



Ditch the Desflurane

a WAN and PAN initiative to reduce OT carbon emissions



Singapore Healthcare Management 2024

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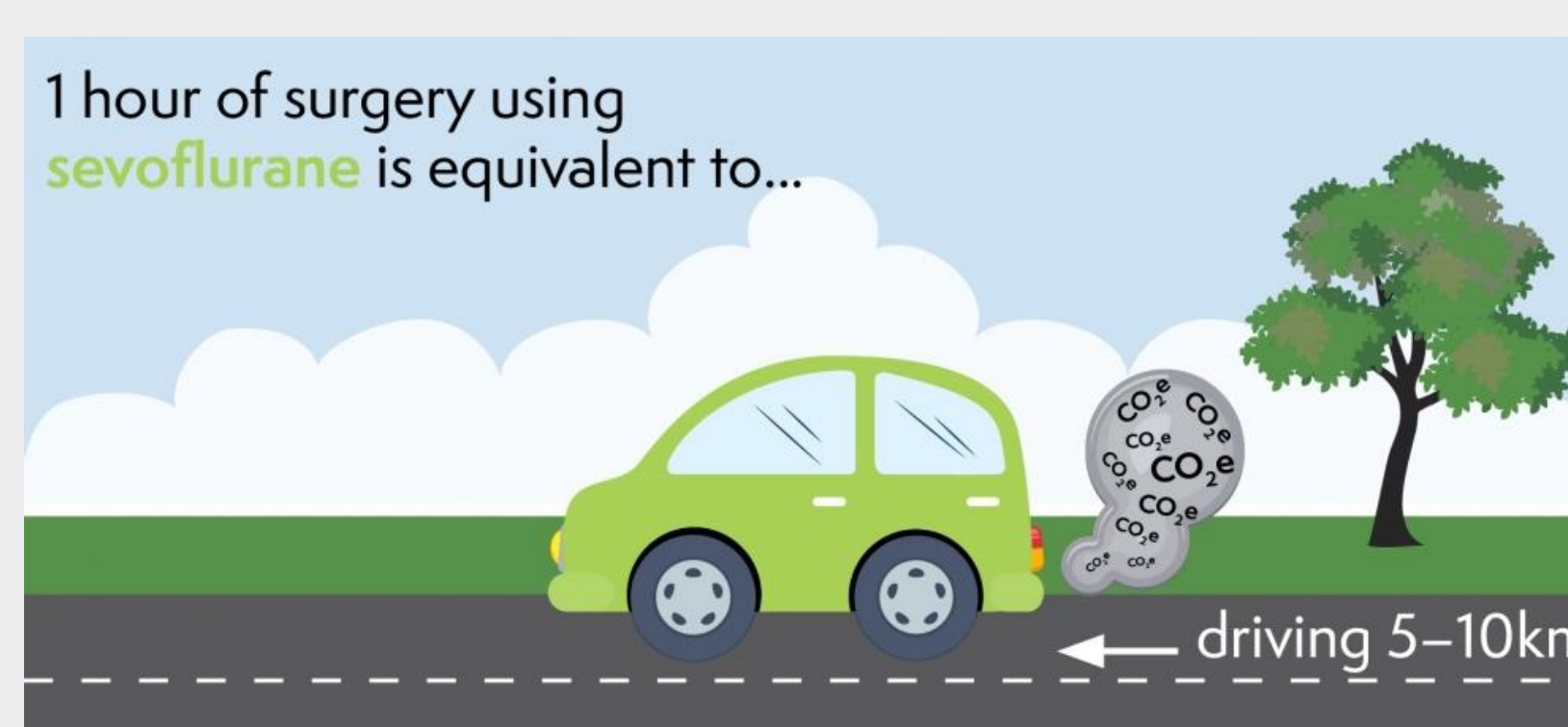
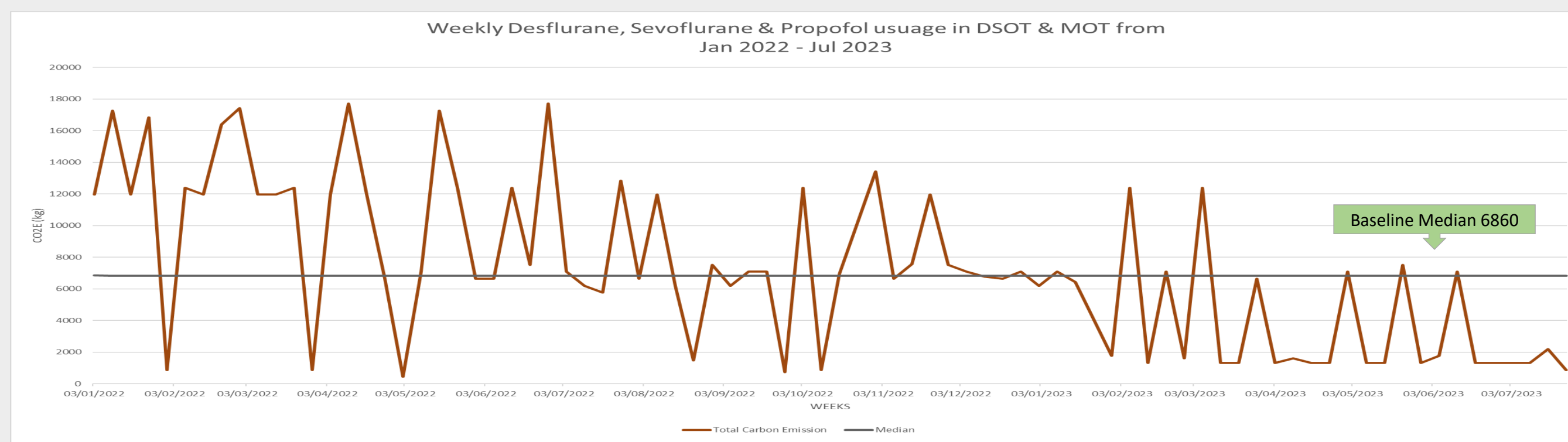
1. Anaesthesia (AN-Women), 2. Anaesthesia (AN-Paed) 3. Pharmacy
4. Operating Theatres, Nursing, 5. Quality Safety & Risk Management

