The Royal College of Ophthalmologists' National Ophthalmology Database study of cataract surgery: report 19, a comparative study of the cost and carbon footprint of local anaesthesia techniques for cataract surgery

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Introduction:

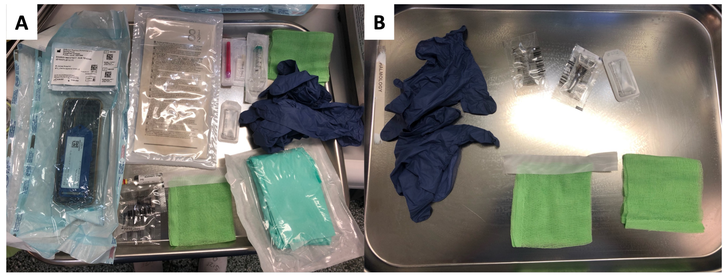
- The NHS has set the ambitious goal of becoming "net zero" by 2040 (1).
- Ophthalmology is the highest volume outpatient specialty in England and is likely responsible for a significant part of the cost and carbon footprint of the NHS (2,3).
- Cataract surgery is the most common operation in the NHS and is typically performed using topical or sub-Tenon's anaesthesia (4).
- Topical anaesthesia is growing in popularity and is associated with lower anaesthetic related complication rates than sub-Tenon's anaesthesia, but sub-Tenon's anaesthesia was still used in 45.9% of NHS cases between 2010 and 2019 (4).
- Topical anaesthesia requires less equipment and technical expertise than sub-Tenon's anaesthesia, so increasing its usage may reduce the cost and carbon footprint of services.

Research Question: "What would the cost and carbon footprint savings be if we stopped excessive use of sub-Tenons anaesthesia for cataract surgery in the NHS?"

Method:

1. Theatre lists at St James University Hospital were observed to determine the products and staffing required for topical and sub-Tenon's anaesthesia and waste disposal practices.
2. The cost of staff, equipment and waste disposal were obtained from NHS reports, hospital management and local service providers.
3. The carbon footprint of equipment production and waste disposal was estimated using published emission factors after deconstructing and weighing equipment (5).
4. The carbon footprint of reusable equipment was estimated using published studies in consultation with a local service provider (B. Braun Sterilog) (5).
5. The number of cataract cases that could be converted from sub-Tenon's to topical anaesthesia nationally was determined using the National Ophthalmology Database (NOD).

Figure 1: A) Equipment used for sub-Tenon's anaesthesia. B) Equipment used for topical anaesthesia



Results:

- The equipment used for topical and sub-Tenon's anaesthesia is shown in figure 1.
- Sub-Tenon's anaesthesia equipment cost around £10 more than topical anaesthesia and generated around 1.7 times more carbon dioxide equivalent (CO_2e) per case (table 1).
- Staffing costs for sub-Tenon's anaesthesia greatly varied, ranging from £14.15 for cases performed by band 6 staff to £42.56 for cases performed by consultant anaesthetists.
- Reusable sub-Tenon's sets were £0.15 more expensive and produced more CO_2e than single-use sets, mostly because of the need for decontamination (table 1).

Table 1: The cost and carbon footprint of topical and sub-Tenon's anaesthesia

	Cost of equipment per case (£)	Total cost per case (including staffing) (£)	Carbon dioxide equivalent produced per case (grams)
Topical anaesthesia	**2.99**	**14.60–17.14***	**712.41**
Sub-Tenon's anaesthesia (single-use equipment)	**13.59**	**27.74–56.15****	**1,186.44**
Sub-Tenon's anaesthesia (reusable equipment)	**13.74**	**27.89–56.30****	**1,261.89**

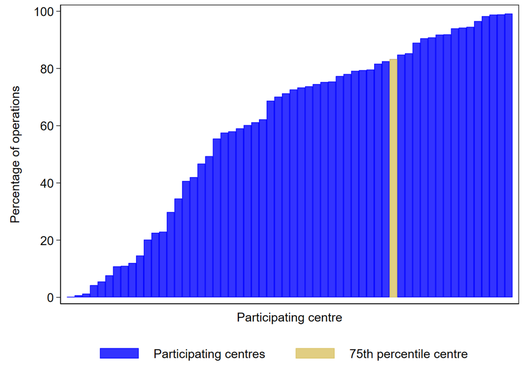
* The upper range is for band 6 staff applying the anesthetic; the lower range is for band 5 staff

** The upper range is for a consultant anesthetist applying the anesthetic; the lower range is for band 6 staff

NOD data:

- The percentage of cataract cases performed using topical anaesthesia at NHS centres offering surgical training in England on the NOD is shown in figure 2.
- Overall, topical anaesthesia was used in 61.5% (70,904/115,165) of the cataract operations, with some centres using topical anaesthesia in <1% of cases and others using it in >95% of cases.
- The centre on the 75th percentile used topical anaesthesia in 83.2% of cases, as shown in figure 2.
- If all NHS centres in England used topical anaesthesia at least as much as the centre on the 75th percentile, around 25,000 cases could feasibly be converted from sub-Tenon's to topical anaesthesia each year.
- Converting cases from sub-Tenon's to topical anaesthesia at NHS hospitals in England could annually save the NHS £265,000–£1,038,750 and 11,850kg of CO_2e.

Figure 2: Percentage of operations performed under topical anaesthesia



Conclusions:

- Some NHS hospitals offering surgical training in England use sub-Tenons anaesthesia for nearly all cases; others use almost exclusively topical anaesthesia—but there is no clinical rationale for this variation in practice.
- We suggest that all NHS hospitals in England with trainees should aspire to use topical anaesthesia for at least around 85% of cataract cases, since it is cheaper and more environmentally sustainable.
- Increasing the usage of topical anaesthesia in the UK could contribute substantially towards achieving the NHS aspiration of becoming "net zero" by 2040.

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