

Životní prostředí a anestezie

Josef Škola, XXVIII. kongres ČSARIM, Brno, 16. září 2022

Bez střetu zájmů ve vztahu k této prezentaci.

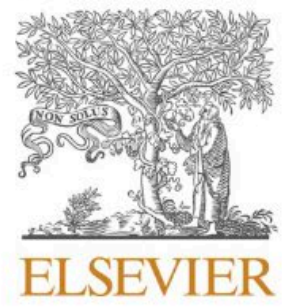
Since the pre-industrial period, human activities are estimated to have increased Earth's global average temperature by about 1 degree Celsius (1.8 degrees Fahrenheit), a number that is currently increasing by more than 0.2 degrees Celsius (0.36 degrees Fahrenheit) per decade. The current warming trend is unequivocally the result of human activity since the 1950s and is proceeding at an unprecedented rate over millennia.

<https://climate.nasa.gov/global-warming-vs-climate-change/>



Key facts

- **Climate change affects the social and environmental determinants of health – clean air, safe drinking water, sufficient food and secure shelter.**
- **Between 2030 and 2050, climate change is expected to cause approximately 250 000 additional deaths per year, from malnutrition, malaria, diarrhoea and heat stress.**
- **The direct damage costs to health (i.e. excluding costs in health-determining sectors such as agriculture and water and sanitation), is estimated to be between USD 2-4 billion/year by 2030.**
- **Areas with weak health infrastructure – mostly in developing countries – will be the least able to cope without assistance to prepare and respond.**
- **Reducing emissions of greenhouse gases through better transport, food and energy-use choices can result in improved health, particularly through reduced air pollution.**



