Improving inhaler technique for a more sustainable NHS

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PrescQIPP
Community Interest Company

High-quality & low-carbon asthma care: a green challenge and a golden opportunity!

Right diagnosis

- Patients on inhalers without a diagnosis!
- Severe asthma vs suboptimal inhaler technique
- Air pollution, smoke, housing, vehicle emissions…

Right disease management

- Address over-reliance on relievers (SABA/LABA), under-use of preventers (ICS)
- Optimise according to guidelines e.g. consider MART (combined maintenance and reliever therapy)
- Optimise inhaler technique

Better care,
greener care

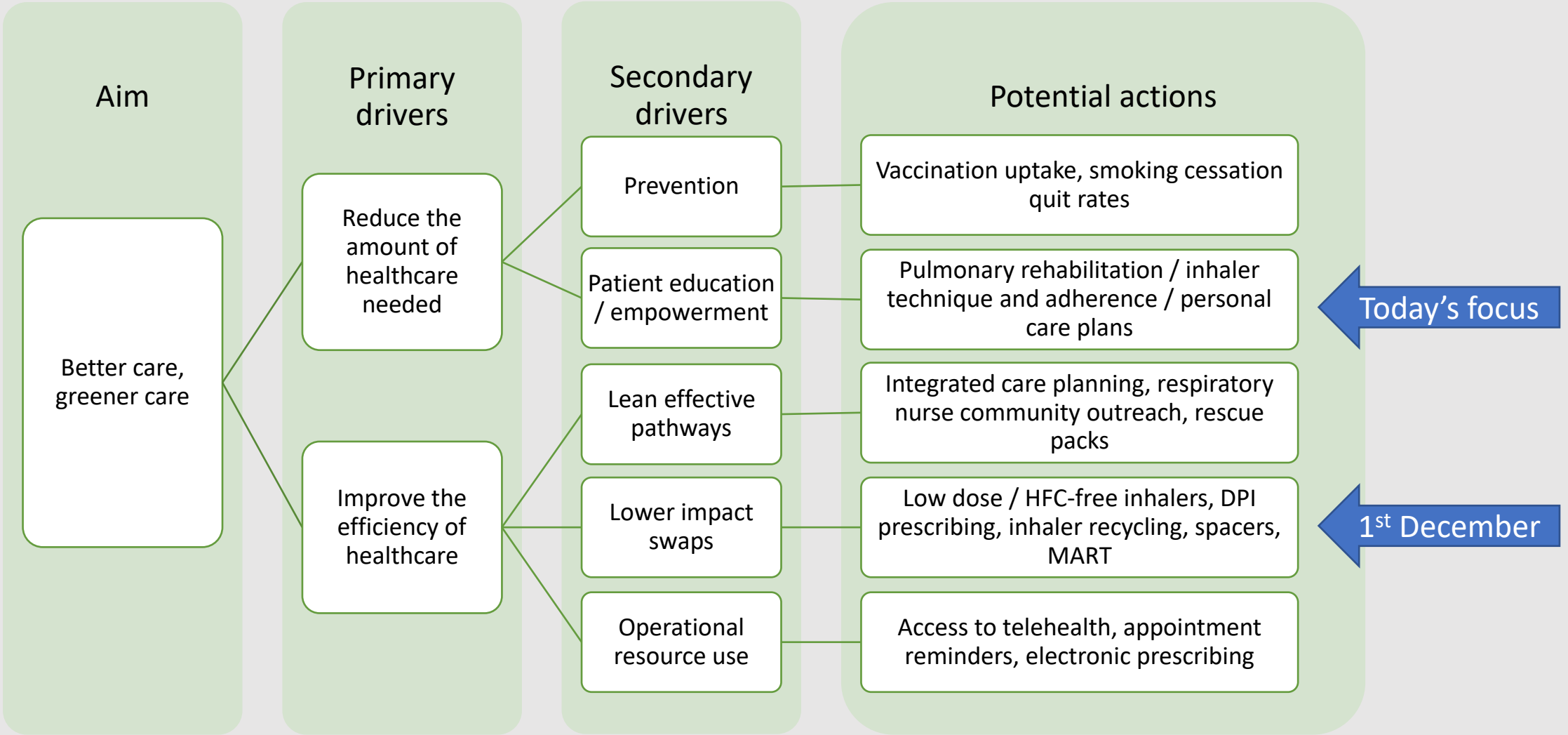
Right device

- Dry powder inhalers or soft mist inhalers where clinically appropriate
- If aerosol (pMDI) inhalers are needed, then choose brand and regime to minimise carbon footprint
- Optimise drug delivery

Right disposal

- Return all aerosol inhalers for incineration / recycling
- Dispose of at the right time (not too soon or too late!)
- Optimise local return schemes

