NSW Health

Guidance for the Supply of Nitrous Oxide in New Healthcare Facilities

New Builds

Introduction

Purpose

This document is a supplementary guide to the previously published Guidance for the Reduction of Nitrous Oxide Waste in Existing Healthcare Facilities: Current Builds, which focuses on strategies to reduce nitrous oxide waste in existing facilities.

The purpose of this document is to guide a reduction in the installation of reticulated nitrous oxide pipelines in the designs of new healthcare facilities or the redevelopment of existing healthcare facilities. Where complete exclusion of reticulated systems is not feasible, it is recommended to implement small, targeted systems, primarily for birthing units, and to use portable cylinders in other areas where nitrous oxide is required.

This guidance advocates for a facility-specific needs assessment, emphasising close collaboration with clinical, corporate, infrastructure, and capital projects teams to ensure sustainable practices are incorporated from the outset.

These recommendations have been developed from extensive stakeholder engagement with clinicians and experts from the NSW Health Nitrous Oxide Expert User Group and are designed to encourage teams to adopt a more proactive approach in their practices.

For further advice, consultation or information from the Nitrous Oxide Expert User Group, please direct any inquiries to moh-netzero@health.nsw.gov.au.

Context

Nitrous oxide is an anaesthetic gas with a global warming potential (GWP) of 298, compared to carbon dioxide's GWP of 1. Nitrous oxide is a potent greenhouse gas that contributes substantially to climate change when leaked into the atmosphere.

Reducing the environmental impact of nitrous oxide in clinical settings involves two key steps:

1) Reducing leaks from supporting infrastructure by reducing reliance on large central reticulated supplies.
2) Reducing clinical use of the gas where it offers no clinical benefit or there is a more environmentally sustainable alternative

Key recommendations:

- Incorporate into the designs of healthcare facility new builds and redevelopments the intention to **exclude reticulated nitrous oxide systems**, with **possible exceptions** for high volume use areas such as birthing units (which could be serviced by a small localised reticulated supply).
- Incorporate into the designs of healthcare facility new builds and redevelopments, the use of **portable cylinders** for other clinical areas requiring nitrous oxide, considering storage and

transport requirements. Develop **operational protocols** for safe and responsible handling of portable cylinders and security of supply.

Exclusion of reticulated nitrous oxide

It is recommended to exclude reticulated nitrous oxide systems in the design of healthcare facility new builds and redevelopments. Designing new infrastructure presents a valuable opportunity to eliminate reliance on central reticulation systems and pipelines overall.

There are examples in Australia of new hospital facilities being planned without reticulated nitrous oxide systems, or with birthing unit-specific reticulated systems.

Case Study: The Prince Charles Hospital, Queensland Health.

The Prince Charles Hospital in Queensland is the largest cardiothoracic hospital in Australia and has successfully eliminated reticulated nitrous oxide in their new builds, as part of their capital expansion project.

The expansion includes a new acute services building and an expanded paediatrics service, which will not include reticulated nitrous oxide supply.

The hospital had also included a plan to use portable cylinders for paediatric services and other clinical areas.

Learnings: Even with the expansion of paediatric services in the new building, the hospital remained committed to eliminating reticulated nitrous oxide. This case demonstrates that hospitals can successfully remove piped nitrous oxide systems, even with paediatric services, by implementing alternative solutions like portable cylinders.

Possible exceptions

Many healthcare systems, including Queensland Health, are adopting pro-active strategies. The opportunity to design or redevelop a hospital is infrequent, and when it arises, each project should take a case-based, facility-specific approach, ensuring solutions are tailored to the specific needs and context of the facility.

If reticulated nitrous oxide is required in the design of a new building, it is recommended to install a smaller, localised reticulated system that only supplies nitrous oxide to specific areas such as birthing units. It is recommended that such systems avoid ‘pendants’ due to their high nitrous oxide leakage risk, and that only direct wall outlets should be installed.

Future leak detection in central reticulated nitrous oxide systems

For all new installations, a flowmeter with remote monitoring capability should be installed at the cylinder manifold for:

a. Providing measured system flow trends over time that, when adjusted for activity, will provide indications of leakage.
b. Facilitating confirmatory leak testing if, and when, flow trends indicate potential leaks, by providing the flow testing capability.
c. Provide a mechanism for routine testing to be undertaken as per point b) above.

Additionally, consider incorporating the following components into the system to assist in locating any future leaks:

a. Connection points for portable flowmeters downstream of valve boxes with a bypass for normal operation.
b. Insertion points for future portable pressure gauges at main branch pipes to assist in future pressure testing for potential leakage.

At a minimum, mandated regular pressure testing routines with zero tolerance of pressure loss, should be implemented.

All leak detection procedures would involve direct clinical staff oversight and corroboration. Daily clinical staff checking protocols are important, such as regularly ensuring firm nitrous oxide hose connections at nitrous oxide wall outlets and connected equipment inlets. These measures are necessarily higher than those recommended in the current Australian Standard AS2896 for Medical Gas Systems.

Incorporation of portable cylinders

It is recommended to plan for the use of portable nitrous oxide cylinders in the design of healthcare facility new builds and redevelopments for clinical areas with lower volume nitrous oxide use. The facility design should account for safe storage, efficient transport, and operational logistics to ensure smooth integration into clinical workflows.

Operational protocols

It is recommended to implement Workplace Health and Safety (WHS) guidelines specific to the storage, handling, and transport of portable nitrous oxide cylinders. Staff should receive training on safe handling practices, including the transport of cylinders between different areas of the hospital.

Protocols for the use of portable cylinders should be developed, with a Nurse Manager and/or the Head of Anaesthetics overseeing the clinical governance for use. This protocol should outline the responsibilities of clinical teams, covering all aspects from storage, clinical use and reporting. The design of the facility should also include secure and accessible storage areas for portable cylinders, with well-defined routes and procedures for their safe transportation within the hospital.

Conclusion

When designing new healthcare facilities or redeveloping existing facilities, it is recommended to involve clinicians in efforts to reduce reliance on reticulated nitrous oxide pipelines. These new designs present an opportunity to rethink traditional practices and implement more sustainable approaches. By excluding nitrous oxide pipelines, manifolds, and central reticulated systems, facilities can reduce the environmental impact associated with nitrous oxide use. Where a reticulated system is required, it should be as small and localised as possible, with leak detection systems incorporated into their design.

The use of portable cylinders should be considered for clinical areas that do not require high volume nitrous oxide use. Facility designs must incorporate secure storage and efficient logistics for cylinder transport, ensuring both operational safety and functionality.

This approach empowers healthcare facilities to prioritise high-value, patient-centred care by actively engaging clinicians in the decision-making process and aligning infrastructure with clinical demands. By adopting innovative and adaptable solutions, healthcare systems can not only enhance operational efficiency but also reduce the carbon emissions of healthcare.

References:

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