Physical space and its impact on waste management in the neonatal care setting

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Abstract

This paper reports an investigation intended to obtain some understanding of how the working environment might influence the practice and knowledge of those involved in the management of healthcare waste. The National Health Service (NHS) has a continuing waste problem, and the way it manages waste harms the environment and consumes resources. It has been estimated that the carbon footprint of the NHS in England is approximately 20 million tons of CO₂e. It has been suggested that better waste segregation could lead to more effective recycling, saving up to 42,000 tonnes of CO₂. This qualitative study employed non-participant observation and semi-structured interviews. The interviews were carried out with the key informants within the participating neonatal intensive care unit. Findings from this study indicate that space and the physical arrangement of the environment are significant and influential factors in clinical practice. Where the clinical environment is not supportive, poor infection control and waste management practice is likely to occur. However, proximity of staff caused by a lack of physical space might facilitate situated learning and a collective development of knowledge in practice. The implementation of sustainable waste management practices would be more likely to succeed in an environment that facilitates correct waste segregation.

Introduction

The National Health Service (NHS) has a continuing waste problem and the way the organisation manages its waste harms the environment and consumes resources. It has been estimated that the carbon footprint of the NHS in England alone is in the region of 20 million tons of CO₂e (NHS Sustainable Development Unit (SDU), 2012), and while much of this carbon footprint stems from travel, energy consumption and procurement, a significant contribution is made by the management of waste (NHS SDU, 2009). The problem has been recognised by

the Department of Health (DH, 2013) and their guidance acknowledges the need to reduce the impacts caused by NHS carbon production.

In 2007/08 the NHS Sustainable Development Unit found that quantities of healthcare waste in the NHS had continued to grow and that its management cost the NHS £71.2 million. In recent years, growing concern about infection risk has contributed to increasing amounts of disposable, single use items and their packaging being disposed of as clinical waste. Much of this waste is incinerated although a portion of it may potentially be recyclable. This problem of course is not exclusive to the United Kingdom (UK), and similar experiences have been reported elsewhere. For example, Chung and Meltzer (2009) suggested that healthcare in the United States (US) contributed 8% of all US greenhouse gas emissions and 7% of US CO₂ emissions. A proportion of these emissions are created by the generation, management and disposal of healthcare waste. Kaplan et al (2012) found that US health services generated over 6.5 thousand metric tons of waste each day, with large portions of this being transported to and disposed of in landfills or by incineration (Lee et al, 2002). It has also been suggested that as much as 85% of healthcare waste is non-hazardous (Kaplan et al, 2012) and may have been incorrectly, and expensively, disposed of as clinical waste as a result of problems with, for example, waste segregation. Within the NHS in England and Wales it has been calculated that more correct and efficient waste segregation could lead to more effective recycling, for example of paper, newspapers and cardboard, thus saving up to 42,000 tonnes of CO₂ (NHS SDU, 2009).

By safely, lawfully and ethically reducing volumes of healthcare waste, the costs associated with its disposal could be significantly reduced. Arguably, healthcare waste could be managed in a more sustainable fashion by employing a reduce, reuse, recycle (3R) philosophy, thus reducing costs and releasing funds that could be invested in patient care.

Preceding this current study, Nichols et al (2013) carried out an interview study exploring the attitudes, beliefs, behaviour and knowledge of individuals involved in the waste management

process and their views on the viability of applying a 3R philosophy to its management in healthcare settings. This study concluded that sustainable healthcare waste management was desirable from both environmental and financial perspectives, and that further investigation should be carried out into the role of informal learning within practice and the significance of the clinical, working environment in facilitating sustainable healthcare waste management (Nichols et al, 2013).

The current paper reports the findings of an investigation situated in an acute clinical setting which intended to identify some understanding of ways in which the working environment might influence the behaviour, knowledge and practice of those involved in the generation, management and disposal of healthcare waste. This understanding may then be built upon in order to inform further research and contribute to the healthcare waste management agenda.

