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How Can Behaviour Change Theory Contribute to a Reduce, Re-use and Recycle Approach to Waste Management in the UK NHS: A Feasibility Study

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Abstract: The UK National Health Service (NHS) overall annual carbon emissions is estimated to be around 21 million tonnes; producing 250,000 tonnes of waste a year with 80% of this waste going to landfill. Examples of good practice in addressing sustainability and climate change are found within healthcare. However these require changes in mindset, including values, attitudes, norms and behaviors which are required along with clear definitions of the problems faced in terms of economics, society and culture in order to respond positively to change. Initial investigations of the literature indicate that behavior change theory may provide a feasible means of achieving constructive changes in clinical waste management; such approaches require further investigation. This paper describes a feasibility study designed to examine issues that might affect the introduction of a behavior change strategy improve waste management in a healthcare setting. Guided by the evidence gained from our systematic review, 20 interviews were carried out with senior managers, clinicians and support staff involved in the management of healthcare waste from a broad range of agencies in South West England. Interviews were audio-recorded and transcribed for analysis. Thematic content analysis was conducted in order to identify key issues and actions. Data extraction, coding and analysis was cross checked independently by the four

members of the research team. Initial findings suggest tensions, between Government and local policies, between organizations and individuals, and between the operational requirements of health and safety and maintaining appropriate and ethical patient care.

Keywords: Healthcare waste, infection control, management systems, procurement, behavior change

1. Introduction

The UK National Health Service (NHS) overall annual carbon emissions is estimated to be around 21 million tonnes; producing 250,000 tonnes of waste a year with 80% of this waste going to landfill [1]. To identify how and why these levels continue to rise there is a need to understand 1) the production and purchasing of goods designed for use in healthcare organizations; 2) the culture of the organizations producing waste; 3) current healthcare waste management systems; and, 4) the current behavior, attitudes and values of healthcare workers towards the removal of waste. Initial investigations of the literature indicate that behavior change theory aimed at both systems and individuals may enable the development of drivers which introduce a reduce, reuse and recycle philosophy to the management of healthcare waste [2-4]. This paper describes one stage of a feasibility study designed to examine issues that might affect the introduction of a behavior change strategy to improve waste management in a healthcare setting.

The feasibility study was divided into four stages. The first stage was a systematic review of current research in relation to healthcare waste management. The review results indicated the need for:

- an understanding of the mind set of individuals,
- recognition that NHS employees who recycled at home were also more likely to do so at work,;
- recognition that self-reports of behaviour do not necessarily translate into actual behaviour; and,
- behaviour change is needed at an organisational level.

Guided by the evidence gained from our systematic review, the second stage of the feasibility study involved twenty in depth qualitative interviews with senior managers, clinicians and support staff involved in the management of healthcare waste from a broad range of public and private, health advisor and health provider agencies in South West England.

2. Methods

The study setting was a region within South West England that includes a private hospital, an NHS (Government funded) hospital and a number of care homes (offering residential and day care for the elderly). Participants were purposively sampled in order to include a range of views from each of the organizations and different types of staff (n=20). The semi-structured interviews, using a structured interview guide, took place in venues and at times negotiated with, and convenient for, the participants. Interviews did not exceed 1 hour duration. Participants were reminded that all data they provided was coded to protect their identity and to allow them to speak candidly. The structured interview guide included demographic information; background/context / information, culture of the organization/

barriers/possibilities for change; specific reduce, re-use, recycle questions and the participants attitudes towards such issues as climate change and sustainability.

All the interviews were digitally recorded and transcribed. All processes were informed, designed and executed in full accordance with established principles for research involving human participants. Guiding principles for designing and carrying out research were adhered to, these include respect for all individuals involved in the research, valid consent, openness, honesty, right to withdraw, and confidentiality (Nursing and Midwifery Council's Code of Professional Conduct 2008).

Thematic analysis [5] was conducted in order to inductively develop codes and themes. Data extraction, coding and analysis were cross checked independently by members of the research team. The researcher read and re-read the transcripts identifying areas of concordance and divergence across the interviews. This enabled both the breadth and depth of the data to be thoroughly investigated and all interview data to be part of the analysis. Overall themes were developed following discussion of the initial findings with members of the research team. Study rigor was established through the use of a decision trail following the principles of credibility, transferability and dependability [6].

3. Findings

The findings identified a complex pathway of confounding factors which led to the vast quantities of waste being produced by the UK NHS. It was not simply an issue of individual members of staff putting non-infectious items in clinical waste bags which appeared to cause an unnecessary increase in the amount of clinical waste being removed. The interviewees in this study described a systemic failure based on a lack of coordination and understanding of the issues, which started at the legislation stage, infiltrated the manufacture and procurement of materials and products, and, eventually stifled a health service provider organization already struggling with economic pressures, inadequate buildings, and pressures on space.

