



## **Towards a Greener Theatre: Evaluating the Environmental Impact of Syringe and Glove Use in Anaesthesia**

Nosaiba Ezzelarab<sup>1\*</sup>, Priya Jha<sup>2</sup>

**\*Correspondence to: Nosaiba Ezzelarab.**

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Received: 09 June 2025

Published: 27 June 2025

**Abstract**

**Background:** *The environmental footprint of healthcare is increasingly recognised as a pressing issue, particularly in high-resource areas like operating theatres. While anaesthetic gases are well known contributors to emissions, the environmental cost of single-use items such as gloves and syringes is frequently overlooked [1,2].*

**Objective:** *This study aimed to assess the frequency of glove and syringe use in anaesthetic practice and explore opportunities to reduce associated waste within a safe clinical framework.*

**Methods:** *A prospective audit was undertaken at two NHS hospitals, focusing on routine elective theatre lists. Data were collected on glove and syringe consumption and extrapolated to generate annual estimates. Practices around reuse and equipment efficiency were also observed.*

**Results:** *On average, 30.21 syringes and 5.64 pairs of gloves were used per anaesthetic list. Annualised figures revealed a consumption of approximately 94,309 syringes and 55,454 pairs of gloves per anaesthetist. Minimal instances of reuse were observed, though several opportunities for improved efficiency were identified.*

**Conclusion:** *The audit highlights that everyday anaesthetic practices contribute significantly to clinical waste. Small adjustments, informed by local context and staff engagement, may yield substantial environmental benefits.*

**Keywords:** *Anaesthesia, Sustainability, Operating Theatre, Syringes, Gloves, Environmental Impact.*

**Introduction**

Climate change has emerged as one of the greatest health threats of the 21st century, with the healthcare sector paradoxically contributing to the very problem it seeks to treat. Globally, healthcare is responsible for nearly 5% of total carbon emissions, with operating theatres recognised as major hotspots for waste production and energy consumption [1]. Among the drivers of this footprint are single-use plastics—an issue that has received comparatively little attention in sustainability discourse when compared to anaesthetic gases.

Within anaesthesia, gloves and syringes are indispensable tools. However, their convenience and ubiquity obscure their environmental cost. Nitrile gloves, for example, are energy-intensive to produce and typically incinerated after use, generating greenhouse gases and toxic byproducts [2]. Syringes, though small, are used in high volumes and made from polymers with poor recyclability. Despite their impact, studies focusing on the consumption patterns and waste output of such items remain sparse.

This study set out to quantify the use of gloves and syringes in anaesthesia within two NHS hospitals. By understanding current practice, we aim to identify realistic and clinically safe opportunities to minimise waste, aligning everyday decision-making with broader goals of environmental responsibility.

## Methods

This prospective audit was carried out across two NHS sites: Barnet Hospital and Chase Farm Hospital. Elective surgical lists were included, while obstetric and emergency theatres were excluded. Data collection focused on the number of gloves and syringes used by anaesthetists during a typical list. An average of five cases per list was observed.

