#662: Environmental Impact of Disposable Ureteroscopy: Carbon Footprint Analyses

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INTRODUCTION

Disposable ureteroscopes have simplified workflow and reduced cross-contamination risks, yet their environmental impact remains poorly quantified. We hypothesized that the use of the Innovex™ single-use ureteroscope generates a measurable carbon footprint per case, largely driven by manufacturing and material waste. The aim of this study was to quantify the carbon footprint in disposable ureteroscopy cases.

METHODS

We conducted a prospective analysis of three ureteroscopy procedures using the Innovex™ disposable ureteroscope system. For each procedure, we recorded the combined weight of disposable instruments (ureteroscope, access sheath, guidewires, retrieval basket, irrigation tubing), excluding fluid waste. Published life-cycle assessment (LCA) data were used to estimate carbon emissions per kilogram of device manufactured and disposed. No reusable instruments were employed in these cases, isolating the footprint of the disposable approach.

RESULTS

The disposable instruments used per ureteroscopy case weighed between 0.83 and 1.39 kg in our series, reflecting the Innovex™ ureteroscope alongside ancillary single-use items. Using LCA conversion factors, the manufacturing of the disposable devices for each case is estimated to produce on the order of 7–12 kg CO_2e per case. Despite the Innovex™ device's lighter mass compared to alternatives; the overall per-case carbon footprint remains comparable due to additional single-use items.

DISCUSSION

Our findings show that even lightweight disposable systems result in a substantial carbon footprint per case. The environmental impact of single-use ureteroscopy is primarily driven by manufacturing, particularly from plastic and electronic components. Although the lighter Innovex™ design may offer a marginal reduction in emissions, the overall footprint is comparable to prior studies reporting ~4.43–4.47 kg CO_2e for both single-use and reusable ureteroscopes when analyzed in full LCA models. Transport and disposal phases likely add to the total carbon burden, though they were not directly measured here.

CONCLUSION

Even with innovations in device design, single-use ureteroscopes contribute significantly to carbon emissions. As the field of endourology evolves, incorporating environmental sustainability into surgical decision-making is essential. Adoption of greener practices, including hybrid models and improved material efficiency, may help reduce the environmental impact of ureteroscopic procedures.

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