CLIMATE CONSCIOUS INHALER PRESCRIBING

TACKLING CLIMATE CHANGE, ONE PEN STROKE AT A TIME

UBC THERAPEUTICS INITIATIVE

NOVEMBER 16TH, 2022

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DISCLOSURES

- We have no industry-related financial disclosures
- We have received a small stipend from CASCADES (Creating a Sustainable Canadian Health System in a Climate Crisis) a not-for-profit organization funded by Environment and Climate Change Canada for work on the National Advisory Committee on Inhaler Sustainability
- The Critical Air Project has received a national innovation grant and support from the CASCADES Network
- Mitigating potential bias
  - Only published trial data is presented
  - Recommendations are consistent with published guidelines

AT THE END OF THIS TALK, YOU WILL BE ABLE TO

Discuss

the environmental impact of inhaler therapy

Identify

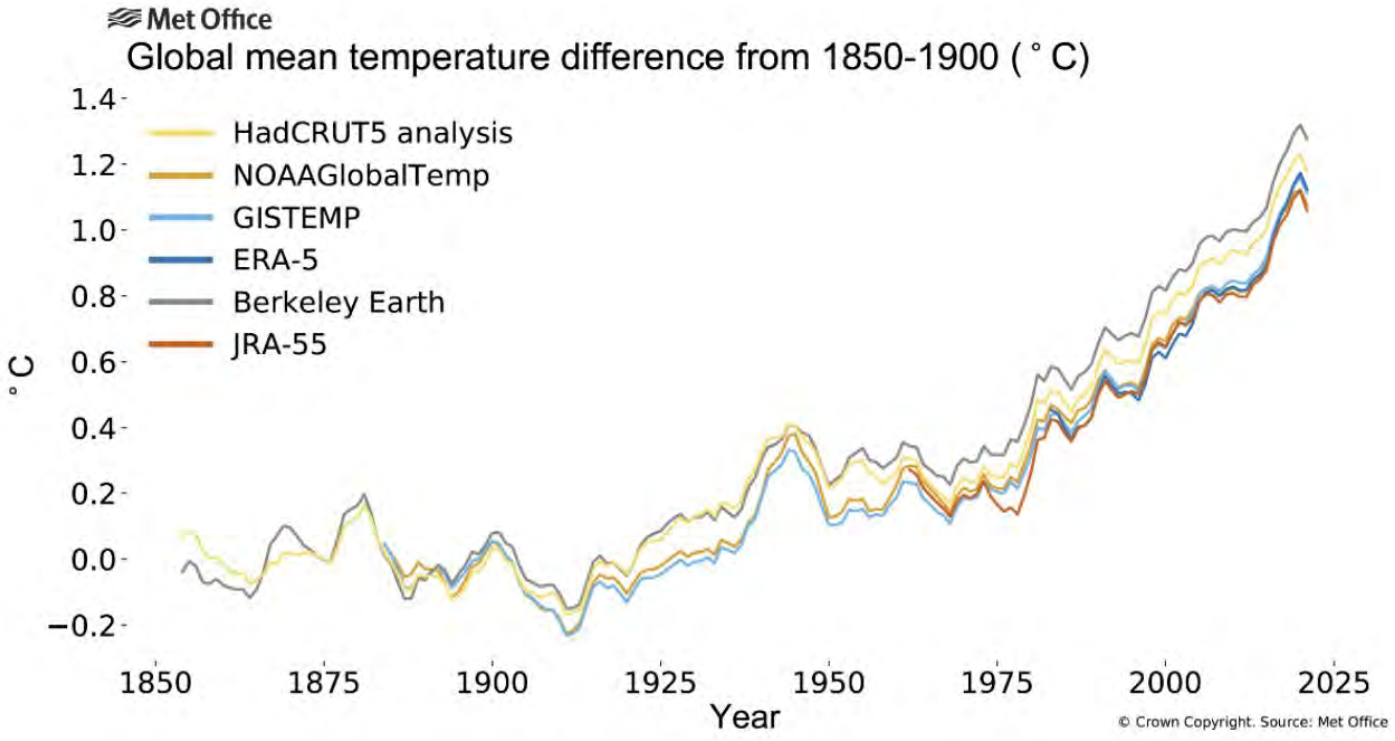
three concrete steps you can take to reduce the climate impact of your practice

Know

That ‘Green Care is Great Care"


CLIMATE CRISIS

THE TIMES THEY ARE A-**CHANGIN'**



(Bob Dylan was right)

Global mean temperature rise of 1.1C above pre-industrial levels

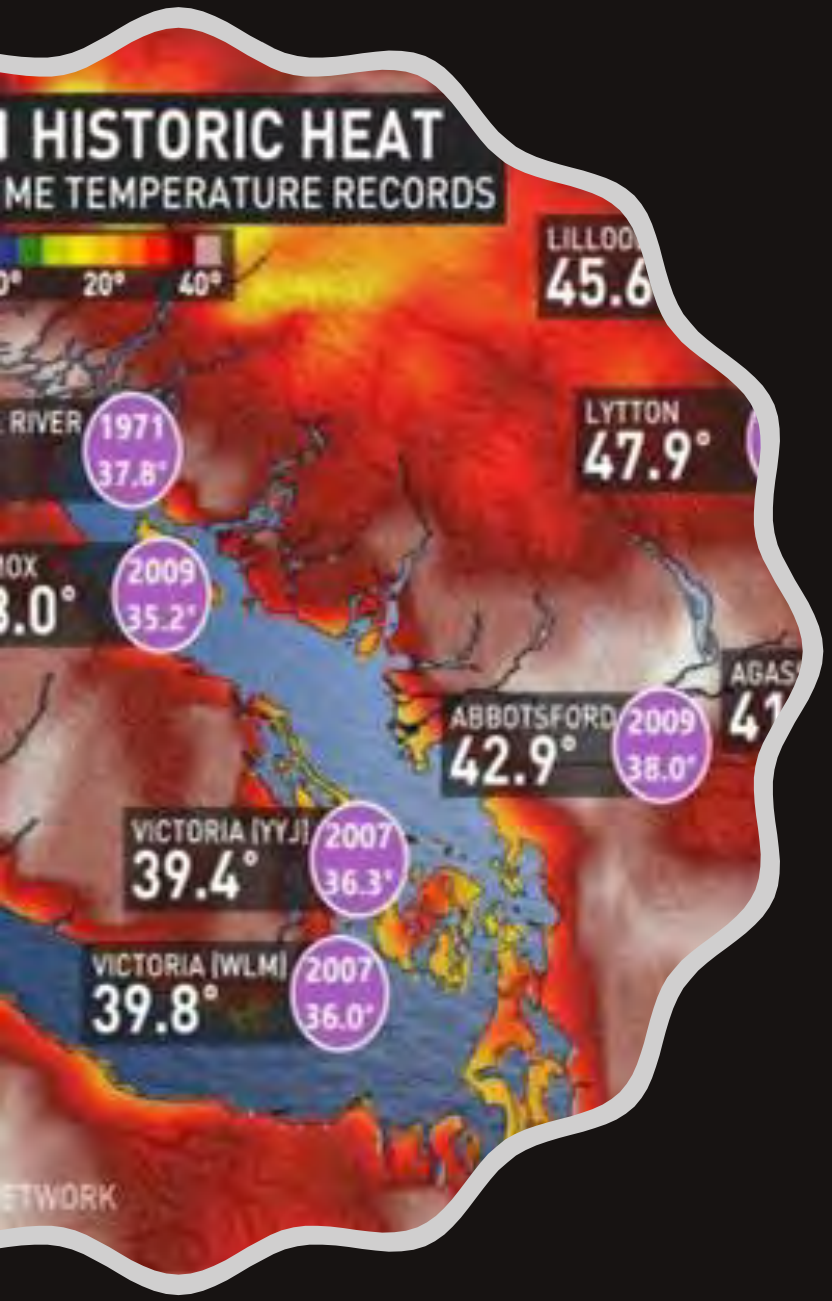
Figure 1: Examples of impacts of Climate Change on Health and Health Systems in Canada

The Lancet Countdown, November 2019

IT IS HERE. IT IS NOW.

The Climate Crisis is the single greatest threat to humanity in the 21st century (Costello, 2009)

Global trend towards worsening health outcomes – including Canada (The Lancet Countdown, October 2022)



IN 2021 ALONE

DID I MENTION THERE'S ALSO AN ONGOING GLOBAL PANDEMIC?

WHAT ABOUT HEALTHCARE THOUGH?