The carbon footprint of respiratory care can be improved in many ways



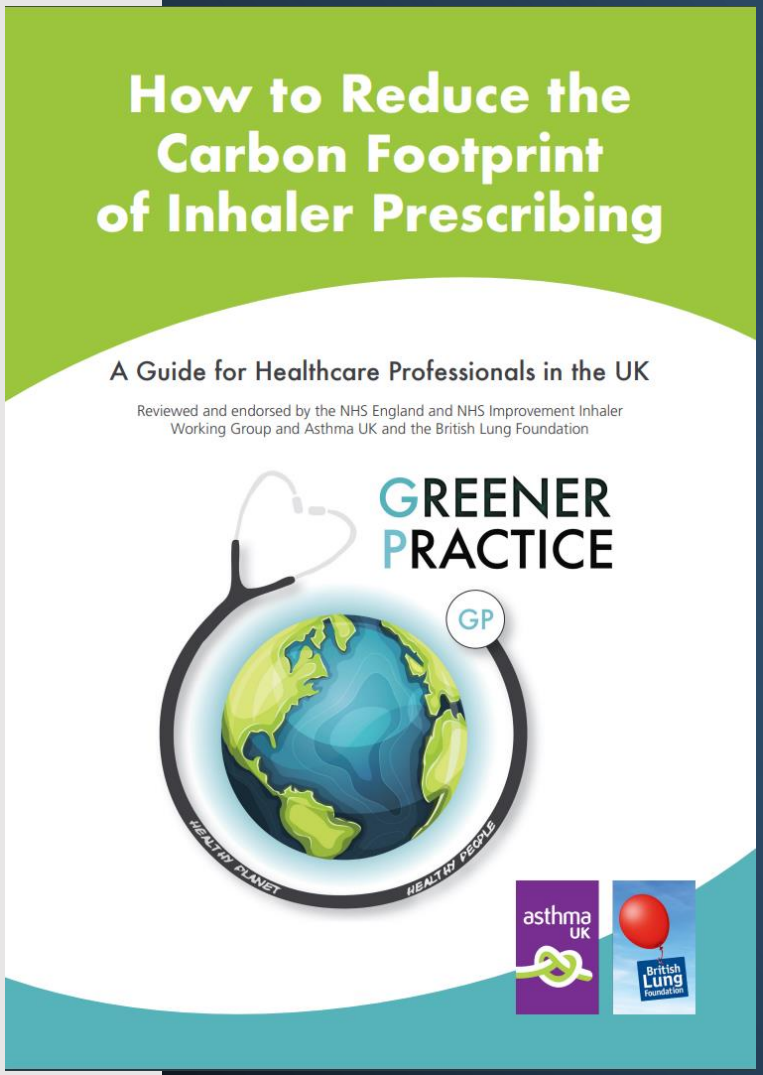
Mortimer F, 2010 *Clinical Medicine*

Helpful guidelines

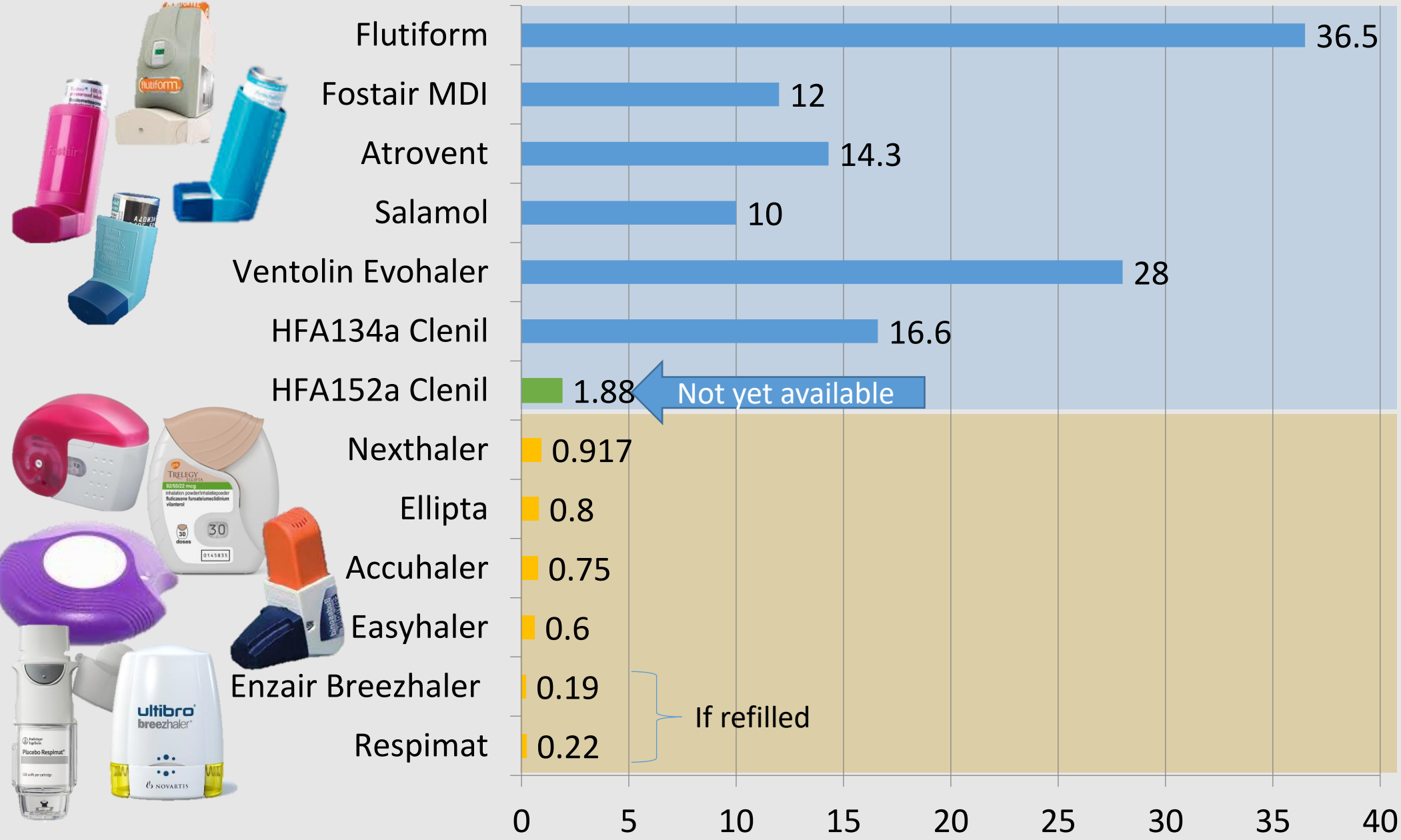
“Prescribers, pharmacists and patients should be aware that there are significant differences in the global-warming potential of different MDIs and that **inhalers with low global-warming potential should be used when they are likely to be equally effective**.” BTS/Sign Asthma Guidelines (2019)

Download this PrescQIPP inhaler guide which outlines the global warming potential of different inhaler types.

