

The Future of Operating Rooms is Green

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Introduction

Patient safety is always the first priority when it comes to operating rooms. However, operating rooms are one of the largest users of supplies and generators of hospital waste. The operating room (OR) is a strategic priority for any hospital hoping to reduce its impact on their environment. **This project asked, "What are the overall operations, equipments, and barriers identified within an operating room wanting to go green?"** This question aims to analyze and evaluate the implementation of sustainable practices and changes to medical centers throughout the UCSD campus. This analysis is essential in understanding how to reduce hospital waste while maintaining patient safety.

UC San Diego Health is on a sustainability journey, and our staff has made it clear that they are eager to "green" our operations in support of the UC Sustainable Practices Policy and Sustainable Procurement Guidelines. Throughout the **UCSD medical centers**, we have broad interest in reducing waste, saving energy, protecting water quality, providing wholesome foods, reducing hazardous chemicals, and ensuring that our intensive 24/7 operations to provide excellent healthcare does not add to health, environmental and social problems in the communities we serve.

I have been working in alignment with the Greening the OR (GOR) committee, leadership and staff to conduct an evaluation of equipment in the Operating Rooms (ORs), **conducting** inventory, **evaluating** typical uses and constraints, energy use, downtime impacts, financial and staffing impacts, **reviewing** the overall GOR checklist, conducting interviews with staff, and developing a web presence on Pulse to support overall GOR goals.



Conceptual Framework

What is greening the operating room?

Greening the operating room is the process of designing and implementing strategies that reduce energy use, supply costs, and waste generated in the OR. Areas of focus in the OR include leadership, waste, supply chain, chemicals, energy and water, greenhouse gases, and the built environment. Participants include OR physicians, nurses, nurse educators, Environmental Services (EVS), Environmental Health and Safety (EHS), Energy Management, PeriOp, Sterile Processing (SPD), pharmacy, procurement, sustainability, anesthesia, and clinical technology. Efforts to Green the OR are balanced and grounded by patient safety and infection prevention.

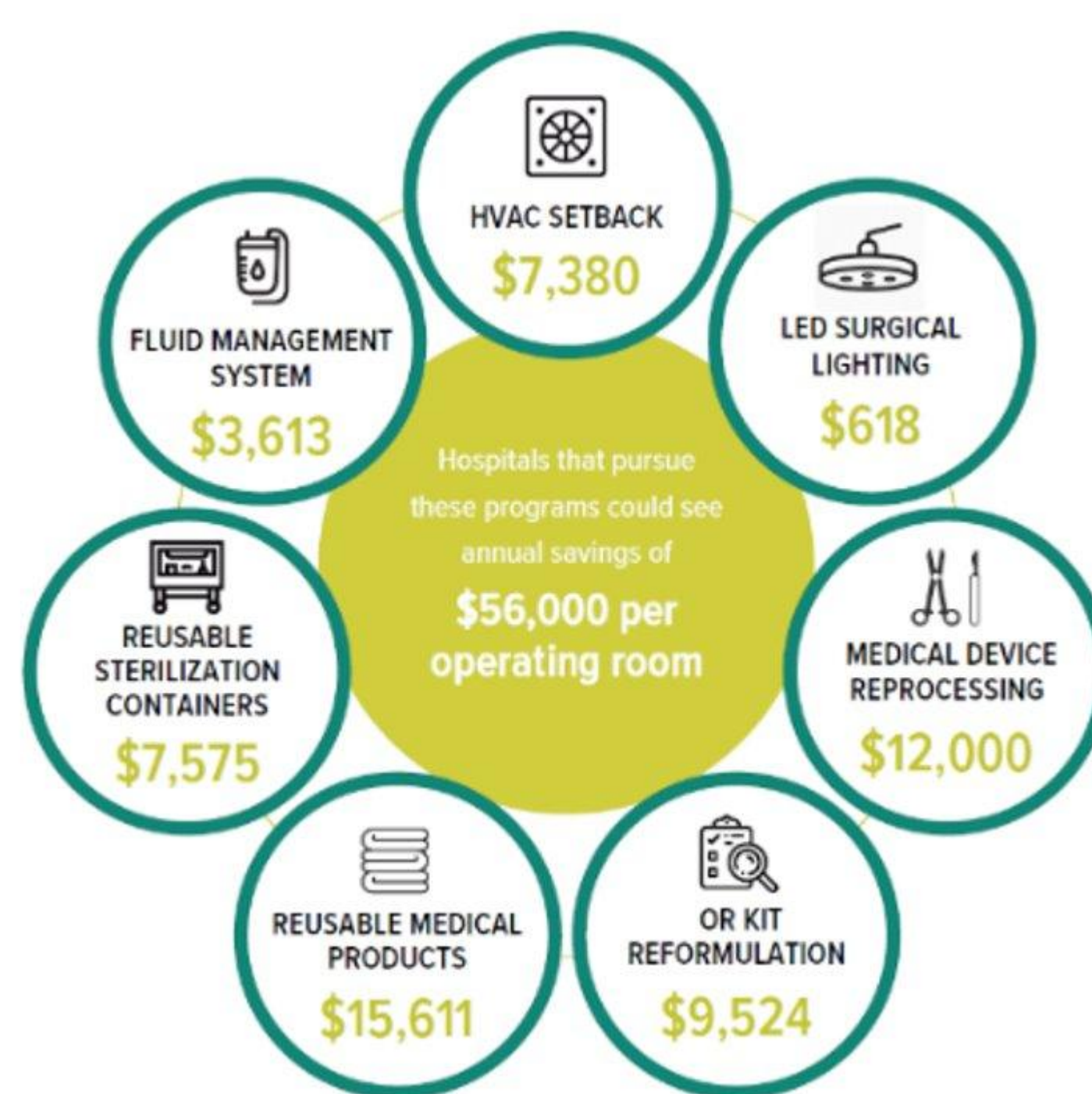
Operating rooms produce 20-30% of a facility's total waste. If hospitals were to pursue programs that reused, reprocessed, and reevaluated OR systems there would be an annual savings of \$56,000 per OR. A few highlighted impacts include:

- Perioperative practice settings generate up to 70% of a facility's total waste (44-46)
- Consume three to six more times more energy per square foot than the rest of the hospital. (29)
- Supply costs can comprise up to 56% of the total OR budget. (47)
- Anesthesia gases comprise more than 51% of the surgical procedure footprint (29) and represent 5% of a facility's greenhouse gas emissions. (48)

Source: AORN Environmental Responsibility Statement, <https://www.aorn.org/guidelines/clinical-resources/position-statements>

Methods and Materials

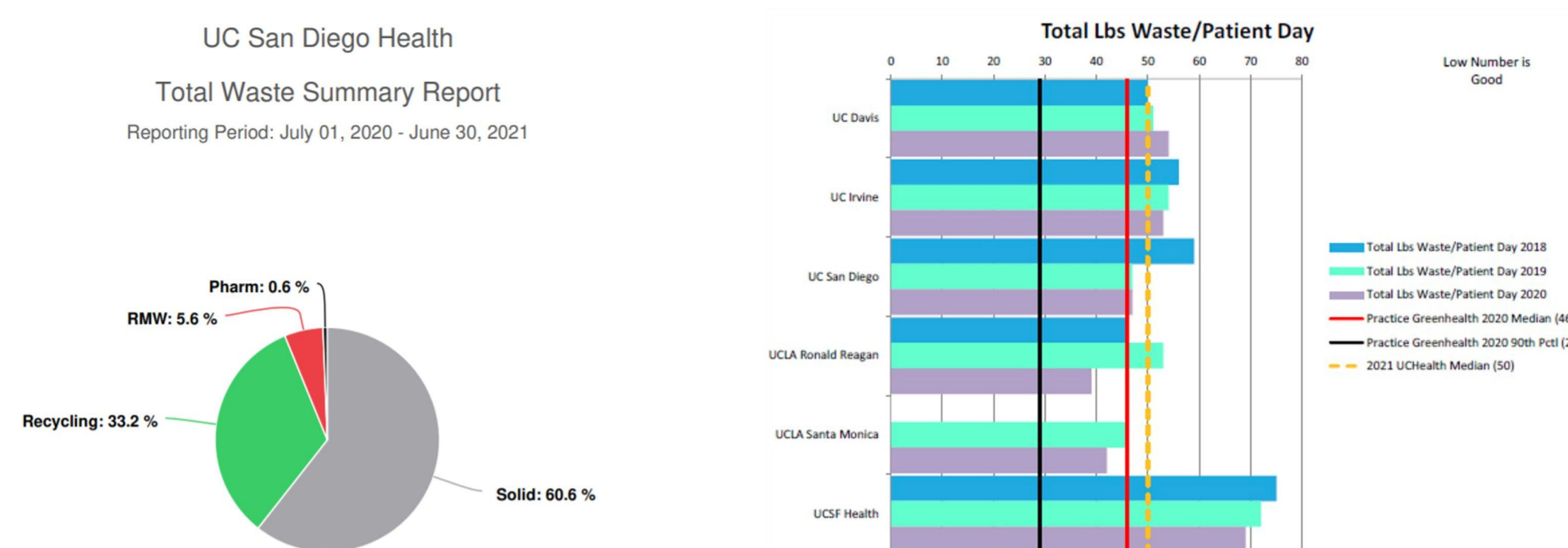
- Semi-structured and structured interviews with GOR members
- Content analysis of GOR checklist and goals
- Conduct inventory at Shiley Eye Institute Operating Room
- Statistics from the following sources:
 - AORN Environmental Responsibility Statement
 - Practice Greenhealth Website
 - Practice Greenhealth Annual Benchmark Report