Methods

Setting

The site of the empirical research was a busy neonatal intensive care unit (NNU) within a UK district general hospital. The site was selected because it contained a relatively stable population of staff, which would allow continuity of data gathering. The nature of the work carried out within the unit exposed staff, patients and visitors to infection risk related to waste management, and managing this risk would require research participants to demonstrate their infection control knowledge, beliefs, behaviours and attitudes.

Ethics

All staff based within the unit and the parents/visitors of neonates cared for on the unit were provided with written information about the project. Guiding principles for designing and carrying out research were adhered to, and these included 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). Written consent was obtained from research participants only after they had had the opportunity to consider the written information and question members of the research team. Patients, their carers or families were not involved in the research, but due to the involvement of NHS staff the approval and guidance of the local NHS Research Ethics Committee was obtained.

Observational method

A total of 11 visits were made to the NNU beginning in January 2013 and ending in May 2013. Of these, eight visits were used for non-participant observation of research participants. These visits took around four hours, during which time two research participants were observed individually and consecutively in practice, each for two hours. In total 16 participants were observed in practice. Participants were purposively sampled to obtain a breadth and depth of knowledge and opinion from staff employed on the unit. Participants were recruited from domestic, medical and nursing staff. Empirical data was gathered through the use of non-participant observation of research participants within clinical practice, with follow-up semi-structured interviews carried out with key informants. The observational study was conducted with the intention of monitoring the generation and management of waste within the clinical setting. The primary purpose of the observation was to witness the inter-relationships and practices of people in a clinical environment. It was important to remember that the researcher might have affected the behaviour of the people observed because of his/her presence and this was reflected upon during the process of observation and during analysis of the results (Alvesson and Skoldberg, 2000). Follow-up interviews were intended to enable further investigation of themes, notions and questions identified during the observational phase.

Interview method

Following the observational visits, three further visits to the NNU took place, during which six semi-structured interviews with key informants recruited from the medical and nursing staff based within the NNU were carried out, in private, on the neonatal unit; each interview typically took around 40 minutes. Interviews explored participants' attitudes, beliefs, behaviour and knowledge about their working environment, and its impacts (if any) on healthcare waste management. A topic guide was developed to facilitate the interview process.

Analysis method

Field notes, observations and interviews were digitally recorded and then transcribed in an electronic format and analysed using qualitative data analysis software. Thematic content analysis (Mays et al, 2005) was conducted in order to identify issues that emerged from the data. Similar thematic analysis methods have been successfully used previously (Richardson et al, 2008; Nichols et al, 2013). The field notes included recordings, quotes, ideas, impressions, behaviours and a chronology of events. The data were then sorted into codes and categories (Creswell, 1998). Rigour was ensured through a continuous, conscious and critical approach to the research design, its application, and its means of collecting, interpreting and communicating data and research findings.

Results

Segregation of waste

Very shortly after commencing observation within the NNU problems were apparent in the segregation of waste. Typically, only one type of waste bin/stream was available within nurseries in which neonates were cared for, i.e. yellow and black striped waste bags indicating their use for offensive/hygiene waste such as human hygiene waste, sanitary waste and disposable personal protective equipment (PPE) that is not classified as clinical waste (DH, 2013). As a result of only this single waste stream being available within nurseries, the majority of waste, with the exclusion of sharps, pharmaceutical and cytotoxic waste, was disposed of via the yellow and black striped/offensive waste stream:

Participant (P): "It's because ideally I think the waste services would like us to have one of each but we haven't got the space to have one of each bins, but I think that's what really we should have, a choice of bin, one beside the other."

This lack of segregation was a theme identified by all participants and was a continuing phenomenon observed within the clinical areas of the NNU and throughout the duration of the study. It commonly resulted in inappropriate disposal of waste that was not compliant with local or national waste management policy, guidance and legislation (DH, 2013) as indicated by the recorded observation below:

Observer (O): "So that's another inappropriate disposal event, nothing at all that's visibly contaminated, it's all paper towels and gloves, which has gone into the waste bin, the yellow and black stripe bag, and the fact that the bin lid appears to be jammed open is quite useful because you can look into it and see that there's an absence of clinical waste or any of the sanpro waste that's supposed to be going in it."

