BY DAVID F. CHANG, MD

Reducing Waste in Cataract Surgery

Survey reveals where OR reduction—and savings—can occur

Two recent studies from the Aravind Eye Hospital System in southern India have raised provocative questions about unnecessary and excessive operating room (OR) waste with cataract surgery. In the first study, Thiel and co-authors used lifecycle assessment (LCA) models to show that the carbon footprint of phacoemulsification in developed countries may be as much as 20x that of the same procedure at Aravind.[1]

For example, phacoemulsification in the United Kingdom produces approximately 130 kg of carbon dioxide equivalents (CO2eq) per case, equivalent to the carbon emissions from driving a car 310 miles.[2] Using comparable LCA methodology, Thiel found that one phacoemulsification case at Aravind generated approximately 6 kg CO2eq, the equivalent of driving a car 16 miles.[3]

Disposal of single-use devices and their packaging accounts for a major part of our surgical carbon footprint. Some single-use practice is motivated by a perception of greater safety and hygiene. However, regulations and liability concern also force us to discard many potentially reusable items after a single use.

In contrast, Aravind reuses the majority of its surgical supplies for cataract surgery. This includes topical and intraocular pharmaceuticals, irrigating solution, phaco tips and tubing, metal blades, cannulas, unused sutures, and non-metal devices such as iris retractors. Cloth masks and caps are laundered daily, and the OR staff wear the same gown and gloves for approximately 10 cases (rinsing their gloves with an antiseptic solution between cases).

If Aravind were to dispose of all surgical supplies after each use, it would result in a 13-fold increase in carbon emissions per case, in addition to the added expense.[1]

90%
of survey respondents think OR waste is excessive

Comparing Infection Rates

Aravind's focus on cost-effectiveness and resource conservation has been in place for decades because almost 60% of the cataract surgeries at Aravind are provided at little or no cost to indigent patients.

By comparison, our ORs have strict regulations mandating single-use of pharmaceuticals and most surgical supplies in order to prevent surgical infection.

Considering our unwillingness to sacrifice patient safety to lower costs, how does Aravind's endophthalmitis rate compare to ours? Our 2019 paper reported an outstanding endophthalmitis rate of 0.01% (1 per 10,000) in 335,037 consecutive phacoemulsification cases at Aravind's 10 surgical facilities, which routinely employed intracameral (IC) moxifloxacin prophylaxis.[3] Prior to routine use of IC moxifloxacin, the rate was 0.06% in 293,232 consecutive phacoemulsification cases at Aravind. In the United States, where perhaps half of cataract surgeons employ IC antibiotic prophylaxis, our endophthalmitis rate is 0.04%, according to the American Academy of Ophthalmology (AAO) IRIS registry.[4,5] In other words, Aravind's infection rates are better, or at least comparable when allowing for inconsistent adoption of IC antibiotic prophylaxis in the United States. These findings raise the sobering possibility that many of our mandated single-use practices, which so significantly inflate our costs and carbon footprint, are of unproven benefit.

Survey on OR Waste

To evaluate the attitudes of cataract surgeons and nurses toward OR waste, a survey was conducted by the Ophthalmic Instrument Cleaning and Sterilization (OICS) Task Force last fall. Comprising experts representing the American Society of Cataract and Refractive Surgery (ASCRS), AAO, OOSS, and the Canadian Ophthalmological Society, the OICS Task Force surveyed cataract surgeons belonging to these four societies. Per AAO policy, only a sample of their membership was surveyed. The

online survey was managed by OOSS and required entry of the respondent's name and email address to prevent duplicate responses.

More than 1,300 respondents completed the lengthy survey, including more than 1,000 surgeons.[6] Surprisingly, more than 400 respondents took the time to enter optional comments at the survey's conclusion. Most respondents (86%) were American; 5% were Canadian. Sixty one percent operate in a multispecialty (23%) or ophthalmology-only (38%) ASC. A wide range of surgical volume was represented, with 71% of surgeons performing between 200 and 1,000 cases per year.

