

# Investigating the usage and reducing wastage of nitrous oxide at Kingston General Hospital: a Quality Improvement Initiative

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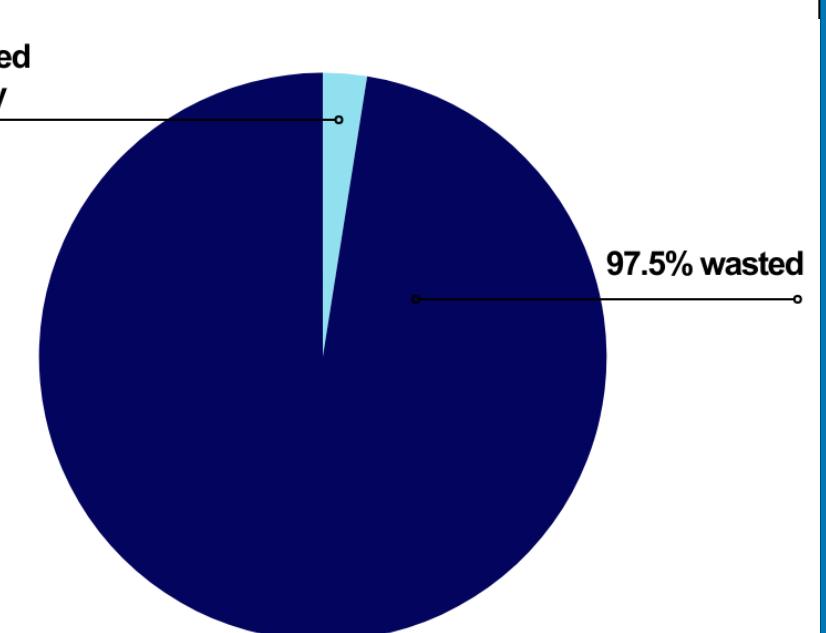
## Background

Nitrous oxide (N<sub>2</sub>O) is an anesthetic gas with sedative, amnestic, and analgesic properties. It has a significant negative environmental impact, with an atmospheric life of approximately 120 years and a global warming potential of 265. Multiple hospital systems spanning various countries have detected significant leaks in their N<sub>2</sub>O pipeline system, indicating a large loss of gas before the product reaches the patient.

A survey of our department showed that N<sub>2</sub>O is not frequently used by most clinicians, and that when it is used, it is typically for short time periods and in specific cases (GA c-section, pediatric inhalational inductions, facilitating IV access).

An audit performed at KGH in the spring of 2024 showed that 338,000 litres of N<sub>2</sub>O were purchased

over a 17-week period, while clinical use only accounted for 8,500 litres.