- On one hand, we need to manage the health impacts of the climate crisis
- On the other hand…
- Healthcare system generate terrific GHG emissions
  - Canada's health care system is responsible for 33 million tonnes of CO2 equivalents yearly … or **4.6% of the national total**! (Eckelman et al, 2018)
- 25% of total life cycle healthcare GHG emissions in Canada come from prescription and non-prescription drugs (Eckelman et al, 2018)

OUR GREATEST OPPORTUNITY

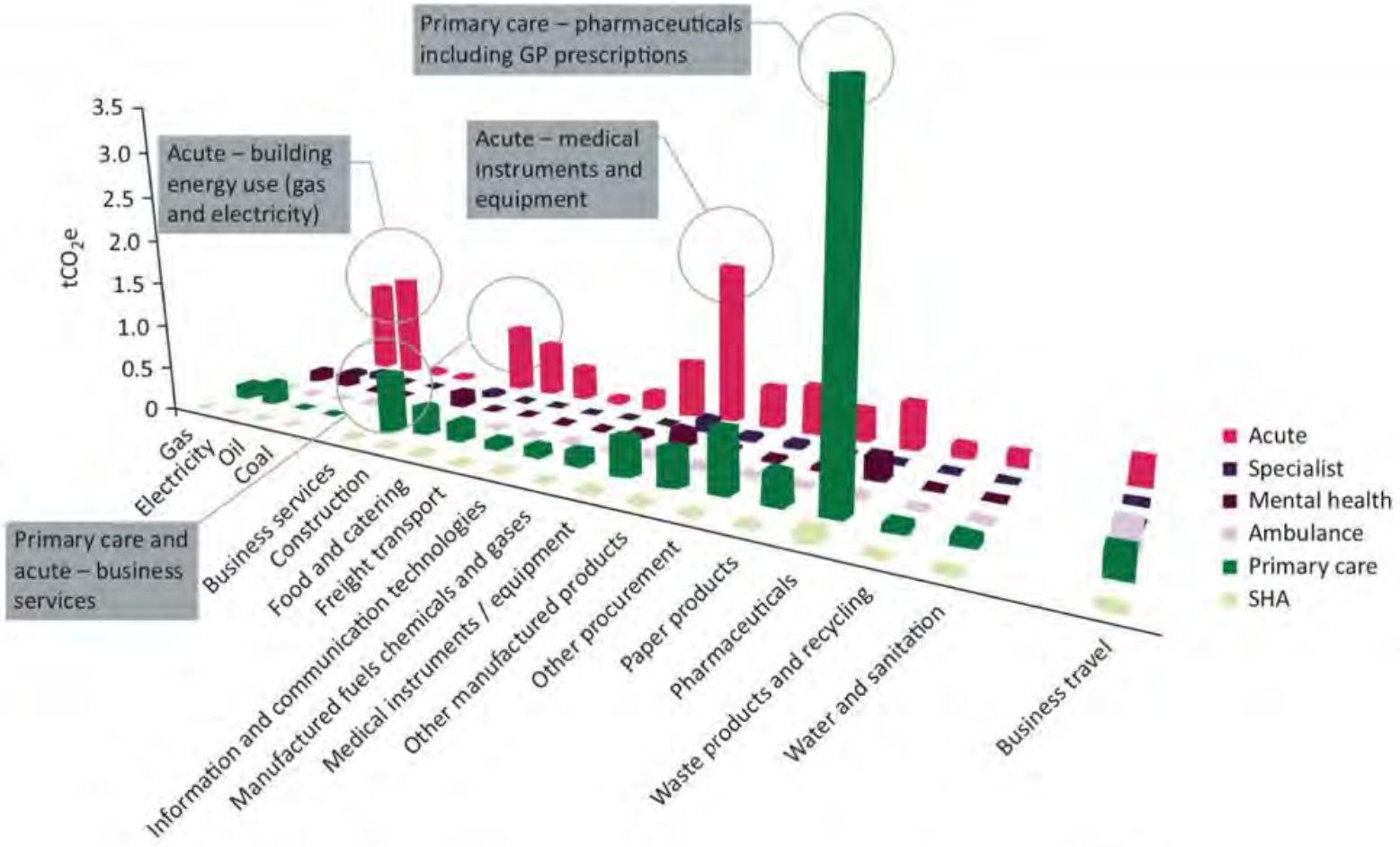


Fig 4. Goods and services carbon hotspots by healthcare sector. Source: *Goods and services carbon hotspots*. NHS Sustainable Development Unit, 2012.[10] Reproduced with permission. SHA = strategic health authority

METERED-DOSE INHALERS

A BRIEF HISTORY OF MDIS

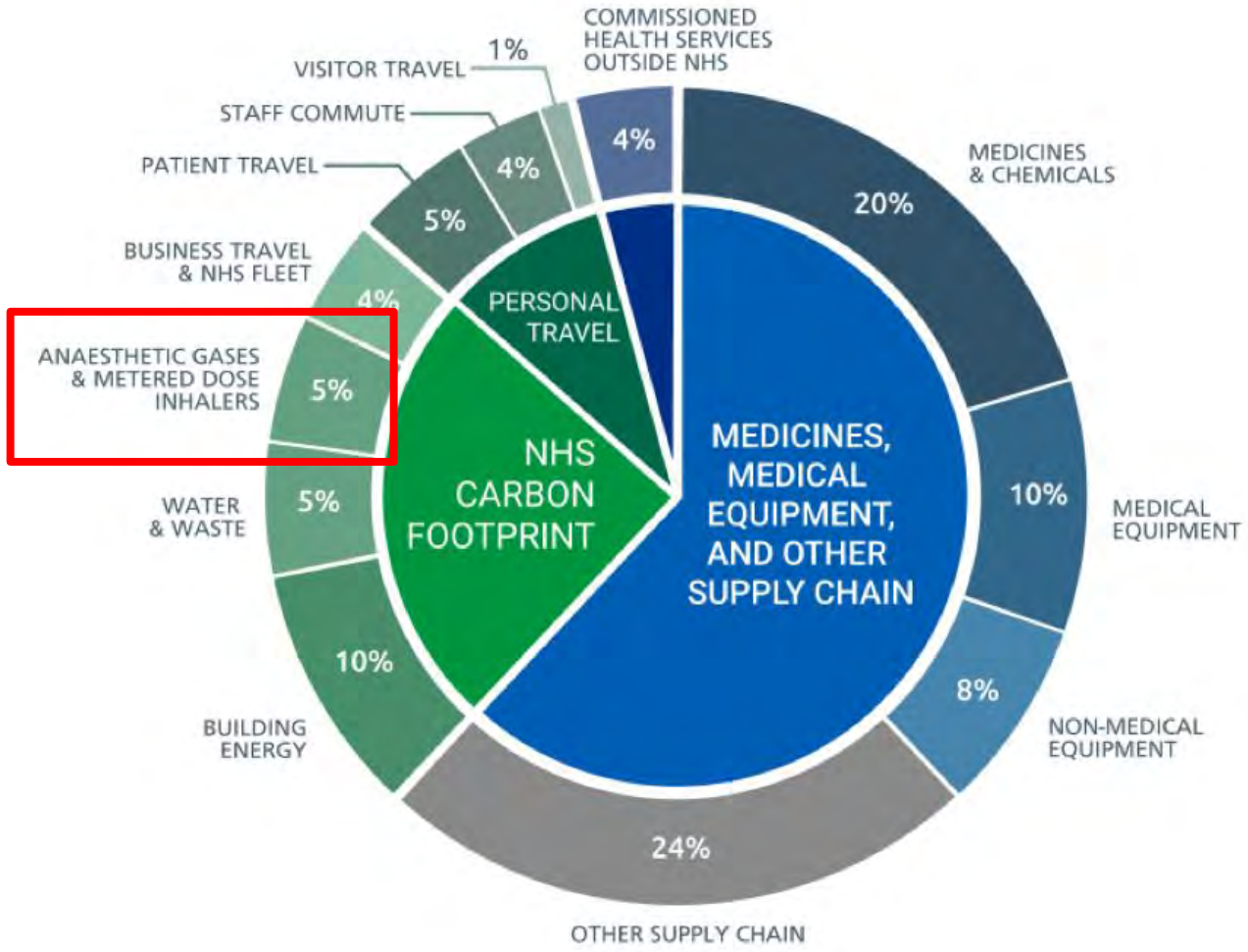
1950s
- 1956 MDIs first introduced
- CFC propellants used

1990s
- 1987 Montreal protocol to reduce ozone depleting chemicals
- MDI propellant changed to HFA

2000s
- 1997 Kyoto protocol to reduce GHG emissions
- Boom of inhaler innovation with varying degrees of uptake

(Stein & Thiel, 2017)

Source: https://cascadescanada.ca/resources/all-topics/inhalers/infographics-posters-inhalers/



ARE THEY REALLY THAT BIG OF A **DEAL...?**

3.5% of NHS carbon footprint comes exclusively from Metered Dose Inhalers (Tennison et al, 2021)

Fraser Health Authority
INHALER DISPENSATION AND EMISSIONS DATA (2016–2021)

