SASA Position Statement 2024

Environmental Impact of Inhalational Anaesthetics
SASA position statement on the Environmental Impact of Inhalational Anaesthetics

Purpose

The purpose of this position statement is to:

1. affirm SASA’s commitment to environmentally sustainable anaesthetic practice.
2. assist clinicians in taking environmental sustainability into consideration with daily clinical decisions regarding inhalational anaesthetic agents.
3. assist healthcare facilities in formulating environmentally sustainable policies.

Background

Introduction

Ongoing anthropogenic greenhouse gas emission is leading to an alarming increase in global surface temperatures and resultant climate change.1-3 Human health is directly and inextricably linked to our natural environment, and climate change has been declared by the World Health Organization to be the “greatest threat to global health in the 21st century.”4 In order to avert environmental disaster and consequent threat to human health, meaningful decrease in global greenhouse gas emissions has become an emergency.1

Paradoxically, modern healthcare systems are extremely resource-intensive, producing large quantities of single-use, non-recyclable material which require embedded energy and raw materials to produce, and may contain toxic materials which contaminate natural resources after disposal.2, 5 It has been estimated that healthcare is responsible for 1 -5 % of annual global greenhouse gas (GHG) emissions, or 2.4 gigatons of carbon equivalent emission (CO₂e) per year, with an appreciable contribution from anaesthetic gases.6, 7 Calls have therefore been made to find alternative, more environmentally sustainable anaesthetic techniques without compromising patient safety.3

Underlying climate science

Table 1 compares various climate-related indices for commonly used inhalational anaesthetic agents and the major GHGs.1, 8-12 Radiative forcing is the nett change in energy balance of the earth’s atmosphere caused by greenhouse gases.13
Global warming potential (GWP), a theoretical time-integrated global mean RF for a single pulse emission of a gas versus that for the same amount of CO₂, was developed in order to quantify the warming potential of each emitted gas in a multi-gas model. Despite various scientific limitations of the concept of GWP, this index remains the IPCC standard of comparison for long-lived greenhouse gases.

Short Lived Climate Forcers (SLCF) is a heterogenous group of gases and particulate matter, which have atmospheric lifetimes of under 20 years, and includes the volatile anaesthetic agents. The IPCC cautions that the use of GWP for SLCFs may be too simplistic owing to regional and temporal inhomogeneity. It is likely that, whilst the volatile anaesthetic agents are potent greenhouse gases, their global impact on climate change is extremely small.

Table 1 Climate indices of greenhouse gases

<table>
<thead>
<tr>
<th>Greenhouse gas</th>
<th>Atmospheric Lifetime (years)</th>
<th>GWP100</th>
<th>ODP</th>
<th>Atmospheric Concentric (ppt)</th>
<th>Radiative forcing (W.m⁻²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide (CO₂)</td>
<td>100 +</td>
<td>1</td>
<td>0</td>
<td>420 000 000</td>
<td>2,16</td>
</tr>
<tr>
<td>Methane (CH₄)</td>
<td>12,4</td>
<td>27</td>
<td>0</td>
<td>1 920 000</td>
<td>0,54</td>
</tr>
<tr>
<td>Nitrous oxide (N₂O)</td>
<td>123</td>
<td>298</td>
<td>0,017</td>
<td>336 000</td>
<td>0,21</td>
</tr>
<tr>
<td>Isoflurane</td>
<td>3,5</td>
<td>510</td>
<td>0,01</td>
<td>0,11</td>
<td>0,00006</td>
</tr>
<tr>
<td>Sevoflurane</td>
<td>1,4</td>
<td>144</td>
<td>0</td>
<td>0,16</td>
<td>0,00003</td>
</tr>
<tr>
<td>Desflurane</td>
<td>14,1</td>
<td>2 540</td>
<td>0</td>
<td>0,37</td>
<td>0,00017</td>
</tr>
</tbody>
</table>

GWP₁₀₀: Global Warming Potential with a 100-year time horizon; ODP, Ozone Depletion Potential with reference to CFC-11; ppt, parts per trillion

Statement

1. Patient safety and clinical outcomes remain the priority in anaesthetic decision-making. However, when two or more anaesthetic options are clinically equivalent, consideration should be given to using the technique with the lowest environmental impact.
2. Nitrous oxide (N\textsubscript{2}O) is an important, long lived greenhouse gas and has been implicated in the destruction of atmospheric ozone. Routine use in anaesthesia is not supported and use should be restricted to specific clinical cases only. Attention should be paid to minimising unintended release of N\textsubscript{2}O through pipe system leaks and consideration should be given to abandoning piped N\textsubscript{2}O in preference for E-cylinders attached to anaesthetic machines, where feasible.

3. Desflurane is a potent greenhouse gas but accounts for only 0.005\% of total anthropogenic greenhouse emissions. In clinically equivalent scenarios, alternative anaesthetic agents with lower environmental impact should be considered, providing these do not increase total CO\textsubscript{2} emissions.

4. In clinical scenarios where inhalational agents are used, their environmental effects should be mitigated by using the lowest possible fresh gas flow rate and for the shortest clinically necessary duration.

Revision
This statement should be regularly reviewed and updated as new published evidence emerges.

Related SASA Documents
Practice Guidelines 2022
References


