NEASH: The North East Anaesthesia Sustainable Healthcare Network

A Coordinated Region-Wide Audit of the Environmental Impact of Our Inhalational Anaesthetic Use

Slides designed by: Dr Jordan Minns – NEASH Coordinator, May 2021
With input from Dr Cathy Lawson and Dr Chris Allen
Appreciation and thanks to everyone involved in data collection

Presentation delivered by:

What we did:

$KgCO_2e$ → $KgCO_2e/hr$

Why did we do it?

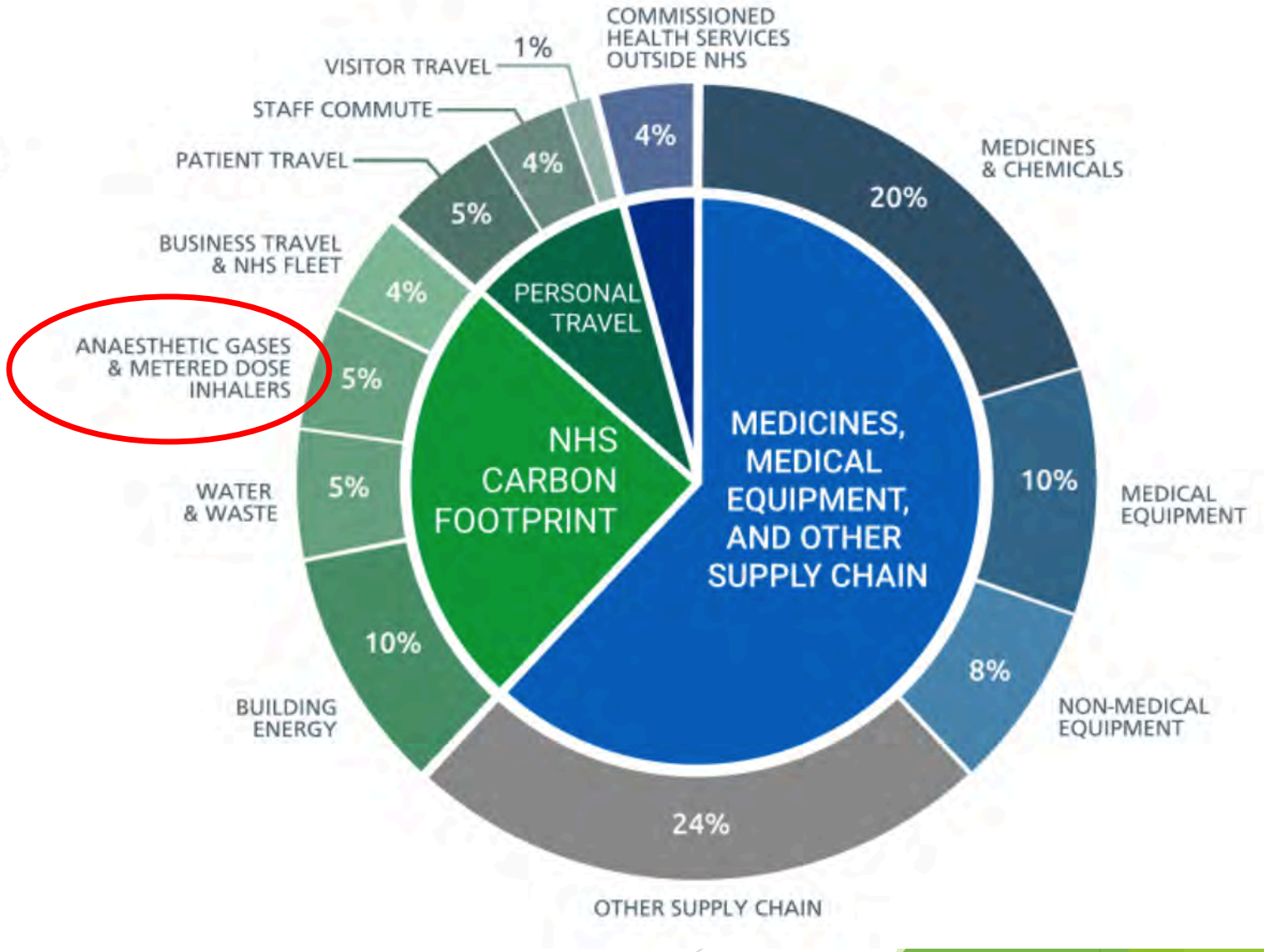
The NHS produces 5.4% of the UK's greenhouse gases. How can hospitals cut their emissions?

