SPECIAL REPORT

Survey of cataract surgeons' and nurses' attitudes toward operating room waste

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In an online survey of more than 1300 cataract surgeons and nurses, 93% believed that operating room waste is excessive and should be reduced; 78% believed that we should reuse more supplies; 90% were concerned about global warming; and 87% wanted medical societies to advocate for reducing the surgical carbon footprint. The most commonly cited reasons for excessive waste were regulatory and manufacturer restrictions on reuse or multiple use of devices, supplies, and pharmaceuticals. More than 90% believed that profit, liability reduction, and failure to consider carbon footprint drive manufacturers to produce more single-use products; more than 90% want more reusable products and more regulatory and manufacturer discretion over when and which products can be reused. Assuming comparable cost, 79% of surgeons preferred reusable over disposable instruments. In order of decreasing consensus, most were interested in reusing topical and intracameral medications, phacoemulsification tips, irrigating solutions/tubing, blades, cannulas, devices, and surgical gowns.

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Newly published data from the Aravind Eye Care System (AECS) in Tamil Nadu, India, document an endophthalmitis rate of 0.02% in more than 1 million consecutive cataract surgeries in which all eyes also received topical and intracameral antibiotic prophylaxis.[1] This is lower than the American Academy of Ophthalmology Intelligent Research in Sight registry endophthalmitis rate of 0.04%, which could reflect that intracameral antibiotic prophylaxis is not routine in the United States.[2,3] Another compelling observation is that, within the AECS, most disposable supplies, such as surgical gloves, gowns, irrigation/aspiration (I/A) tubing, irrigation bottles, cannulas, blades, and both intraocular and topical drugs, are routinely reused to reduce cost and waste.[1,4] Because approximately 60% of their surgical volume is performed in charity patients for little to no cost, the AECS must maximize surgical efficiency, volume, and cost-effectiveness, while maintaining quality through carefully monitored outcomes.[5]

The carbon footprint of cataract surgery has increasingly become a subject of research.[4–8] A study of 4 cataract surgical sites in the United States quantified the substantial financial and environmental waste generated by unused medication, which was largely topical.[6] A British study found that 1 phacoemulsification procedure in the United Kingdom generated the same carbon emissions (132.9 kg) as driving a car 500 km (310 miles).[7] By comparison, phacoemulsification at AECS was found to generate the same carbon emissions (5.9 kg) as driving a car 25 km (16 miles).[4] Compared with the United States and United Kingdom, AECS' low infection rates with cataract surgery were achieved with 1/10th the supply costs and 1/20th the global warming emissions.[5] A recent prospective study from Malaysia estimated that approximately 50% of waste from cataract surgery is recyclable.[8]

Specialty-specific guidelines for the cleaning and sterilization of intraocular surgical instruments were recently developed by the Ophthalmic Instrument Cleaning and Sterilization (OICS) Task Force, comprising experts representing the ASCRS, the American Academy of Ophthalmology (AAO), the Outpatient Ophthalmic Surgery Society (OOSS), and the Canadian Ophthalmological Society.[9] Citing published AECS data in these guidelines, the OICS Task Force raised a thought-provoking possibility: "The potential clearly exists that many practices mandated by regulatory and licensing agencies might not have a proven benefit for ocular surgery and therefore might not justify the significantly higher cost and carbon footprint they entail. Further studies could be performed to evaluate some practices, such as the reuse of disposable instruments."[9,10] Considering these recent studies, the OICS Task Force surveyed cataract surgeons belonging to the 4

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societies to evaluate their opinions regarding operating room (OR) waste, factors that drive excessive waste, and willingness to consider economic and environmental sustainability initiatives.

METHODS

A 23-question, multiple-choice, online survey was developed by the OICS Task Force specifically for cataract surgeons. Respondents were invited to submit individual comments at the conclusion of the survey. A parallel survey was developed for OR administrators and nurses who staff cataract surgery. Most of the questions were identical, except for those relating to decisions that would only be made by the surgeon. The survey was prefaced with the published information cited in the first 2 paragraphs of this article.

