

Prescribing & wastage

Mathilde Gaudreau-Simard, MD MHSc

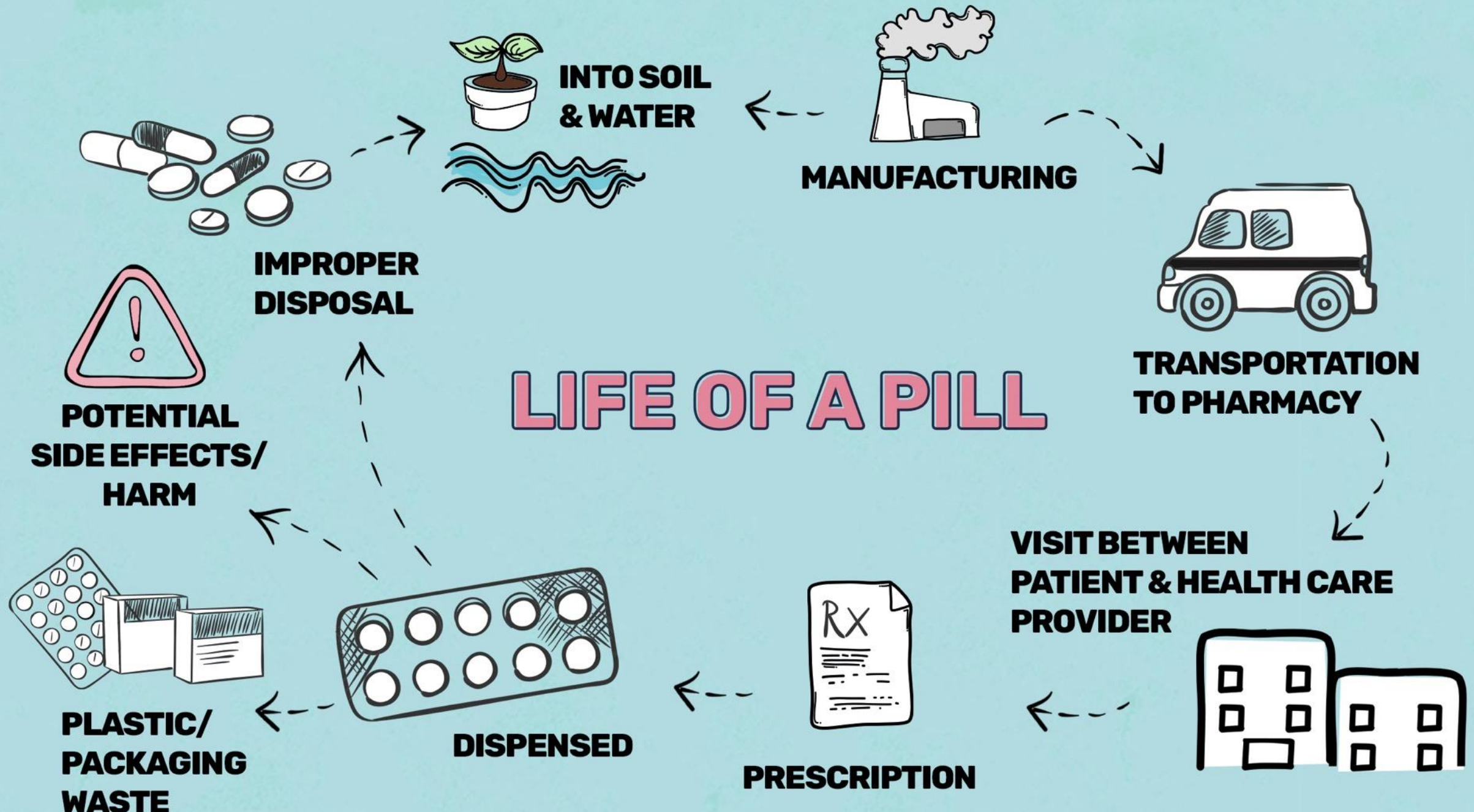
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Faculty/Presenter Disclosure

- **Faculty:** Mathilde Gaudreau-Simard
- **Relationships with financial sponsors:**
 - None