Contents lists available at ScienceDirect

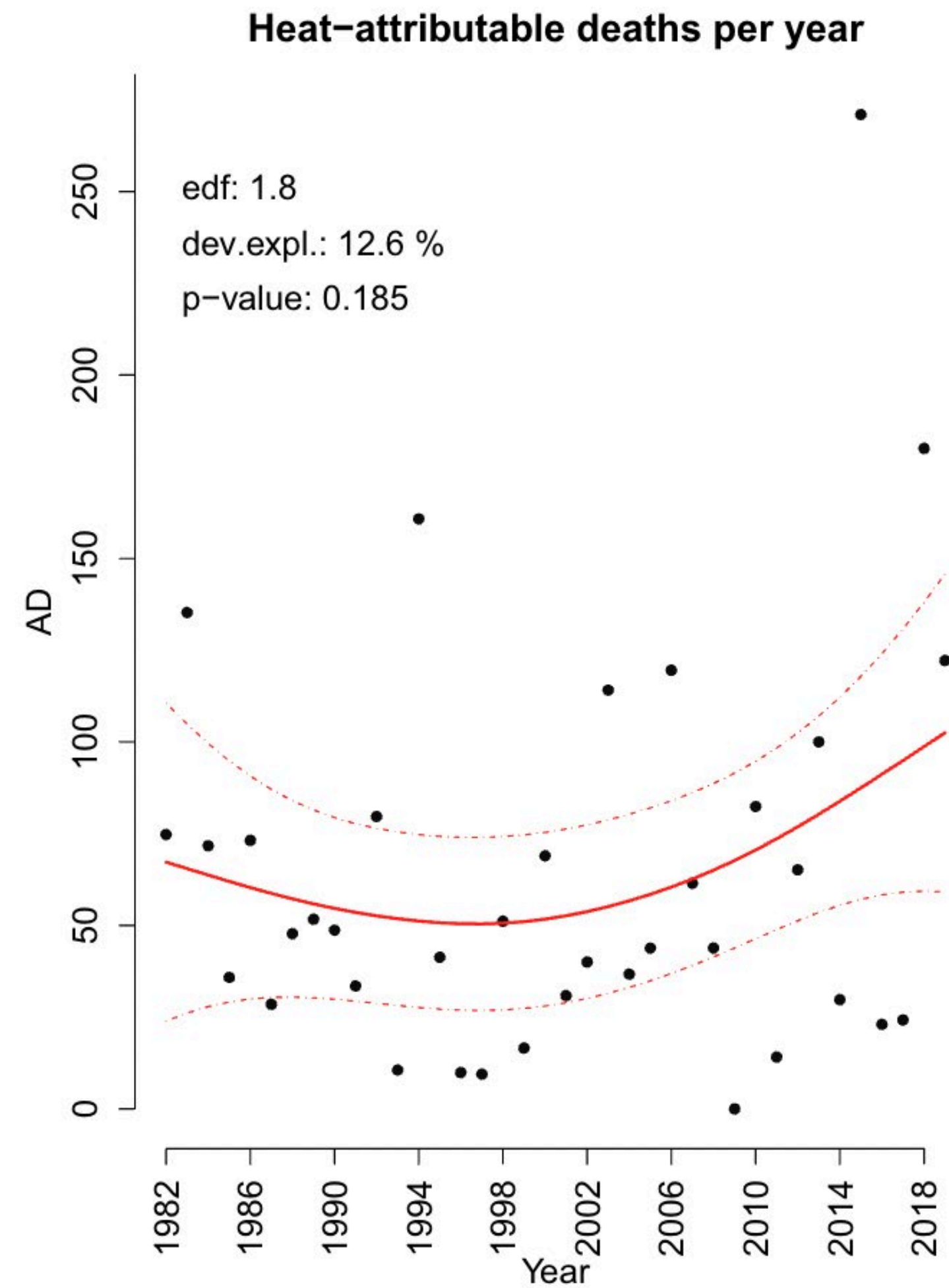
Urban Climate

journal homepage: www.elsevier.com/locate/uclim



Temporal changes of heat-attributable mortality in Prague, Czech Republic, over 1982–2019

Aleš Urban^{a,b,*}, Osvaldo Fonseca-Rodríguez^{a,c,d}, Claudia Di Napoli^{e,f},
Eva Plavcová^b



Desflurane Should Des-appear: Global and Financial Rationale

Matthew J. Meyer, MD

HEALTH CARE AND THE GLOBAL CLIMATE

The World Health Organization has declared climate change “the greatest threat to global health.”¹² Globally, health care is responsible for 4.6% of greenhouse gas emissions.¹³ In the United States, health care is responsible for 10% of US greenhouse gas emissions.¹⁴

Each year health care pollutants result in the loss of >400,000 disability-adjusted life years in the United States alone.¹⁴ This staggering number is similar in magnitude to the harm caused by medical errors reported in the groundbreaking *Institute of Medicine* article on patient safety¹⁵ that meaningfully changed the practice of medicine. It is time we acknowledge

Jak to souvisí s anestezií?

Global Warming Potential of Inhaled Anesthetics: Application to Clinical Use

Susan M. Ryan, MD, PhD,* and Claus J. Nielsen, CSc†

Table 1. Tropospheric Lifetime and 20-Year Global Warming Potential of Inhaled Anesthetics

Compound	Lifetime (y)	GWP ₂₀
Carbon dioxide ¹⁵		1
Sevoflurane	1.2	349
Isoflurane	3.6	1401
Desflurane	10	3714
Nitrous oxide ¹⁵	114	289

GWP₂₀ = 20-year global warming potential.

GWP is a measure of how much a given mass of greenhouse gas contributes to global warming over a specified time period.¹³ It is a relative scale that compares the contribution of the gas in question to that of the same mass of CO₂. The GWP of CO₂ is, by definition, 1. This allows a standard comparison of GWP between any gas and CO₂, or between 2 gases, such as inhaled anesthetics. Although GWP can be measured over any time horizon, the relatively short atmospheric lifetimes of the potent inhaled anesthetics studied here warrant the use of 20-year time-integrated values (GWP₂₀); most of their impact has occurred within the 20-year timeframe because this is twice as long as the longest potent inhaled anesthetic's lifetime (approximately 10 years for desflurane).‡ GWP₂₀ is also a frequently measured time horizon for a large number of gases and allows comparison with other greenhouse gases