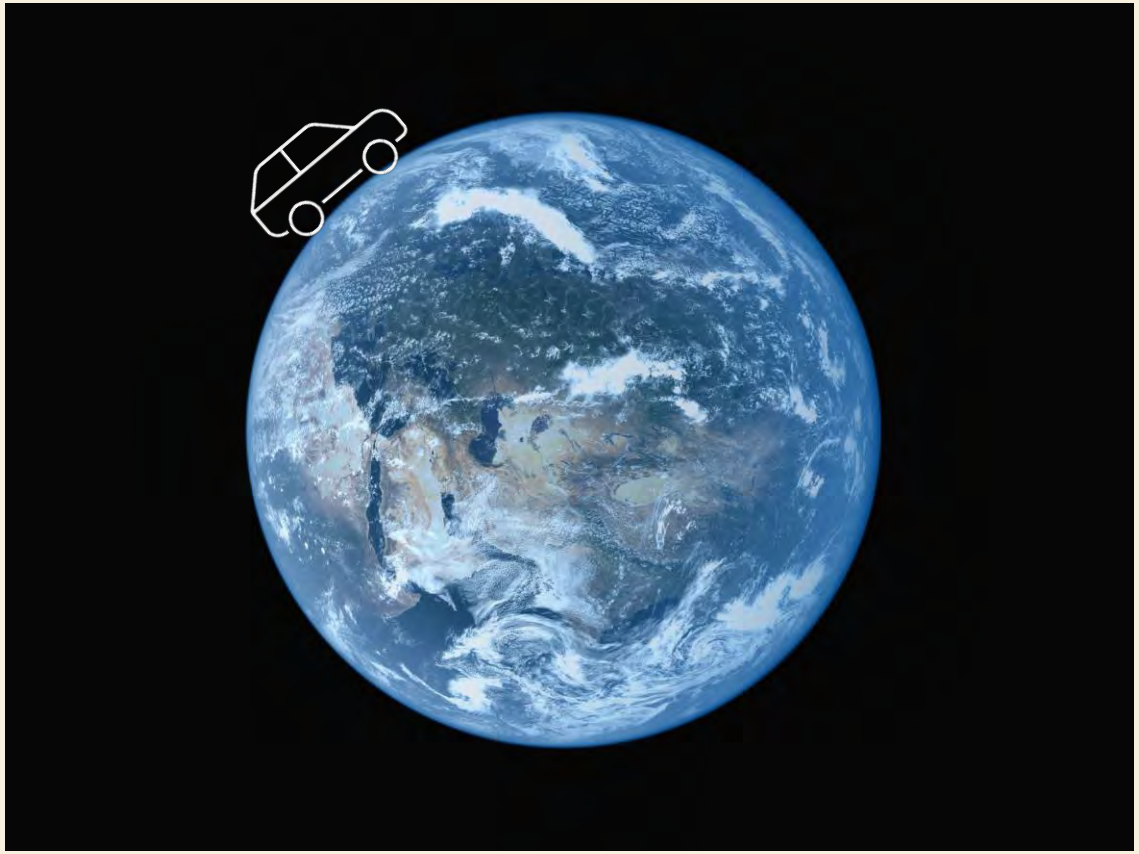
Year	Number of MDIs	Number of DPIs/SMIs	Total Carbon Footprint	Percentage of Footprint from	Fraser Health Carbon Footprint	Percentage of Fraser Health Footprint (%)
2016						
201						
20						
2019						
2020						26.3
2021	354,704					21.7
Annual Average	394,094	199,536	9,822	98.7	38,951	23.2

9822 (tC02e) is equivalent to 39,236,165 km driven by an average gasoline-powered passenger vehicle

Slide borrowed with gratitude
From Darryl Quantz
Public Health, FHA

A SINGLE BC HEALTH AUTHORITY'S INHALER USE IS EQUIVALENT TO…

Driving around the circumference of the earth 979 times



WORLDWIDE…

1 ton HFA134a = 1,300 tons CO_2

800 million inhalers are produced yearly worldwide (MTOC, 2018)

… over 13 BILLION tons CO_2e

NOT ALL INHALER DEVICES ARE MADE EQUAL

MDIs	DPIs			SMIs
	Diskus 	Ellipta 	Twisthaler 	
	Turbuhaler 	Handihaler 	Breezhaler 	
	Genuair 	Respclick 	Inhub 	

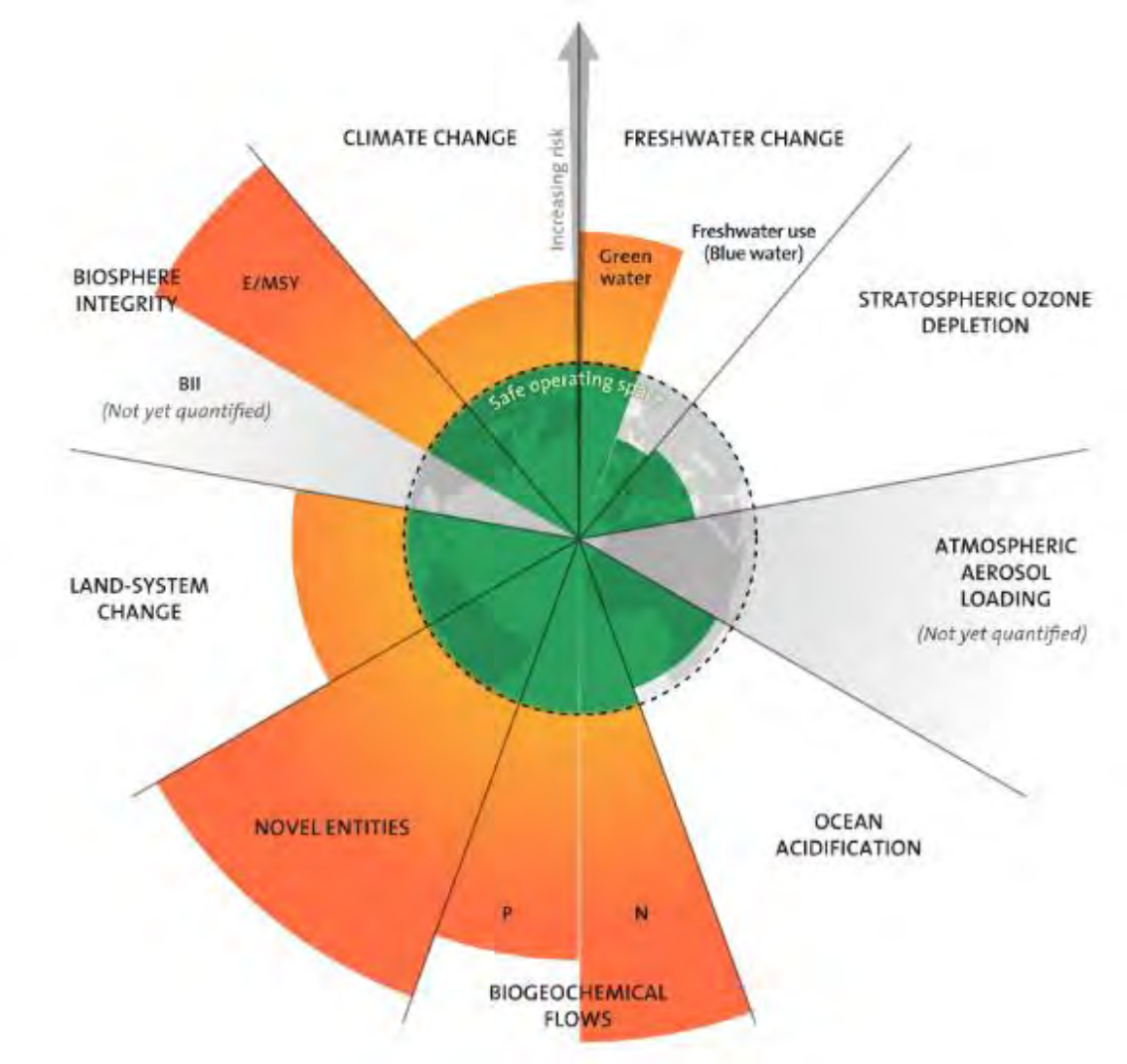
SOME (MORE) MDI CONCERNS

- Exorbitant carbon footprint

- Require complex coordination techniques to achieve a clinically effective dose
  - Critical handling error compromising drug delivery in 44% of MDI uses; compared to 21% for DPI (Diskus) (Molimard et al, 2017)

- No dose counters
  - OVERestimating doses left: Up to 40% of patients believe they are taking their medication when MDI empty (Conner & Buck, 2013)
  - UNDERrestimating number of doses left: More than half of patients refill their MDIs more frequently than would be advised (Sander et al, 2006)