Download this Greener Practice prescribing guide which has been endorsed by the BLF, Asthma UK and NHS England



Carbon footprint of various inhalers in kg CO_2e per device or per month



Aerosol pMDI inhalers are "high carbon" due to the propellant gas

Dry powder inhalers and soft mist inhalers are "low carbon" as they do not use propellant gases

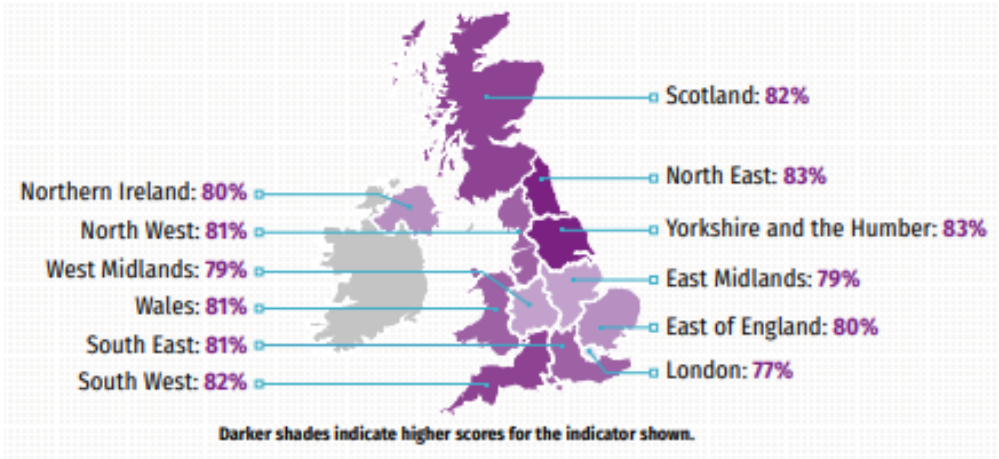
Janson C, Henderson R, Löfdahl M, *et al Thorax* 2020;**75**:82-84.

The problem

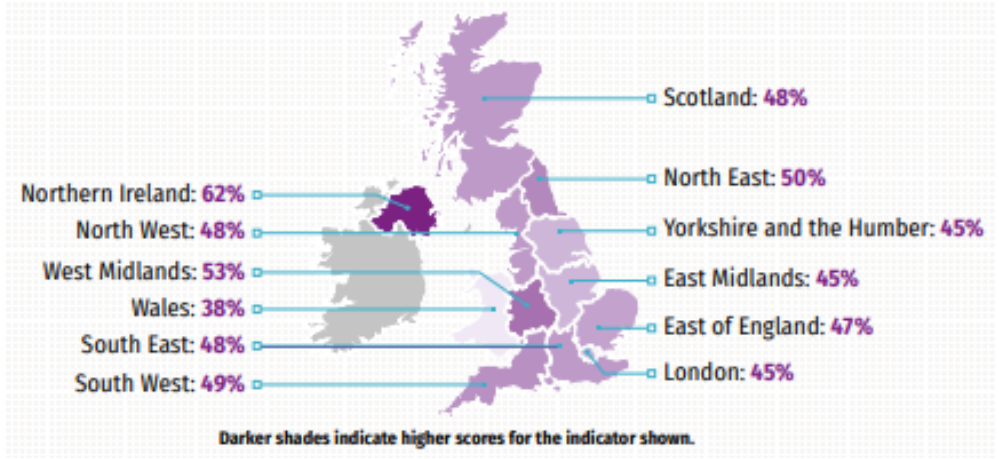
- Using inhalers incorrectly is associated with poor disease control, increased risk of exacerbations, hospital admissions and death.
- Over-reliance on short-acting bronchodilators and under-use of preventer inhalers is also a major cause of mortality and morbidity.
- A systematic review found that around 30% of people using inhalers had ‘poor’ inhaler technique, and that no **appreciable change in this has occurred over the last 40 years**.

Sanchis et al 2016 https://doi.org/10.1016/j.chest.2016.03.041

Percentage of people with asthma receiving an inhaler technique check, across the UK