LIFE OF A PILL

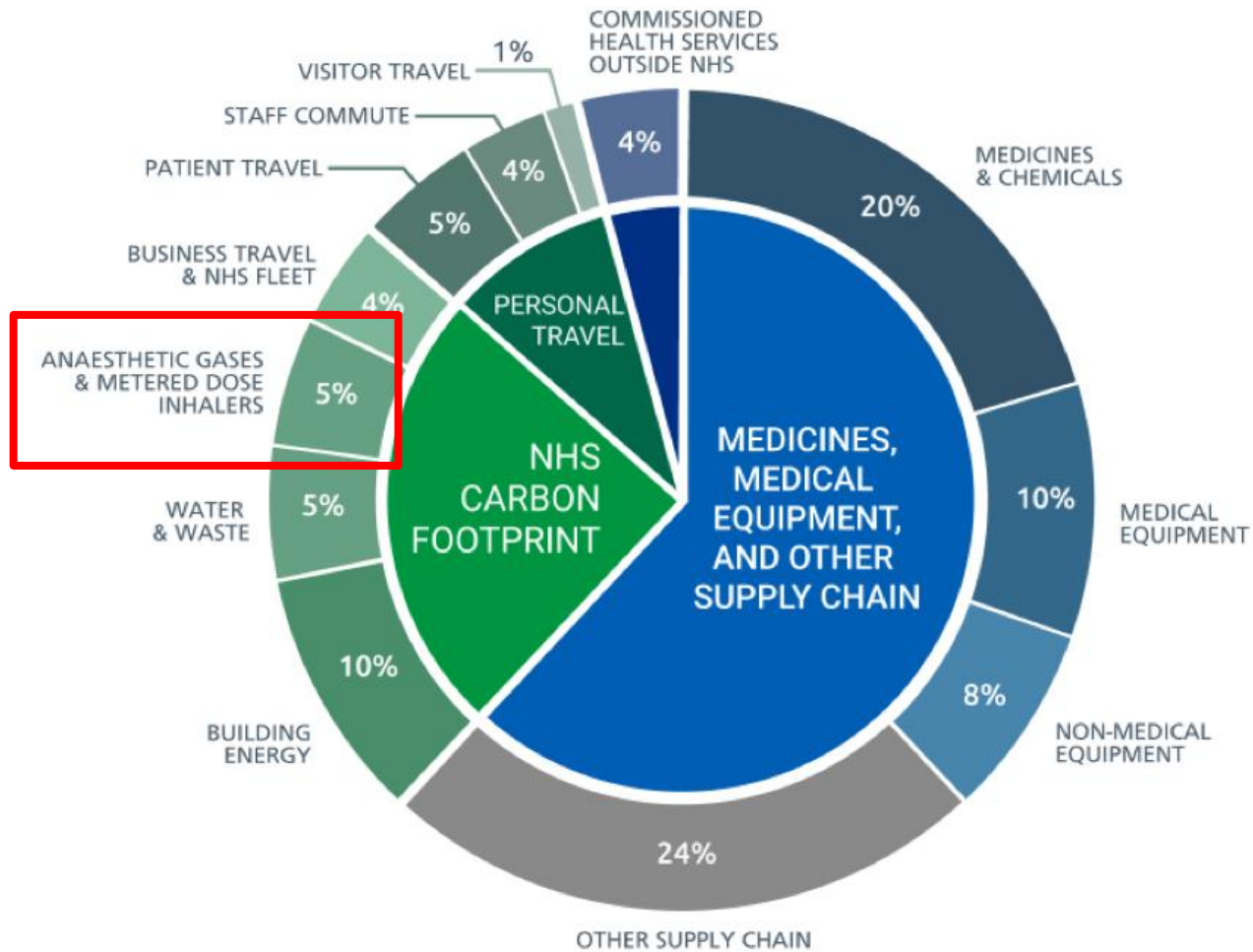




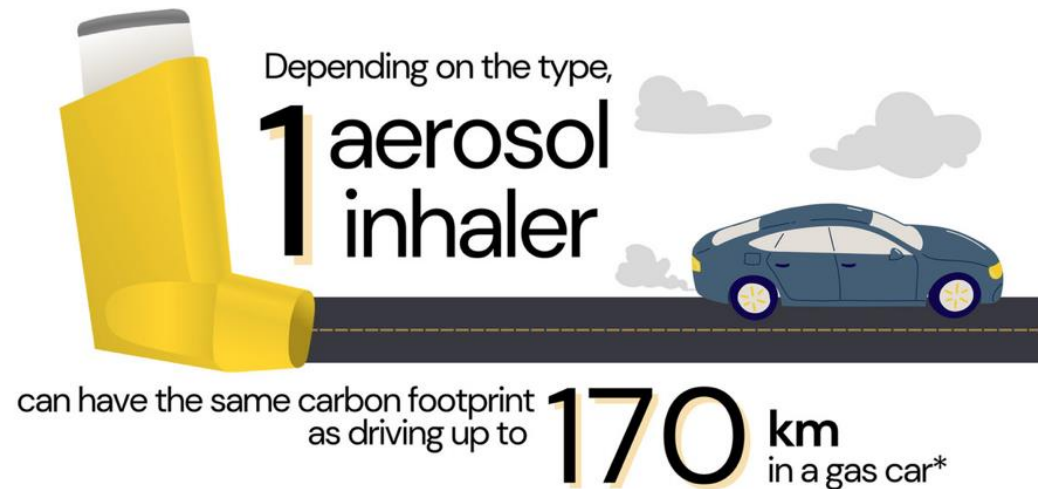
The unique case of Metered Dose Inhalers (MDIs)

Why MDIs?

3.5% of NHS carbon footprint comes exclusively from Metered Dose Inhalers



High carbon footprint



High burden of disease

- In Canada,
 - 3.8 million people over the age of 1 are living with asthma
 - 2.0 million are living with chronic obstructive pulmonary disease (COPD)

Prone to wastage

- A BC study found that (1)
 - 34% of all ipratropium inhalers dispensed were wasted
 - 87% of all doses dispensed were wasted
- US study (2)
 - Among more than 500 patients with COPD or asthma admitted to hospital, 87% of MDI- and DPI-dispensed doses were wasted


(1) Aeng ESY, McDougal KC, Allegretto-Smith EM, Tejani AM. Hidden costs of multiple-dose products: quantifying Ipratropium inhaler wastage in the hospital setting. *Can J Hosp Pharm* [Internet] 2021;74(2):117.

(2) Sakaan S, Ulrich D, Luo J, Finch CK, Self TH. Inhaler use in hospitalized patients with chronic obstructive pulmonary disease or asthma: assessment of wasted doses. *Hosp Pharm* 2015;50(5):386-90.

Environmentally sustainable
opportunities for health systems:
Metered-dose inhaler prescribing,
dispensing, use and waste at a
tertiary academic centre

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Methods