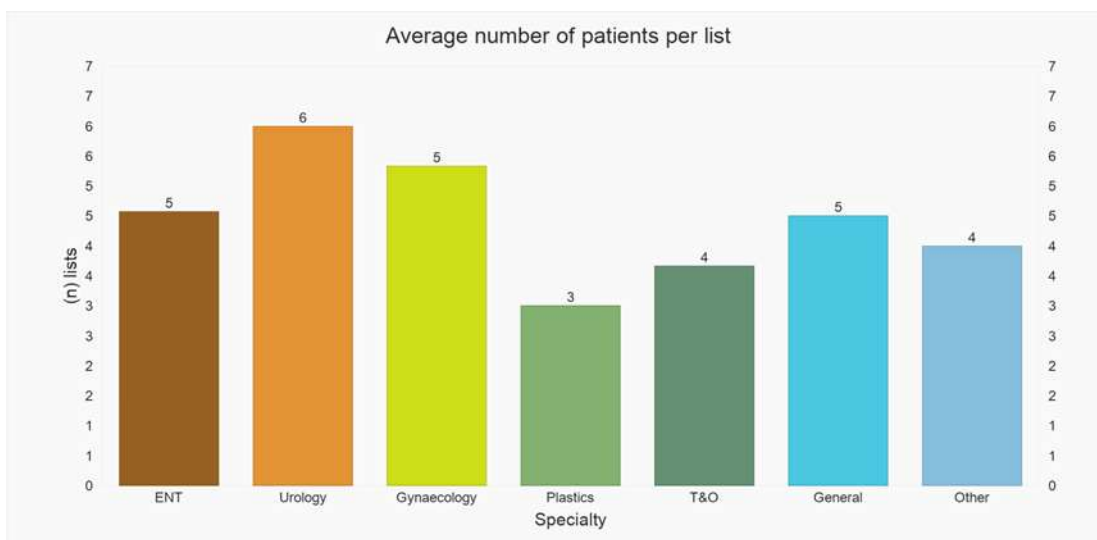
For each list, the total number of syringes and glove pairs used was recorded. Extrapolation was conducted to estimate yearly usage, based on the frequency of elective surgical lists across the two hospitals. Anecdotal notes were collected where syringe reuse occurred within safe clinical boundaries (e.g., using the same drug for a single patient).

