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Research Article

Towards Greener Healthcare: Evaluating Plastic Waste Reduction in a UK Hospital Setting

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ABSTRACT

Introduction: Plastic waste in healthcare settings presents a significant environmental and public health challenge, largely due to the widespread use of single-use items. This audit, conducted in the Acute Medical Unit (AMU) at the Royal Infirmary of Edinburgh, aimed to quantify plastic-containing clinical waste, implement targeted interventions to reduce it, and evaluate their impact through a re-audit.

Methods: Data were collected from store order reports over two periods: October–November 2023 and January–February 2025. Interventions included the introduction of paper medicine pots and restricting plastic cup orders to departmental requests. A patient survey conducted in November 2024 revealed strong support for sustainable alternatives. Stakeholder engagement including sustainability and procurement teams was critical to the initiative's success.

Results: The initial audit showed that 83.2% of waste items contained plastic, compared to 81% in the second phase, indicating a modest reduction. The patient survey found that 64.3% preferred paper straws, and 71.4% favored reusable mugs.

Conclusion: The findings suggest that small, targeted changes combined with staff and patient engagement can lead to meaningful reductions in plastic waste. Continued investment in sustainable products, education, and regular re-auditing is essential to support long-term environmental goals in healthcare.Keywords: Evaluating, Plastic Waste, Reduction.

Keywords: Climate Change; Healthcare; Acute Medicine; Hospitals; Plastic use

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Introduction

Plastic has become an indispensable component of modern healthcare, particularly through the widespread use of single-use items designed to ensure sterility and prevent cross-contamination [1]. However, despite their clinical necessity, these items pose significant environmental and public health challenges throughout their life cycle from resource extraction and manufacturing to disposal. The healthcare sector's heavy reliance on plastics not only contributes to environmental degradation but also undermines system resilience, as evidenced by the shortages of protective equipment during the peak of the COVID-19 pandemic [2]. Moreover, disposable items often incur higher operational costs; for example, reusable isolation gowns have demonstrated up to a 30% cost reduction compared to their single-use counterparts [3]. The global production of plastic is projected to double within the next two decades and triple by 2060, exacerbating its environmental and health impacts [4].

Healthcare professionals are uniquely positioned to lead change by promoting responsible plastic use particularly with single-use items raising awareness, and inspiring action across clinical, community, and policy domains. While public awareness of plastic pollution is growing, its contribution to the climate crisis remains less widely understood. The entire plastic life cycle is deeply intertwined with fossil fuel production and consumption [5]. Oil and gas extraction often through environmentally damaging methods such as fracking emits pollutants and disrupts ecosystems. The refining and manufacturing stages are energy-intensive, releasing substantial greenhouse gases and toxic by-products [6]. Even during use, plastics release micro-particles and chemical additives that affect terrestrial and marine environments [7]. Disposal methods such as incineration and landfill further contribute to carbon emissions and long-term ecological harm [8].

With petrochemical production expected to drive a significant increase in crude oil consumption by 2040, the unchecked growth of plastic manufacturing poses a serious threat to global climate and health objectives [9]. The health implications of plastic exposure are equally concerning. Microplastics, now found in air, water, and food, may enter the human body and pose unknown long-term health risks. Toxic substances released throughout the plastic life cycle have been linked to adverse effects on neurological, reproductive, and immune systems, and are associated with certain cancers [10].

Vulnerable communities, particularly those located near manufacturing and disposal sites, face disproportionate health risks [11]. Recognizing these dangers, Canada has classified plastic-manufactured items as toxic under its Environmental Protection Act, and the United Nations has identified plastic pollution as a global threat to human rights.

In the UK, the scale of clinical waste is substantial. NHS Scotland generates approximately 18,468 tonnes of clinical waste annually (as of June 2022), while NHS providers in England produce around 156,000 tonnes each year [12]. These figures underscore the urgent need for systemic interventions to reduce plastic waste in healthcare settings and support broader environmental and public health goals.

Healthcare services, especially those caring for vulnerable populations, have a critical role in mitigating these risks by advocating for safer alternatives and integrating sustainable practices into clinical care. This paper presents findings from a quality improvement project conducted in an Acute Medical Unit in a UK hospital, focusing on plastic use in clinical practice. The results highlight the broader relevance of plastic reduction strategies not only for high-income countries like the UK but also for lower-income nations, where healthcare systems are increasingly reliant on single-use plastics for daily operations.

Methods

This quality improvement study was conducted within the Acute Medical Unit (AMU) at the Royal Infirmary of Edinburgh (RIE) to support strategic goals related to environmental sustainability, operational efficiency, and regulatory compliance. The primary aim was to assess the composition of clinical waste, with a particular focus on plastic-containing items, to inform resource optimization and reduce the environmental footprint of medical practices. By identifying the proportion of plastic versus non-plastic waste, the initial audit sought to generate actionable data that could guide future waste reduction initiatives and recycling efforts. Additionally, the audit aimed to raise awareness among healthcare staff, enhance compliance with waste management protocols, and support a culture of continuous improvement.