A link to the online survey was emailed to members of ASCRS, AAO, OOSS, and Canadian Ophthalmological Society. The OOSS membership includes ambulatory surgery center administrators, and they were asked to forward the e-survey to their OR nursing staff. Commencing on August 28, 2019, the 4 societies separately emailed the survey link on different dates, staggered by 1 to 2 weeks. The online survey remained open until December 31, 2019. Per AAO policy, only a random sample of AAO membership was surveyed, but a link was also provided in the U.S. member newsletter. Although many surgeons received the same emailed link from different societies, duplicate responses were prevented by requiring a name and email address for access to the survey and allowing only 1 submission for each email address. Responses were deidentified for analysis. Respondents were invited to complete the survey only if they performed cataract surgery, staffed cataract surgery cases as nurses, or were OR administrators.

RESULTS

A total of 1634 respondents answered the first qualifying question, with 1,262 (77%) self-identified as cataract surgeons, 301 (18%) as nurses/administrators who staff cataract surgery, and 71 (4%) as neither. Subsequent data from the latter group of respondents were disqualified. Of the remaining 1563 respondents, 1317 (84%) completed all applicable questions. The median time for survey completion was 12 minutes 27 seconds.

Demographics

There were 1241 total surgeons responding to the question about practice region (Table 1). Of them, 1067 (86%) were from the USA. Seventy percent were in practice for more than 10 years, whereas 5% were in training. Sixty-one percent of surgeons primarily operate in ambulatory surgery centers, compared with 35% in hospital-based ORs. Higher-volume surgeons (>500 cases/yr) accounted for 39%; 18% were lower-volume surgeons (<200 cases/yr). Among surgeons, there were more than twice as many men than women (2.3 times), whereas female nurses/administrators outnumbered males by a factor of 6. According to the 2019 year-end membership data of the AAO, 5553 U.S. members self-identified as primarily comprehensive ophthalmologists, and 2811 U.S. members self-identified as primarily cataract/anterior segment surgeons. A total of 953 American surgeons responded to the nondemographic questions, which would approximate 11% to 12% of all American comprehensive and anterior segment ophthalmologists (95% confidence level ± 3%).

Opinions Regarding Operating Room Waste

A total of 1139 respondents (91%) expressed concern about global warming and climate change: 60% responding "very concerned"; 9% were not concerned. Most (93%) respondents consider the amount of trash produced during cataract surgery to be excessive, with 68% rating this as "far too much", 5% believe the amount of trash to be appropriate, and 2% had no opinion. A total of 93% felt that we should develop approaches to reduce waste, and 78% felt that we should seek more ways to safely reuse supplies and instruments. Only 4% felt that no changes are needed.

Table 2 summarizes the perceived impact of a variety of factors on excessive trash generation in ophthalmic ORs. Cited as having the highest impact by the surgeon respondents were regulatory agencies (82%) or facility regulations (74%) limiting surgeon discretion for reusing supplies, supply manufacturers driving the market toward single-use products to increase profit (77%) and reduce liability (70%), perceived safety benefit of single-use products (74%), wasteful packaging (71%), and lack of environmental and carbon footprint considerations (65%). Perceived performance benefit (33%), surgeons not reusing supplies when possible (33%), surgeon preference (26%), and patient preference (7%) were least frequently cited as being strong drivers toward single-use products. Nurse respondents were generally in agreement with surgeons about high impact drivers. However, nurses more frequently cited perceived performance benefits (49%) and surgeon preference (44%) as strong drivers.

Regarding recommendations, most surgeon respondents would support each of the waste reduction strategies listed in Table 3. At least 90% would support manufacturers offering more reusable instruments and supplies, using recycled content in product packaging, and considering carbon footprint in product design. At least 93% of surgeons want more discretion to reuse products allowed by regulatory bodies and manufacturers of devices and supplies. Of the listed strategies, more studies to assess the safety of reusing supplies, drugs, and devices garnered the least strong support (68% strongly agree). Nursing responses were in general agreement, although there was less strong support for increased surgeon discretion.

