

SusQI Project Report

<p>Project Title: BLUE GAS THINKING; raising awareness of the environmental impact of nitrous oxide use in anaesthesia</p>	<p>Date of Report: Project completed in 2019 as part of the Royal Devon and Exeter Green Team Competition.</p>
<p>Team Members:</p> <ul style="list-style-type: none"> • Dr Clare Swarbrick • Dr Pete Valentine • Dr Fiona Martin • Dr Pete Ford • Dr Alastair Martin 	

Background:

5% of the carbon footprint of acute NHS trusts comes from anaesthetic gases. Gases used in anaesthesia are released into the atmosphere where they have a high global warming potential. The large percentage of carbon emissions coming from anaesthetic gases places anaesthetic departments in a position of influence in reducing the carbon footprint of the wider NHS. Measuring, monitoring and reporting anaesthetic gas use is essential to reducing emissions. Across all trust sites at the RD&E 315 000L of nitrous oxide are used (not including Entonox), this is equivalent to 185 tonnes of carbon dioxide. This would have the same carbon footprint as 26 return flights from the UK to Sydney!

When the compared the marginal gains that were possible through projects such as recycling and use of reusable items, it was clear that these did not fulfil their potential massive reduction in environmental impact. The team noted that there are alternatives to nitrous oxide available, such as oxygen, that maintain clinical outcomes but do not have the negative environmental impact. The team thought that this project gave them the biggest potential target reduction in carbon footprint though they knew that it would be a challenge to change attitudes towards a gas that is so well established in clinical practice.

Specific Aims:

To eliminate the use of nitrous oxide in theatres (apart from maternity) at the RD&E.

Methods:

The team used the following methods to start changing the use of nitrous oxide in the department:

- informal conversations with colleagues, both face-to-face and by email.
- an education session, during a departmental clinical governance meeting, followed by a debate.
- The team calculated the carbon impact of this amount of nitrous use and carried out further calculations to make the figures relatable to 'real world situations', such as distance flown in an aeroplane and number of miles driven in a car.

- reminder stickers on anaesthetic machines to encourage anaesthetists to use the minimum amount of gas required for effective anaesthesia.

Measurements:

The team worked with pharmacy colleagues to estimate how much nitrous oxide (in litres) was being used. Nitrous oxide is mainly supplied via a manifold of large cylinders and delivered via pipeline. New cylinders are ordered as the manifold empties. They examined the ordering accounts for nitrous oxide per month and averaged use per month (as often more than one month elapses before cylinders replacing). They then compared 2018 figures with 2019 figures.

Measurement was put in place for ongoing monitoring as, given that the figures were amount ordered rather than used, data for the 2.5 months of the competition would not provide an accurate estimate of use.

CO₂e savings were calculated using an emissions factor of 0.559 kgCO₂e / litre¹

Financial savings were calculated based on Trust procurement data.

Results:

Clinical outcomes:

Nitrous oxide has adverse effects on some patients including nausea and hypoxia.

Environmental sustainability:

The figures showed that there was a reduction for use in January-July 2019 of 60,000 litres in 2019, equating to 29,112 kgCO₂e, in comparison to 2018. Therefore an estimated annual reduction of 102,857 litres - a 25% reduction is forecast.

This may represent a general trend in the decrease of use, although the team do not have the data for the rate of reduction over previous year. The project aimed to accelerate this reduction in the light of the climate crisis.

If the education campaign was effective in maintaining this rate of reduction, a further saving of 70,714 litres of nitrous oxide, equal to 49,906kgCO₂e, would be saved in 2020.

Social sustainability:

The use of nitrous oxide for paediatric induction also slightly increases the rate of miscarriage in staff. These side effects are unusual but it is beneficial to avoid these effects if possible.

Recently there have been thefts of nitrous oxide from the Nuffield Hospital in Exeter and from the local supply depot. By reducing nitrous oxide use the team reduce the overall availability of this gas which may be abused.

Fiona Martin, Consultant Anaesthetist commented;

"I had not really thought of the environmental aspects of using it until we made a green team. I asked a colleague in a hospital which was recently rebuilt and at this point nitrous oxide was removed about how people managed when they moved into the new building and he said "it makes exactly no difference at all. Makes no difference for gas inductions. It's a nothing!" (They've also almost ditched desflurane for environmental reasons)."

Economic sustainability:

The total cost of supplying nitrous oxide for a year and hiring the relevant cylinders is £2,117.25. Added to this is the cost of maintaining the pipes and manpower required to change cylinders and monitor use. If able to reduce or remove nitrous oxide this would save the trust a significant amount of money.

The total annual cost of supplying nitrous oxide and hiring the relevant cylinders is £2,117.25. Added to this is the cost of maintaining the pipes and manpower required to change cylinders and monitor use. If the reduction continues as forecasted by 25%, then the saving in 2019 would be £529, not considering the potential savings of required maintenance and labour.

Barriers encountered / Limitations of the work

The main barrier encountered was following the debate, when a vote on whether nitrous oxide should be removed from theatres (except for maternity theatre) was carried out by a small subsection of the anaesthetics department. The vote sadly fell in favour of keeping nitrous oxide with a consensus that most anaesthetists wanted the option of using it, although the majority felt that they would reduce their usage.

Conclusions:

This change has massive environmental potential but due to its' magnitude the team were unable to achieve their initial aim of removing nitrous oxide from theatres completely in the short time frame available for the competition.

They have started a discussion that is gaining momentum and it will be revisited with updates on the anaesthetic departments carbon footprint at clinical governance meetings. The team hope that with a regular reminder of their responsibilities as individual clinicians and as a department, the movement to reduce and eventually remove nitrous oxide will ensure lasting change.

The team have also engaged with trainees, who are the consultants of the future. During training, future behaviours can be shaped by education and the practices of others. They have set up a training day to encourage the use of alternatives to anaesthetic gases; total intravenous anaesthesia (TIVA), and aim to embed the benefits and inspire confidence of trainees to use a more environmentally friendly mode of anaesthesia.

References

1. *Sustainability Reporting Template 2018/19 (Sustainable Development Unit)*

*Please note the Sustainable Development Unit (now the Greener NHS Team) emissions factors used are now out of date. Please refer to updated factors for new projects.