Desflurane Should Des-appear: Global and Financial Rationale

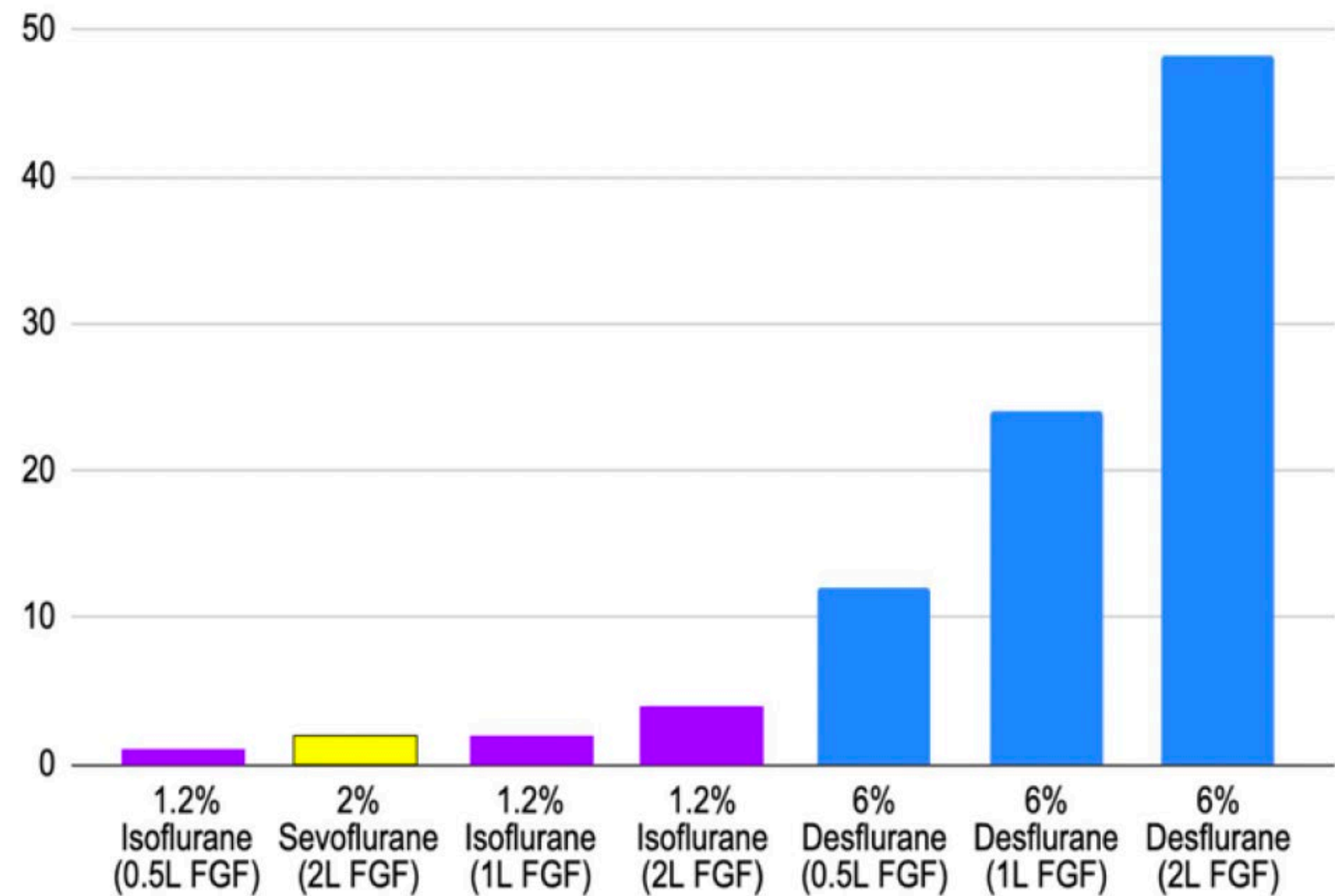
Matthew J. Meyer, MD

The overall contribution of anesthetic gases to total health care greenhouse gas burden has been estimated at 2% in England's National Health Service (NHS). To contextualize this number, the NHS Sustainable Development Unit estimates a single hour of anesthesia; using the most carbon-intensive volatile anesthetic (eg, desflurane) is similar to the emissions from driving 370 km in a gas-powered automobile.¹⁹ By abstaining from (or dramatically reducing) desflurane, anesthesiologists can make a large reduction in these emissions with likely no clinical implications.

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Susan M. Ryan, MD, PhD,* and Claus J. Nielsen, CSc†

Relative Social Cost of Volatile Anesthesia Choice

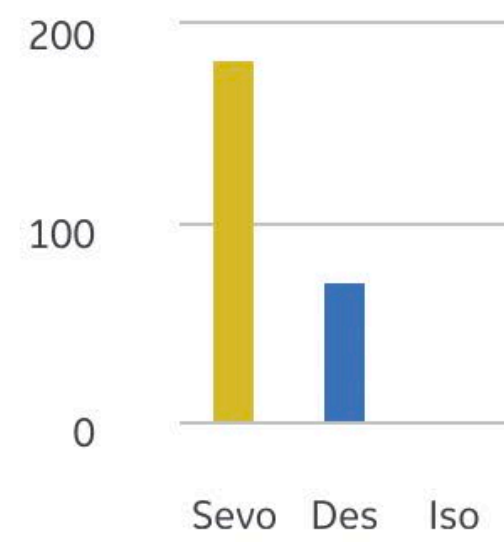


Daily Averages

Flow Rate	Maintenance
1,0 L/min	0,8 L/min
Induction	Induction
8,0 L/min	Duration
	2,2 min
Cost per minute	Cost per case
€0,09	€6,03

Daily Totals

# of Machines	Total
4	
# of Cases	
16	