Introduction and Background:

Healthcare accounts for 10% of all greenhouse gas emissions in the United States, with Operating Theatre (OT) consuming up to six times more energy. These gases are potent greenhouse gases and is banned in Scotland. There are two common inhalational anaesthetics currently available: Sevoflurane and Desflurane. They both have different pharmacological properties. Desflurane has previously been preferred over Sevoflurane due to faster wake-up times, especially in longer surgeries. It has been shown that these small reductions in wake-up times, time to emergence when compared to sevoflurane and propofol-based.

Problem:

High carbon emissions in OT (Day Surgery and Major OT) contributed by Desflurane use. An hour of sevoflurane will have the warming effect of 800 – 1,600g CO₂, the equivalent of driving 5 – 10km. An hour of desflurane will warm the atmosphere by the equivalent of at least 30 – 60kg CO₂, the equivalent of driving 200–400km.



Aim:

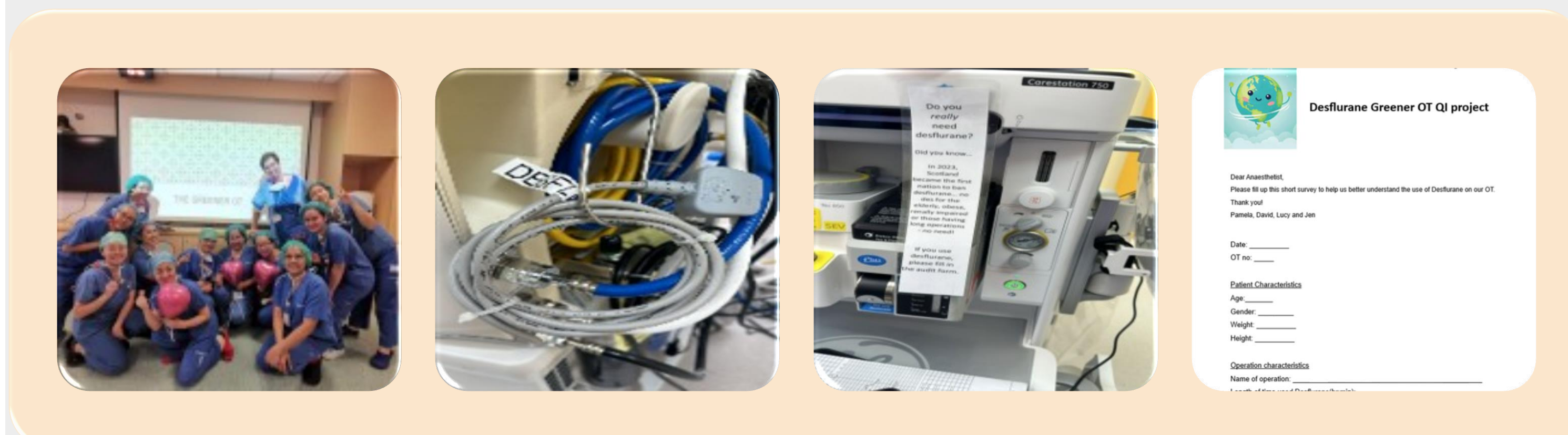
Reduce carbon dioxide equivalent (CO₂e) emissions from our OT by 50% over 10 weeks starting 1 August 2023.

Methodology and Solutions:

A multi-disciplinary workgroup was formed, and a Root Cause Analysis was conducted to deep dive into the problem. Data was collected from Pharmacy on Desflurane, Sevoflurane and Propofol quantities supplied to all OTs were collected on a weekly basis from January 2022 to October 2023. Weekly total CO₂e of anaesthetic was based on 886kg of CO₂e per desflurane (240ml) bottle, 49kg of CO₂e per sevoflurane (250ml) bottle and 0.0105kg CO₂e per 50ml bottle of propofol.^{2,3}, Pre and Post intervention anonymous feedback survey for both Women's and Paediatric's anaesthetists were collected, demographics, usage of Desflurane, Sevoflurane, flow rates and Reason for Desflurane use are some of the questions asked. With the feedback, interventions was implemented from 1 August 2023.

Results:

There is an 80% reduction in CO₂e emissions from operating theatres (OT) over 10 weeks starting 1 August 2023 to February 2024. The reduction was also attributed to buy-in from anaesthetists who already read/practise sustainable anaesthesia. The improvements are sustainable since the implementation. Other benefits include cost savings of 40% to OT.

