

Methodology

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Prospective analysis of 1,000 standalone phacoemulsification surgeries

EXCLUSION

Complex/combined cases

Capital infrastructure

CARBON MEASUREMENT

Surgical waste -> bin-by-bin recording data

Energy: HVAC & lighting (estates data)

Sterilization: CSSD logs

Travel: survey-based estimates

ANALYSIS FRAMEWORK

Lifecycle CO₂e calculated using EPA TRACI 2.1

1000 Cases

Bangladesh EYE HOSPITAL
Eye Care, We Care

NHS Barts Health NHS Trust

CLINICAL OUTCOME

Post-operative infection rate

Patient satisfaction

The Problem

How much carbon does one cataract surgery really cost?

Measured and compared the carbon footprint of phacoemulsification in the UK NHS and a high-volume South Asian eye hospital

Identify how resource-lean systems deliver cataract surgery with far lower carbon impact

UNITED KINGDOM

Comparable clinical outcomes

Equivalent operation

Significant differences in resource use and emissions

UK NHS — Carbon Footprint

UK CATARACT SURGERY- CARBON FOOTPRINT

Continuous Climate Control

Single-use Instruments

Underfilled Sterilization Cycles

Carbon Footprint	Solid waste	Energy use	HVAC	Autoclave
128.3 kg CO ₂ e	3.7 kg	33.8 kWh/case	30.4 kWh	2.18 kWh

Endophthalmitis: 0

Patient satisfaction: 95.1%

PER PHACOEMULSIFICATION THROUGHPUT 12 CASES/DAY

Bangladesh — Carbon Footprint

BANGLADESH CATARACT SURGERY- CARBON FOOTPRINT

Batch Sterilization

Reusable Instruments

Multi-use Medications

Carbon footprint	Solid Waste	Energy Waste	HVAC	Autoclave
17.1 kg CO ₂ e	0.45 kg	8.4 kWh/case	2.8 kWh	0.093 kWh

Endophthalmitis: 0

Patient satisfaction: 90.9%

PER PHACOEMULSIFICATION THROUGHPUT 37 CASES/DAY

Compared to NHS

86% CO₂e

87.8% Waste

Reference: In a Portuguese multicenter cross-over study of 114 patients, multi-dose eye drop containers were easier to handle, easier to instill and preferred over single-dose containers, with less residual waste at disposal. Dias JA 2025.

The Gap — +55.6 tCO₂e Excess Emissions

Jackie Chan

Bruce Lee

Bangladesh EYE HOSPITAL

NHS

+55.6 tCO₂e

Equivalent to 325,000 km of car travel from the same operation, with identical clinical outcomes

EXCESS EMISSIONS

Surgeon Attitudes — APAO Survey N=2,095

94% CONCERNED ABOUT CLIMATE CHANGE

96% SAY CATARACT WASTE IS EXCESSIVE

80% SUPPORT SAFE REUSE

92% WANT MORE REUSABLE INSTRUMENTS

41% ALREADY REUSING SURGICAL SUPPLIES

(CHANG & SEE, ASIA-PACIFIC JOURNAL OF OPHTHALMOLOGY, 2025)

The Green Blueprint — Replicable Framework

"The Green Cataract Surgery Blueprint: A Replicable Framework for Measuring Surgical Carbon Footprint"

We are sharing the method, so anyone can measure their own