

Introduction

Hospital imaging technology accounts for a significant energy usage in healthcare.

While energy consumption in CT and MRI machines has been studied extensively, the energy consumption of ultrasound machines has been overlooked in the literature as a source of energy waste. Anesthesiologists frequently use ultrasound in regional anesthesia.

Study Aim: to quantify the energy consumption of ultrasound machines and study energy-saving strategies to decrease ultrasound machines' energy usage at our institution. Powering down medical equipment during non-operational times is a potential strategy for reducing energy waste.

Hypothesis: turning the ultrasound machine off when not in use and overnight would significantly decrease energy consumption.

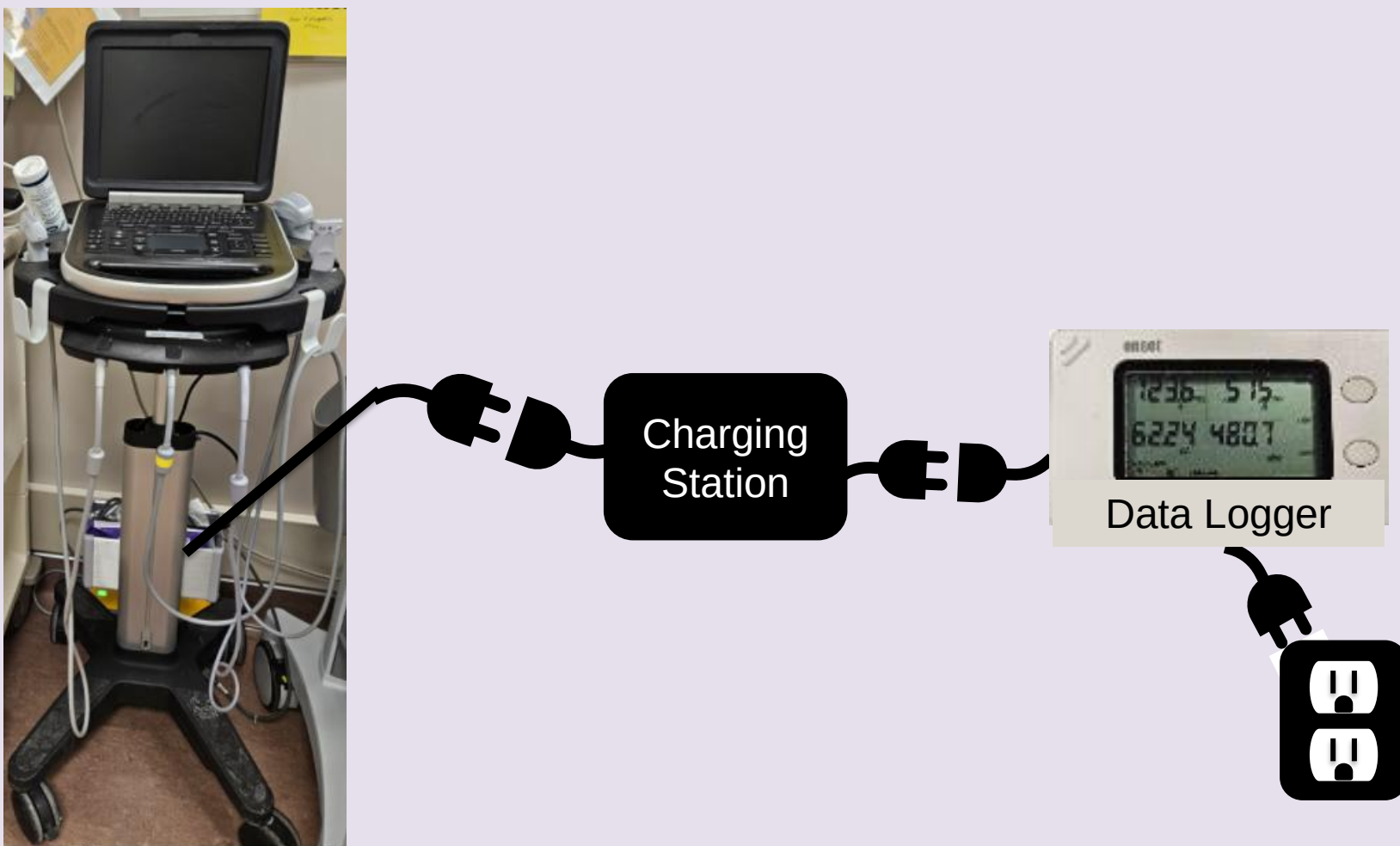


Figure 1. Ultrasound Data Collection Setup

Materials and Methods

Pre-intervention: The typical use of an existing ultrasound machine without energy-saving interventions was logged over a full week.

Energy-saving Intervention: During the following week, the energy-saving intervention involved turning off the same ultrasound machine when not in use, including overnight power-down.

Primary Outcome: Energy consumption in kilowatt-hours (kWh) in the pre-intervention and intervention group. The secondary outcomes were the amount of usage time of the ultrasound machine and the energy cost.

Emissions estimates were calculated using 110g of CO₂ emission per kWh of electricity. Cost savings were estimated using the value of CAD 0.192 per kWh.

Results

Our intervention **saved 81%** relative energy compared to pre-intervention and, when accounting for active scanning time, this energy saving became 87% per minute of active scanning time (Table 1).

For a single ultrasound machine, the absolute energy saving per day equals 1.4 kWh, which can be extrapolated to 519.3 kWh of energy savings per year.

This is equivalent to **57 kg CO₂ emissions per year** and yearly energy **cost savings of CAD100**.

