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Managing medical waste in humanitarian supply chains: lessons for healthcare services

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Abstract:

This comment piece sheds light on the issue of medical waste in humanitarian supply chains. It discusses the challenges of managing medical waste in the volatile humanitarian context. Then, it explores the ways to tackle the challenges, through digital tools and technologies, inter-organisational collaboration, and designing the waste out. Finally, it contextualises the lessons learnt from humanitarian sector for healthcare service providers such as NHS.

Key words

Humanitarian supply chain, Medical waste; Sustainability; Waste management

Introduction

Humanitarian logistics and supply chain management involve processes of planning, implementing and controlling the flow and storage of goods and information, from origin to consumption point, for the purpose of alleviating the suffering of vulnerable people (Thomas and Kopczak, 2005). The context of humanitarian logistics distinguishes it from commercial logistics. In the former, the timing, location and extent of the next crisis are largely unknown and, when crises happen, they are subject to urgency and time pressure. Humanitarian organisations often face damaged transportation and telecommunication infrastructure, which adds to the complexity of logistics planning in an already volatile context. Moreover, the affected communities, known as beneficiaries, often do not have a voice to state their needs (Kunz et al, 2017).

Humanitarian organisations work to deliver essential items to beneficiaries, such as food, medicine and blankets. The supply chain management of medical products is particularly important, as they require more strict considerations for storage, transportation and distribution. When unused medicine reaches the end of its shelf life, it can pose a threat to the vulnerable community impacted by a disaster. If not properly managed, medical waste can reach local black markets or contaminate the soil and water. However, in an unstable environment, such as amid an armed conflict or in a refugee camp, infrastructure is often fragile and minimal, making proper waste management a challenge. This article explores the problems leading to mismanagement of medical waste in humanitarian supply chains, with suggestions of how to address these issues and the lessons that could be applied to a healthcare service context.

Barriers to medical waste management in the humanitarian context

Lack of supply chain visibility and atypical organisational design

One of the key issues in humanitarian supply chains is the lack of visibility. Humanitarian organisations have a decentralised structure, with some decisions being made by headquarters in a developed country (usually in Europe or the United States) and some being made at the local level by the delegations and country offices. This decentralised structure and decision-making model, while beneficial for swift response, restricts supply chain visibility and governance. In an interview between the author and a senior humanitarian practitioner based at the organisation's headquarter, the latter stated that 'We do not know much what happens to [medical items] after delivery to country offices.'

In an opaque supply chain, there is a risk that decisions made at headquarters will not be suitable for implementation in the field.

Earmarked funding

Unlike the commercial sector, which aims to maximise profit in the market, humanitarian organisations largely rely on charitable donations. Public and private donors fund field operations and headquarters' running costs. Often, these donors tie their donations to a specific cause, programme or region, which is known as earmarked funding. When funds are earmarked, humanitarian organisations may not spend them for reasons other than those specified by the donor. This considerably reduces their flexibility to deal with other pressing issues, such as waste management. For example, if a donor earmarks their funds for the procurement of medicine for communities affected by the war in Ukraine, the recipient humanitarian organisation may not spend those funds to develop a reverse logistics system for the transportation and proper disposal of medical waste. They also cannot assign the funds to other regions where supplies of medicine may be more needed, such as South Sudan. Therefore, research Zarei et al (2019) identified earmarked funding as the main barrier to medical waste management.

Unsolicited medical donations and material convergence

When a disaster strikes, an influx of medicine donations along with other items are often sent to the afflicted regions. When large amounts of donated medicines reach the borders of the disaster area, humanitarian organisations can become overwhelmed and struggle to efficiently receive, sort and dispatch these items to where they are needed. This leads to a backlog of items at airports, distribution centres and warehouses at the borders of the afflicted region. This accumulation of unsolicited donations is known as material convergence.