Opinions Regarding Reuse of Surgical Products, Pharmaceuticals, and Instruments

Table 4 describes the willingness of surgeons and nurses to reuse or consider reusing a variety of surgical products, intraocular drugs, and topical drugs. At least 97% of surgeons would consider reusing each of the topical drugs listed, and 90% to 95% would consider reusing the commercially packaged intraocular drugs listed for more than 1 patient. Although the comparable willingness was not as high, most would consider reusing pharmaceuticals compounded by pharmacies or in the OR. At least 90% of nurses would consider reusing topical drugs. Although most would consider reusing intraocular pharmaceuticals for multiple

Table 1. Surgeon and nurse respondent demographics in percentages (nurse %).

Primary Practice Region	USA	Canada	Latin America	Europe/ Middle East/Africa	Asia Pacific
Surgeons, n = 1241 (nurses/admins, n = 296) (%)	86 (95)	5 (2)	3 (0.34)	3 (0.34)	3 (2)
Type of Operating Facility	**Academic HOPD**	**Freestanding ASC (Multispecialty)**	**Freestanding ASC (Ophthalmology Only)**	**Private HOPD**	**Other**
Surgeons, n = 1244 (nurses admins, n = 295) (%)	21 (11)	23 (16)	38 (66)	14 (2)	5 (5)
Gender	**Female**	**Male**	**Not Answered**		
Surgeons, n = 1246 (nurses admins, n = 298) (%)	30 (85)	69 (14)	1 (1)		
Years of Practice	**Currently in Training**	**1-5**	**6-10**	**11-25**	**>25**
Surgeons, n = 1063 (nurses, n = 283) (%)	5 (2)	12 (17)	13 (19)	38 (35)	32 (28)
Average Annual No. Cataract Surgeries	**<200**	**200-500**	**501-1000**	**>1000**	
Surgeons (n = 1058) (%)	18	43	28	11	

ASC = ambulatory surgical center; HOPD = hospital outpatient department

patients, far more nurses than surgeons expressed an unwillingness to allow such use.

Seventy-nine percent of surgeon respondents would prefer reusable over disposable instruments if they provided equal functionality, performance, and cost; 8% would prefer disposable instruments, and 13% had no preference. Products garnering the most support and consideration for reuse by surgeons were phacoemulsification tips (92%) and I/A tips (90%), followed by irrigating solutions (78%) and tubing (76%) (Table 4). At least 72% would also consider reusing capsulotomy needles, small gauge cannulas, metal blades, and nonmetal devices such as iris or capsule retractors. Compared with surgeons, nurses were less willing to reuse each of these items.

Factors from the survey that decrease or increase willingness to use supplies and medications for multiple patients are listed in Table 5. Having the greatest impact are malpractice liability (89%), risk of endophthalmitis (86%), and risk of toxic anterior segment syndrome (TASS) (82%). Concerns over staff safety or decreased efficiency were much less influential (rated as significant impact by only 11% and 7%, respectively). Compared with the surgeons, nurses were slightly more concerned about endophthalmitis and TASS risk, staff safety, and efficiency. For at least 93% of surgeons and nurses, cost savings, improved efficiency, and reducing waste and carbon footprint all positively impact willingness to reuse supplies and medications.

Table 6 summarizes the willingness of respondents to consider a variety of practices to reduce OR waste. Surgeons were most unwilling to reuse gloves or gowns (77% and 28%,

Table 2. Drivers of operating room waste.