- Retrospective point-prevalence study at the Ottawa Hospital (tertiary care center, 2 campuses)
- Adult patients, admitted to medicine or surgery & discharged or deceased, with at least 1 MDI prescription



prescriptions



MDIs dispensed



actuations used



MDIs with no use
actuations wasted

TABLE 1 Baseline characteristics

Characteristics*	All patients, n = 100	
Age (years)	69.4 ± 15.9	
Sex (female)	60/100 (60)	
Smoking status	Current smoker	25/100 (25)
	Past smoker	45/100 (45)
	Nonsmoker	30/100 (30)
Comorbidities (percentage)	COPD diagnosis	43/100 (43)
	COPD requiring oxygen use at home	5/100 (5)
	Asthma	40/100 (40)
Metered-dose inhalers prescribed at home	Salbutamol	62/100 (62)
	Ipratropium	6/100 (6)
	Fluticasone	6/100 (6)
	Ciclesonide	1/100 (1)
	Fluticasone/salmeterol	4/100 (4)
	Mometasone/formoterol	7/100 (7)
Inpatient diagnoses	Asthma exacerbation	7/100 (7)
	COPD exacerbation	28/100 (28)
	Respiratory tract infection	43/100 (43)
	Shortness of breath related to heart failure	14/100 (14)
	Pulmonary embolism	5/100 (5)
	Bronchiectasis	9/100 (9)
	Pulmonary fibrosis	8/100 (8)
Admission service	Sarcoidosis	1/100 (1)
	Medicine	90/100 (90)
	Surgery	10/100 (10)
Physical transfers per patient between units during admission	4 (0–11)	
Hospital length of stay (days)	7 (1–47)	

*Data presented as mean ± standard deviation, proportion (%) or median (range). COPD, chronic obstructive pulmonary disease.

