# Small Drapes, Big Impact: Rethinking Drape Size for Infection Control in Cataract Surgery

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## ABSTRACT

**Introduction:** The American Academy of Ophthalmology has reported that each cataract surgery in the United States produces 2.3 to 3.9 kg of waste. Studies from the Aravind Eye Care System in India have shown that, despite reusing surgical supplies between patients, postoperative endophthalmitis rates were lower than those reported in the United States. This suggests that much of the surgical material used in the United States may be unnecessary to prevent endophthalmitis. Identifying strategies to reduce waste generated by ophthalmic surgery is important. The purpose of this study was to determine whether postoperative endophthalmitis rates differed between cataract surgeries performed using full- or three-quarter-size surgical drapes.

**Methods:** We conducted a retrospective review comparing the use of Alcon full-size (6500 $in^2$) and three-quarter-size (3465 $in^2$) surgical drapes for phacoemulsification cataract surgery at a university-affiliated ambulatory surgery center between 2020 and 2024. Outcomes included postoperative endophthalmitis rates, surgical waste generated ($in^2$), and cost.

**Results:** A total of 21469 cataract surgeries were completed at the University of Wisconsin-Madison (UW Health's) ambulatory surgery center between 2020 and 2024. A total of 4897 (22.81%) cases used three-quarter-size surgical drapes and 16 572 (77.19%) used full-size surgical drapes. There were no cases of endophthalmitis in either group. Compared with full-size drapes, the three-quarter-size drapes reduced material use by 47% and saved $17,139.50.

**Conclusions:** No difference in postoperative endophthalmitis rates was observed between groups. Therefore, three-quarter-size surgical drapes may represent an acceptable alternative to full-size drapes for improving the sustainability of cataract surgery.


## INTRODUCTION

According to the World Health Organization, climate change is a significant threat to human health, contributing to an estimated 13 million climate-associated deaths annually.[1] Globally, the health care sector is estimated to be responsible for 5% of all greenhouse gas emissions.[2] In the United States, the health care sector accounts for 10% of all greenhouse gas emissions and is the second-largest contributor to landfills after the food industry.[3] Operating rooms account for almost 70% of health care-sector emissions.[4]

Cataracts are the leading cause of visual impairment and blindness, making cataract surgery one of the most commonly performed procedures worldwide.[5] An estimated 20 million cataract surgeries are performed annually, with 3.7 million performed in the United States alone.[6] In resource-rich countries, cataract surgery utilizes single-use products that generate substantial waste. In 2016, the American Academy of Ophthalmology reported that each cataract surgery in the United States produces 2.3 to 3.9 kg of waste, all of which is landfill or biohazardous material.[7,8]

In resource-limited countries, the cost of surgery is a significant barrier for patients seeking cataract treatment.[9] To make eye care more accessible, the Aravind Eye Care System (AECS) in India developed an innovative model of care centered on time and resource efficiency.[7] As a result, surgeries are performed on multiple patients simultaneously within a single operating room, without changing surgical gowns or gloves between cases, and surgical

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and pharmaceutical supplies are routinely reused.[10] AECS produces 250 g of waste per phacoemulsification case, less than 11% of the waste generated by a comparable case in the United States.[7]

Despite reusing surgical supplies between patients and managing a high patient volume, AECS maintains a lower rate of postoperative endophthalmitis (0.01%) than that reported in the United States (0.04%).[7,10,11] These findings suggest that much of the single-use surgical equipment and supplies used in the United States may not prevent postoperative endophthalmitis. This observation is supported by published practice guidelines indicating that the primary measures associated with reducing postoperative endophthalmitis are preoperative preparation with povidone-iodine, intracameral antibiotic injection at the conclusion of surgery, and meticulous surgical technique.[12] Therefore, because ophthalmology has one of the highest surgical volumes in medicine, identifying strategies to reduce surgical waste is imperative.

We argue that full-size surgical drapes are unnecessary for cataract cases; shorter surgical drapes provide the same level of sterility given that they adequately cover the surgical field. The primary source of intraocular infection is bacteria from the patient's ocular surface, including the cornea and conjunctiva, and adnexa, including the eyelids, lacrimal glands, and extraocular muscles.[13] Eyelids and eyelashes remain covered with shorter surgical drapes, while areas distal to the patient's knee, which are not sources of endophthalmitis-causing infection, remain exposed.

This report presents a 5-year comparison of endophthalmitis rates, surgical waste, and cost savings between cataract surgery cases using full and three-quarter-size surgical drapes to determine whether smaller drapes are an acceptable alternative to reduce surgical waste.