How Would You Rate the Impact of Each of the Following as Drivers of Waste/Trash Generation in Ophthalmic ORs?			
Surgeons (n = 1101); Nurses/Admins (n = 262)	**High Impact MD (RN) (%)**	**Moderate Impact MD (RN) (%)**	**Little or No Impact MD (RN) (%)**
Perceived safety benefits of disposable items	74 (73)	22 (23)	4 (4)
Perceived performance benefits of disposable items	33 (49)	44 (40)	24 (10)
Surgeon preference for single-use items	26 (44)	45 (41)	28 (15)
Surgeons do not reuse supplies when possible	33 (39)	37 (41)	30 (20)
Surgical teams open too many supplies during surgery	37 (31)	39 (43)	24 (26)
Single-use items packaged in ways that create unnecessary waste	71 (71)	24 (23)	5 (6)
Hospital/facility policies limit surgeon discretion for reusing supplies	74 (53)	21 (30)	5 (18)
Regulatory agencies limit surgeon discretion for reusing supplies	82 (74)	15 (19)	3 (7)
Patients want single-use instruments	7 (18)	19 (24)	74 (58)
Manufacturers mandate single-use IFU to limit liability	70 (72)	26 (24)	4 (4)
Manufacturers drive the market toward more profitable single-use products	77 (79)	20 (18)	3 (3)
Lack of environmental/carbon footprint considerations	65 (57)	26 (33)	10 (11)

IFU = instructions for use; OR = operating room

Table 3. Global strategies to reduce waste.

To What Extent Do You Agree or Disagree With the Following?					
Surgeons (n = 1101); Nurses/Admins (n = 262)	Strongly Agree MD (RN) (%)	Somewhat Agree MD (RN) (%)	Neither Agree Nor Disagree MD (RN) (%)	Somewhat Disagree MD (RN) (%)	Strongly Disagree MD (RN) (%)
Device and supply manufacturers should use recycled content in packaging for medical supplies.	72 (69)	18 (23)	7 (5)	1 (2)	1 (1)
Device and supply manufacturers should consider the environment/carbon footprint in their product design.	76 (72)	16 (22)	5 (4)	1 (0)	1 (2)
Manufacturers should offer more reusable instruments and supplies as an option.	81 (72)	13 (21)	5 (4)	1 (2)	0 (2)
Device and supply manufacturers should allow surgeons more discretion in their IFU (eg, suggest single use but allow reuse).	75 (58)	18 (28)	5 (8)	2 (3)	1 (3)
Regulatory bodies should allow surgeons more discretion in reusing supplies, drugs, and devices.	81 (62)	14 (24)	3 (7)	1 (4)	0 (3)
Healthcare systems should adopt practices and policies that reduce carbon footprint in ORs.	78 (71)	14 (22)	5 (5)	1 (0)	2 (1)
The medical societies to which I belong should advocate for the reduction of carbon footprint in operating rooms.	71 (61)	16 (23)	7 (16)	3 (0)	3 (1)
We need more studies to assess the safety of reuse of supplies, drugs, and devices.	68 (71)	19 (22)	7 (5)	3 (2)	2 (1)

IFU = instructions for use; OR = operating room

respectively). They were most willing to consider eliminating the full-body drape (95%), using the same surgical mask all day (95%), saving and donating unused surgical supplies (97%), and sending pharmaceuticals home with patients from the OR (93%). Nearly 90% surgeons would consider using short-cycle sterilization for sequential same-day surgery (91%) and not changing patients into hospital gowns (90%). Fifty-six percent would consider or currently perform immediately sequential bilateral cataract surgery, whereas 34% would not consider this, and 10% were unsure. Compared with surgeons, far more nurses were unwilling to consider glove reuse (93% vs 77%), gown reuse (70% vs 28%), all-day mask use (22% vs 4%), short-cycle sterilization (23% vs 5%), single-use device reprocessing (20% vs 5%), and sending topical pharmaceuticals home with patients (26% vs 4%).

Table 7 summarizes the perceived impact of a variety of factors on utilization of single-use instruments. In order of highest impact, the surgeon respondents cited the following as being major factors: liability reduction (66%), easier regulatory approval (65%), manufacturer profit (62%), patient safety (49%), reducing staff processing work (45%), lack of carbon footprint considerations (40%), instrument performance (38%), and improved OR efficiency (37%). Less than 10% felt that liability reduction and easier regulatory approval were insignificant factors.