The observed inability to segregate waste was again claimed by all participants to be caused by a lack of space within the unit in which to locate alternative bins and make alternative waste streams available to staff. This lack of space within the clinical environment appeared to

have a significant impact on the practice of the NNU staff. As indicated in the recorded observation below:

O: *"It's becoming more and more obvious that space is a major issue in this place and it's having an impact on how they can manage their waste and how they manage their workload generally. (Name of participant), I just saw she was looking for somewhere that she could rest a set of notes so that she could do some writing in the notes, there's nowhere available for her and the only place that she could find a flat surface that she could actually write on the notes is on the baby weighing scales."*

The issue of a lack of space within the NNU and its impact on the ability of the staff to carry out their work correctly and effectively was a recurrent theme and issue identified by participants. However, despite lacking space and the facilities to manage waste as required by policy, guidance and legislation, it was clear that all but one of the participants did have some knowledge of correct waste management behaviour, were aware of failings within the NNU and were motivated to make positive changes where possible as suggested in the following:

P: *"Think we need a small black, a small yellow bin maybe on the wall."*

P: *"If there's hardly any clinical waste we don't really need a big clinical waste bin do we?"*

Handwashing and infection control

Similar to the experience relating to waste management, knowledge of safe and fundamental infection control practices such as hand washing was also demonstrated by participants, although again there was some evidence of compromise caused by a lack of space within the clinical environment. This was highlighted in the following recorded observation of medical staff preparing and inserting a venous long line into a neonate:

O: *"This issue about the amount of space that's available, the medical staff getting stuff ready for the long line, very little room to manoeuvre and they were juggling around chairs and around bins to try and find space and then eventually when the trolley was ready and had to go into the patient's bed space they had to lift a stool which was adjacent to the patient's bed for parents to sit on, and lift that over the aseptic field for the long line, which I don't think is ideal practice."*

Regardless of the perceived lack of space within the NNU and compromises caused by it, good examples of infection control practice were observed and recorded, for example:

O: *"Just something worth noting is the amount of information on walls and in all these different nurseries, it's not difficult to find written information on hand decontamination, you've got the five moments of hand hygiene, there's also information on how to manage sharps, that's all available and there's also needle stick and contamination injury information, that's all very easy to find."*

However, evidence gained from observation suggests that some good practice associated with hand washing, for example, may have had an adverse impact on waste management practice within the NNU as indicated in the following observation of a nurse decontaminating her hands after an episode of patient care:

O: *"Hand decontamination absolutely as per regulations and all of the waste is got rid of but again it's an incorrect disposal event, there's perfectly clean uncontaminated packaging going into the*

yellow and black striped waste bin again because there just is no other option available."

The above arguably suggests that good practice, for example in hand washing, may result in poor practice, in waste segregation, as a consequence of limited physical space in which to offer alternative waste streams and a less than supportive environment in which to practise. Such issues identified during the non-participant observational phase of the research were raised again during follow-up interviews with participants. These interviews are discussed below.

The issue of limitations with regard to waste management was a persistent theme raised by all participants:

P1: *"There's only one bin in each room so everything goes in the one bin regardless because you haven't got time to run around and find a different one, with the exception is that there is, in the lab, which is quite a little walk, and outpatients, where we would discard like the blood transfusion bags and things like that."*

However, interviews also provided evidence that participants were aware of the need to segregate waste correctly and some of the potential cost implications of failing to do so, for example:

P5: *"I don't think that people have the opportunity to put waste in the correct bins because there is no extra bin, so everything goes into the most expensive bins that we have, even if it's like a paper towel."*

Interviews also provided evidence that participants were interested in and motivated to change their existing waste management practices, if given the opportunity:

P3: *"I think there's a lot of unnecessary waste. Well if we could segregate I'm sure we would, if we had the space to then we would, but as you've witnessed you can't put more than one bin in the area."*

