



**Assessment of surgical waste generation and recycling in orthopedic subspecialties: A preoperative and operative period study**

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**Introduction**

The operating room has emerged as a significant contributor to hospital waste, accounting for an estimated one-quarter to half of the total waste generated. Surprisingly, recycling practices for surgical waste in the preoperative setting remain uncommon, despite the existence of numerous recyclable materials. This study aimed to address this critical issue by investigating the volume of waste generated during the preoperative and operative periods across various orthopedic subspecialties. Additionally, it sought to evaluate the extent to which recycling measures were implemented to manage this waste. Understanding the magnitude of waste generation and recycling practices in the preoperative setting is crucial for developing effective waste management strategies. By focusing on orthopedic subspecialties, this research offers specific insights into a significant source of hospital waste and the potential for improvement through recycling initiatives. The primary objective of this study was twofold: first, to determine the precise quantity of waste produced in the preoperative and operative periods within several orthopedic subspecialties, and second, to assess the proportion of this waste that underwent recycling processes.

**Experimental**

Surgical cases at Cisanello Hospital in Pisa, Italy, were prospectively chosen over a 3-months period. Data collection involved comprehensive waste audits conducted during the preoperative and operative periods to achieve the study's objectives. Multiple orthopedic subspecialties were included to ensure diverse representation. Waste was collected, weighed, and divided into recyclable, nonrecyclable, and biological categories in the preoperative period and into recyclable, nonrecyclable, and biological categories in the intraoperative period. The primary outcome was the amount of recyclable waste produced per case. Secondary outcomes included the amount of nonrecyclable, biological, and total waste produced. An analysis of variance was performed to test



for statistically significant differences among subspecialties. Recycling practices, if any, were documented and evaluated to determine the recycling rates within the studied settings.



Figure 1. The sequential process of waste collection, segregation, and weighing.

## Results and Discussion

This study included 77 procedures. A total of 624.42 kg of waste was collected, with a mean mass of 8.10 kg per case. 19.8% of the total waste was collected in the preoperative periods including non-recyclable wastes (19.85 w%), recyclable wastes (57.29 w%), and biological wastes (22.84 w %) while 89.19 % of the total waste was collected in operative periods including non-recyclable wastes (7.75 w%), recyclable wastes (12.12 w%) and biological wastes (80.19 w%). These findings will contribute to a better understanding of the current state of waste management in the pre-operative and operative periods and provide a basis for implementing more sustainable practices.

## Conclusions

This study sheds light on the significant amount of waste generated in the operating room, particularly in orthopedic subspecialties, and the potential for implementing recycling initiatives to manage this waste. The findings reveal that a substantial quantity of recyclable materials is discarded, highlighting the need for improved waste management strategies. The study's results provide a baseline understanding of waste generation during the preoperative and operative periods, emphasizing the importance of implementing more sustainable practices in these settings. By quantifying the amount of waste produced and evaluating recycling practices, this research offers valuable insights for healthcare facilities aiming to enhance their waste management processes and contribute to environmental sustainability. Future efforts can focus on developing and implementing effective recycling measures to reduce the environmental impact of surgical waste in the operating room.

**Biography** Bahareh Azimi is a postdoctoral researcher at University of Pisa. She published 32 articles (h-index of 16). Her research is focused on developing nanofibers and nanoparticles, which can be used to create advanced wound dressings, drug delivery systems, and cosmetic products with enhanced efficacy.