The survey described single-use device reprocessing as a U.S. FDA-approved process where third parties collect single-use devices, clean, repair, sterilize, and resell them to medical care facilities for less than the original price. This was used by 7% of surgeons and would be considered by another 84% (Table 6). Table 7 lists factors that affect surgeon willingness to use reprocessed single-use medical supplies and devices. Major factors in order of impact were performance (79%), facility regulations (72%), safety risk (72%), cost (59%), and carbon footprint considerations (58%). Patient preference or perception was cited as the least important factor.

DISCUSSION

It is estimated that approximately 10% of global warming greenhouse gas emissions in the United States are from the healthcare sector, with the OR being one of the largest sources.[11] Cataract surgery is the most commonly performed operation in the world, giving ophthalmology an opportunity to make a meaningful impact in reducing economic and environmental waste in its surgical services. Recent studies have outlined multiple strategies to decrease waste and greenhouse gas emissions from cataract surgery.[4–8] These included multiuse pharmaceuticals, reusable or reprocessed supplies, and recycling single-use products made from reusable materials. The latter is perhaps the least effective means of emissions reduction and should be implemented after other efficiency improvements, but recycling could reduce carbon dioxide equivalents by 0.139 kg per case, as estimated by the Malaysian study.[8]

The surgeons and nurses responding to the survey universally agreed that we are generating excessive OR waste. This mirrors findings from a small survey of ophthalmologists in New Zealand, where 88% of the 49 respondents agreed or strongly agreed with the statement "ophthalmologists should adjust their everyday practice to be more sustainable."[12] Respondents to our survey overwhelmingly believe that manufacturers play a significant role in this problem (Table 2). More than 95% of surgeons and nurses believe that both profit and limiting liability are factors driving manufacturers toward single-use products,

Table 4. Willingness to use products on multiple patients.

Rate your Willingness to Use the Following on Multiple Patients in Cataract Surgery:				
Topical Pharmaceuticals from Bottles (Multidose) Surgeons (n = 1044); Nurses/Admins (n = 243)	**Currently Use as Multidose MD (RN) (%)**	**Willing to Consider Multidose Use MD (RN) (%)**	**Unwilling to Use as Multidose MD (RN) (%)**	**Unsure MD (RN) (%)**
Mydriatics	48 (54)	51 (37)	1 (4)	1 (5)
Antibiotics	45 (58)	53 (36)	1 (4)	1 (2)
NSAIDs	38 (49)	59 (44)	1 (4)	2 (4)
Anesthetics	43 (48)	55 (44)	1 (5)	1 (3)
IOP-lowering medications	42 (50)	55 (44)	1 (3)	1 (3)
Intraocular Pharmaceuticals Surgeons (n = 1050); Nurses/Admins (n = 247)	**Currently Use as Multidose MD (RN) (%)**	**Willing to Consider Multidose Use MD (RN) (%)**	**Unwilling to Use as Multidose MD (RN) (%)**	**Unsure MD (RN) (%)**
Antibiotics	32 (41)	63 (48)	3 (8)	2 (2)
α-agonists/mydriatics	34 (38)	61 (45)	2 (9)	3 (8)
Miotics	20 (31)	73 (50)	3 (10)	4 (8)
Lidocaine	30 (36)	65 (55)	3 (7)	2 (2)
Capsular dye	10 (11)	80 (62)	7 (20)	3 (7)
Corticosteroids (eg, triamcinolone)	16 (22)	76 (59)	4 (12)	4 (7)
Commercially packaged solutions (in general)	11 (12)	84 (67)	3 (12)	2 (9)
Compounded solutions (in general)	12 (16)	74 (57)	7 (21)	7 (6)
Solutions mixed by OR nurse (in general)	15 (18)	67 (58)	10 (19)	8 (5)
Supply Items (assuming they are cleaned and sterilized appropriately) Surgeons (n = 1070); Nurses/Admins (n = 249)	**Currently Reuse MD (RN) (%)**	**Willing to Consider Reuse MD (RN) (%)**	**Unwilling to Reuse MD (RN) (%)**	**Unsure MD (RN) (%)**
Phaco tips	38 (29)	54 (40)	5 (24)	3 (7)
I/A tips	41 (38)	49 (36)	6 (19)	4 (7)
Phaco and I/A tubing	7 (4)	69 (36)	17 (51)	7 (9)
Irrigating solution/bottle (ie, use open bottles for more than 1 patient)	8 (6)	70 (44)	15 (45)	6 (4)
Capsulotomy needle/cystotome	13 (10)	59 (41)	22 (42)	6 (7)
Small-gauge cannulas	27 (26)	47 (34)	21 (36)	6 (4)
Metal blades	14 (21)	64 (48)	18 (27)	4 (4)
Nonmetal surgical devices (iris and capsule retractors, pupil expansion rings)	9 (13)	63 (38)	20 (40)	8 (9)
Sutures (eg, other half)	3 (2)	56 (21)	32 (67)	9 (10)