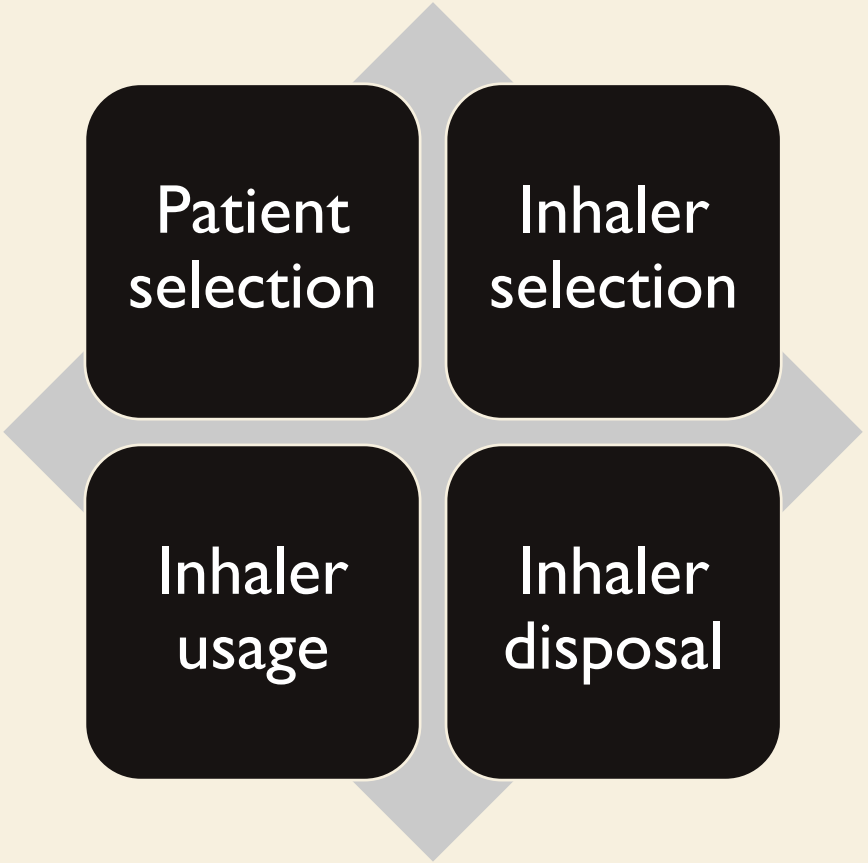
PLANETARY BOUNDARIES AND DIFFERENT INHALER DEVICES



Jeswani, 2019

Image: https://www.stockholmresilience.org/research/planetary-boundaries.html

WHAT CAN I DO IN MY PRACTICE?



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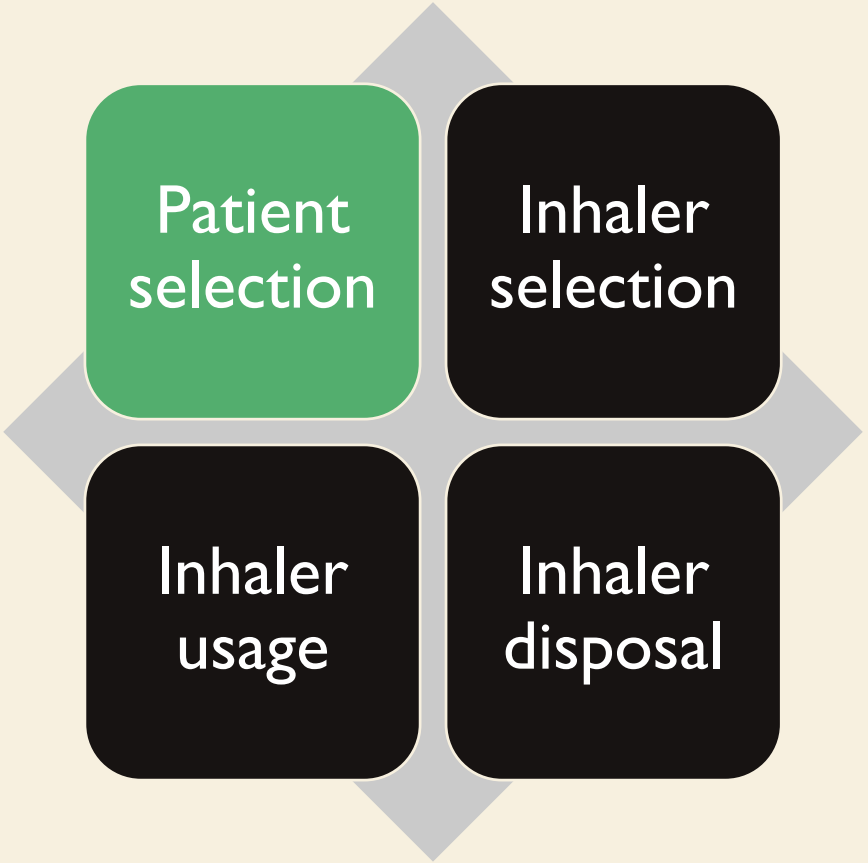

DOES MY PATIENT ACTUALLY NEED AN INHALER?

- 1/3 patients labelled with asthma don't have asthma (Aaron et al, 2017)
- 4/5 patients with negative spirometry remain on an inhaler (GINA, 2021)
- Manage expectations (Ebell et al, 2013)
  - Typical duration of post-viral cough 18 days
  - Patient expectation of post-viral cough 5-9 days
  - What's the harm? (Kavanagh et al, 2019)
    - Missing an alternate diagnosis
    - Identifying/labelling someone as sick
    - Financial impact
    - Drug side effects
    - Insurance coverage issues

Choosing Wisely Canada™

DOES MY PATIENT ACTUALLY NEED AN INHALER?

Don't initiate long-term maintenance inhalers in stable patients with suspected COPD if they have not had confirmation of post-bronchodilator airflow obstruction with spirometry. (Choosing Wisely Canada, 2021)

Don't initiate medications for asthma (e.g., inhalers, leukotriene receptor antagonists, or other) in patients ≥ 6 years old who have not had confirmation of reversible airflow limitation with spirometry, and in its absence, a positive methacholine or exercise challenge test, or sufficient peak expiratory flow variability. (Choosing Wisely Canada, 2021)

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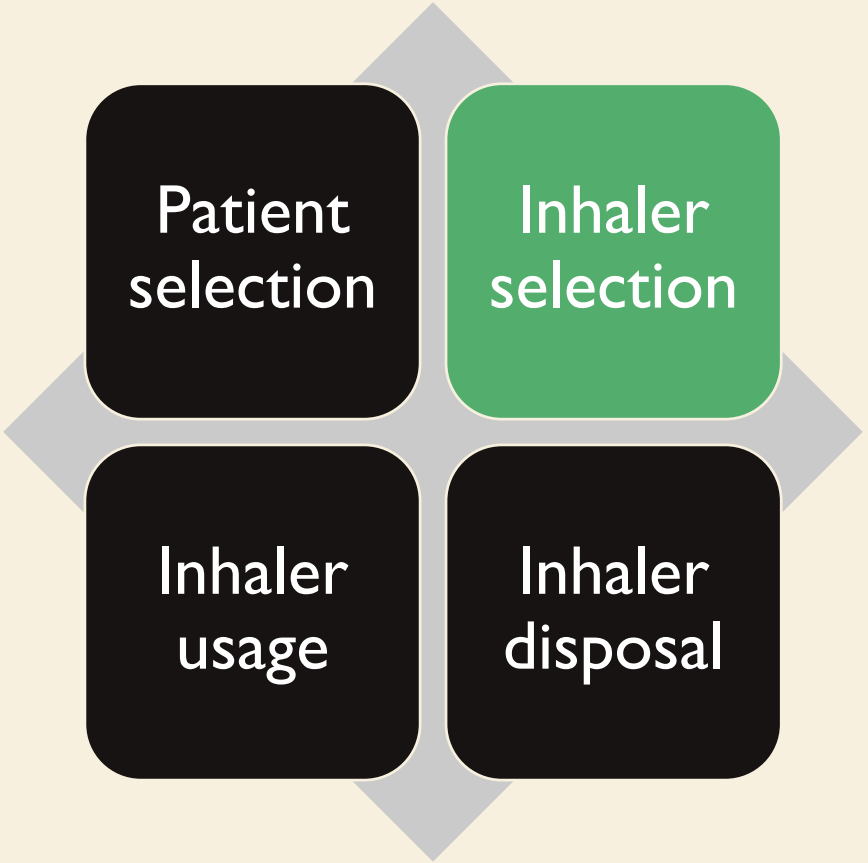
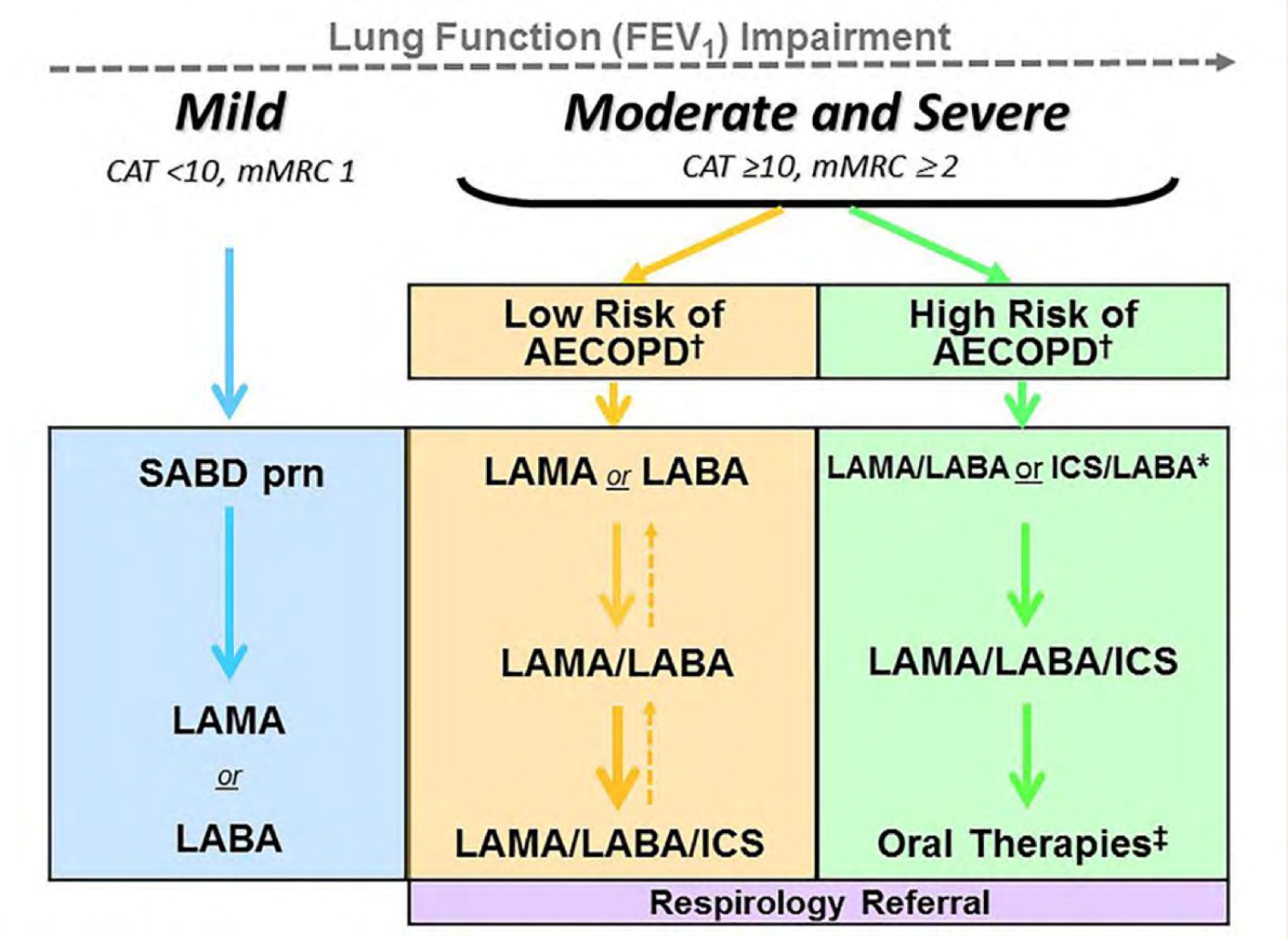


