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Sustainable Practice and Behaviour Change in Healthcare Waste Management: A Review of the Literature

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Abstract: The management of waste within the United Kingdom National Health Service (NHS) has considerable real and potential costs in both financial and environmental terms. Despite discussion within the literature and the publication of strategies to address these costs little evidence is found of attempts to implement a reduce, reuse, recycle philosophy in NHS waste management. This paper will discusses the findings of a literature review on waste management and behavioural change approaches which might aid the implementation of a reduce, reuse, recycle philosophy in waste management within healthcare settings.

Keywords: waste management; behaviour change; sustainability; healthcare.

1. Introduction

The disposal of clinical waste is costly to the National Health Service (NHS), with Hutchins and White [1], finding that in 2005 its disposal cost £73m. Therefore during times of increasingly restricted healthcare budgets, it is of growing concern that much of the clinical waste generated in the NHS is potentially recyclable and could thus contribute to cost savings, but in reality little evidence of effective recycling is found [1]. Plans and strategies have been proposed, such as Waste Not, Want Not – A Strategy for Tackling Waste Production in England (2002) [2] aiming to reduce dependence on costly forms of waste disposal such as landfill or incineration, and to enhance sustainability whilst reducing the environmental impact of the NHS, but arguably these plans and strategies have as yet failed to embrace or implement a reduce, reuse, recycle philosophy in NHS waste management.

The NHS produces large volumes of waste, Scotland alone generates over 45,000 tons of waste annually, of this 15,000 tons consists of clinical waste requiring expensive disposal methods [2, 3, and 4]. Not only is this costly to dispose of but it is also damaging to the environment. Climate change is a "new front for health" [5 p205] and strategies are needed to address the consequences of unsustainable consumption and climate change [6, 7, 8 and 9]. Attempts to reduce waste generation in the NHS and its disposal to landfill are likely to be welcome due to the lack of potential landfill sites and their impact on human health and climate change, for example through methane emissions [2]. Examples of good practice in addressing sustainability and climate change are found within the NHS. For example, Cornwall Primary Care Trust has taken some action in addressing sustainable waste management [10]. However, such instances remain comparatively rare and it has been argued that organisations currently responsible for commissioning and providing healthcare services in the United Kingdom (UK) such as Strategic Health Authorities and Primary Care Trusts have not fully considered the impacts of climate change or developed strategies aimed at promoting resilient and sustainable communities [11, 12]. It is also arguably unclear how recent changes in UK health policy may impact upon this situation in the future, but it could be suggested that recent changes in UK health policy may offer an opportunity to integrate waste and recycling into a broader sustainability strategy.

It could also be suggested that the strict control and policing of waste disposal in the UK might dampen any enthusiasm to implement a reduce, reuse, recycle philosophy in NHS waste management. The management, storage, carriage, treatment and disposal of healthcare waste in the UK is well controlled and falls within a range of European Union (EU) and UK legislation, regulation and guidance [13]. Healthcare organisations that might be tempted to make changes in their waste management services and strategies will be mindful of the risk of litigation if they fail to comply with relevant legislation and regulation.

In addition to legal considerations, ethical issues associated with the management of clinical waste have also been discussed. Moszczynski [14] argues that three discrete topics require exploration – that of patient consent to the use or reuse of recycled or reprocessed items in their care; financial responsibility in regard to healthcare organisations demonstrating their sound use of resources; and environmental governance in regard to the reduction of waste management practices that may be ecologically damaging, such as incineration or disposal to landfill sites.

The literature indicates that more could be done in practice to reduce the volumes of waste generated in the NHS, and that the safe reduction in volume, reuse and recycling of waste would

contribute to achieving this aim [1, 15]. By safely, lawfully and ethically reducing volumes of waste, the costs associated with its disposal could be significantly reduced, thus releasing funds that could be spent on direct patient care.

2. Methods

This paper will discuss the findings of a literature review which focused on waste management and behavioural approaches which might aid the implementation of a reduce, reuse, recycle philosophy in waste management within healthcare settings. Searches were conducted via a range of healthcare and psychology related databases. During July and August 2010 the following databases were searched: Pubmed, Medline, CINAHL, AMED, ASSIA, IBSS and EBSCO, ISI Web of Knowledge, PsycINFO, SwetsWise, PsyARTICLES and ScienceDirect. These searches focused upon papers published between 2000 and 2010.

Search terms used included - Clinical Waste, Health and Healthcare Waste, Hazardous Waste, Sharps Waste, Waste Disposal, Waste Management, Recycle, Re-use, Reduce, Sustainability, Behaviour, Behaviour Change, Health, Healthcare, Health Care.

Criteria for papers to be included in the literature review were -

Papers published since 2000, UK legislation, policies and guidance on clinical waste management.

Papers published in English.

Papers reporting process and costs of healthcare/clinical waste management in UK.

Papers reporting waste management and recycling behaviour in clinical healthcare settings in the UK and other countries.