I/A = irrigation/aspiration; IOP = intraocular pressure; NASAID = nonsteroidal antiinflammatory drug; OR = operating room

with at least 70% believing that each of these is a major factor. Unnecessarily wasteful packaging of single-use items is believed to be a factor by 95% and a major factor by 71%. Lack of carbon footprint consideration is believed to be a factor by 91% of surgeons and a major factor by 65%. Most surgeons (≥90%) want manufacturers to consider carbon footprint in their product design, to use recycled content for packaging, and to offer more reusable products (Table 3).

There was strong consensus that another major contributor to excessive waste are regulatory policies that prohibit reuse of many potentially multiuse products and medications (Table 2). Many regulatory agencies require ORs to strictly follow manufacturers' instructions for use. However, instructions for use stipulations for single-use are often not evidence based and might exist to protect manufacturers from liability. Surgeons strongly agreed that regulatory agencies, healthcare systems, and manufacturers should allow surgeons more discretion over whether and when it is safe and appropriate to reuse surgical instruments, supplies, and drugs (Table 3). There was virtually unanimous support for using bottles of perioperative topical medications for multiple patients (Table 4).

Regarding interest in reusable options, the survey provides useful market data for the surgical instrument, pharmaceutical, and supply industry (Table 4). The survey responses are at odds with the notion that both patients and surgeons want to move toward more disposable instrumentation and single-use supplies (Table 2). Rather, most surgeons and nurses prefer having more reusable options. There is strong surgeon interest in reusing irrigating solutions, I/A tubing, phacoemulsification and I/A tips, metal blades, cystotomes, cannulas, and even unused sutures (Table 4). Fewer than 4% of surgeons would oppose reusing intracameral antibiotics, mydriatics, miotics, lidocaine, and steroids, and 10% or less would oppose reusing compounded solutions or those mixed in the OR.

Table 5. Factors affecting willingness to use products on multiple patients.

To What Extent Do the Following Factors *Decrease* Your Willingness to Use Supplies and Medications on Multiple Patients?			
Surgeons (n = 1037) Nurses/Admins (n = 244)	**Significant Impact MD (RN) (%)**	**Some Impact MD (RN) (%)**	**No Impact MD (RN) (%)**
Endophthalmitis risk	48 (62)	38 (32)	15 (6)
TASS risk	43 (56)	39 (36)	18 (9)
Concern over staff safety	11 (21)	37 (47)	52 (32)
Decreased efficiency	7 (17)	31 (44)	62 (39)
Malpractice liability	51 (46)	38 (42)	11 (11)
To What Extent Do the Following Factors *Increase* Your Willingness to Use Supplies and Medications on Multiple Patients?			
Surgeons (n = 1026) Nurses/Admins (n = 240)	**Significant Impact MD (RN) (%)**	**Some Impact MD (RN) (%)**	**No Impact MD (RN) (%)**
Cost savings	63 (73)	35 (25)	2 (3)
Waste reduction	78 (77)	20 (20)	2 (3)
Reduced carbon footprint	66 (66)	27 (30)	7 (4)
Improved efficiency	63 (68)	33 (27)	4 (5)