TABLE 2 Dispensing, use and waste of MDIs prescribed in hospital

	Salbutamol		Ipratropium		Ciclesonide		Aggregate of all 3 MDIs
	Per patient	Aggregate (n = 100)	Per patient	Aggregate (n = 100)	Per patient	Aggregate (n = 100)	Aggregate (n = 100)
MDI prescriptions	1	100	0.5	50	0.07	7	NA
No. of MDIs dispensed	1 (1–7)	191	2 (1–7)	116	1 (1–2)	8	315
No. of MDIs with no use	1 (0–3)	66	0 (0–6)	29	0 (0–1)	1	96
No. of actuations dispensed	200 (200–1400)	38,200	400 (200–1400)	23,200	30 (30–60)	240	61,440
No. of actuations used	5 (0–232)	2656	26 (0–244)	1947	8 (0–35)	64	4667
No. of actuations wasted	200 (44–1322)	35,544	372 (44–1394)	21,053	25 (20–30)	176	56,773
No. of actuations used/dispensed	2656/38,200 (7%)		1947/23,200 (8%)		64/240 (27%)		4667/61,440 (8%)
Estimated annual MDIs dispensed from purchasing data	9240		4931		819		14,990
Estimated annual carbon cost of wasted actuations (tCO ₂ e)	242.3		66.2		7.3		315.8

Aggregate refers to the entire study cohort of 100 patients. Data presented as actual counts, median (range) or proportion (percentage). MDI, metered-dose inhaler; NA, not applicable; tCO₂e, tons of carbon dioxide equivalents.

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- Extrapolated to annual inventory and purchasing history (14,990 MDIs used/yr)
- MDI waste contributes **315.8 tCO₂e** to TOH's greenhouse gas emissions





What can we do?

Prescribing





Reduce Demand for Health Services



Social
Determinants
of Health



Health
Promotion



Disease
Prevention



Chronic
Disease
Management



Match Supply of Health Services to Demand



Primary and
Community
Care Services



Ensure
Appropriateness
of Care



Stewardship
Programs



Reduce Emissions from Supply of Health Services



Green
Infrastructure
and Operations



Decarbonised
Transport



Circular Economy
in Supply Chains



Coordinated
Care Delivery



Integrated
Technology
Systems



Virtual
Care

DOES MY PATIENT ACTUALLY NEED AN INHALER?


- 1/3 patients labelled with asthma don't have asthma (1)
- 4/5 patients with negative spirometry remain on an inhaler (2)
- Manage expectations (3)
 - Typical duration of post-viral cough 18 days
 - Patient expectation of post-viral cough 5-9 days

Inpatient diagnoses	Asthma exacerbation	7/100 (7)
	COPD exacerbation	28/100 (28)
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	Pulmonary fibrosis	8/100 (8)
	Sarcoidosis	1/100 (1)

(1) Aaron SD, Vandemheen KL, FitzGerald JM, Ainslie M, Gupta S, Lemièrre C, Field SK, McIvor RA, Hernandez P, Mayers I, Mulpuru S, Alvarez GG, Pakhale S, Mallick R, Boulet LP; Canadian Respiratory Research Network. Reevaluation of Diagnosis in Adults With Physician-Diagnosed Asthma. *JAMA*. 2017 Jan 17;317(3):269-279.

(2) Global Initiative for Asthma, 2021, <https://ginasthma.org/reports/>

(3) Ebell MH, Lundgren J, Youngpairoj S. How long does a cough last? Comparing patients' expectations with data from a systematic review of the literature. *Ann Fam Med*. 2013 Jan-Feb;11(1):5-13. doi: 10.1370/afm.1430. PMID: 23319500; PMCID: PMC3596033.

