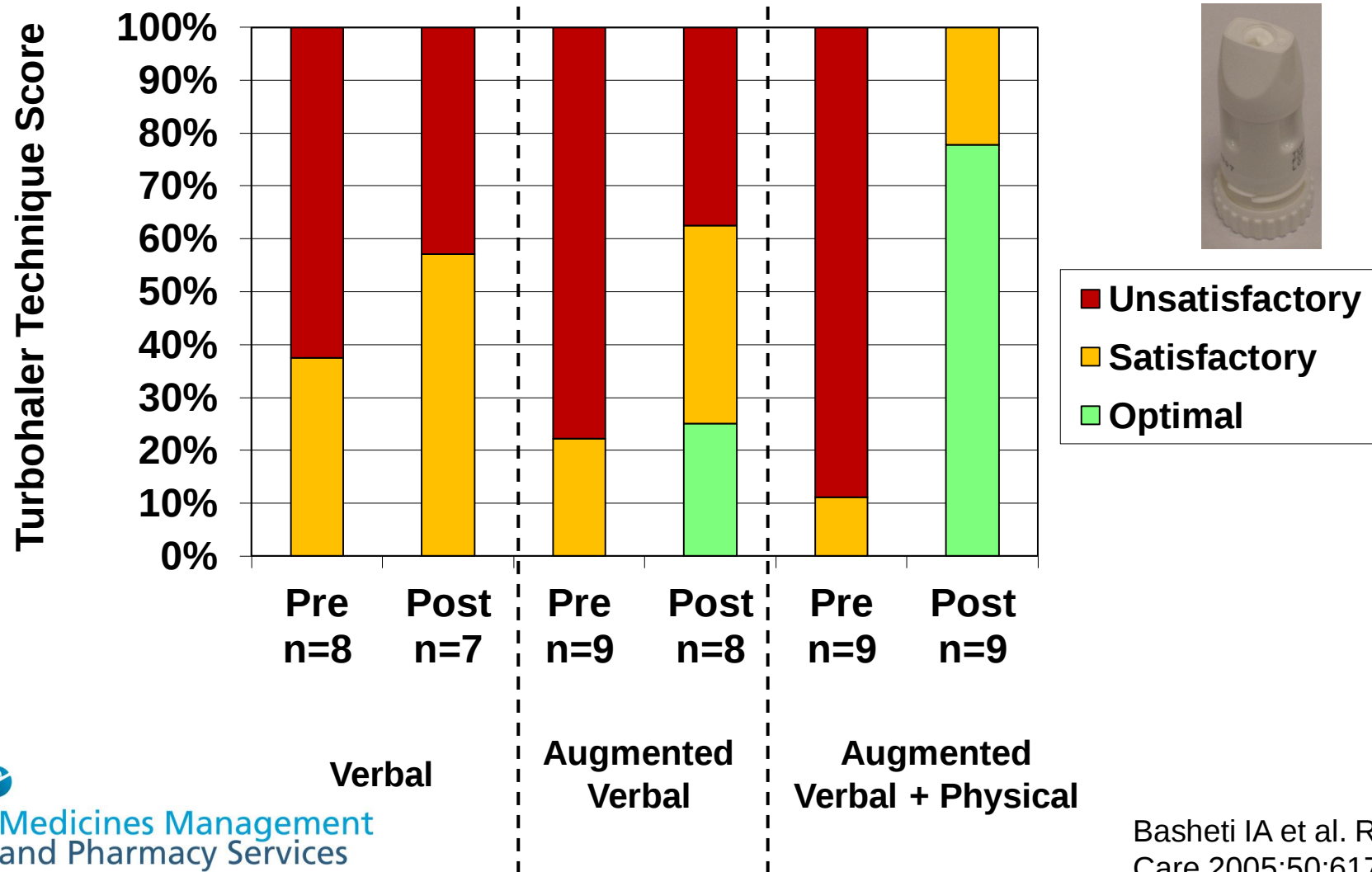
NICE clinical guideline 101: Chronic obstructive pulmonary disease. 2010



How should we teach inhaler technique?

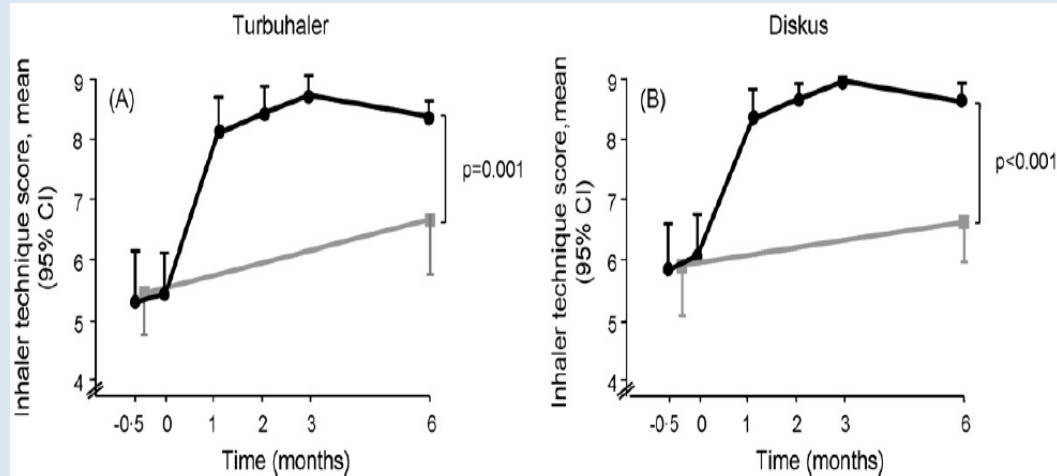


How Should We Teach Inhaler Technique?