Despite their compassionate motives, unsolicited donations can have a detrimental impact on humanitarian supply chain. For example, in the ongoing war in Ukraine, beneficiaries need specific medical items that are not generally owned by the public and must be ordered from specialist suppliers (Schiffling and Piotrowicz, 2022). However, humanitarian organisations in Poland, Romania, Czechia and Hungary have been overwhelmed with unwanted supplies of medicine from around the world, some of which are near their expiry date (Schiffling and Piotrowicz, 2022). Another example of this occurred following the 2010 earthquake in Haiti, where donated medical equipment was not compatible with the system configuration and voltage used in the country's hospitals, and thus ended up in warehouses, occupying valuable space. In general, a large donation of medical supplies is unusable for humanitarian organisations, as they may have a limited time until their expiry date, or the label may be written in a language that is unreadable to the local population and/or the humanitarian staff in the field. The need for temperature-controlled storage with some medications can also be challenging if a large supply is received in an environment that is experiencing (or has just experienced) a crisis.

Expired medicine and bad publicity

Negative publicity for a humanitarian organisation leads to reduced trust among donors and a lower possibility of being sufficiently funded. Humanitarian organisations that deal with medical products are aware that medical waste is a significant issue in the humanitarian context. However, developing guidelines and standard operating procedures to deal with unused medical items could lead to negative publicity in the eyes of their donors. The author interviewed staff at an international humanitarian organisation in Copenhagen, Denmark, which had begun to develop a guideline to deal with unused expired contraceptives. However, during the conversation about the guideline, the first thing mentioned by the chief procurement officer was '[The guideline] created such a bad publicity for us. The donors perceived it as their money is being wasted, so we did not continue on that'.

Managing medical waste in the humanitarian context

The challenge of managing medical waste in the humanitarian supply chain is multi-faceted and intricate; there is no one-size-fits-all solution that can address the problem on a global scale. The nature of the crisis, the cultural context and the needs of the beneficiaries in the Ukraine conflict are fundamentally different to those of the beneficiaries facing drought, famine and displacement in Somalia, yet both are examples of a humanitarian crisis and are dealt with by similar international humanitarian organisations. Despite this, as knowledge and awareness about medical waste management develop, new solutions are emerging.

Digital tools

As discussed, lack of supply chain visibility is one of the root causes medical waste generation and subsequent mismanagement. Emerging technologies, such as blockchain, can be the key. Blockchain

is a jointly-distributed ledger, which allows transactions to be recorded digitally and linked to a chain containing the entire history of an asset. Transactions are recorded only after they are validated using a consensus-encrypted protocol. This means that when a transaction happens, such the arrival of medical supplies to a seaport, all supply chain actors from the supplier, shipper, humanitarian organisation's headquarters and country office are updated. This can help them to keep track of the shipments, update their inventories and estimation of needs, and stay notified until the last mile distribution. Moreover, an integrated blockchain-enabled supply chain can alert staff when medical items near their expiry date and show nearby regions that may be in need of those items. It can also be used to help with coordinating and scheduling the use of empty capacity in backhaul running trucks or freights to collect and transport medical waste to a recycling facility. An empirical study by Baharmand et al (2021) showed that the use of blockchain can improve visibility, traceability, trust and transparency in humanitarian supply chains.

However, humanitarian supply chains are typically slow to adopt new technologies. While digitalisation in the commercial sector has transcended logistics from a peripheral function to a strategic one, humanitarian logistics are still heavily relying on manual processes. Low acceptance and poor implementation rates have sometimes led to negative consequences. For example, a report by Human Rights Watch (2021) showed that, as a result of poor information management, the biometric data of Rohingya refugees were shared with Myanmar's government, from which they were fleeing.