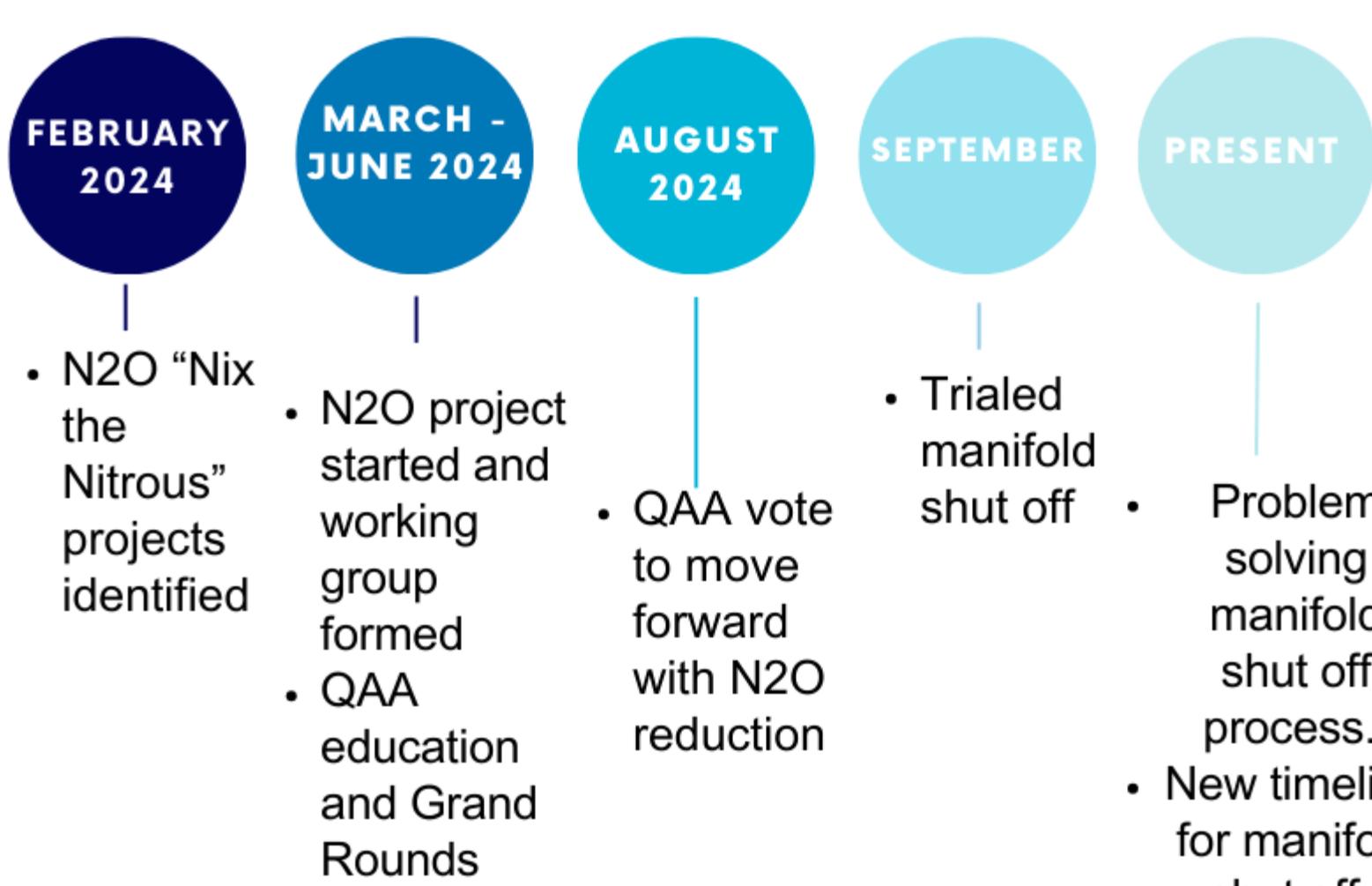
## Aim

By October 2025, we aim to reach zero wastage of manifold nitrous oxide at Kingston General Hospital and to have a 50% decrease in the amount of nitrous oxide that is ordered by KGH.

## Strategy for Change

Eliminate pipeline N<sub>2</sub>O wastage by disabling the N<sub>2</sub>O manifold and using E-cylinders outfitted on the back of each anesthetic gas machine (AGM) to provide point of care delivery of N<sub>2</sub>O.

## N<sub>2</sub>O QI PROJECT TIMELINE



## Attempt # 1

### PLAN

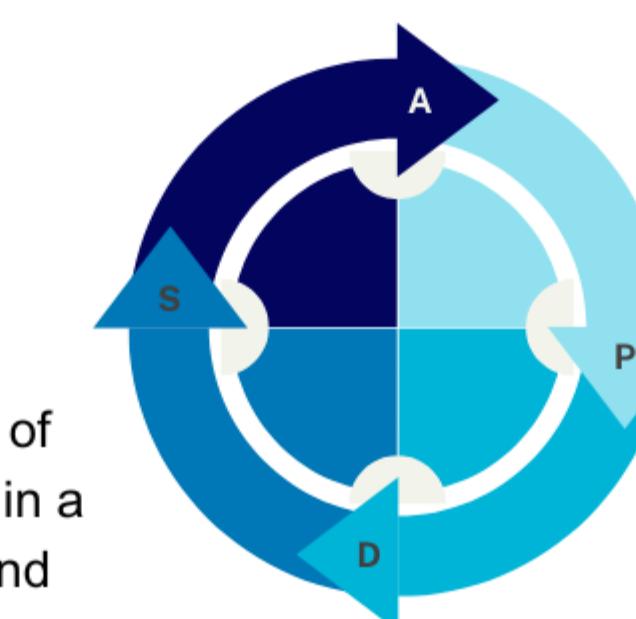
- Survey department members to gauge clinical N<sub>2</sub>O usage
- Assess number of large N<sub>2</sub>O tanks ordered over 17 week period
- Assess amount of N<sub>2</sub>O used weekly over 17 week period
- Obtain departmental approval to run a trial of using N<sub>2</sub>O E-cylinders and shutting off the N<sub>2</sub>O manifold
- Connect a portable E-cylinder of N<sub>2</sub>O to each anesthetic gas machine
- Shut off the N<sub>2</sub>O manifold
- PROBLEM: N<sub>2</sub>O low pressure alarms**



## Attempt # 2 – In progress

### ACT

- Permanently decommission the N<sub>2</sub>O manifold



### STUDY

- Reassess the amount of N<sub>2</sub>O ordered by KGH in a 3 month time period and compare to previous ordering practices
- Determine the amount of N<sub>2</sub>O wastage by comparing supplied amount of N<sub>2</sub>O with clinical use

### PLAN

- Collaboration with maintenance department to circumvent the local N<sub>2</sub>O low pressure alarms
- Plan to connect a medical air compressor to the pipeline and proceed with using E-cylinders on each anesthetic machine

### DO

- Go live with the above plan of using E-cylinders as the supply of N<sub>2</sub>O

## SWOT ANALYSIS

### Strengths

Support from maintenance team

Support from Anesthesia Assistant group

Support from the anesthesia department

### Weaknesses

Opening the tank at the back of the AGM before use

Leakage through the E-cylinder

Inability to easily and accurately determine how much N<sub>2</sub>O is left in each tank

Lack of storage areas for extra E-cylinders

### Opportunities

Educate clinicians about the environmental effects of N<sub>2</sub>O

Educate clinicians about viable alternatives to using N<sub>2</sub>O

Expanding the project to Hotel Dieu Hospital if successful at KGH

### Threats

Supply chain issues leading to difficulty obtaining E-cylinders

Clinician dissatisfaction

## Next steps

- Cap off N<sub>2</sub>O manifold to eliminate manifold and pipeline wastage.
- Reassess the amount of nitrous oxide being ordered by KGH.
- Assess clinician satisfaction with using E-cylinders on AGMs.
- Expand the project to the Hotel Dieu Hospital site of KHSC and eliminate the nitrous oxide pipeline at HDH.
- Engage clinicians in further education regarding the environmental effects of nitrous oxide to decrease clinical use.