TASS = toxic anterior segment syndrome

The market for reprocessing single-use surgical instruments is growing rapidly in the United States. Items that would otherwise be discarded can be reprocessed and reused multiple times, which would reduce both facility costs and landfill waste.[13] Although not widely available for ophthalmic instruments, the fact that 91% of surgeons would consider using reprocessed single-use devices indicates a strong potential market for such services (Table 6). Table 7 indicates that performance, safety, cost, and regulatory compliance are surgeons' main priorities for this process. Of the most significant factors that decrease their willingness to reuse supplies and medications, malpractice liability was cited as or more frequently than either endophthalmitis or TASS (Table 5).

Regarding OR protocols, there is strong support for not changing surgical masks, eliminating full-body draping, and not having patients change into gowns. Most respondents would consider or are currently using short-cycle sterilization techniques, sending unused topical medications home with patients, and donating unused surgical supplies. Sixty-four percent of surgeons would consider not changing surgical gowns between cases. Only one third of surgeons are opposed to performing immediate sequential bilateral cataract surgery. Mandates toward single use might also make the healthcare system more vulnerable in times of crisis. The need to conserve personal protective equipment, such as surgical masks and gowns, was one reason for suspending elective surgery during the COVID-19 pandemic.[14] Supply reduction

Table 6. Willingness to adopt waste-reducing practices.

What is Your Willingness to Do the Following in Cataract Surgery?				
Surgeons (n = 1031) Nurses/Admins (n = 243)	**Currently Done MD (RN) (%)**	**Willing to Consider MD (RN) (%)**	**Unwilling to Consider MD (RN) (%)**	**Unsure MD (RN) (%)**
Eliminate full-body drape (use a face drape only)	44 (51)	51 (38)	4 (7)	1 (4)
Do not change the patient into hospital gown (patient stays in own clothing)	56 (68)	34 (22)	7 (7)	3 (2)
Do not change surgical gowns between every case (surgeon and scrub nurse)	4 (1)	60 (21)	28 (70)	7 (8)
Do not change surgical gloves between every case	1 (.41)	16 (4)	77 (93)	7 (3)
OR staff use same surgical mask all day	64 (27)	31 (48)	4 (22)	1 (3)
Reprocess and reuse single-use instruments from surgeries (eg, third-party reprocessing contract)	7 (5)	84 (61)	5 (20)	4 (14)
Use short-cycle, sequential same-day sterilization techniques (shortened autoclave cycle)	26 (21)	65 (48)	5 (23)	5 (8)
Immediately sequential bilateral cataract surgery	8 (5)	48 (51)	34 (32)	10 (12)
Send pharmaceuticals (eg, topical antibiotics) home with patients from the OR	26 (8)	67 (56)	4 (26)	2 (10)
Save and donate unused surgical supplies	26 (32)	71 (64)	2 (2)	1 (2)

OR = operating room

Table 7. Surgical instrument, device, and supply reuse.