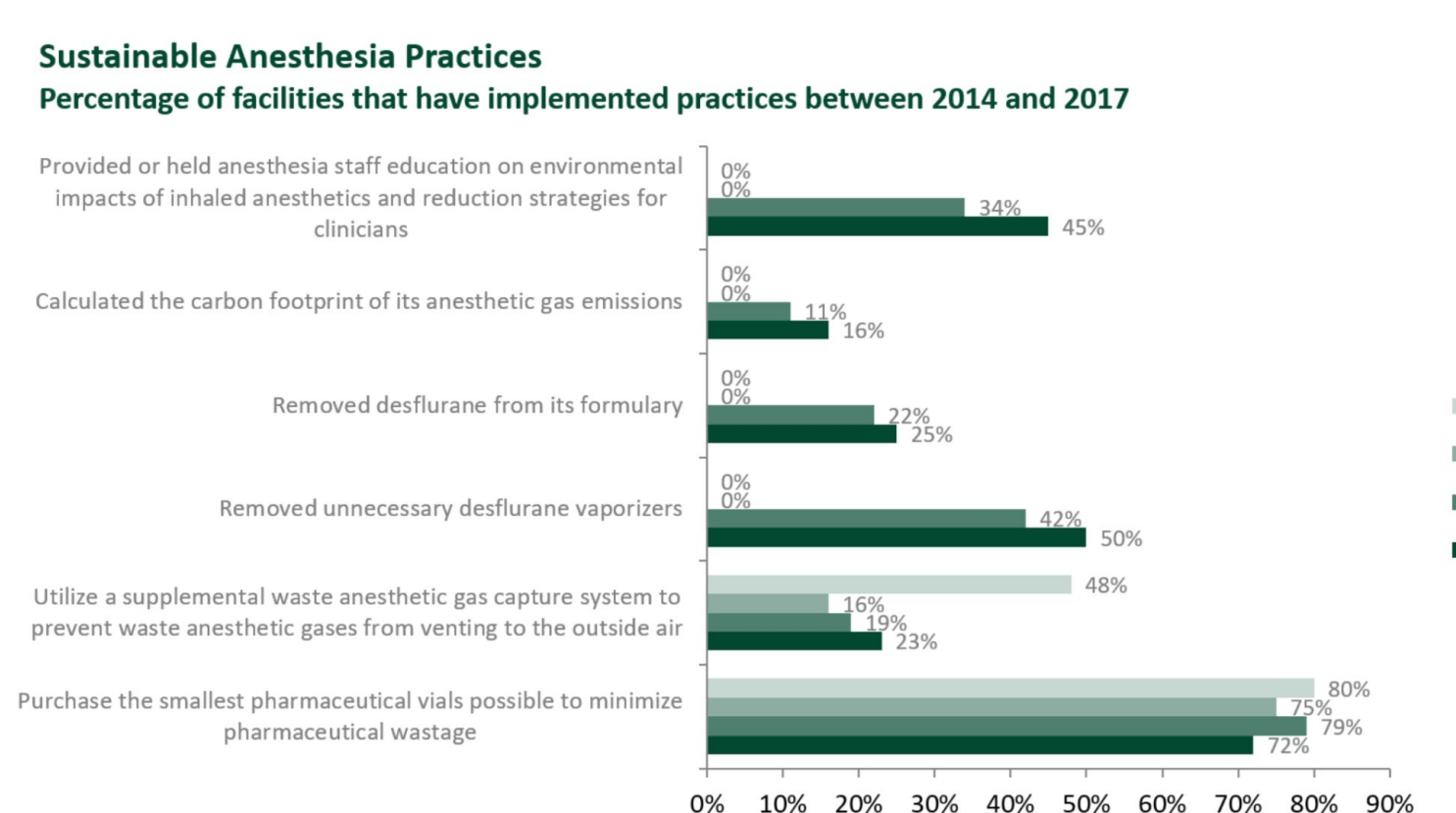
Results and Outcomes

What have we done?

Greening the OR focuses on areas of leadership, waste, supply chain, chemicals, energy & water, greenhouse gases, and the built environment. Therefore, I conducted my analysis within each of these areas and found a significant amount of changes and improvements, all leading to carbon neutrality.



Comparing UCSD Health to our sister medical centers, UCSD Health has eliminated 18,000 disposable Bair Paws patient warming gowns from landfills, saving \$170,000 annually. With a focus on reducing regulated medical wastes, battery disposal, and RCRA hazardous drug waste from OR Anesthesia cart, and increased reprocessing collection and buy back, savings for this year are \$650,000 (\$450,000 last year).



Source: Practice Greenhealth, <https://practicegreenhealth.org/>

UCSD Health has completed the three year anesthesia gas baseline GHG 2018-2020 and have eliminated desflurane (an anesthetic gas over 2500 more times harmful to the atmosphere than CO₂) from the formulary.

Here at UCSD Health, we have changed over 2500 OR lights to LED with an estimated annual energy savings of nearly \$65,000. We have also completed an energy use analysis on anesthesia machines and are continuing to collect data.

Conclusions

Greening the operating room is a newer concept within climate sustainability and health, so reasonably there are apprehensions when it comes to implementing the practice. Other barriers included different configurations at different OR locations, making it difficult to implement GOR practices and COVID limiting our research. But, I have seen a great deal of excitement and encouragement from the members I have worked with. There are many opportunities to Greening the OR and we have simply just touched on a few of them. My analysis of Greening the OR has shown that there are many cost savings associated with sustainable health changes, workers of hospitals are more satisfied with greener practices, and overall carbon emissions are reduced, benefiting the climate and health of our community.