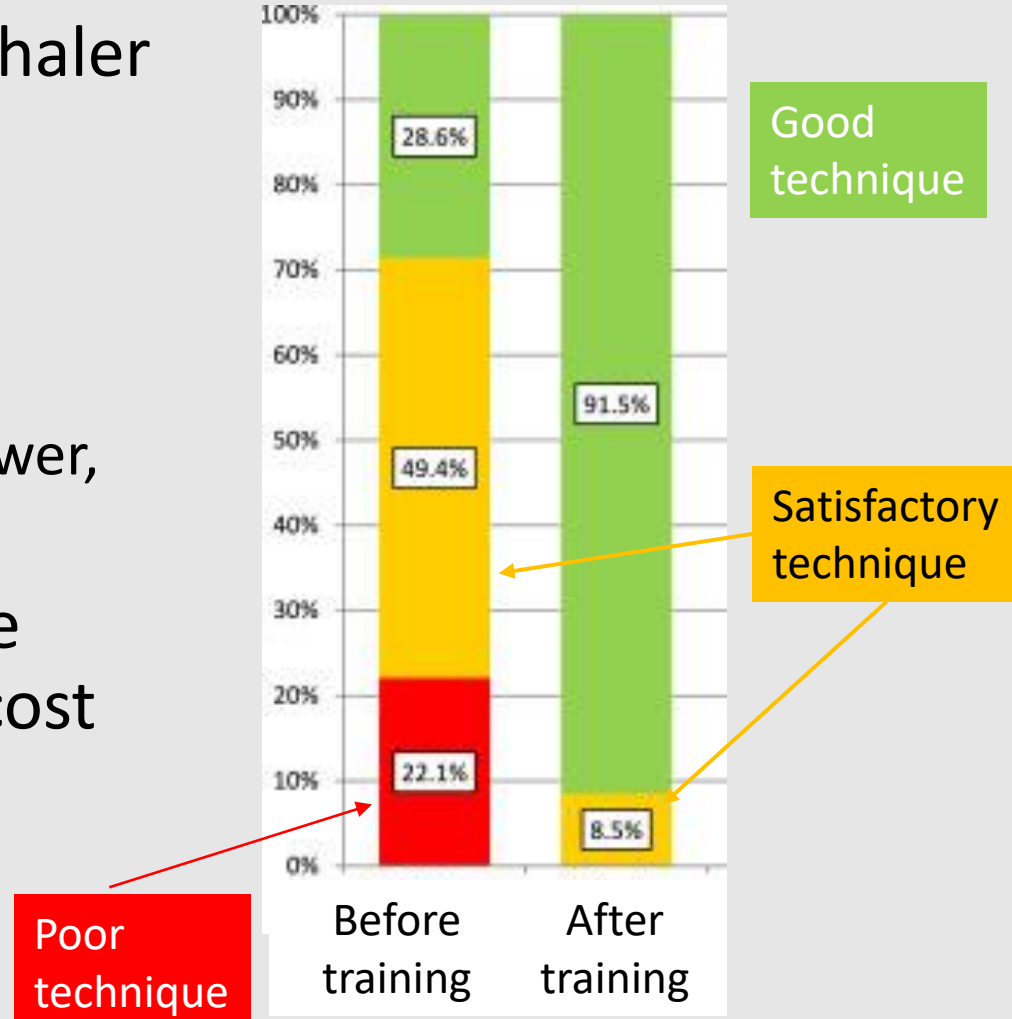
Asthma action plan uptake, across the UK



Asthma UK Annual Asthma Survey 2018

How does better inhaler technique help?

- In a recent ward-based study, optimising inhaler technique for asthma and COPD patients achieved a significant reduction in
  - moderate-to-severe exacerbations (25% fewer, $p<0.05$) and
  - annualised rate of hospital admissions (43% fewer, $p<0.0005$).
- Improvements were also observed in future length of stay (- 1.6 days) and the average cost of admission (-£748).



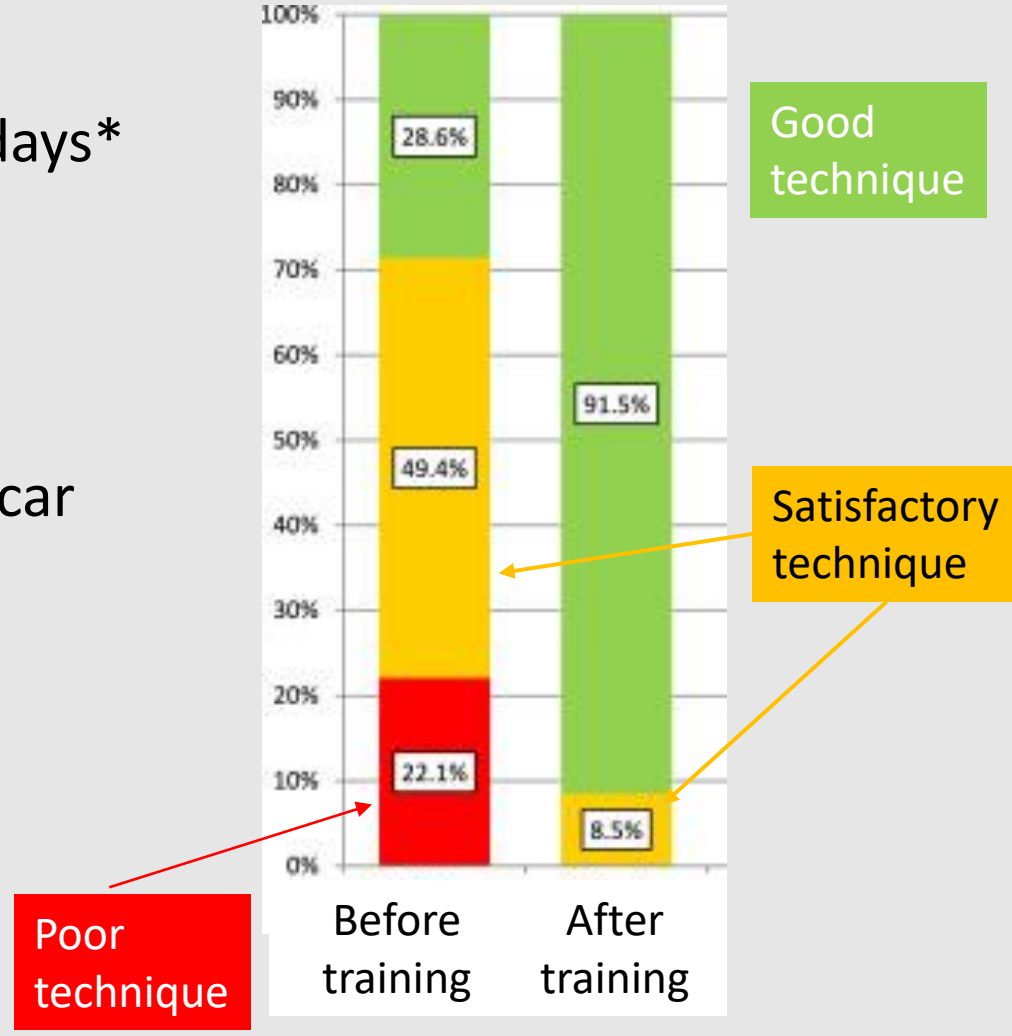
Capstick et al 2021 https://doi.org/10.1016/j.rmed.2021.106583

How does better inhaler technique help?