Inter-organisational coordination

Humanitarian supply chains can involve multiple actors, including large international humanitarian organisations; local non-governmental organisations; private sector logistics providers; military, public and governmental organisations; donors; and individual volunteers. For example, to address the ongoing Rohingya humanitarian crisis, more than 130 partners are working together in Cox's Bazar, Bangladesh, the main refugee camp, as well as other locations (The Government of Bangladesh, 2022). However, inter-organisational coordination is often a challenge for humanitarian organisations, which have faced criticism for poor coordination, duplication and working in isolation from one another (Burlando et al, 2006). This can lead to an oversupply of some medicine, especially common types, such as painkillers and antibiotics, and a shortage of others, such as those needed for patients with cancers and rare diseases, which may have a lower demand but are crucial for survival.

In 2005, the United Nations began an approach whereby humanitarian organisations working in the same sector of humanitarian action are 'clustered' together and led by a cluster lead agency. For example, the World Food Programme is the lead by the Logistics Cluster (https://logcluster.org). While the cluster approach has improved inter-organisational collaboration, the need for the cluster lead agency to both lead the cluster and manage its own operations can have a negative impact on trust and coordination within the cluster (Ruesch et al, 2022). Humanitarian organisations still have limited knowledge of each other's operations and work is still needed to achieve harmonised and coordinated multi-agency supply chain management.

Designing out waste

Humanitarian operations often lack recycling facilities for medical items and have poor reverse logistics (Zarei et al, 2019). Therefore, designing out waste at the early stages of product design and manufacturing could be the most viable solution. For example, Healthcare Without Harm are developing strategies to reduce the environmental footprint of medical supply chains, such as using biodegradable packaging, designing packaging to be reusable or packing in batches instead of single items. These strategies could be applied to both standard healthcare services and humanitarian operations.

Cash donations and cash-based interventions

Generally, material donations are needed only when the local market cannot supply them; in most humanitarian contexts, local market starts functioning just days, if not hours, after the disaster's beginning (Heaslip et al, 2018). Therefore, humanitarian organisations have started to promote cash donations in order to implement 'cash-based interventions' (Heaslip et al, 2018), whereby cash or digital vouchers (rather than material supplies) are distributed to beneficiaries so that they can freely purchase what they need from the local market. Receiving cash donations also gives humanitarian organisations the flexibility to purchase exactly what is needed, while preventing the problems associated with unsolicited donations, material convergence and earmarked funding.

Sustainability in strategic objectives

In an interview with the author, one humanitarian worker stated that the attitude in the industry had previously been that '*our job is to save lives, not to save the planet; this is not in our mandate*'. However, this is now changing, with humanitarian organisations increasingly providing staff training on waste management and considering issues relating to sustainability in their operations and performance assessments. Organisations such as the International Committee of the Red Cross have started to incorporate environmental sustainability in their strategic objectives. Yet, a further change of mentality is needed; humanitarian organisations need to believe that, while their main onus is supporting beneficiaries, they are also responsible for their ecological footprint, whether this is from waste generation or the environmental impact of transporting, storing and distributing medical supplies.

What can healthcare services learn from humanitarian supply chains?

There are similarities between public health services, such as the NHS, and humanitarian organisations. Both have previously been criticised for working in silos (McCartney, 2016) and being slow to adopt new technology (Castle-Clark et al, 2017), issues that the NHS is now making progress in addressing through the shift to integrated care systems and the increased use of digital tools. Similarly, both humanitarian organisations and public health services, such as the NHS, must improve their medical waste management (NHS England, 2022). The technical and managerial body of knowledge around medical waste management is developing rapidly, but thus far little has been applied to the humanitarian setting. To address this, it is important that researchers and experts work to contextualise existing knowledge into a usable form for humanitarian organisations.

In turn, there are several lessons that organisations such as the NHS can take away from the issues relating to humanitarian supply chains discussed here. First, despite the criticisms levelled at humanitarian organisations regarding poor inter-organisational collaboration, they are agile in their operations, responding quickly to unpredictable crises and forming partnerships rapidly to support beneficiaries. During the COVID-19 pandemic, the NHS had a slow response in some similar aspects of their response, such as knowledge sharing among UK hospitals and internationally, inter-hospital patient transfers to use excess healthcare system's capacity in other regions, and working with vaccine producers to ensure equality in accessing vaccines globally, being developed at the time. Agility is a key capability in humanitarian organization' operations, which can be benchmarked by NHS in giving early emergency response to crises such as a pandemic.