Total Cost	
€96,55	



Average Agent Consumption

Sevoflurane	14,1 mL/case	€0,07 cost/min
Desflurane	24,0 mL/case	€0,16 cost/min
Isoflurane	0,0 mL/case	€0,00 cost/min

Emissions

Total	303,83 kgCO2e
Car Travel Equivalent	22,6 hours

Monthly Totals to Date

Info	Total	Daily Trend vs. Prev. Mo.
Cases	128	▲ 56,0%
AA	1.596,0 mL	▲ 39,0%
Sevo	1.312,0 mL	▲ 27,0%
Des	284,0 mL	▲ 180,0%
Iso	0,0 mL	▲ 0,0%
Emissions	1.315,99 kgCO2e	▲ 121,5%
Cost	€587,00	▲ 42,00%

Daily View 15 September 2022

Name	Device ID	Cases	mL of Sev	mL of Des	mL of Iso	Emissions kgCO2e	Cost	Ind Duration (min)	Avg Ind L/min	Avg Main L/min	Avg Total L/min	Action
MNUL COS-3	APWX00534	2	22,0	0,0	0,0	4,4	€7,71	0,0	6,3	0,6	0,6	View Details
MNUL COS-4	APWX00535	2	43,4	0,0	0,0	8,6	€15,17	3,6	15,0	0,6	0,8	View Details
MNUL DeOS	APWX01689	8	110,7	0,0	0,0	21,9	€38,74	2,1	6,2	1,4	2,0	View Details
MNUL GynOS	APWX01690	4	7,3	71,9	0,0	269,0	€34,92	0,0	15,0	0,8	0,9	View Details

Daily Averages

Flow Rate 0,9 L/min	Maintenance 0,8 L/min
Induction 15,0 L/min	Induction Duration 0,0 min
Cost per minute €0,16	Cost per case €8,73

