

Implementation of environmentally sustainable practices at the UCSF School of Dentistry



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Background

- The US healthcare education system provides quality clinical training for students, however does little to reduce the environmental impact of healthcare delivery. The current US healthcare system generates 12% of national acid rain production, 10% of greenhouse gas emissions, and 10% of smog formation [1].
- With 56% of US doctors owning their practices, a unique opportunity exists for owners to lessen healthcare's ecological footprint [2,3].

Introduction

- As an institution, UCSF is the second largest waste generating organization in San Francisco, second to the city government.
- In December 2018 UCSF, excluding the hospital, spent \$180,450 on waste disposal, \$19,438 from the School of Dentistry (SoD). [3]
- UCSF uses Recology, a resource recovery company, to dispose of waste. Recology offers up to 75% discounts on waste removal based on waste diversion, and charges 33% less to remove recyclables over garbage. [3]
- Until now all SoD waste has been treated as garbage. By channeling waste flow to proper subsets, the SoD could cut down both its environmental impact and its waste disposal costs.

Hypothesis

We hypothesize that the implementation of a new waste disposal system, coupled with waste flow education, will increase the waste diversion rate in the SoD's simulation lab.

Objectives

- To design and implement waste diversion procedures in the SoD
- To increase sustainability and awareness amongst SoD students, staff, and faculty through waste flow education modules
- To determine both the effectiveness and impact of new policies and education on the outcomes of proper waste disposal
- To obtain student opinions on sustainable dentistry

References

- [1] Eckelman MJ, Sherman J (2016) Environmental Impacts of the U.S. Health Care System and Effects on Public Health. *PLoS ONE* 11(6): e0157014. <https://doi.org/10.1371/journal.pone.0157014>
- [2] Practice ownership is declining. Vujicic, Marko. *The Journal of the American Dental Association*, Volume 148, Issue 9, 690 - 692
- [3] Data obtained staff in the UCSF department of facility services

Procedure / Methods

1.) New Simulation Lab Waste Diversion Procedures

- We installed recycling bins adjacent to existing garbage bins and designed/installed dental-specific instructional signs (Figure 1).



Figure 1. Newly created waste flow instructional signs.

2.) Waste Flow Education

- We led an instructional lecture in first and second year classes to instruct students and faculty on proper waste flow.

3.) Waste Audit to monitor impact and effectiveness:

- Photos and waste depth were recorded for each of the bins (13 recycling, 13 garbage) at 5 PM, for 5 consecutive weekdays
- Volume was calculated using waste depth (Figure 2).
- Bin surface photos were assigned a score from 0-5 (Figure 3).
 - 0 = no compliance
 - 5 = perfect compliance.

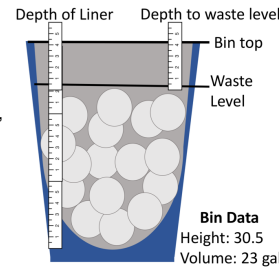


Figure 2. Volume calculation rationale from depth measurements

Results



Garbage Bin: 0 = 0% correct

Garbage: 2.5 = 50% correct

Recycle Bin: 5 = 100% correct

Figure 3. Visual inspection photos examples.

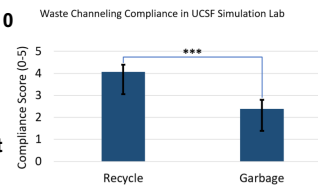


Figure 4. Average daily compliance rating (Scale 0-5; n = 5). Mean recycle: 4.06 ± 0.33 . Mean garbage: 2.38 ± 0.41 . (Unpaired Student T-Test $p < 0.0001$).

Results Continued

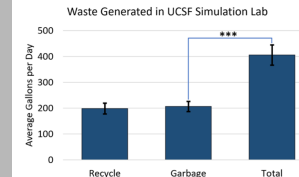


Figure 5. Average daily simulation lab waste (n = 5). Mean recycle: 199 ± 21 gal. Mean garbage: 207 ± 20 gal. Mean total: 406 ± 39 gal. (Unpaired Student T-Test $p < 0.0001$).

| Cost of hauling all waste as garbage | Cost of hauling waste as garbage with recycle | Cost cut from recycle | % cost cut from recycle |
|--------------------------------------|---|-----------------------|-------------------------|
| \$88.86 | \$75.55 | \$13.31 | 14.95 % |

Table 1. Average daily cost to dispose of sim-lab waste. Cost to haul garbage: \$0.24/gal and recycling: \$0.16/gal.

Discussion

- In one week, this proof of concept study showed average SoD simulation lab waste diversion was 48.98% (n = 5; $p < 0.0001$). This indicates the feasibility of more sustainable dental education, and provides evidence for changes in student/faculty habits.
- A 48.98% waste diversion rate equates to a 14.95% decrease in disposal costs, which if maintained for 40 weeks, amounts to \$66.59 weekly and \$2,663 annual savings.
- A compliance comparison between recycle and garbage demonstrated higher recycling protocol adherence (n = 5; $p < 0.0001$). This trend may be due to instructions to dispose waste in garbage if opting out or unsure of recyclability.
- The compliance comparison shows room for further improvement in waste diversion. With Recology's diversion rate discounts, additional recycling systems and better compliance could increase the SoD's current 23% discount, totaling \$5,831 in December, to a max of 75%, offering an additional \$13,000/mo savings

Future Plans

- IRB proposal for a Qualtrics survey on students opinions about sustainable dentistry.
- Implementing compost and special material bins to Simulation lab. (Figure 6).
- Implementing soft plastic recycling for plastic barriers.
- Potential glove recycling and reusable autoclave bag services.



Figure 6. Next step waste flow signs.

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