The analysis of the data from the twenty in-depth interviews across a range of organizations developed three themes 1) systems; 2) attitudes and behavior, and 3) the way forward. It appeared to be the system design and processes which led to many of the issues identified such as the increase in waste, or poor separation of waste, therefore we report on those findings in particular here. The concerns in relation to systems focus on three distinct but interwoven issues: legislation and guidance; procurement and packaging; and, the health-provider organization.

3.1. Key to Quotations from the Transcripts:

Number of transcript	=	first number in code
Line in transcripts	=	second number in code
[ ]	=	some text has been removed to maintain sense of the chosen quote
xxx	=	some text has been removed to maintain confidentiality of names and places

3.2. Legislation and Guidance

The data provided a description of how individual organizations managed their waste collections and how in some cases private and public organizations were working together in some small ways.

The majority of organizations had issues with space management (even in office based rather than health care institutions). They also described difficulties in providing clear up-to-date information which was relevant and delivered in a form that was appropriate to the needs of different groups. In addition there were general issues with the location of bins and the removal of waste. However the sense of urgency to get to grips with the problem was apparent across the data:

> *… organizations know they've got to take this agenda seriously. But there are still elements, I think there are still, we know we've got to take this agenda seriously but we're still working in the old ways 18:196*

Interviewees were concerned with the vagueness of what constituted clinical waste. There appeared to be tensions between infection control guidance and waste management guidance, the former concerned with protecting patients and the latter with health and safety at work:

> *I think having a clear definition of what clinical waste is would help. ……. We got the regulations that were broken down into hazardous, infective, non-infective, clinical – all these different terminologies. And that's just recently been revised. It would say things like, bodily fluids from a non-infective patient, but how do you know somebody is non-infective, because as infection control practitioners we would always advise that all bodily fluids be treated as potentially infectious by nature.15:95*

The problems with definition were compounded by inconsistent approaches:

> *I mean one of the fundamental weaknesses here is that we haven't had a consistent or coordinated approach to waste for the organization which, considering the size of our organization, is a bit of a travesty, really.4:288*

It was suggested that these two interest groups (infection control and waste departments) tended to work in silos meaning that staff received conflicting advice. It was apparent from the interviewees in advice provider organizations that 'good NHS Hospitals' were those who had invested in environment/waste committees which included a range of staff and provided on-site immediate advice on how to manage specific items of waste and were thus able to respond quickly when staff needed help to make changes at department and unit level. It was suggested that hospitals that had made those investments made sufficient savings in reduction in waste produced to make them financially viable:

> *The good Trusts* (Hospitals) *are very good but there is a gap, there are those Trusts that monitor legislation and appliance across everything, not just environment, and you'll see them moving with the times. And there are those that are probably still back in the days of Crown immunity and what we're seeing is the gap between the good ones and the bad ones opening up. The good ones continue to progress with the changes in legislation, the increasing dependence or drive for sustainability. So their procedures are continually improving, they're doing more and more and they're building on their past successes. 5.533*

3.3. Procurement and Manufacturing

Many of the interviewees raised the problem of the vast amount of packaging that equipment was wrapped in when it arrived at ward level. Managing cardboard and other packaging materials seemed to be a major issue amongst all the organizations involved in the study. Some organizations had

reduced the amount of products arriving on site by instigating a strict ordering system, only ordering what was necessary on an individual patient basis and managing a detailed stock control:

> *Some* (residential) *homes allow the pharmacists, the chemists, to re-order everything, and they will just tick every box and re-order, because obviously they're going to gain by that I would imagine. [ ] , because we actually control our stock. [ ] We have xxx quality support I think they're called, and they come and do an audit every so many months in every home, and they check if we're holding too much stock. [ ] l we're not buying them in. Again we're saving the NHS money, which again is our money. It's good practice anyway to do that and not to have too much stock. It's actually criminal, the amount of waste through drugs. It really is quite horrendous. I have, as a community nurse in my previous job, gone into homes, big homes, and they've had bags and bags and bags of dressings, and again they're not allowed to use them for anybody else. They just have to be thrown. It's shocking really.20:410*

When we asked interviewees about the types of waste they handled and the methods they used to dispose of it they focused on the packaging as a major issue. The types of waste created depended on the environment in which people were working. Many of the interviewees were office bound so they needed to manage, paper (both confidential and general), cardboard, plastics, foil and food waste. Health service providers, in addition to general waste, had to manage latex, polythene, linen, sharps, all of which might carry infectious material and then human tissue from operating theatres. However each item used at come wrapped in a variety of packaging materials:

> *Procedure packs without their sharps, of course, so dressings packs etc. Lots and lots of it is just boxes, packets, syringe packets from opening syringes. Because all of our syringes are single use and come singly wrapped. Lots of polythene, plastic, cardboard, loads and loads of stuff that you wouldn't classify as clinical waste normally. Huge boxes that equipment comes in. Lots of paper, masses and masses of paper, which we do separate mostly, and that goes as confidential waste* 14:144

Of note was that in the NHS staff felt the packaging issue was not in their control, that they were not able to influence policy to a level where manufacturers would be taken to task for unnecessary packaging:

> *I think it's out of our hands. If you had a word with one of the store people who obviously do the ordering and oversee the arrival of various items that are used in theatre and on ward, it's the way it's packed. It might come from abroad, and every box for a little piece of equipment that theatre might use, it's got a how to use manual. Every box has got one of those. So you're throwing the waste paper away. It's obviously never used, never looked at.16:286*

Yet there was a general feeling that in private healthcare organizations or small businesses there might be a possibility to negotiate with manufacturers or, if that had no effect, refusing to buy items with too much packaging:

> *If you are in an organization, in a large organization, sat there doing a task whether it's in a factory, in a hospital or whatever, that's producing a waste, your ability to influence reduction through procurement is almost nil. In a small organization, if you're a small business man, the cost of that affects you directly and you can directly influence procurement. You say, I'm gonna*

buy smaller packaging so I waste less, so it doesn't cost me any more. And you can go and do it. The bigger the organization, the harder that is to feed through unless you've got very, very good systems. 6:597

3.4. The Health Provider Organization

Apart from the difficulties in managing excess cardboard and other packaging materials, the interviewees identified areas of concerns about the buildings in which they worked and the way systems had been set up to manage waste. In the first instance staff were working in buildings which were no longer fit for purpose. New builds offered the possibility of incorporating a range of adaptations which might improve the storage and management of waste. In existing buildings as patient/client throughput increased, the resulting increase in activity increased the waste produced. This increased throughput created challenging problems relating to how they disposed of waste and where they could site bins to make sure, at minimum, rubbish was put in a bag even if it wasn't the correct color bag.

In both old and new buildings interviewees identified the lack of space for recycling or storage of waste. Lack of space meant that choices needed to be made about placement of bins. For example if there was only space for one bin in order to protect patients the one bin was designated clinical waste and all waste was put in that bin whether or not it was infected. This then had to be dealt with as clinical waste and therefore incurred unnecessary costs.

It's very hard to put systems in place in a lot of areas because we don't have the room. If you go into say an anesthetics room, which we would love to do some recycling in, there is no room to put any other bins. There's not room for what there is at the moment. Unfortunately a lot of our buildings are elderly. This one was built in the '60s, in '65 I think, so it was designed for a different time. And now they could do with more room, more storage, and that is an issue almost across the board, storage, you know, room and space to keep things. That is one of the biggest barriers to recycling and having correct bins in place.8:377

Even where there were bins, where they should be located remained an issue. If clinical waste bins were placed near to hand wash basins then paper towels would inevitably be put in them. With limited space and the need to maintain a clean environment for vulnerable patients sometimes choices had to be made between infection control and the reduction of clinical waste:

Placement is one thing, placement of bins. You wouldn't want a clinical waste bin next to a sink unless it was a special area which was dealing with people with a highly contagious disease. So placement is one thing and education is another.6:628

This issue of poor separation was not just related to space and location of bins, when we questioned those who were responsible for auditing the separation of waste they felt that as the definition of clinical waste had changed so had people's behavior about what to put in which bin:

I think clinical waste over the years, or the understanding of the concept of clinical waste has probably changed quite a lot. Because in the past you would put gloves and aprons in the yellow bags regardless. You'd put paper hand towels in the yellow bags, regardless. And again, in a previous working life we had yellow bags everywhere on the wards. We didn't have any

mixture. It was all yellow bags. The thought process behind that being, 'It's been on a ward. It's got to be clinical waste.'15:434

Yet when we discussed this with staff providing direct care in vulnerable areas they had no choice but to put aprons and gloves in clinical waste bag, there was no space for a range of different colored options:

We call things clinical waste that aren't and we do that for instance in our bathrooms because we have a lot of ladies who've just given birth and so we could get a lot of blood stains, domestic waste. So therefore we've identified our bathrooms, well our two bathrooms, as clinical waste, even though most of what goes into that bag is not clinical waste at all. And you could say we put two bins in there but the toilet here is like three foot square and there's no room for the bin it's got, let alone a second one. 14:120