The issue of a lack of space in which to practise was a constant theme raised by all participants during both observation and interview. Participants claimed that a lack of space within their clinical environment also impacted upon other fundamental areas of infection prevention and control:

P2: *"There isn't enough space, I know when they did the infection control... they came up with a tape measure and showed how much room we should have ideally and it's nowhere near, what little room we've got."*

Evidence was also found of an acknowledgement by participants that the environment in which they were working might have an impact of infection risk:

P3: *"I hope that one day somebody will recognise the fact that the space is probably a big contributing factor to our infections."*

Few positives associated with a lack of space were claimed by participants. Nonetheless, there was evidence to suggest that proximity to colleagues might enable the observation and challenging of poor practice and the encouragement and reinforcement of good practice:

P5: *"Well the thing about being close to people they can't get away with anything can they, we notice."*

Discussion

Evidence gained during both observation of, and interviews with, participants indicates very clearly that the working environment had a

significant impact on practice within the NNU. Lack of space in which to work was a continuing theme raised by participants and this phenomenon was also seen during the non-participant observation phase of the research. This is disappointing from an infection prevention and control point of view as evidence in the literature suggests that crowded NNUs that lack basic facilities, such as in waste management or hand hygiene, may have raised infection rates (Goldmann et al, 1981; Von Dolinger de Brito et al, 2007).

The findings from this study also support the argument that space and the physical arrangement of the environment are significant and influential factors in clinical practice (Allermann Beck et al, 2009; Gooding et al, 2011; Nichols et al, 2013). This is ably demonstrated by the virtual absence of segregation of waste within the NNU unit. Arguably, this absence was not caused by a lack of knowledge or motivation on behalf of the staff of the NNU, but was primarily caused by a lack of alternative waste streams within the NNU, thus obliging staff to dispose of their waste within the one waste stream commonly available to them. The lack of alternatives was itself seen to be caused by a deficiency of space in which to site alternative waste streams and bins. Evidence also suggests that hand washing and asepsis may also have been adversely impacted upon by the lack of space within the NNU. Enabling access to adequate hand decontamination facilities is well established and well documented good practice (Warren and Kollef, 2005).

It must be acknowledged that this investigation was sited in one clinical area, and it would be unreasonable to attempt to generalise based upon the evidence gained from an investigation that took place in what may have been a clinical setting that had an atypical lack of space in which to practise and manage waste. This should be recognised as a limitation of the investigation. It has been difficult to convey in words just how crowded the NNU was and how space was at a premium in practice. The site of the empirical research may have been atypically restricted in terms of space but it could also be argued that many other clinical areas within healthcare organisations may similarly lack space and may experience similar problems in managing and segregating their waste.

There are some positives that may be drawn from this investigation. Despite finding themselves in what they felt was a less than ideal working environment, evidence suggested that participants were knowledgeable about the standards of practice that they should be aiming to achieve. They also demonstrated their motivation in achieving them and changing practice if opportunities to do so were available, for example in waste segregation. Furthermore, evidence gained during interviews suggested that proximity of staff caused by a lack of physical space might to some extent facilitate situated, tacit learning and a collective development of knowledge in practice (Nonaka et al, 2000; Wenger, 2000; Nichols and Badger, 2008). This may provide an opportunity for further investigation and exploitation as a means of generating knowledge and improving practice.

Conclusion

The literature suggests that the way healthcare organisations manage their waste is often expensive, wasteful and polluting (Chung and Meltzer, 2009; Kaplan et al, 2012). Evidence gained in this investigation supports this suggestion, finding a lack of segregation of waste in practice, thus contributing to uncontaminated and domestic waste being routinely directed into the offensive/hygiene waste stream, which is more costly to dispose of. This supports the argument of Kaplan et al (2012) that much healthcare waste is incorrectly and expensively disposed of as a result of poor segregation.

It is clear that where the clinical environment is not supportive, poor infection prevention and control and waste management practice is likely to occur. Furthermore, any attempt to implement sustainable waste management practices, for example through the implementation of a 3R policy, must be based upon the foundation of an environment that facilitates and supports correct waste segregation.

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