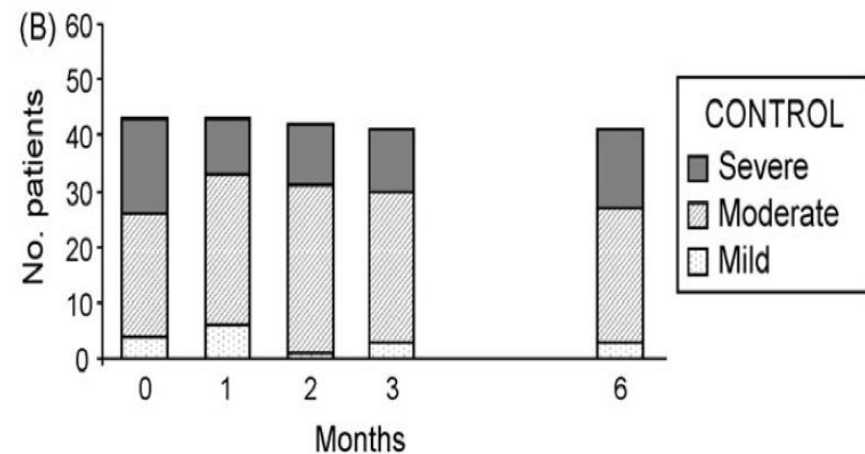
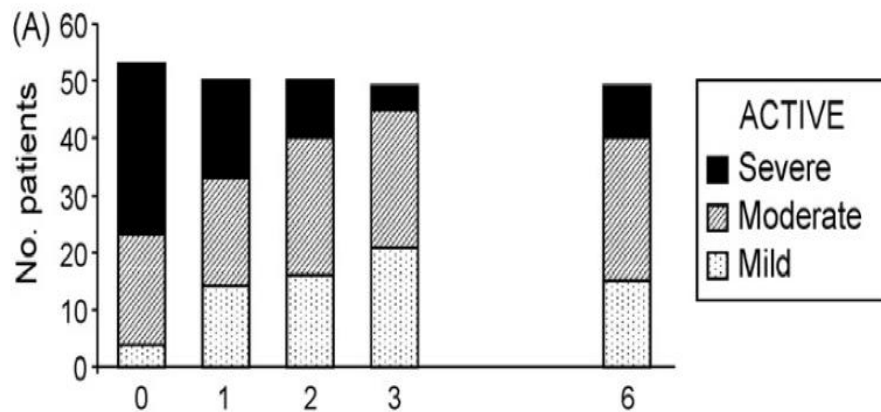


Community Pharmacy Service: Teaching Inhaler Technique Improves Asthma Outcomes

Inhaler Technique



Asthma Severity



Choosing Inhaler Devices



Categorising Inhaler Devices

Aerosol			Dry Powder Inhaler (DPI)		
Metered Dose Inhaler (MDI)	Soft Mist Inhaler	Breath-actuated pMDI	Single dose DPI – Blister	Single dose DPI – Capsule	Reservoir Multidose DPI
pMDI	Respimat	Autohaler	Accuhaler	Aeroliser	Easyhaler
		Easi-Breathe	Ellipta	Breezhaler	Genuair
			Forspiro	HandiHaler	NEXThaler
				Zonda	Novolizer
					Spiromax
					Turbohaler
					Twisthaler





Choosing an Inhaler

Action 1. Assess patient's inspiratory ability—observe the patient inhaling (using their own inhaler if available)

Ask the patient to try both of the following inhalation manoeuvres:

- **Quick and deep**—can the patient take a quick, deep breath in within **2–3 seconds**?
- **Slow and steady**—can the patient take a slow, steady breath in over **4–5 seconds**?

