

# Operating room waste management: A case study of primary hip operations at a leading national health service hospital in the United Kingdom

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## Background

Climate change is a significant global health threat.<sup>1</sup> The United Kingdom (UK) National Health Service (NHS) has committed to delivery net zero carbon emissions, describing a wide variety of strategies and world-leading climate change mitigation objectives.<sup>2</sup>

In 2019, NHS Digital reported the NHS in England generates approximately 538,600 tonnes<sup>3</sup> of waste per year and contributes approximately 6% carbon footprint of the UK emissions.<sup>2</sup>

Surgical health care is resource intensive and one of the major contributors to climate change within the healthcare sector performing over 10 million surgical procedures annually; an increase of 40% from 2005-2006 reported figures.<sup>4</sup>

Studies report the burden of waste generated by surgery accounts for up to 70% of a hospitals' total waste volume.<sup>5</sup> Moreover, primary hip operations (PHO) generate a large volume of waste with primary research reporting a single procedure produces more than 13 kg of waste.<sup>6</sup>

The current research aims to highlight the burden of waste produced by PHOs. It hypothesises there is significant potential for reducing waste through improved waste recycling practices and reduced use of single-use devices (SUDs).

## Aims

- To examine current waste management of a commonly performed procedure within an operating room at a large UK NHS hospital
- The study measured the volume and type of waste produced for PHOs and estimated the total waste produced across the UK by the procedure