Switching anaesthetic gases, using electric ambulances and 'greening' dialysis are reducing the NHS's carbon footprint

How much of the NHS's emissions come SOLELY from anaesthetic gases…?

Figure 2: Sources of carbon emissions by proportion of NHS Carbon Footprint Plus

2%!



NHS

Delivering a 'Net Zero' National Health Service

Figure 10: Reducing emissions from inhalers and anaesthetic gases

The next few slides – some background info…

- Global Warming Potential (GWP)
- CO_2 equivalents in kilograms ($KgCO_2e$) of the anaesthetics we use
- Volatile versus TIVA

What is Global Warming Potential (GWP)?

A relative measure of how much heat greenhouse gas traps in the atmosphere

$CO_2 = 1$

GWPs of different anaesthetic agents ($KgCO_2e$):

=21

=130

=510

=2540!!!

=265 AND stays in atmosphere for over 100 years

What are the different CO_2 equivalents for our agents?

Agent	Atmospheric lifetime (years)	GWP_{100}	MAC value %	1 MAC hour anaesthetic* ($KgCO_2e$)	Distance travelled/hr (Km/h)
Sevoflurane	1.1	130	2	0.6	2
Isoflurane	3.2	510	1	1.2	4
Desflurane	14	2540	6	33.5	108
Nitrous Oxide	110	310	105	n/a	n/a

* Flow rate of 0.5L/min with FiO_2 0.4 and O_2/air carrier gas admixture. Value inclusive of CO_2e for O_2

How about TIVA?

- For a 7 hour anaesthetic:
  - Sevo = 5.75 $kgCO_2e$
  - Iso = 11.1 $KgCO_2e$
  - Des = 308.7 $KgCO_2e$

- TIVA (propofol & remifentanil) = 3 $KgCO_2e$

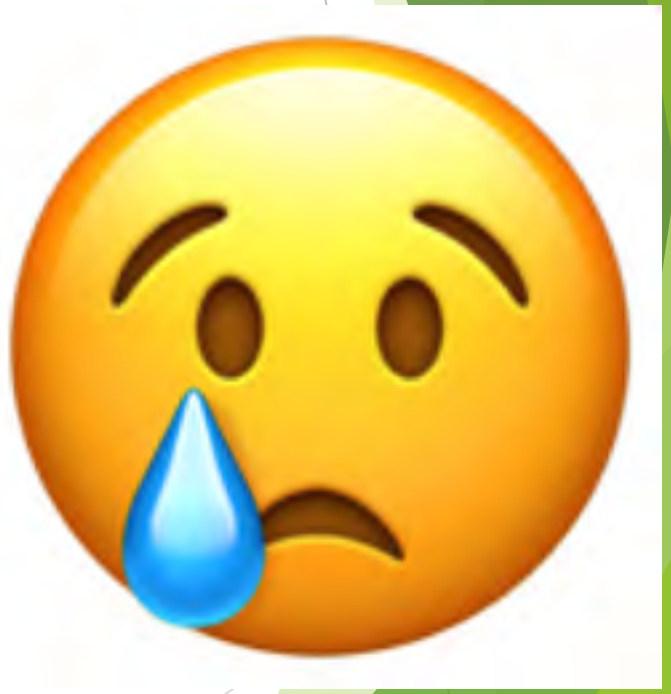
This includes:

- Plastic/glass manufacturing AND incineration of drug/syringes/giving sets
- Electricity for pumps
- BIS equipment and disposables