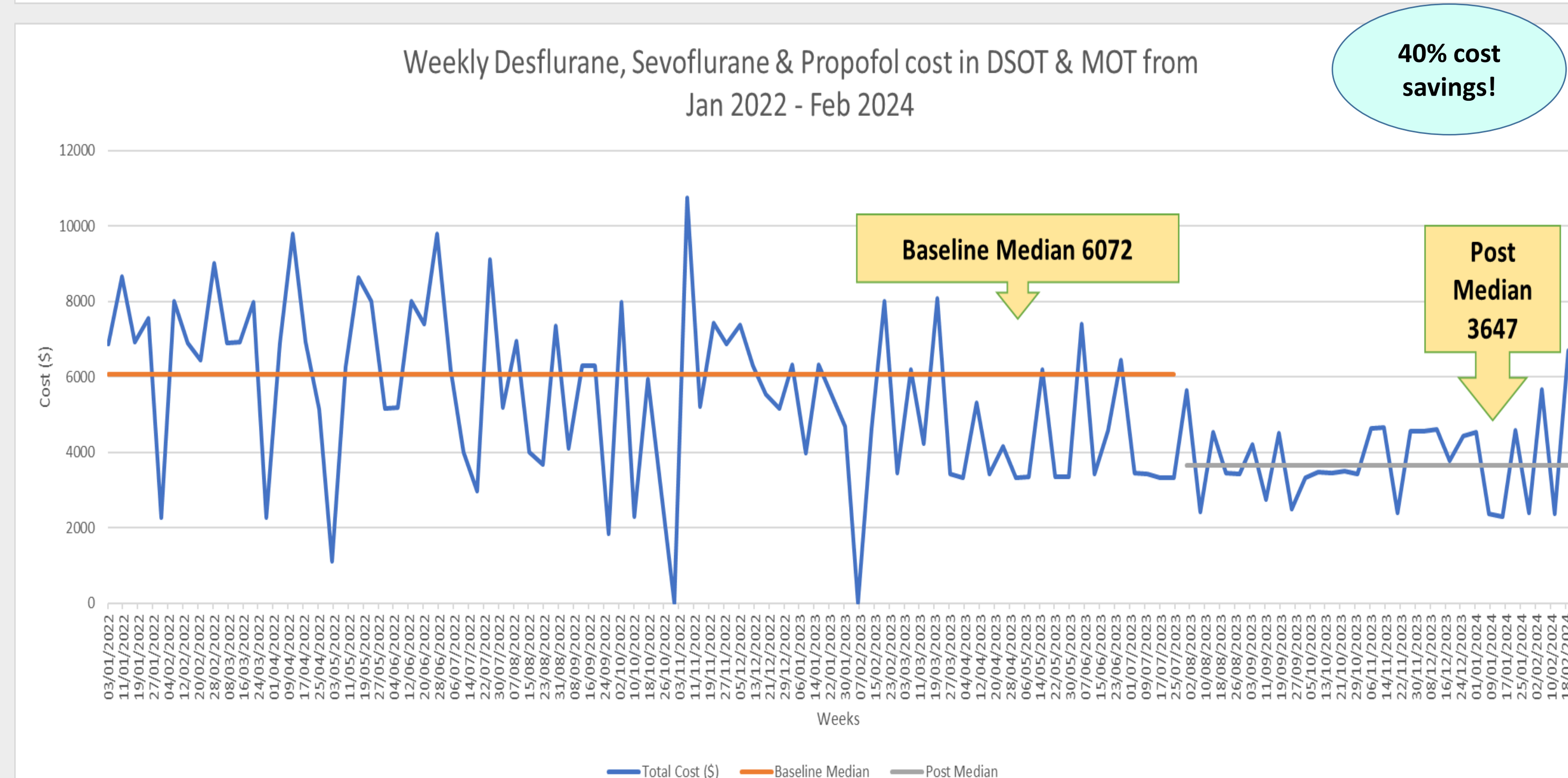