Daily Totals

Daily Cost: **€34,93**
of Cases: **4**

Average Agent Consumption

Sevoflurane 7,3 mL/case	€0,15 cost/min
Desflurane 24,0 mL/case	€0,16 cost/min
Isoflurane 0,0 mL/case	€0,00 cost/min

Emissions

Total
269,0
kgCO2e

Car Travel Equivalent
20,0
hours

Monthly Totals to Date

Info	Total	Daily Trend vs. Prev. Mo.
Cases	43	▲ 30,0%
AA	414,0 mL	▲ -13,0%
Sevo	176,0 mL	▲ -39,0%
Des	238,0 mL	▲ 55,0%
Iso	0,0 mL	▲ 0,0%
Emissions	921,34 kgCO2e	▲ 43,5%
Cost	€169,00	▲ -8,00%

MNUL GynOS

Device ID# APWX01690

Date	AA On	AA Off	Duration	AA	AA mL	Emissions kgCO2e	AA Cost	AA Cost/min	Ind Duration (min)	Avg Ind L/min	Avg Main L/min	Avg Total L/min
15/09/2022	08:04	08:21	17 mins	Sevo	7,3	1,45	€2,57	€0,15	0,1	15,0	3,0	3,1
15/09/2022	09:08	10:31	83 mins	Des	32,5	120,9	€14,62	€0,18	0,0	0,0	0,8	0,8
15/09/2022	11:03	12:11	68 mins	Des	17,0	63,15	€7,64	€0,11	0,0	0,0	0,6	0,6
15/09/2022	13:44	14:40	56 mins	Des	22,4	83,5	€10,10	€0,18	0,0	0,0	0,6	0,6



EUROPEAN
COMMISSION

Strasbourg, 5.4.2022
SWD(2022) 96 final

PART 2/2

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

Accompanying the document

**Proposal for a
REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing
Regulation (EU) No 517/2014**

- Prohibit the *use* of desflurane as **inhalation anesthetic from 2026** unless there are no suitable alternatives for the intended use



ČESKÁ SPOLEČNOST ANESTEZIOLOGIE, RESUSCITACE
A INTENZIVNÍ MEDICÍNY ČLS JEP

CZECH SOCIETY OF ANAESTHESIOLOGY
AND INTENSIVE CARE MEDICINE



WWW.CSARIM.CZ

Expertní stanovisko výboru ČSARIM č. 3/2020

ENVIRONMENTÁLNÍ DOPADY INHALAČNÍCH ANESTETIK

Na základě požadavku firmy AbbVie s.r.o. (dále jen AbbVie) a souvisejícího smluvního ujednání mezi ČSARIM a AbbVie o provedení práce vypracovala pracovní skupina (PS) ČSARIM expertní stanovisko (dále jen stanovisko) k environmentálním dopadům používání inhalačních anestetik.

Co s tím?