The scope of the audit included both the Acute Medical Unit and the Ambulatory Care Unit, covering a two-month period from October to November 2023. Data were collected from monthly store order reports provided by the RIE store unit, which detailed the types and quantities of items ordered. No direct physical sorting or measurement of waste was performed. The

audit excluded intravenous (IV) solution bags from its analysis. Data were organized and analyzed using Microsoft Excel to determine the percentage of plastic-containing waste relative to non-plastic items. Risk assessment indicated no known risks associated with the audit.

The findings were communicated to key stakeholders, including sustainability teams and procurement officers, to support informed decision-making and promote environmentally conscious practices within the hospital. The interventions were followed by another cycle of auditing. This paper presents the results of both the first and second audit cycles.

Results

The initial audit, conducted in October and November 2023, revealed that 83.2% of the waste items generated in the Acute Medical Unit (AMU) at the Royal Infirmary of Edinburgh were plastic-containing clinical waste (PLC), while 16.8% were non-plastic items. A follow-up audit in January and February 2025 showed a slight reduction in plastic waste, with 81% of items classified as PLC and 19% as non-plastic. Although the decrease was modest, it indicated a positive trend toward reducing plastic usage. It is important to note that the total number of waste-generating items recorded in the first phase was 598, compared to 300 items in the second phase, which may have influenced the comparative percentages. Following recommendations from the initial audit and an incident involving a patient lip injury caused by a disposable plastic medicine pot, the AMU introduced paper medicine pots and adjusted the ordering process for plastic medicine cups, making them available only upon departmental request. This change was reflected in the second audit phase, where paper medicine pots accounted for 0.33% of items, compared to 0.50% for plastic medicine cups in the first phase. Although the shift was small, it was considered a step forward in reducing plastic waste in general clinical use.

A survey conducted in the Acute Medical Unit (AMU) involved 14 patients and their relatives to assess preferences regarding the use of plastic and alternative materials. The results showed that a majority (64.3%) preferred paper straws over plastic ones (35.7%).

When it came to drinkware, 71.4% favored reusable mugs or cups, while 57.1% opted for disposable paper cups. Only a small proportion (14.2%) preferred disposable plastic cups. These findings suggest a general preference for more sustainable options among patients and relatives in the AMU setting.

Stakeholder engagement was also a key component of the audit. Sustainability teams and the Material Management Development team expressed support for the initiative and recommended further discussions with the procurement team, which oversees the catalogue and ordering processes through the National Distribution Service (NDS), Scotland's central provider of clinical supplies. Their involvement highlights the importance of cross-departmental collaboration in achieving meaningful reductions.

Discussion

This audit highlights that even modest interventions such as replacing plastic medicine cups with paper alternatives and engaging staff and patients can contribute to measurable reductions in plastic-containing clinical waste. The slight decrease in plastic waste observed between the two audit phases, though limited, reflects the potential of targeted changes to influence broader sustainability goals within hospital settings.

Stakeholder engagement, particularly from sustainability and material management teams, was instrumental in supporting the initiative and identifying pathways for collaboration with procurement services, such as the National Distribution Service (NDS). However, the audit also underscores the need for sustained and systemic efforts. Achieving significant reductions in plastic waste will require investment in alternative products, the development of appropriate waste streams for biodegradable materials, and ongoing dialogue with procurement and regulatory bodies.

Education and awareness campaigns targeting both staff and patients are essential to foster behavioural change and ensure compliance with new waste management protocols. Future audits will be necessary to evaluate the long-term impact of these interventions and guide continuous improvement.

Conclusion

This audit demonstrates that even modest interventions such as replacing plastic medicine cups with paper alternatives and actively engaging staff and patients can lead to measurable reductions in plastic-containing clinical waste. The slight decrease in plastic waste observed between the two audit phases, though limited, reflects the potential of targeted changes to support broader sustainability goals within hospital settings.

The introduction of paper medicine pots following a patient safety incident, along with departmental control over plastic cup ordering, illustrated a practical

and responsive approach to waste reduction. Patient feedback further reinforced the feasibility of adopting more sustainable practices. Most surveyed patients expressed a preference for paper straws and reusable mugs over disposable plastic items, indicating a general openness to environmentally friendly alternatives.

Stakeholder engagement, particularly from sustainability and material management teams, was instrumental in supporting the initiative and identifying pathways for collaboration with procurement services, such as the National Distribution Service (NDS). However, the audit also underscores the need for sustained and systemic efforts. Achieving significant reductions in plastic waste will require investment in alternative products, the development of appropriate waste streams for biodegradable materials, and ongoing dialogue with procurement and regulatory bodies.

Education and awareness campaigns targeting both staff and patients are essential to foster behavioral change and ensure compliance with new waste management protocols. Future audits will be necessary to evaluate the long-term impact of these interventions and guide continuous improvement.

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Competing Interests

The authors declare no conflict of interest.

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Ethical Considerations

This work was done as part of a quality improvement project, therefore, no ethical approval was requested.

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