Papers focusing on methods of changing behaviour in waste management / recycling in clinical healthcare settings in the UK and other countries.

Papers were excluded from the literature review if they were -

Editorials, letters and conference abstracts, news articles, non-English language papers or papers published before 2000.

3. Results and Discussion

Gaiser et al [16] found that cost savings could potentially be made through changing the waste disposal practices within a hospital anaesthesia department. In their 6 month study, Gaiser et al [16] redirected glass waste generated by the anaesthesia department away from the disposal routes previously used and instead collected and weighed the glass waste indicating that savings could be made by the safe collection, segregation and recycling of glass waste. These findings appear to support those of Hutchins & White [1], whose audit of waste produced by 6 hospital operating theatres estimated that recycling of anaesthetic waste within the hospital could save approximately £21,000 annually. Hutchins and White's [1] data also suggest that clinical anaesthesia accounts for 10000 - 20000 tonnes of NHS solid waste annually, and go on to argue that ways to reduce, reuse and recycle waste may be hindered by social, institutional and legal barriers to changing waste management behaviour.

Other studies have also shown potential for increased recycling of plastic waste within healthcare settings. Lee et al [17] investigated five American hospitals and found that areas such as hospital

cafeterias produce considerable volumes of plastic waste that may be suitable for recycling. The findings of Lee et al [17] highlight that different policies may be needed in different areas. Clearly, in clinical areas caution should be taken when considering the recycling of any materials that may be contaminated, potentially infectious or hazardous to health and action taken to ensure that waste is segregated and managed lawfully and safely [17].

Studies have also discussed the use of interventions intended to reduce volumes of waste generated. Interventions used include compulsory staff training, colour coding of waste bins, reducing the size of clinical waste bins and providing extra bins dedicated to the recycling of plastic, cardboard and paper [18, 19]. These interventions intended to facilitate waste reduction by changing staff attitudes and behaviour related to waste. It is suggested that clear systems of labeling, categorisation and segregation of waste will enable increased recycling [17].

In addition to the use of compulsory staff training, other studies have drawn upon the use of active staff involvement, motivated and committed individuals or groups, and the support of senior managers in achieving changes in the way that waste is managed [17, 19]. The literature also identified gaps between the intended and actual behaviour of healthcare employees towards the environment in general and recycling in particular [10, 19, 20, and 21]. Barriers and enablers to recycling behaviour were found to be both institutional (the importance given to recycling behaviour at an 'organisational' level) and individual (attitudes, beliefs and motivation). Similar organisational barriers were also identified in a study of waste management within 5 European hospitals [23]. This study revealed problems within the hospitals relating to their definition and segregation of waste and advocated regular review of the hospitals waste management systems [23].

Audit has also been used as a means to investigate waste management in healthcare. Dettenkofer et al [24] carried out an audit using a checklist based on the European Eco-Management and Audit Scheme. This audit highlighted the economic benefits of environmental management and provided a checklist for environmental behaviours within hospitals. However Dettenkofer et al [24] also point to the limitations of hospital environmental audit tools, for example their cost implications in data collection, and the problem of sustaining a corporate 'ecology identity' which enables changes in behaviour at both organisational and individual levels when staff turnover may be high.

Systems approaches such as Hazard Analysis Critical Control Point (HACCP) have been used to highlight where changes in waste management could be made e.g. within endoscopy units [25]. Other approaches include that of Karlsson & Ohman [26] who measured the carbon footprints of products used in healthcare, highlighting those products with the greatest carbon footprint produced during their lifetime, including the products manufacture, use and final disposal as waste. Similar approaches such as life-cycle thinking [27, 28, and 29] have been proposed. Life-cycle thinking assesses a product's overall impact on the environment throughout its production and existence, not just the impact of its disposal following use [27]. Kaiser et al [27] argue that life-cycle thinking may be effectively implemented through environmental education of employees in combination with specialist environmental staff employed to manage the waste system. Holistic approaches such as life-cycle thinking could arguably enable desirable changes in waste management within healthcare [29].

Environmental purchasing is another method of using a life-cycle approach to assess the environmental impact of healthcare products and services [27]. Such an approach could enable negotiation with product suppliers leading to the purchase of environmentally friendly products.

Through shrewd, well informed purchasing, healthcare products that potentially contribute to a greater carbon footprint could be replaced by lower emitting products. All of these approaches suggest that some form of behaviour change at an organisational level in regard to waste strategies - including the decisions and choices made regarding initial purchasing of products, - may have a positive impact in implementing a reduce, reuse, recycle philosophy within healthcare settings.

As discussed by Lee et al [17], Gaiser et al [16] and Hutchins & White [1], the literature highlights a need to identify opportunities for greater local recycling within hospitals to reduce volumes of waste requiring expensive and potentially ecologically damaging disposal [30, 31 and 32]. Examples of recyclable products are provided, such as blue sterile wrapping [33] and building materials that may be reused when hospitals are demolished [34]. Again it can be argued that the success of actions such as this will require individual and organisational behaviour change. Moore [31] argues that hospitals have a responsibility to put procedures in place that will enable employees' behaviour to become pro-environmental. For example more efficient segregation of waste can only be achieved if employees have appropriate methods put in place to enable them to do this.