In Your Opinion, What are the Primary Drivers for Single-Use Instruments in Ophthalmic Surgery?			
Surgeons (n = 1013); RNs Not Polled	**Major Factor (%)**	**Minor Factor (%)**	**Not Significant (%)**
Instrument performance	38	42	20
Liability reduction	66	26	8
Patient safety	49	40	12
Staff safety	16	48	36
Patient desirability or preference	6	29	65
Cost savings to hospital/facility	26	36	39
Reduced staff processing requirements (eg, cleaning and sterilization)	45	45	10
Improved OR efficiency	37	47	16
Lack of environmental/carbon footprint considerations	40	28	32
Manufacturer profit	62	20	18
Easier regulatory approval pathway	65	26	9
To What Extent Do the Following Factors Affect Your Willingness to Use Reprocessed Single-Use Medical Supplies and Devices?			
Surgeons (n = 1009); RNs Not Polled	**Major Factor (%)**	**Minor Factor (%)**	**Not Significant (%)**
Cost	59	33	8
Safety risk	72	22	6
Performance of the item	79	18	3
Relationship with and/or confidence in vendor	33	39	27
Facility regulations	72	24	5
Patient perception	16	44	39
Environmental/carbon footprint considerations	58	30	12

OR = operating room

and optimization, then, could also represent a strategy for increased resilience of the medical system.

Most surgeons (87%) would like their medical societies to advocate for the reduction of carbon footprint in ORs; only 6% disagree (Table 3). This is consistent with 91% of respondents being concerned about global warming. After these survey results were shared with the leadership of ASCRS and AAO, both organizations formally decided to join the Medical Society Consortium on Climate and Health (https://medsocietiesforclimatehealth.org/), which was launched in 2017 to inform its member physicians, the public, and policymakers about the harmful health effects of climate change on Americans. One of the consortium's goals is to reduce the carbon footprint of the healthcare system. Although 29 major medical societies have joined, ASCRS and AAO are the first from ophthalmology.

The AECS has documented excellent endophthalmitis rates despite routine reuse of many surgical products, and our survey respondents generally share the opinion that many such products could be safely reused.[1,10] AECS's published endophthalmitis data suggest that rigidly mandating single use of many cataract surgical products might unnecessarily increase economic and environmental waste on a large global scale. The escalating volume of cataract surgery worldwide threatens to make the staggering cost of such waste unsustainable, and this issue urgently warrants further analysis and debate. The fact that many mandated practices are not medically proven was illustrated by a recent study that found no infection-reducing benefit to surgical jackets and bouffant use at a large tertiary center that was spending more than $300 000 annually on required surgical jackets.[15] The authors concluded, "Institutions should evaluate their own data to determine whether recommendations by outside governing organizations are beneficial and cost-effective."

The rarity of postsurgical endophthalmitis, however, makes randomized clinical trials difficult to perform. Lacking better evidence, it seems that the preponderance of surgeons wants the discretion to exercise their best clinical judgment in determining which surgical products and medications could be reused assuming proper cleaning, handling, and sterilization. The best-available evidence could include sizable retrospective registry data and publicly shared healthcare system data.[1,2] For regulatory agencies and manufacturers, the AECS studies and this survey support permitting greater surgeon and staff discretion in reusing certain products, assuming that protocols are established, and infection rates are continuously monitored and benchmarked. Such discretion would mirror the appropriate and well-established capability of all physicians to prescribe and practice medicine off label.

In conclusion, there is a strong consensus among cataract surgeons and nurses that OR waste is excessive and is driven by overly rigid regulation, product liability concerns, and manufacturers' profit incentive. Most surgeons and nurses want to reduce OR waste and desire more reusable

options, more discretion on when to reuse products, and greater manufacturer consideration of carbon footprint, such as with product packaging. The OICS Task Force calls on regulatory agencies and the surgical manufacturing industry to collaborate with ophthalmologists and nurses on reducing needless waste and to ensure the economic and environmental sustainability of cataract surgery.

WHAT WAS KNOWN

- In an effort to reduce surgical infection, strict regulations prevent the use of many operating room supplies, devices, and pharmaceuticals on multiple patients. Manufacturers' instructions for use specify single use for many of these products.

WHAT THIS PAPER ADDS

- Most cataract surgeons and nurses agree that operating room waste is excessive and blame rigid requirements imposed by manufacturers and regulatory agencies.
- Most are willing to reuse many supplies, pharmaceuticals, and single-use devices and desire the discretion to do so.

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