- Last year in England there were
  - 75,000 COPD admissions lasting on average 4 days*
  - 40,000 asthma admission lasting 2 days*

Each admission

- 125kg CO2e / day** = London to Scotland in a car
- Social consequences for patient/carers
- £722 cost of an emergency admission, then £419/day



*NHS Digital Hospital Episode Statistics 2020-2021
** Tennison et al Lancet 2021
*** National schedule of NHS costs 2019-2020

But it’s getting more complex…

Proliferation of devices, drugs and brands

Respiratory Inhaler Identification Chart

Examples of different inhaler devices are illustrated to aid identification. Please note different strengths may be different colours from those illustrated. Some of these inhalers may not be included in the NHSGG&C formulary. See http://www.ggcprescribing.org.uk/ for formulary status, inhaler device guidance and NHSGG&C Guidelines. Refer to BNF and SPC for full product information.

NHS Greater Glasgow and Clyde

Short-acting Beta$_2$ Agonist Inhalers (SABAs)

- Salbutamol MDI* (aerosol) Brands include: Airomir®, AirSalb®, Salamol®, Ventolin®
- Easyhaler® salbutamol (dry powder)
- Salamol® Easi-Breathe salbutamol (aerosol)
- Airomir® Autohaler salbutamol (aerosol)
- Ventolin® Accuhaler salbutamol (dry powder)
- Bricanyl® Turbohaler terbutaline (dry powder)

Long-Acting Beta$_2$ Agonist Inhalers (LABAs)

- Atimos® Modulite formoterol (aerosol)
- Easyhaler® formoterol (dry powder)
- Neovent® MDI* salmeterol (aerosol)
- Onbrez® Breezhaler indacaterol (inhalation powder, hard capsule)
- Oxis® Turbohaler formoterol (dry powder)
- Serevent® Accuhaler salmeterol (dry powder)
- Serevent® salmeterol (aerosol)
- Striverdi® Respimat olodaterol (solution for inhalation)

Muscarinic Antagonist Inhalers - Long-acting (LAMA) and short-acting (SAMA - Atrovent only)

- Spiriva® HandiHaler & capsules, tiotropium (inhalation powder, hard capsule)
- Eklira® Genuair aclidinium (dry powder)
- Incruse® Ellipta umeclidinium (dry powder)
- Seebri® Breezhaler glycopyrronium (inhalation powder, hard capsule)
- Spiriva® Respimat tiotropium (solution for inhalation)
- Atrovent® MDI* ipratropium (aerosol)

Spacer Devices

- Aerochamber Plus® medium volume spacer also available as child (yellow) and infant (orange) spacers
- Volumatic® large volume spacer also available with paediatric mask

Corticosteroid Inhalers (ICS)

- Clenil® Modulite MDI* beclometasone (aerosol)
- Easyhaler® beclometasone (dry powder)
- Qvar® Easi-Breathe beclometasone (aerosol)
- Budelin® Novolizer budesonide (dry powder)
- Easyhaler® budesonide (dry powder)
- Flixotide® Accuhaler fluticasone propionate (dry powder)
- Flixotide® Evohaler fluticasone propionate (aerosol)
- Pulmicort® Turbohaler budesonide (dry powder)
- Qvar® Autohaler beclometasone (aerosol)
- Qvar® MDI* beclometasone (aerosol)

Combination LABA/LAMA Inhalers

- Duaklir® Genuair formoterol & aclidinium (dry powder)
- Anoro® Ellipta vilanterol & umeclidinium (dry powder)
- Spiolto® Respimat tiotropium & olodaterol (solution for inhalation)
- Ultibro® Breezhaler glycopyrronium & indacaterol (inhalation powder, hard capsule)

Combination ICS/LABA Inhalers

- Fostair® MDI* beclometasone & formoterol (aerosol)
- Fostair® NEXThaler beclometasone & formoterol (dry powder)
- Duoresp® Spiromax budesonide & formoterol (dry powder)

Combination ICS/LABA Inhalers

- Symbicort® Turbohaler budesonide & formoterol (dry powder)
- AirFluSal® Forspiro fluticasone propionate & salmeterol (dry powder)
- Flutiform® MDI* fluticasone propionate & formoterol (aerosol)
- Relvar® Ellipta fluticasone furoate & vilanterol (dry powder)
- Seretide® Accuhaler fluticasone propionate & salmeterol (dry powder)
- Seretide® Evohaler fluticasone propionate & salmeterol (aerosol)
- Sirdupla® MDI* fluticasone propionate & salmeterol (aerosol)
- Symbicort MDI* budesonide & formoterol (aerosol)

*MDI = metered dose inhaler

Endorsed by NHSGGC Respiratory Managed Clinical Network, July 2016.

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Common classes of inhaled drug

SABA

- Short acting beta-agonist
- Relieves acute breathlessness
- Regular use => poor control?