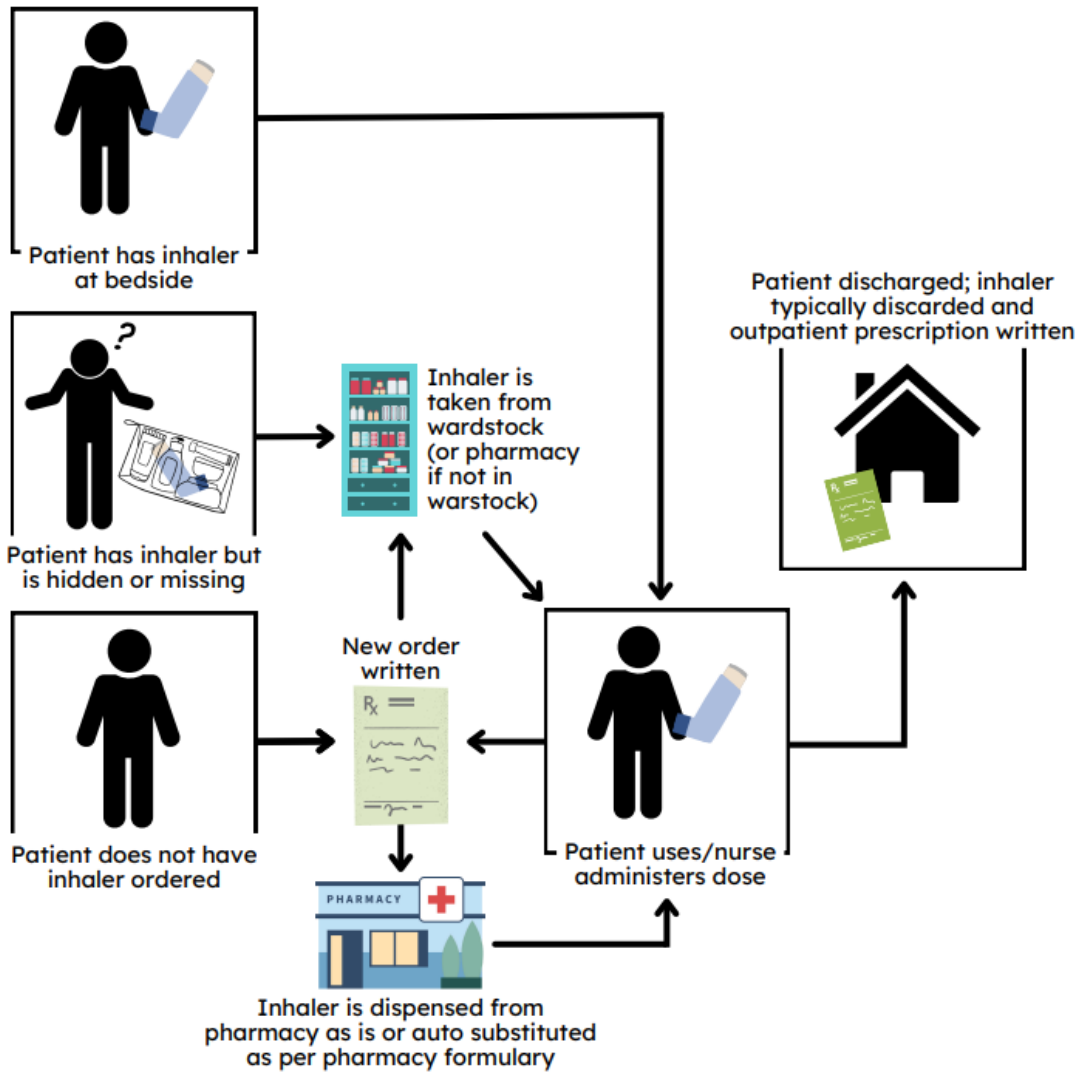


Don't prescribe greenhouse gas-intensive metered-dose inhalers (MDIs) where a lower carbon alternative with comparable efficacy is available (e.g. dried-powder inhaler, soft-mist inhaler, or low-propellant MDI) in situations where technique is adequate and where patient preference has been considered.

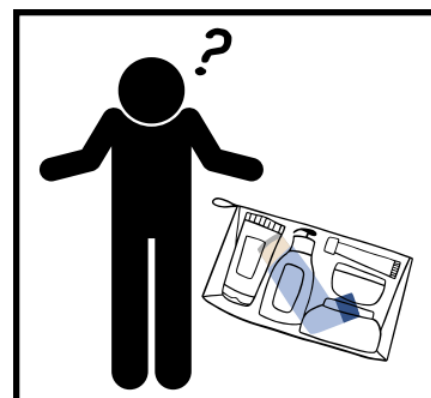
Wastage



NEED FOR INHALER IDENTIFIED



Process map: Inhaler journey for admitted patients

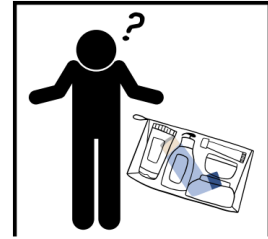


Patient has inhaler but is hidden or missing



Inhaler is taken from wardstock (or pharmacy if not in wardstock)