Future Goals

What's still to come?

Waste/ Procurement and Chemicals

EH&S is working with anesthesia and pharmacy to create a waste flow chart and poster, in addition to battery disposal training. We are working with waste management on recycling OR packaging. We would also like to review supply/donation programs for items that are unopened or unused. We also participated in OR custom pack reviews, removing items seldom used. Consideration is underway for replacing some plastic products with NewGen Surgical's eco-friendly trays, needle counters, basins, and bowls. We are also looking into a potential UC wide initiative to purchase PVC/DEHP-free IV bags and tubing.

Climate/ Anesthesia

Working on data collection for the fresh gas flow analysis and best practice pilots (IRB). From this study, anesthesia will be able to introduce Best Practice Advisory (BPA) for anesthesia fresh gas flows and education modules.

Leadership

We are working on establishing clear lines of communication and process to extend impact of GOR. We are considering including proper waste disposal in OR into competencies. We are also considering reusables versus disposables during contract renewals and maximizing reprocessing.

Energy

HVAC setbacks are currently on hold. The energy use analysis for anesthesia machines are underway and LED lighting retrofits are progressing.

Water

We need to review motion sensors on scrub sinks and see if sterilizers have water economizers.

Literature Cited

- AORN Environmental Responsibility Statement: <https://www.aorn.org/guidelines/clinical-resources/position-statements>
- Practice Greenhealth <https://practicegreenhealth.org/>

Acknowledgements

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