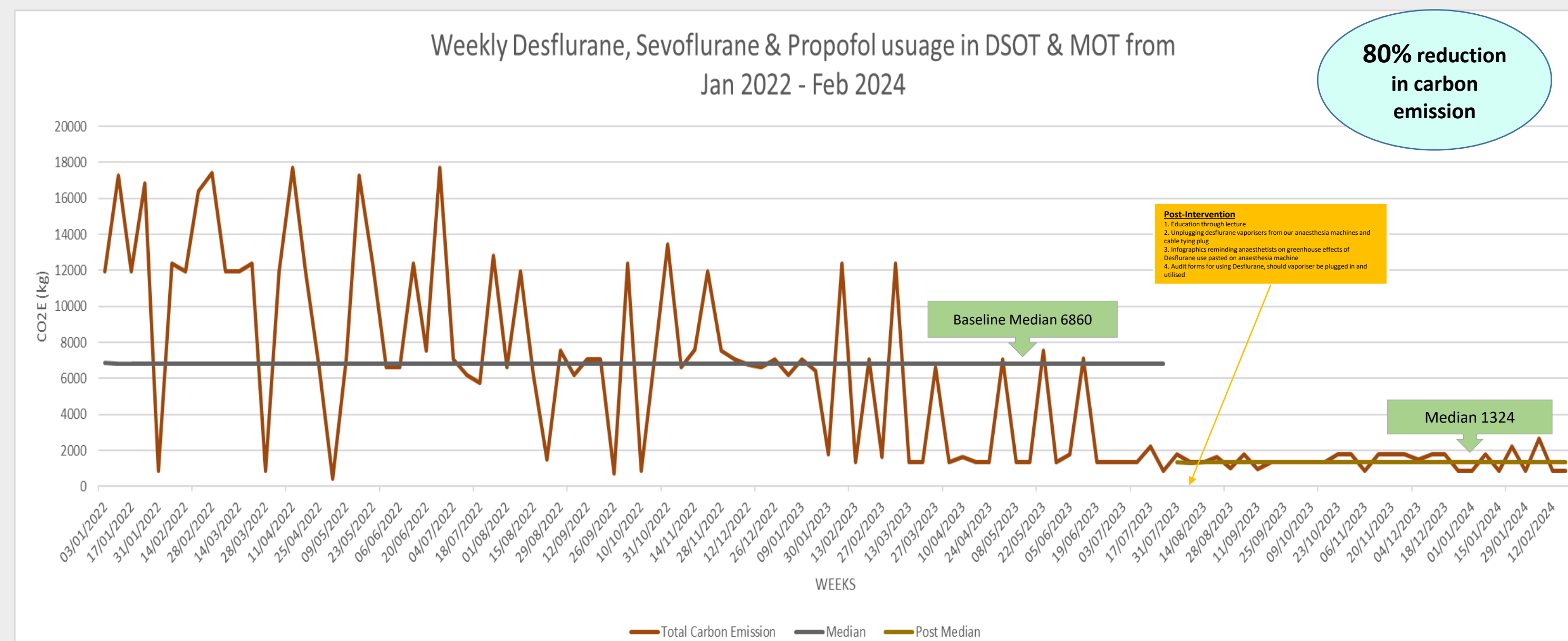