The engagement of all healthcare workers is essential in efforts to reduce the effects of healthcare on climate change. However, some argue that nurses in particular should be at the forefront of these efforts [31, 35].

Harris et al [35] argue that nurses are essential for the successful implementation of waste management measures, and provide examples of ways in which nurses have contributed to aspects of water conservation and the use of mercury free products. However, it could be contended that all healthcare employees need procedures to be established by their employing organisation that allow them to make a contribution, for example through explicit targets for waste segregation, reduction and recycling [31]. Coller & Grunseth [32] provide an example of a successful group of employees dedicated to making changes to their hospital; this team effectively dealt with issues such as recycling and reducing waste. Examples such as these demonstrate how champions and early adopters supported by strong leadership could take forward initiatives and encourage others to change behaviour [34, 36].

The argument in favour of increasing the contribution of healthcare workers in sustainable practice is supported by the findings of Melamed & Jackson [37] and Mohan et al [38] who suggest that an effective strategy for promoting greener hospitals is to give nurses and doctors a more active role. Actions that might contribute to this include recycling while at work, developing plans to reduce, reuse and recycle waste and the procurement of environmentally friendly products.

Of course not all staff may want to adopt the kind of active roles described by Melamed & Jackson [37] and Mohan et al [38]. Topf [39] examined the psychological motivators underpinning hospital employees' unwillingness to become pro-environmental and found factors such as individual denial and groupthink lead to employees' indifference to making hospitals 'greener'. Topf [39] provides a conceptual model to change behaviour and promote pro-environmental behaviour that could be implemented and evaluated. Essentially, Topf [39] discusses readiness to change and proposes forced compliance through institutional or Governmental policies to be accompanied by the removal of situational barriers to environmental practices in order to achieve success. A factor in Topf's [39] model - 'Instruction in Green Practices' enhances environmental behaviour, and provides staff with greater control over their environment, thus promoting person-environment congruence.

From a control of infection point of view it might be argued that any pro environmental behaviour, particularly in regard to healthcare waste, would have to be carried out within the requirements of the law, the prevention of infection and the maintenance of safety. These concerns may be particularly significant when considering the reprocessing and reuse of medical devices. However, initiatives involving reprocessing, where a used, reusable or single use device goes through a process to become ready again for patient use have been carried out, thus reducing volumes of waste generated and saving money. Although there have been concerns about contamination occurring, Kwakye et al. [40] show that this procedure has a reliable safety record. However Kwakye et al. [40] fail to suggest ways to make this more acceptable to and increase its use amongst healthcare professionals, or to address the potential legal problems associated with the reuse of medical devices.

Climate change, dwindling resources and waste are a challenge for individuals and organisations alike. This paper set out to review the literature discussing behaviour change approaches to waste management within healthcare organisations; differing approaches to the implementation of behaviour change were seen. These ranged from changes to healthcare environments, procurement and purchasing behaviour to education and awareness raising. These approaches demonstrate the need for top-down approaches and behaviour change in implementing pro – environmental, sustainable waste management. These need to be complemented by bottom-up approaches that consult the expertise of staff on the ground and take their working practices and pressures into account. The literature emphasised the importance of making sustainability information salient and accessible in order to change behaviour. Behaviour change needs to be supported at all levels, from senior managers to clinical personnel and support staff. Clearly, more research is needed to assess the actions some healthcare organisations are taking and to test new strategies. Future research should learn from previous empirical work and use process and effect evaluations including objective outcome measures that circumvent issues of social desirability and experimenter bias. Including behaviour change explicitly in holistic waste management strategies could have large benefits for the environment, and reduce healthcare costs considerably. Moreover, behaviour change has the potential to be generalised beyond the targeted issue and spill over into other domains of life.

4. Conclusions

The literature indicates the need for an understanding of the mindset of individuals, including knowledge of their values, attitudes, norms and behaviours in order to enable a positive response to change [41]. Healthcare workers that reported recycling behaviour at home were also more likely to report recycling at work. Such reports were influenced by underlying attitudes and beliefs about the environment. However, these self-reports of behaviour did not necessarily translate into actual behaviour when measured through observation and closer analysis. Suggestions for means of implementing behaviour change at an organisational level include management training and staff development, with an emphasis on cost-savings, increased communication about recycling and environmental issues. Behaviour change theories have great potential to provide a framework of achieving constructive changes in waste management. Further research is needed, specifically on the views of stakeholders responsible for the safe management of waste. It is imperative that an understanding is gained of their attitudes, behaviour, knowledge and practice regarding waste and the

234 possibility of applying a reduce, reuse, recycle philosophy in its management, underpinned by
235 behaviour change theories.

236 **Conflict of Interest**

237 The authors declare no conflict of interest.

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