4. Discussion and Conclusions

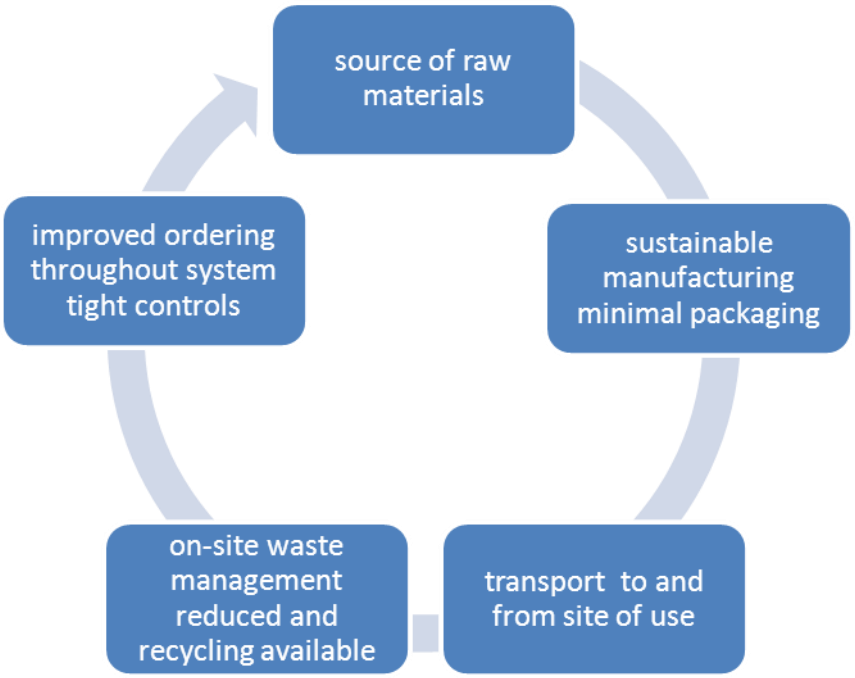
Deciding how to manage the disposal of healthcare waste in a system which is functioning to capacity presents a range of issues. Over-packaging and lack of space, the location of bins and the high turnover of patients create pressures on the health care system and individual staff members. In this study staff were fully aware of the need to reduce packaging, re-use items where possible, and send waste for recycling, they did so at home, but at work competing pressures meant that waste disposal was not a priority. The results from the systematic review found that people who recycle at home are more likely to recycle at work [3], however our interviewees suggested this was only possible when it was easy to do so. This study has highlighted some of the difficulties which prevent them from separating waste at ward or unit level. The advice provided to the UK NHS on recycling of waste [7] needs to take in to account the pressures at ward level and provide more innovative methods of separation which require little effort or space but enable staff to manage waste effectively.

The Audit Commission report [8] which provides an account of the UK NHS response to sustainable procurement comments '*Many processes known to reduce procurement costs such as consolidating orders and invoices, rationalizing the supplier base and reducing the number of different makes of products are still not being taken up by many Trusts'*. This interview study data confirms the findings of the Audit Commission report and further describes the particular issues which staff have to manage at ward level. Ordering needs further rationalization and manufacturers need to be challenged to explain why individual items need to be packaged to such a degree that the amount of waste produced far exceeds the size of the item being used.

The range of issues raised by this interview study is complex and calls for leadership commitment but also the need to hear staff on the frontline who are working in often very challenging situations. Space, lack of coordination between infection control and waste management and time pressures prevent them from fully adopting a change in practice. We have identified manufacturing and procurement as a starting point for relieving the pressures at ward level. Reducing packaging would free storage space and create more space for patient care. Diagram 1 describes this pathway. There is a need for a flow of information from staff to legislators which will enable constant evaluation of the systems in place to manage waste. In order to achieve sharing of information there needs to be local collaboration across organizations based on enabling the three R's to become imbedded into organization's practice.

The pathway tracks the stages involved in reduction of packaging: 1) the source of raw materials for manufacture should be focused on sustainable products, only using what is necessary for the product; 2) minimal packaging of items would allow economies of scale; 3) transport throughout production and delivery focused on minimizing trips, and sourcing products closer to home; 4) on-site waste management will reduce if there is a reduction in packaging; 5) tightly controlled ordering and procurement systems will drive down costs as customers insist on products which have minimal packaging. The whole system should be constantly monitored and evaluated so that minimum levels of procurement and packaging are maintained.

Diagram 1. A Sustainable Procurement Pathway.



Government and non-governmental organizations have developed a range of guidelines and policies to both tackle climate change and create a more sustainable health service [9-10]. There are many organizations working to audit and monitor how this legislation is put into place and financial savings because of these changes have been significant. What this study adds is an in-depth understanding of the problems and difficulties created by the systems that are designed to help dispose of healthcare waste effectively and efficiently. All the participants were aware of how things could improve so the first stage in a behavior change approach is in place. What is needed now is to work with manufacturers, to change attitudes and practices and to listen to staff about what is and what is not possible.

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Conflict of Interest

The authors declare no conflict of interest.

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