Can perform **quick and deep** manoeuvre only

Consider a DPI

Can perform **both** inhalation manoeuvres

Consider a DPI, pMDI, or SMI

Can perform **slow and steady** manoeuvre only

Consider a pMDI or SMI

If unsure after observing the patient, consider the use of devices to assess inspiratory ability, such as:

- AIM machine
- device training attachments
- Flo-Tone Trainer
- In-Check DIAL inspiratory flow meter

Select required drug formulation once inhaler device type has been chosen, in line with local formulary



Medicines Management
and Pharmacy Services

Inhaler Technique: 7 Steps to Success

1. Preparation

- Check dose counter
- Shake inhaler (where applicable)

2. Priming

- Before first use (where applicable)
- Open inhaler / remove cap

3. Exhaling

- Fully and away from mouthpiece

4. Mouth

- Place mouthpiece in mouth & close lips for tight seal

5. Inhalation

- **DPI: quick and deep inhalation (within 2–3 seconds)**
- **pMDI/SMI: slow and steady inhalation (over 4–5 seconds)**

6. Breath holding

- Remove from mouth, hold breath for 5 seconds

7. Closing and repeating

- Close inhaler / replace cap
- Repeat as necessary



Aerosol Inhalers

	MDI 	SMI Respimat 	BA-MDI Autohaler/Easi-Breathe 
Range of Drugs	• Wide range of drugs/classes • Compatibility with Spacer (needed for many)	• Long-acting bronchodilators	• ICS and SABA only
Dose Delivery	• Low IFR needed • Many inhale too fast	• Low IFR needed • Efficient dose delivery	• Low IFR needed
Ease of Use	• Moderate dexterity • Coordination required • Many use incorrectly • Haleraid available	• High dexterity • Complex loading/priming • Locks when empty	• Low dexterity
Dose Counter	• Dose counter: ICS/LABA (not SABA or ICS)	• Dose indicator	• None
Feedback	• Taste / sound	• Taste / click	• Taste / click



Single Dose DPI - Blisters

	Accuhaler 	Ellipta 	Forspiro 
Range of Drugs	- SABA - LABA - ICS; ICS/LABA	- ICS/LABA - LAMA - LAMA/LABA	FP/Salm only (1 strength)
Dose Delivery	- Medium-low airflow resistance - Relatively consistent across IFR 30-90L/min - Do not invert	- Medium-low airflow resistance - Consistent across IFR 43-130L/min - Do not invert	- Medium-low airflow resistance - Relatively consistent across IFR 30-90L/min - Do not invert
Ease of Use	- Low-moderate dexterity - Gritty if not used correctly	- Low dexterity - Simple device	Moderate-high dexterity
Dose Counter	Small dose counter	Large dose counter	Dose counter
Feedback	Taste	Taste	- Taste - Visual: loading of doses & used blisters

Single Dose DPI - Capsule

	Breezhaler 	HandiHaler 	Zonda 
Range of Drugs	- LABA - LAMA - LAMA/LABA	LAMA	LAMA
Dose Delivery	- Low airflow resistance - Relatively consistent across IFR 50-100L/min - Do not invert - Risk of inhaling capsule fragments	- High airflow resistance - Relatively consistent across IFR 28-60L/min - Do not invert - Risk of inhaling capsule fragments	- High airflow resistance - No data on drug delivery? - Do not invert ? Risk of inhaling capsule fragments ?
Ease of Use	- High dexterity - Significant manipulation - Redesigned blisters easier to open	- High dexterity - Significant manipulation - Blisters difficult to open	- High dexterity - Significant manipulation - Capsules in bottle
Dose Counter	Capsule count (in blister)	Capsule count (in blister)	Capsule count (in blister)
Feedback	- Taste - Whirring/vibration - Visual: transparent caps	- Taste - Whirring/vibration - Visual: open caps	- Taste - Whirring/vibration - Visual: transparent caps

Reservoir Multidose DPI (1)

	Easyhaler 	Spiromax 	Turbohaler 
Range of Drugs	- SABA - LABA - ICS - ICS/LABA (due 2017)	ICS/LABA	- SABA - LABA - ICS - ICS/LABA
Dose Delivery	- High airflow resistance - Consistent across IFR 30-60L/min - Do not invert	- Medium airflow resistance - Higher dose delivery at faster IFRs (90 vs 40 L/min) - Do not invert	- Medium-high airflow resistance - Higher dose delivery at faster IFRs (90 vs 40 L/min) - Do not invert
Ease of Use	- Low dexterity - Prime in vertical position	- Low dexterity - Simple device - Prime in vertical-horizontal position	- Moderate dexterity - Prime in vertical position - Turn aid available
Dose Counter	Dose counter (steps of 10)	Dose counter (steps of 2)	Dose counter (Symbicort – steps of 20) or indicator
Feedback	- Taste - Window shows unused doses	Taste	Generally no taste

Reservoir Multidose DPI (2)

	Genuair		NEXThaler	
				
Range of Drugs	- LAMA - LAMA/LABA		ICS/LABA	
Dose Delivery	- Medium airflow resistance - Consistent - No delivery <35L/min - Do not invert		- Medium-high airflow resistance - Relatively consistent across IFR 30-90L/min - No delivery <30L/min	
Ease of Use	- Low dexterity - Prime in vertical position - Locks when empty		- Low dexterity - Simple device - Prime in vertical position	
Dose Counter	Dose counter (steps of 10)		Dose counter (steps of 1)	
Feedback	- Taste - Click - Window Green -> Red		- Taste - Click	

Summary

- **Sup-optimal** prescribing and use of respiratory medicines is widespread amongst **patients** and **healthcare professionals**.
- **New inhaled drugs & devices** provide opportunities for greater patient choice & may assist in medicines optimisation.
- **Education** is a key intervention.