Next few slides: Our audit

- Limitations
- Results
- Discussion
- Next steps

Limitations

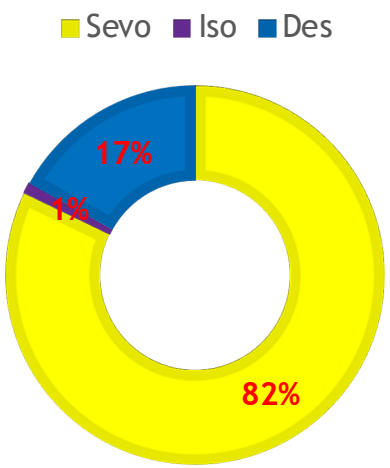


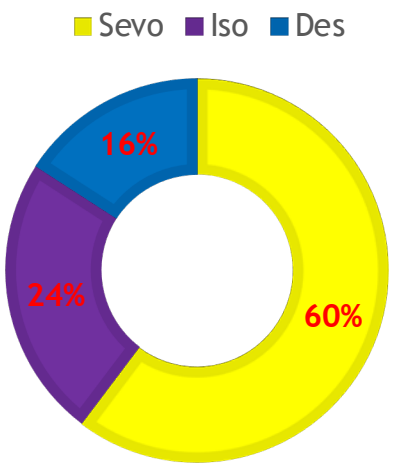

RESULTS

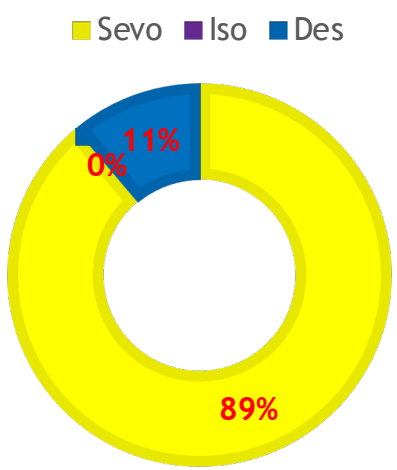
Minutes of data captured from anaesthetic machines in theatre

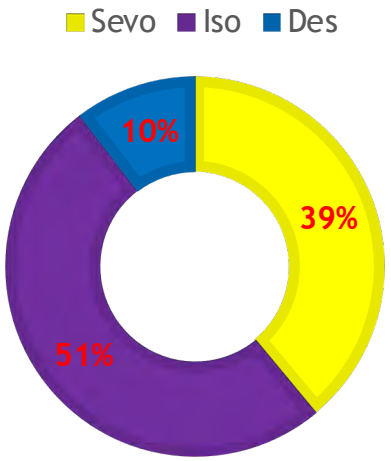
= 2,275 hours!

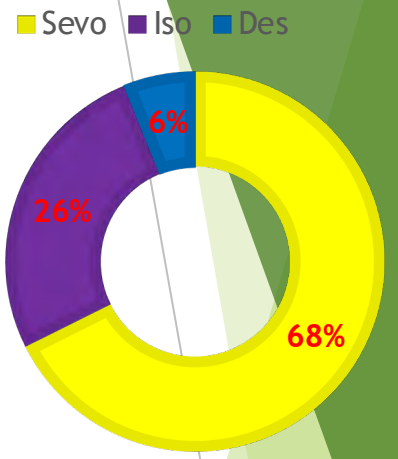
Sevo/Iso/Des: Percentage (by volume in mls) used in theatre