IS MY PATIENT GETTING THE RIGHT INHALER?

- Are they getting the right drug class? Are they getting the right dose?
- Are they getting the right delivery mechanism for them?
- Are they comfortable with the decision to change their inhaler?
- Can they afford this prescription? Can I make it more affordable?

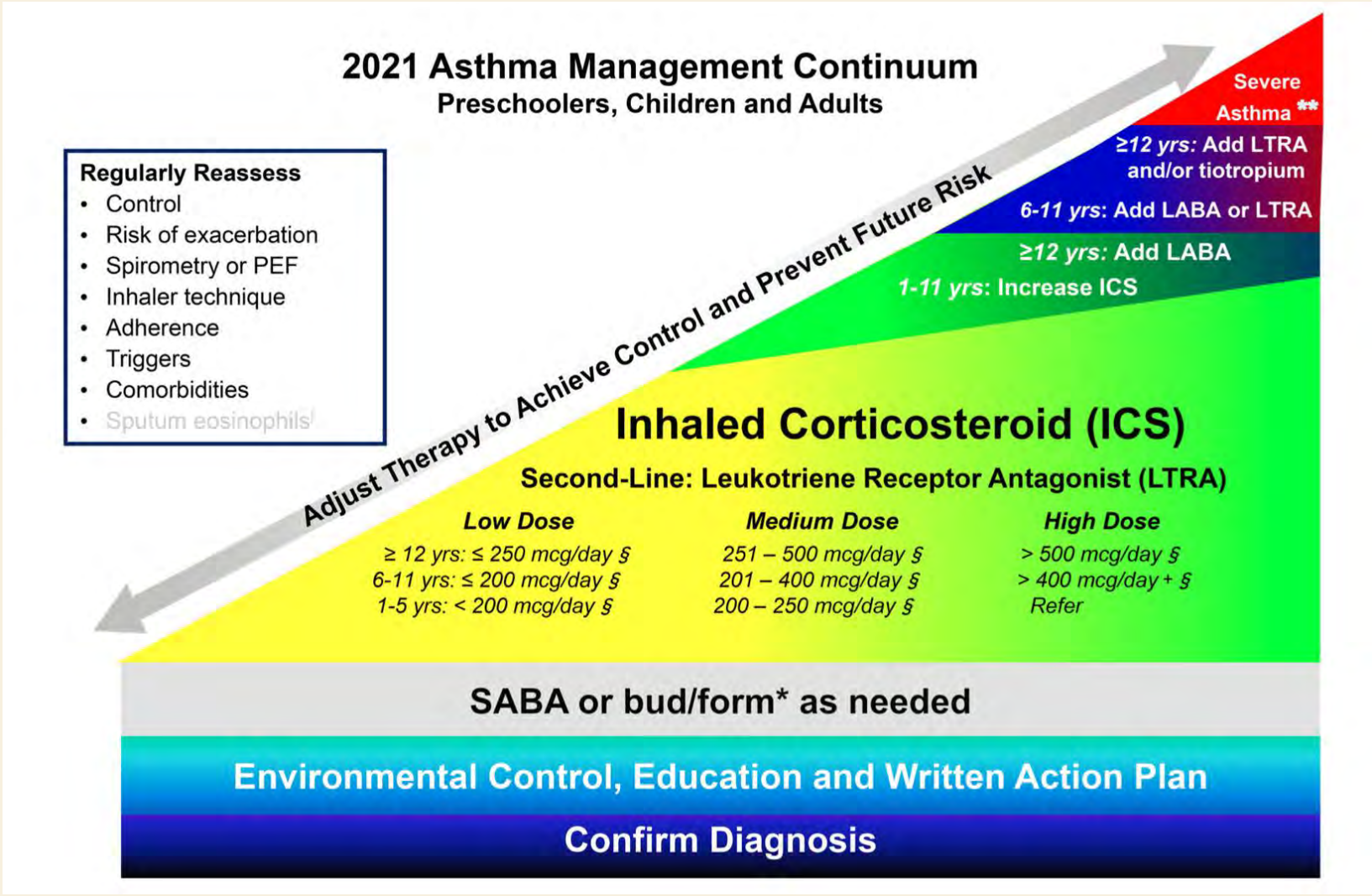
ASTHMA VS COPD

COPD



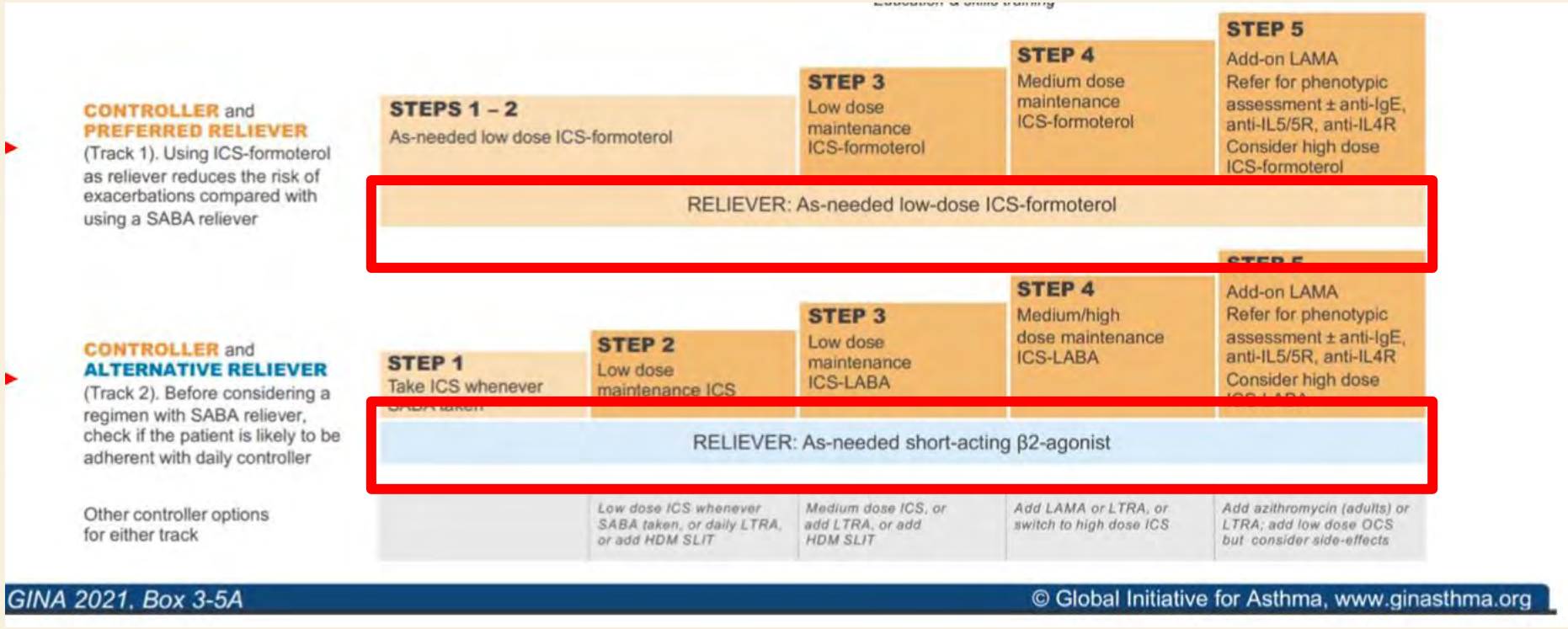
CTS 2019 COPD GUIDELINE

ASTHMA



CTS 2021 ASTHMA GUIDELINE

ARE THEY GETTING THE RIGHT DRUG CLASS? THE RIGHT DOSE?



(GINA, 2021)

Table 3. Well-controlled asthma criteria.

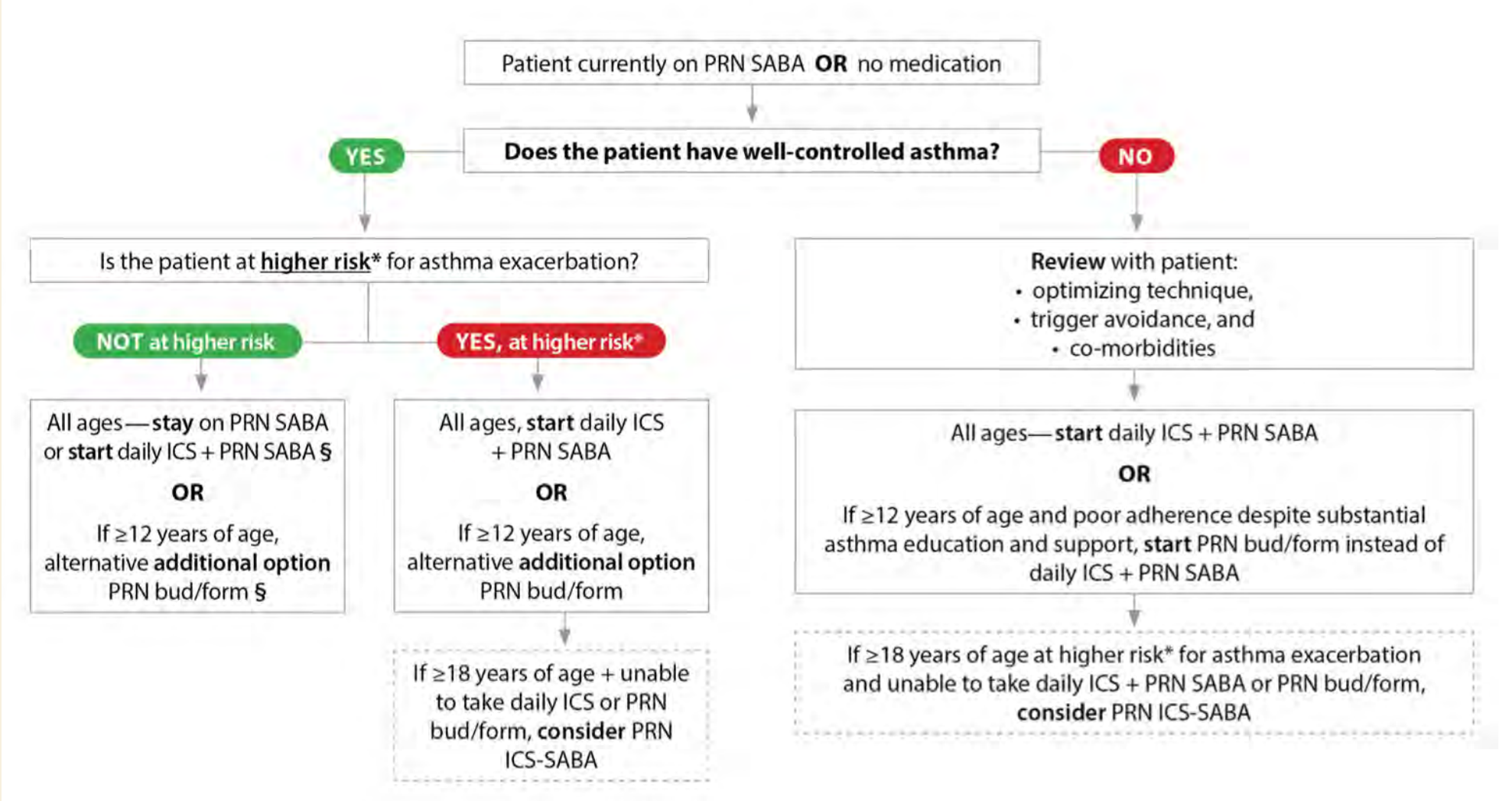
Characteristic	Frequency or value
Daytime symptoms	≤2 days/week
Nighttime symptoms	<1 night/week and mild
