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Reducing Healthcare Waste Through Systemic Design

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Reducing Healthcare Waste Through Systemic Design

Possibilities and practices for sustainable healthcare

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The healthcare sector produces substantial amounts of clinical and non-clinical waste, which creates a significant financial cost and environmental footprint to safely dispose of and manage the waste, in addition to sustainability implications for producing, transporting and using healthcare products. This participatory research project is a multi-partner collaboration between a university and three healthcare organisations to explore possibilities and identify new practices to reduce healthcare waste for improved sustainability. The multi-disciplinary research team includes design, materials science, waste, sustainability and healthcare professionals, therefore providing a range of perspectives. A mixed methods approach will use focus groups with healthcare staff and analysis of procurement data to identify highly consumed items and those with a high level of waste, as well as explore the systemic challenges causing the waste. For instance, waste resulting from over-packaging, pre-packaged items containing unnecessary components, systemic inefficiencies and poor waste management practices. Inventories will be conducted of shortlisted items to describe their lifecycle, weight, associated packaging and composition. This evaluation will include a detailed analysis of materials to identify the types of plastic and

makeup of composite materials and to better understand their function, recyclability, and reusability. Recommendations for sustainable alternatives and systemic redesign will be fed back to the three participating healthcare organisations in a follow-up workshop. This work-in-progress presentation to the RSD11 conference will share key findings from the design component of the project as a report of the ongoing research. The research team will be responsive to comments received during the conference presentation to further enhance the analysis of how systemic design can contribute to reducing healthcare waste.

KEYWORDS: Waste, healthcare, systemic design, sustainability, environmental footprint

RSD TOPIC: Health & Well-Being

Presentation description

Background context

Healthcare generates 4.4% of global carbon emissions, and if healthcare were a country, it would be the 5th largest emitter of greenhouse gases (Karliner et al., 2019). Its impact was acknowledged at the COP26 programme of events on healthcare sustainability (UN Climate Change Conference UK, 2021). Each National Health Service (NHS) organisation in England spends, on average, £300,000 a year on waste disposal, with large amounts of bin misuse and high volumes of single-use products (Royal College of Nursing, 2018). This participatory research project addresses these challenges by collaborating with the healthcare community to evaluate items and materials entering the waste stream and co-designing interventions. The project will focus on items used in high volumes or which have a high level of wastage, as identified by the 'community'.

The project is co-producing knowledge with end-users of the research, recognising their experience, needs and preferences and fostering greater agency to implement findings. Therefore, the end-users for this participatory research are healthcare professionals, and the 'community' is healthcare clinical and estates staff. The multi-disciplinary

research team is made up of university staff with expertise in sustainability from a range of different backgrounds, including design, waste management, materials science and nursing. A surgeon, nurse, waste coordinator and head of environmental services from three NHS England healthcare organisations are the community partner co-researchers.

Project aims

The research question guiding this project is: How can healthcare waste be reduced for improved environmental, financial and social sustainability of healthcare practice? The aims identified to address this question are:

1. To collaborate with the healthcare community in identifying a shortlist of healthcare supplies which are highly consumed or that create a high level of waste.
2. To explore healthcare staff's views on why the shortlisted clinical items create large amounts of waste and their recommendations for waste reduction.
3. To describe each of the shortlisted clinical items' procurement details, function, volume, weight, associated packaging, composition, lifecycle, reusability and recyclability.
4. To co-develop sustainable alternatives or systemic redesign of the shortlisted clinical items for reducing the waste generated from their use in healthcare practice.

Methods

The project is using participatory research methodology (Bergold & Thomas, 2012; Vaughn & Jacquez, 2020). The Integrated Knowledge Transition model (Boland et al., 2020; Gagliardi et al., 2016; Kothari et al., 2017) is the conceptual framework underpinning the design, which is defined as "research co-production whereby researchers partner with knowledge users throughout the research process and who can use the research recommendations in practice or policy" (Boland et al., 2020). The community partner co-researchers have contributed to conceptualising the project, designing the methods and writing the grant proposal. This collaboration between

university and healthcare staff co-researchers continues throughout data collection, data analysis and dissemination of results.

The mixed-methods design (Creswell & Creswell, 2018; Flick, 2018; Leavy, 2017) includes collecting qualitative data from focus groups with healthcare staff and quantitative data from product inventory and materials science evaluations of shortlisted items identified from procurement information and the focus group interviews. The principles of contextual design will guide a design evaluation of the shortlisted items and their associated packaging. The design workstream will also explore sustainable alternatives or systemic redesign of these priority clinical products and their use in healthcare practice to reduce waste. A Team-Based Reflexivity Model (Rankl et al., 2021) is used by the research team throughout the planning, implementation and dissemination of the research project to regularly share assumptions, experiences and critical reflections. Rigour is enhanced by following the criteria set out in the Mixed Methods Appraisal Tool (Hong QN, 2018; Pluye & Hong, 2014) and ensuring the participatory methodology and mixed-methods design are transparent and clearly justified (O'Cathain et al., 2008).

