



# Pulse lavage in lower limb arthroplasty: awash with carbon saving opportunities

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## Introduction

Pulse lavage is used in cemented orthopaedic procedures to prepare the bone bed, improve fixation strength at the bone-cement interface, and reduce the risk of bone cement implantation syndrome. The most widely used devices in NHS Scotland are battery operated, single-use plastic, and require the use and subsequent removal of 6-10 batteries per case prior to disposal. Once removed they may be reused for other purposes but most are disposed of due to fire risk with improper storage. We sought to calculate the approximate carbon cost of battery-operated pulse lavage in Scotland for the year 2022.

## Methods

We used data from the Scottish Arthroplasty Project and Scottish Hip Fracture Audit to establish the number of primary hip replacements, knee replacements, and hip hemiarthroplasty procedures performed in 2022. We modelled the standard uses of eight AA batteries (at 23g each) per case. To calculate the carbon footprint associated we used the 'UK Government GHG conversion factors dataset' to calculate the carbon footprint in material use (materials, manufacture, and transport) and disposal.

## Results

Data from the Scottish Arthroplasty Project and Scottish Hip Fracture Audit established that 11,175 primary hip or knee replacements and 4,036 hip hemiarthroplasty procedures were performed in 2022. Therefore, around 15,000 pulse lavage units were used in primary lower limb arthroplasty. If each case had utilised a system which uses eight AA batteries (at 23g each) then 120,000 batteries equating to 2.76 tonnes, would have been used. The carbon footprint for material use ( $2.76 \times 4633.48 = 12788.40$ ) and for disposal ( $2.76 \times 8.883 = 24.52$ ) demonstrates a total carbon footprint of 12,813KgCO<sub>2</sub> associated with the use of disposable batteries in pulse lavage for the year 2022. This represents the carbon equivalent of a standard petrol car driving around the world 1.29 times. These calculations do not include the carbon cost of disposable plastic handpieces.

## Conclusions

Single-use, disposable battery use in orthopaedic joint surgery creates a high but preventable carbon burden. Alternatives to current practice exist including AC power adaptor options. Reuseable alternatives which utilise the power tool to drive the motor for pulse lavage may save up to 55% of clinical waste.

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Table 1: Summary equipment list

Equipment for each operation in a procedure room	Number
Disposable instrument tray	1
Size 7 glove set	2
800ml Kidney dish S/W	2
Single use jeweller bipolar forcep, 115mm, 0.5mm non-stick tip, integral 3m cable, fly leads	1
Tourniquet Dispo Cuff (46cm/18in)	1
Tourniquet barrier	1
10 ml syringe	2
ChloroPrep with Tint (10.5ml)	2

## References

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