Physical activity	Normal
Exacerbations	Mild and infrequent*
Absence from work or school due to asthma	None
Need for a reliever (SABA or bud/form)†	≤2 doses per week
FEV_1 or PEF	≥90% of personal best
PEF diurnal variation	<10–15%#
Sputum eosinophils	<2–3%•

A patient who meets all of the above criteria would be considered to have well-controlled asthma.

IS MY PATIENT RELYING TOO HEAVILY ON SABAS?

(CTS Guidelines, 2021)

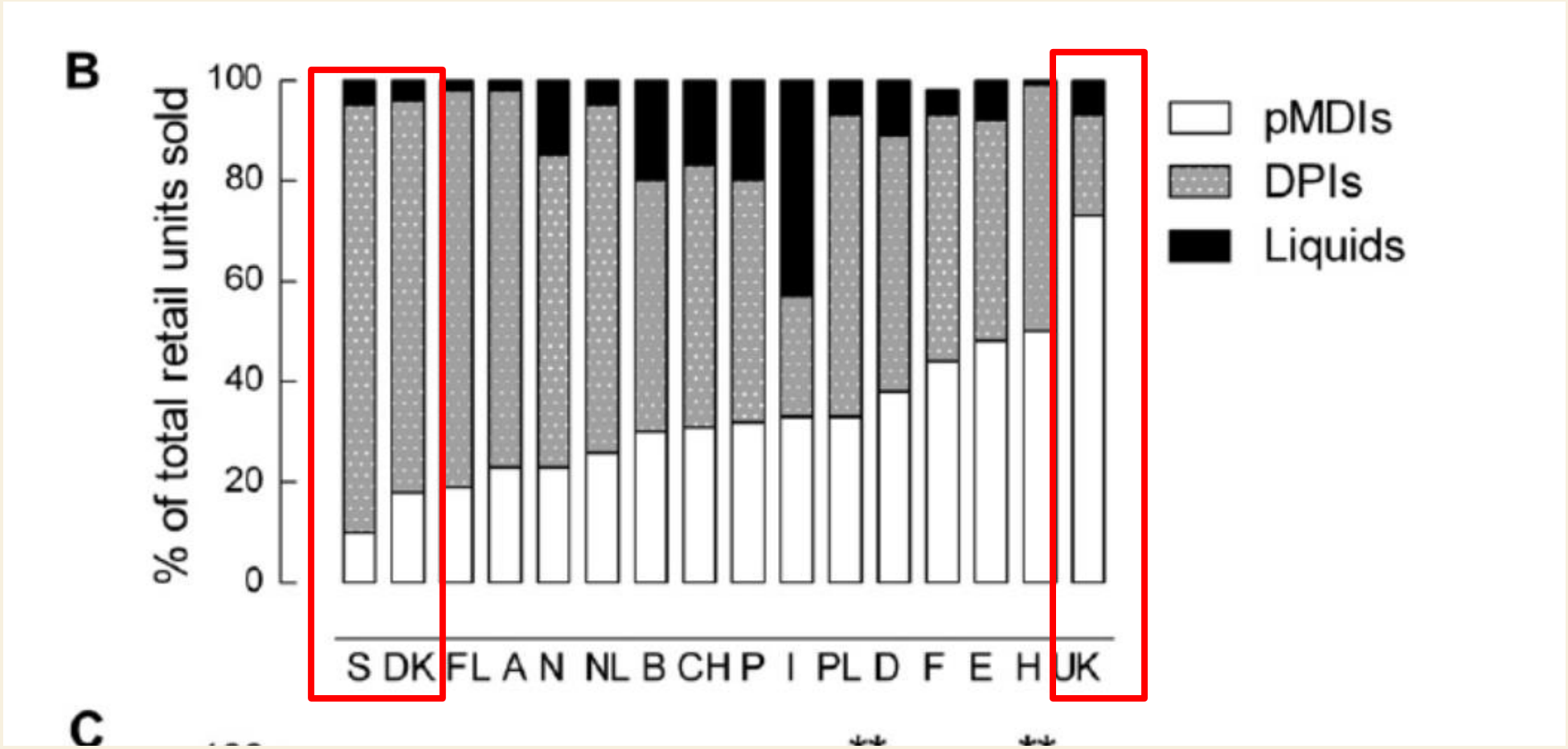
Before represcribing SABA monotherapy, consider



MDIs	DPIs			SMIs
	Diskus 	Ellipta 	Twisthaler 	
	Turbuhaler 	Handihaler 	Breezhaler 	
	Genuair 	Respclick 	Inhub 	

www.lung.ca ☐ Patient education ☐ Inhaler use videos

WHAT'S EUROPE DOING?