OR Waste is "Excessive"

Over 90% of respondents believe that OR waste is excessive, and only 5% felt that no changes were needed. Identical percentages of surgeons/nurses felt that surgical and pharmaceutical manufacturers drive the market toward more profitable of single-use products (97%), mandate single-usage to limit liability (96%), package single-use items in ways that create unnecessary waste (95/94%) and don't consider carbon footprint in their product design (91/90%); most felt they should use recyclable packaging (90/92%), should offer more reusable instruments and supplies (94/93%), and should permit surgeons more discretion to reuse products in their instructions-for-use (93/86%).

Most surgeons and nurses also believe that regulatory agencies (97/93%) and hospital/facility policies (95/83%) limiting surgeon discretion for reusing supplies are drivers of waste.

Of specific interest to manufacturers is that 10x as many surgeons would prefer reusable (79%) than disposable (8%) instruments that are of equal cost; 13% had no preference. Most surgeons were willing to consider reusing topical (98%) and commercial (95%) or compounded (86%) intraocular drugs; willingness was lower for nurses for commercial (79%) or compounded (73%) intraocular solutions. Most surgeons were willing to reuse phaco tips, irrigating solutions and tubing, metal blades, cannulas, and iris or capsular retractors; most nurses were also willing to reuse these products, but in lower percentages than the surgeons. For surgeons and nurses, 28/70% were unwilling to reuse surgical gowns, 77/93% were unwilling to reuse surgical gloves, and 4/22% were unwilling to use the same surgical mask all day.

79%
of surgeons would prefer reusable instruments that are of equal cost to single-use

According to some estimates, approximately 10% of greenhouse gas emissions in the US are generated by the healthcare system.[7] The operating room is a significant contributor. In our survey, 91% were concerned about global warming, and 87% of surgeons (84% of nurses) wanted their medical societies to advocate for reducing surgery's carbon footprint.

Medical Society Consortium on Climate and Health

After these results were shared with the leadership of ASCRS and AAO, these became the first two ophthalmology societies to join 27 other major medical associations in the Medical Society Consortium on Climate and Health. ASCRS and AAO members can individually join the consortium (medsocietiesforclimatehealth.org) at no charge to access educational materials, webinars, and advocacy resources relating to the impact of climate change on public health. Part of the consortium's mission is to reduce the carbon footprint of the healthcare system. Given that cataract surgery is the most common operation performed globally in all of medicine, ophthalmologists, nurses, ASCs, hospitals, regulatory agencies, and the surgical manufacturing industry have a crucial collaborative opportunity to reduce OR waste and to make cataract surgery more economically and environmentally sustainable. ■

References

1. Thiel CL, Schehlein E, Ravilla T, et al. Cataract surgery and environmental sustainability: Waste and lifecycle assessment of phacoemulsification at a private healthcare facility. J Cataract Refract Surg. 2017;43:1391-1398.

2. Morris DS, Wright T, Somner JE, Connor A. The carbon footprint of cataract surgery. *Eye.* 2013;27: 495-501.

3. Haripriya A, Chang DF, Ravindran RD. Endophthalmitis reduction with intracameral moxifloxacin in eyes with and without surgical complications: Results from two-million consecutive cataract surgeries. *J Cataract Refract Surg.* 2019;45;1226-1233.

4. Chang DF, Braga-Mele R, Henderson BA, et al. A. Antibiotic prophylaxis of postoperative endophthalmitis after cataract surgery: Results of the 2014 ASCRS member survey. *J Cataract Refract Surg.* 2015;41:1300–1305.

5. Pershing S, Lum F, Hsu S, et al. Endophthalmitis after cataract surgery in the United States: A report from the Intelligent Research in Sight Registry, 2013-2017. *Ophthalmology.* 2020;127: 151-158.

6. Chang DF, Thiel CL. Survey of cataract surgeons' and nurses' attitudes toward operating room waste. *J Cataract Refract Surg.* 2020:46(7): 933-940.

7. Eckelman MJ, Sherman J. Environmental impacts of the U.S. health care system and effects on public health. *PLoS One.* 2016;11(6):e0157014. Published 2016 Jun 9. doi:10.

Dr. Chang is in private practice in Los Altos, CA, and founded the Peninsula Eye Surgery Center in 2005. He is also the co-chair of the Ophthalmic Instrument Cleaning and Sterilization Task Force.