Background

- Healthcare systems adversely impact the environment through resource consumption, waste generation, and greenhouse gas emission.¹⁻²
- SCRUB sinks used for sterile hand scrubs are a source of water waste in the operating room (OR) and identify modifiable factors for reducing water waste in the OR.

Objective

- To quantify water wasted at OR scrub sinks at a single center and identify modifiable factors for reducing water waste in the OR.

Methods

1. Observed scrubbing at 98 OR sinks at 2 academic hospitals; included sinks with electronic timers (N=84) and knee panels controls (N=14).
2. Water waste = seconds of water flow after conclusion of scrub.
3. Sampled water flow rates at both sink types.
4. Anonymous, voluntary surveys to assess frequency of scrubbing with and without electronic timers (N=84) and knee panels.

Results

- Observed 201 instances of OR sink use, 159 instances of water waste.
- Water flow rates varied from 3–7 L/min; median flow rate 5.1 L/min.
- Median: 131 seconds (IQR 64, 182 seconds) of water wasted.
- Water flow rates are similar at all OR sinks.
- Hand scrub habits of survey respondents are representative of everyone who scrubs in the OR despite skewed distribution of responding specialties.
- Estimated median total volume of water waste for 34,554 cases/year: 301,498.9 L (IQR 124,146.6; 804,601.2).

Limitations

- The following assumptions were made in the analytic process to comply with resource restraints and institutional research policies:
  - Water wasted and number of people scrubbed per case during 5-week observation period is representative of all scrub sink activity and all cases.
  - Hand flow rates are similar at all OR sinks.
  - Hand scrub habits of survey respondents are representative of everyone who scrubs in the OR despite skewed distribution of responding specialties.

Conclusions

- The estimated median volume of water wasted is approximately the volume of water used in 6 months by an average American household of four or the volume of drinking water needed in one day by 94,000 people.
- We found significant differences in water waste between types of sink controls, agreeing with previous studies.⁴⁻⁵
- We found significant differences in user scrub choice.
- We encourage examination of facility characteristics and practices to develop and implement plans that will conserve water without compromising safety.

References

5. https://www.epa.gov/watersense/indoor-water-use-united-states
7. https://www.epa.gov/watersense/indoor-water-use-united-states

Table 1. Operating Room Sinks

<table>
<thead>
<tr>
<th>Floor</th>
<th>Knee-Operated Sink</th>
<th>Timer-Controlled Sink</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>48</td>
<td>52</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>C</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>D</td>
<td>20</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>80</td>
<td>92</td>
</tr>
</tbody>
</table>

Table 2. Median water waste by sink type

<table>
<thead>
<tr>
<th>All Sinks (N=94)</th>
<th>Knee-Operated (N = 14)</th>
<th>Timer-Controlled (N = 80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (min)</td>
<td>2.00 (95.3)</td>
<td>2.02 (95.3)</td>
</tr>
<tr>
<td>Flow Rate (L/min)</td>
<td>5.30 (4.7, 6.8)</td>
<td>6.50 (5.9, 6.8)</td>
</tr>
<tr>
<td>Water Wasted per Scrub (L)</td>
<td>10.24 (7.2, 19.9)</td>
<td>10.42 (19.2)</td>
</tr>
</tbody>
</table>

Table 3a. Hand Scrub Habits of Survey Respondents

<table>
<thead>
<tr>
<th>Affiliation</th>
<th>Respondents (N)</th>
<th>Types of sterile scrubs</th>
<th>Wet N (%)</th>
<th>Alcohol-Based N (%)</th>
<th>Both** N (%)</th>
<th>P value</th>
<th>Total Scrubs (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>224</td>
<td>833 (67.1)</td>
<td>89 (7)</td>
<td></td>
<td></td>
<td>1247</td>
<td></td>
</tr>
<tr>
<td>Surgical Staff</td>
<td>63</td>
<td>131 (25.6)</td>
<td>22 (5.1)</td>
<td></td>
<td></td>
<td>433</td>
<td></td>
</tr>
<tr>
<td>Attending Surgeons</td>
<td>161</td>
<td>212 (26.0)</td>
<td>67 (8.2)</td>
<td></td>
<td></td>
<td>814</td>
<td></td>
</tr>
</tbody>
</table>

Table 3b. Attending Hand Scrub Habits Among Attending Surgeons

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Respondents (N)</th>
<th>Types of sterile scrubs</th>
<th>Wet N (%)</th>
<th>Alcohol-Based N (%)</th>
<th>Both** N (%)</th>
<th>P value</th>
<th>Total Scrubs (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ob/Gyn</td>
<td>77</td>
<td>82 (38.1)</td>
<td>98 (45.6)</td>
<td></td>
<td>35 (16.3)</td>
<td>215</td>
<td></td>
</tr>
<tr>
<td>Surgery</td>
<td>30</td>
<td>66 (28.6)</td>
<td>157 (68)</td>
<td></td>
<td>10 (4.3)</td>
<td>231</td>
<td></td>
</tr>
<tr>
<td>Ophtho</td>
<td>24</td>
<td>44 (28.8)</td>
<td>109 (71.2)</td>
<td>0 (0)</td>
<td>153</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ortho</td>
<td>14</td>
<td>13 (13.3)</td>
<td>67 (68.4)</td>
<td>18 (18.4)</td>
<td>98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urology</td>
<td>8</td>
<td>5 (11.6)</td>
<td>38 (88.4)</td>
<td>0 (0)</td>
<td>43</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Estimated Annual Water Wasted in Pavilion A-D

<table>
<thead>
<tr>
<th>Type of Sink</th>
<th>Cases in OR With Knee-Operated Sinks (N=55)</th>
<th>Cases in OR With Timer-Controlled Sinks (N=55)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume (L)</td>
<td>(124,146,6,804,601.2)</td>
<td>(124,146,588,218.4)</td>
</tr>
<tr>
<td>Cost ($)</td>
<td>(366,95,1,738.66)</td>
<td>(366,95,1,738.66)</td>
</tr>
</tbody>
</table>

Acknowledgements

The authors would like to acknowledge the Northwestern University Feinberg School of Medicine Summer Research Scholars Program and the Lanterman Vascular Surgery Student Research Program for their support.

Footnotes

- *Wet L 2500 L of water waste observed during the study period
- **Refers to scrub performed in 2-week period
- ***Refers to wet scrub followed by alcohol-based scrub

Journal

American Journal of Surgery

Author(s)

Carolyn J. Hu, Imad Khan, Margaret Reilly, Deena El-Gabrin, Andrew W. Hoel, Cord Sturgeon, Karen J. Hol

Institution

Northwestern University Feinberg School of Medicine, Northwestern Medicine Department of Surgery, and Southern Illinois University School of Medicine

Address

2525 Lakefill Road, Chicago, IL 60614

Phone

(312) 996-4000

Fax

(312) 996-4100

Email

info@northwesternmedicine.edu

Website

www.nwmedicine.org