ICS

- Inhaled corticosteroid
- Used regularly to reduce lung inflammation and acute flare ups

LABA / LAMA

- Long acting beta-agonist / muscarinic antagonists
- Symptom relief in moderate/severe COPD

Combination

- ICS + LABA
- Combined therapy for COPD and asthma not controlled by ICS + tablets alone

Patient-held inhalation devices

Aerosol (pMDI)

- Requires SLOW and STEADY inhalation (over 3-5 secs)
- Good for very young, very old, severe disease
- Contains HFC propellants
- Requires breath/actuation coordination OR spacer OR breath actuated device
- May not have dose counter

Spacer

- Used with aerosol inhalers only
- Chamber removes need for breath/actuation coordination
- Facemask removes need for tight lip seal
- Can be as effective as nebulisers in an acute attack
- Either tidal breathing or single breath and hold

Dry powder (DPI)

- Requires QUICK and DEEP inhalation (within 2-3 secs)
- Good for people with normal inspiratory flow
- Non HFC so better for the environment
- Needs priming
- Does not require spacer
- Breath actuated

Soft-mist (SMI)

- Multi-dose solution for inhalation
- Good for people with poor inspiratory flow
- Non-HFC ‘vape’ technology
- Does not require spacer or coordination
- Limited formulary (currently LABA/LAMA only)

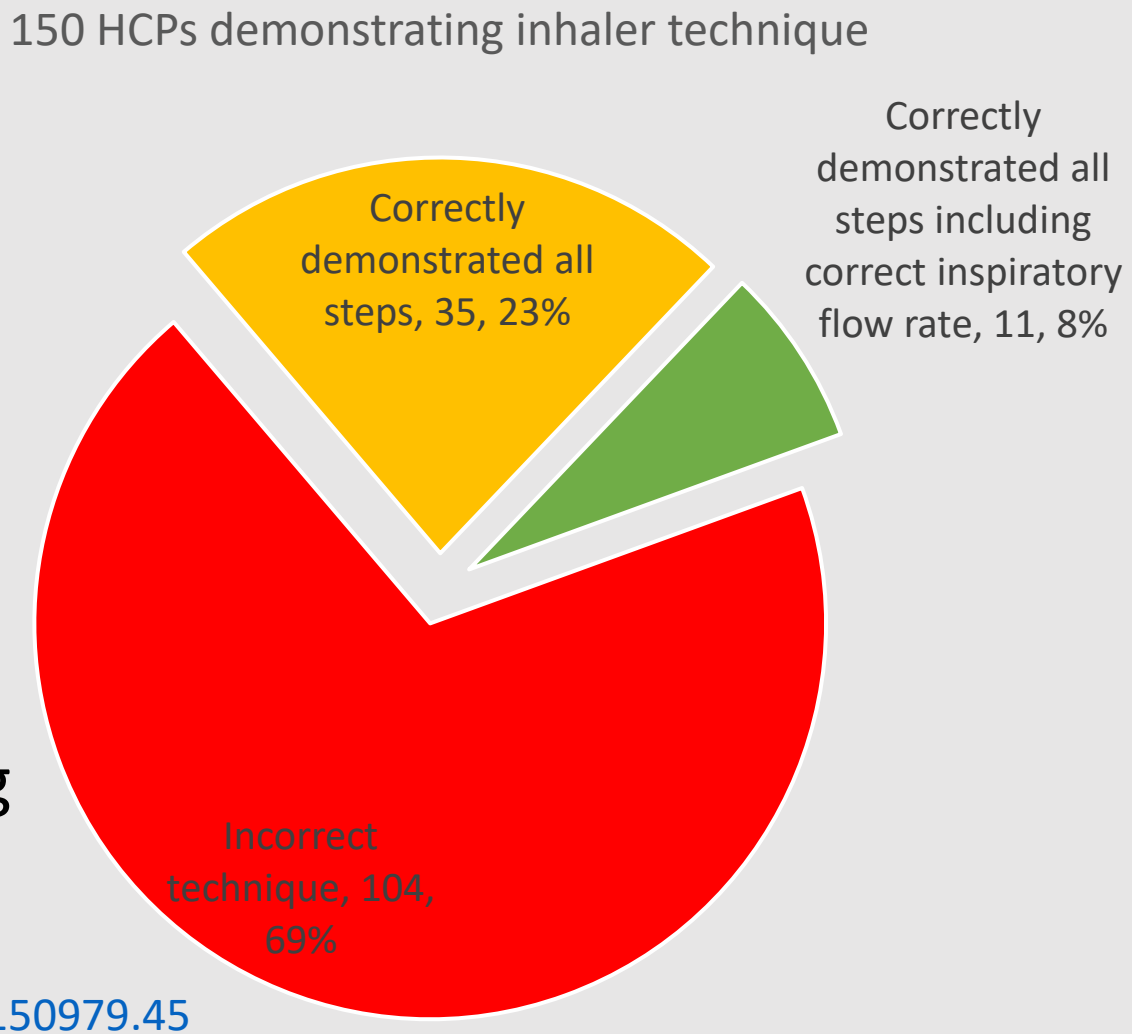
7 steps for correct inhaler technique (and common errors)

1. Preparation	2. Priming	3. Exhaling	4. Mouth	5. Inhalation	6. Breath holding	7. Closing / repeating
failure to shake aerosol failure to check date/dose counter failure to insert DPI cannister	failure to open cap failure to prime device correctly holding inhaler upside down	failure to exhale fully exhaling into device	failure to make a tight seal not lifting chin (lowers tongue)	poor timing of aerosol actuation too fast or forceful (aerosol) too weak or slow (DPI)	failure to hold breath for 5-10 seconds	incorrect second dose prep/ timing/ inhalation