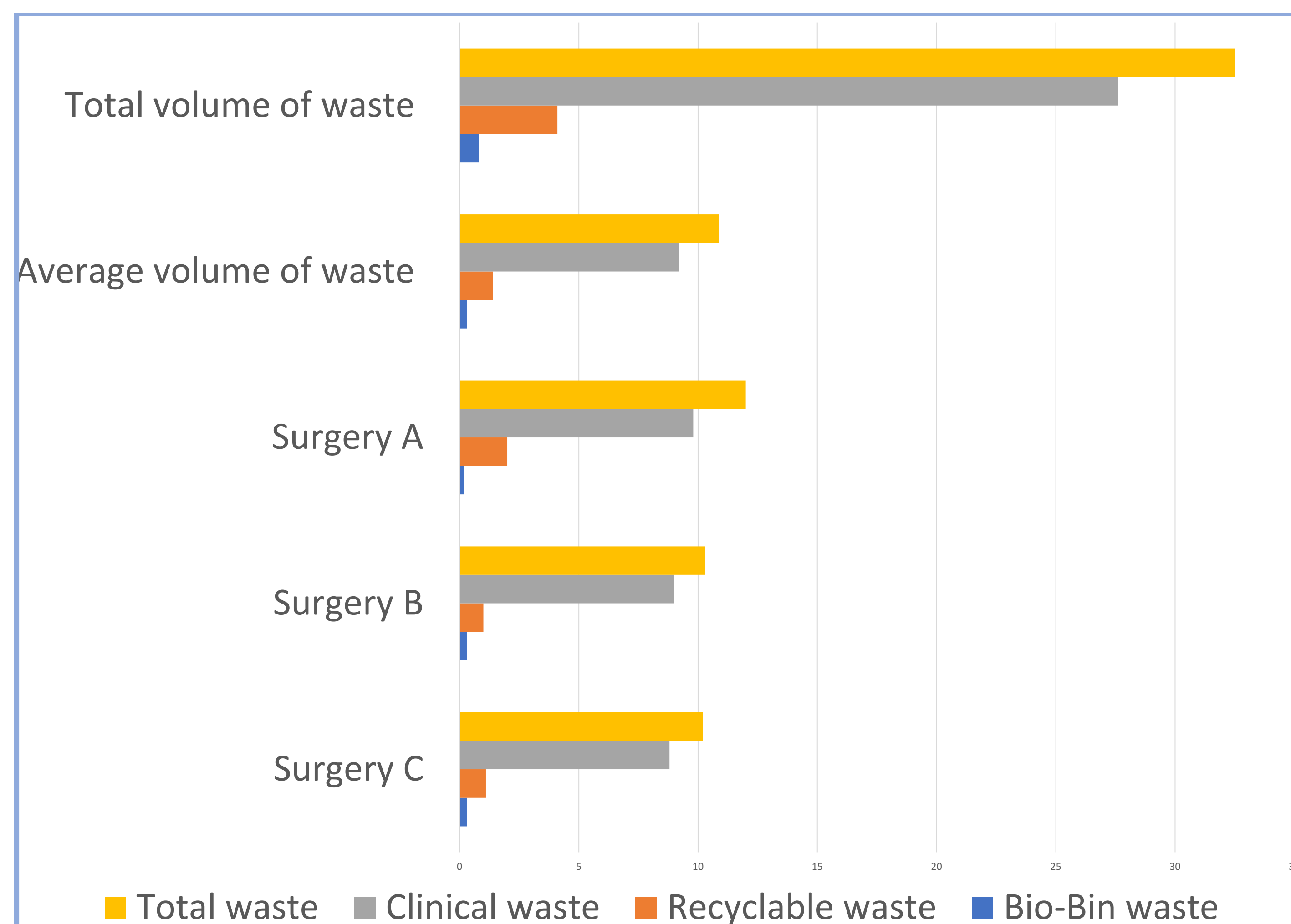


Figure 1. Waste volume streams produced by the PHOs measured in kilograms

## Methods

- Surgical waste audits of three PHOs were undertaken within a single orthopaedic department based at Freeman Hospital, Newcastle upon Tyne Hospitals NHS Foundation Trust, UK
- The surgical waste audits will be referred to as Surgery A, Surgery B and Surgery C
- To obtain real-world data, the staff agreed to manage the waste as they normally would for each operation
- National Joint Registry (NJR) data was used to extrapolate waste audit findings to estimate the annual volume of waste produced by PHOs in the NHS

## Conclusion

It was estimated that in the NHS, approximately 1043 tonnes of waste is produced annually by PHOs alone. A significant volume of this waste could be prevented through reduced use of single-use devices and recycling

## Modified Method (Surgery C waste audit)

- It became clear from intraoperative observation of Surgery A and Surgery B that significant volumes of visibly clean recyclable waste were being disposed of via the clinical waste stream in the operating theatre
- Thus, prior to the Surgery C waste audit, the method of waste auditing was modified; the researchers asked the staff to collect all recyclable waste as usual until the point in time when they would normally stop collecting the recyclable waste highlighted as "knife to skin"
- From that moment onwards, the staff collected the rest of the recyclable waste in a separate plastic bag labelled as 'additional recyclable waste' for separate weighing to highlight the missed opportunity to improve waste segregation

## Results

- The average volume of waste per surgical procedure was 10.9 kg, consisting of clinical (84.4%), recyclable (12.8%) and bio-bin (2.8%) waste. **Fig.1 and Fig.2**
- This research also found that single-use devices contribute significantly to operating room waste **Fig. 3**
- In addition, it was estimated that there is a missed opportunity to reduce clinical waste volume in each procedure, where approximately 15% of clinical waste disposal consisted of visibly clean recyclable waste material, including cardboard and plastics. **Table 1.**

Table 1. Surgery C waste audit results.

Waste streams	Volume (kg)	Percentage of total waste
Total waste	10.2	100.0
Clinical waste (including additional recyclable waste collected)	8.8	86.3
Additional recyclable waste collected	1.5	14.7
Recyclable waste collected as per protocol	1.1	10.8
Bio-bin waste	0.3	2.9