Second, supply chain visibility is a key issue to the NHS, especially upstream. Although NHS organisations may have good information about its direct suppliers of medical products, moving further upstream in the supply chain, there is increasingly limited knowledge, control and visibility of indirect suppliers. For example, in 2008, it was revealed that NHS surgical scissors were being

produced in sweatshops in Pakistan by child labour (Randerson, 2008). The NHS has now a better grip over its direct suppliers, but an estimated 95% of surgical instruments produced in Pakistan are still being outsourced to informal suppliers that use child labour, with long working hours and inhumane conditions (Ethical Trading Initiative, 2020). The use of digital tools, as well as interventions such as audits, could help to improve the environmental sustainability and social ethics of the NHS's upstream supply chain. Moreover, proper contract management and the incorporation of stricter sustainability terms should be prioritised to reduce medical waste, as this is still a major problem in the NHS; Kemp and Meisel (2021) found that 10 million surgical gowns, worth £70 million, were ordered from a United States-based firm in 2020 but, because packaging specifications were not properly defined in the contract, use of the gowns was suspended as a result of safety concerns.

Third, although the NHS is not a charity, the organization and its associated bodies do run campaigns to raise funds via public donations. Encouraging unearmarked cash donations could allow the NHS to spend the funds in the areas with the most need, rather than being restricted to a specific area. Finally, although 'mainstreaming digitally-enabled primary and outpatient care across the NHS' is a key aim in the NHS (2019) Long Term Plan, sustainability is often been taken for granted. While, the plan draws focus to the financial sustainability of the NHS, little attention is given to environmental and social sustainability. Overlooked issues include environmentally sustainable management of waste generated by the NHS (especially from disposable instruments), as well as social issues relating to safe working environments for staff, ethical supply chain management and the gender pay gap, both in the NHS itself and its suppliers. These issues need to be incorporated into the NHS's strategic objectives, with clear measures and indicators for improvement.

Conclusions

The management of medical waste is a longstanding issue, both in healthcare services such as the NHS and in humanitarian organisations. However, only recently have this issue begun to receive adequate attention. The volatility and complexity of the humanitarian context makes proper waste management challenging. However, there are various potential solutions to these issues, such as the use of digital tools and cash-based interventions, which have started to gain momentum in recent years.

Public health services such as the NHS can learn from strategies used in medical supply chain management in humanitarian organisations. These strategies include the rapid establishment of trust between organisations during a crisis, the raising of unearmarked cash donations, and the incorporation of environmentally and socially sustainable objectives in strategic planning. Overall, medical waste in humanitarian supply chains and its implications for public health is a developing research area, which has direct relevance for healthcare practitioners. More research is needed to develop research- and experience-based solutions to these issues, possibly incorporating the expertise of both humanitarian organisations and healthcare professionals.

Key points

- Tackling medical waste in humanitarian supply chains is a pressing issue that remains largely overlooked in research and practice. It can be attributed to a) not incorporating sustainability in strategic planning, b) atypical humanitarian organisations' design, and c) unsolicited donations.
- Several remedies could be sought; a) using digital tools such as blockchain to enhance visibility in humanitarian supply chains, b) better inter-organisational coordination to reduce duplication,
 c) working with suppliers to design waste out, and d) encouraging donors to cash and unearmarked donations.
- The key learnings for public healthcare systems are a) developing agility as an essential capability to providing first emergency response, b) extending monitoring beyond direct suppliers to indirect suppliers for sustainability compliance, and c) inclusion of environmental and social sustainability objectives in long-term planning.

Conflicts of interest

The author declares that there are no conflicts of interest.

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