(Lavorini et al, 2011)

Table 1. Minimal and Optimal Peak Inspiratory Flow Rates (L/min) for Dry Powder Inhalers

Device	*Minimal*	*Optimal*
Turbuhaler®/Flexhaler®	30	60
Easyhaler®	30	30
Diskus®	30	60
HandiHaler®	20	30
Ellipta®	30	60
Aerolizer®	40	65
Genuair®	40	45
Breezhaler®	50	50
Spiromax®	40	40
Novolizer®	35	50
NEXThaler®	35	35

(Ghosh et al, 2017)

IS MY PATIENT GETTING THE RIGHT DELIVERY MECHANISM FOR THEM?

What is their inspiratory capacity?

- PIFR consistently reduced at FEV1 < 30% (Prime et al, 2015)
- PIFR < 30 in 10-12% of patients with COPD (Chen et al, 2020;Hua et al 2020)

Do they have physical barriers to inhaler use?

- Arthritis, weakness, etc

CO_2e saving effect/year

Change to plant based diet: 500 kg
Change gasoline to hybrid car: 500 kg

Avoid all food waste: 370 kg

Wash clothes in cold water: 250 kg

Recycle: 210 kg

Wall insulation: 180 kg

Upgrade light bulbs: 60 kg
Plant a tree: 35 kg

(Janson et al, 2019)

WILL IT REALLY MAKE THAT BIG OF A **DIFFERENCE? IT'S ONLY ONE INHALER...**

Switching ONE patient's daily controller from MDI to DPI

- ☐ 235kg CO2/year

Switching ONE patient's daily controller and their SABA from MDI to DPI

- ☐ **425kg CO2/year**

IS MY PATIENT COMFORTABLE WITH CHANGING INHALERS?

- Importance of shared decision-making when discussing inhaler changes (Bloom et al, 2019; Bjermer, 2014)
- Non-consensual switch associated with "patient discontent, reduced confidence in the medication, and [patient] uncertainty regarding the degree of disease control" (Pangione et al, 2020)
- Some DPIs and Lactose content considerations

WHAT ABOUT COST OF SWITCHING?

Example of moderate intensity ICS prescription	**Cost of inhaler***	**Number of actuations per device**	**Cost per dose****
Fluticasone MDI 125 mcg 1 inh BID	$66.63	120	**$0.56/dose**
Budesonide DPI 200 mcg 1 inh BID	$91.17	200	**$0.46/dose**
Example of moderate intensity ICS/LABA prescription	**Cost of inhaler*****	**Number of actuations per device**	**Cost per dose****
Fluticasone/Salmeterol MDI 125/25 mcg 1 inh BID	$140.82	120	**$1.17/dose**
Budesonide/Formoterol DPI 200/6 mcg 1 inh BID	$115.86	120	**$0.97/dose**
Example of SABA prescription	**Cost of inhaler***	**Number of actuations per device**	**Cost per dose****
Salbutamol MDI 100 mcg 2 inh QID PRN	$18.45	200	**$0.19/dose (2 inh)**
Terbutaline DPI 0.5 mg 1 inh QID PRN	$21.38	100	**$0.21/dose**

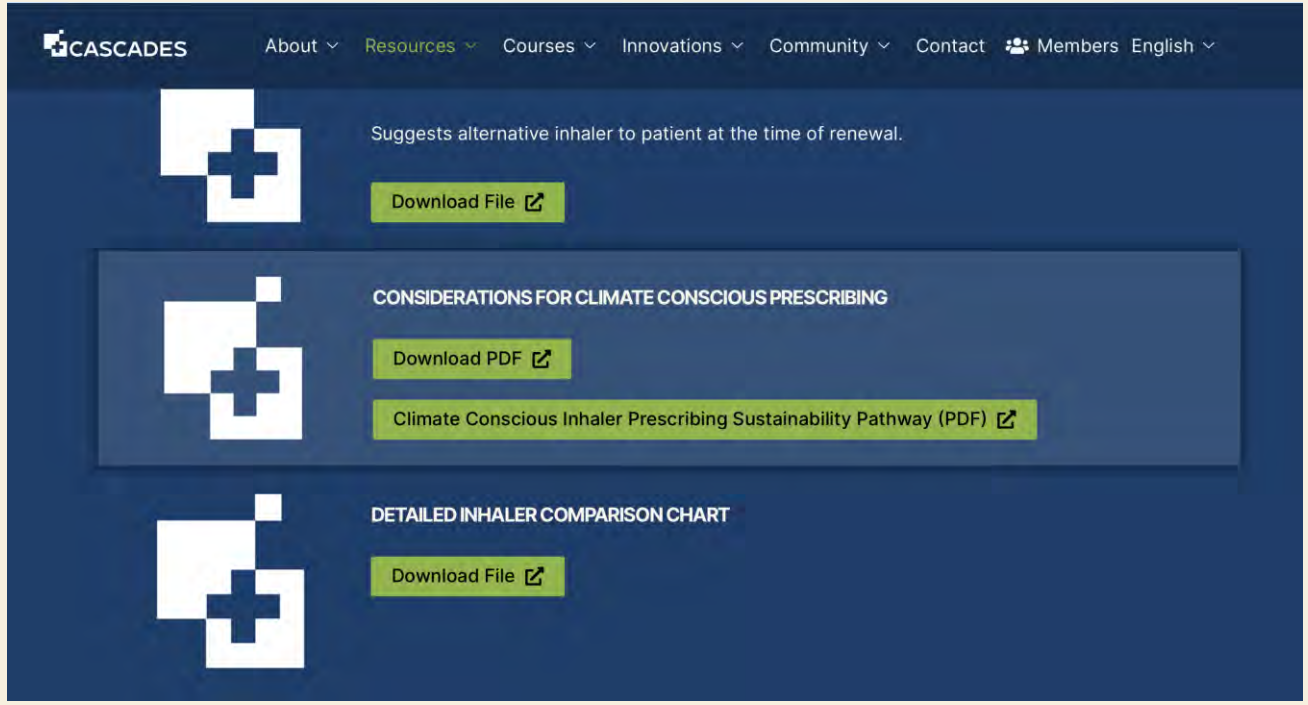
**excludes dispensing fee*

***cost retrieved from drugsearch.ca*

Stoynova & Culley, 2022

What's covered in BC?

- SABA – Salbutamol MDI and Terbutaline DPI
- ICS – ALL single agent ICS regardless of device type



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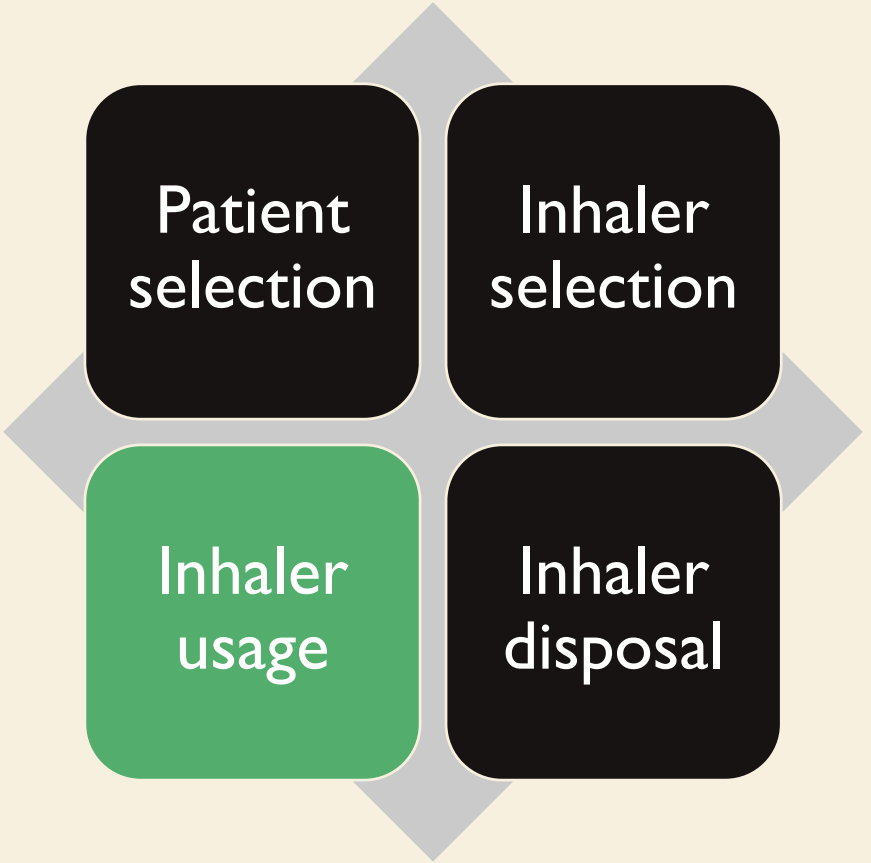