Figure 2. Waste produced by one PHO

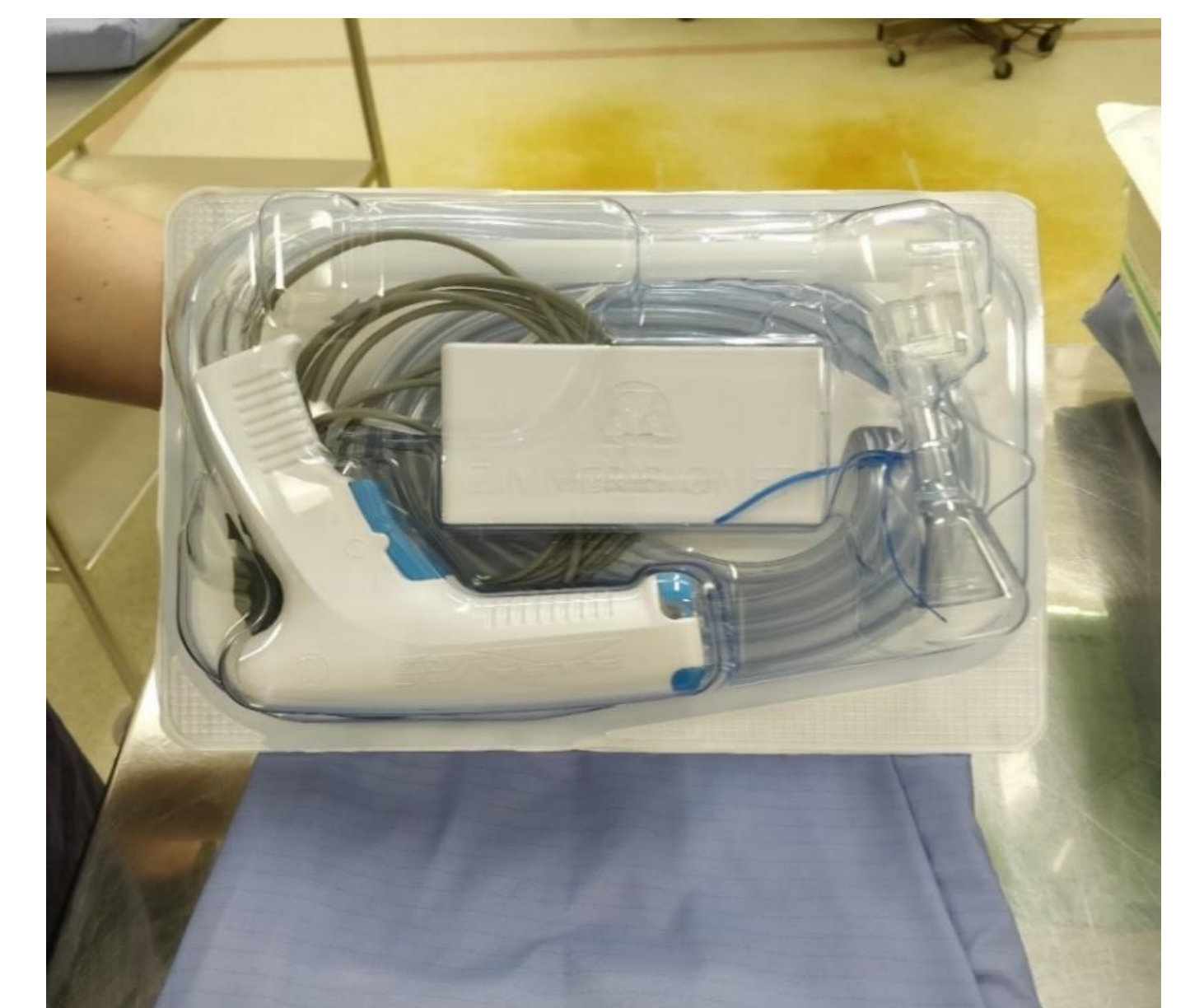


Figure 3. A single use pulse lavage device

## Discussion

- The NJR reports >95K PHOs are undertaken each year. This study calculates a single PHO generates approximately 11kg of waste and therefore the UK NHS PHOs generate approximately 1043 tonnes of waste annually
- The demand for surgery overall – and large joint replacement surgical procedures – is increasing, heightening its future environmental impact
- Research reports surgical waste can be halved reducing the environmental impact and costs through improved waste segregation and reduced use of SUDs
- The strength of this study addresses a lack of published primary research data reporting the proportion of waste disposed of via the different waste streams within surgery, and spotlights the burden of waste caused by surgical SUDs
- The main limitation of this study is it is small
- This research recommends conducting full life-cycle assessments and research into the contamination risk of using reusable devices versus SUDs. This will further strengthen the evidence supporting a return to reusable devices, concomitantly reducing environmental and financial impacts significantly