Educate on It & Remove It

Educate on It

Desflurane Should Des-appear: Global and Financial Rationale

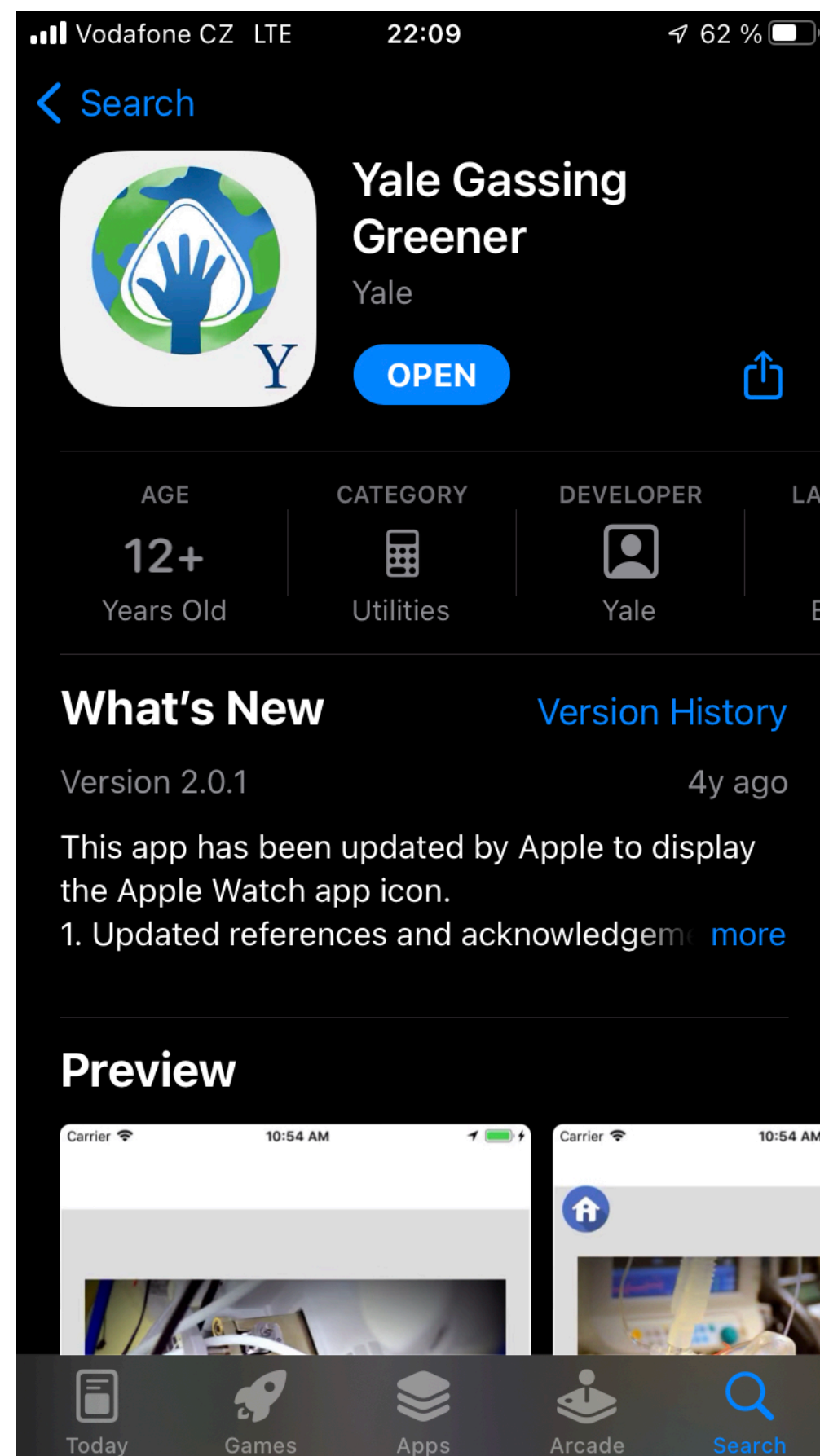
Matthew J. Meyer, MD
DOI: 10.1213/ANE.00000000000005102

Reducing the Global / Financial Costs of General Anesthesia

- Chose volatile anesthetics with **lowest GWP₂₀**
 - **Sevoflurane** and **isoflurane** are much lower than desflurane³
- **Reduce fresh gas flows** to the lowest clinically appropriate rate
 - Consider closed-circuit anesthesia³²
- **Propofol** has the smallest GHG impact per MAC-hour¹¹
- **Avoid nitrous oxide** unless clinically indicated³⁰

Educate on It

Yale Gassing Greener App



Remove It



Shrnutí

- volatilní anestetika i oxid dusný jsou různě potentní skleníkové plyny
- největší negativní efekt má desfluran a oxid dusný
- v EU dojde k významné limitaci používání desfluranu od roku 2026
- enviromentální dopady mohou (měly by?) být jedním z faktorů při volbě způsobu podání anestezie
- minimal-flow anestezie významně redukuje enviromentální dopad inhalačních anestetik

Děkuji za pozornost

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