(1) Lecture to the Paediatric and Women's anaesthetists and anaesthesia nurses on low-flow anaesthesia and the greenhouse effects of Desflurane use

(2) Unplugging desflurane vaporisers from our anaesthesia machines and cable tying plug

(3) Infographics reminding anaesthetists on greenhouse effects of Desflurane use pasted on anaesthesia machine

(4) Audit forms for using Desflurane, should vaporiser be plugged in and utilised



Conclusion:

We attribute our significant and sustained drop in overall CO₂e emissions to: (1) Educating anaesthetists and nurses on the carbon emissions of their anaesthetic choice, (2) Installing physical barriers in using Desflurane (unplugging and cable-tying), (3) Anaesthetists switching to Sevoflurane and Propofol TIVA which has much lower CO₂e emissions. While Desflurane has not been removed from the formulary, its use has reduced significantly. In addition, there is no Desflurane written off due to no usage and expired. Despite some other local and international hospitals removing the Desflurane vapouriser totally from the anaesthesia machine, our approach was to leave it on our machine, but unplugged. This contributed to a higher acceptance of our intervention as the change was more gradual. Currently, we can consider removing it totally from our anaesthesia machine (as 75% of anaesthetists polled are agreeable).

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3. McGain, F., Sheridan, N., Wickramarachchi, K., Yates, S., Chan, B., & McAlister, S. (2021). Carbon Footprint of General, Regional, and Combined Anesthesia for Total Knee Replacements. *Anesthesiology*, 135(6), 976–991.