## Results

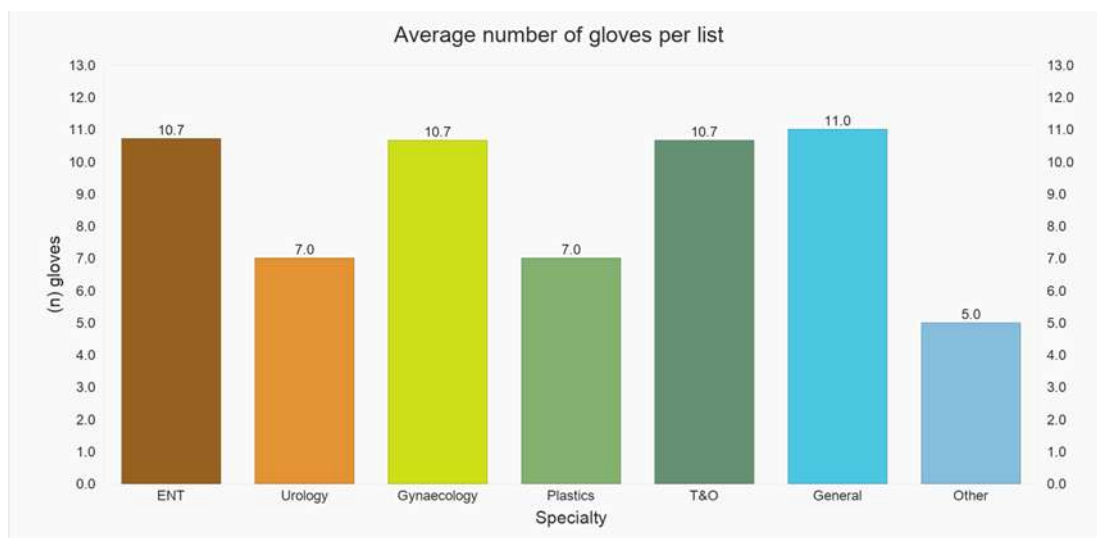
**Average number of cases per list: 5**

**Average syringe usage per list: 30.21**

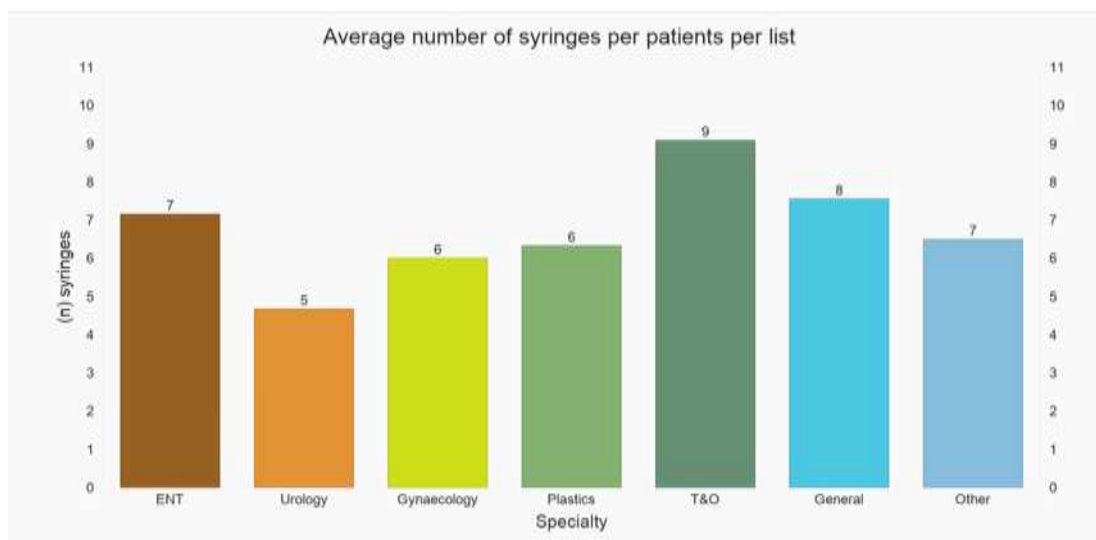
**Average glove usage per anaesthetist per list: 5.64 pairs**



**Fig 1**



**Fig 2**

**Fig 3****Annual estimates:**

Syringes: Approximately 94,309 used per year across Barnet and CFH theatres.

Gloves: 55,454 pairs used per year per anaesthetist.

Minimal reuse was recorded, and no breaches of infection control protocol were identified. Glove use remained consistent across lists and matched standard PPE protocol.

**Discussion**

The results confirm that anaesthetic practice contributes significantly to single-use plastic waste in theatres. Though individually small, the cumulative environmental cost of gloves and syringes is substantial. The carbon footprint of a single nitrile glove pair is estimated at 0.42 kg CO<sub>2</sub>e [3], and for a 5 mL polypropylene syringe, approximately 0.07–0.10 kg CO<sub>2</sub>e [4]. When scaled, this represents a notable source of emissions.

A number of practical strategies emerged from the audit, including promoting mindful glove use encouraging staff to evaluate the necessity of glove changes during non-sterile, low-risk tasks, and avoiding routine double-gloving unless clinically indicated.

Beyond these, several additional strategies could be explored:

- Implementing a glove-use algorithm that prompts staff to evaluate clinical necessity before donning gloves, especially during non-invasive or low-risk tasks.
- Stocking a wider variety of syringe sizes to match actual drug volume needs more precisely, thereby reducing partial use and waste.
- Investing in supplier partnerships that prioritise low-carbon or recyclable products, and requesting Environmental Product Declarations (EPDs) during procurement.
- Engaging staff in green champions programmes, where anaesthetic teams take ownership of sustainability efforts, audit their own practices, and propose department-level initiatives.

Encouragingly, this audit highlighted a general awareness of environmental concerns among anaesthetic teams, suggesting receptivity to behaviour change. However, systemic changes, such as sustainable procurement policies and education are essential to achieving meaningful, lasting reductions.

## Conclusion

Theatre-based anaesthetic practice generates considerable plastic waste through routine use of syringes and gloves. This audit demonstrates the scale of this impact and highlights realistic opportunities to reduce it. By integrating sustainability into everyday decision-making, anaesthetists can contribute to broader healthcare goals of environmental stewardship without compromising patient safety.

**Acknowledgements** We thank the anaesthetic teams at Barnet Hospital and Chase Farm Hospital for their participation and support.

**Ethics Statement** This audit was registered with the local Clinical Audit Department. No patient-identifiable data were collected, and ethical approval was not required.

**Conflict of Interest** The authors declare no conflicts of interest.

**Funding** No external funding was received for this project.

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