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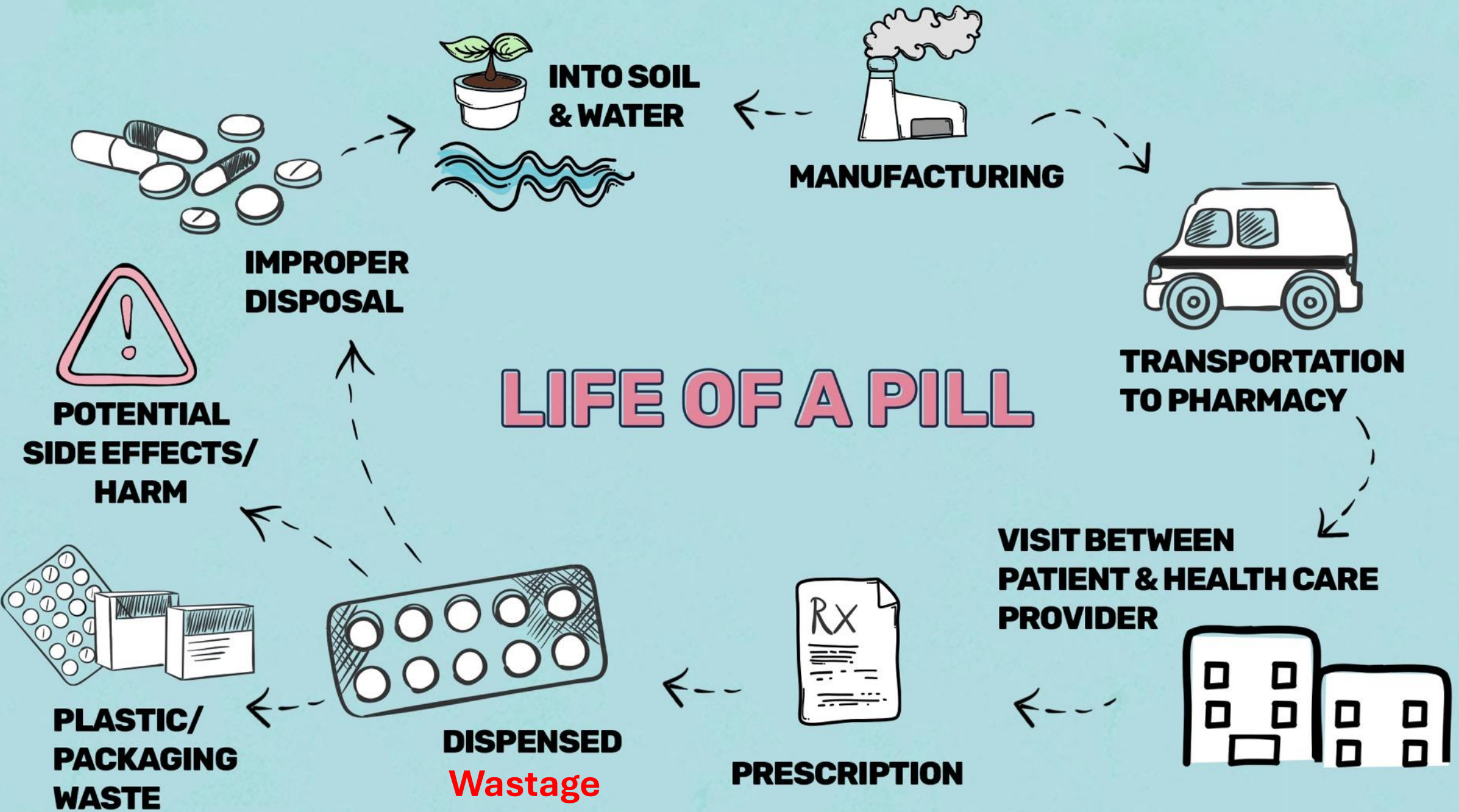


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Patient discharged; inhaler typically discarded and outpatient prescription written



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Thank you!

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