

P47

INHALATIONAL ANAESTHETIC AGENT CONSUMPTION: A STRATEGY TO REDUCE USAGE AND THE ENVIRONMENTAL IMPACT AT LEEDS CHILDREN'S HOSPITAL

T. Miller, Leeds Children's Hospital, Leeds Teaching Hospitals NHS Trust, UK

Background

Inhalational anaesthetic agents (IAA) are now recognised as potent greenhouse gases. Once in the atmosphere, IAA occupy the troposphere, maximally absorbing infrared radiation at wavelengths of 7-10 μ m. Their greenhouse effect is magnified since solar radiation at these wavelengths would normally be released away from Earth through the 'atmospheric window'. Nitrous oxide, a smaller molecule with longer lifespan, additionally rises into the stratosphere, contributing to ozone depletion [1].

The Sustainable Development Unit (SDU) report 5% of the carbon footprint of acute UK hospitals derives from anaesthetic gases [2]. The CO₂e equivalent emissions (CO₂e, or 'carbon footprint') of IAA can easily be calculated using the Global Warming Potential (GWP)[3]. Paediatric anaesthesia presents specific barriers to environmental initiatives, namely prevalence of nitrous oxide use, gas inductions and the use of open circuits.

Problem

Following an audit of paediatric theatres at Leeds Children's Hospital, interrogating the electronic logbook of our anaesthetic machines, we found IAA consumption and thus CO₂e to be very variable, from 16kg to 927kg per case (the equivalent of driving a medium-sized car 3000 miles from London to Jerusalem!)

Correcting for case duration, the main factors determining CO₂e were choice of agent, use of nitrous oxide and flow rates. An Ayre's T-piece with Jackson-Rees modification was used in over 50% of inductions, requiring high flows of IAA and exposing staff to unscavenged gases.

Strategy for Change

Using our audit of 120 cases as a benchmark, we formulated a strategy, a 5-point plan to encourage more sustainable IAA usage within our department:

1. Presentations on the environmental impact of IAA at departmental and trust level.
2. Presenting our audit findings, using real world comparators to illustrate CO₂e per anaesthetic.
3. Advocating:
 - Avoidance of desflurane and nitrous oxide.
 - Low flow anaesthesia (<0.5L/min).
 - Using MAC sparing agents, regional anaesthesia and TIVA.
4. Encourage debate regarding lower flows at induction and the use of circle circuits with a 0.5L or 1L reservoir bag rather than an Ayre's T-piece.

5. Attach an easy-to-use calculator to each anaesthetic machine, enabling anaesthetists to calculate their personal IAA carbon footprint per case.

Measure of Improvement

Following implementation of our strategy we plan to re-audit anaesthetic gas usage to assess the impact of our 5-point plan.

Lessons Learnt

Most anaesthetists are motivated and aware that volatile anaesthetic gases are potent pollutants, but may not be aware of the environmental impact of their personal practice.

Message for Others

Through a process of education and discussion and by empowering anaesthetists with simple measures to calculate and reduce their carbon footprint at work, we hope to reduce the environmental impact from IAA at Leeds Children's Hospital.

References:

1. Matt Campbell, J. M. Tom Pierce, Atmospheric science, anaesthesia, and the environment, BJA Education, Volume 15, Issue 4, August 2015, Pages 173–179, <https://doi.org/10.1093/bjaceaccp/mku033>

2. Sustainable Development Unit - Carbon Footprint from Anaesthetic gas use - Report (2013)

<https://www.sduhealth.org.uk/areas-of-focus/carbon-hotspots/anaesthetic-gases.aspx>

3. Myhre, G., D. Shindell, F.-M. Bréon, W. Collins, J. Fuglestedt, J. Huang, D. Koch, J.-F. Lamarque, D. Lee, B. Mendoza, T. Nakajima, A. Robock, G. Stephens, T. Takemura and H. Zhang, 2013: Anthropogenic and Natural Radiative Forcing Supplementary Material. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. https://www.ipcc.ch/site/assets/uploads/2018/07/WGI_AR5.Chap_8_SM.pdf