## METHODS

A retrospective review was performed to compare the use of Alcon full-size (6500 $in^2$) and three-quarter-size (3465 $in^2$) surgical drapes for cataract surgery at the University of Wisconsin-Madison ambulatory surgery center. Only phacoemulsification cases performed between 2020 and 2024 were included. Analysis included a comparison of postoperative endophthalmitis rates, surgical waste generated ($in^2$), and cost. Combined phacoemulsification cases with corneal, glaucoma, or other concurrent procedures were excluded. Use of surgical drape size was based on surgeon preference. The operating surgeon draped all patients.

This study was exempt from Institutional Review Board oversight.

## RESULTS

A total of 21 469 cataract surgeries were completed at the University of Wisconsin-Madison ambulatory surgery center from 2020 through 2024; 4897 (22.81%) cases used three-quarter-size surgical drapes, and 16 572 (77.19%) used full-size surgical drapes. Ten surgeons used full-size surgical drapes. All cases using three-quarter-size drapes were performed by a single surgeon. There were no cases of endophthalmitis in either group.

Cases using full-size drapes resulted in a total of 107 718 000 $in^2$ of waste from surgical drapes alone, whereas cases using three-quarter-size drapes generated 16 968 105 $in^2$ of waste. Each three-quarter-size drape contains 47% less material than a full-size drape, resulting in a savings of 14 862 395 $in^2$ of material over the 5-year study period. The facility saved $17,139.50 by using the smaller drapes.

## DISCUSSION

In 2021, the World Health Organization declared climate change to be the single biggest threat facing humanity.[14] If the health care system were a country, it would be the fifth-largest contributor to carbon emissions in the world, with emissions stemming primarily from power consumption in operating rooms, medication production, medical supply packaging, and transportation of patients, staff, and supplies.[15] Ophthalmology has one of the highest surgical volumes of any medical specialty and is therefore thought to contribute substantially to these emissions. Furthermore, because of the world's aging population, the demand for eye care is expected to increase significantly over the next 20 years.[16] Consequently, adopting more sustainable practices is an important priority within ophthalmology,

In a 2020 survey of more than 1300 cataract surgeons and nurses by the Ophthalmic Instrument Cleaning and Sterilization (OICS), 93% of respondents stated that operating room waste is excessive and should be reduced.[17] Several sources of unnecessary waste in cataract surgery have been identified in the literature. The use of water-based scrub techniques for surgical antisepsis was reported to use 61 000 L of water annually per operating room at a large ophthalmic surgical hospital.[18] Packaging associated with intraocular lenses (IOLs) and viscoelastic materials contributes more than 30% of the waste generated during cataract surgery, despite the IOL itself weighing approximately 1 g.[19] Drug waste management also contributes substantially, producing an estimated 30 kg of carbon emissions per cataract surgery.[20]

We identify full-size surgical drapes as another source of excess waste in cataract surgery. We hypothesized that because the sterile field remains completely covered by the drape regardless of whether it extends to the patient's feet or mid-thigh, shorter surgical drapes would be appropriate for cataract surgery. Our findings demonstrated no cases of postoperative endophthalmitis during the 5-year study period among phacoemulsification cases using three-quarter-size drapes. Similarly, no cases occurred among surgeries using full-size drapes, suggesting that shorter surgical drapes do not increase infection risk.

A recent study reported that over 50% of energy consumption during cataract surgery at a British academic institution was associated with the production, use, and disposal of surgical materials,

highlighting the substantial environmental burden of these materials.[21] Three-quarter-size surgical drapes use 47% less material than full-size drapes and can reduce the amount of waste generated. Over the 5-year study period, their use saved 14.8 million $in^2$ of material, an area approximately equivalent to 1.8 football fields. Furthermore, because shorter surgical drapes cost less, they also provide a financial benefit.

Given that three-quarter-size surgical drapes did not adversely affect patient outcomes, reduced material waste, and were associated with lower costs, their use during cataract surgery appears justified. Even shorter surgical drapes are available on the market and use up to 70% less material than full-size drapes; however, further research is needed to determine their role in cataract surgery.

### Limitations

This study is limited by its single-institution design. Additional multicenter studies with larger sample sizes would further strengthen the evidence supporting these findings.

## CONCLUSIONS

The results of this study demonstrated no difference in postoperative endophthalmitis rates between drape sizes. Therefore, shorter surgical drapes may be an acceptable alternative to full-size drapes for improving the sustainability of cataract surgery.

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