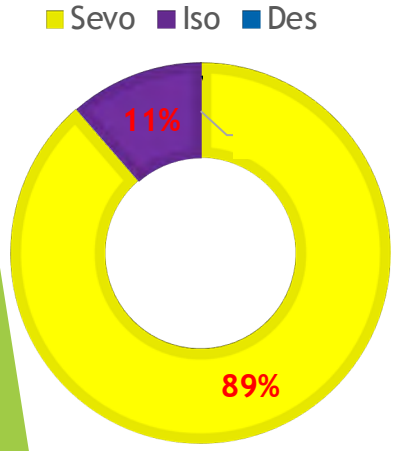


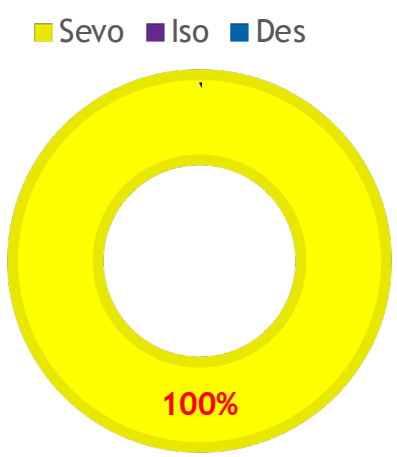


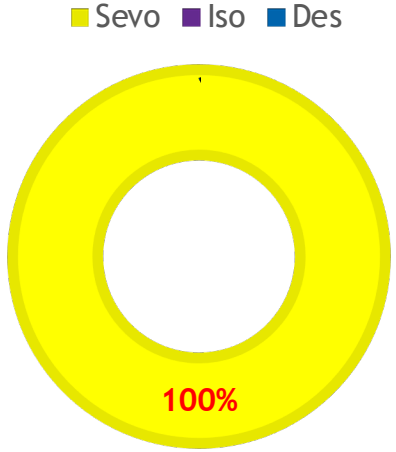


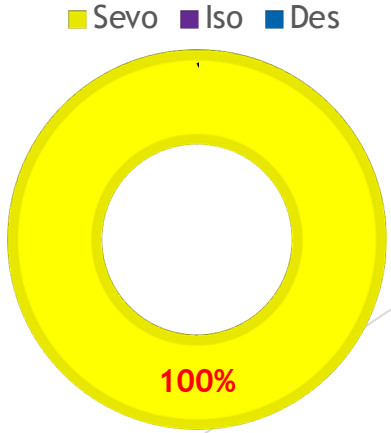


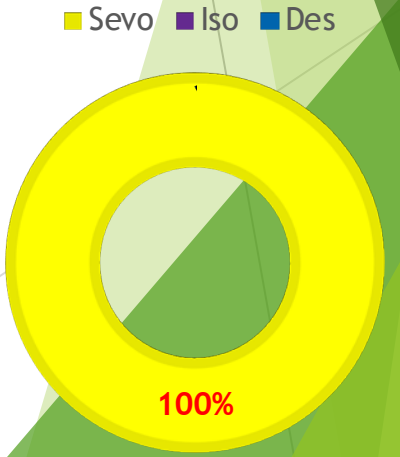




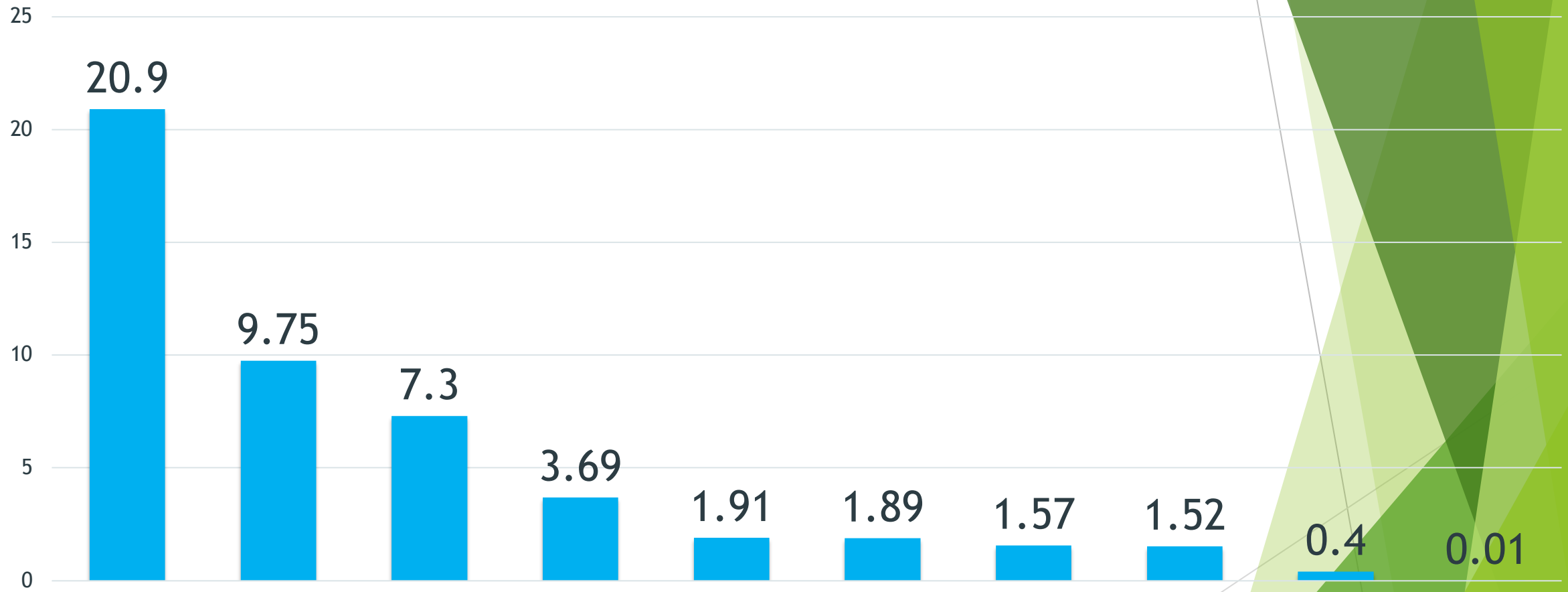




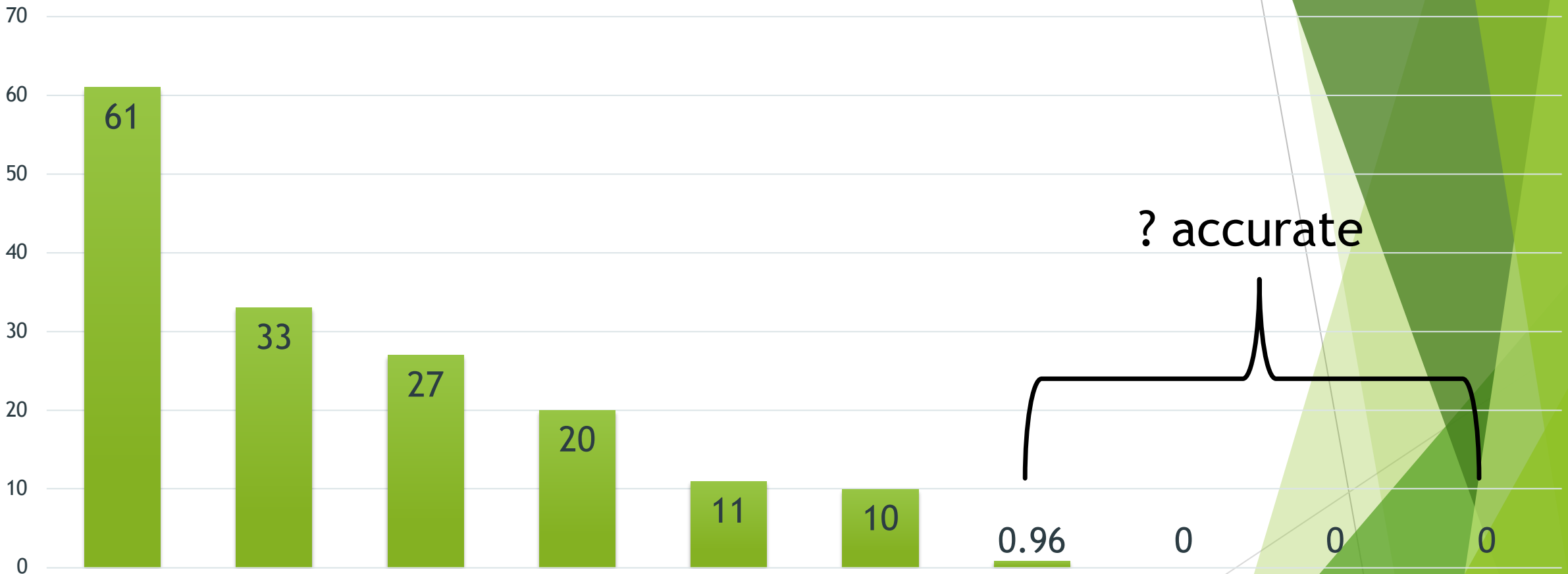




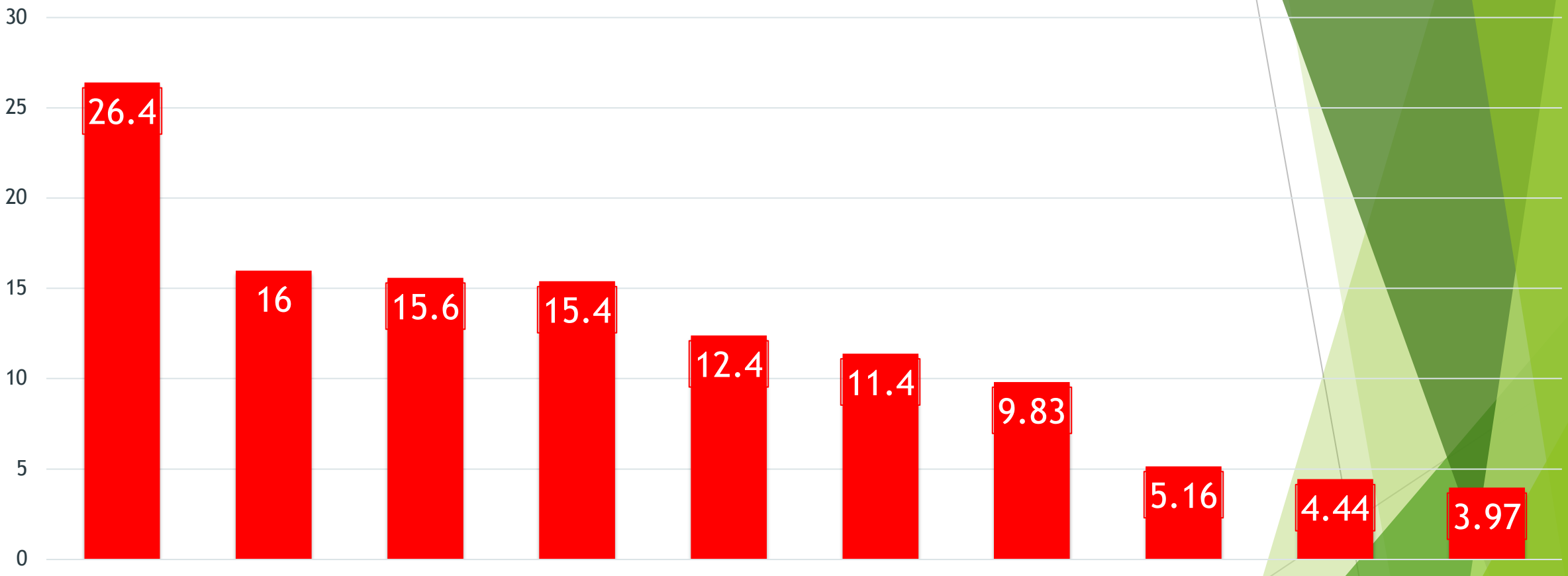
N_2O administered in theatre (averaged to L/hr)



Percentage of GA given as TIVA



Grand total: $KgCO_2e$/hr from GA in theatre



Discussion – keep it really simple…

- The main factors which result in high $KgCO_2e/hr$ are:

Strategies to reduce carbon emissions from anaesthetic gas use

- Choice (sevo>iso>des)
- Flow rates (lower esp. at induction)
- Carrier gas choice (no N_2O)

- Delivery technique (end tidal vs. manual control)
- Capture technology
- Use of lower carbon anaesthesia alternatives (regional and TIVA)