Capstick et al 2021 https://doi.org/10.1016/j.rmed.2021.106583 and Asthma UK

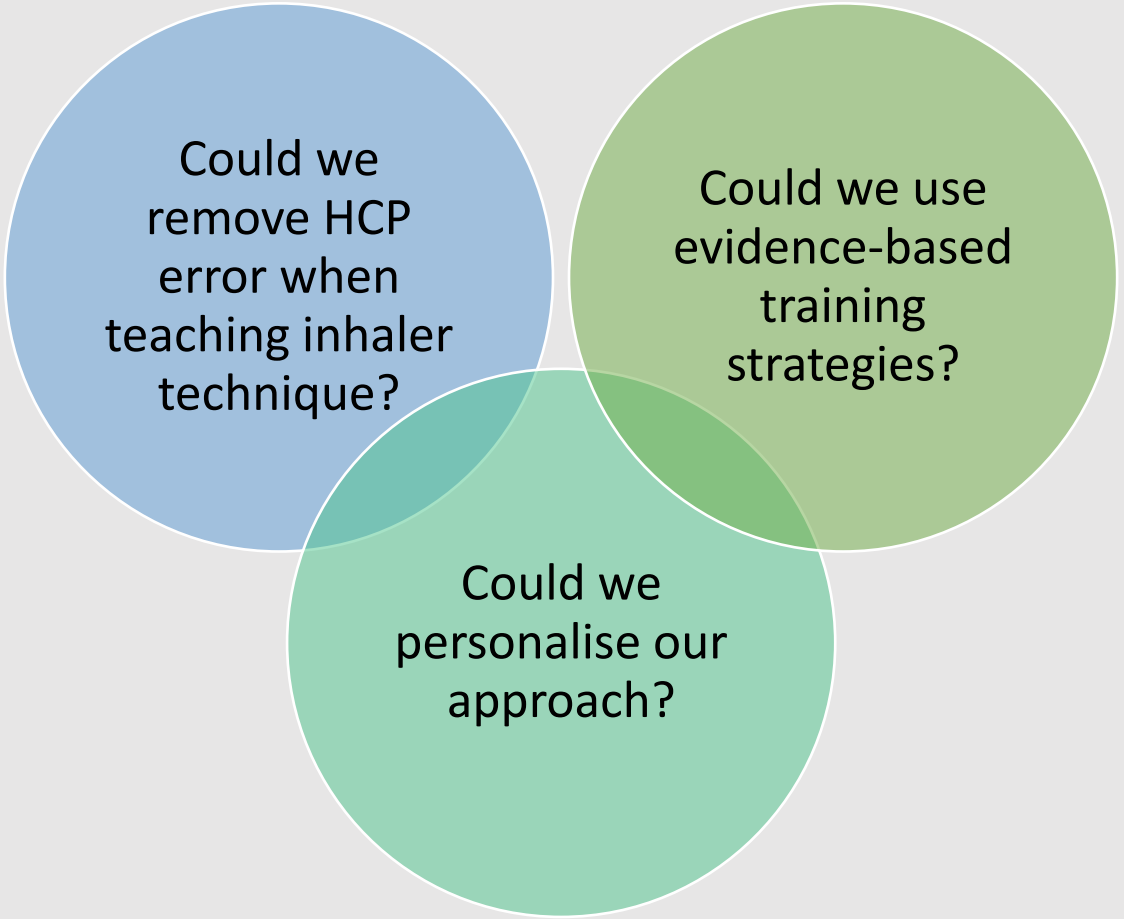
It’s not just patients that get it wrong!

- 150 Healthcare professionals (74 Primary Care Trust; 76 Acute Trust) were asked to demonstrate how they would self-administer a pMDI placebo inhaler.
- Of the 150 HCPs assessed only 11 (7%) could demonstrate all the recognised steps in administration including correct inspiratory flow using in-check dial.



Baverstock et al 2010 http://dx.doi.org/10.1136/thx.2010.150979.45

Is it time to rethink how we teach / check / improve inhaler technique?



Recommendation 1: use training videos

Unless you are *absolutely sure* of your technique, use validated videos to demonstrate the correct 7 steps for the inhaler device prescribed.

- See Asthma UK training videos / Right Breathe training videos

Activity: find and watch training videos for

1. An aerosol (pMDI) inhaler with and without spacer e.g. Salamol
2. A dry powder inhaler (DPI) e.g. Easi-breathe, Ellipta
3. A soft mist inhaler (SMI) e.g. Respimat

Can you spot the 7 steps in each video?

Compare both Asthma UK and RightBreathe videos – which might suit different types of patient?

Recommendation 2: use evidence-based training strategies and a personalised approach

- Engage
  - Establish relevance and importance of good inhaler technique
  - Reassure: new skills take time; it's OK to admit not using; OK to have difficulty with their technique etc.
  - Establish prior knowledge, current technique & concerns (e.g. arthritis)
- Demonstrate (or **watch video** with patient)
  - Explain and demonstrate the 7 steps
  - Invite patient/carer to demonstrate back
- Feedback & repeat
  - "How do you think you did?"; feedback as needed
  - Repeat until confident and correct
  - Consider changing device (e.g. to breath actuated device) if repeatedly incorrect
- Discuss
  - Mouth care, inhaler care, spacer care
  - What to do daily, what to do if feeling worse, what do if reliever isn't working
  - How to get repeat prescriptions, when to expect follow-up / review
  - How to check whether inhaler is empty/near empty
  - Returning inhalers to pharmacist for recycling / safe disposal
  - Invite questions and respond to concerns
- Support self-care
  - Share patient-centred sources of reliable information e.g. Asthma UK
  - Before and after Asthma Control Test (ACT)
  - Printed personalised action plan
  - Peak flow diary / app? Follow-up call?