Triangulation will occur by using these different types of data from multiple sources across the various project workstreams (Flick, 2018). Integration of the qualitative and quantitative data will take place by using the focus group findings to inform the product inventory, materials and design evaluations (Fetters et al., 2013). Further integration will come from synthesising the qualitative and quantitative data analyses across the different workstreams into final conclusions. The research team will deliver a follow-up workshop to the three participating NHS Trusts (two hospitals and one community organisation in Southeast England) to share the recommendations for healthcare waste reduction directly with the collaborative partners. These recommendations will be based on improvements for environmental, financial and social sustainability in relation to healthcare waste.

Results

The purpose of this presentation for the RSD11 conference is to present a works-in-progress evaluation of the data collection and analysis achieved by October 2022. There will be an emphasis on the project's fourth aim related to systemic redesign to demonstrate possibilities and potential new practices for waste reduction to improve sustainability in healthcare. Completed data collection at the time of abstract submission includes two focus group interviews and materials science evaluation of a selection of healthcare items identified as priority items for reducing healthcare waste.

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References

1. Bergold, J., & Thomas, S. (2012). Participatory research methods: A methodological approach in motion. *Historical Social Research/Historische Sozialforschung*, 191-222.
2. Boland, L., Kothari, A., McCutcheon, C., Graham, I. D., & for the Integrated Knowledge Translation Research, N. (2020). Building an integrated knowledge translation (IKT) evidence base: colloquium proceedings and research direction. *Health Research Policy and Systems*, *18*(1), 8. https://doi.org/10.1186/s12961-019-0521-3
3. Creswell, J. W., & Creswell, J. D. (2018). *Research design: qualitative, quantitative and mixed methods approaches* (International student edition. ed.). SAGE. http://prism.librarymanagementcloud.co.uk/brighton-ac/items/1449791
4. Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs-principles and practices. *Health services research*, *48*(6 Pt 2), 2134-2156. https://doi.org/10.1111/1475-6773.12117
5. Flick, U. (2018). *Doing triangulation and mixed methods* (Second edition. ed.). SAGE. http://prism.librarymanagementcloud.co.uk/brighton-ac/items/1470921

6. Gagliardi, A. R., Berta, W., Kothari, A., Boyko, J., & Urquhart, R. (2016). Integrated knowledge translation (IKT) in health care: a scoping review. *Implementation Science*, *11*(1), 38. https://doi.org/10.1186/s13012-016-0399-1
7. Hong QN, P. P., Fàbregues S, Bartlett G, Boardman F, Cargo M, Dagenais P, Gagnon M-P, Griffiths F, Nicolau B, O'Cathain A, Rousseau M-C, Vedel I. . (2018). *Mixed Methods Appraisal Tool (MMAT) Version 2018*. http://mixedmethodsappraisaltoolpublic.pbworks.com/w/file/fetch/127916259/MMAT_2018_criteria-manual_2018-08-01_ENG.pdf
8. Karliner, J., Slotterback, S., Boyd, R., Ashby, B., & Steele, K. (2019). Health care's climate footprint. How the health sector contributes to the global climate crisis and opportunities for action. https://noharm-global.org/sites/default/files/documents-files/5961/HealthCaresClimateFootprint_092319.pdf
9. Kothari, A., McCutcheon, C., & Graham, I. D. (2017). Defining integrated knowledge translation and moving forward: a response to recent commentaries. *International journal of health policy and management*, *6*(5), 299.
10. Leavy, P. (2017). *Research design: quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*. The Guilford Press. http://prism.librarymanagementcloud.co.uk/brighton-ac/items/1458013
11. O'Cathain, A., Murphy, E., & Nicholl, J. (2008). The quality of mixed methods studies in health services research. *Journal of Health Services Research and Policy*, *13*(2), 92-98. https://doi.org/10.1258/jhsrp.2007.007074
12. Pluye, P., & Hong, Q. N. (2014). Combining the Power of Stories and the Power of Numbers: Mixed Methods Research and Mixed Studies Reviews. *Annual Review of Public Health*, *35*(1), 29-45. https://doi.org/10.1146/annurev-publhealth-032013-182440
13. Rankl, F., Johnson, G. A., & Vindrola-Padros, C. (2021). Examining what we know in relation to how we know it: A team-based reflexivity model for rapid qualitative health research. *Qualitative Health Research*, *31*(7), 1358-1370. https://doi.org/10.1177/1049732321998062
14. Royal College of Nursing. (2018). Freedom of information follow up report on management of waste in the NHS. https://www.rcn.org.uk/professional-development/publications/pdf-006683

15. UN Climate Change Conference UK. (2021). *The COP26 health programme.* https://ukcop26.org/the-cop26-health-programme/
16. Vaughn, L. M., & Jacquez, F. (2020). Participatory Research Methods–Choice Points in the Research Process. *Journal of Participatory Research Methods*, *1*(1), 13244.