INHALER TECHNIQUE

- Familiarize yourself with different inhaler delivery mechanisms

https://www.lung.ca/lung-health/get-help/how-use-your-inhaler

- Review patient's technique– or ask pharmacist/RT to do so

- Counsel on appropriate usage

WHAT CAN I DO IN MY PRACTICE?

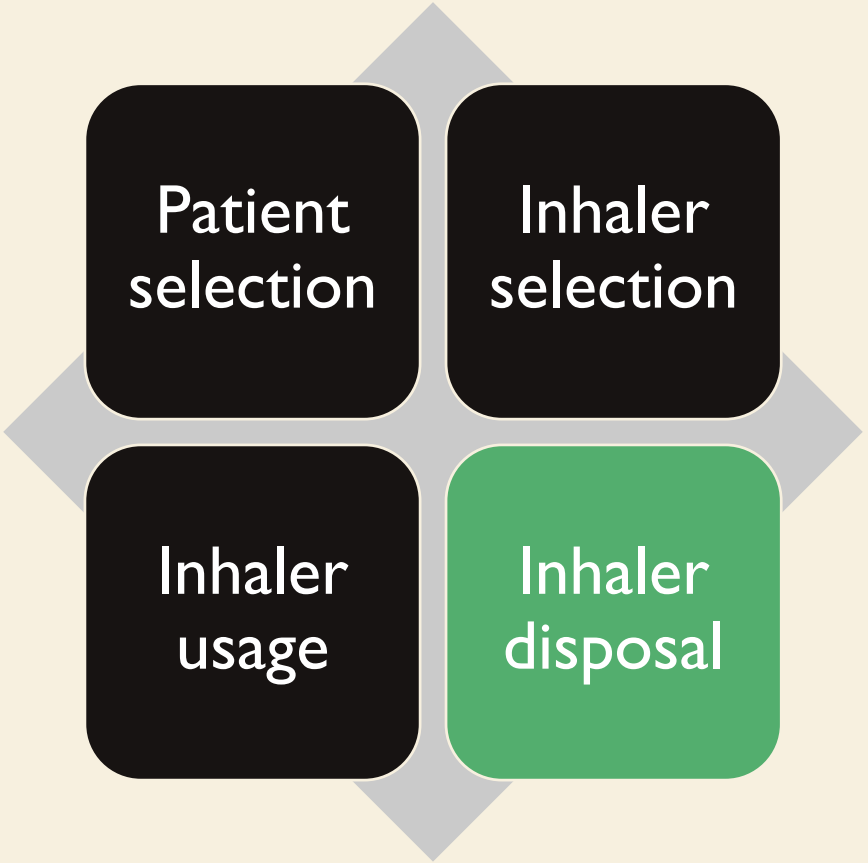
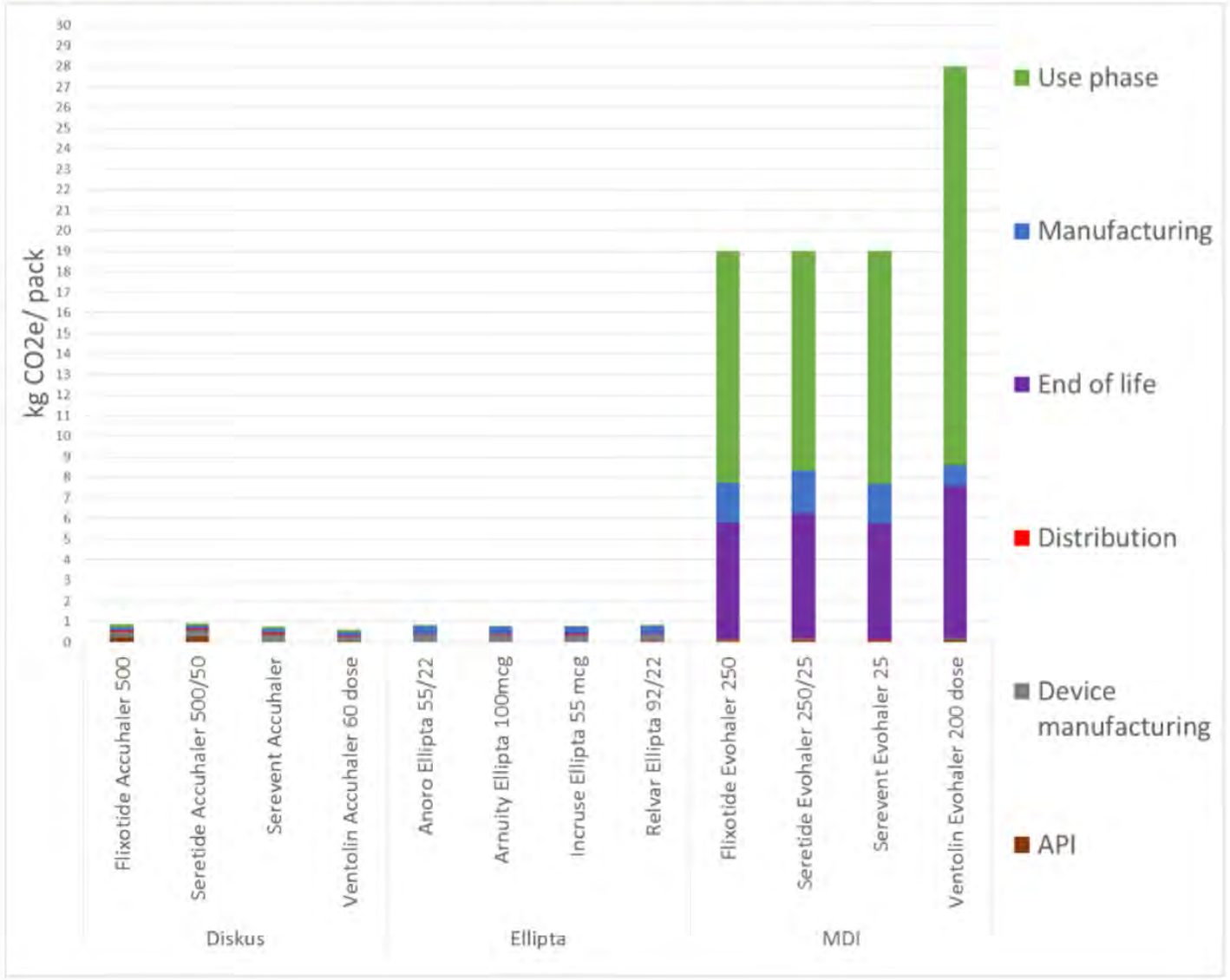


Figure 1: Absolute emissions per pack (kg CO2e/pack) for all products



INHALER DISPOSAL

A third of MDI footprint comes from from end-of-life emissions (Janson et al, 2020)

You can't just chuck these things in the trash!

- Bring to pharmacy for safe disposal
- Current best practices are incineration which is poorly enacted (Thomas et al, 2019)

CASE – Jeremy Bearimy

- 21M previously healthy
- “I had asthma as a kid but I outgrew it”
- Worsening wheezing, shortness of breath – can’t keep up with the varsity basketball team

- “I got a blue inhaler at a walk in clinic and it works – I just need a refill”

- Uses salbutamol as rescue inhaler 8-10 times a day, including nocturnal symptoms twice a week

…what now?

- 1) Does my patient need an inhaler?
  - Spirometry FEV1 72% predicted with significant bronchodilator response (18% and 300mL)
- 2) Is my patient getting the right inhaler?
  - Asthma → poorly controlled
  - Needs steroids → Budesonide 200 mg 1 inh BID
- 3) Does my patient know how to use their inhaler?
  - "New prescription. Please review inhaler technique"
- 4) "Please bring your inhaler back to the pharmacy"

MORE THAN JUST INHALERS…

National Health Service, 2021

QUESTIONS?
COMMENTS?

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