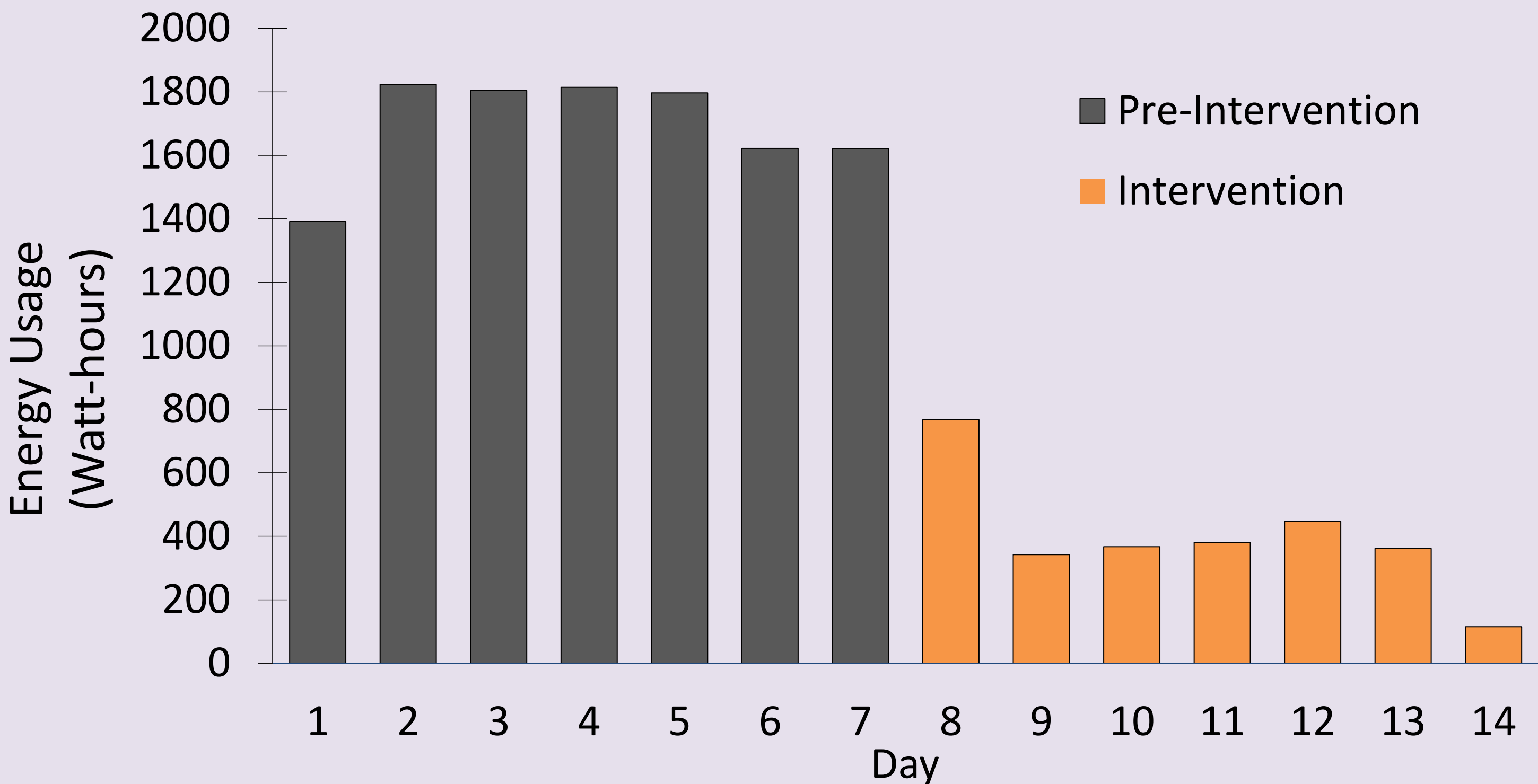


Figure 2: Daily energy consumption over pre-intervention and intervention week

Table 1: Summary of energy data for an ultrasound machine

	Pre-Intervention	Intervention
Active Scanning Time, mins	347	511
Number of Scans	31	54
Energy Consumption, W·h (CI)	12,306.09 (0.011)	2,346.32 (0.008)
Energy Consumption per Day, W·h/Day	1,758.0	335.2
Energy Used Per Minute of Active Scan, W·h/min	35.5	4.6
Mean Energy Consumption, W·h (SD)	1.22 (0.54)	0.23 (0.41)
Mean Active Power, W (SD)	73.32 (33.02)	13.98 (24.86)
Total Energy Savings, W·h/Day (% savings)		1,422.79 (81)
Energy Saved per minute of active scan, W·h/min (% savings)		30.87 (87)

Conclusion

Actively switching off the ultrasound machine when not in use is a **simple, convenient**, and adequate opportunity to significantly reduce energy consumption, minimize carbon footprint, and save costs.

This intervention is a valuable strategy to **reduce scope 2 emissions**, which play a large part in healthcare's carbon footprint.

Considering the number of ultrasound machines in an average hospital, this represents a promising area for a simple intervention in planet health.

References:

- Energy Use in Medical Imaging Equipment in Healthcare Facilities, Vol. 1, p. 1, 2024.,
- Healthcare Energy End-Use Monitoring, Vol. 1, p. 20, 2014.
- Canada Energy Regulator, Vol. 1, p. 110, 2023.
- Electricity Prices in Canada, Vol. 1, p. 1, 2023.

Contact

Edward Umberto Serghi
edward.serghi@ucalgary.ca
Dr. Vivian H.Y. Ip
hip@ualberta.ca