Discussion - keep it really simple…

- The greenest way of administering a GA is…

TIVA

Turn your flows UP to 6L/min when using TIVA!

Discussion - keep it really simple…

- If you can't/don't want to use TIVA…

Use this instead

Or this:

(Turn your flows as low as you can go)

Next steps - ICS NE and Cumbria Targets:

1: 

<10% overall volatile used (by volume) in all Trusts by April 2022

2: Reduce medical gas waste, especially N_2O

Prevent atmospheric release of medical gases

Next steps:

- NEASH is presenting this work to all hospitals in the NE and Cumbria
- Please monitor your annual volatile procurement – ensure strategies in place to achieve NHS Net Zero/ICS targets by April 2022
- We will repeat our region-wide audit in approx. six months to assess whether we have made an impact
- Next NEASH project – The Nitrous Oxide Project

- Refs:
- Allen C. Baxter I. Comparing the environmental impact of inhalational anaesthesia and propofol-based intravenous anaesthesia. *Anaesthesia* 2020; 76: 862-863
- Bawden A. The NHS produces 5.4%of the UK's greenhouse gases. How can hospitals cut their emissions? *The Guardian* 2019; Sept 18
- https://apps.apple.com/gb/app/anaesthetic-impact-calculator/id1070999985
- https://play.google.com/store/apps/details?id=com.sleekwater.anaesthesia&hl=en_GB
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- *https://www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2020/10/delivering-a-net-zero-national-health-service.pdf*
- Zhong G. Abbas A. Jones J. et al. Environmental and economic impact of using increased fresh gas flow to reduce carbon dioxide absorbent consumption in the absence of inhalational anaesthetics. *BJA* 2020; 125: 773-778