Tips for discussion section

- Mouth care
  - Rinse/brush teeth and spit after steroid inhalers to avoid fungal mouth infections and systemic absorption
- Spacer care
  - Hand wash spacers with detergent monthly but don't scrub/rub as this can build static (or prescribe anti-static); repeat prescription w/ limited issue.
- Printed action plans?
  - Asthma
  - COPD
- What, when, why?
  - Treatment (AKA maintenance/preventer)
  - Relievers
- Consider using stickers
  - SLOW & STEADY for aerosol/SMI
  - QUICK & DEEP for dry powder
- When to replace?
  - Some aerosol inhalers do not have dose indicators: **check number of doses per inhaler** in BNF
  - Aerosols should contain liquid when shaken: empty is empty, but residual liquid may be just propellant
  - A typical 200 dose treatment inhaler will last ? weeks at 4 doses/day
  - A typical 200 dose reliever inhaler will last ?? weeks at 4 doses/week, less if used more

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  - SLOW & STEADY for aerosol/SMI
  - QUICK & DEEP for dry powder
- When to replace?
  - Some aerosol inhalers do not have dose indicators: **check number of doses per inhaler** in BNF
  - Aerosols should contain liquid when shaken: empty is empty, but residual liquid may be just propellant
  - A typical 200 dose treatment inhaler will last **7** weeks at 4 doses/day
  - A typical 200 dose reliever inhaler will last **50** weeks at 4 doses/week, less if used more

How would you identify patients to prioritise for a review?

- Paste your thoughts into the chat

- Are they using >3 reliever inhalers each year? (work down from ~20!)
- Are they under-ordering their treatment therapy (ICS)?
- Have they had a recent admission?
  - Is this severe asthma or suboptimal inhaler technique/adherence?
- Are they needing oral corticosteroids?
  - Needing their rescue packs? 1 or more courses of prednisolone in last 6 months?
- Are they on the right drugs according to latest guidelines?
  - No diagnostic code and receiving inhalers?
  - Could they be a candidate for combined maintenance and reliever therapy (MART)?
- Are they on the right device for better greener care?
  - Could they be swapped to an equally effective dry powder inhaler, or lower HFC aerosol inhaler?
  - Breath actuated device? Dose counter? Spacer? Soft-mist inhaler?

Self-test quiz

Which of these inhalers are suitable for patients with poor inspiratory flow?

- Answer: aerosol *and* soft mist

- A) aerosol

- B) dry powder

- C) soft mist

Self-test quiz

Which of these inhalers requires a QUICK and DEEP inhalation, within 2-3 secs?

- Answer: dry powder

- A) aerosol

- B) dry powder

- C) soft mist

Self-test quiz

Which of these inhalers contains an HFC propellant?

- Answer: aerosol

- A) aerosol

- B) dry powder

- C) soft mist

Self-test quiz

What strategies might help someone with poor breath/actuation coordination

- Answer: all three

- A) adding a spacer

- B) switching to breath actuated (including DPI)

- C) switching to soft mist (currently LABA and LAMA only)

Talking heads exercise

Four consultation scenarios

- You post suggested phrases into the chat
- Our clinicians WILL SAY YOUR WORDS
- I will be your patient…

Case 1

Paste your suggested phrases for the clinician into the chat

An adult with newly diagnosed moderate COPD, persistent difficulty coordinating aerosol actuation with inhalation. GP has asked you to review their device (ICS + LABA)

How would you…

- …check prior knowledge, technique, concerns?
- …check the patient is on the right drug AND right device (most effective, greenest option)?
- …find the right device-specific validated videos for the 7 steps?
- …check for errors in inhaler technique (what are the likely errors)?
- …personalise your approach?
- …safety net?
- …support effective self-care?
- …explain the need to return to used devices to pharmacy?

Case 2

Paste your suggested phrases for the clinician into the chat

A well controlled asthmatic teenager wanting to change from aerosol to dry powder preventer inhaler due to environmental concerns, good previous aerosol technique, new to DPI. One recent admission for acute asthma.

How would you…

- …check prior knowledge, technique, concerns?
- …check the patient is on the right drug AND right device (most effective, greenest option)?
- …find the right device-specific validated videos for the 7 steps?
- …check for errors in inhaler technique (what are the likely errors)?
- …personalise your approach?
- …safety net?
- …support effective self-care?
- …explain the need to return to used devices to pharmacy?

Case 3

Paste your suggested phrases for the clinician into the chat

A person returning to the pharmacist as they were changed from Ventolin (pMDI) to Easyhaler (DPI) without anyone explaining properly. Doesn't like or trust the new inhaler.

How would you…

- …check prior knowledge, technique, concerns?
- …check the patient is on the right drug AND right device (most effective, greenest option)?
- …find the right device-specific validated videos for the 7 steps?
- …check for errors in inhaler technique (what are the likely errors)?
- …personalise your approach?
- …safety net?
- …support effective self-care?
- …explain the need to return to used devices to pharmacy?

Case 4

Paste your suggested phrases for the clinician into the chat

A parent with a 7 year-old child with occasional viral wheeze, prescribed a salbutamol aerosol reliever with spacer

How would you…

- …check prior knowledge, technique, concerns?
- …check the patient is on the right drug AND right device (most effective, greenest option)?
- …find the right device-specific validated videos for the 7 steps?
- …check for errors in inhaler technique (what are the likely errors)?
- …personalise your approach?
- …safety net?
- …support effective self-care?
- …explain the need to return to used devices to pharmacy?

Thank you!

NHS
Health Education England